

## Minutes for the Plan meeting of 4 Jan 2017

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### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov : offset not yet fixed (to be done later with mechanical), but new data taken for E & H plane -- looks ok; to do cross-polar measurements.

21 Dec : plans for correcting the offset -- next Monday 26th.; meanwhile, earlier data has been given to SC and he will produce an updated result for band-4 within the next week.

====> test range activity planned for 9 Jan.

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

====> will be completed by 6 Jan.

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

====> awaiting feedback

(ii) need to cross-check mismatch of values for band-3 (250-500);

30 Nov : will check and update, including referring to some existing literature

21 Dec : some work has been done, but needs an internal cross-check & then discussion.

(iii) need to see if QH losses have been incorporated into the calculations;

30 Nov : GP has done some of the work; need to circulate and get agreement.

(iv) does the study cover all the uGMRT bands.

30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.

16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.

21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in Tsys) -- TBC.

(iv) can it be extended to deriving the final beam pattern for feed + antenna

This is being looked into

21 Dec : first version doc has been sent by SC -- needs follow-up

====> feedback awaited on this item.

1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document

30 Nov : yet to be completed.

21 Dec : updated & internally circulated;

(ii) results from recent tests

30 Nov : running of tests has conflict with online system (JPK is looking into this)

21 Dec : all x30 Ae data collection leads to 'online' ssystem hanging; planning with x15 Ae (29Dec);

(iii) labeling scheme for keeping track of the units to be taken up for refinement and implementation

16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.

30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular back-up of the files to be worked out.

1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system

30 Nov : same as above

21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)

(ii) status of prototype for temp and power monitoring at OF rack at antenna base

16 Nov : sample data set taken but not long enough; to wait for next round of tests; prototype unit installed at C2 and connected to M&C system, but not being monitoring regularly; would like to do some more test and development before finalising the scheme.

30 Nov : (ii) is on-hold after prototype development.

1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares

30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.

====> 4 complete sets of spares available now (ready for installation at antenna)

(ii) finalisation of report by VBB

16 Nov : same status as last week.

30 Nov : report pending with SSK

====> no updates

1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs

30 Nov : some failed units are being retuned...

(ii) status of new 2-stage design installed on 2 antennas : working ok ?

30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.

(ii) status of new 3-stage design : optimisation of RL was being attempted

16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better than 10 dB across the band; Tlna ~ 20 K (by old noise comm calibration scheme); to try improve further, while assembling second unit.

30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna (2 units to be made ready).

21 Dec : 2 K improvement seen (< 20 K) ; report to be available in 1 week

====> second unit has been assembled; overlapping plots show good repeatability; report will be ready by 6 Jan.

1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB problem and W5 -- problem not identified); C14 showing poor deflection and falling

at high freq -- checked for pointing and OF attn, now to try changing the feed.  
====> results from tests on 13 Dec discussed : 21 antennas available; dip seen for L-band vanished after replacing common box (which antenna?), but unit appears to be ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2; W5 poor bandshape; C14 noise deflection discussed.

#### 1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring in control room

30 Nov : this is now available under the standard monitoring tools; control part has some problem and needs login to control PC -- SOP for this to be provided to control room.

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue;

#### 1.10 Mass production of Band-4 (550-900) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow; 12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.

30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity units are available).

21 Dec : 1 more week delay due to vendor's delay

====> hoods have arrived today; 12th antenna to be completed by 15-20 Jan.

## 2. RFI related :

### 2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting to be completed

30 Nov : YG + PAR to work on this final version.

(ii) study of RFI environment, including internally generated RFI in main building

30 Nov : tests of individual labs : with AC units and otherwise -- shows different labs in different light; agreed to identify the worst culprits by kind of equipment etc and provide an update.

(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests

16 Nov & 30 Nov & 21 Dec : no updates.

### 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database

(ii) response to pending requests for clearance e.g. Serum Institute...

21 Dec : awaiting call from Serum Institute for the next visit; asked all technical details of their planned equipments;

(iii) work out new action plan, given the current government policies

30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to their location for looking at specific instruments.

21 Dec : one site visited.

====> awaiting call for visit to site of the party

### 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters

30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems (they are the only one to have got license in this range) -- it is strong enough to cause saturation in spite of filter; need to find the specific towers and then follow-up with Reliance.

21 Dec : no updates.

### 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems

30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need to identify which make is coming finally.

21 Dec : no updates.

### ==> OTHER INPUTS :

==> 20W LED tubelight - procured x4 units; LED driver separated

==> in shielded box, they are RFI-wise acceptable;

==> RFI emission plots displayed : plots for 'driver-in-shielded-box' case

==> is exactly like 'power-completely-OFF' case;

==> Pictures displayed for shielded box housing drivers for x4 LED lamps;

==> has run successfully upto 10-m long cable between the driver box

==> and the LED lamps;

==> Scheme is suitable for labs;

==>

==> Ador UPS : 1+9 units; vendor modified x9 units;

==> tests carried out after fixing by vendor,

==> comparison plots showed (most RFI reduction at 50 MHz & 300 MHz)

==> x8 units tested so far - all x8 are OK

==>

==> laptop model identification of acceptable RFI emission :

==> measurements from RFI tests displayed;

==> discrete lines seen : 200-600 MHz strong radiation

==> -100 dBm level (at 3 m); earlier procured Toshiba model was

==> had similar emission (at 3 m distance)

## 3. Operations related :

### 3.1 Interfacing of FE with new M&C system :

(i) latest status of testing with Rabbit card in common box at antenna base

16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).

30 Nov : no new updates on this

21 Dec : antenna control part is working; FE monitoring still not working; Charu is looking into this...

(ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus

16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration

and testing in 2 weeks time and put on first antenna with RS-232 cable driving;  
later to convert that to ethernet over fibre; mass production may need only new  
plates to be made by workshop -- other aspects are in-house in FE lab.  
30 Nov : item also being discussed under FE agenda item (in alternate week)  
21 Dec : planned this week

### 3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery  
and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgetary quote; formal quote expected shortly.

====> folder cleared ; PO should be done shortly.

### 3.3 GMRT M&C system Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal  
meeting.

====> internal lab meeting held on 3 Jan (now every Tuesday)

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans

30 Nov : discussions ongoing; kick-off meeting planned.

21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery  
will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.

====> regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary'  
etc shared with TCS.

### 3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for  
material for review committee started

30 Nov : discussions and work ongoing, including preparations for discussions with  
TM review panel.

21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase :  
requirement compatibility; architecture explanation given; scalability etc; need many  
upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;

====> preparation of docs in progress; ph-2 work now beginning...

## 4. Back-ends related :

### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh  
paper needs to be looked into for revision; nothing really pending, except for the  
report on the attenuation values : new set of tests done and results look ok and  
will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed);  
may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?

====> To follow-up on GWB refereeing process.

### 4.2 Updates on existing GWB-3 system :

(i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;  
28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

====> no progress since last time.

(ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;  
for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be closed ?

14 Dec : problem perhaps in AIPS settings? matter can be closed?

21 Dec : no further updates on this.

====> to keep open for some time till ICH confirms with one more data set.

4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

(ii) integration, testing and release of 2nd half 16-antenna system :

configuring of m/cs is done, testing is to start now; GPU delivery to be followed up;

30 Nov : testing shows some packet loss (very small) but appears not related to BW and data rate; maybe related to CX4 drivers -- need to generate proper stats.

14 Dec : problem in ROACH (FPGA board) : 3/8 not recognizing PPS signals; one OK now after replacing with spare boards; other 2 need to be replaced with 'old' boards;

21 Dec : system is configured with 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/c (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links. Tests going on for some time now on arbitrary inputs to test data recovery -- there are occasional loss of eth packets (1 or 2 pkts per 10 sec) on 1-2 out of 16 links which changes randomly on reboot. Other than this, the acq and correlation code runs stably; further, Roach boards are showing spurious triggering. Need to find out where it is coming from; meanwhile, to try and see if possibility of false triggering can be reduced by opening the gate at 0.9 s or so.

28 Dec : zeroed the problem down to ADC + Roach board combination.

modified new GUI (most likely only m/c IDs to be changed -- to be done by NSR); to start looking at other changes needed in the host m/cs etc for taking the place of a working system; IPs for the new host m/cs etc; getting the remaining T630s ready for refurbishment of 1st 16 antenna system.

====> problem solved by isolating malfunctioning ADC boards and ensuring that 8 good cards on each Roach board (2nd ADC is slave and can be malfunctioning card !); also first half correlator has 14 good cards out of 16. (IMH to follow-up and try to isolate the cause of the problem); noise source test appears to be ok; sky test to be done once modified GUI is ready -- by Thurs or Fri of this week. Then one week to clear all the modes. Code is identical to existing GWB3 and hence performance should be the same (except the occasional packet drop). 2 weeks for user level tests -- hence end Jan to see if switch over can be done to new system for GTAC observations, and start refurbishing of old system; to try and assemble the nodes for the refurbished system in parallel. To order additional disks as needed.

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

====> new arrangement for evacuating warm air from existing GWB racks is almost ready.

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (may come earlier)

21 Dec : this is a serious matter and needs follow-up !!!

====> direct contact with nvidia rep looks like resulting in some speed-up in delivery.

(v) targets and plans for release of full 30-antenna system : when will it be ready

and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful

ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work

for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed

but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : need to plan the code optimisation that will be needed.

====> not discussed today; can take up at a later date.

EXTRA ITEM : network connectivity issues :

(i) extra IPs needed on .4 n/w for GWB 2nd half system

====> this is done

(ii) updated IP table for .4 n/w to be made available by computer group

====> work ongoing

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

====> updated diagram is now available -- to be shared with all concerned persons.

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

====> updated diagram discussed; upto 3 1 Gbe links from gwbh machines is possible

with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these

connections and demonstrate 2 x 1 Gbe transfer from h2 & h3 together to NCRA end.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

====> agreed to look for options

4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :

(i) refinements of the first draft of the note

(ii) plans for getting first unit connected and tested

(iii) plans for testing high speed recording to disks

16 Nov : lab set-up for grabbing and recoding has been done; while continuing with

this, need to work on the set-up for sending parallel copy of the data, including

procurement of longer CX4 cables.

30 Nov & 21 Dec : not discussed.

====> basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.

4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)

16 Nov : some changes have been made by SHR, but the sub-microsec correction still needs to be done; also to follow-up about h4k file.

21 Dec : modified code has been made, but not yet tested; can try to see if it can be made available in the current release.

====> agreed to defer to next release.

4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans

(ii) spectral domain RFI filtering : current status and plans

(iii) beamformer RFI filtering : current status and plans

16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.

30 Nov : not discussed in detail.

21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file..

emulator has some changes and improvements, including random location of the RFI.

====> for (i) modifications in simulator; counter mode now working -- can have 2 different modes, tested at module level, now integrated into the design, will be testing in next few days; fractional thld done in simulation, to convert to design and test. (ii) to try and run the filter in real-time from shm data.

#### 4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and tests ongoing; also tested by sending digitised packets to antenna and loop back; using GWB2 for doing all the correlations.

#### 4.8 Status update on processing of tender reponses for Maser units (BAK)

(i) finalisation of processing of folder

(ii) planning for kind of environmental set-up required

16 Nov : most of the issues have been resolved, waiting for one party to complete the payment terms; pending issue about performance bank guarantee for different amounts of periods.

30 Nov : work is ongoing, but item not discussed.

====> TEC clearance ok; recommendation to open price bids -- to check the status.

To contact Prof Sen Gupta for a discussion.

### 5. Other items :

#### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been



provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

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## Minutes for the Plan meeting of 11 Jan 2017

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### 1. FE & OF related :

#### 1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in T<sub>lna</sub> for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

28 Dec & 11 Jan : no updates.

#### 1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible;

28 Dec & 11 Jan : no updates.

#### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

(i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months should be enough to complete the tasks i.e. April 2017.

====> 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

(ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good :

comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

====> analysis of Jan data awaited.

(iii) Summary of phase centre measurements and decision about future plans

(iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

====> data collected, report expected within 2-3 days.

(iv) LO settings for all sub-bands etc to be finalised.

14 Dec : 250-500 LO setting document / table already finalized;

28 Dec : no updates; person on leave.

====> astronomer feedback awaited (to check if final table communicated to control room).

#### 1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus

14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01);

box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)  
28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).

====> box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.

(ii) Plans for mass production

30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.

1.5 Apex radiation scheme (PAR/SRoy) :

(i) Current status of measurements and interpretations

(ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

====> no updates, though there has been some email discussion between SRoy and PAR

1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) :

Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of health of Walsh switching.

1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

## 1.8 New filters for L-band (AP) :

(i) status update on installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing

16 Nov : arm antenna installation to be resumed;

14 Dec : all west arm will be completed by 16-Dec-2016;

28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.

====> S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).

(ii) delivery of remaining units of main L-band BPF from Epitome

16 Nov : BPF completed and handed over to BE team -- this can be closed.

28 Dec : can be closed.

## 1.9 OF system updates :

(i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.

====> current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.

(ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates

28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.

====> cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.

## 2. RFI related :

### 2.1 Spectral line RFI (PAR/SSK) :

(i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks

28 Dec : RFI team visited Junnar cable TV operator for getting response to letter that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.

(ii) Digital TV follow-up

23 Nov : letter is still pending !

28 Dec : no updates.

(iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source

====> 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.

### 2.2 Satellinte RFI monitoring & avoidance system (PAR/SNK) :

(i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and ,, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)

(ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)

(iii) Plans for sending information to back-end reciever chain

(iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week

28 Dec : no updates.

### 2.3 RFI from power lines and transformers (PAR/RVS) :

- (i) review current status
- (ii) specific follow-up actions

23 Nov : not discussed

28 Dec : no updates.

### 2.4 RFI from LED lamps (PAR/RVS) :

- (i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

- (ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

### 2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested; 8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.

4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified units -- all are ok. Need follow-up as mentioned on 28 Dec.

## 3. Operations related :

### 3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) :

- (i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.

28 Nov : still waiting for 80 nos PCBs to come.

====> 84 PCBs received; can go ahead with further assembly now.

- (ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);

28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.

====> 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.

(iii) status of mass production of network switch enclosure

23 Nov : 28 units ready (need total of 35)

14 Dec : now 32 (of 35) ready;

28 Dec : same status of 32 out of 35.

3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

(i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing

23 Nov : C00 & C10 are mostly complete (item could be closed?)

28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.

(ii) plans for going beyond 2 antennas

23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)

28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?;

elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.

====> mechanical completed for 10 antennas; electrical completed for 13 antennas;

Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.

(iii) update on improved RFI shielding at antenna shell

23 Nov : shielding test measurements done for present configuration; awaiting finger-lines to be added before repeating the tests (which antenna?)

28 Dec : folder in process for placing order for the finger-lines.

3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems

28 Dec : Ops team has a plan for this; can be discussed in detail next time.

====> final plan placed on web portal (for lab people)

(ii) plans for switch-over -- to make it as seamless as possible.

30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.

28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.

3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)

14 Dec : HP layer3 switch finalized; bidgetry quote Rs 3.5 lakh; indent prepared.

====> item can be closed.

(ii) Plans for procurement

23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.

28 Dec : indent raised.

4. Back-ends related :

4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

====> one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

====> one rack modified (4 antennas) and systems being tested; will report shortly, and if everything ok, will go ahead with the mods for all the 8 racks.

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.

14 Dec : changes to DRAFT report in progress;

28 Dec : still in progress

====> not ready yet.

New item : new Walsh ckt :

For 10 antennas which have new 1st LO system (LOFSW based units), ...

2 antennas have independent MCM for driving the new CPLD

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh

4.2 Power equalisation scheme and relate topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

====> still pending

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

4.3 Updates on existing GWB-3 system :

(i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

====> no work done on this.

(ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of

level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?

14 Dec : problem perhaps in AIPS settings; matter can be closed ?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

====> no updates.

4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

(ii) integration, testing and release of 2nd half 16-antenna system :

configuring of m/cs is done, testing is to start now; GPU delivery to be followed up;

23 Nov : second half 16 antenna system is under test (tbd by next week).

30 Nov : testing shows some packet loss (very small) but appears not related to BW and data rate; maybe related to CX4 drivers -- need to generate proper stats.

14 Dec : problem in ROACH (FPGA board) : 3/8 not recognizing PPS signals; one OK now after replacing with spare boards; other 2 need to be replaced with 'old' boards;

21 Dec : system is configured with 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/c (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each

with 2 ADCs and 2 x 10 Gbe links. Tests going on for some time now on arbitrary inputs to test data recovery -- there are occasional loss of eth packets (1 or 2

pkts per 10 sec) on 1-2 out of 16 links which changes randomly on reboot. Other than this, the acq and correlation code runs stably; further, Roach boards are

showing spurious triggering. Need to find out where it is coming from; meanwhile, to try and see if possibility of false triggering can be reduced by opening the

gate at 0.9 s or so.

28 Dec : zeroed the problem down to ADC + Roach board combination.

modified new GUI (most likely only m/c IDs to be changed -- to be done by NSR); to start looking at other changes needed in the host m/cs etc for taking the place of

a working system; IPs for the new host m/cs etc; getting the remaining T630s ready for refurbishment of 1st 16 antenna system.

4 Jan 17 : problem solved by isolating malfunctioning ADC boards and ensuring that 8 good cards on each Roach board (2nd ADC is slave and can be malfunctioning card !);

also first half correlator has 14 good cards out of 16. (IMH to follow-up and try to isolate the cause of the problem); noise source test appears to be ok; sky test to

be done once modified GUI is ready -- by Thurs or Fri of this week. Then one week to clear all the modes. Code is identical to existing GWB3 and hence performance

should be the same (except the occasional packet drop). 2 weeks for user level tests -- hence end Jan to see if switch over can be done to new system for GTAC

observations, and start refurbishing of old system; to try and assemble the nodes for the refurbished system in parallel. To order additional disks as needed.

====> tests of both 16-antenna GWBs ongoing and situation looks good; some more tests to be done this week, including some user level tests today; meanwhile,

SHR to look into integrated code for running as 30 antenna system with different OS machines for each half and try to test the same by next week; additional disks

to be added on the 3 new host machines; SOP has been released by SHR; in parallel to get 8 new nodes assembled with all peripherals (and K40s as soon as they come).

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.



====> no further work on GWB; plan is to have similar change for GSB during next MTAC-- preparations for this are on-going.

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (but may come earlier?)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up in delivery; to follow-up closely.

====> YG to follow-up.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : no specific updates, except that code optimisation will need to be done.

14 Dec : need a discussion to decide the way forward on this...

4.5 Network related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half system

4 Jan 17 : this is done -- to confirm and close.

(ii) updated IP table for .4 n/w to be made available by computer group

4 Jan 17 : work ongoing -- to check status with comp group.

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines is possible with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together to NCRA end; comp group to set up the test, alongwith VVS at Pune end.

====> 3 connections made to gwbh1-3, and live test demo done; it appears that only 2 of the 8 x 1Gbps links from switch to aggregator are working ! This needs to be debugged between comp group and OF group.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

4 Jan 17 : comp group agreed to look for options.

4.6 Longer term plans for GWB-4 (SHR/ICH/SSK/BAK) :

(i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link

(ii) Disks for data recording, including trials with SSD options

(iii) investigating next gen GPUs

(iv) migration to next version of CUDA (7.5 and beyond)

23 Nov : CUDA 7.5 is being tried in the new version of GWB

(iv) Additional modes and features in GWB system :

(a) 4 beams, with upto 2 voltage beams with coherent dedispersion

23 Nov : 4 beams (IA/PA) implemented but yet to be tested to shortest integrations;

2 voltage beams (1 with full BW and 2 with half BW are planned for new system)

(b) PA - IA beam mode

(c) beam formation with different phase centres

(d) improved I/O capabilities : change in data sending code; alternate n/w ?

(e) gated correlator : folding visibilities with pulsar period

(f) polyphase filter bank

(g) 2 inputs per Roach board

(h) time + DUT corrections

- (i) net-sign correction
  - (j) full backward compatibility of off-line utilities
- 23 Nov : some work has been done, but not clear if this meets / works for all requirements.
- 28 Dec : not discussed.

#### 4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

- (i) Summary of current status for temperature monitoring
  - (ii) Plans for future enhancement and release for regular use
  - (iii) Monitoring of other health parameters
- 14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack (uses DAQ card);
- 28 Dec : not discussed.
- ====> no significant new updates.

#### 4.8 Other issues :

- (i) Cross-coupling tests in GAB + GWB
- 14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?
- 28 Dec : some issues need a bit more of discussion before reaching a final conclusion.
- ====> ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%
- (ii) Walsh related work.
- 14 Dec : some tests in progress; porting to GWB (Python package being modified);
- 28 Dec : work is still ongoing.
- ====> porting work is nearing completion.

#### 5. Other items :

##### 5.1 Python assembly work (HSK/SSK) :

- (i) Summary of the work done so far and conclusions from the same
- 23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.
- 21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).
- (ii) Plans to decide for the final option to be adopted
- 23 Nov : to be taken up after note is circulated and new version is tested.
- 14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.
- 21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.
- (iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.
- =====



## Minutes for the Plan meeting of 18 Jan 2017

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### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov : offset not yet fixed (to be done later with mechanical), but new data taken for E & H plane -- looks ok; to do cross-polar measurements.

21 Dec : plans for correcting the offset -- next Monday 26th.; meanwhile, earlier data has been given to SC and he will produce an updated result for band-4 within the next week.

4 Jan : test range activity planned for 9 Jan.

====> rescheduled to 23 Jan.

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

4 Jan : will be completed by 6 Jan.

====> manual 'digitization' of plot (hard copy) is agreed [rather than indefinitely 'waiting' for a machine readable data file to become available somehow];

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

4 Jan : awaiting feedback

(ii) need to cross-check mismatch of values for band-3 (250-500);

30 Nov : will check and update, including referring to some existing literature

21 Dec : some work has been done, but needs an internal cross-check & then discussion.

(iii) need to see if QH losses have been incorporated into the calculations;

30 Nov : GP has done some of the work; need to circulate and get agreement.

(iv) does the study cover all the uGMRT bands.

30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.

16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.

21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in Tsys) -- TBC.

(iv) can it be extended to deriving the final beam pattern for feed + antenna

This is being looked into

21 Dec : first version doc has been sent by SC -- needs follow-up

4 Jan : feedback awaited on this item.

====> feedback from astronomes awaited

#### 1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document

30 Nov : yet to be completed.

21 Dec : updated & internally circulated;

(ii) results from recent tests

30 Nov : running of tests has conflict with online system (JPK is looking into this)

21 Dec : all x30 Ae data collection leads to 'online' ssystem hanging; planning with x15 Ae (29Dec);

====> 'online' issue remained for '15' antenna also (after '30' antenna case failed);

now suggested to repeat for '10' antenna case; test planned for a future wednesday;

(iii) labeling scheme for keeping track of the units to be taken up for refinement and implementation

16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.

30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular back-up of the files to be worked out.

#### 1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system

30 Nov : same as above

21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)

====> data showed 'flat' value over 24 hrs; C3 & E2 to be tried again today.

(ii) status of prototype for temp and power monitoring at OF rack at antenna base

16 Nov : sample data set taken but not long enough; to wait for next round of tests;

prototype unit installed at C2 and connected to M&C system, but not being monitoring regularly; would like to do some more test and development before finalising the scheme.

30 Nov : (ii) is on-hold after prototype development; to be taken up only after Rabbit card based system is in place.

#### 1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares

30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.

4 Jan : 4 complete sets of spares available now (ready for installation at antenna)

(ii) finalisation of report by VBB

16 Nov : same status as last week.

30 Nov : report pending with SSK

4 Jan : no updates

====> report to be ready by 25 Jan.

#### 1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs

30 Nov : some failed units are being retuned...

(ii) status of new 2-stage design installed on 2 antennas : working ok ?

30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.

(ii) status of new 3-stage design : optimisation of RL was being attempted

16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better than 10 dB across the band; Tlna ~ 20 K (by old noise comm calibration scheme); to try improve further, while assembling second unit.

30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna

(2 units to be made ready).

21 Dec : 2 K improvement seen (< 20 K) ; report to be available in 1 week

4 Jan : second unit has been assembled; overlapping plots show good repeatability; report will be ready by 6 Jan.

====> report already circulated last week [ ~ 20 K over full band; gain ~ 44dB flat; return loss better than -11dB over entire band (-14/-15 dB most places); worst case -11 dB near lower freq band edge]

### 1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB problem and W5 -- problem not identified); C14 showing poor deflection and falling at high freq -- checked for pointing and OF attn, now to try changing the feed.

4 Jan : results from tests on 13 Dec discussed : 21 antennas available; dip seen for L-band vanished after replacing common box (which antenna?), but unit appears to be ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2; W5 poor bandshape; C14 noise deflection discussed.

====> 06-Jan-2017 tests reported; (only 15 antennas were available); E6 showed ripples in CH1 (but could be cable twist; as today NOT noticed); E6 CH2 deflection HIGHER than expected (red dots) !! "measurement" error? 'naming' of file ? similarly W5 CH2; results show MAJOR drift in deflection (~ 15 dB spread !) -- BUT NO CORRECTIVE ACTION TAKEN !! Primary purpose of monitoring is LOST ! SKR was 'un-sure' about this responsibility - now clarified; henceforth, he will follow up on errant antennas;

### 1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring in control room

30 Nov : this is now available under the standard monitoring tools; control part has some problem and needs login to control PC -- SOP for this to be provided to control room.

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue;

### 1.10 Mass production of Band-4 (550-900) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow; 12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.

30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity units are available).

21 Dec : 1 more week delay due to vendor's delay

4 Jan : hoods have arrived today; 12th antenna to be completed by 15-20 Jan.

====> system for 12th antenna will be ready by Monday 23 Jan (lab tests are in progress now); by April x16 system target can still be met.

## 2. RFI related :

## 2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting to be completed

30 Nov : YG + PAR to work on this final version.

(ii) study of RFI environment, including internally generated RFI in main building

30 Nov : tests of individual labs : with AC units and otherwise -- shows different labs in different light; agreed to identify the worst culprits by kind of equipment etc and provide an update.

(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests

16 Nov & 30 Nov & 21 Dec : no updates.

## 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database

(ii) response to pending requests for clearance e.g. Serum Institute...

21 Dec : awaiting call from Serum Institute for the next visit; asked all technical details of their planned equipments;

(iii) work out new action plan, given the current government policies

30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to their location for looking at specific instruments.

21 Dec : one site visited.

4 Jan : awaiting call for visit to site of the party

## 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters

30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems (they are the only one to have got license in this range) -- it is strong enough to cause saturation in spite of filter; need to find the specific towers and then follow-up with Reliance.

21 Dec : no updates.

====> measurements happening this week; update by next week.

## 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems

30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need to identify which make is coming finally.

21 Dec : no updates.

Other item (antenna UPS related) :

====> 2 remaining UPS units also cleared for RFI now (2 units needed to be rectified); now OK to use this second batch of 10 UPS units.

## 3. Operations related :

### 3.1 Interfacing of FE with new M&C system :

(i) latest status of testing with Rabbit card in common box at antenna base

16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).

30 Nov : no new updates on this

21 Dec : antenna control part is working; FE monitoring still not working; Charu is

looking into this...

====> trying with different delay to see if it solves the problem, but not yet working with online control...

(ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus  
16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration and testing in 2 weeks time and put on first antenna with RS-232 cable driving; later to convert that to ethernet over fibre; mass production may need only new plates to be made by workshop -- other aspects are in-house in FE lab.

30 Nov : item also being discussed under FE agenda item (in alternate week)

21 Dec : planned this week

====> final status is Box #1 was made functional at antenna base and was taken up to antenna focus as Box #2 does not work reliably -- hangs and needs power reset (has been tested with a couple of different Rabbit cards?); problem not solved; agreed to try the option of swapping the Rabbit cards between Box #1 and Box #2 and seeing what is the outcome. To report this by tomorrow and then decide if a 3rd box needs to be made ready.

3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgetary quote; formal quote expected shortly.

4 Jan : folder cleared ; PO should be done shortly.

====> Order has been released; full delivery time is 3 months; first box to be supplied earlier and tested...

3.3 GMRT M&C system Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal meeting.

4 Jan : internal lab meeting held on 3 Jan (now every Tuesday)

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans

30 Nov : discussions ongoing; kick-off meeting planned.

21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.

4 Jan : regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary' etc shared with TCS.

====> interaction

3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for material for review committee started

30 Nov : discussions and work ongoing, including preparations for discussions with TM review panel.

21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase : requirement compatibility; architecture explanation given; scalability etc; need many upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;

4 Jan : preparation of docs in progress; ph-2 work now beginning...

====> aim to have 6+ antenna set-up with PC + switch + Rabbit talking to Sentinel



+ OF + Servo (to check if existing PC104 will work directly) or not; to check enough Miltech PCs available -- Sumit and Mangesh to look into it.; need to move from Fedora to Ubuntu; aim to start testing at antenna base by 23/24. Additionally, need some temporary space (couple of months) for working on 2 PCs in or near control room...

#### 4. Back-ends related :

##### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh paper needs to be looked into for revision; nothing really pending, except for the report on the attenuation values : new set of tests done and results look ok and will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed); may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?

4 Jan : To follow-up on GWB refereeing process.

====> GWB response received, relatively minor modifications are needed and SHR is looking into this; for Walsh, waiting for response -- can check after 20 days (end of this week / early next week).

##### 4.2 Updates on existing GWB-3 system :

(i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

4 Jan & 11 Jan : no progress since last time.

====> no work done yet.

(ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes; for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be closed ?

14 Dec : problem perhaps in AIPS settings? matter can be closed?

21 Dec : no further updates on this.

4 Jan : to keep open for some time till ICH confirms with one more data set.

====> no updates from ICH.

##### 4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

(ii) integration, testing and release of 2nd half 16-antenna system :

configuring of m/cs is done, testing is to start now; GPU delivery to be followed up;

30 Nov : testing shows some packet loss (very small) but appears not related to BW and data rate; maybe related to CX4 drivers -- need to generate proper stats.

14 Dec : problem in ROACH (FPGA board) : 3/8 not recognizing PPS signals; one OK now after replacing with spare boards; other 2 need to be replaced with 'old' boards;

21 Dec : system is configured with 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/c (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links. Tests going on for some time now on arbitrary

inputs to test data recovery -- there are occasional loss of eth packets (1 or 2 pkts per 10 sec) on 1-2 out of 16 links which changes randomly on reboot. Other than this, the acq and correlation code runs stably; further, Roach boards are showing spurious triggering. Need to find out where it is coming from; meanwhile, to try and see if possibility of false triggering can be reduced by opening the gate at 0.9 s or so.

28 Dec : zeroed the problem down to ADC + Roach board combination. modified new GUI (most likely only m/c IDs to be changed -- to be done by NSR); to start looking at other changes needed in the host m/cs etc for taking the place of a working system; IPs for the new host m/cs etc; getting the remaining T630s ready for refurbishment of 1st 16 antenna system.

4 Jan 17 : problem solved by isolating malfunctioning ADC boards and ensuring that 8 good cards on each Roach board (2nd ADC is slave and can be malfunctioning card !); also first half correlator has 14 good cards out of 16. (IMH to follow-up and try to isolate the cause of the problem); noise source test appears to be ok; sky test to be done once modified GUI is ready -- by Thurs or Fri of this week. Then one week to clear all the modes. Code is identical to existing GWB3 and hence performance should be the same (except the occasional packet drop). 2 weeks for user level tests -- hence end Jan to see if switch over can be done to new system for GTAC observations, and start refurbishing of old system; to try and assemble the nodes for the refurbished system in parallel. To order additional disks as needed.

11 Jan : tests of both 16-antenna GWBs ongoing and situation looks good; some more tests to be done this week, including some user level tests today; meanwhile, SHR to look into integrated code for running as 30 antenna system with different OS machines for each half and try to test the same by next week; additional disks to be added on the 3 new host machines; SOP has been released by SHR; in parallel to get 8 new nodes assembled with all peripherals (and K40s as soon as they come). ==> testing of 2nd half 16-antenna seems to be ok; interferometry tests appeared ok, beam tests had a problem which was fixed; may do some more thorough testing today; meanwhile, testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready; appears to be satisfactory (though no improvements in ambient temp recorded ?).

11 Jan : no further work on GWB; plan is to have similar hcnage for GBS during next MTAC -- preparations for this are on-going.

==> some rearrangement of 1U nodes hosting ADCs may be needed.

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (may come earlier)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep looks like resulting in some speed-up in delivery; to follow-up closely.

11 Jan : YG to contact nvidia and micropoint persons.

==> see update above.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful

ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : need to plan the code optimisation that will be needed.

14 Dec : need a discussion to decide the way forward on this.

4 Jan 17 : not discussed today; can take up at a later date.

====> defer this for some more time.

#### 4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :

(i) refinements of the first draft of the note

(ii) plans for getting first unit connected and tested

(iii) plans for testing high speed recording to disks

16 Nov : lab set-up for grabbing and recoding has been done; while continuing with this, need to work on the set-up for sending parallel copy of the data, including procurement of longer CX4 cables.

30 Nov & 21 Dec : not discussed.

4 Jan 17 : basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.

====> to test the dual copy design for correlations using existing 16-antenna corr with dummy inputs; then to connect to one machine where tests can be done for raw voltage recording and a single node correlator with flexible beamforming.

#### 4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)

16 Nov : some changes have been made by SHR, but the sub-microsec correction still needs to be done; also to follow-up about h4k file.

21 Dec : modified code has been made, but not yet tested; can try to see if it can be made available in the current release.

4 Jan 17 : agreed to defer to next release.

====> to keep deferred for now.

#### 4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans

(ii) spectral domain RFI filtering : current status and plans

(iii) beamformer RFI filtering : current status and plans

16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.

30 Nov : not dicussed in detail.

21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file..

emulator has some changes and improvements, including random location of the RFI.

4 Jan 17 : for (i) modifications in simulator; counter mode now working -- can have 2 different modes, tested at module level, now integrated into the design, will be testing in next few days; fractional thld done in simulation, to convert to design

and test. (ii) to try and run the filter in real-time from shm data.

====> not discussed, but summary of offline discussions is as follows : (i) some additional features added to RFI simulator unit; fractional threshold and counter mode now available for use in the voltage filtering unit; cumulative experience shows that we may be not using the optimal filtering technique for voltage mode -- should try the alternative approach of conversion to intensity and integration to desired time constant -- closer to a true matched filter.

#### 4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and tests ongoing; also tested by sending digitised packets to antenna and loop back; using GWB2 for doing all the correlations.

====> feasibility study done using C09 antenna with noise sources and real signal -- needs a fixed delay correction of 1.5 km to get maximum correlation; trying setup with E5; meanwhile, a few different tests can be tried with the C09 set-up; comparison of scheme running on GWB2 and GWB3 tried out.

#### 4.8 Status update on processing of tender reponses for Maser units (BAK)

(i) finalisation of processing of folder

(ii) planning for kind of environmental set-up required

16 Nov : most of the issues have been resolved, waiting for one party to complete the payment terms; pending issue about performance bank guarantee for different amounts of periods.

30 Nov : work is ongoing, but item not discussed.

4 Jan 17 : TEC clearance ok; recommendation to open price bids -- to check the status. To contact Prof Sen Gupta for a discussion.

====> final TEC documnets done and sent for next step; to follow-up and check status.

### 5. Other items :

#### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

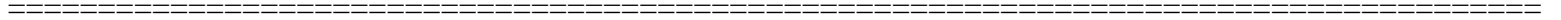
23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to

decide the final choice of ID.



## Minutes for the Plan meeting of 25 Jan 2017

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### 1. FE & OF related :

#### 1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in T<sub>lna</sub> for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

28 Dec & 11 Jan : no updates.

====> no updates, VBB on leave.

#### 1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible;

28 Dec & 11 Jan : no updates.

====> 5th antenna (?) completed about 10 days ago, C13.

#### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

(i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months should be enough to complete the tasks i.e. April 2017.

11 Jan : 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

====> needs combined tuning of filters to fix the problem; work ongoing.

(ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good : comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

11 Jan : analysis of Jan data awaited.

====> analysis of new data (on CasA) -- appears to be systematic 1-1.5 dB less deflection than predicted and control room values -- needs to be checked and followed up in consultation with ICH, DVL, SC & GP; few antennas with some odd behaviour e.g. E3 and maybe E2.

(iii) Summary of phase centre measurements and decision about future plans

====> no action yet.

(iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

11 Jan : data collected, report expected within 2-3 days.

====> Sougata + Ankur will provide update next time.

(v) LO settings for all sub-bands etc to be finalised.

14 Dec : 250-500 LO setting document / table already finalized;

28 Dec : no updates; person on leave.

11 Jan : astronomer feedback awaited (to check if final table shared with control room).

====> Not yet shared with control room; to refine based on : 6 dB point for main BPF and 10 dB for subband filters, for the default BW.

#### 1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus

14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01);

box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)

28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).

11 Jan : box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.

(ii) Plans for mass production

30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.

====> one box tested at antenna focus and working ok; 2nd box not yet tested at focus; even for the 1st box, repeatability is not there.

#### 1.5 Apex radiation scheme (PAR/SRoy) :

(i) Current status of measurements and interpretations

(ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

11 Jan : no updates, though there has been some email discussion between SRoy and PAR

====> need to check with SRoy and PAR.

#### 1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) :

Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of health of Walsh switching.

11 Jan : there is some confusion about what is being done, and what has been achieved !

For 10 antennas which have new 1st LO system (LOFSW based units), it should NOT be possible to have Walsh modulation at present !

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh...

====> SC not present.

#### 1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

==> SC not present.

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

====> SC not present.

#### 1.8 New filters for L-band (AP) :

(i) status update on installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing

16 Nov : arm antenna installation to be resumed;

14 Dec : all west arm will be completed by 16-Dec-2016;

28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.

11 Jan : S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).

====> only 2 antennas W-arm remaining to be done.

(ii) delivery of remaining units of main L-band BPF from Epitome

16 Nov : BPF completed and handed over to BE team -- this can be closed.

28 Dec : can be closed.

#### 1.9 OF system updates :

(i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.

11 Jan : current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.

(ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates

28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.

11 Jan : cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.

(iii) 8 Gbps GMRT to Pune link : it was found that only 1 or 2 Gbps was working;

====> detailed debugging has been done by OF team and now it appears all the 4 wavelengths and hence 8 gbps lines are functional -- only one wavelength is marginal (to order spares for taking care of such issues); also remote monitoring facility at Rajgurunagar with SMS facility to be activated.



## 2. RFI related :

### 2.1 Spectral line RFI (PAR/SSK) :

#### (i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks

28 Dec : RFI team visited Junnar cable TV operator for getting response to letter that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.

====> discussed with Jondhale -- he will speak to the party and see if some progress can be made; otherwise to escalate the matter; also to estimate the number of splitters etc that can be provided to W-arm operator to mitigate the problem.

#### (ii) Digital TV follow-up

23 Nov : letter is still pending !

28 Dec : no updates.

====> to expedite the matter !

#### (iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source

11 Jan : 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.

====> need a site visit to understand better.

### 2.2 Satellite RFI monitoring & avoidance system (PAR/SNK) :

#### (i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and ,, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)

====> need to follow-up on identifying for LEOS.

#### (ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)

====> new limit is about 8 deg -- to cross-check if ok and close.

#### (iii) Plans for sending information to back-end receiver chain

====> to check with Santaji about the plans for this

#### (iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week

28 Dec : no updates.

====> to include in the plans for visit by Nick Rees in week of 6th Feb.

### 2.3 RFI from power lines and transformers (PAR/RVS) :

#### (i) review current status

#### (ii) specific follow-up actions

23 Nov : not discussed

28 Dec : no updates.

====> ...

### 2.4 RFI from LED lamps (PAR/RVS) :

#### (i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

#### (ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight

driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

====> report has been circulated; solution looks promising; to try for compact version of the solution; working with workshop to mechanical items; will need to order some components for bulk production.

### 2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested; 8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.

4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified units -- all are ok. Need follow-up as mentioned on 28 Dec.

18 Jan 17 : all 10 units tested and cleared; now OK to use this 2nd batch of 10 units in antennas; need follow-up on status of ordering last batch of 14 units.

====> matter closed for now from RFI team side; to take up when next lot comes.

New item : Reliance Jio system is transmitting in 850 band -- requested their engr to see if they can switch to 1800 band -- waiting for response -- to follow closely.

### 3. Operations related :

#### 3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) :

##### (i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.

28 Nov : still waiting for 80 nos PCBs to come.

11 Jan : 84 PCBs received; can go ahead with further assembly now.

====> this can be closed.

##### (ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);

28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.

11 Jan : 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.

====> Rabbit card enclosure now going smoothly : about 2-3 per week; to send some samples for RFI testing.

##### (iii) status of mass production of network switch enclosure

23 Nov : 28 units ready (need total of 35)

14 Dec : now 32 (of 35) ready;

28 Dec : same status of 32 out of 35.

====> 32 out of 35 completed; remaining 3 are in use and will be done when free; meanwhile, to send a few samples for RFI testing.

### 3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

(i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing

23 Nov : C00 & C10 are mostly complete (item could be closed?)

28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.

(ii) plans for going beyond 2 antennas

23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)

28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?;

elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.

11 Jan : mechanical completed for 10 antennas; electrical completed for 13 antennas; Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.

(iii) update on improved RFI shielding at antenna shell

23 Nov : shielding test measurements done for present configuration; awaiting finger-lines to be added before repeating the tests (which antenna?)

28 Dec : folder in process for placing order for the finger-lines.

====> mechanical has resumed work; same for electrical; will be updating spreadsheet; column for servo has been added in spreadsheet -- to remind them to start updating;

### 3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems

28 Dec : Ops team has a plan for this; can be discussed in detail next time.

11 Jan : final plan placed on web portal (for lab people)

(ii) plans for switch-over -- to make it as seamless as possible.

30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.

28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.

====> can defer till after the demo.

### 3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)

14 Dec : HP layer3 switch finalized; bidgetry quote Rs 3.5 lakh; indent prepared.

11 Jan : item can be closed.

(ii) Plans for procurement

23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.

28 Dec : indent raised.

====> procedural issues related to advance payment etc...

### Other updates :

1. testing of common box with Rabbit card : new clue related to grounding of enable signal of decoder IC may provide the breakthrough -- tested in lab and

will take to antenna base now.

2. Getting new M&C system working and ready for demo : 2 more Miltech PCs now working stably; porting to Ubuntu going on fairly well; inputs from servo to give modified PC-104 PIUs going ok; inputs from TCS and internal colleagues also going ok; demo can be planned from GMRT control room.

4. Back-ends related :

4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

11 Jan : one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

====> s'ware work for the above is still in progress.

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

11 Jan : one rack modified (4 antennas) and systems being tested; will report shortly, and if everything ok, will go ahead with the mods for all the 8 racks.

====> same status as above; test report has been circulated internally.

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.

14 Dec : changes to DRAFT report in progress;

28 Dec : still in progress

11 Jan : not ready yet.

====> no new updates.

New item : new Walsh ckt :

For 10 antennas which have new 1st LO system (LOFSW based units), ...

2 antennas have independent MCM for driving the new CPLD

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh

4.2 Power equalisation scheme and relate topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

11 Jan : still pending

====> revised version circulated internally.

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

#### 4.3 Updates on existing GWB-3 system :

(i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

18 Jan : no progress on this upto now, due to work on release of 30 antenna system.

====> still pending.

(ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?

14 Dec : problem perhaps in AIPS settings; matter can be closed ?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

11 & 18 Jan : no updates.

====> still pending.

#### 4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

(ii) integration, testing and release of 2nd half 16-antenna system :

configuring of m/cs is done, testing is to start now; GPU delivery to be followed up;

23 Nov : second half 16 antenna system is under test (tbd by next week).

30 Nov : testing shows some packet loss (very small) but appears not related to BW and data rate; maybe related to CX4 drivers -- need to generate proper stats.

14 Dec : problem in ROACH (FPGA board) : 3/8 not recognizing PPS signals; one OK now after replacing with spare boards; other 2 need to be replaced with 'old' boards;

21 Dec : system is configured with 8 compute nodes (T630s) with 2 nos of K20 each,

3 host m/c (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each

with 2 ADCs and 2 x 10 Gbe links. Tests going on for some time now on arbitrary

inputs to test data recovery -- there are occasional loss of eth packets (1 or 2

pkts per 10 sec) on 1-2 out of 16 links which changes randomly on reboot. Other

than this, the acq and correlation code runs stably; further, Roach boards are

showing spurious triggering. Need to find out where it is coming from; meanwhile,

to try and see if possibility of false triggering can be reduced by opening the

gate at 0.9 s or so.

28 Dec : zeroed the problem down to ADC + Roach board combination.

modified new GUI (most likely only m/c IDs to be changed -- to be done by NSR); to

start looking at other changes needed in the host m/cs etc for taking the place of

a working system; IPs for the new host m/cs etc; getting the remaining T630s ready

for refurbishment of 1st 16 antenna system.

4 Jan 17 : problem solved by isolating malfunctioning ADC boards and ensuring that

8 good cards on each Roach board (2nd ADC is slave and can be malfunctioning card !);

also first half correlator has 14 good cards out of 16. (IMH to follow-up and try to

isolate the cause of the problem); noise source test appears to be ok; sky test to

be done once modified GUI is ready -- by Thurs or Fri of this week. Then one week to clear all the modes. Code is identical to existing GWB3 and hence performance should be the same (except the occasional packet drop). 2 weeks for user level tests -- hence end Jan to see if switch over can be done to new system for GTAC observations, and start refurbishing of old system; to try and assemble the nodes for the refurbished system in parallel. To order additional disks as needed.

11 Jan : tests of both 16-antenna GWBs ongoing and situation looks good; some more tests to be done this week, including some user level tests today; meanwhile, SHR to look into integrated code for running as 30 antenna system with different OS machines for each half and try to test the same by next week; additional disks to be added on the 3 new host machines; SOP has been released by SHR; in parallel to get 8 new nodes assembled with all peripherals (and K40s as soon as they come).

18 Jan : testing of 2nd half 16-antenna seems to be ok; interferometry tests appeared ok, beam tests had a problem which was fixed; may do some more thorough testing today; meanwhile, testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

====> 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.

11 Jan : no further work on GWB; plan is to have similar change for GSB during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (but may come earlier?)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up in delivery; to follow-up closely.

11 Jan : YG to follow-up.

18 Jan : see update above.

====> 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : no specific updates, except that code optimisation will need to be done.

14 Dec : need a discussion to decide the way forward on this.

4, 11 & 18 Jan : deferred for some more time, till 30-antenna system is released.

====> as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

#### 4.5 Network related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half sytem

4 Jan 17 : this is done -- to confirm and close.

(ii) updated IP table for .4 n/w to be made available by computer group

4 Jan 17 : work onging -- to check status with comp group.

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines is possible with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together to NCRA end; comp group to set up the test, alongwith VVS at Pune end.

11 Jan : 3 connections made to gwbh1-3, and live test demo done; it appears that only 2 of the 8 x 1Gbps links from switch to aggregator are working ! This needs to be debugged between comp group and OF group.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

4 Jan 17 : comp group agreed to look for options.

#### 4.6 Longer term plans for GWB-4 (SHR/ICH/SSK/BAK) :

(i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link

(ii) Disks for data recording, including trials with SSD options

(iii) investigating next gen GPUs

(iv) migration to next version of CUDA (7.5 and beyond)

23 Nov : CUDA 7.5 is being tried in the new version of GWB

(iv) Additional modes and features in GWB system :

(a) 4 beams, with upto 2 voltage beams with coherent dedispersion

23 Nov : 4 beams (IA/PA) implemented but yet to be tested to shortest integrations; 2 voltage beams (1 with full BW and 2 with half BW are planned for new system)

(b) PA - IA beam mode

(c) beam formation with different phase centres

(d) improved I/O capabilities : change in data sending code; alternate n/w ?

(e) gated correlator : folding visibilities with pulsar period

(f) polyphase filter bank

(g) 2 inputs per Roach board

(h) time + DUT corrections

(i) net-sign correction

(j) full backward compatibility of off-line utilities

23 Nov : some work has been done, but not clear if this meets / works for all requirements.

28 Dec : not discussed.

====> can take up after 3 improvements mentioned above are completed.

#### 4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

(i) Summary of current status for temperature monitoring

(ii) Plans for future enhancementst and release for regular use

(iii) Monitoring of other health parameters

14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack (uses DAQ card);

28 Dec : not discussed.

11 Jan : no significant new updates.

====> no new updates, but plans for collecting the temp data and bringing to common m/c that is accessible to control room is being planned. installation of cacti also to be taken up.

#### 4.8 Other issues :

##### (i) Cross-coupling tests in GAB + GWB

14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?

28 Dec : some issues need a bit more of discussion before reaching a final conclusion.

11 Jan : ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%

====> no updates; needs a discussion.

##### (ii) Walsh related work.

14 Dec : some tests in progress; porting to GWB (Python package being modified);

28 Dec : work is still ongoing.

11 Jan : porting work is nearing completion.

====> now in testing phase.

#### 5. Other items :

##### 5.1 Python assembly work (HSK/SSK) :

###### (i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

###### (ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

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## Minutes for the Plan meeting of 15 Feb 2017

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### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov : offset not yet fixed (to be done later with mechanical), but new data taken for E & H plane -- looks ok; to do cross-polar measurements.

21 Dec : plans for correcting the offset -- next Monday 26th.; meanwhile, earlier data has been given to SC and he will produce an updated result for band-4 within the next week.

4 Jan : test range activity planned for 9 Jan.

18 Jan : rescheduled to 23 Jan.

====> no updates, can try to update from recent emails...

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

4 Jan : will be completed by 6 Jan.

18 Jan : manual 'digitization' of plot (hard copy) is agreed [rather than indefinitely 'waiting' for a machine readable data file to become available somehow];

====> no updates, can check recent emails for updates.

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

4 Jan : awaiting feedback

(ii) need to cross-check mismatch of values for band-3 (250-500);

30 Nov : will check and update, including referring to some existing literature

21 Dec : some work has been done, but needs an internal cross-check & then discussion.

(iii) need to see if QH losses have been incorporated into the calculations;

30 Nov : GP has done some of the work; need to circulate and get agreement.

(iv) does the study cover all the uGMRT bands.

30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.

16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.

21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in Tsys) -- TBC.

(iv) can it be extended to deriving the final beam pattern for feed + antenna

This is being looked into

21 Dec : first version doc has been sent by SC -- needs follow-up

4 & 18 Jan : feedback awaited on this item.

====> to try to find a slot when all concerned are present to get to the finer points and close the matters.

#### 1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document

30 Nov : yet to be completed.

21 Dec : updated & internally circulated;

====> GP to follow-up on internal clearance.

(ii) results from recent tests

30 Nov : running of tests has conflict with online system (JPK is looking into this)

21 Dec : all x30 Ae data collection leads to 'online' ssystem hanging; planning with x15 Ae (29Dec);

18 Jan : 'online' issue remained for '15' antenna also (after '30' antenna case failed); now suggested to repeat for '10' antenna case; test planned for a future wednesday;

====> to try with smaller number of antennas for now; need discussion with Ops group about the limitation and how it would get overcome.

(iii) labeling scheme for keeping track of the units to be taken up for refinement and implementation

16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.

30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular back-up of the files to be worked out.

====> no updates.

#### 1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system

30 Nov : same as above

21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)

18 Jan : data showed 'flat' value over 24 hrs; C3 & E2 to be tried again today.

====> not clear about the above problem (needs follow-up with Ops group); to check with 4 antenna test and report back.

(ii) status of prototype for temp and power monitoring at OF rack at antenna base

16 Nov : sample data set taken but not long enough; to wait for next round of tests; prototype unit installed at C2 and connected to M&C system, but not being monitoring regularly; would like to do some more test and development before finalising the scheme.

30 Nov : (ii) is on-hold after prototype development; to be taken up only after Rabbit card based system is in place.

#### 1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares

30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.

4 Jan : 4 complete sets of spares available now (ready for installation at antenna)

(ii) finalisation of report by VBB

16 Nov : same status as last week.

30 Nov : report pending with SSK

18 Jan : report to be ready by 25 Jan.

====> 4 spare systems available.

#### 1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs

30 Nov : some failed units are being retuned...

(ii) status of new 2-stage design installed on 2 antennas : working ok ?

30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.

(ii) status of new 3-stage design : optimisation of RL was being attempted

16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better than 10 dB across the band; Tlna ~ 20 K (by old noise comm calibration scheme); to try improve further, while assembling second unit.

30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna (2 units to be made ready).

21 Dec : 2 K improvement seen (< 20 K) ; report to be available in 1 week

4 Jan : second unit has been assembled; overlapping plots show good repeatability; report will be ready by 6 Jan.

18 Jan : report already circulated last week [ ~ 20 K over full band; gain ~ 44dB flat; return loss better than -11dB over entire band (-14/-15 dB most places); worst case -11 dB near lower freq band edge]

====> no updates.

### 1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB problem and W5 -- problem not identified); C14 showing poor deflection and falling at high freq -- checked for pointing and OF attn, now to try changing the feed.

4 Jan : results from tests on 13 Dec discussed : 21 antennas available; dip seen for L-band vanished after replacing common box (which antenna?), but unit appears to be ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2; W5 poor bandshape; C14 noise deflection discussed.

18 Jan : 06-Jan-2017 tests reported; (only 15 antennas were available); E6 showed ripples in CH1 (but could be cable twist; as today NOT noticed); E6 CH2 deflection HIGHER than expected (red dots) !! "measurement" error? 'naming' of file ? similarly W5 CH2; results show MAJOR drift in deflection (~ 15 dB spread !) -- BUT NO CORRECTIVE ACTION TAKEN !! Primary purpose of monitoring is LOST ! SKR was 'un-sure' about this responsibility - now clarified; henceforth, he will follow up on errant antennas.

====> E6 ripple in Ch1 fixed (bad cable); C14 feed needs to be replaced (tbd soon); tests at antenna base for selected set of antennas shows ~6-8 dB variations -- this needs to be investigated and understood.

### 1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring in control room

30 Nov : this is now available under the standard monitoring tools; control part has some problem and needs login to control PC -- SOP for this to be provided to control room.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue.

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

### 1.10 Mass production of Band-4 (550-900) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow; 12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.

30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity units are available).

21 Dec : 1 more week delay due to vendor's delay

4 Jan : hoods have arrived today; 12th antenna to be completed by 15-20 Jan.

18 Jan : system for 12th antenna will be ready by Monday 23 Jan (lab tests are in progress now); by April x16 system target can still be met.

====> 13th antenna (C03) installed this week (2 weeks since last one);

## 2. RFI related :

### 2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting to be completed

30 Nov : YG + PAR to work on this final version.

(ii) study of RFI environment, including internally generated RFI in main building

30 Nov : tests of individual labs : with AC units and otherwise -- shows different labs in different light; agreed to identify the worst culprits by kind of equipment etc and provide an update.

(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests

16 Nov & 30 Nov & 21 Dec : no updates.

### 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database

(ii) response to pending requests for clearance e.g. Serum Institute...

21 Dec : awaiting call from Serum Institute for the next visit; asked all technical details of their planned equipments;

(iii) work out new action plan, given the current government policies

30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to their location for looking at specific instruments.

21 Dec : one site visited.

4 Jan : awaiting call for visit to site of the party.

====> one round of discussions have happened with Serum institute -- they would like to finish the installation and then call for testing and possible modifications; our response should be that we would like to test the existing set-up and indicate the mods to be done and these should be implemented in both existing and new setup and then taken up for testing.

Another party wanting to set-up unit for DC control drives in Junnar / Ambegaon area.

### 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters

30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems (they are the only one to have got license in this range) -- it is strong enough to cause saturation in spite of filter; need to find the specific towers and then follow-up with Reliance.

18 Jan : measurements happening this week; update by next week.

====> completed survey of 82 towers around Y-array : 14 towers in 850 band (Reliance Jio) and 6 towers in 950 GSM band; rest are in 1800 band. Max power in 850 band ~ -16 dBm (at ~ 100 m distance) for few towers. Follow-up for both 850 and 950 being pursued, including dialogue with Reliance Jio to see if they can switch to 1800 band.

## 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems

30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need to identify which make is coming finally.

21 Dec : no updates.

====> 33 nos (Voltas instead of BlueStar) have arrived; need to finalise the locations and the specific schemes for installation; need to make shielded units for all 33 nos; components for 25 units are available; boxes for 10 nos are in hand except for back plate and chromatisation (expected to take one week); work request for next 10 has been given (repeat order); some difference in wiring for Voltas unit -- needs some rework of the design / layout; also one type of connector is different and this also needs to be resolved; PAR to send an email explaining the steps to be taken to complete the RFI shielding work, and expected timelines for the same.

Regarding installation : there is a table giving the locations for 31 units (including replacements of 5 existing units) -- to check if outgoing lines can be behind the unit; to install sample one unit in canteen annexe, test the RFI shielding.

## 3. Operations related :

### 3.1 Interfacing of FE with new M&C system :

(i) latest status of testing with Rabbit card in common box at antenna base

16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).

30 Nov : no new updates on this

21 Dec : antenna control part is working; FE monitoring still not working; Charu is looking into this...

18 Jan : trying with different delay to see if it solves the problem, but not yet working with online control...

(ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus

16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration and testing in 2 weeks time and put on first antenna with RS-232 cable driving; later to convert that to ethernet over fibre; mass production may need only new plates to be made by workshop -- other aspects are in-house in FE lab.

30 Nov : item also being discussed under FE agenda item (in alternate week)

21 Dec : planned this week

18 Jan : final status is Box #1 was made functional at antenna base and was taken up to antenna focus as Box #2 does not work reliably -- hangs and needs power reset (has been tested with a couple of different Rabbit cards?); problem not solved; agreed to try the option of swapping the Rabbit cards between Box #1 and Box #2 and seeing what is the outcome. To report this by tomorrow and then decide if a 3rd box needs to be made ready.

25 Jan : testing of common box with Rabbit card : new clue related to grounding of enable signal of decoder IC may provide the breakthrough -- tested in lab and will take to antenna base now.

====> email update from Raj Upgrade : One rabbit MCM has been installed at C01 antenna dish focus; MCM communication is proper but needs to give hardware reset while changing frequency band.

### 3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgetary quote; formal quote expected shortly.

4 Jan : folder cleared ; PO should be done shortly.

18 Jan : Order has been released; full delivery time is 3 months; first box to be supplied earlier and tested...

====> email update from Raj Upgrade : expecting the delivery of one Miltec machine shortly; also initiated talk with Miltec to supply it as early as possible.

### 3.3 GMRT M&C system Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal meeting.

4 Jan : internal lab meeting held on 3 Jan (now every Tuesday)

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans

30 Nov : discussions ongoing; kick-off meeting planned.

21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.

4 Jan : regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary' etc shared with TCS.

18 Jan : work ongoing; need more regular interactions of TCS with GMRT team members.

====> email update from Raj Upgrade : 2 CMC and 6 LMC machines are UP & running; team members are now very much familiar with CMC, LMC installation, features, testing and can carry independent tasks.

### 3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for material for review committee started

30 Nov : discussions and work ongoing, including preparations for discussions with TM review panel.

21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase : requirement compatibility; architecture explanation given; scalability etc; need many upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;

4 Jan : preparation of docs in progress; ph-2 work now beginning...

18 Jan : aim to have 6+ antenna set-up with PC + switch + Rabbit talking to Sentinel + OF + Servo (to check if existing PC104 will work directly) or not; to check enough Miltech PCs available -- Sumit and Mangesh to look into it.; need to move from Fedora to Ubuntu; aim to start testing at antenna base by 23/24. Additionally, need some temporary space (couple of months) for working on 2 PCs in or near control room...

====> Last week 6 antennae Control & monitoring system was set-up and demonstrated to SKA reviewer (Nick Rees) and SKA India team.

## 4. Back-ends related :

### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh

paper needs to be looked into for revision; nothing really pending, except for the report on the attenuation values : new set of tests done and results look ok and will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed); may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?

4 Jan : To follow-up on GWB refereeing process.

18 Jan : GWB response received, relatively minor modifications are needed and SHR is looking into this; for Walsh, waiting for response -- can check after 20 days (end of this week / early next week).

#### 4.2 Updates on existing GWB-3 system :

##### (i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

4, 11 & 18 Jan : no progress since last time.

====> no updates.

##### (ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes; for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be closed ?

14 Dec : problem perhaps in AIPS settings? matter can be closed?

21 Dec : no further updates on this.

4 Jan : to keep open for some time till ICH confirms with one more data set.

18 Jan : no updates from ICH.

====> ICH has updated that another data set has been checked and found ok; matter can be closed.

#### 4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

##### (i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

##### (ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT lose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes

(T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

====> basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready; appears to be satisfactory (though no improvements in ambient temp recorded ?).

11 Jan : no further work on GWB; plan is to have similar hcnage for GBS during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (may come earlier)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep looks like resulting in some speed-up in delivery; to follow-up closely.

11 Jan : YG to contact nvidia and micropoint persons.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : need to plan the code optimisation that will be needed.

14 Dec : need a discussion to decide the way forward on this.

4, 18 Jan 17 : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

====> SSK to try and restart the old 16-antenna CD pipeline code using the SOPs etc from Kishalay...

4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :



(i) refinements of the first draft of the note  
(ii) plans for getting first unit connected and tested  
(iii) plans for testing high speed recording to disks  
16 Nov : lab set-up for grabbing and recoding has been done; while continuing with this, need to work on the set-up for sending parallel copy of the data, including procurement of longer CX4 cables.  
30 Nov & 21 Dec : not discussed.  
4 Jan 17 : basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.  
18 Jan : to test the dual copy design for correlations using existing 16-antenna corr with dummy inputs; then to connect to one machine where tests can be done for raw voltage recording and a single node correlator with flexible beamforming.  
====> no updates.

#### 4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)  
16 Nov : some changes have been made by SHR, but the sub-microsec correction still needs to be done; also to follow-up about h4k file.  
21 Dec : modified code has been made, but not yet tested; can try to see if it can be made available in the current release.  
4 & 18 Jan 17 : agreed to defer to next release.  
====> deferred as above.

#### 4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans  
(ii) spectral domain RFI filtering : current status and plans  
(iii) beamformer RFI filtering : current status and plans  
16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.  
30 Nov : not dicussed in detail.  
21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file...  
emulator has some changes and improvements, including random location of the RFI.  
4 Jan 17 : for (i) modifications in simulator; counter mode now working -- can have 2 different modes, tested at module level, now integrated into the design, will be testing in next few days; fractional thld done in simuation, to convert to design and test. (ii) to try and run the filter in real-time from shm data.  
18 Jan : not discussed, but summary of offline discussions is as follows : (i) some additional features added to RFI simulator unit; fractional threshold and counter mode now available for use in the voltage filtering unit; cumuative experience shows that we may be not using the optimal filtering technique for voltage mode -- should try the alternative approach of conversion to intensity and integration to desired time constant -- closer to a true matched filter.  
====> some updates from Kaushal about looking at options for more optimised filtering

of broadband time domain data :

Modified the design to support 16K window size - this is the default design now;  
Fractional threshold available (tested with antenna signals) - default option now;  
Made the DDC mode design compatible with the ongoing changes;  
RFI Counter design ready - format to read the data including timestamp from a single  
ROACH complete, undergoing more tests before release;  
Supporting regular tests - spectral line (Nissim), continuum (Ruta, Dharam, Ishwar);  
Handling longer duration RFI using median of MAD technique - initial results are  
encouraging, detailed tests going on;  
Looking at likely causes of missing RFI during real-time excision and at possible  
alternate methods for time-domain filtering;  
Ongoing: Updating SOP with changes made till date;

RFI emulator: (last update email - Jan) :

Last development: Adding facility for random insertion and random amplitude of RFI  
Understanding the GUI and MCM control program - backup from Rahul Bhor;

Narrowband RFI filtering: (updates email sent periodically) :

Initial version of the code has been timed; optimized for computing faster sorting for  
median computation, is now much better;  
Moving towards expected version of filtering code - with optimized functions to meet  
real-time requirements (0.671s) and necessary functionality;  
Ongoing: Testing the code on recorded data and timing the code for all 60 self outputs;  
Looking at synchronization between the data path and RFI filter (along with Sanjay);  
Looking at merging of lta file and flags for the FITS file format (along with Sanjay).

4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and  
tests ongoing; also tested by sending digitised packets to antenna and loop back;  
using GWB2 for doing all the correlations.

18 Jan : feasibility study done using C09 antenna with noise sources & real signal --  
needs a fixed delay correction of 1.5 km to get maximum correlation; trying setup  
with E5; meanwhile, a few different tests can be tried with the C09 set-up; comparison  
of scheme running on GWB2 and GWB3 tried out.

4.8 Status update on processing of tender reponses for Maser units (BAK)

(i) finalisation of processing of folder

(ii) planning for kind of environmental set-up required

16 Nov : most of the issues have been resolved, waiting for one party to complete the  
payment terms; pending issue about performance bank guarantee for different amounts  
of periods.

30 Nov : work is ongoing, but item not discussed.

4 Jan 17 : TEC clearance ok; recommendation to open price bids -- to check the status.

To contact Prof Sen Gupta for a discussion.

18 Jan : final TEC documnets done and sent for next step; to follow-up and check status.

====>

5. Other items :

5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

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## Minutes for the Plan meeting of 22 Feb 2017

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### 1. FE & OF related :

#### 1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in  $T_{lna}$  for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

28 Dec & 11 Jan : no updates; no updates, VBB on leave.

====> first results of variation of  $T_{sys}$  for Band-4 FE unit of QH + DC + LNA (which goes next to the hood) -- absolute value of Temp is higher than  $T_{lna}$  at ambient and also the variation of  $T_{sys}$  with ambient (0 to 60 deg C) is larger than for  $T_{lna}$  alone. To cross-check whether known loss of QH and DC at room temp can explain the room temp values and then extrapolate from there for different ambient temps.

#### 1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible;

28 Dec & 11 Jan : no updates.

25 Jan 17 : 5th antenna (?) completed about 10 days ago, C13.

====> only 5 antennas completed by January; request for next set of 5 feeds has been given to mechanical approx beginning of Jan -- expecting 2 dipoles shortly, but reflector and BFRs will take some time; meanwhile one FE box is ready; to get if possible 2 more to be ready, so that 2-3 antennas can be installed in quick succession. Need to have enough QH + DC (is matter of cutting right length of material and assembly); LNA have all PCBs, need chassis (ordered in sets of 20); same situation for BPF; however, request for new stools (with modified height) has not been given (!!); due to some rethink about optimal stool height (!); follow-up action on this : to discuss with mechanical to see if existing or spare stools can be modified / cut to meet the height requirement and use for the next 2-3 antennas.

#### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

(i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months should be enough to complete the tasks i.e. April 2017.

11 Jan : 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

25 Jan : needs combined tuning of filters to fix the problem; work ongoing.

====> successful in tuning the integrated unit (for 2 boxes, both channels); and 23 antennas are completed, and work is ongoing; next antenna in about 2 weeks.

(ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good : comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

11 Jan : analysis of Jan data awaited.

25 Jan : analysis of new data (on CasA) -- appears to be systematic 1-1.5 dB less deflection than predicted and control room values -- needs to be checked and followed up in consultation with ICH, DVL, SC & GP; few antennas with some odd behaviour e.g. E3 and maybe E2.

(iii) Summary of phase centre measurements and decision about future plans

25 Jan : no action yet.

(iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

11 Jan : data collected, report expected within 2-3 days.

25 Jan : Sougata + Ankur will provide update next time.

====> SC will send update within a week.

(v) LO settings for all sub-bands etc to be finalised.

14 Dec : 250-500 LO setting document / table already finalized;

28 Dec : no updates; person on leave.

11 Jan : astronomer feedback awaited (to check if final table shared with control room).

25 Jan : Not yet shared with control room; to refine based on : 6 dB point for main BPF and 10 dB for subband filters, for the default BW.

====> draft document has been circulated to DVL & YG for trials, for 3 bands (Band-3, 4 & 5); for Band-3 which shows max variation of sub-band responses, the basic response is taken as the one found in majority of units and 10 dB criteria is applied to that response to get the LO values; either lower or higher or both side LOs are recommended depending on the situation, and some justification has been given for all the cases; YG to check if this can be released to control room and all users.

#### 1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus

14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01); box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)

28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).

11 Jan : box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.

(ii) Plans for mass production

30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.

25 Jan : one box tested at antenna focus and working ok; 2nd box not yet tested at focus; even for the 1st box, repeatability is not there.

#### 1.5 Apex radiation scheme (PAR/SRoy) :

(i) Current status of measurements and interpretations

(ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

11 Jan : no updates, though there has been some email discussion between SRoy and PAR

25 Jan : need to check with SRoy and PAR.

1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) :

Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of health of Walsh switching.

11 Jan : there is some confusion about what is being done, and what has been achieved ! For 10 antennas which have new 1st LO system (LOFSW based units), it should NOT be possible to have Walsh modulation at present !

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh...

25 Jan : SC not present.

====> now clear that only those antennas (20 ?) which DO NOT have the new synth units can be tested for Walsh; latest tests on these (done in Jan), showed ok results for 19 out of 20 (one antenna was down due to mech problems).

1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

25 Jan : SC not present.

====> SC to check with JPK about the progress on implementation of the SOP for use by control room in normal PMQC type of tests and generation of stats to report to FE team.

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

25 Jan : SC not present.

1.8 New filters for L-band (AP) :

(i) status update on installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing

16 Nov : arm antenna installation to be resumed;  
14 Dec : all west arm will be completed by 16-Dec-2016;  
28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.  
11 Jan : S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).  
25 Jan : only 2 antennas W-arm remaining to be done.  
(ii) delivery of remaining units of main L-band BPF from Epitome  
16 Nov : BPF completed and handed over to BE team -- this can be closed.  
28 Dec : can be closed.

#### 1.9 OF system updates :

##### (i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.  
11 Jan : current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.

##### (ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates

28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.

11 Jan : cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.

##### (iii) 8 Gbps GMRT to Pune link : it was found that only 1 or 2 Gbps was working;

25 Jan : detailed debugging has been done by OF team and now it appears all the 4 wavelengths and hence 8 gbps lines are functional -- only one wavelength is marginal (to order spares for taking care of such issues); also remote monitoring facility at Rajgurunagar with SMS facility to be activated.

## 2. RFI related :

### 2.1 Spectral line RFI (PAR/SSK) :

#### (i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks

28 Dec : RFI team visited Junnar cable TV operator for getting response to letter that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.

25 Jan : discussed with Jondhale -- he will speak to the party and see if some progress can be made; otherwise to escalate the matter; also to estimate the number of splitters etc that can be provided to W-arm operator to mitigate the problem.

#### (ii) Digital TV follow-up

23 Nov : letter is still pending !

25 Jan : need to expedite the matter !

#### (iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source

11 Jan : 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.

25 Jan : need a site visit to understand better.

### 2.2 Satellite RFI monitoring & avoidance system (PAR/SNK) :

#### (i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and ,, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)

25 Jan : need to follow-up on identifying for LEOS.

(ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)

25 Jan : new limit is about 8 deg -- to cross-check if ok and close.

(iii) Plans for sending information to back-end receiver chain

25 Jan : to check with Santaji about the plans for this

(iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week

28 Dec : no updates.

25 Jan : to include in the plans for visit by Nick Rees in week of 6th Feb.

2.3 RFI from power lines and transformers (PAR/RVS) :

(i) review current status

(ii) specific follow-up actions

23 Nov : not discussed

28 Dec : no updates.

25 Jan : no updates.

2.4 RFI from LED lamps (PAR/RVS) :

(i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

(ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

25 Jan : report has been circulated; solution looks promising; to try for compact version of the solution; working with workshop to mechanical items; will need to order some components for bulk production.

2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested; 8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.



4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified units -- all are ok. Need follow-up as mentioned on 28 Dec.  
18 Jan 17 : all 10 units tested and cleared; now OK to use this 2nd batch of 10 units in antennas; need follow-up on status of ordering last batch of 14 units.  
25 Jan : matter closed for now from RFI team side; to take up when next lot comes.

### 3. Operations related :

#### 3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) :

##### (i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.  
28 Nov : still waiting for 80 nos PCBs to come.  
11 Jan : 84 PCBs received; can go ahead with further assembly now.  
25 Jan : this can be closed.

##### (ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);  
28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.  
11 Jan : 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.  
25 Jan : Rabbit card enclosure now going smoothly : about 2-3 per week; to send some samples for RFI testing.

====> 18 are done; 19gh ongoing.

##### (iii) status of mass production of network switch enclosure

23 Nov : 28 units ready (need total of 35)  
14 Dec : now 32 (of 35) ready;  
28 Dec : same status of 32 out of 35.  
25 Jan : 32 out of 35 completed; remaining 3 are in use and will be done when free; meanwhile, to send a few samples for RFI testing.  
====> some sample unit(s) has been given to RFI team for testing -- Raj to confirm; to check if all shielded connectors are procured or not.

#### 3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

##### (i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing

23 Nov : C00 & C10 are mostly complete (item could be closed?)  
28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.

##### (ii) plans for going beyond 2 antennas

23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)  
28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?; elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.

11 Jan : mechanical completed for 10 antennas; electrical completed for 13 antennas; Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.

##### (iii) update on improved RFI shielding at antenna shell

23 Nov : shielding test measurements done for present configuration; awaiting finger-lines to be added before repeating the tests (which antenna?)

28 Dec : folder in process for placing order for the finger-lines.  
25 Jan : mechanical has resumed work; same for electrical; will be updating spreadsheet; column for servo has been added in spreadsheet -- to remind them to start updating;

### 3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems

28 Dec : Ops team has a plan for this; can be discussed in detail next time.

11 Jan : final plan placed on web portal (for lab people)

(ii) plans for switch-over -- to make it as seamless as possible.

30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.

28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.

25 Jan : can defer till after the demo.

====> Ops team appears to prefer scenario 1 -- incremental approach; to generate a note within next 4 weeks on this.

### 3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)

14 Dec : HP layer3 switch finalized; bidgetry quote Rs 3.5 lakh; indent prepared.

11 Jan : item can be closed.

(ii) Plans for procurement

23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.

28 Dec : indent raised.

25 Jan : procedural issues related to advance payment etc...

====> not clear if this matter has been resolved before Charu went for surgery...

### 3.5 Interfacing and control of new systems such as Noise Cal & Walsh :

For 10 antennas which have new 1st LO system (LOFSW based units), need to be clear about the control path; also 2 of these antennas have independent MCM for driving the new CPLD; need a wider discussion about M&C for new system for these aspects related to Noise Cal and Walsh.

====> need 2 CPLDs in new set-up : one for new FSW LO, one for Walsh + Noise on-off etc, and both can't be connected to MCM 2 and hence an additional MCM is needed. To find out a way around this issue, so that progress can be made...

## 4. Back-ends related :

### 4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

11 Jan : one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

25 Jan : s'ware work for the above is still in progress.

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

11 Jan : one rack modified (4 antennas) and systems being tested; will report shortly, and if everything ok, will go ahead with the mods for all the 8 racks.

25 Jan : same status as above; test report has been circulated internally.

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.

14 Dec : changes to DRAFT report in progress;

28 Dec : still in progress

11 Jan : not ready yet.

25 Jan : no new updates.

4.2 Power equalisation scheme and relate topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

11 Jan : still pending

25 Jan : revised version circulated internally.

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

4.3 Updates on existing GWB-3 system :

(i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

18 Jan : no progress on this upto now, due to work on release of 30 antenna system.

25 Jan : still pending.

(ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?

14 Dec : problem perhaps in AIPS settings; matter can be closed ?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

11, 18 & 25 Jan : no updates.

4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

(ii) integration, testing and release of 2nd half 16-antenna system :

configuring of m/cs is done, testing is to start now; GPU delivery to be followed up;

23 Nov : second half 16 antenna system is under test (tdb by next week).

30 Nov : testing shows some packet loss (very small) but appears not related to BW and data rate; maybe related to CX4 drivers -- need to generate proper stats.

14 Dec : problem in ROACH (FPGA board) : 3/8 not recognizing PPS signals; one OK now after replacing with spare boards; other 2 need to be replaced with 'old' boards;

21 Dec : system is configured with 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/c (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links. Tests going on for some time now on arbitrary inputs to test data recovery -- there are occasional loss of eth packets (1 or 2 pkts per 10 sec) on 1-2 out of 16 links which changes randomly on reboot. Other than this, the acq and correlation code runs stably; further, Roach boards are showing spurious triggering. Need to find out where it is coming from; meanwhile, to try and see if possibility of false triggering can be reduced by opening the gate at 0.9 s or so.

28 Dec : zeroed the problem down to ADC + Roach board combination. modified new GUI (most likely only m/c IDs to be changed -- to be done by NSR); to start looking at other changes needed in the host m/cs etc for taking the place of a working system; IPs for the new host m/cs etc; getting the remaining T630s ready for refurbishment of 1st 16 antenna system.

4 Jan 17 : problem solved by isolating malfunctioning ADC boards and ensuring that 8 good cards on each Roach board (2nd ADC is slave and can be malfunctioning card !); also first half correlator has 14 good cards out of 16. (IMH to follow-up and try to isolate the cause of the problem); noise source test appears to be ok; sky test to be done once modified GUI is ready -- by Thurs or Fri of this week. Then one week to clear all the modes. Code is identical to existing GWB3 and hence performance should be the same (except the occasional packet drop). 2 weeks for user level tests -- hence end Jan to see if switch over can be done to new system for GTAC observations, and start refurbishing of old system; to try and assemble the nodes for the refurbished system in parallel. To order additional disks as needed.

11 Jan : tests of both 16-antenna GWBs ongoing and situation looks good; some more tests to be done this week, including some user level tests today; meanwhile, SHR to look into integrated code for running as 30 antenna system with different OS machines for each half and try to test the same by next week; additional disks to be added on the 3 new host machines; SOP has been released by SHR; in parallel to get 8 new nodes assembled with all peripherals (and K40s as soon as they come).

18 Jan : testing of 2nd half 16-antenna seems to be ok; interferometry tests appeared ok, beam tests had a problem which was fixed; may do some more thorough testing today; meanwhile, testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

====> upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

(iii) power and cooling related issues :  
for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.  
4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.  
11 Jan : no further work on GWB; plan is to have similar change for GSB during next MTAC -- preparations for this are on-going.  
18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.  
(iv) availability of components esp GPUs :  
23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.  
14 Dec : delayed further by 30 days (but may come earlier?)  
21 Dec : this is a serious matter and needs follow-up !!  
4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up in delivery; to follow-up closely.  
11 Jan : YG to follow-up.  
18 Jan : see update above.  
25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.  
(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :  
target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.  
23 Nov : no specific updates, except that code optimisation will need to be done.  
14 Dec : need a discussion to decide the way forward on this.  
4, 11 & 18 Jan : deferred for some more time, till 30-antenna system is released.  
25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.  
====> to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

#### 4.5 Network related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half system  
4 Jan 17 : this is done -- to confirm and close.  
(ii) updated IP table for .4 n/w to be made available by computer group  
4 Jan 17 : work ongoing -- to check status with comp group.  
(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group  
4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.  
(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch  
4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines is possible with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together to NCRA end; comp group to set up the test, alongwith VVS at Pune end.  
11 Jan : 3 connections made to gwbh1-3, and live test demo done; it appears that only 2 of the 8 x 1Gbps links from switch to aggregator are working ! This needs to be debugged between comp group and OF group.  
(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch  
4 Jan 17 : comp group agreed to look for options.

#### 4.6 Longer term plans for GWB-4 (SHR/ICH/SSK/BAK) :

(i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link

(ii) Disks for data recording, including trials with SSD options

(iii) investigating next gen GPUs

(iv) migration to next version of CUDA (7.5 and beyond)

23 Nov : CUDA 7.5 is being tried in the new version of GWB

(iv) Additional modes and features in GWB system :

(a) 4 beams, with upto 2 voltage beams with coherent dedispersion

23 Nov : 4 beams (IA/PA) implemented but yet to be tested to shortest integrations;

2 voltage beams (1 with full BW and 2 with half BW are planned for new system)

(b) PA - IA beam mode

(c) beam formation with different phase centres

(d) improved I/O capabilities : change in data sending code; alternate n/w ?

(e) gated correlator : folding visibilities with pulsar period

(f) polyphase filter bank

(g) 2 inputs per Roach board

(h) time + DUT corrections

(i) net-sign correction

(j) full backward compatibility of off-line utilities

23 Nov : some work has been done, but not clear if this meets / works for all requirements.

28 Dec : not discussed.

25 Jan : can take up after 3 improvements mentioned above are completed.

4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

(i) Summary of current status for temperature monitoring

(ii) Plans for future enhancement and release for regular use

(iii) Monitoring of other health parameters

14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack (uses DAQ card);

28 Dec : not discussed.

11 Jan : no significant new updates.

25 Jan : no new updates, but plans for collecting the temp data and bringing to common m/c that is accessible to control room is being planned. installation of cacti also to be taken up.

4.8 Other issues :

(i) Cross-coupling tests in GAB + GWB

14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?

28 Dec : some issues need a bit more of discussion before reaching a final conclusion.

11 Jan : ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%

25 Jan : no updates; needs a discussion.

(ii) Walsh related work.

14 Dec : some tests in progress; porting to GWB (Python package being modified);

28 Dec : work is still ongoing.

11 Jan : porting work is nearing completion.

25 Jan : now in testing phase.

5. Other items :

5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

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## Points from the Plan meeting held on 08-Mar-2017

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(updates in usual format : in lines beginning with '==>')

### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov : offset not yet fixed (to be done later with mechanical), but new data taken for E & H plane -- looks ok; to do cross-polar measurements.

21 Dec : plans for correcting the offset -- next Monday 26th.; meanwhile, earlier data has been given to SC and he will produce an updated result for band-4 within the next week.

4 Jan : test range activity planned for 9 Jan.

18 Jan : rescheduled to 23 Jan.

15 Feb : no updates, can try to update from recent emails...

==> offsets have been corrected; 610 MHz measurements done;

==> other freq being done now; report awaited;

==> method for cross-polar measurements needs review before executing

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

4 Jan : will be completed by 6 Jan.

18 Jan : manual 'digitization' of plot (hard copy) is agreed [rather than indefinitely 'waiting' for a machine readable data file to become available somehow];

15 Feb : no updates, can check recent emails for updates.

==> no update 08Mar2017

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

4 Jan : awaiting feedback

==> awaiting feedbacks from ICH & DVL

(ii) need to cross-check mismatch of values for band-3 (250-500);

30 Nov : will check and update, including referring to some existing literature

21 Dec : some work has been done, but needs an internal cross-check & then discussion.

(iii) need to see if QH losses have been incorporated into the calculations;



30 Nov : GP has done some of the work; need to circulate and get agreement.

==> report circulated; feedback awaited

(iv) does the study cover all the uGMRT bands.

30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.

16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.

21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in Tsys) -- TBC.

(v) can it be extended to deriving the final beam pattern for feed + antenna

This is being looked into

21 Dec : first version doc has been sent by SC -- needs follow-up

4 & 18 Jan : feedback awaited on this item.

15 Feb : to try to find a slot when all concerned are present to get to the finer points and close the matters.

1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document

30 Nov : yet to be completed.

21 Dec : updated & internally circulated;

15 Feb : GP to follow-up on internal clearance.

(ii) results from recent tests

30 Nov : running of tests has conflict with online system (JPK is looking into this)

21 Dec : all x30 Ae data collection leads to 'online' ssystem hanging; planning with x15 Ae (29Dec);

18 Jan : 'online' issue remained for '15' antenna also (after '30' antenna case failed); now suggested to repeat for '10' antenna case; test planned for a future wednesday;

15 Feb : to try with smaller number of antennas for now; need discussion with Ops group about the limitation and how it would get overcome.

==> GP & Jitendra following up today

(iii) labeling scheme for keeping track of the units to be taken up for refinement and implementation

16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.

30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular back-up of the files to be worked out.

15 Feb : no updates.

1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system

30 Nov : same as above

21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)

18 Jan : data showed 'flat' value over 24 hrs; C3 & E2 to be tried again today.

15 Feb : not clear about the above problem (needs follow-up with Ops group); to check with 4 antenna test and report back.

(ii) status of prototype for temp and power monitoring at OF rack at antenna base  
16 Nov : sample data set taken but not long enough; to wait for next round of tests;  
prototype unit installed at C2 and connected to M&C system, but not being monitoring  
regularly; would like to do some more test and development before finalising the  
scheme.

30 Nov : (ii) is on-hold after prototype development; to be taken up only after  
Rabbit card based system is in place.

#### 1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares

30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.

4 Jan : 4 complete sets of spares available now (ready for installation at antenna)

(ii) finalisation of report by VBB

16 Nov : same status as last week.

30 Nov : report pending with SSK

18 Jan : report to be ready by 25 Jan.

15 Feb : 4 spare systems available.

==> 5th L-band spare has been assembled - currently under test

#### 1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs

30 Nov : some failed units are being retuned...

==> all spares available

(ii) status of new 2-stage design installed on 2 antennas : working ok ?

30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.

(ii) status of new 3-stage design : optimisation of RL was being attempted

16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better  
than 10 dB across the band; Tlna ~ 20 K (by old noise comm calibration scheme); to  
try improve further, while assembling second unit.

30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of  
interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna  
(2 units to be made ready).

21 Dec : 2 K improvement seen (< 20 K) ; report to be available in 1 week

4 Jan : second unit has been assembled; overlapping plots show good repeatability;  
report will be ready by 6 Jan.

18 Jan : report already circulated last week [ ~ 20 K over full band; gain ~ 44dB flat;  
return loss better than -11dB over entire band (-14/-15 dB most places); worst case  
-11 dB near lower freq band edge]

15 Feb : no updates.

==> x6 new PCBs (x2 circuits assembled; awaiting chassis; expected next week)

#### 1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB  
problem and W5 -- problem not identified); C14 showing poor deflection and falling  
at high freq -- checked for pointing and OF attn, now to try changing the feed.

4 Jan : results from tests on 13 Dec discussed : 21 antennas available; dip seen for  
L-band vanished after replacing common box (which antenna?), but unit appears to be  
ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2;  
W5 poor bandshape; C14 noise deflection discussed.

18 Jan : 06-Jan-2017 tests reported; (only 15 antennas were available); E6 showed ripples in CH1 (but could be cable twist; as today NOT noticed); E6 CH2 deflection HIGHER than expected (red dots) !! "measurement" error? 'naming' of file ? similarly W5 CH2; results show MAJOR drift in deflection (~ 15 dB spread !) -- BUT NO CORRECTIVE ACTION TAKEN !! Primary purpose of monitoring is LOST ! SKR was 'un-sure' about this responsibility - now clarified; henceforth, he will follow up on errant antennas.

15 Feb : E6 ripple in Ch1 fixed (bad cable); C14 feed needs to be replaced (tbd soon); tests at antenna base for selected set of antennas shows ~6-8 dB variations -- this needs to be investigated and understood.

==> ripples were due to cables;

==> C14 slope in deflection was possibly due to feed issue - now new feed has been

==> put; tests awaited

1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring in control room

30 Nov : this is now available under the standard monitoring tools; control part has some problem and needs login to control PC -- SOP for this to be provided to control room.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue.

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

1.10 Mass production of Band-4 (550-900) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow; 12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.

30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity units are available).

21 Dec : 1 more week delay due to vendor's delay

4 Jan : hoods have arrived today; 12th antenna to be completed by 15-20 Jan.

18 Jan : system for 12th antenna will be ready by Monday 23 Jan (lab tests are in progress now); by April x16 system target can still be met.

15 Feb : 13th antenna (C03) installed this week (2 weeks since last one);

==> dipole shortage; 14th antenna to be completed by ~ 15-Mar-2017;

==> QC issue with dipole units fabricated by outsourced party;

==> dipoles need to be fabricated in-house;

2. RFI related :

2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting to be completed

30 Nov : YG + PAR to work on this final version.

(ii) study of RFI environment, including internally generated RFI in main building  
30 Nov : tests of individual labs : with AC units and otherwise -- shows different  
labs in different light; agreed to identify the worst culprits by kind of equipment etc  
and provide an update.  
(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests  
16 Nov & 30 Nov & 21 Dec : no updates.

## 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database  
(ii) response to pending requests for clearance e.g. Serum Institute...  
21 Dec : awaiting call from Serum Institute for the next visit; asked all technical  
details of their planned equipments;  
(iii) work out new action plan, given the current government policies  
30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to  
their location for looking at specific instruments.  
21 Dec : one site visited.  
4 Jan : awaiting call for visit to site of the party.  
15 Feb : one round of discussions have happened with Serum institute -- they would like  
to finish the installation and then call for testing and possible modifications; our  
response should be that we would like to test the existing set-up and indicate the  
mods to be done and these should be implemented in both existing and new setup and  
then taken up for testing.  
Another party wanting to set-up unit for DC control drives in Junnar / Ambegaon area.

==> DIC & MIDC people came to GMRT; our request agreed to [move away]

## 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters  
30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems  
(they are the only one to have got license in this range) -- it is strong enough to  
cause saturation in spite of filter; need to find the specific towers and then  
follow-up with Reliance.  
18 Jan : measurements happening this week; update by next week.  
15 Feb : completed survey of 82 towers around Y-array : 14 towers in 850 band (Reliance  
Jio) and 6 towers in 950 GSM band; rest are in 1800 band. Max power in 850 band  
~ -16 dBm (at ~ 100 m distance) for few towers. Follow-up for both 850 and 950 being  
pursued, including dialogue with Reliance Jio to see if they can switch to 1800 band.

==> draft letter circulated (vendor is generally positive; but formal communication  
==> needs to go soon)

## 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems  
30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need  
to identify which make is coming finally.  
21 Dec : no updates.  
15 Feb : 33 nos (Voltas instead of BlueStar) have arrived; need to finalise the  
locations and the specific schemes for installation; need to make shielded units  
for all 33 nos; components for 25 units are available; boxes for 10 nos are in hand  
except for back plate and chromatisation (expected to take one week); work request for  
next 10 has been given (repeat order); some difference in wiring for Voltas unit --  
needs some rework of the design / layout; also one type of connector is different and  
this also needs to be resolved; PAR to send an email explaining the steps to be taken  
to complete the RFI shielding work, and expected timelines for the same.

Regarding installation : there is a table giving the locations for 31 units (including replacements of 5 existing units) -- to check if outgoing lines can be behind the unit; to install sample one unit in canteen annexe, test the RFI shielding.

- ==> one set of measurement done (without shielding) - under analysis
- ==> by next week shielded case will be measured & compared;
- ==> RFI group designed shielding box pictures displayed;
- ==> uses many cables with RFI shielded interface connectors;
- ==> it includes high current carrying (220V AC) lines, needing shielded connectors !
  
- ==> LED panel/ tube light shielding : report generated on tests - broad band radiation
- ==> from commercial units (x4 units in one box) - shielding is ~ 75 dB ; results appear encouraging; Syska (x1 22W), Philips (X4 20W); -150 dBm final number arrived at.
  
- ==> high failure rate of LEDs due to voltage fluctuations;

### 3. Operations related :

#### 3.1 Interfacing of FE with new M&C system :

- (i) latest status of testing with Rabbit card in common box at antenna base
    - 16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).
    - 30 Nov : no new updates on this
    - 21 Dec : antenna control part is working; FE monitoring still not working; Charu is looking into this...
    - 18 Jan : trying with different delay to see if it solves the problem, but not yet working with online control...
  - (ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus
    - 16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration and testing in 2 weeks time and put on first antenna with RS-232 cable driving; later to convert that to ethernet over fibre; mass production may need only new plates to be made by workshop -- other aspects are in-house in FE lab.
    - 30 Nov : item also being discussed under FE agenda item (in alternate week)
    - 21 Dec : planned this week
    - 18 Jan : final status is Box #1 was made functional at antenna base and was taken up to antenna focus as Box #2 does not work reliably -- hangs and needs power reset (has been tested with a couple of different Rabbit cards?); problem not solved; agreed to try the option of swapping the Rabbit cards between Box #1 and Box #2 and seeing what is the outcome. To report this by tomorrow and then decide if a 3rd box needs to be made ready.
    - 25 Jan : testing of common box with Rabbit card : new clue related to grounding of enable signal of decoder IC may provide the breakthrough -- tested in lab and will take to antenna base now.
    - 15 Feb : email update from Raj Uprade : One rabbit MCM has been installed at C01 antenna dish focus; MCM communication is proper but needs to give hardware reset while changing frequency band.
- ==> it is working only for some bands (C01); needs rethink on strategy;

### 3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgetary quote; formal quote expected shortly.

4 Jan : folder cleared ; PO should be done shortly.

18 Jan : Order has been released; full delivery time is 3 months; first box to be supplied earlier and tested...

15 Feb : email update from Raj Upade : expecting the delivery of one Miltec machine shortly; also initiated talk with Miltec to supply it as early as possible.

==> one unit has come; will be tested & feedback given to Miltech

### 3.3 GMRT M&C system Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal meeting.

4 Jan : internal lab meeting held on 3 Jan (now every Tuesday)

==> all team members are clear on their respective roles & are contributing

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans

30 Nov : discussions ongoing; kick-off meeting planned.

21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.

4 Jan : regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary' etc shared with TCS.

18 Jan : work ongoing; need more regular interactions of TCS with GMRT team members.

15 Feb : email update from Raj Upade : 2 CMC and 6 LMC machines are UP & running; team members are now very much familiar with CMC, LMC installation, features, testing and can carry independent tasks.

==> interim review held; schedule is 6 weeks slippage/ delayed;

==> mitigation planned for that delay;

### 3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for material for review committee started

30 Nov : discussions and work ongoing, including preparations for discussions with TM review panel.

21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase : requirement compatibility; architecture explanation given; scalability etc; need many upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;

4 Jan : preparation of docs in progress; ph-2 work now beginning...

18 Jan : aim to have 6+ antenna set-up with PC + switch + Rabbit talking to Sentinel + OF + Servo (to check if existing PC104 will work directly) or not; to check enough Miltech PCs available -- Sumit and Mangesh to look into it.; need to move from Fedora to Ubuntu; aim to start testing at antenna base by 23/24. Additionally, need some temporary space (couple of months) for working on 2 PCs in or near control room...

15 Feb : Last week 6 antennae Control & monitoring system was set-up and demonstrated

to SKA reviewer (Nick Rees) and SKA India team.

==> SKA committee is reviewing our work;  
==> cost estimate proposal from India was submitted to SKA claiming 50% saving  
==> on TM work using Indian scheme;

==> x21 shielded Rabbit boxes completed;  
==> RFI team has been given x1 unit for measuring its shielding capability;

#### 4. Back-ends related :

##### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh paper needs to be looked into for revision; nothing really pending, except for the report on the attenuation values : new set of tests done and results look ok and will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed); may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?

4 Jan : To follow-up on GWB refereeing process.

18 Jan : GWB response received, relatively minor modifications are needed and SHR is looking into this; for Walsh, waiting for response -- can check after 20 days (end of this week / early next week).

##### 4.2 Updates on existing GWB-3 system :

(i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

4, 11 & 18 Jan : no progress since last time.

15 Feb : no updates.

==> band shape correction remains to be implemented;

(ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes; for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be closed ?

14 Dec : problem perhaps in AIPS settings? matter can be closed?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

##### 4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each,

3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT loose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

==> option added for logging packet loss; NOT after each scan (very high I/O overhead);

==> But, it is logged at the end of observations (N.B. file needs renaming, or else

==> it will be overwritten by next observation !);

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready; appears to be satisfactory (though no improvements in ambient temp recorded ?).

11 Jan : no further work on GWB; plan is to have similar hcnage for GBS during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

==> GWB work over;



==> for GSB, planning stage (to be done during upcoming MTAC);

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (may come earlier)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep looks like resulting in some speed-up in delivery; to follow-up closely.

11 Jan : YG to contact nvidia and micropoint persons.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

==> x20 GPUs have arrived; tested OK; already in machines;

==> (FREE) demo Pascal unit did not come

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : need to plan the code optimisation that will be needed.

14 Dec : need a discussion to decide the way forward on this.

4, 18 Jan 17 : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

15 Feb : SSK to try and restart the old 16-antenna CD pipeline code using the SOPs etc from Kishalay...

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

==> full system released on 28-Feb-2017;

==> total x5 host machines available; x4 have x2 GPUs each;

==> additional tests are in progress on the released version;

4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :

(i) refinements of the first draft of the note

(ii) plans for getting first unit connected and tested

(iii) plans for testing high speed recording to disks

16 Nov : lab set-up for grabbing and recoding has been done; while continuing with this, need to work on the set-up for sending parallel copy of the data, including procurement of longer CX4 cables.

30 Nov & 21 Dec : not discussed.

4 Jan 17 : basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.

18 Jan : to test the dual copy design for correlations using existing 16-antenna corr with dummy inputs; then to connect to one machine where tests can be done for raw voltage recording and a single node correlator with flexible beamforming.

15 Feb : no updates.

==> 374 mbps speed achieved; but need slightly higher speed

#### 4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)

16 Nov : some changes have been made by SHR, but the sub-microsec correction still needs to be done; also to follow-up about h4k file.

21 Dec : modified code has been made, but not yet tested; can try to see if it can be made available in the current release.

4 & 18 Jan 17 : agreed to defer to next release.

15 Feb : deferred as above.

==> current release has this 'sub-microsec correction' ENABLED;

==> it is now possible to send those values to header files;

#### 4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans

(ii) spectral domain RFI filtering : current status and plans

(iii) beamformer RFI filtering : current status and plans

16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.

30 Nov : not discussed in detail.

21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file...

emulator has some changes and improvements, including random location of the RFI.

4 Jan 17 : for (i) modifications in simulator; counter mode now working -- can have 2 different modes, tested at module level, now integrated into the design, will be testing in next few days; fractional thld done in simulation, to convert to design and test. (ii) to try and run the filter in real-time from shm data.

18 Jan : not discussed, but summary of offline discussions is as follows : (i) some additional features added to RFI simulator unit; fractional threshold and counter mode now available for use in the voltage filtering unit; cumulative experience shows that we may be not using the optimal filtering technique for voltage mode -- should try the alternative approach of conversion to intensity and integration to desired time constant -- closer to a true matched filter.

====> some updates from Kaushal about looking at options for more optimised filtering of broadband time domain data :

Modified the design to support 16K window size - this is the default design now;

Fractional threshold available (tested with antenna signals) - default option now;

Made the DDC mode design compatible with the ongoing changes;

RFI Counter design ready - format to read the data including timestamp from a single ROACH complete, undergoing more tests before release;

Supporting regular tests - spectral line (Nissim), continuum (Ruta, Dharam, Ishwar);

Handling longer duration RFI using median of MAD technique - initial results are encouraging, detailed tests going on;

Looking at likely causes of missing RFI during real-time excision and at possible

alternate methods for time-domain filtering;  
Ongoing: Updating SOP with changes made till date;

RFI emulator: (last update email - Jan) :  
Last development: Adding facility for random insertion and random amplitude of RFI  
Understanding the GUI and MCM control program - backup from Rahul Bhor;

Narrowband RFI filtering: (updates email sent periodically) :  
Initial version of the code has been timed; optimized for computing faster sorting for median computation, is now much better;  
Moving towards expected version of filtering code - with optimized functions to meet real-time requirements (0.671s) and necessary functionality;  
Ongoing: Testing the code on recorded data and timing the code for all 60 self outputs;  
Looking at synchronization between the data path and RFI filter (along with Sanjay);  
Looking at merging of lta file and flags for the FITS file format (along with Sanjay).

==> now optimizing real time filtering;  
==> all bands filtering on recorded;

==> Broad band RFI filtering : emulator tested; other techniques being explored;

==> SOP updated; to be released next week

#### 4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and tests ongoing; also tested by sending digitised packets to antenna and loop back; using GWB2 for doing all the correlations.

18 Jan : feasibility study done using C09 antenna with noise sources & real signal -- needs a fixed delay correction of 1.5 km to get maximum correlation; trying setup with E5; meanwhile, a few different tests can be tried with the C09 set-up; comparison of scheme running on GWB2 and GWB3 tried out.

==> C9 & E5 setups faced problems (ethernet card issue); now fixed;  
==> GWB2 (early digitization) & GWB3 being used for comparison;  
==> delay requirement has reduced (due to early digitization);

#### 4.8 Status update on processing of tender reponses for Maser units (BAK)

(i) finalisation of processing of folder

(ii) planning for kind of environmental set-up required

16 Nov : most of the issues have been resolved, waiting for one party to complete the payment terms; pending issue about performance bank guarantee for different amounts of periods.

30 Nov : work is ongoing, but item not discussed.

4 Jan 17 : TEC clearance ok; recommendation to open price bids -- to check the status.

To contact Prof Sen Gupta for a discussion.

18 Jan : final TEC documnets done and sent for next step; to follow-up and check status.

15 Feb : activities ongoing...

==> Negotiating commitee met the vendor (no reduction on price; but add modules  
==> 'FREE'; paymentntern as poer NCRA conditions)  
==> Dr Sengupta will be visiting next week;

==> first unit delivery after 5 months; second unit 4 months after 1st delivery;

5. Other items :

5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

=====

## Minutes for the Plan meeting of 15 Mar 2017

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### 1. FE & OF related :

#### 1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in  $T_{lna}$  for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

22 Feb : first results of variation of  $T_{sys}$  for Band-4 FE unit of QH + DC + LNA

(which goes next to the hood) -- absolute value of Temp is higher than  $T_{lna}$  at ambient and also the variation of  $T_{sys}$  with ambient (0 to 60 deg C) is larger than for  $T_{lna}$  alone. To cross-check whether known loss of QH and DC at room temp can explain the room temp values and then extrapolate from there for different ambient temps.

====> new test done with QH + LNA only (compared with QH + DC + LNA) -- shows lower variation of  $T_{sys}$  over 60 deg range of chamber (35-40 instead of 55-60 seen earlier); agreed to try to estimate the loss of QH and DC with temperature and use theoretical formula along with  $T_{lna}$  as fn of temp to predict the observed  $T_{sys}$  vs temp curves and compare with the measurements.

#### 1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible.

22 Feb 17 : only 5 antennas completed by January; request for next set of 5 feeds has been given to mechanical approx beginning of Jan -- expecting 2 dipoles shortly, but reflector and BFRs will take some time; meanwhile one FE box is ready; to get if possible 2 more to be ready, so that 2-3 antennas can be done in quick succession.

Need to have enough QH + DC (is matter of cutting right length of material and assembly); for LNA : have all PCBs, need chassis (ordered in sets of 20); same situation for BPF; however, request for new stools (with modified height) has not been given (!); due to some rethink about optimal stool height (!); follow-up action on this : to discuss with mechanical to see if existing or spare stools can be modified / cut to meet the height requirement and use for the next 2-3 antennas.

====> HRB had requested for 5 feeds (DRF 130-260 MHz) out of which 5 dipoles arrived and reflectors + BFRs will arrive by 18 Mar; mounting stools (1190 mm), 30 nos. requested, out of which, 2 stools will arrive on 18 Mar; hence, new installation only by next week;

#### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

(i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months

should be enough to complete the tasks i.e. April 2017.

11 Jan 17 : 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

25 Jan : needs combined tuning of filters to fix the problem; work ongoing.

22 Feb : successful in tuning the integrated unit (for 2 boxes, both channels); and

23 antennas are completed, and work is ongoing; next antenna in about 2 weeks.

====> one more box was made ready, but gave trouble after exhibit at Science Day (!); has been made ready again (all the cables were changed). Will go up shortly.

Meanwhile, next set is getting ready.

(ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good : comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

11 Jan : analysis of Jan data awaited.

25 Jan : analysis of new data (on CasA) -- appears to be systematic 1-1.5 dB less deflection than predicted and control room values -- needs to be checked and followed up in consultation with ICH, DVL, SC & GP; few antennas with some odd behaviour e.g. E3 and maybe E2.

====> no updates as Ankur is not available

(iii) Summary of phase centre measurements and decision about future plans

25 Jan : no action yet.

====> still pending.

(iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

11 Jan : data collected, report expected within 2-3 days.

25 Jan : Sougata + Ankur will provide update next time.

22 Feb : SC will send update within a week.

====> some work is still pending; SC will complete and send within a week.

(v) LO settings for all sub-bands etc to be finalised.

14 Dec : 250-500 LO setting document / table already finalized;

28 Dec : no updates; person on leave.

11 Jan : astronomer feedback awaited (to check if final table shared with control room).

25 Jan : Not yet shared with control room; to refine based on : 6 dB point for main BPF and 10 dB for subband filters, for the default BW.

22 Feb : draft document has been circulated to DVL & YG for trials, for 3 bands (Band-3, 4 & 5); for Band-3 which shows max variation of sub-band responses, the basic response is taken as the one found in majority of units and 10 dB criteria is applied to that response to get the LO values; either lower or higher or both side LOs are recommended depending on the situation, and some justification has been given for all the cases; YG to check if this can be released to control room and all users.

====> some responses from DVL + Nilesh et al -- some clarifications sent; some more tests to be carried out this week.

#### 1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus

14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01);

box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)

28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled

for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).

11 Jan : box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.

(ii) Plans for mass production

30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.

25 Jan : one box tested at antenna focus and working ok; 2nd box not yet tested at focus; even for the 1st box, repeatability is not there.

1.5 Apex radiation scheme (PAR/SRoy) :

(i) Current status of measurements and interpretations

(ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

11 Jan : no updates, though there has been some email discussion between SRoy and PAR

25 Jan : need to check with SRoy and PAR.

====> PAR and SRoy yet to have a detailed discussion; meanwhile another round of tests done on C1 -- showing a different pattern than C10. Need to summarise and circulate and then take up for discussion.

1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) :

Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of health of Walsh switching.

11 Jan : there is some confusion about what is being done, and what has been achieved ! For 10 antennas which have new 1st LO system (LOFSW based units), it should NOT be possible to have Walsh modulation at present !

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh...

22 Feb : now clear that only those antennas (20 ?) which DO NOT have the new synth units can be tested for Walsh; latest tests on these (done in Jan), showed ok results for 19 out of 20 (one antenna was down due to mech problems).

====> no immediate action here; need to work out with analog BE team.

1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

22 Feb : SC to check with JPK about the progress on implementation of the SOP for use by control room in normal PMQC type of tests and generation of stats to report to FE team.

====> control room people (JPK and SNK) are looking into the code written for GSB to see if it can be done for GWB.

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

22 Feb : to plan for the discussion.

====> agreed to make a presentation on 20th in the poln meeting.

1.8 New filters for L-band (AP) :

(i) status update on installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing

16 Nov : arm antenna installation to be resumed;

14 Dec : all west arm will be completed by 16-Dec-2016;

28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.

11 Jan : S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).

25 Jan : only 2 antennas W-arm remaining to be done.

(ii) delivery of remaining units of main L-band BPF from Epitome

16 Nov : BPF completed and handed over to BE team -- this can be closed.

28 Dec 16 : can be closed.

1.9 OF system updates :

(i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.

11 Jan : current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.

====> this is status quo; few extra high power lasers at 1310 nm for forward link have been procured; cards being made ready; will be used as and when loss becomes too large in far away antennas.

(ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates

28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.

11 Jan : cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.

====> expected by end of this month.

(iii) 8 Gbps GMRT to Pune link : it was found that only 1 or 2 Gbps was working;

25 Jan : detailed debugging has been done by OF team and now it appears all the 4 wavelengths and hence 8 gbps lines are functional -- only one wavelength is marginal (to order spares for taking care of such issues); also remote monitoring facility at Rajgurunagar with SMS facility to be activated.

====> spares have been ordered; monitoring unit is ready -- small change needed in software and then can be installed.



## 2. RFI related :

### 2.1 Spectral line RFI (PAR/SSK) :

#### (i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks

28 Dec : RFI team visited Junnar cable TV operator for getting response to letter that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.

25 Jan : discussed with Jondhale -- he will speak to the party and see if some progress can be made; otherwise to escalate the matter; also to estimate the number of splitters etc that can be provided to W-arm operator to mitigate the problem.

#### (ii) Digital TV follow-up

23 Nov : letter is still pending !

25 Jan : need to expedite the matter !

#### (iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source

11 Jan : 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.

25 Jan : need a site visit to understand better.

### 2.2 Satellite RFI monitoring & avoidance system (PAR/SNK) :

#### (i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and ,, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)

25 Jan : need to follow-up on identifying for LEOS.

#### (ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)

25 Jan : new limit is about 8 deg -- to cross-check if ok and close.

#### (iii) Plans for sending information to back-end receiver chain

25 Jan : to check with Santaji about the plans for this

#### (iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week

28 Dec : no updates.

25 Jan : to include in the plans for visit by Nick Rees in week of 6th Feb.

### 2.3 RFI from power lines and transformers (PAR/RVS) :

#### (i) review current status

#### (ii) specific follow-up actions

23 Nov : not discussed

28 Dec : no updates.

25 Jan : no updates.

### 2.4 RFI from LED lamps (PAR/RVS) :

#### (i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

#### (ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

25 Jan : report has been circulated; solution looks promising; to try for compact version of the solution; working with workshop to mechanical items; will need to order some components for bulk production.

08 Mar : LED panel/ tube light shielding : report generated on tests - broad band radiation from commercial units (x4 units in one box) - shielding is ~ 75 dB ; results appear encouraging; Syska (x1 22W), Philips (X4 20W); -150 dBm final number arrived at. high failure rate of LEDs due to voltage fluctuations;

2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested; 8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.

4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified units -- all are ok. Need follow-up as mentioned on 28 Dec.

18 Jan 17 : all 10 units tested and cleared; now OK to use this 2nd batch of 10 units in antennas; need follow-up on status of ordering last batch of 14 units.

25 Jan : matter closed for now from RFI team side; to take up when next lot comes.

New results : characterisation of mobile phone RFI in the GMRT campus -- some interesting plots; using JIO CDMA uplinks and their effect can be seen.

3. Operations related :

3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) :

(i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.

28 Nov : still waiting for 80 nos PCBs to come.

11 Jan : 84 PCBs received; can go ahead with further assembly now.

25 Jan : this can be closed.

(ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);

28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.

11 Jan : 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.

25 Jan : Rabbit card enclosure now going smoothly : about 2-3 per week; to send some samples for RFI testing.

22 Feb : 18 are done; 19th ongoing.

====> 23 completed; one unit given to RFI team for measuring shielding.

(iii) status of mass production of network switch enclosure

23 Nov : 28 units ready (need total of 35)

14 Dec : now 32 (of 35) ready;

28 Dec : same status of 32 out of 35.

25 Jan : 32 out of 35 completed; remaining 3 are in use and will be done when free; meanwhile, to send a few samples for RFI testing.

22 Feb : some sample unit(s) has been given to RFI team for testing -- Raj to confirm; to check if all shielded connectors are procured or not.

====> samples have been given and tests are being carried out today.

3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

(i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing

23 Nov : C00 & C10 are mostly complete (item could be closed?)

28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.

(ii) plans for going beyond 2 antennas

23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)

28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?;

elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.

11 Jan : mechanical completed for 10 antennas; electrical completed for 13 antennas; Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.

25 Jan : mechanical has resumed work; same for electrical; will be updating spreadsheet; column for servo has been added in spreadsheet -- to remind them to start updating;

====> mech has completed 13 antennas; electrical has installed all the UPS units (23), other changes need to be checked; servo has completed 10 antennas.

(iii) update on improved RFI shielding at antenna shell

23 Nov : shielding test measurements done for present configuration; awaiting finger-lines to be added before repeating the tests (which antenna?)

28 Dec : folder in process for placing order for the finger-lines.

3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems

28 Dec : Ops team has a plan for this; can be discussed in detail next time.

11 Jan : final plan placed on web portal (for lab people)

(ii) plans for switch-over -- to make it as seamless as possible.

30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.

28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.

25 Jan : can defer till after the demo.

22 Feb : Ops team appears to prefer scenario 1 -- incremental approach; to generate

a note within next 4 weeks on this.

====> still pending for team to send a draft doc.

### 3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)

14 Dec : HP layer3 switch finalized; budgetary quote Rs 3.5 lakh; indent prepared.

11 Jan : item can be closed.

(ii) Plans for procurement

23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.

28 Dec : indent raised.

25 Jan : procedural issues related to advance payment etc...

22 Feb : not clear if this matter has been resolved before Charu went on leave...

====> need to check with Charu.

### 3.5 Interfacing and control of new systems such as Noise Cal & Walsh :

For 10 antennas which have new 1st LO system (LOFSW based units), need to be clear about the control path; also 2 of these antennas have independent MCM for driving the new CPLD; need a wider discussion about M&C for new system for these aspects related to Noise Cal and Walsh.

22 Feb : need 2 CPLDs in new set-up : one for new FSW LO, one for Walsh + Noise on-off etc, and both can't be connected to MCM 2 and hence an additional MCM is needed. To find out a way around this issue, so that progress can be made...

====> 2 options are being explored by BE team without increasing the number of MCMs from present count; some prototypes are being tested and will be reported upon shortly. For the longer term, need to see if antenna based Rabbit card can fulfill these roles.

## 4. Back-ends related :

### 4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

11 Jan : one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

25 Jan : s'ware work for the above is still in progress.

====> still in progress, no new update.

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

11 Jan : one rack modified (4 antennas) and systems being tested; will report shortly, and if everything ok, will go ahead with the mods for all the 8 racks.

25 Jan : same status as above; test report has been circulated internally.

====> will complete the modifications for all racks in MTAC; meanwhile, the filters

can be used with unequal gain in different antennas; command is available to control room and can be tried.

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.

14 Dec : changes to DRAFT report in progress;

11 Jan : still in progress -- not ready yet.

25 Jan : no new updates.

====> no new updates; BAK to check.

4.2 Power equalisation scheme and relate topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

11 Jan : still pending

25 Jan : revised version circulated internally.

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

====> BAK to check and get back.

4.3 Updates on existing GWB-3 system :

(i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

4, 11 & 18 Jan : no progress on this upto now, due to work on release of 30 antenna system.

25 Jan & 15 Feb : still pending.

22 Feb & 08 Mar : remains to be implemented -- can be taken up in the list of tasks now.

====> SHR has not yet gone back to this topic.

(ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?

14 Dec : problem perhaps in AIPS settings; matter can be closed ?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov 16 : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each

with 2 ADCs and 2 x 10 Gbe links;  
initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT loose sync; agreed to leave like this for now and revisit later on.  
ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.  
testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.  
integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.  
18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.  
25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.  
15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.  
22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.  
8 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); But, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).  
(iii) power and cooling related issues :  
for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.  
23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.  
4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.  
11 Jan : no further work on GWB; plan is to have similar change for GSB during next MTAC -- preparations for this are on-going.  
18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.  
8 Mar : plans for work on GSB during upcoming MTAC -- needs a discussion.  
(iv) availability of components esp GPUs :  
23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.  
14 Dec : delayed further by 30 days (but may come earlier?)  
21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up in delivery; to follow-up closely.

11 Jan : YG to follow-up with nvidia and micropoint.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

====> BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : no specific updates, except that code optimisation will need to be done.

14 Dec : need a discussion to decide the way forward on this.

4, 11 & 18 Jan : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

====> discussion on long-term issues to be taken up next week.

#### 4.5 Network related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half system

4 Jan 17 : this is done -- to confirm and close.

(ii) updated IP table for .4 n/w to be made available by computer group

4 Jan 17 : work ongoing -- to check status with comp group.

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines is possible with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together to NCRA end; comp group to set up the test, alongwith VVS at Pune end.

11 Jan : 3 connections made to gwbh1-3, and live test demo done; it appears that only 2 of the 8 x 1Gbps links from switch to aggregator are working ! This needs to be debugged between comp group and OF group.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

4 Jan 17 : comp group agreed to look for options.

====> can be taken up next time.

#### 4.6 Longer term plans for GWB-4 (SHR/ICH/SSK/BAK) :

(i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link

(ii) Disks for data recording, including trials with SSD options

(iii) investigating next gen GPUs

(iv) migration to next version of CUDA (7.5 and beyond)

23 Nov : CUDA 7.5 is being tried in the new version of GWB

(iv) Additional modes and features in GWB system :

(a) 4 beams, with upto 2 voltage beams with coherent dedispersion

23 Nov : 4 beams (IA/PA) implemented but yet to be tested to shortest integrations;

2 voltage beams (1 with full BW and 2 with half BW are planned for new system)

(b) PA - IA beam mode

(c) beam formation with different phase centres

(d) improved I/O capabilities : change in data sending code; alternate n/w ?

(e) gated correlator : folding visibilities with pulsar period

(f) polyphase filter bank

(g) 2 inputs per Roach board

(h) time + DUT corrections

(i) net-sign correction

(j) full backward compatibility of off-line utilities

23 Nov : some work has been done, but not clear if this meets / works for all requirements.

28 Dec : not discussed.

25 Jan : can take up after 3 improvements mentioned above are completed.

====> to be taken up next week.

4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

(i) Summary of current status for temperature monitoring

(ii) Plans for future enhancement and release for regular use

(iii) Monitoring of other health parameters

14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack (uses DAQ card);

28 Dec : not discussed.

11 Jan : no significant new updates.

25 Jan : no new updates, but plans for collecting the temp data and bringing to common m/c that is accessible to control room is being planned. installation of cacti also to be taken up.

====> machine has been made ready; cactii has been installed; gradually adding nodes to the list and making them ready for monitoring; a separate home-grown product (using cgitplot) also being made ready for monitoring IB network.

4.8 Other issues :

(i) Cross-coupling tests in GAB + GWB

14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?

28 Dec : some issues need a bit more of discussion before reaching a final conclusion.

11 Jan : ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%

25 Jan : no updates; needs a discussion.

(ii) Walsh related work.

14 Dec : some tests in progress; porting to GWB (Python package being modified);

28 Dec : work is still ongoing.

11 Jan : porting work is nearing completion.

25 Jan : now in testing phase.

5. Other items :

5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.



21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

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## Minutes for the Plan meeting of 22-Mar-2017

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### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov : offset not yet fixed (to be done later with mechanical), but new data taken for E & H plane -- looks ok; to do cross-polar measurements.

21 Dec : plans for correcting the offset -- next Monday 26th.; meanwhile, earlier data has been given to SC and he will produce an updated result for band-4 within the next week.

4 Jan : test range activity planned for 9 Jan.

18 Jan : rescheduled to 23 Jan.

8 Mar : offsets have been corrected; 610 MHz measurements done; other freq being done now; report awaited; method for cross-polar measurements needs review before executing.

====> new results presented : from ~ 600 to 800 MHz in ~ 50 MHz steps; to see if we can get closer to 550 and 850 MHz and repeat. Also to try Band-2 (120-250) feed and see if re-measurement of Band-3 (250-500) is useful.

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

4 Jan : will be completed by 6 Jan.

18 Jan : manual 'digitization' of plot (hard copy) is agreed [rather than indefinitely 'waiting' for a machine readable data file to become available somehow];

15 Feb : no updates, can check recent emails for updates.

08 Mar : no updates.

====> no updates, can keep pending for some time.

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

4 Jan : awaiting feedback

8 Mar : awaiting feedbacks from ICH & DVL

====> ICH and DVL reminded; will get back in next few days with comments and then possible follow-up and closure can be explored.

(ii) need to cross-check mismatch of values for band-3 (250-500);

30 Nov : will check and update, including referring to some existing literature

21 Dec : some work has been done, but needs an internal cross-check & then discussion.

====> new doc has the updated values for this.

(iii) need to see if QH losses have been incorporated into the calculations;

30 Nov : GP has done some of the work; need to circulate and get agreement.

8 Mar : report circulated; feedback awaited

====> new doc has the updated values for this also.

(iv) does the study cover all the uGMRT bands.

30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.

16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.

21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in Tsys) -- TBC.

====> new doc covers all the bands, except for 120-250 (Band-2) as measured feed radiation pattern is not available (standard 65% across the full band has been assumed).

(v) can it be extended to deriving the final beam pattern for feed + antenna

This is being looked into

21 Dec : first version doc has been sent by SC -- needs follow-up

4 & 18 Jan : feedback awaited on this item.

15 Feb : to try to find a slot when all concerned are present to get to the finer points and close the matters.

====> can be presented this Friday and then taken up for follow-up discussion.

#### 1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document

30 Nov : yet to be completed.

21 Dec : updated & internally circulated;

15 Feb : GP to follow-up on internal clearance.

(ii) results from recent tests

30 Nov : running of tests has conflict with online system (JPK is looking into this)

21 Dec : all x30 Ae data collection leads to 'online' system hanging; planning with x15 Ae (29Dec);

18 Jan : 'online' issue remained for '15' antenna also (after '30' antenna case failed); now suggested to repeat for '10' antenna case; test planned for a future wednesday;

15 Feb : to try with smaller number of antennas for now; need discussion with Ops group about the limitation and how it would get overcome.

08 Mar : GP & Jitendra following up today

(iii) labeling scheme for keeping track of the units to be taken up for refinement and implementation

16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.

30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular back-up of the files to be worked out.

15 Feb : no updates.

#### 1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system

30 Nov : same as above

21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)

18 Jan : data showed 'flat' value over 24 hrs; C3 & E2 to be tried again today.

15 Feb : not clear about the above problem (needs follow-up with Ops group); to check with 4 antenna test and report back.

(ii) status of prototype for temp and power monitoring at OF rack at antenna base

16 Nov : sample data set taken but not long enough; to wait for next round of tests; prototype unit installed at C2 and connected to M&C system, but not being monitoring regularly; would like to do some more test and development before finalising the scheme.

30 Nov : (ii) is on-hold after prototype development; to be taken up only after Rabbit card based system is in place.

#### 1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares

30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.

4 Jan : 4 complete sets of spares available now (ready for installation at antenna)

(ii) finalisation of report by VBB

16 Nov : same status as last week.

30 Nov : report pending with SSK

18 Jan : report to be ready by 25 Jan.

15 Feb : 4 spare systems available.

08 Mar : 5th L-band spare has been assembled - currently under test

====> now down to four spares (due to C14 problem).

#### 1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs

30 Nov : some failed units are being retuned...

08 Mar : all spares available

(ii) status of new 2-stage design installed on 2 antennas : working ok ?

30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.

(ii) status of new 3-stage design : optimisation of RL was being attempted

16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better than 10 dB across the band; Tlna ~ 20 K (by old noise comm calibration scheme); to try improve further, while assembling second unit.

30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna (2 units to be made ready).

21 Dec : 2 K improvement seen (< 20 K) ; report to be available in 1 week

4 Jan : second unit has been assembled; overlapping plots show good repeatability; report will be ready by 6 Jan.

18 Jan : report already circulated last week [ ~ 20 K over full band; gain ~ 44dB flat; return loss better than -11dB over entire band (-14/-15 dB most places); worst case -11 dB near lower freq band edge]

15 Feb : no updates.

08 Mar : x6 new PCBs (x2 circuits assembled; awaiting chassis; expected next week)

====> above new units have been assembled and tested -- results look ok, will be circulated shortly.

#### 1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB problem and W5 -- problem not identified); C14 showing poor deflection and falling at high freq -- checked for pointing and OF attn, now to try changing the feed.

4 Jan : results from tests on 13 Dec discussed : 21 antennas available; dip seen for L-band vanished after replacing common box (which antenna?), but unit appears to be ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2; W5 poor bandshape; C14 noise deflection discussed.

18 Jan : 06-Jan-2017 tests reported; (only 15 antennas were available); E6 showed ripples in CH1 (but could be cable twist; as today NOT noticed); E6 CH2 deflection

HIGHER than expected (red dots) !! "measurement" error? 'naming' of file ?  
similarly W5 CH2; results show MAJOR drift in deflection (~ 15 dB spread !) -- BUT  
NO CORRECTIVE ACTION TAKEN !! Primary purpose of monitoring is LOST ! SKR was  
'un-sure' about this responsibility - now clarified; henceforth, he will follow  
up on errant antennas.

15 Feb : E6 ripple in Ch1 fixed (bad cable); C14 feed needs to be replaced (tbd soon);  
tests at antenna base for selected set of antennas shows ~6-8 dB variations -- this  
needs to be investigated and understood.

08 Mar : ripples were due to cables; C14 slope in deflection was possibly due to  
feed issue -- now new feed has been put; tests awaited

====> C14 brought down and being looked into by S Ramesh; about 10-12 dB spread in  
off-source values (but deflection is reasonable stable) -- needs joint follow-up with  
FE and OF persons.

1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring  
in control room

30 Nov : this is now available under the standard monitoring tools; control part has  
some problem and needs login to control PC -- SOP for this to be provided to control  
room.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue.

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal  
SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

1.10 Mass production of Band-4 (550-900) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow;  
12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still  
not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.

30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to  
request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity  
units are available).

21 Dec : 1 more week delay due to vendor's delay

4 Jan : hoods have arrived today; 12th antenna to be completed by 15-20 Jan.

18 Jan : system for 12th antenna will be ready by Monday 23 Jan (lab tests are in  
progress now); by April x16 system target can still be met.

15 Feb : 13th antenna (C03) installed this week (2 weeks since last one);

08 Mar : dipole shortage; 14th antenna to be completed by ~ 15-Mar-2017; QC issue with  
dipole units fabricated by outsourced party; dipoles need to be fabricated in-house;

====> 15 antennas completed; issue of dipoles not having Nickel coated -- will come  
by Sat. (meanwhile, one has gone without coating and will be replaced later on);  
for future orders, to do the dipole in-house and send for coating and deliver.

2. RFI related :

2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting  
to be completed

30 Nov : YG + PAR to work on this final version.

(ii) study of RFI environment, including internally generated RFI in main building  
30 Nov : tests of individual labs : with AC units and otherwise -- shows different  
labs in different light; agreed to identify the worst culprits by kind of equipment etc  
and provide an update.  
(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests  
16 Nov & 30 Nov & 21 Dec : no updates.

## 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database  
(ii) response to pending requests for clearance e.g. Serum Institute...  
21 Dec : awaiting call from Serum Institute for the next visit; asked all technical  
details of their planned equipments;  
(iii) work out new action plan, given the current government policies  
30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to  
their location for looking at specific instruments.  
21 Dec : one site visited.  
4 Jan : awaiting call for visit to site of the party.  
15 Feb : one round of discussions have happened with Serum institute -- they would like  
to finish the installation and then call for testing and possible modifications; our  
response should be that we would like to test the existing set-up and indicate the  
mods to be done and these should be implemented in both existing and new setup and  
then taken up for testing.  
Another party wanting to set-up unit for DC control drives in Junnar / Ambegaon area.  
08 Mar : DIC & MIDC people came to GMRT; our request agreed to [move away]

## 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters  
30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems  
(they are the only one to have got license in this range) -- it is strong enough to  
cause saturation in spite of filter; need to find the specific towers and then  
follow-up with Reliance.  
18 Jan : measurements happening this week; update by next week.  
15 Feb : completed survey of 82 towers around Y-array : 14 towers in 850 band (Reliance  
Jio) and 6 towers in 950 GSM band; rest are in 1800 band. Max power in 850 band  
~ -16 dBm (at ~ 100 m distance) for few towers. Follow-up for both 850 and 950 being  
pursued, including dialogue with Reliance Jio to see if they can switch to 1800 band.  
08 Mar : draft letter circulated (vendor is generally positive; but formal communication  
needs to go soon)  
15 Mar : New results : characterisation of mobile phone RFI in the GMRT campus -- some  
interesting plots; using JIO CDMA uplinks and their effect can be seen.

## 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems  
30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need  
to identify which make is coming finally.  
21 Dec : no updates.  
15 Feb : 33 nos (Voltas instead of BlueStar) have arrived; need to finalise the  
locations and the specific schemes for installation; need to make shielded units  
for all 33 nos; components for 25 units are available; boxes for 10 nos are in hand  
except for back plate and chromatisation (expected to take one week); work request for  
next 10 has been given (repeat order); some difference in wiring for Voltas unit --  
needs some rework of the design / layout; also one type of connector is different and  
this also needs to be resolved; PAR to send an email explaining the steps to be taken  
to complete the RFI shielding work, and expected timelines for the same.

Regarding installation : there is a table giving the locations for 31 units (including replacements of 5 existing units) -- to check if outgoing lines can be behind the unit; to install sample one unit in canteen annexe, test the RFI shielding.  
08 Mar : one set of measurement done (without shielding) - under analysis; by next week shielded case will be measured & compared; RFI group designed shielding box pictures displayed; uses many cables with RFI shielded interface connectors; it includes high current carrying (220V AC) lines, needing shielded connectors !

### 3. Operations related :

#### 3.1 Interfacing of FE with new M&C system :

(i) latest status of testing with Rabbit card in common box at antenna base  
16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).

30 Nov : no new updates on this

21 Dec : antenna control part is working; FE monitoring still not working; Charu is looking into this...

18 Jan : trying with different delay to see if it solves the problem, but not yet working with online control...

(ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus  
16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration and testing in 2 weeks time and put on first antenna with RS-232 cable driving; later to convert that to ethernet over fibre; mass production may need only new plates to be made by workshop -- other aspects are in-house in FE lab.

30 Nov : item also being discussed under FE agenda item (in alternate week)

21 Dec : planned this week

18 Jan : final status is Box #1 was made functional at antenna base and was taken up to antenna focus as Box #2 does not work reliably -- hangs and needs power reset (has been tested with a couple of different Rabbit cards?); problem not solved; agreed to try the option of swapping the Rabbit cards between Box #1 and Box #2 and seeing what is the outcome. To report this by tomorrow and then decide if a 3rd box needs to be made ready.

25 Jan : testing of common box with Rabbit card : new clue related to grounding of enable signal of decoder IC may provide the breakthrough -- tested in lab and will take to antenna base now.

15 Feb : email update from Raj Uprade : One rabbit MCM has been installed at C01 antenna dish focus; MCM communication is proper but needs to give hardware reset while changing frequency band.

08 Mar : it is working only for some bands (C01); needs rethink on strategy.

====>

#### 3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgetary quote; formal quote expected shortly.

4 Jan : folder cleared ; PO should be done shortly.

18 Jan : Order has been released; full delivery time is 3 months; first box to be supplied earlier and tested...

15 Feb : email update from Raj Upgrade : expecting the delivery of one Miltec machine shortly; also initiated talk with Miltec to supply it as early as possible.  
08 Mar : one unit has come; will be tested & feedback given to Miltech  
====> new Miltech PC put through RFI test; informal looks ok; formal may be an issue.

### 3.3 GMRT M&C system Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal meeting.

4 Jan : internal lab meeting held on 3 Jan (now every Tuesday)

08 Mar : all team members are clear on their respective roles & are contributing

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans

30 Nov : discussions ongoing; kick-off meeting planned.

21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.

4 Jan : regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary' etc shared with TCS.

18 Jan : work ongoing; need more regular interactions of TCS with GMRT team members.

15 Feb : email update from Raj Upgrade : 2 CMC and 6 LMC machines are UP & running; team members are now very much familiar with CMC, LMC installation, features, testing and can carry independent tasks.

08 Mar : interim review held; schedule is 6 weeks slippage/ delayed; mitigation planned for that delay;

====> work progressing; may test sub-array and tracking in coming MTAC.

### 3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for material for review committee started

30 Nov : discussions and work ongoing, including preparations for discussions with TM review panel.

21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase : requirement compatibility; architecture explanation given; scalability etc; need many upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;

4 Jan : preparation of docs in progress; ph-2 work now beginning...

18 Jan : aim to have 6+ antenna set-up with PC + switch + Rabbit talking to Sentinel + OF + Servo (to check if existing PC104 will work directly) or not; to check enough Miltech PCs available -- Sumit and Mangesh to look into it.; need to move from Fedora to Ubuntu; aim to start testing at antenna base by 23/24. Additionally, need some temporary space (couple of months) for working on 2 PCs in or near control room...

15 Feb : Last week 6 antennae Control & monitoring system was set-up and demonstrated to SKA reviewer (Nick Rees) and SKA India team.

08 Mar : SKA committee is reviewing our work; cost estimate proposal from India was submitted to SKA claiming 50% saving on TM work using Indian scheme;

## 4. Back-ends related :

### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh



paper needs to be looked into for revision; nothing really pending, except for the report on the attenuation values : new set of tests done and results look ok and will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed); may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?

4 Jan : To follow-up on GWB refereeing process.

18 Jan : GWB response received, relatively minor modifications are needed and SHR is looking into this; for Walsh, waiting for response -- can check after 20 days (end of this week / early next week).

#### 4.2 Updates on existing GWB-3 system :

##### (i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

4, 11 & 18 Jan : no progress since last time.

25 Jan & 15 Feb : still pending.

22 Feb & 08 Mar : band shape correction yet to be implemented -- can be taken up now.

15 Mar : SHR has not yet gone back to this topic.

##### (ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes; for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be closed ?

14 Dec : problem perhaps in AIPS settings? matter can be closed?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

#### 4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

##### (i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

##### (ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT lose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes

(T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

08 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); but, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

====> email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready; appears to be satisfactory (though no improvements in ambient temp recorded ?).

11 Jan : no further work on GWB; plan is to have similar hcnage for GBS during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

08 Mar : plans for work on GSB during upcoming mTAC -- needs a discussion.

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (may come earlier)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep looks like resulting in some speed-up in delivery; to follow-up closely.

11 Jan : YG to contact nvidia and micropoint persons.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful

ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : need to plan the code optimisation that will be needed.

14 Dec : need a discussion to decide the way forward on this.

4, 18 Jan 17 : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

15 Feb : SSK to try and restart the old 16-antenna CD pipeline code using the SOPs etc from Kishalay...

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion of long-term issues to be taken up next week (22 Mar).

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :

(i) refinements of the first draft of the note

(ii) plans for getting first unit connected and tested

(iii) plans for testing high speed recording to disks

16 Nov : lab set-up for grabbing and recoding has been done; while continuing with this, need to work on the set-up for sending parallel copy of the data, including procurement of longer CX4 cables.

30 Nov & 21 Dec : not discussed.

4 Jan 17 : basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.

18 Jan : to test the dual copy design for correlations using existing 16-antenna corr with dummy inputs; then to connect to one machine where tests can be done for raw voltage recording and a single node correlator with flexible beamforming.

15 Feb : no updates.

08 Mar : 374 mbps speed achieved; but need slightly higher speed

4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)

16 Nov : some changes have been made by SHR, but the sub-microsec correction still needs to be done; also to follow-up about h4k file.

21 Dec : modified code has been made, but not yet tested; can try to see if it can be made available in the current release.

4 & 18 Jan 17 : agreed to defer to next release.

15 Feb : deferred as above.

08 Mar : current release has this 'sub-microsec correction' ENABLED; it is now possible to send those values to header files;

4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans

(ii) spectral domain RFI filtering : current status and plans

(iii) beamformer RFI filtering : current status and plans

16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.

30 Nov : not dicussed in detail.

21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file...

emulator has some changes and improvements, including random location of the RFI.

4 Jan 17 : for (i) modifications in simulator; counter mode now working -- can have 2 different modes, tested at module level, now integrated into the design, will be testing in next few days; fractional thld done in simulation, to convert to design and test. (ii) to try and run the filter in real-time from shm data.

18 Jan : not discussed, but summary of offline discussions is as follows : (i) some additional features added to RFI simulator unit; fractional threshold and counter mode now available for use in the voltage filtering unit; cumuative experience shows that we may be not using the optimal filtering technique for voltage mode -- should try the alternative approach of conversion to intensity and integration to desired time constant -- closer to a true matched filter.

08 Mar : some updates from Kaushal about looking at options for more optimised filtering of broadband time domain data :

Modified the design to support 16K window size - this is the default design now;

Fractional threshold available (tested with antenna signals) - default option now;

Made the DDC mode design compatible with the ongoing changes;

RFI Counter design ready - format to read the data including timestamp from a single ROACH complete, undergoing more tests before release;

Supporting regular tests - spectral line (Nissim), continuum (Ruta, Dharam, Ishwar);

Handling longer duration RFI using median of MAD technique - initial results are encouraging, detailed tests going on;

Looking at likely causes of missing RFI during real-time excision and at possible alternate methods for time-domain filtering;

Ongoing: Updating SOP with changes made till date;

RFI emulator: (last update email - Jan) :

Last development: Adding facility for random insertion and random amplitude of RFI

Understanding the GUI and MCM control program - backup from Rahul Bhor;

Narrowband RFI filtering: (updates email sent periodically) :

Initial version of the code has been timed; optimized for computing faster sorting for median computation, is now much better;

Moving towards expected version of filtering code - with optimized functions to meet real-time requirements (0.671s) and necessary functionality;

Ongoing: Testing the code on recorded data and timing the code for all 60 self outputs;

Looking at synchronization between the data path and RFI filter (along with Sanjay);

Looking at merging of lta file and flags for the FITS file format (along with Sanjay).

08 Mar : now optimizing real time filtering; all bands filtering on recorded; Broad band RFI filtering : emulator tested; other techniques being explored; SOP updated;

to be released next week.

#### 4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and tests ongoing; also tested by sending digitised packets to antenna and loop back; using GWB2 for doing all the correlations.

18 Jan : feasibility study done using C09 antenna with noise sources & real signal -- needs a fixed delay correction of 1.5 km to get maximum correlation; trying setup with E5; meanwhile, a few different tests can be tried with the C09 set-up; comparison of scheme running on GWB2 and GWB3 tried out.

08 Mar : C9 & E5 setups faced problems (ethernet card issue); now fixed; GWB2 (early digitization) & GWB3 being used for comparison; delay requirement has reduced (due to early digitization);

#### 4.8 Status update on processing of tender responses for Maser units (BAK)

(i) finalisation of processing of folder

(ii) planning for kind of environmental set-up required

16 Nov : most of the issues have been resolved, waiting for one party to complete the payment terms; pending issue about performance bank guarantee for different amounts of periods.

30 Nov : work is ongoing, but item not discussed.

4 Jan 17 : TEC clearance ok; recommendation to open price bids -- to check the status. To contact Prof Sen Gupta for a discussion.

18 Jan : final TEC documents done and sent for next step; to follow-up and check status.

15 Feb : activities ongoing...

08 Mar : Negotiating committee met the vendor (no reduction on price; but add modules 'FREE'; payment terms as per NCRA conditions); Dr Sengupta will be visiting next week; first unit delivery after 5 months; second unit 4 months after 1st delivery;

#### 5. Other items :

##### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go

on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

====> review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need to agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

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## Minutes for the Plan meeting of 5 Apr 2017

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### 1. FE & OF related :

#### 1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in  $T_{lna}$  for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

22 Feb : first results of variation of  $T_{sys}$  for Band-4 FE unit of QH + DC + LNA

(which goes next to the hood) -- absolute value of Temp is higher than  $T_{lna}$  at ambient and also the variation of  $T_{sys}$  with ambient (0 to 60 deg C) is larger than for  $T_{lna}$  alone. To cross-check whether known loss of QH and DC at room temp can explain the room temp values and then extrapolate from there for different ambient temps.

15 Mar : new test done with QH + LNA only (compared with QH + DC + LNA) -- shows lower variation of  $T_{sys}$  over 60 deg range of chamber (35-40 instead of 55-60 seen earlier); agreed to try to estimate the loss of QH and DC with temperature and use theoretical formula along with  $T_{lna}$  as fn of temp to predict the observed  $T_{sys}$  vs temp curves and compare with the measurements.

====> new results of  $T_{sys}$  vs temp for just LNA, LNA+QH, LNA+DC, LNA+QH+DC : appears to show reasonably flat variation of  $T_{lna}$  with temp; more variation for LNA+QH; but some of the curves cross each other (and have offsets) with temp -- bit difficult to understand; agreed to try S-params for each device as fn of temp, for same RF (610); meanwhile, theoretical calculations ongoing.

#### 1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible.

22 Feb 17 : only 5 antennas completed by January; request for next set of 5 feeds has been given to mechanical approx beginning of Jan -- expecting 2 dipoles shortly, but reflector and BFRs will take some time; meanwhile one FE box is ready; to get if possible 2 more to be ready, so that 2-3 antennas can be done in quick succession. Need to have enough QH + DC (is matter of cutting right length of material and assembly); for LNA : have all PCBs, need chassis (ordered in sets of 20); same situation for BPF; however, request for new stools (with modified height) has not been given (!!); due to some rethink about optimal stool height (!); follow-up action on this : to discuss with mechanical to see if existing or spare stools can be modified / cut to meet the height requirement and use for the next 2-3 antennas.

15 Mar : HRB had requested for 5 feeds (DRF 130-260 MHz) out of which 5 dipoles arrived and reflectors + BFRs will arrive by 18 Mar; mounting stools (1190 mm), 30 nos. requested, out of which, 2 stools will arrive on 18 Mar; hence, new installation only by next week;

====> 2 nos of feed + reflector + BFRs + stool in hand; 1 box ready; one more can be ready in next few days; can target 2 antennas in MTAC period; to see if 3 can be tried.

### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

#### (i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months should be enough to complete the tasks i.e. April 2017.

11 Jan 17 : 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

25 Jan : needs combined tuning of filters to fix the problem; work ongoing.

22 Feb : successful in tuning the integrated unit (for 2 boxes, both channels); and

23 antennas are completed, and work is ongoing; next antenna in about 2 weeks.

15 Mar : one more box was made ready, but gave trouble after exhibit at Science Day (!); has been made ready again (all the cables were changed). Will go up shortly.

Meanwhile, next set is getting ready.

====> 25th antenna done to ver2 level; some issues related to tuning of the integrated filters (assigned to SC).

#### (ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good : comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

11 Jan : analysis of Jan data awaited.

25 Jan : analysis of new data (on CasA) -- appears to be systematic 1-1.5 dB less deflection than predicted and control room values -- needs to be checked and followed up in consultation with ICH, DVL, SC & GP; few antennas with some odd behaviour e.g. E3 and maybe E2.

15 Mar : no updates as Ankur is not available

====> updates from new data; 2 antennas showing less deflection in ch 1 only -- to be investigated; not much other issues.

#### (iii) Summary of phase centre measurements and decision about future plans

25 Jan : no action yet.

15 Mar : still pending.

#### (iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

11 Jan : data collected, report expected within 2-3 days.

25 Jan : Sougata + Ankur will provide update next time.

22 Feb : SC will send update within a week.

15 Mar : some work is still pending; SC will complete and send within a week.

====> some tests done using OF monitoring system (seems not all antennas working and also varying behaviour) : summary from 10-12 antennas, 3 sub-bands (one corrupted by RFI) : some cases show narrower BW, and some show wider BW; for narrower BW cases, coating the PCB appears to correct for most of the discrepancy -- needs a short report on this; last 5 antennas have gone up with the coating -- should be able to cross-check the performance; need to find a solution for broader BW case !

#### (v) LO settings for all sub-bands etc to be finalised.

14 Dec : 250-500 LO setting document / table already finalized;

28 Dec : no updates; person on leave.

11 Jan : astronomer feedback awaited (to check if final table shared with control room).

25 Jan : Not yet shared with control room; to refine based on : 6 dB point for main



BPF and 10 dB for subband filters, for the default BW.

22 Feb : draft document has been circulated to DVL & YG for trials, for 3 bands (Band-3, 4 & 5); for Band-3 which shows max variation of sub-band responses, the basic response is taken as the one found in majority of units and 10 dB criteria is applied to that response to get the LO values; either lower or higher or both side LOs are recommended depending on the situation, and some justification has been given for all the cases; YG to check with DVL etc if this can be released to control room and all users.

15 Mar : some responses from DVL + Nilesh et al -- some clarifications sent; some more tests to be carried out this week.

====> no updates for this time.

#### 1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus

14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01); box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)

28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).

11 Jan : box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.

(ii) Plans for mass production

30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.

25 Jan : one box tested at antenna focus and working ok; 2nd box not yet tested at focus; even for the 1st box, repeatability is not there.

#### 1.5 Apex radiation scheme (PAR/SRoy) :

(i) Current status of measurements and interpretations

(ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

11 Jan : no updates, though there has been some email discussion between SRoy and PAR

25 Jan : need to check with SRoy and PAR.

15 Mar : PAR and SRoy yet to have a detailed discussion; meanwhile another round of tests done on C1 -- showing a different pattern than C10. Need to summarise and circulate and then take up for discussion.

====> no updates (but check email from SRoy this morning)

#### 1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) :

Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of health of Walsh switching.

11 Jan : there is some confusion about what is being done, and what has been achieved ! For 10 antennas which have new 1st LO system (LOFSW based units), it should NOT be possible to have Walsh modulation at present !

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh...

22 Feb : now clear that only those antennas (20 ?) which DO NOT have the new synth units can be tested for Walsh; latest tests on these (done in Jan), showed ok results for 19 out of 20 (one antenna was down due to mech problems).

15 Mar : no immediate action here; need to work out with analog BE team.

### 1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

22 Feb : SC to check with JPK about the progress on implementation of the SOP for use by control room in normal PMQC type of tests and generation of stats to report to FE team.

15 Mar : control room people (JPK and SNK) are looking into the code written for GSB to see if it can be done for GWB.

====> SC to follow-up with JPK on the matter.

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

22 Feb : to plan for the discussion.

15 Mar : agreed to make a presentation on 20th in the poln meeting.

====> presentation showed reasonable results; action items : to compare feed response with WiPLD results of HRB; compute 3 dB BW vs freq for Band-3 for feed + dish and compare with observed results; need a software with finite element method approach for this simulation -- Antsys or Fecko; to check availability in different places in and around Pune.

### 1.8 New filters for L-band (AP) :

(i) status update on installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing

16 Nov : arm antenna installation to be resumed;

14 Dec : all west arm will be completed by 16-Dec-2016;

28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.

11 Jan : S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).

25 Jan : only 2 antennas W-arm remaining to be done.

(ii) delivery of remaining units of main L-band BPF from Epitome  
16 Nov : BPF completed and handed over to BE team -- this can be closed.  
28 Dec 16 : can be closed.

#### 1.9 OF system updates :

(i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.

11 Jan : current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.

15 Mar : this is status quo; few extra high power lasers at 1310 nm for forward link have been procured; cards being made ready; will be used as and when loss becomes too large in far away antennas.

(ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates

28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.

11 Jan : cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.

15 Mar : expected by end of this month.

====> OTDR not arrived yet; second fibre bundle ordered but not yet delivered.

(iii) 8 Gbps GMRT to Pune link : it was found that only 1 or 2 Gbps was working;

25 Jan : detailed debugging has been done by OF team and now it appears all the 4 wavelengths and hence 8 gbps lines are functional -- only one wavelength is marginal (to order spares for taking care of such issues); also remote monitoring facility at Rajgurunagar with SMS facility to be activated.

15 Mar : spares have been ordered; monitoring unit is ready -- small change needed in software and then can be installed.

====> not yet installed, waiting for Rahul Bhor.

#### 2. RFI related :

##### 2.1 Spectral line RFI (PAR/SSK) :

(i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks

28 Dec : RFI team visited Junnar cable TV operator for getting response to letter that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.

25 Jan : discussed with Jondhale -- he will speak to the party and see if some progress can be made; otherwise to escalate the matter; also to estimate the number of splitters etc that can be provided to W-arm operator to mitigate the problem.

(ii) Digital TV follow-up

23 Nov : letter is still pending !

25 Jan : need to expedite the matter !

(iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source

11 Jan : 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.

25 Jan : need a site visit to understand better.

##### 2.2 Satellite RFI monitoring & avoidance system (PAR/SNK) :

(i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and ,, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)

25 Jan : to follow-up on identifying for LEOS.

(ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)

25 Jan : new limit is about 8 deg -- to cross-check if ok and close.

(iii) Plans for sending information to back-end receiver chain

25 Jan : to check with Santaji about the plans for this

(iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week

28 Dec : no updates.

25 Jan : to include in the plans for visit by Nick Rees in week of 6th Feb.

2.3 RFI from power lines and transformers (PAR/RVS) :

(i) review current status

(ii) specific follow-up actions

23 Nov : not discussed

28 Dec : no updates.

25 Jan : no updates.

2.4 RFI from LED lamps (PAR/RVS) :

(i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

(ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

25 Jan : report has been circulated; solution looks promising; to try for compact version of the solution; working with workshop to mechanical items; will need to order some components for bulk production.

08 Mar : LED panel/ tube light shielding : report generated on tests - broad band radiation from commercial units (x4 units in one box) - shielding is ~ 75 dB ; results appear encouraging; Syska (x1 22W), Philips (X4 20W); -150 dBm final number arrived at. high failure rate of LEDs due to voltage fluctuations;

2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested;

8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.

4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified units -- all are ok. Need follow-up as mentioned on 28 Dec.

18 Jan 17 : all 10 units tested and cleared; now OK to use this 2nd batch of 10 units in antennas; need follow-up on status of ordering last batch of 14 units.

25 Jan : matter closed for now from RFI team side; to take up when next lot comes.

### 3. Operations related :

#### 3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) :

##### (i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.

28 Nov : still waiting for 80 nos PCBs to come.

11 Jan : 84 PCBs received; can go ahead with further assembly now.

25 Jan : this can be closed.

##### (ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);

28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.

11 Jan : 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.

25 Jan : Rabbit card enclosure now going smoothly : about 2-3 per week; to send some samples for RFI testing.

22 Feb : 18 are done; 19th ongoing.

15 Mar : 23 completed; one unit given to RFI team for measuring shielding.

====> going on track, will finish all 30 by April end.

##### (iii) status of mass production of network switch enclosure

23 Nov : 28 units ready (need total of 35)

14 Dec : now 32 (of 35) ready;

28 Dec : same status of 32 out of 35.

25 Jan : 32 out of 35 completed; remaining 3 are in use and will be done when free; meanwhile, to send a few samples for RFI testing.

22 Feb : some sample unit(s) has been given to RFI team for testing -- Raj to confirm; to check if all shielded connectors are procured or not.

15 Mar : samples have been given and tests are being carried out today.

====> no immediate action item.

#### 3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

##### (i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing

23 Nov : C00 & C10 are mostly complete (item could be closed?)

28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.

##### (ii) plans for going beyond 2 antennas

23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)

28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?; elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment

in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.  
11 Jan : mechanical completed for 10 antennas; electrical completed for 13 antennas; Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.  
25 Jan : mechanical has resumed work; same for electrical; will be updating spreadsheet; column for servo has been added in spreadsheet -- to remind them to start updating;  
15 Mar : mech has completed 13 antennas; electrical has installed all the UPS units (23), other changes need to be checked; servo has completed 10 antennas.  
====> 8 antennas completed for M&C systems; 3 extra Miltec to be tested; 4 are non working -- being looked into (total of 15 Miltechs); apparently no change in status of other systems (mech, elec, servo) -- JPK to check and follow-up.  
(iii) update on improved RFI shielding at antenna shell  
23 Nov : shielding test measurements done for present configuration; awaiting finger-lines to be added before repeating the tests (which antenna?)  
28 Dec : folder in process for placing order for the finger-lines.  
====> no updates.

### 3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems  
28 Dec : Ops team has a plan for this; can be discussed in detail next time.  
11 Jan : final plan placed on web portal (for lab people)  
(ii) plans for switch-over -- to make it as seamless as possible.  
30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.  
28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.  
25 Jan : can defer till after the demo.  
22 Feb : Ops team appears to prefer scenario 1 -- incremental approach; to generate a note within next 4 weeks on this.  
15 Mar : still pending for team to send a draft doc.  
====> still pending.

### 3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)  
14 Dec : HP layer3 switch finalized; bidgetry quote Rs 3.5 lakh; indent prepared.  
11 Jan : item can be closed.  
(ii) Plans for procurement  
23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.  
28 Dec : indent raised.  
25 Jan : procedural issues related to advance payment etc...  
22 Feb : not clear if this matter has been resolved before Charu went on leave...  
15 Mar : need to check with Charu.  
====> HP make layer-3 switch has no issues about advance payment and order has been placed and delivery expected by end of hthis month; the advance payment problem was for SFP adapter -- this needs to be resolved.

### 3.5 Interfacing and control of new systems such as Noise Cal & Walsh :

For 10 antennas which have new 1st LO system (LOFSW based units), need to be clear about the control path; also 2 of these antennas have independent MCM for driving the new CPLD; need a wider discussion about M&C for new system for these aspects related to Noise Cal and Walsh.

22 Feb : need 2 CPLDs in new set-up : one for new FSW LO, one for Walsh + Noise on-off etc, and both can't be connected to MCM 2 and hence an additional MCM is needed. To find out a way around this issue, so that progress can be made...

15 Mar : 2 options are being explored by BE team without increasing the number of MCMs from present count; some prototypes are being tested and will be reported upon shortly. For the longer term, need to see if antenna based Rabbit card can fulfill these roles.

3.6 Update on Rabbit Card in Common Box : useful discussion alongwith wiring diagrams; two possible causes identified : old FE power supplies may be having more noise (200 mV) than the new ABR power supply (50 mV) -- to try C01 with the new supply; Rabbit card has ground to common box chassis (unlike MCM-5 card) -- can try to isolate this in the second box being made ready and take to another antenna.

#### 4. Back-ends related :

##### 4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

11 Jan : one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

25 Jan : s'ware work for the above is still in progress.

15 Mar : still in progress, no new update.

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

11 Jan : one rack modified (4 antennas) and systems being tested; will report shortly, and if everything ok, will go ahead with the mods for all the 8 racks.

25 Jan : same status as above; test report has been circulated internally.

15 Mar : will complete the modifications for all racks in MTAC; meanwhile, the filters can be used with unequal gain in different antennas; command is available to control room and can be tried.

====> phase jump problem requires use of 4350 IC circuit -- this has been tested in GAB on one antenna both pols and found to work OK; need to repeat same test with 4351 IC also and then bulk order of 4351 IC can be done (will take about 2 months); will need modified CPLD based ckt + software for using 4350/51 at antenna base as 1st LO for legacy system.

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.

14 Dec : changes to DRAFT report in progress;

11 Jan : still in progress -- not ready yet.

25 Jan : no new updates.

15 Mar : no new updates; BAK to check.

#### 4.2 Power equalisation scheme and relate topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

11 Jan : still pending

25 Jan : revised version circulated internally.

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

15 Mar : BAK to check and get back.

====> Atul has initiated the discussion with control room colleagues; SRoy + Nilesh discussion now has the basic code working and SRoy is doing some testing and debugging and will report the result in few weeks, after which one could talk about releasing the package with the different modes.

#### 4.3 Updates on existing GWB-3 system :

(i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

4, 11 & 18 Jan : no progress on this upto now, due to work on release of 30 antenna system.

25 Jan & 15 Feb : still pending.

22 Feb & 08 Mar : remains to be implemented -- can be taken up in the list of tasks now.

15 Mar : SHR has not yet gone back to this topic.

====> new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

(ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?

14 Dec : problem perhaps in AIPS settings; matter can be closed ?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

#### 4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov 16 : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on

1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate;



maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT lose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

8 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); But, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.

11 Jan : no further work on GWB; plan is to have similar change for GSB during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

8 Mar : plans for work on GSB during upcoming MTAC -- needs a discussion.

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (but may come earlier?)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up in delivery; to follow-up closely.

11 Jan : YG to follow-up with nvidia and micropoint.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : no specific updates, except that code optimisation will need to be done.

14 Dec : need a discussion to decide the way forward on this.

4, 11 & 18 Jan : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion on long-term issues to be taken up next week.

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

====> most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver5.

4.5 Network related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half sytem

4 Jan 17 : this is done -- to confirm and close.

(ii) updated IP table for .4 n/w to be made available by computer group

4 Jan 17 : work onging -- to check status with comp group.

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines is possible with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together to NCRA end; comp group to set up the test, alongwith VVS at Pune end.

11 Jan : 3 connections made to gwbh1-3, and live test demo done; it appears that only 2 of the 8 x 1Gbps links from switch to aggregator are woking ! This needs to be debugged between comp group and OF group.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

4 Jan 17 : comp group agreed to look for options.

15 Mar : can be taken up next time.

#### 4.6 Longer term plans for GWB-4 (SHR/ICH/SSK/BAK) :

- (i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link
- (ii) Disks for data recording, including trials with SSD options
- (iii) investigating next gen GPUs
- (iv) migration to next version of CUDA (7.5 and beyond)

23 Nov : CUDA 7.5 is being tried in the new version of GWB

#### (iv) Additional modes and features in GWB system :

- (a) 4 beams, with upto 2 voltage beams with coherent dedispersion

23 Nov : 4 beams (IA/PA) implemented but yet to be tested to shortest integrations;  
2 voltage beams (1 with full BW and 2 with half BW are planned for new system)

#### (b) PA - IA beam mode

- (c) beam formation with different phase centres

(d) improved I/O capabilities : change in data sending code; alternate n/w ?

(e) gated correlator : folding visibilities with pulsar period

(f) polyphase filter bank

(g) 2 inputs per Roach board

(h) time + DUT corrections

(i) net-sign correction

(j) full backward compatibility of off-line utilities

23 Nov : some work has been done, but not clear if this meets / works for all requirements.

28 Dec : not discussed.

25 Jan : can take up after 3 improvements mentioned above are completed.

15 Mar : to be taken up next week.

#### 4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

(i) Summary of current status for temperature monitoring

(ii) Plans for future enhancement and release for regular use

(iii) Monitoring of other health parameters

14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack (uses DAQ card);

28 Dec : not discussed.

11 Jan : no significant new updates.

25 Jan : no new updates, but plans for collecting the temp data and bringing to common m/c that is accessible to control room is being planned. installation of cacti also to be taken up.

15 Mar : machine has been made ready; cacti has been installed; gradually adding nodes to the list and making them ready for monitoring; a separate home-grown product (using cgitplot) also being made ready for monitoring IB network.

#### 4.8 Other issues :

(i) Cross-coupling tests in GAB + GWB

14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?

28 Dec : some issues need a bit more of discussion before reaching a final conclusion.

11 Jan : ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%

25 Jan : no updates; needs a discussion.

(ii) Walsh related work.

14 Dec : some tests in progress; porting to GWB (Python package being modified);

28 Dec : work is still ongoing.

11 Jan : porting work is nearing completion.

25 Jan : now in testing phase.

## 5. Other items :

### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need ot agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

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## Minutes for the Plan meeting of 12 Apr 2017

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### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov : offset not yet fixed (to be done later with mechanical), but new data taken for E & H plane -- looks ok; to do cross-polar measurements.

21 Dec : plans for correcting the offset -- next Monday 26th.; meanwhile, earlier data has been given to SC and he will produce an updated result for band-4 within the next week.

8 Mar : offsets have been corrected; 610 MHz measurements done; other freq being done now; report awaited; method for cross-polar measurements needs review before executing.

22 Mar : new results presented : from ~ 600 to 800 MHz in ~ 50 MHz steps; to see if we can get closer to 550 and 850 MHz and repeat. Also to try Band-2 (120-250) feed and see if re-measurement of Band-3 (250-500) is useful.

====> no new updates; some follow-up activities planned for next week.

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

18 Jan : manual 'digitization' of plot (hard copy) is agreed [rather than indefinitely 'waiting' for a machine readable data file to become available somehow];

15 Feb : no updates, can check recent emails for updates.

22 Mar : no updates, can keep pending for some time.

====> status quo

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

4 Jan : awaiting feedback

22 Mar : ICH and DVL reminded; will get back in next few days with comments and then possible follow-up and closure can be explored.

====> to schedule a final joint discussion for closure, within next 2 weeks.

(ii) need to cross-check mismatch of values for band-3 (250-500);

30 Nov : will check and update, including referring to some existing literature

21 Dec : some work has been done, but needs an internal cross-check & then discussion.

22 Mar : new doc has the updated values for this.

(iii) need to see if QH losses have been incorporated into the calculations;

30 Nov : GP has done some of the work; need to circulate and get agreement.

8 Mar : report circulated; feedback awaited

22 Mar : new doc has the updated values for this also.

(iv) does the study cover all the uGMRT bands.

30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.

16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.

21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in Tsys) -- TBC.

22 Mar : new doc covers all the bands, except for 120-250 (Band-2) as measured feed radiation pattern is not available (standard 65% across the full band has been assumed).

====> measured radiation pattern not yet available; will be done after finishing work on Band-4 (550-850 MHz).

(v) can it be extended to deriving the final beam pattern for feed + antenna; this is being looked into :

21 Dec : first version doc has been sent by SC -- needs follow-up

4 & 18 Jan : feedback awaited on this item.

15 Feb : to try to find a slot when all concerned are present to get to the finer points and close the matters.

22 Mar : can be presented this Friday in the polarisation meeting, and then taken up for follow-up discussion.

====> see discussion from last week's meeting; action items have been identified there.

#### 1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document

30 Nov : yet to be completed.

21 Dec : updated & internally circulated;

15 Feb : GP to follow-up on internal clearance.

====> SSK to check and follow-up on clearing the report

(ii) results from recent tests

30 Nov : running of tests has conflict with online system (JPK is looking into this)

21 Dec : all x30 Ae data collection leads to 'online' ssystem hanging; planning with x15 Ae (29Dec);

18 Jan : 'online' issue remained for '15' antenna also (after '30' antenna case failed); now suggested to repeat for '10' antenna case; test planned for a future wednesday;

15 Feb : to try with smaller number of antennas for now; need discussion with Ops group about the limitation and how it would get overcome.

08 Mar : GP & Jitendra following up today

====> 15 antenna test with online now successful; trying for 30 antenna test this week.

(iii) labeling scheme for keeping track of the units to be taken up for refinement and implementation

16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.

30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular back-up of the files to be worked out.

15 Feb : no updates.

====> additional disks made available for back-up of the units; in-house development by Sanjeet ongoing -- can review in about 2 weeks.

(iv) Lband system does NOT have total power monitoring at present : prototype scheme being worked out by Ramesh and may be available shortly; will include basic temp monitor (for the box; not for LNA).

### 1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system

30 Nov : same as above

21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)

18 Jan : data showed 'flat' value over 24 hrs; C3 & E2 to be tried again today.

15 Feb : not clear about the above problem (needs follow-up with Ops group); to check with 4 antenna test and report back.

====> monitoring goes hand in hand with power monitoring.

(ii) status of prototype for temp and power monitoring at OF rack at antenna base

16 Nov : sample data set taken but not long enough; to wait for next round of tests;

prototype unit installed at C2 and connected to M&C system, but not being monitoring regularly; would like to do some more test and development before finalising the scheme.

30 Nov : (ii) is on-hold after prototype development; to be taken up only after Rabbit card based system is in place.

====> no change in status

### 1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares

30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.

4 Jan : 4 complete sets of spares available now (ready for installation at antenna)

15 Feb : 4 spares available.

08 Mar : 5th L-band spare has been assembled - currently under test

22 Mar : now down to four spares (due to C14 problem).

====> 2 complete sets still available; 3 units under repair

(ii) finalisation of report by VBB

16 Nov : same status as last week.

30 Nov : report pending with SSK

18 Jan : report to be ready by 25 Jan.

====> updated had been circulated; can take it up for brief discussion next time and try to close.

### 1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs

30 Nov : some failed units are being retuned...

08 Mar : all spares available

(ii) status of new 2-stage design installed on 2 antennas : working ok ?

30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.

(ii) status of new 3-stage design : optimisation of RL was being attempted

16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better than 10 dB across the band; Tlna ~ 20 K (by old noise comm calibration scheme); to try improve further, while assembling second unit.

30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna (2 units to be made ready).

21 Dec : 2 K improvement seen (< 20 K) ; report to be available in 1 week

4 Jan : second unit has been assembled; overlapping plots show good repeatability; report will be ready by 6 Jan.

18 Jan : report already circulated last week [ ~ 20-25 K over full band; gain ~ 44 dB flat; return loss better than -11dB over entire band (-14/-15 dB most places); worst case -11 dB near lower freq band edge]

08 Mar : x6 new PCBs (x2 circuits assembled; awaiting chassis; expected next week)

22 Mar : above new units have been assembled and tested -- results look ok, will be circulated shortly.

====> 4 units of 3-stage amplifier built and compared for performance : getting good repeatability; completely dynamic range measurement and stability inside env chamber; agreed to put 4 units on 2 antennas (CSQ) and check for the performance, including change in power levels and hence change in OF attn etc.

#### 1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB problem and W5 -- problem not identified); C14 showing poor deflection and falling at high freq -- checked for pointing and OF attn, now to try changing the feed.

4 Jan : results from tests on 13 Dec discussed : 21 antennas available; dip seen for L-band vanished after replacing common box (which antenna?), but unit appears to be ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2; W5 poor bandshape; C14 noise deflection discussed.

18 Jan : 06-Jan-2017 tests reported; (only 15 antennas were available); E6 showed ripples in CH1 (but could be cable twist; as today NOT noticed); E6 CH2 deflection HIGHER than expected (red dots) !! "measurement" error? 'naming' of file ? similarly W5 CH2; results show MAJOR drift in deflection (~ 15 dB spread !) -- BUT NO CORRECTIVE ACTION TAKEN !! Primary purpose of monitoring is LOST ! SKR was 'un-sure' about this responsibility - now clarified; henceforth, he will follow up on errant antennas.

15 Feb : E6 ripple in Ch1 fixed (bad cable); C14 feed needs to be replaced (tbd soon); tests at antenna base for selected set of antennas shows ~6-8 dB variations -- this needs to be investigated and understood.

08 Mar : ripples were due to cables; C14 slope in deflection was possibly due to feed issue -- now new feed has been put; tests awaited

22 Mar : C14 brought down and being looked into by S Ramesh; about 10-12 dB spread in off-source values (but deflection is reasonable stable) -- needs joint follow-up with FE and OF persons.

====> new result show similar as above : deflection is mostly all right, but off levels still have a large spread;

Note1 : some antennas have old notch filter (about 5 antennas?) -- need to change these to new notch filters...

Note2 : to try sample 1000 to 1400 MHz BPF on trial basis.

#### 1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring in control room

30 Nov : this is now available under the standard monitoring tools; control part has some problem and needs login to control PC -- SOP for this to be provided to control room.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue.

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

#### 1.10 Mass production of Band-4 (550-850) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow; 12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still



not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.  
30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity units are available).

18 Jan : system for 12th antenna will be ready by Monday 23 Jan (lab tests are in progress now); by April x16 system target can still be met.

15 Feb : 13th antenna (C03) installed this week (2 weeks since last one);

08 Mar : dipole shortage; 14th antenna to be completed by ~ 15-Mar-2017; QC issue with dipole units fabricated by outsourced party; dipoles need to be fabricated in-house;

22 Mar : 15 antennas completed; issue of dipoles not having Nickel coated -- will come by Sat. (meanwhile, one has gone without coating and will be replaced later on); for future orders, to do the dipole in-house and send for coating and deliver.

====> 6 nos of coated dipoles now available (small mech adjustment needed to match the holes -- need to cross-check; agreed for modifying 2 nos by putting a compensating offset holes on the cavity -- this can be tested for proper performance; meanwhile, to expedite the completion of 3 nos of in-house made dipoles and deliver at the earliest by next week.

## 2. RFI related :

### 2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting to be completed

30 Nov : YG + PAR to work on this final version.

====> needs to be actioned asap.

(ii) study of RFI environment, including internally generated RFI in main building

30 Nov : tests of individual labs : with AC units and otherwise -- shows different labs in different light; agreed to identify the worst culprits by kind of equipment etc and provide an update.

====> this is due, but has not started yet due to other activities.

(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests

16 Nov & 30 Nov & 21 Dec : no updates.

(iv) absolute calibration of measurement set-up for RFI testing : to translate levels measured there to levels expected at antenna focus.

### 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database

(ii) response to pending requests for clearance e.g. Serum Institute...

21 Dec : awaiting call from Serum Institute for the next visit; asked all technical details of their planned equipments;

30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to their location for looking at specific instruments.

21 Dec : one site visited.

4 Jan : awaiting call for visit to site of the party.

15 Feb : one round of discussions have happened with Serum institute -- they would like to finish the installation and then call for testing and possible modifications; our response should be that we would like to test the existing set-up and indicate the mods to be done and these should be implemented in both existing and new setup and then taken up for testing.

Another party wanting to set-up unit for DC control drives in Junnar / Ambegaon area.

====> RFI tests planned at Serum Inst premises next week.

(iii) work out new action plan, given the current government policies

08 Mar : MIDC people from Chakan came to GMRT for exploring possible sites for new

industry zones; following discussions, agreed to our request to avoid heavy industry in GMRT area -- maybe IT related in Peth etc; also about help in surveying sites for level of RFI etc -- how is this to be formalised -- we should send a letter from our side; check with JKS.

similarly, there is a note from DAE asking for things that need protection -- to see if JKS can follow-up on this.

### 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters

30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems (they are the only one to have got license in this range) -- it is strong enough to cause saturation in spite of filter; need to find the specific towers and then follow-up with Reliance.

18 Jan : measurements happening this week; update by next week.

15 Feb : completed survey of 82 towers around Y-array : 14 towers in 850 band (Reliance Jio) and 6 towers in 950 GSM band; rest are in 1800 band. Max power in 850 band ~ -16 dBm (at ~ 100 m distance) for few towers. Follow-up for both 850 and 950 being pursued, including dialogue with Reliance Jio to see if they can switch to 1800 band.

08 Mar : draft letter circulated (vendor is generally positive; but formal communication needs to go soon)

15 Mar : New results : characterisation of mobile phone RFI in the GMRT campus -- some interesting plots; using JIO CDMA uplinks and their effect can be seen.

### 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems

30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need to identify which make is coming finally.

21 Dec : no updates.

15 Feb : 33 nos (Voltas instead of BlueStar) have arrived; need to finalise the locations and the specific schemes for installation; need to make shielded units for all 33 nos; components for 25 units are available; boxes for 10 nos are in hand except for back plate and chromatisation (expected to take one week); work request for next 10 has been given (repeat order); some difference in wiring for Voltas unit -- needs some rework of the design / layout; also one type of connector is different and this also needs to be resolved; PAR to send an email explaining the steps to be taken to complete the RFI shielding work, and expected timelines for the same.

Regarding installation : there is a table giving the locations for 31 units (including replacements of 5 existing units) -- to check if outgoing lines can be behind the unit; to install sample one unit in canteen annexe, test the RFI shielding.

08 Mar : one set of measurement done (without shielding) - under analysis; by next week shielded case will be measured & compared; RFI group designed shielding box pictures displayed; uses many cables with RFI shielded interface connectors; it includes high current carrying (220V AC) lines, needing shielded connectors !

====> 10 AC units have been installed; only 3 have the RFI shielding installed (are the other 7 being used !); 3 more RFI units are getting ready; to speed-up the remaining RFI units; and then go for the next batch of AC units; meanwhile, one bump of RFI remains at around 325 MHz -- may be coming from blower assembly : to disassemble on unit and check for source of RFI.

Separate item update : new LED light (Hi-Lite) 15 W -- appears to have NO RFI at all; can follow-up to test thoroughly by procuring a few

### 3. Operations related :

### 3.1 Interfacing of FE with new M&C system :

(i) latest status of testing with Rabbit card in common box at antenna base

16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).

30 Nov : no new updates on this

21 Dec : antenna control part is working; FE monitoring still not working; Charu is looking into this...

18 Jan : trying with different delay to see if it solves the problem, but not yet working with online control...

(ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus

16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration and testing in 2 weeks time and put on first antenna with RS-232 cable driving; later to convert that to ethernet over fibre; mass production may need only new plates to be made by workshop -- other aspects are in-house in FE lab.

30 Nov : item also being discussed under FE agenda item (in alternate week)

18 Jan : final status is Box #1 was made functional at antenna base and was taken up to antenna focus as Box #2 does not work reliably -- hangs and needs power reset (has been tested with a couple of different Rabbit cards?); problem not solved; agreed to try the option of swapping the Rabbit cards between Box #1 and Box #2 and seeing what is the outcome. To report this by tomorrow and then decide if a 3rd box needs to be made ready.

25 Jan : testing of common box with Rabbit card : new clue related to grounding of enable signal of decoder IC may provide the breakthrough -- tested in lab and will take to antenna base now.

15 Feb : email update from Raj Upgrade : One rabbit MCM has been installed at C01 antenna dish focus; MCM communication is proper but needs to give hardware reset while changing frequency band.

08 Mar : it is working only for some bands (C01); needs rethink on strategy.

22 Mar : problems persist; long discussion about what may be the cause; need to get a proper wiring diagram to check the grounding of the system for possible loopholes that may be causing the flaky behaviour...

5 Apr : useful discussion alongwith wiring diagrams; two possible causes identified : old FE power supplies may be having more noise (200 mV) than the new ABR power supply (50 mV) -- to try C01 with the new supply; Rabbit card has ground to common box chassis (unlike MCM-5 card) -- can try to isolate this in the second box being made ready and take to another antenna.

====> common box on C1 now working properly (!) -- problem was in sequence of commands sent from control room -- there was a monitor command sequence in the cmdfile that was the culprit.

Agreed that only main bottleneck remaining is monitoring of FE system -- this can continue in parallel, even as we go ahead with mass installation of the Rabbit based common box; third stream of activity to be initiated is lab test of ethernet based control of Rabbit card in common box, via optical fibre link (bypassing cable ethernet).

### 3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgetary quote; formal quote expected shortly.

4 Jan : folder cleared ; PO should be done shortly.

18 Jan : Order has been released; full delivery time is 3 months; first box to be supplied earlier and tested...

15 Feb : email update from Raj Upgrade : expecting the delivery of one Miltec machine shortly; also initiated talk with Miltec to supply it as early as possible.

08 Mar : one unit has come; will be tested & feedback given to Miltech

22 Mar : new Miltech PC put through RFI test; informal report : looks ok; formal report may take some time.

====> go ahead given to Miltech for full delivery.

Addition item : issue of Windows software licences discussed (with MSU present) -- agreed to go ahead with ~ 20 stand-alone licenses for use by tech groups.

### 3.3 GMRT M&C sytem Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal meeting.

4 Jan : internal lab meeting held on 3 Jan (now every Tuesday)

08 Mar : all team members are clear on their respective roles & are contributing

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans

30 Nov : discussions ongoing; kick-off meeting planned.

21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.

4 Jan : regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary' etc shared with TCS.

18 Jan : work ongoing; need more regular interactions of TCS with GMRT team members.

15 Feb : email update from Raj Upgrade : 2 CMC and 6 LMC machines are UP & running; team members are now very much familiar with CMC, LMC installation, features, testing and can carry independent tasks.

08 Mar : interim review held; schedule is 6 weeks slippage/ delayed; mitigation planned for that delay;

22 Mar : work progressing; may test sub-array and tracking in coming MTAC.

### 3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for material for review committee started

30 Nov : dicussions and work ongoing, including preparations for discussions with TM review panel.

21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase : requirement compatibility; architecture explanation given; scalability etc; need many upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;

4 Jan : preparation of docs in progress; ph-2 work now beginning...

18 Jan : aim to have 6+ antenna set-up with PC + switch + Rabbit talking to Sentinel + OF + Servo (to check if existing PC104 will work directly) or not; to check enough Miltech PCs available -- Sumit and Mangesh to look into it.; need to move from Fedora to Ubuntu; aim to start testing at antenna base by 23/24. Additionally, need some temporary space (couple of months) for working on 2 PCs in or near control room...

15 Feb : Last week 6 antennae Control & monitoring system was set-up and demonstrated to SKA reviewer (Nick Rees) and SKA India team.

08 Mar : SKA committee is reviewing our work; cost estimate proposal from India was

submitted to SKA claiming 50% saving on TM work using Indian scheme;

#### 4. Back-ends related :

##### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh paper needs to be looked into for revision; nothing really pending, except for the report on the attenuation values : new set of tests done and results look ok and will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed); may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?

4 Jan : To follow-up on GWB refereeing process.

18 Jan : GWB response received, relatively minor modifications are needed and SHR is looking into this; for Walsh, waiting for response -- can check after 20 days (end of this week / early next week).

##### 4.2 Updates on existing GWB-3 system :

(i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

4, 11 & 18 Jan : no progress since last time.

25 Jan & 15 Feb : still pending.

22 Feb & 08 Mar : band shape correction yet to be implemented -- can be taken up now.

15 Mar : SHR has not yet gone back to this topic.

(ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes; for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be closed ?

14 Dec : problem perhaps in AIPS settings? matter can be closed?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

##### 4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT lose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put

8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released. integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

08 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); but, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

===> email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready; appears to be satisfactory (though no improvements in ambient temp recorded ?).

11 Jan : no further work on GWB; plan is to have similar hcnage for GBS during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

08 Mar : plans for work on GSB during upcoming mTAC -- needs a discussion.

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (may come earlier)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep looks like resulting in some speed-up in delivery; to follow-up closely.

11 Jan : YG to contact nvidia and micropoint persons.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and

peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : need to plan the code optimisation that will be needed.

14 Dec : need a discussion to decide the way forward on this.

4, 18 Jan 17 : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

15 Feb : SSK to try and restart the old 16-antenna CD pipeline code using the SOPs etc from Kishalay...

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion of long-term issues to be taken up next week (22 Mar).

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver5.

====> ready to release ver5 -- basic things seem to be working;

calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

For next steps going forward (add to agenda item in other week) :

-- DUT correction to be checked and explained by Sanjay

-- towards a PFB : to resurrect the old code into new GWB5 and compute the overheads

-- towards a gated interferometer : to look at the MAC code that can do the gated integration; to send the gate information to the GPU from CPU.

-- reduced beam I/O by reducing 16 bits to 8 bits IA/PA and 8 bits to 4 bits for

voltage

- making 4 beams pointing in different directions and test
- getting second copy of data to separate cluster going : for both raw voltage recording, as well as for multi-beaming kind of work
- archiving of beamformer data : better header and also metadata required

4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :

(i) refinements of the first draft of the note

(ii) plans for getting first unit connected and tested

(iii) plans for testing high speed recording to disks

16 Nov : lab set-up for grabbing and recoding has been done; while continuing with this, need to work on the set-up for sending parallel copy of the data, including procurement of longer CX4 cables.

30 Nov & 21 Dec : not discussed.

4 Jan 17 : basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.

18 Jan : to test the dual copy design for correlations using existing 16-antenna corr with dummy inputs; then to connect to one machine where tests can be done for raw voltage recording and a single node correlator with flexible beamforming.

15 Feb : no updates.

08 Mar : 374 mbps speed achieved; but need slightly higher speed

4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)

16 Nov : some changes have been made by SHR, but the sub-microsec correction still needs to be done; also to follow-up about h4k file.

21 Dec : modified code has been made, but not yet tested; can try to see if it can be made available in the current release.

4 & 18 Jan 17 : agreed to defer to next release.

15 Feb : deferred as above.

08 Mar : current release has this 'sub-microsec correction' ENABLED; it is now possible to send those values to header files;

4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans

(ii) spectral domain RFI filtering : current status and plans

(iii) beamformer RFI filtering : current status and plans

16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.

30 Nov : not discussed in detail.

21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file...

emulator has some changes and improvements, including random location of the RFI.

4 Jan 17 : for (i) modifications in simulator; counter mode now working -- can have



2 different modes, tested at module level, now integrated into the design, will be testing in next few days; fractional thld done in simulation, to convert to design and test. (ii) to try and run the filter in real-time from shm data.

18 Jan : not discussed, but summary of offline discussions is as follows : (i) some additional features added to RFI simulator unit; fractional threshold and counter mode now available for use in the voltage filtering unit; cumulative experience shows that we may be not using the optimal filtering technique for voltage mode -- should try the alternative approach of conversion to intensity and integration to desired time constant -- closer to a true matched filter.

08 Mar : some updates from Kaushal about looking at options for more optimised filtering of broadband time domain data :

Modified the design to support 16K window size - this is the default design now;

Fractional threshold available (tested with antenna signals) - default option now;

Made the DDC mode design compatible with the ongoing changes;

RFI Counter design ready - format to read the data including timestamp from a single ROACH complete, undergoing more tests before release;

Supporting regular tests - spectral line (Nissim), continuum (Ruta, Dharam, Ishwar);

Handling longer duration RFI using median of MAD technique - initial results are encouraging, detailed tests going on;

Looking at likely causes of missing RFI during real-time excision and at possible alternate methods for time-domain filtering;

Ongoing: Updating SOP with changes made till date;

RFI emulator: (last update email - Jan) :

Last development: Adding facility for random insertion and random amplitude of RFI

Understanding the GUI and MCM control program - backup from Rahul Bhor;

Narrowband RFI filtering: (updates email sent periodically) :

Initial version of the code has been timed; optimized for computing faster sorting for median computation, is now much better;

Moving towards expected version of filtering code - with optimized functions to meet real-time requirements (0.671s) and necessary functionality;

Ongoing: Testing the code on recorded data and timing the code for all 60 self outputs;

Looking at synchronization between the data path and RFI filter (along with Sanjay);

Looking at merging of lta file and flags for the FITS file format (along with Sanjay).

08 Mar : now optimizing real time filtering; all bands filtering on recorded; Broad

band RFI filtering : emulator tested; other techniques being explored; SOP updated;

to be released next week.

4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and tests ongoing; also tested by sending digitised packets to antenna and loop back; using GWB2 for doing all the correlations.

18 Jan : feasibility study done using C09 antenna with noise sources & real signal -- needs a fixed delay correction of 1.5 km to get maximum correlation; trying setup with E5; meanwhile, a few different tests can be tried with the C09 set-up; comparison of scheme running on GWB2 and GWB3 tried out.

08 Mar : C9 & E5 setups faced problems (ethernet card issue); now fixed; GWB2 (early digitization) & GWB3 being used for comparison; delay requirement has reduced (due to early digitization)

==> new test has been carried out with C9 and E5 on actual on-source observation

and brief comparison.

#### 4.8 Time-Frequency Standards (BAK) :

(i) procurement of Maser units

(ii) planning for kind of environmental set-up required for Maser units

(iii) planning for long-term maintenance and development

16 Nov : most of the issues have been resolved, waiting for one party to complete the payment terms; pending issue about performance bank guarantee for different amounts of periods.

30 Nov : work is ongoing, but item not discussed.

4 Jan 17 : TEC clearance ok; recommendation to open price bids -- to check the status.

To contact Prof Sen Gupta for a discussion.

18 Jan : final TEC documents done and sent for next step; to follow-up and check status.

15 Feb : activities ongoing...

08 Mar : Negotiating committee met the vendor (no reduction on price; but add modules 'FREE'; payment terms as per NCRA conditions); Dr Sengupta will be visiting next week;

first unit delivery after 5 months; second unit 4 months after 1st delivery;

====> to take up next week.

#### 5. Other items :

##### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need to agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

====> sample unit getting ready -- length needs to be reduced; do asap and get hose assembled and then install on C03.

=====



1. FE & OF related :

1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in  $T_{lna}$  for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

22 Feb : first results of variation of  $T_{sys}$  for Band-4 FE unit of QH + DC + LNA

(which goes next to the hood) -- absolute value of Temp is higher than  $T_{lna}$  at ambient and also the variation of  $T_{sys}$  with ambient (0 to 60 deg C) is larger than for  $T_{lna}$  alone. To cross-check whether known loss of QH and DC at room temp can explain the room temp values and then extrapolate from there for different ambient temps.

15 Mar : new test done with QH + LNA only (compared with QH + DC + LNA) -- shows lower variation of  $T_{sys}$  over 60 deg range of chamber (35-40 instead of 55-60 seen earlier); agreed to try to estimate the loss of QH and DC with temperature and use theoretical formula along with  $T_{lna}$  as fn of temp to predict the observed  $T_{sys}$  vs temp curves and compare with the measurements.

5 Apr : new results of  $T_{sys}$  vs temp for just LNA, LNA+QH, LNA+DC, LNA+QH+DC : appears to show reasonably flat variation of  $T_{lna}$  with temp; more variation for LNA+QH; but some of the curves cross each other (and have offsets) with temp -- bit difficult to understand; agreed to try S-params for each device as fn of temp, for same RF (610); meanwhile, theoretical calculations ongoing.

====> new update, which measures loss of QH with temp, shows change from 0.1 to 0.2 dB over 60 deg and can explain the observed variation of  $T_{sys}$  with temp. To check if any info is available about loss of QH with temp; second is the mystery about lines crossing each other -- needs to be understood; then can check about extending the study to Band-3 also.

1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible.

22 Feb 17 : only 5 antennas completed by January; request for next set of 5 feeds has been given to mechanical approx beginning of Jan -- expecting 2 dipoles shortly, but reflector and BFRs will take some time; meanwhile one FE box is ready; to get if possible 2 more to be ready, so that 2-3 antennas can be done in quick succession. Need to have enough QH + DC (is matter of cutting right length of material and assembly); for LNA : have all PCBs, need chassis (ordered in sets of 20); same situation for BPF; however, request for new stools (with modified height) has not been given (!!); due to some rethink about optimal stool height (!); follow-up action on this : to discuss with mechanical to see if existing or spare stools can

be modified / cut to meet the height requirement and use for the next 2-3 antennas.  
15 Mar : HRB had requested for 5 feeds (DRF 130-260 MHz) out of which 5 dipoles arrived and reflectors + BFRs will arrive by 18 Mar; mounting stools (1190 mm), 30 nos. requested, out of which, 2 stools will arrive on 18 Mar; hence, new installation only by next week;  
5 Apr : 2 nos of feed + reflector + BFRs + stool in hand; 1 box ready; one more can be ready in next few days; can target 2 antennas in MTAC period; to see if 3 can be tried.  
====> no progress now, as attention has shifted to common box for some time; now tasks have been reassigned and work on this will pick up now.

### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

#### (i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months should be enough to complete the tasks i.e. April 2017.

11 Jan 17 : 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

25 Jan : needs combined tuning of filters to fix the problem; work ongoing.

22 Feb : successful in tuning the integrated unit (for 2 boxes, both channels); and 23 antennas are completed, and work is ongoing; next antenna in about 2 weeks.

15 Mar : one more box was made ready, but gave trouble after exhibit at Science Day (!); has been made ready again (all the cables were changed). Will go up shortly.

Meanwhile, next set is getting ready.

5 Apr : 25th antenna done to ver2 level; some issues related to tuning of the integrated filters (assigned to SC).

====> 26th antenna also completed; going reasonably smoothly.

#### (ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good : comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

11 Jan : analysis of Jan data awaited.

25 Jan : analysis of new data (on CasA) -- appears to be systematic 1-1.5 dB less deflection than predicted and control room values -- needs to be checked and followed up in consultation with ICH, DVL, SC & GP; few antennas with some odd behaviour e.g. E3 and maybe E2.

15 Mar : no updates as Ankur is not available

5 Apr : updates from new data; 2 antennas showing less deflection in ch 1 only -- to be investigated; not much other issues.

====> no updates this meeting.

#### (iii) Summary of phase centre measurements and decision about future plans

25 Jan : no action yet.

15 Mar : still pending.

====> still pending

#### (iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

11 Jan : data collected, report expected within 2-3 days.

25 Jan : Sougata + Ankur will provide update next time.

22 Feb : SC will send update within a week.

15 Mar : some work is still pending; SC will complete and send within a week.

5 Apr : some tests done using OF monitoring system (seems not all antennas working

and also varying behaviour) : summary from 10-12 antennas, 3 sub-bands (one corrupted by RFI) : some cases show narrower BW, and some show wider BW; for narrower BW cases, coating the PCB appears to correct for most of the discrepancy -- needs a short report on this; last 5 antennas have gone up with the coating -- should be able to cross-check the performance; need to find a solution for broader BW case !

====> quality check on 24 antennas done; about 4-5 antennas showing discrepant band for most sub-bands; FE team feels confident that this can be fixed with the coating option; to make a table for all antennas all sub-bands for user to decide what to be done; to fix as and when FE box comes down for other work.

(v) LO settings for all sub-bands etc to be finalised.

14 Dec : 250-500 LO setting document / table already finalized;

28 Dec : no updates; person on leave.

11 Jan : astronomer feedback awaited (to check if final table shared with control room).

25 Jan : Not yet shared with control room; to refine based on : 6 dB point for main BPF and 10 dB for subband filters, for the default BW.

22 Feb : draft document has been circulated to DVL & YG for trials, for 3 bands (Band-3, 4 & 5); for Band-3 which shows max variation of sub-band responses, the basic response is taken as the one found in majority of units and 10 dB criteria is applied to that response to get the LO values; either lower or higher or both side LOs are recommended depending on the situation, and some justification has been given for all the cases; YG to check with DVL etc if this can be released to control room and all users.

15 Mar : some responses from DVL + Nilesh etal -- some clarifications sent; some more tests to be carried out this week.

5 Apr : no updates for this time.

====> DVL and co to provide update by next week; can discuss 2 weeks later.

#### 1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus

14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01); box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)

28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).

11 Jan : box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.

(ii) Plans for mass production

30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.

25 Jan : one box tested at antenna focus and working ok; 2nd box not yet tested at focus; even for the 1st box, repeatability is not there.

====> ready to start the mass production and installation; may be able to achieve 2-3 weeks per box in long run after first 2-3 boxes; to coordinate with Ops group for supply of Rabbit in shielded box. Also to do the R&D for getting the ethernet control option tested and going and put it into mass production -- this needs an extra input port on common box -- agreed to use 50 MHz port for immediate and redesign the plate for additional input port and put into new boxes as and when ready, without affecting the rate of mass production of common boxes.

### 1.5 Apex radiation scheme (PAR/SRoy) :

(i) Current status of measurements and interpretations

(ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

11 Jan : no updates, though there has been some email discussion between SRoy and PAR

25 Jan : need to check with SRoy and PAR.

15 Mar : PAR and SRoy yet to have a detailed discussion; meanwhile another round of tests done on C1 -- showing a different pattern than C10. Need to summarise and circulate and then take up for discussion.

====> no updates, though some ongoing email dialogue between SRoy and PAR...

### 1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) :

Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of health of Walsh switching.

11 Jan : there is some confusion about what is being done, and what has been achieved ! For 10 antennas which have new 1st LO system (LOFSW based units), it should NOT be possible to have Walsh modulation at present !

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh...

22 Feb : now clear that only those antennas (20 ?) which DO NOT have the new synth units can be tested for Walsh; latest tests on these (done in Jan), showed ok results for 19 out of 20 (one antenna was down due to mech problems).

15 Mar : no immediate action here; need to work out with analog BE team.

### 1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

22 Feb : SC to check with JPK about the progress on implementation of the SOP for use by control room in normal PMQC type of tests and generation of stats to report to FE team.

15 Mar : control room people (JPK and SNK) are looking into the code written for GSB to see if it can be done for GWB.

5 Apr : SC to follow-up with JPK on the matter.

====> code has been obtained and possible issues in it have been identified; to see

if the job can be taken over by control room colleague.

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

22 Feb : to plan for the discussion.

15 Mar : agreed to make a presentation on 20th in the poln meeting.

5 Apr : presentation showed reasonable results; action items : to compare feed response with WiPLD results of HRB; compute 3 dB BW vs freq for Band-3 for feed + dish and compare with observed results; need a software with finite element method approach for this simulation -- Antsys or Fecko; to check availability in different places in and around Pune.

====> no new updates right now.

### 1.8 New filters for L-band (AP) :

(i) status update on installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing

16 Nov : arm antenna installation to be resumed;

14 Dec : all west arm will be completed by 16-Dec-2016;

28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.

11 Jan : S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).

25 Jan : only 2 antennas W-arm remaining to be done.

(ii) delivery of remaining units of main L-band BPF from Epitome

16 Nov : BPF completed and handed over to BE team -- this can be closed.

28 Dec 16 : can be closed.

### 1.9 OF system updates :

(i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.

11 Jan : current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.

15 Mar : this is status quo; few extra high power lasers at 1310 nm for forward link have been procured; cards being made ready; will be used as and when loss becomes too large in far away antennas.

(ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates

28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.

11 Jan : cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.

15 Mar : expected by end of this month.

5 Apr : OTDR not arrived yet; second fibre bundle ordered but not yet delivered.

(iii) 8 Gbps GMRT to Pune link : it was found that only 1 or 2 Gbps was working;

25 Jan : detailed debugging has been done by OF team and now it appears all the 4 wavelengths and hence 8 gbps lines are functional -- only one wavelength is marginal (to order spares for taking care of such issues); also remote monitoring facility at Rajgurunagar with SMS facility to be activated.

15 Mar : spares have been ordered; monitoring unit is ready -- small change needed in software and then can be installed.

5 Apr : not yet installed, waiting for Rahul Bhor.



## 2. RFI related :

### 2.1 Spectral line RFI (PAR/SSK) :

#### (i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks

28 Dec : RFI team visited Junnar cable TV operator for getting response to letter that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.

25 Jan : discussed with Jondhale -- he will speak to the party and see if some progress can be made; otherwise to escalate the matter; also to estimate the number of splitters etc that can be provided to W-arm operator to mitigate the problem.

#### (ii) Digital TV follow-up

23 Nov : letter is still pending !

25 Jan : need to expedite the matter !

#### (iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source

11 Jan : 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.

25 Jan : need a site visit to understand better.

### 2.2 Satellite RFI monitoring & avoidance system (PAR/SNK) :

#### (i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and „, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)

25 Jan : need to follow-up on identifying for LEOS.

#### (ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)

25 Jan : new limit is about 8 deg -- to cross-check if ok and close.

#### (iii) Plans for sending information to back-end receiver chain

25 Jan : to check with Santaji about the plans for this

#### (iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week

28 Dec : no updates.

25 Jan : to include in the plans for visit by Nick Rees in week of 6th Feb.

### 2.3 RFI from power lines and transformers (PAR/RVS) :

#### (i) review current status

#### (ii) specific follow-up actions

23 Nov : not discussed

25 Jan : no updates.

### 2.4 RFI from LED lamps (PAR/RVS) :

#### (i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

#### (ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less

intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

25 Jan : report has been circulated; solution looks promising; to try for compact version of the solution; working with workshop to mechanical items; will need to order some components for bulk production.

08 Mar : LED panel/ tube light shielding : report generated on tests - broad band radiation from commercial units (x4 units in one box) - shielding is ~ 75 dB ; results appear encouraging; Syska (x1 22W), Philips (X4 20W); -150 dBm final number arrived at. high failure rate of LEDs due to voltage fluctuations;

11 Apr : new model of LED light identified with very low level of RFI (none at all !?!) Hi-Lite 15 W; sample unit of this LED panel displayed; agreed to procure a few units and do a thorough follow-up.

### 2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested; 8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.

4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified units -- all are ok. Need follow-up as mentioned on 28 Dec.

18 Jan 17 : all 10 units tested and cleared; now OK to use this 2nd batch of 10 units in antennas; need follow-up on status of ordering last batch of 14 units.

25 Jan : matter closed for now from RFI team side; to take up when next lot comes.

12 Apr : indent process for the last lot was held up due to issue of exact specs for RFI related properties (!); finally, agreed to go ahead with the existing clause as likely there will be one round of modifications needed if some specific part is changed by the vendor. Electrical team to expedite the paper work.

### 3. Operations related :

#### 3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) : (i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.

28 Nov : still waiting for 80 nos PCBs to come.

11 Jan : 84 PCBs received; can go ahead with further assembly now.

25 Jan : this can be closed.

#### (ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);

28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.

11 Jan : 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.  
25 Jan : Rabbit card enclosure now going smoothly : about 2-3 per week; to send some samples for RFI testing.  
22 Feb : 18 are done; 19th ongoing.  
15 Mar : 23 completed; one unit given to RFI team for measuring shielding.  
5 Apr : going on track, will finish all 30 by April end.  
====> Ops group to talk to FE group to start regular supply of Rabbit + shielded enclosure for installation and commissioning of common boxes for antennas.  
(iii) status of mass production of network switch enclosure  
23 Nov : 28 units ready (need total of 35)  
14 Dec : now 32 (of 35) ready;  
28 Dec : same status of 32 out of 35.  
25 Jan : 32 out of 35 completed; remaining 3 are in use and will be done when free; meanwhile, to send a few samples for RFI testing.  
22 Feb : some sample unit(s) has been given to RFI team for testing -- Raj to confirm; to check if all shielded connectors are procured or not.  
15 Mar : samples have been given and tests are being carried out today.  
5 Apr : no immediate action item.  
====> confirmed that all 32 boxes have shielded connectors; to check with RFI team about results from RFI tests of integrated system.

### 3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

(i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing  
23 Nov : C00 & C10 are mostly complete (item could be closed?)  
28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.  
(ii) plans for going beyond 2 antennas  
23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)  
28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?; elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.  
11 Jan : mechanical completed for 10 antennas; electrical completed for 13 antennas; Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.  
25 Jan : mechanical has resumed work; same for electrical; will be updating spreadsheet; column for servo has been added in spreadsheet -- to remind them to start updating;  
15 Mar : mech has completed 13 antennas; electrical has installed all the UPS units (23), other changes need to be checked; servo has completed 10 antennas.  
5 Apr : 8 antennas completed for M&C systems; 3 extra Miltec to be tested; 4 are non working -- being looked into (total of 15 Miltechs); apparently no change in status of other systems (mech, elec, servo) -- JPK to check and follow-up.  
====> servo has completed 15, electrical has completed 23, and mechanical has done 13 antennas; M&C system on 8 antennas, 2 more are ready + 1 in testing in lab; Ops group needs 5 nos of 2 TB disks and comp group has provided 2 nos -- to arrange for ~ 10 nos of 2 TB disks.  
(iii) update on improved RFI shielding at antenna shell  
23 Nov : shielding test measurements done for present configuration; awaiting

finger-lines to be added before repeating the tests (which antenna?)

28 Dec : folder in process for placing order for the finger-lines.

5 Apr : no updates.

====>

3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems

28 Dec : Ops team has a plan for this; can be discussed in detail next time.

11 Jan : final plan placed on web portal (for lab people)

====> 8 + 2 + 1 units as given above; further growth only constrained by availability of Miltech PCs.

(ii) plans for switch-over -- to make it as seamless as possible.

30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.

28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.

25 Jan : can defer till after the demo.

22 Feb : Ops team appears to prefer scenario 1 -- incremental approach; to generate a note within next 4 weeks on this.

15 Mar : still pending for team to send a draft doc.

5 Apr : still pending.

====> can check again with Ops group next week, for a possible discussion 2 weeks later.

3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)

14 Dec : HP layer3 switch finalized; budget quote Rs 3.5 lakh; indent prepared.

11 Jan : item can be closed.

(ii) Plans for procurement

23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.

28 Dec : indent raised.

25 Jan : procedural issues related to advance payment etc...

22 Feb : not clear if this matter has been resolved before Charu went on leave...

15 Mar : need to check with Charu.

5 Apr : HP make layer-3 switch has no issues about advance payment and order has been placed and delivery expected by end of this month; the advance payment problem was for SFP adapter -- this needs to be resolved.

====> matter is resolved and delivery is expected by end of this month.

3.5 Interfacing and control of new systems such as Noise Cal & Walsh :

For 10 antennas which have new 1st LO system (LOFSW based units), need to be clear about the control path; also 2 of these antennas have independent MCM for driving the new CPLD; need a wider discussion about M&C for new system for these aspects related to Noise Cal and Walsh.

22 Feb : need 2 CPLDs in new set-up : one for new FSW LO, one for Walsh + Noise on-off etc, and both can't be connected to MCM 2 and hence an additional MCM is needed. To find out a way around this issue, so that progress can be made...

15 Mar : 2 options are being explored by BE team without increasing the number of MCMs from present count; some prototypes are being tested and will be reported upon shortly. For the longer term, need to see if antenna based Rabbit card can fulfill these roles.

3.6 Update on Rabbit Card in Common Box : follow-up from discussion of last week to track the progress and latest situation...

====> FE team plans for roll-out discussed above; Ops group to provide required number of Rabbit in shielded card; main remaining task is to get the FE monitoring working on the Rabbit interface to FE system : CPK has been doing some debugging to get to the bottom of the problem; JPK and CPK to sit together to see if earlier work done on 15m with Labjack for similar control of FE system can help.

#### 4. Back-ends related :

##### 4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

11 Jan : one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

25 Jan : s'ware work for the above is still in progress.

15 Mar : still in progress, no new update.

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

11 Jan : one rack modified (4 antennas) and systems being tested; will report shortly, and if everything ok, will go ahead with the mods for all the 8 racks.

25 Jan : same status as above; test report has been circulated internally.

15 Mar : will complete the modifications for all racks in MTAC; meanwhile, the filters can be used with unequal gain in different antennas; command is available to control room and can be tried.

5 Apr : phase jump problem requires use of 4350 IC circuit -- this has been tested in GAB on one antenna both pols and found to work OK; need to repeat same test with 4351 IC also and then bulk order of 4351 IC can be done (will take about 2 months); will need modified CPLD based ckt + software for using 4350/51 at antenna base as 1st LO for legacy system.

12 Apr : follow-up discussion with users like NK indicates that higher priority for having GAB + GWB uGMRT working without phase jump on switching, and solving the problem for legacy GMRT can be lower priority; accordingly, 2 possible solution options discussed for uGMRT : (a) have 2 signal generators set for the 2 frequencies needed and switch their output to the common LO signal line on the switching command (b) have one unit of the new 4351 IC completed with proper control logic to act as the single source of common LO; agreed to aim for option (b) on time scales ~ month or so.

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.

14 Dec : changes to DRAFT report in progress;

11 Jan : still in progress -- not ready yet.

25 Jan : no new updates.

15 Mar : no new updates; BAK to check.

##### 4.2 Power equalisation scheme and relate topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

11 Jan : still pending

25 Jan : revised version circulated internally.

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

15 Mar : BAK to check and get back.

5 Apr : Atul has initiated the discussion with control room colleagues; SRoy + Nilesh discussion now has the basic code working and SRoy is doing some testing and debugging and will report the result in few weeks, after which one could talk about releasing the package with the different modes.

#### 4.3 Updates on existing GWB-3 system :

(i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

4, 11 & 18 Jan : no progress on this upto now, due to work on release of 30 antenna system.

25 Jan & 15 Feb : still pending.

22 Feb & 08 Mar : remains to be implemented -- can be taken up in the list of tasks now.

15 Mar : SHR has not yet gone back to this topic.

5 Apr : new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

12 Apr : agreed for BE team to repeat noise source tests and check carefully for spurious lines; then repeat with sky signal as needed.

====> still pending.

(ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?

14 Dec : problem perhaps in AIPS settings; matter can be closed ?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

#### 4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov 16 : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT loose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released. integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

8 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); But, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.

11 Jan : no further work on GWB; plan is to have similar change for GSB during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

8 Mar : plans for work on GSB during upcoming MTAC -- needs a discussion.

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (but may come earlier?)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up

in delivery; to follow-up closely.

11 Jan : YG to follow-up with nvidia and micropoint.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

====> Pascal GPUs (2 nos) have come; need to be benchmarked.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : no specific updates, except that code optimisation will need to be done.

14 Dec : need a discussion to decide the way forward on this.

4, 11 & 18 Jan : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion on long-term issues to be taken up next week.

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working;

calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

====> for ver 4.5 : calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).



#### 4.5 Network related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half system

4 Jan 17 : this is done -- to confirm and close.

(ii) updated IP table for .4 n/w to be made available by computer group

4 Jan 17 : work ongoing -- to check status with comp group.

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines is possible with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together to NCRA end; comp group to set up the test, alongwith VVS at Pune end.

11 Jan : 3 connections made to gwbh1-3, and live test demo done; it appears that only 2 of the 8 x 1Gbps links from switch to aggregator are working ! This needs to be debugged between comp group and OF group.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

4 Jan 17 : comp group agreed to look for options.

15 Mar : can be taken up next time.

#### 4.6 Longer term plans for GWB-4 (SHR/GJS/ICH/SSK/BAK) :

List of tasks going forward (needs to be prioritised) :

(i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link (GJS+MGU)

(ii) Disks for data recording, including trials with SSD options (GJS)

(iii) investigating next gen GPUs -- to benchmark sample Pascal units from nvidia (SHR)  
====> to be tried next week.

(iv) migration to next version of CUDA (7.5 and beyond) -- to decide the steps

23 Nov : CUDA 7.5 is being tried in the new version of GWB -- confirm present status

====> confirmed that all v4.5 is on CUDA 7.5 and no upgrade in near future.

(v) DUT correction and timestamp related issues : to confirm present status and decide future course of action (SSK)

====> still pending.

(vi) towards PFB option : resurrect old code into new GWB5 & compute the overheads (SHR)

(vii) towards a gated interferometer : to look at the MAC code that can do the gated integration; to send the gate information to the GPU from CPU (SHR/SSK/YG)

(viii) improving availability of beams by reducing beam I/O : 16 bits to 8 bits for IA/PA beams and 8 bits to 4 bits for voltage beams (SHR/YG)

(ix) options for an additional network for even better I/O capabilities (SHR/GJS)

(x) PA - IA beam mode as an additional option with IA or PA modes (SHR/SSK/YG)

(xi) making 4 PA (or voltage) beams point in 4 different directions -- SSK to look into the change in code needed for this, starting with astrocal

====> SSK has done initial study and plan for generating parameters for all 4 beams from same call to astrocal and then pass to the beamformer; beamformer code needs a change to do one extra multiply by complex number whose phase is calculated on the fly based on antenna, channel, time and beam number.

(xii) towards more general multi-beaming in the long run

(xiii) archiving of beamformer data : better header and also finding what metadata is required -- SSK to look into this, in consultation with Deepak Bhong.

====> to follow-up with DB in next few days.

(xiv) getting second copy of data to separate cluster going : for both raw voltage recording, as well as for multi-beaming kind of work (GJS/BAK)

====> to see if one node (with new disks) can be made ready and put in one rack and connected to Roach board -- can grow to one m/c per rack with separate IB switch...

(xv) decide on 2 vs 4 inputs per Roach board for final configuration  
(xvi) net-sign correction -- confirm current status and decide if further action is needed (SSK)  
====> current status is that adhoc sign flip has been introduced for both corr and beamformer header info; proper modification in code needs to be decided : when and how.  
(xvii) full backward compatibility of off-line utilities (SSK)  
23 Nov 16 : some work has been done, but not clear if this meets / works for all requirements.  
====> has been done and released and users have used it.

#### 4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

(i) Summary of current status for temperature monitoring  
(ii) Plans for future enhancement and release for regular use  
(iii) Monitoring of other health parameters  
14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack (uses DAQ card);  
28 Dec : not discussed.  
11 Jan : no significant new updates.  
25 Jan : no new updates, but plans for collecting the temp data and bringing to common m/c that is accessible to control room is being planned. installation of cacti also to be taken up.  
15 Mar : machine has been made ready; cacti has been installed; gradually adding nodes to the list and making them ready for monitoring; a separate home-grown product (using cgiplot) also being made ready for monitoring IB network.  
====> cacti for temp monitoring for all GWB nodes (temp of cores) -- available on web browser; to release to control room and users and add in GWB SOP; cgiplot -- home grown version that allows to read the raw data and display using cgiplot in a more flexible manner (right now on hold); for IB monitoring : collectl was being used for IB monitoring (right now on hold); for disk usage, cacti has an option, can be released alongwith the temp monitoring. Additional homegrown tool (IMH + others?) also available -- need to check and see what should be the final form.

#### 4.8 Other issues :

(i) Cross-coupling tests in GAB + GWB  
14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?  
28 Dec : some issues need a bit more of discussion before reaching a final conclusion.  
11 Jan : ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%  
25 Jan : no updates; needs a discussion.  
(ii) Walsh related work.  
14 Dec : some tests in progress; porting to GWB (Python package being modified);  
28 Dec : work is still ongoing.  
11 Jan : porting work is nearing completion.  
25 Jan : now in testing phase (on GWB2).  
====> some corrections done for accommodating existing connectivity of GWB of pols with nodes; second correction done for drift of Walsh pattern due to digital bug; will proceed for noise source and astro tests using GWB2.

### 5. Other items :

#### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same  
23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on

antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need ot agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

=====

## Minutes for the Plan meeting of 26 Apr 2017

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### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov : offset not yet fixed (to be done later with mechanical), but new data taken for E & H plane -- looks ok; to do cross-polar measurements.

21 Dec : plans for correcting the offset -- next Monday 26th.; meanwhile, earlier data has been given to SC and he will produce an updated result for band-4 within the next week.

8 Mar : offsets have been corrected; 610 MHz measurements done; other freq being done now; report awaited; method for cross-polar measurements needs review before executing.

22 Mar : new results presented : from ~ 600 to 800 MHz in ~ 50 MHz steps; to see if we can get closer to 550 and 850 MHz and repeat. Also to try Band-2 (120-250) feed and see if re-measurement of Band-3 (250-500) is useful.

12 Apr : no new updates; some follow-up activities planned for next week.

====> Completed measurements for 1 polarization 550-850 MHz (in 25 MHz step). The second polarization has been partially completed : 550-725 MHz; the remaining frequency range to be covered on 28th Apr'17.

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

18 Jan : manual 'digitization' of plot (hard copy) is agreed [rather than indefinitely 'waiting' for a machine readable data file to become available somehow];

15 Feb : no updates, can check recent emails for updates.

22 Mar : no updates, can keep pending for some time.

12 Apr : status quo

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

4 Jan : awaiting feedback

22 Mar : ICH and DVL reminded; will get back in next few days with comments and then possible follow-up and closure can be explored.

12 Apr : to schedule a final joint discussion for closure, within next 2 weeks.

(ii) need to cross-check mismatch of values for band-3 (250-500);

30 Nov : will check and update, including referring to some existing literature

21 Dec : some work has been done, but needs an internal cross-check & then discussion.

22 Mar : new doc has the updated values for this.

(iii) need to see if QH losses have been incorporated into the calculations;

30 Nov : GP has done some of the work; need to circulate and get agreement.

8 Mar : report circulated; feedback awaited

22 Mar : new doc has the updated values for this also.

(iv) does the study cover all the uGMRT bands.

30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.

16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.

21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in Tsys) -- TBC.

22 Mar : new doc covers all the bands, except for 120-250 (Band-2) as measured feed radiation pattern is not available (standard 65% across the full band has been assumed).

12 Apr : measured radiation pattern not yet available; will be done after finishing work on Band-4 (550-850 MHz).

====> radiation pattern (550-850 MHz) has been given to Swagoto

(v) can it be extended to deriving the final beam pattern for feed + antenna; this is being looked into :

21 Dec : first version doc has been sent by SC -- needs follow-up

4 & 18 Jan : feedback awaited on this item.

15 Feb : to try to find a slot when all concerned are present to get to the finer points and close the matters.

22 Mar : can be presented this Friday in the polarisation meeting, and then taken up for follow-up discussion.

12 Apr : see discussion from last week's meeting; action items have been identified there, under polarisation calibration work, and this topic can be followed up there.

#### 1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document

30 Nov : yet to be completed.

21 Dec : updated & internally circulated;

15 Feb : GP to follow-up on internal clearance.

12 Apr : SSK to check and follow-up on clearing the report

====> Report has been finalised and circulated.

(ii) results from recent tests

30 Nov : running of tests has conflict with online system (JPK is looking into this)

21 Dec : all x30 Ae data collection leads to 'online' ssystem hanging; planning with x15 Ae (29Dec);

18 Jan : 'online' issue remained for '15' antenna also (after '30' antenna case failed); now suggested to repeat for '10' antenna case; test planned for a future wednesday;

15 Feb : to try with smaller number of antennas for now; need discussion with Ops group about the limitation and how it would get overcome.

08 Mar : GP & Jitendra following up today

12 Apr : 15 antenna test with online now successful; trying for 30 antenna this week.

====> 30 antenna test was done during MTAC; needs to be repeated now.

(iii) labeling scheme for keeping track of the units to be taken up for refinement and implementation

16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.

30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular back-up of the files to be worked out.

12 Apr : additional disks made available for back-up of the units; in-house development by Sanjeet ongoing -- can review in about 2 weeks.

====> software is ready; tested locally; need to feed real data & test.

(iv) Lband system does NOT have total power monitoring at present : prototype scheme being worked out by Ramesh and may be available shortly; will include basic temp monitor (for the box; not for LNA).

====> new scheme has been tested ok in lab; chassis may need modifications for final implementation.

1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system

30 Nov : same as above

21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)

18 Jan : data showed 'flat' value over 24 hrs; C3 & E2 to be tried again today.

15 Feb : not clear about the above problem (needs follow-up with Ops group); to check with 4 antenna test and report back.

12 Apr : monitoring goes hand in hand with power monitoring.

(ii) status of prototype for temp and power monitoring at OF rack at antenna base

16 Nov : sample data set taken but not long enough; to wait for next round of tests;

prototype unit installed at C2 and connected to M&C system, but not being monitoring regularly; would like to do some more test and development before finalising the scheme.

30 Nov : (ii) is on-hold after prototype development; to be taken up only after Rabbit card based system is in place.

12 Apr : no change in status

1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares

30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.

4 Jan : 4 complete sets of spares available now (ready for installation at antenna)

15 Feb : 4 spares available.

08 Mar : 5th L-band spare has been assembled - currently under test

22 Mar : now down to four spares (due to C14 problem).

12 Apr : 2 complete sets still available; 3 units under repair

====> 3rd unit was found to have some issues -- under investigation.

(ii) finalisation of report by VBB

16 Nov : same status as last week.

30 Nov : report pending with SSK

18 Jan : report to be ready by 25 Jan.

12 Apr : updated report had been circulated; can take it up for brief discussion next time and try to close.

1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs

30 Nov : some failed units are being retuned...

08 Mar : all spares available

(ii) status of new 2-stage design installed on 2 antennas : working ok ?

30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.

(ii) status of new 3-stage design : optimisation of RL was being attempted

16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better than 10 dB across the band; Tlna ~ 20 K (by old noise comm calibration scheme); to try improve further, while assembling second unit.

30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna

(2 units to be made ready).

21 Dec : 2 K improvement seen (< 20 K) ; report to be available in 1 week

4 Jan : second unit has been assembled; overlapping plots show good repeatability; report will be ready by 6 Jan.

18 Jan : report already circulated last week [ ~ 20-25 K over full band; gain ~ 44 dB flat; return loss better than -11dB over entire band (-14/-15 dB most places); worst case -11 dB near lower freq band edge]

08 Mar : x6 new PCBs (x2 circuits assembled; awaiting chassis; expected next week)

22 Mar : above new units have been assembled and tested -- results look ok, will be circulated shortly.

12 Apr : 4 units of 3-stage amplifier built and compared for performance : getting good repeatability; completely dynamic range measurement and stability inside env chamber; agreed to put 4 units on 2 antennas (CSQ) and check for the performance, including change in power levels and hence change in OF attn etc.

### 1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB problem and W5 -- problem not identified); C14 showing poor deflection and falling at high freq -- checked for pointing and OF attn, now to try changing the feed.

4 Jan : results from tests on 13 Dec discussed : 21 antennas available; dip seen for L-band vanished after replacing common box (which antenna?), but unit appears to be ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2; W5 poor bandshape; C14 noise deflection discussed.

18 Jan : 06-Jan-2017 tests reported; (only 15 antennas were available); E6 showed ripples in CH1 (but could be cable twist; as today NOT noticed); E6 CH2 deflection HIGHER than expected (red dots) !! "measurement" error? 'naming' of file ? similarly W5 CH2; resuts show MAJOR drift in defelction (~ 15 dB spread !) -- BUT NO CORRECTIVE ACTION TAKEN !! Primary purpose of monitoring is LOST ! SKR was 'un-sure' about this responsibility - now clarified; henceforth, he will follow up on errant antennas.

15 Feb : E6 ripple in Ch1 fixed (bad cable); C14 feed needs to be replaced (tbd soon); tests at antenna base for selected set of antennas shows ~6-8 dB variations -- this needs to be investigated and understood.

08 Mar : ripples were due to cables; C14 slope in deflection was possibly due to feed issue -- now new feed has been put; tests awaited

22 Mar : C14 brought down and being looked into by S Ramesh; about 10-12 dB spread in off-source values (but deflection is reasonable stable) -- needs joint follow-up with FE and OF persons.

12 Apr : new result show similar as above : deflection is mostly all right, but off levels still have a large spread;

Note1 : some antennas have old notch filter (about 5 antennas?) -- need to change these to new notch filters...

Note2 : to try sample 1000 to 1400 MHz BPF on trial basis.

### 1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring in control room

30 Nov : this is now available under the standard monitoring tools; control part has some problem and needs login to control PC -- SOP for this to be provided to control room.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue.

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

#### 1.10 Mass production of Band-4 (550-850) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow; 12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.

30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity units are available).

18 Jan : system for 12th antenna will be ready by Monday 23 Jan (lab tests are in progress now); by April x16 system target can still be met.

15 Feb : 13th antenna (C03) installed this week (2 weeks since last one);

08 Mar : dipole shortage; 14th antenna to be completed by ~ 15-Mar-2017; QC issue with dipole units fabricated by outsourced party; dipoles need to be fabricated in-house;

22 Mar : 15 antennas completed; issue of dipoles not having Nickel coated -- will come by Sat. (meanwhile, one has gone without coating and will be replaced later on);

for future orders, to do the dipole in-house and send for coating and deliver.

12 Apr : 6 nos of coated dipoles now available (small mech adjustment needed to match the holes -- need to cross-check; agreed for modifying 2 nos by putting a compensating offset holes on the cavity -- this can be tested for proper performance; meanwhile, to expedite the completion of 3 nos of in-house made dipoles and deliver at the earliest by next week.

====> x3 dipoles delivered by mech team; x1 of these gone to E5; now total x16 Ae done; remaining x2 will go next week, by 03-May-2017;

## 2. RFI related :

### 2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting to be completed

30 Nov : YG + PAR to work on this final version.

12 Apr : needs to be actioned asap.

(ii) study of RFI environment, including internally generated RFI in main building

30 Nov : tests of individual labs : with AC units and otherwise -- shows different labs in different light; agreed to identify the worst culprits by kind of equipment etc and provide an update.

12 Apr : this is due, but has not started yet due to other activities.

(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests

16 Nov & 30 Nov & 21 Dec : no updates.

====> two experiments done :

(A) expt done using GMRT Ae as RX, & log-periodic Ae as TX; D = 100m & 300m measurements displayed GMRT Ae elev 18/45/90 deg; feed rotation done over 0/45/-45 deg

(B) between x2 GMRT Ae (C1, C8) ; one as TX & another as RX; D=375m with function generator directly feeding RF to GMRT 325MHz FEED as TX; results displayed; 78 deg

(3dB) HPBW

(iv) absolute calibration of measurement set-up for RFI testing : to translate levels measured there to levels expected at antenna focus.

====> power calibrated for any lab equipment emission limit (upto what allowed) --



plots displayed

## 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database

(ii) response to pending requests for clearance e.g. Serum Institute...

21 Dec : awaiting call from Serum Institute for the next visit; asked all technical details of their planned equipments;

30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to their location for looking at specific instruments.

21 Dec : one site visited.

4 Jan : awaiting call for visit to site of the party.

15 Feb : one round of discussions have happened with Serum institute -- they would like to finish the installation and then call for testing and possible modifications; our response should be that we would like to test the existing set-up and indicate the mods to be done and these should be implemented in both existing and new setup and then taken up for testing.

Another party wanting to set-up unit for DC control drives in Junnar / Ambegaon area.

12 Apr : RFI tests planned at Serum Inst premises next week.

====> test planned on 02-May-2017 at Serum Inst premises

(iii) work out new action plan, given the current government policies

08 Mar : MIDC people from Chakan came to GMRT for exploring possible sites for new industry zones; following discussions, agreed to our request to avoid heavy industry in GMRT area -- maybe IT related in Peth etc; also about help in surveying sites for level of RFI etc -- how is this to be formalised -- we should send a letter from our side; check with JKS.

similarly, there is a note from DAE asking for things that need protection -- to see if JKS can follow-up on this.

## 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters

30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems (they are the only one to have got license in this range) -- it is strong enough to cause saturation in spite of filter; need to find the specific towers and then follow-up with Reliance.

18 Jan : measurements happening this week; update by next week.

15 Feb : completed survey of 82 towers around Y-array : 14 towers in 850 band (Reliance Jio) and 6 towers in 950 GSM band; rest are in 1800 band. Max power in 850 band ~ -16 dBm (at ~ 100 m distance) for few towers. Follow-up for both 850 and 950 being pursued, including dialogue with Reliance Jio to see if they can switch to 1800 band.

08 Mar : draft letter circulated (vendor is generally positive; but formal communication needs to go soon)

15 Mar : New results : characterisation of mobile phone RFI in the GMRT campus -- some interesting plots; using JIO CDMA uplinks and their effect can be seen.

## 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems

30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need to identify which make is coming finally.

21 Dec : no updates.

15 Feb : 33 nos (Voltas instead of BlueStar) have arrived; need to finalise the locations and the specific schemes for installation; need to make shielded units for all 33 nos; components for 25 units are available; boxes for 10 nos are in hand except for back plate and chromatisation (expected to take one week); work request for next 10 has been given (repeat order); some difference in wiring for Voltas unit --

needs some rework of the design / layout; also one type of connector is different and this also needs to be resolved; PAR to send an email explaining the steps to be taken to complete the RFI shielding work, and expected timelines for the same.

Regarding installation : there is a table giving the locations for 31 units (including replacements of 5 existing units) -- to check if outgoing lines can be behind the unit; to install sample one unit in canteen annexe, test the RFI shielding.

08 Mar : one set of measurement done (without shielding) - under analysis; by next week shielded case will be measured & compared; RFI group designed shielding box pictures displayed; uses many cables with RFI shielded interface connectors; it includes high current carrying (220V AC) lines, needing shielded connectors !

12 Apr : 10 AC units have been installed; only 3 have the RFI shielding installed (are the other 7 being used !); 3 more RFI units are getting ready; to speed-up the remaining RFI units; and then go for the next batch of AC units; meanwhile, one bump of RFI remains at around 325 MHz -- may be coming from blower assembly : to disassemble on unit and check for source of RFI.

Separate item update : new LED light (Hi-Lite) 15 W -- appears to have NO RFI at all; can follow-up to test thoroughly by procuring a few units.

====> demo of RFI free LED lamp 15W done (in lab, x5 units have been assembled); plots of RFI from LED lamp displayed : 15W (5 units) ; 26W (1 unit) HI-LITE 15W unit's RFI (ON & OFF) identical noise floors; similarly 26W lamp also shows RFI same noise floor for ON or OFF; also tested at all GMRT band : clean (no lines); upto -130 dBm level; conclusion : 15W units can be used for corridor lighting

### 3. Operations related :

#### 3.1 Interfacing of FE with new M&C system :

(i) latest status of testing with Rabbit card in common box at antenna base

16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).

30 Nov : no new updates on this

21 Dec : antenna control part is working; FE monitoring still not working; Charu is looking into this...

18 Jan : trying with different delay to see if it solves the problem, but not yet working with online control...

(ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus

16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration and testing in 2 weeks time and put on first antenna with RS-232 cable driving; later to convert that to ethernet over fibre; mass production may need only new plates to be made by workshop -- other aspects are in-house in FE lab.

30 Nov : item also being discussed under FE agenda item (in alternate week)

18 Jan : final status is Box #1 was made functional at antenna base and was taken up to antenna focus as Box #2 does not work reliably -- hangs and needs power reset (has been tested with a couple of different Rabbit cards?); problem not solved; agreed to try the option of swapping the Rabbit cards between Box #1 and Box #2 and seeing what is the outcome. To report this by tomorrow and then decide if a 3rd box needs to be made ready.

25 Jan : testing of common box with Rabbit card : new clue related to grounding

of enable signal of decoder IC may provide the breakthrough -- tested in lab and will take to antenna base now.

15 Feb : email update from Raj Upgrade : One rabbit MCM has been installed at C01 antenna dish focus; MCM communication is proper but needs to give hardware reset while changing frequency band.

08 Mar : it is working only for some bands (C01); needs rethink on strategy.

22 Mar : problems persist; long discussion about what may be the cause; need to get a proper wiring diagram to check the grounding of the system for possible loopholes that may be causing the flaky behaviour...

5 Apr : useful discussion alongwith wiring diagrams; two possible causes identified : old FE power supplies may be having more noise (200 mV) than the new ABR power supply (50 mV) -- to try C01 with the new supply; Rabbit card has ground to common box chassis (unlike MCM-5 card) -- can try to isolate this in the second box being made ready and take to another antenna.

12 Apr : common box on C1 now working properly (!) -- problem was in sequence of commands sent from control room -- there was a monitor command sequence in the cmdfile that was the culprit.

Agreed that only main bottleneck remaining is monitoring of FE system -- this can continue in parallel, even as we go ahead with mass installation of the Rabbit based common box; third stream of activity to be initiated is lab test of ethernet based control of Rabbit card in common box, via optical fibre link (bypassing cable ethernet).

===> update on monitoring aspect : problem found with 4 lines on interface card that appear to be picking up spurious signals; isolated by connecting straps directly from IC pin to destination point and solved the problem; to confirm that problem clearly identified and solved; and then agree on changes to be made to PCB via straps (after cutting the offending tracks) and implement in mass production.

### 3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgetary quote; formal quote expected shortly.

4 Jan : folder cleared ; PO should be done shortly.

18 Jan : Order has been released; full delivery time is 3 months; first box to be supplied earlier and tested...

15 Feb : email update from Raj Upgrade : expecting the delivery of one Miltec machine shortly; also initiated talk with Miltec to supply it as early as possible.

08 Mar : one unit has come; will be tested & feedback given to Miltech

22 Mar : new Miltech PC put through RFI test; informal report : looks ok; formal report may take some time.

12 Apr : go ahead given to Miltech for full delivery.

===> CPK to call and check the status.

Addition item : issue of Windows software licences discussed (with MSU present) -- agreed to go ahead with ~ 20 stand-alone licenses for use by tech groups.

### 3.3 GMRT M&C sytem Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal meeting.

4 Jan : internal lab meeting held on 3 Jan (now every Tuesday)

08 Mar : all team members are clear on their respective roles & are contributing

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans  
30 Nov : discussions ongoing; kick-off meeting planned.  
21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.  
4 Jan : regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary' etc shared with TCS.  
18 Jan : work ongoing; need more regular interactions of TCS with GMRT team members.  
15 Feb : email update from Raj Ugrade : 2 CMC and 6 LMC machines are UP & running; team members are now very much familiar with CMC, LMC installation, features, testing and can carry independent tasks.  
08 Mar : interim review held; schedule is 6 weeks slippage/ delayed; mitigation planned for that delay;  
22 Mar : work progressing; may test sub-array and tracking in coming MTAC.  
===> could not meet the above target due to modifications for A&A issues and other things; work is ongoing at present.

### 3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for material for review committee started

30 Nov : discussions and work ongoing, including preparations for discussions with TM review panel.

21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase : requirement compatibility; architecture explanation given; scalability etc; need many upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;

4 Jan : preparation of docs in progress; ph-2 work now beginning...

18 Jan : aim to have 6+ antenna set-up with PC + switch + Rabbit talking to Sentinel + OF + Servo (to check if existing PC104 will work directly) or not; to check enough Miltech PCs available -- Sumit and Mangesh to look into it.; need to move from Fedora to Ubuntu; aim to start testing at antenna base by 23/24. Additionally, need some temporary space (couple of months) for working on 2 PCs in or near control room...

15 Feb : Last week 6 antennae Control & monitoring system was set-up and demonstrated to SKA reviewer (Nick Rees) and SKA India team.

08 Mar : SKA committee is reviewing our work; cost estimate proposal from India was submitted to SKA claiming 50% saving on TM work using Indian scheme;

===> discussions ongoing; need to prepare an updated response to new version of report expected by tomorrow or so.

Additional item : Layer-3 switch received.

Additional item : discussed draft document produced by Ops team on long-term plans for installation of new M&C system; general agreement for incremental approach noted; next level points to be addressed discussed -- doc to be updated with these and taken up for discussion...

## 4. Back-ends related :

### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh paper needs to be looked into for revision; nothing really pending, except for the report on the attenuation values : new set of tests done and results look ok and

will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed); may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?

4 Jan : To follow-up on GWB refereeing process.

18 Jan : GWB response received, relatively minor modifications are needed and SHR is looking into this; for Walsh, waiting for response -- can check after 20 days (end of this week / early next week).

====> no new issues here.

#### 4.2 Updates on existing GWB-3 system :

##### (i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

4, 11 & 18 Jan : no progress since last time.

25 Jan & 15 Feb : still pending.

22 Feb & 08 Mar : band shape correction yet to be implemented -- can be taken up now.

15 Mar : SHR has not yet gone back to this topic.

12 Apr : still pending

====> not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

##### (ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes; for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be closed ?

14 Dec : problem perhaps in AIPS settings? matter can be closed?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

#### 4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

##### (i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

##### (ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT lose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate

existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

08 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); but, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;  
===> new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready; appears to be satisfactory (though no improvements in ambient temp recorded ?).

11 Jan : no further work on GWB; plan is to have similar hcnage for GBS during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of IU nodes hosting ADCs may be needed.

08 Mar : plans for work on GSB during upcoming mTAC -- needs a discussion.

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (may come earlier)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep looks like resulting in some speed-up in delivery; to follow-up closely.

11 Jan : YG to contact nvidia and micropoint persons.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal

unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

====> need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : need to plan the code optimisation that will be needed.

14 Dec : need a discussion to decide the way forward on this.

4, 18 Jan 17 : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

15 Feb : SSK to try and restart the old 16-antenna CD pipeline code using the SOPs etc from Kishalay...

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion of long-term issues to be taken up next week (22 Mar).

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

====> ready to release ver4.5 -- basic things seem to be working;

calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

12 Apr : for ver 4.5, calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).

4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :

(i) refinements of the first draft of the note

(ii) plans for getting first unit connected and tested

(iii) plans for testing high speed recording to disks

16 Nov : lab set-up for grabbing and recoding has been done; while continuing with this, need to work on the set-up for sending parallel copy of the data, including procurement of longer CX4 cables.

30 Nov & 21 Dec : not discussed.

4 Jan 17 : basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.

18 Jan : to test the dual copy design for correlations using existing 16-antenna corr with dummy inputs; then to connect to one machine where tests can be done for raw voltage recording and a single node correlator with flexible beamforming.

15 Feb : no updates.

08 Mar : 374 MBps speed achieved; but need slightly higher speed

====> old gw9h9 (T630 m/c) removed and T620 m/c put in for doing the further work; length of cables -- 3m may be enough for using existing slot in the racks; to look into modifications of FPGA code for more eth cores; simple code for correlation of limited number of antenna etc... longer-term plan with longer cables, more racks, more nodes etc to be thought about.

4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)

16 Nov : some changes have been made by SHR, but the sub-microsec correction still needs to be done; also to follow-up about h4k file.

21 Dec : modified code has been made, but not yet tested; can try to see if it can be made available in the current release.

4 & 18 Jan 17 : agreed to defer to next release.

15 Feb : deferred as above.

08 Mar : current release has this 'sub-microsec correction' ENABLED; it is now possible to send those values to header files;

====> updated timestamp with higher accuracy is coming now; needs to be verified for correctness; CDP vs PA timestamping still to be resolved.

4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans

(ii) spectral domain RFI filtering : current status and plans

(iii) beamformer RFI filtering : current status and plans

16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.

30 Nov : not discussed in detail.

21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file...

emulator has some changes and improvements, including random location of the RFI.

4 Jan 17 : for (i) modifications in simulator; counter mode now working -- can have 2 different modes, tested at module level, now integrated into the design, will be



testing in next few days; fractional thld done in simulation, to convert to design and test. (ii) to try and run the filter in real-time from shm data.

18 Jan : not discussed, but summary of offline discussions is as follows : (i) some additional features added to RFI simulator unit; fractional threshold and counter mode now available for use in the voltage filtering unit; cumulative experience shows that we may be not using the optimal filtering technique for voltage mode -- should try the alternative approach of conversion to intensity and integration to desired time constant -- closer to a true matched filter.

08 Mar : some updates from Kaushal about looking at options for more optimised filtering of broadband time domain data :

Modified the design to support 16K window size - this is the default design now;

Fractional threshold available (tested with antenna signals) - default option now;

Made the DDC mode design compatible with the ongoing changes;

RFI Counter design ready - format to read the data including timestamp from a single ROACH complete, undergoing more tests before release;

Supporting regular tests - spectral line (Nissim), continuum (Ruta, Dharam, Ishwar);

Handling longer duration RFI using median of MAD technique - initial results are encouraging, detailed tests going on;

Looking at likely causes of missing RFI during real-time excision and at possible alternate methods for time-domain filtering;

Ongoing: Updating SOP with changes made till date;

RFI emulator: (last update email - Jan) :

Last development: Adding facility for random insertion and random amplitude of RFI

Understanding the GUI and MCM control program - backup from Rahul Bhor;

Narrowband RFI filtering: (updates email sent periodically) :

Initial version of the code has been timed; optimized for computing faster sorting for median computation, is now much better;

Moving towards expected version of filtering code - with optimized functions to meet real-time requirements (0.671s) and necessary functionality;

Ongoing: Testing the code on recorded data and timing the code for all 60 self outputs;

Looking at synchronization between the data path and RFI filter (along with Sanjay);

Looking at merging of lta file and flags for the FITS file format (along with Sanjay).

08 Mar : now optimizing real time filtering; all bands filtering on recorded; Broad band RFI filtering : emulator tested; other techniques being explored; SOP updated; to be released next week.

4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and tests ongoing; also tested by sending digitised packets to antenna and loop back;

using GWB2 for doing all the correlations.

18 Jan : feasibility study done using C09 antenna with noise sources & real signal -- needs a fixed delay correction of 1.5 km to get maximum correlation; trying setup with E5; meanwhile, a few different tests can be tried with the C09 set-up; comparison of scheme running on GWB2 and GWB3 tried out.

08 Mar : C9 & E5 setups faced problems (ethernet card issue); now fixed; GWB2 (early digitization) & GWB3 being used for comparison; delay requirement has reduced (due to early digitization)

12 Apr : new test has been carried out with C9 and E5 on actual on-source observation and brief comparison.

====> some updates from recent tests to be available by next week; detailed report of recent work being prepared.

#### 4.8 Time-Frequency Standards (BAK) :

(i) procurement of Maser units

(ii) planning for kind of environmental set-up required for Maser units

(iii) planning for long-term maintenance and development

16 Nov : most of the issues have been resolved, waiting for one party to complete the payment terms; pending issue about performance bank guarantee for different amounts of periods.

30 Nov : work is ongoing, but item not discussed.

4 Jan 17 : TEC clearance ok; recommendation to open price bids -- to check the status.

To contact Prof Sen Gupta for a discussion.

18 Jan : final TEC documents done and sent for next step; to follow-up and check status.

15 Feb : activities ongoing...

08 Mar : Negotiating committee met the vendor (no reduction on price; but add modules 'FREE'; payment terms as per NCRA conditions); Dr Sengupta will be visiting next week; first unit delivery after 5 months; second unit 4 months after 1st delivery;

12 Apr : to take up next time.

====> to confirm date of expiry of validity and follow-up with TIFR for the folder; to check about vibration damping mechanisms available with the system and otherwise; to make a draft note for selection of the room and suggestion modifications to be taken up.

#### 5. Other items :

##### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need to agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take

a call for mass production.

12 Apr : sample unit getting ready -- length needs to be reduced; do asap and get hose assembled and then install on C03.

=====

[Points in lines beginning with the string '==>']

1. FE & OF related :

1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in  $T_{lna}$  for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

22 Feb : first results of variation of  $T_{sys}$  for Band-4 FE unit of QH + DC + LNA

(which goes next to the hood) -- absolute value of Temp is higher than  $T_{lna}$  at ambient and also the variation of  $T_{sys}$  with ambient (0 to 60 deg C) is larger than for  $T_{lna}$  alone. To cross-check whether known loss of QH and DC at room temp can explain the room temp values and then extrapolate from there for different ambient temps.

15 Mar : new test done with QH + LNA only (compared with QH + DC + LNA) -- shows lower variation of  $T_{sys}$  over 60 deg range of chamber (35-40 instead of 55-60 seen earlier);

agreed to try to estimate the loss of QH and DC with temperature and use theoretical formula along with  $T_{lna}$  as fn of temp to predict the observed  $T_{sys}$  vs temp curves and compare with the measurements.

5 Apr : new results of  $T_{sys}$  vs temp for just LNA, LNA+QH, LNA+DC, LNA+QH+DC : appears to show reasonably flat variation of  $T_{lna}$  with temp; more variation for LNA+QH; but some of the curves cross each other (and have offsets) with temp -- bit difficult to understand; agreed to try S-params for each device as fn of temp, for same RF (610); meanwhile, theoretical calculations ongoing.

19 Apr : new update, which measures loss of QH with temp, shows change from 0.1 to 0.2 dB over 60 deg and can explain the observed variation of  $T_{sys}$  with temp. To check if any info is available about loss of QH with temp; second is the mystery about lines crossing each other -- needs to be understood; then can check about extending the study to Band-3 also.

1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible.

22 Feb 17 : only 5 antennas completed by January; request for next set of 5 feeds has been given to mechanical approx beginning of Jan -- expecting 2 dipoles shortly, but reflector and BFRs will take some time; meanwhile one FE box is ready; to get if possible 2 more to be ready, so that 2-3 antennas can be done in quick succession. Need to have enough QH + DC (is matter of cutting right length of material and assembly); for LNA : have all PCBs, need chassis (ordered in sets of 20); same situation for BPF; however, request for new stools (with modified height) has not

been given (!!); due to some rethink about optimal stool height (!); follow-up action on this : to discuss with mechanical to see if existing or spare stools can be modified / cut to meet the height requirement and use for the next 2-3 antennas.  
15 Mar : HRB had requested for 5 feeds (DRF 130-260 MHz) out of which 5 dipoles arrived and reflectors + BFRs will arrive by 18 Mar; mounting stools (1190 mm), 30 nos. requested, out of which, 2 stools will arrive on 18 Mar; hence, new installation only by next week;

5 Apr : 2 nos of feed + reflector + BFRs + stool in hand; 1 box ready; one more can be ready in next few days; can target 2 antennas in MTAC period; to see if 3 can be tried.

19 Apr : no progress now, as attention has shifted to common box for some time; now tasks have been reassigned and work on this will pick up now.

==> 6th box is ready in lab; will go to antenna by next week (12-May-2017)

### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

#### (i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months should be enough to complete the tasks i.e. April 2017.

11 Jan 17 : 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

25 Jan : needs combined tuning of filters to fix the problem; work ongoing.

22 Feb : successful in tuning the integrated unit (for 2 boxes, both channels); and

23 antennas are completed, and work is ongoing; next antenna in about 2 weeks.

15 Mar : one more box was made ready, but gave trouble after exhibit at Science Day (!); has been made ready again (all the cables were changed). Will go up shortly.

Meanwhile, next set is getting ready.

5 Apr : 25th antenna done to ver2 level; some issues related to tuning of the integrated filters (assigned to SC).

19 Apr : 26th antenna also completed; going reasonably smoothly.

==> next box (incorporating new filters) will be ready this week &

==> go to antenna [~ 12-May-2017]

#### (ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good : comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

11 Jan : analysis of Jan data awaited.

25 Jan : analysis of new data (on CasA) -- appears to be systematic 1-1.5 dB less deflection than predicted and control room values -- needs to be checked and followed up in consultation with ICH, DVL, SC & GP; few antennas with some odd behaviour e.g. E3 and maybe E2.

15 Mar : no updates as Ankur is not available

5 Apr : updates from new data; 2 antennas showing less deflection in ch 1 only -- to be investigated; not much other issues.

19 Apr : no updates this meeting.

==> data available, but no plots (laptop crash)

(iii) Summary of phase centre measurements and decision about future plans

25 Jan : no action yet.

15 Mar : still pending.

19 Apr : still pending

(iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

11 Jan : data collected, report expected within 2-3 days.

25 Jan : Sougata + Ankur will provide update next time.

22 Feb : SC will send update within a week.

15 Mar : some work is still pending; SC will complete and send within a week.

5 Apr : some tests done using OF monitoring system (seems not all antennas working and also varying behaviour) : summary from 10-12 antennas, 3 sub-bands (one corrupted by RFI) : some cases show narrower BW, and some show wider BW; for narrower BW cases, coating the PCB appears to correct for most of the discrepancy -- needs a short report on this; last 5 antennas have gone up with the coating -- should be able to cross-check the performance; need to find a solution for broader BW case !

19 Apr : quality check on 24 antennas done; about 4-5 antennas showing discrepant band for most sub-bands; FE team feels confident that this can be fixed with the coating option; to make a table for all antennas all sub-bands for user to decide what to be done; to fix as and when FE box comes down for other work.

==> report circulated; worst affected antenna identified;

==> after ~ 3 months will be taken up;

(v) LO settings for all sub-bands etc to be finalised.

14 Dec : 250-500 LO setting document / table already finalized;

28 Dec : no updates; person on leave.

11 Jan : astronomer feedback awaited (to check if final table shared with control room).

25 Jan : Not yet shared with control room; to refine based on : 6 dB point for main BPF and 10 dB for subband filters, for the default BW.

22 Feb : draft document has been circulated to DVL & YG for trials, for 3 bands (Band-3, 4 & 5); for Band-3 which shows max variation of sub-band responses, the basic response is taken as the one found in majority of units and 10 dB criteria is applied to that response to get the LO values; either lower or higher or both side LOs are recommended depending on the situation, and some justification has been given for all the cases; YG to check with DVL etc if this can be released to control room and all users.

15 Mar : some responses from DVL + Nilesh etal -- some clarifications sent; some more tests to be carried out this week.

5 Apr : no updates for this time.

19 Apr : DVL and co to provide update by next week; can discuss 2 weeks later.

1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus

14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01);

box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)

28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).

11 Jan : box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.

==> box #2 MCM reset option & monitoring finished; to go to C01 antenna tomorrow (04-May-2017);

(ii) Plans for mass production

30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.

25 Jan : one box tested at antenna focus and working ok; 2nd box not yet tested at focus; even for the 1st box, repeatability is not there.

19 Apr : ready to start the mass production and installation; may be able to achieve 2-3 weeks per box in long run after first 2-3 boxes; to coordinate with Ops group for supply of Rabbit in shielded box. Also to do the R&D for getting the ethernet control option tested and going and put it into mass production -- this needs an extra input port on common box -- agreed to use 50 MHz port for immediate and redesign the plate for additional input port and put into new boxes as and when ready, without affecting the rate of mass production of common boxes.

==> x2 boxes in wiring stage; x1 box per month initially (later one box every 3 weeks);

==> redesign of band-selector & interface card completed;

==> mass production can begin now

1.5 Apex radiation scheme (PAR/SRoy) :

(i) Current status of measurements and interpretations

(ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

11 Jan : no updates, though there has been some email discussion between SRoy and PAR

25 Jan : need to check with SRoy and PAR.

15 Mar : PAR and SRoy yet to have a detailed discussion; meanwhile another round of tests done on C1 -- showing a different pattern than C10. Need to summarise and circulate and then take up for discussion.

19 Apr : no updates, though some ongoing email dialogue between SRoy and PAR...

1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) :

Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of health of Walsh switching.

11 Jan : there is some confusion about what is being done, and what has been achieved ! For 10 antennas which have new 1st LO system (LOFSW based units), it should NOT be possible to have Walsh modulation at present !

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh...

22 Feb : now clear that only those antennas (20 ?) which DO NOT have the new synth units can be tested for Walsh; latest tests on these (done in Jan), showed ok results for 19 out of 20 (one antenna was down due to mech problems).

15 Mar : no immediate action here; need to work out with analog BE team.

### 1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

22 Feb : SC to check with JPK about the progress on implementation of the SOP for use by control room in normal PMQC type of tests and generation of stats to report to FE team.

15 Mar : control room people (JPK and SNK) are looking into the code written for GSB to see if it can be done for GWB.

5 Apr : SC to follow-up with JPK on the matter.

19 Apr : code has been obtained and possible issues in it have been identified; to see if the job can be taken over by control room colleague.

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

22 Feb : to plan for the discussion.

15 Mar : agreed to make a presentation on 20th in the poln meeting.

5 Apr : presentation showed reasonable results; action items : to compare feed response with WiPLD results of HRB; compute 3 dB BW vs freq for Band-3 for feed + dish and compare with observed results; need a software with finite element method approach for this simulation -- Antsys or Fecko; to check availability in different places in and around Pune.

19 Apr : no new updates right now.

### 1.8 New filters for L-band (AP) :

(i) status update on installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing

16 Nov : arm antenna installation to be resumed;

14 Dec : all west arm will be completed by 16-Dec-2016;

28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.

11 Jan : S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).

25 Jan : only 2 antennas W-arm remaining to be done.

==> only one antenna (W2) remaining

(ii) delivery of remaining units of main L-band BPF from Epitome

16 Nov : BPF completed and handed over to BE team -- this can be closed.

28 Dec 16 : can be closed.



## 1.9 OF system updates :

### (i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.

11 Jan : current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.

15 Mar : this is status quo; few extra high power lasers at 1310 nm for forward link have been procured; cards being made ready; will be used as and when loss becomes too large in far away antennas.

==> x2 Ae W6 & S6 (?) done ...

### (ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates

28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.

11 Jan : cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.

15 Mar : expected by end of this month.

5 Apr : OTDR not arrived yet; second fibre bundle ordered but not yet delivered.

==> OTDR has arrived;

==> second fiber bundle has also come;

### (iii) 8 Gbps GMRT to Pune link : it was found that only 1 or 2 Gbps was working;

25 Jan : detailed debugging has been done by OF team and now it appears all the 4 wavelengths and hence 8 gbps lines are functional -- only one wavelength is marginal (to order spares for taking care of such issues); also remote monitoring facility at Rajgurunagar with SMS facility to be activated.

15 Mar : spares have been ordered; monitoring unit is ready -- small change needed in software and then can be installed.

5 Apr : not yet installed, waiting for Rahul Bhor.

## 2. RFI related :

### 2.1 Spectral line RFI (PAR/SSK) :

#### (i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks

28 Dec : RFI team visited Junnar cable TV operator for getting response to letter that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.

25 Jan : discussed with Jondhale -- he will speak to the party and see if some progress can be made; otherwise to escalate the matter; also to estimate the number of splitters etc that can be provided to W-arm operator to mitigate the problem.

#### (ii) Digital TV follow-up

23 Nov : letter is still pending !

25 Jan : need to expedite the matter !

#### (iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source

11 Jan : 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.

25 Jan : need a site visit to understand better.

### 2.2 Satellite RFI monitoring & avoidance system (PAR/SNK) :

(i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and ,, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)

25 Jan : need to follow-up on identifying for LEOS.

(ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)

25 Jan : new limit is about 8 deg -- to cross-check if ok and close.

(iii) Plans for sending information to back-end receiver chain

25 Jan : to check with Santaji about the plans for this

(iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week

28 Dec : no updates.

25 Jan : to include in the plans for visit by Nick Rees in week of 6th Feb.

2.3 RFI from power lines and transformers (PAR/RVS) :

(i) review current status

(ii) specific follow-up actions

23 Nov : not discussed

25 Jan : no updates.

NEW POINT :

==> new RFI line observed at 467 MHz ! (need to identify the source)

2.4 RFI from LED lamps (PAR/RVS) :

(i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

(ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

25 Jan : report has been circulated; solution looks promising; to try for compact version of the solution; working with workshop to mechanical items; will need to order some components for bulk production.

08 Mar : LED panel/ tube light shielding : report generated on tests - broad band radiation from commercial units (x4 units in one box) - shielding is ~ 75 dB ; results appear encouraging; Syska (x1 22W), Philips (X4 20W); -150 dBm final number arrived at. high failure rate of LEDs due to voltage fluctuations;

11 Apr : new model of LED light identified with very low level of RFI (none at all !!?)

Hi-Lite 15 W; sample unit of this LED panel displayed; agreed to procure a few units and do a thorough follow-up.

26 Apr : demo of RFI free LED lamp 15W done (in lab, x5 units have been assembled); plots of RFI from LED lamp displayed : 15W (5 units) ; 26W (1 unit) HI-LITE 15W unit's RFI (ON & OFF) identical noise floors; similarly 26W lamp also shows RFI same noise floor for ON or OFF; also tested at all GMRT band : clean (no lines); upto -130 dBm level; conclusion : 15W units can be used for corridor lighting

==> x5 LED lamp (15 W) units installed in corridor

2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested; 8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.

4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified units -- all are ok. Need follow-up as mentioned on 28 Dec.

18 Jan 17 : all 10 units tested and cleared; now OK to use this 2nd batch of 10 units in antennas; need follow-up on status of ordering last batch of 14 units.

25 Jan : matter closed for now from RFI team side; to take up when next lot comes.

12 Apr : indent process for the last lot was held up due to issue of exact specs for RFI related properties (!); finally, agreed to go ahead with the existing clause as likely there will be one round of modifications needed if some specific part is changed by the vendor. Electrical team to expedite the paper work.

NEW POINT

==> x11th (last of the current batch) shielding for AC units completed

==> now waiting for additional chassis

3. Operations related :

3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) :

(i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.

28 Nov : still waiting for 80 nos PCBs to come.

11 Jan : 84 PCBs received; can go ahead with further assembly now.

25 Jan : this can be closed.

(ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);

28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.

11 Jan : 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.

25 Jan : Rabbit card enclosure now going smoothly : about 2-3 per week; to send some samples for RFI testing.

22 Feb : 18 are done; 19th ongoing.

15 Mar : 23 completed; one unit given to RFI team for measuring shielding.

5 Apr : going on track, will finish all 30 by April end.

19 Apr : Ops group to talk to FE group to start regular supply of Rabbit + shielded enclosure for installation and commissioning of common boxes for antennas.

==> x28 boxes are ready & tested;  
==> can be handed over to FE whenever asked;

(iii) status of mass production of network switch enclosure

23 Nov : 28 units ready (need total of 35)

14 Dec : now 32 (of 35) ready;

28 Dec : same status of 32 out of 35.

25 Jan : 32 out of 35 completed; remaining 3 are in use and will be done when free; meanwhile, to send a few samples for RFI testing.

22 Feb : some sample unit(s) has been given to RFI team for testing -- Raj to confirm; to check if all shielded connectors are procured or not.

15 Mar : samples have been given and tests are being carried out today.

19 Apr : confirmed that all 32 boxes have shielded connectors; to check with RFI team about results from RFI tests of integrated system.

3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

(i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing

23 Nov : C00 & C10 are mostly complete (item could be closed?)

28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.

(ii) plans for going beyond 2 antennas

23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)

28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?;

elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.

11 Jan : mechanical completed for 10 antennas; electrical completed for 13 antennas; Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.

25 Jan : mechanical has resumed work; same for electrical; will be updating spreadsheet; column for servo has been added in spreadsheet -- to remind them to start updating;

15 Mar : mech has completed 13 antennas; electrical has installed all the UPS units (23), other changes need to be checked; servo has completed 10 antennas.

5 Apr : 8 antennas completed for M&C systems; 3 extra Miltec to be tested; 4 are non working -- being looked into (total of 15 Miltechs); apparently no change in status of other systems (mech, elec, servo) -- JPK to check and follow-up.

19 Apr : servo has completed 15, electrical has completed 23, and mechanical has done 13 antennas; M&C system on 8 antennas, 2 more are ready + 1 in testing in lab; Ops group needs 5 nos of 2 TB disks and comp group has provided 2 nos -- to arrange for ~ 10 nos of 2 TB disks.

==> x5 total disks (2 TB each) were given to OPR group;  
==> x2 used to replace old disks ; x3 available for any application

(iii) update on improved RFI shielding at antenna shell

23 Nov : shielding test measurements done for present configuration; awaiting finger-lines to be added before repeating the tests (which antenna?)

28 Dec : folder in process for placing order for the finger-lines.

5 Apr : no updates.

3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems

28 Dec : Ops team has a plan for this; can be discussed in detail next time.

11 Jan : final plan placed on web portal (for lab people)

19 Apr : 8 + 2 + 1 units as given above; further growth constrained by availability of Miltech PCs only.

(ii) plans for switch-over -- to make it as seamless as possible.

30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.

28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.

25 Jan : can defer till after the demo.

22 Feb : Ops team appears to prefer scenario 1 -- incremental approach; to generate a note within next 4 weeks on this.

15 Mar : still pending for team to send a draft doc.

5 Apr : still pending.

19 Apr : can check again with Ops group next week, for a possible discussion 2 weeks later.

26 Apr : discussed draft document produced by Ops team on long-term plans for installation of new M&C system; general agreement for incremental approach noted; next level points to be addressed discussed -- doc to be updated with these and taken up for discussion...

==> incorporating points that came out from discussion into the change-over-plan note;

3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)

14 Dec : HP layer3 switch finalized; budgetary quote Rs 3.5 lakh; indent prepared.

11 Jan : item can be closed.

(ii) Plans for procurement

23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.

28 Dec : indent raised.

25 Jan : procedural issues related to advance payment etc...

22 Feb : not clear if this matter has been resolved before Charu went on leave...

15 Mar : need to check with Charu.

5 Apr : HP make layer-3 switch has no issues about advance payment and order has been placed and delivery expected by end of this month; the advance payment problem was for SFP adapter -- this needs to be resolved.

19 Apr : matter is resolved and delivery is expected by end of this month.

==> switch has arrived at Pune

3.5 Interfacing and control of new systems such as Noise Cal & Walsh :

For 10 antennas which have new 1st LO system (LOFSW based units), need to be clear about the control path; also 2 of these antennas have independent MCM for driving the new CPLD; need a wider discussion about M&C for new system for these aspects related to Noise Cal and Walsh.

22 Feb : need 2 CPLDs in new set-up : one for new FSW LO, one for Walsh + Noise on-off etc, and both can't be connected to MCM 2 and hence an additional MCM is needed. To find out a way around this issue, so that progress can be made...

15 Mar : 2 options are being explored by BE team without increasing the number of MCMs from present count; some prototypes are being tested and will be reported upon shortly. For the longer term, need to see if antenna based Rabbit card can fulfill these roles.

==> tests with different interfaces done;

==> avoiding additional MCM (beyond x2 MCM) successful [but with OLD MCMs]

==> in new MCM, use of control pins of MCM used for sentinel will suffice

3.6 Update on Rabbit Card in Common Box : follow-up from discussion of last week to track the progress and latest situation...

19 Apr : FE team plans for roll-out discussed above; Ops group to provide required number of Rabbit in shielded card; main remaining task is to get the FE monitoring working on the Rabbit interface to FE system : CPK has been doing some debugging to get to the bottom of the problem; JPK and CPK to sit together to see if earlier work done on 15m with Labjack for similar control of FE system can help.

==> points closed;

==> new box being out on C01 (at the antenna base tests were successful; now going to

==> turret (today itself; 03-May-2017)

==> Evaluation of SKA TM has completed; final response from NCRA sent;

4. Back-ends related :

4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

11 Jan : one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

25 Jan : s'ware work for the above is still in progress.

15 Mar : still in progress, no new update.

==> x1 ADF-4350 system ready (tested in lab) with switchable

==> freq & power level attenuator;

==> characterization in progress with web-browser (from ONLINE);

==> but need command line functionality (Jitendra had to do)

==> Next, ADF-4351-s needed for individual antennas

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

11 Jan : one rack modified (4 antennas) and systems being tested; will report shortly, and if everything ok, will go ahead with the mods for all the 8 racks.

25 Jan : same status as above; test report has been circulated internally.

15 Mar : will complete the modifications for all racks in MTAC; meanwhile, the filters can be used with unequal gain in different antennas; command is available to control room and can be tried.

5 Apr : phase jump problem requires use of 4350 IC circuit -- this has been tested in GAB on one antenna both pols and found to work OK; need to repeat same test with 4351 IC also and then bulk order of 4351 IC can be done (will take about 2 months); will need modified CPLD based ckt + software for using 4350/51 at antenna base as 1st LO for legacy system.

12 Apr : follow-up discussion with users like NK indicates that higher priority for having GAB + GWB uGMRT working without phase jump on switching, and solving the problem for legacy GMRT can be lower priority; accordingly, 2 possible solution options discussed for uGMRT : (a) have 2 signal generators set for the 2 frequencies needed and switch their output to the common LO signal line on the switching command (b) have one unit of the new 4351 IC completed with proper control logic to act as the single source of common LO; agreed to aim for option (b) on time scales ~ month or so.

==> closed now

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.

14 Dec : changes to DRAFT report in progress;

11 Jan : still in progress -- not ready yet.

25 Jan : no new updates.

15 Mar : no new updates; BAK to check.

4.2 Power equalisation scheme and relate topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

11 Jan : still pending

25 Jan : revised version circulated internally.

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

15 Mar : BAK to check and get back.

5 Apr : Atul has initiated the discussion with control room colleagues; SRoy + Nilesh discussion now has the basic code working and SRoy is doing some testing and debugging and will report the result in few weeks, after which one could talk about releasing the package with the different modes.

==> only plot routine remains (discussion pending - may happen today itself)

4.3 Updates on existing GWB-3 system :

(i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

4, 11 & 18 Jan : no progress on this upto now, due to work on release of 30 antenna system.

25 Jan & 15 Feb : still pending.

22 Feb & 08 Mar : remains to be implemented -- can be taken up in the list of tasks now.

15 Mar : SHR has not yet gone back to this topic.

5 Apr : new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

12 Apr : agreed for BE team to repeat noise source tests and check carefully for spurious lines; then repeat with sky signal as needed.

19 Apr : still pending.

==> using correlated noise fed to 4 inputs : no spurious lines seen

==> conclusion : GWB-3 is not the culprit

==> geometric mean NOT used; sqrt( previous coeff) giving good results;

==> may be finished within this week

(ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?

14 Dec : problem perhaps in AIPS settings; matter can be closed ?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov 16 : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

==> closed

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT loose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs;

IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into



a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

8 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); But, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

==> only writing (packet loss) log in different files remain

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.

11 Jan : no further work on GWB; plan is to have similar change for GSB during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

8 Mar : plans for work on GSB during upcoming MTAC -- needs a discussion.

==> nearly closed; hot air sucking mechanism needed (being explored with Nandi's help)

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (but may come earlier?)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up in delivery; to follow-up closely.

11 Jan : YG to follow-up with nvidia and micropoint.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

==> waiting for adapters to arrive;

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : no specific updates, except that code optimisation will need to be done.

14 Dec : need a discussion to decide the way forward on this.

4, 11 & 18 Jan : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion on long-term issues to be taken up next week.

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K channels for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working;

calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

19 Apr : for ver 4.5 : calculator working and released in GUI; new SOP for v4.5 to be

ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).

==> SOP already released (v 4.5)

4.5 Network related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half sytem

4 Jan 17 : this is done -- to confirm and close.

==> closed (not relevant)

(ii) updated IP table for .4 n/w to be made available by computer group

4 Jan 17 : work ongoing -- to check status with comp group.

==> completed

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.

==> GSB & GWB diagrams available ; completed

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines is possible with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together to NCRA end; comp group to set up the test, alongwith VVS at Pune end.

11 Jan : 3 connections made to gwbh1-3, and live test demo done; it appears that only 2 of the 8 x 1Gbps links from switch to aggregator are woking ! This needs to be debugged between comp group and OF group.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

4 Jan 17 : comp group agreed to look for options.

15 Mar : can be taken up next time.

4.6 Longer term plans for GWB-4 (SHR/GJS/ICH/SSK/BAK) :

List of tasks goinf forward (needs to be prioritised) :

(i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link (GJS+MGU)

(ii) Disks for data recording, including trials with SSD options (GJS)

==> restarted the tests on normal disks

(iii) investigating next gen GPUs -- to benchmark sample Pascal units from nvidia (SHR)

19 Apr : to be tried next week.

(iv) migration to next version of CUDA (7.5 and beyond) -- to decide the steps

23 Nov : CUDA 7.5 is being tried in the new version of GWB -- confirm present status

19 Apr : confirmed that all v4.5 is on CUDA 7.5 and no upgrade in near future.

==> installed CUDA 7.5 on all machines

==> next cycle may go for 8.0 which is now available

(v) DUT correction and timestamp related issues : to confirm present stauts and decide future course of action (SSK)

19 Apr : still pending.

(vi) towards PFB option : resurrect old code into new GWB5 & compute the overheads (SHR)  
(vii) towards a gated interferometer : to look at the MAC code that can do the gated integration; to send the gate information to the GPU from CPU (SHR/SSK/YG)  
(viii) improving availability of beams by reducing beam I/O : 16 bits to 8 bits for IA/PA beams and 8 bits to 4 bits for voltage beams (SHR/YG)  
(ix) options for an additional network for even better I/O capabilities (SHR/GJS)  
(x) PA - IA beam mode as an additional option with IA or PA modes (SHR/SSK/YG)  
(xi) making 4 PA (or voltage) beams point in 4 different directions -- SSK to look into the change in code needed for this, starting with astrocal  
19 Apr : SSK has done initial study and plan for generating parameters for all 4 beams from same call to astrocal and then pass to the beamformer; beamformer code needs a change to do one extra multiply by complex number whose phase is calculated on the fly based on antenna, channel, time and beam number.

==> initial note from SSK;

(xii) towards more general multi-beaming in the long run  
(xiii) archiving of beamformer data : better header and also finding what metadata is required -- SSK to look into this, in consultation with Deepak Bhong.  
19 Apr : to follow-up with DB in next few days.  
(xiv) getting second copy of data to separate cluster going : for both raw voltage recording, as well as for multi-beaming kind of work (GJS/BAK)  
19 Apr : to see if one node (with new disks) can be made ready and put in one rack and connected to Roach board -- can grow to one m/c per rack with separate IB switch...  
(xv) decide on 2 vs 4 inputs per Roach board for final configuration  
(xvi) net-sign correction -- confirm current status and decide if further action is needed (SSK)  
19 Apr : current status is that adhoc sign flip has been introduced for both corr and beamformer header info; proper modification in code needs to be decided : when & how.  
(xvii) full backward compatibility of off-line utilities (SSK)  
23 Nov 16 : some work has been done, but not clear if this meets / works for all requirements.  
19 Apr : has been done and released and users have used it.

#### 4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

(i) Summary of current status for temperature monitoring

==> cacti released to control room;

(ii) Plans for future enhancements and release for regular use  
(iii) Monitoring of other health parameters  
14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack (uses DAQ card);  
28 Dec : not discussed.  
11 Jan : no significant new updates.  
25 Jan : no new updates, but plans for collecting the temp data and bringing to common m/c that is accessible to control room is being planned. installation of cacti also to be taken up.  
15 Mar : machine has been made ready; cacti has been installed; gradually adding nodes to the list and making them ready for monitoring; a separate home-grown product (using cglplot) also being made ready for monitoring IB network.  
19 Apr : cacti for temp monitoring for all GWB nodes (temp of cores) -- available on web browser; to release to control room and users and add in GWB SOP; cglplot -- home grown version that allows to read the raw data and display using cglplot in a more

flexible manner (right now on hold); for IB monitoring : collectl was being used for IB monitoring (right now on hold); for disk usage, cacti has an option, can be released alongwith the temp monitoring. Additional homegrown tool (IMH + others?) also available -- need to check and see what should be the final form.

==> during MTAC, temp displays in CORR room added; (plot facility etc )  
==> control room can always see display of temps : inlet air & outlet air

#### 4.8 Other issues :

##### (i) Cross-coupling tests in GAB + GWB

14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?  
28 Dec : some issues need a bit more of discussion before reaching a final conclusion.  
11 Jan : ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%  
25 Jan : no updates; needs a discussion.

##### (ii) Walsh related work.

14 Dec : some tests in progress; porting to GWB (Python package being modified);  
28 Dec : work is still ongoing.  
11 Jan : porting work is nearing completion.  
25 Jan : now in testing phase (on GWB2).  
19 Apr : some corrections done for accommadating existing connectivity of GWB of pols with nodes; second correction done for drift of Walsh pattern due to digital bug; will proceed for noise source and astro tests using GWB2.

==> delay hunting programme has some bugs, being fixed;  
==> debugging in progress;

#### 5. Other items :

##### 5.1 Python assembly work (HSK/SSK) :

##### (i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

##### (ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.  
14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option

(even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need to agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

=====

## Minutes for the Plan meeting of 17 May 2017

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### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov : offset not yet fixed (to be done later with mechanical), but new data taken for E & H plane -- looks ok; to do cross-polar measurements.

21 Dec : plans for correcting the offset -- next Monday 26th.; meanwhile, earlier data has been given to SC and he will produce an updated result for band-4 within the next week.

8 Mar : offsets have been corrected; 610 MHz measurements done; other freq being done now; report awaited; method for cross-polar measurements needs review before executing.

22 Mar : new results presented : from ~ 600 to 800 MHz in ~ 50 MHz steps; to see if we can get closer to 550 and 850 MHz and repeat. Also to try Band-2 (120-250) feed and see if re-measurement of Band-3 (250-500) is useful.

26 Apr : Completed measurements for 1 polarization 550-850 MHz (in 25 MHz step). Second polarization has been partially completed : 550-725 MHz; the remaining frequency range to be covered on 28th Apr.

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

18 Jan : manual 'digitization' of plot (hard copy) is agreed [rather than indefinitely 'waiting' for a machine readable data file to become available somehow];

15 Feb : no updates, can check recent emails for updates.

22 Mar : no updates, can keep pending for some time.

12 Apr : status quo

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

4 Jan : awaiting feedback

22 Mar : ICH and DVL reminded; will get back in next few days with comments and then possible follow-up and closure can be explored.

12 Apr : to schedule a final joint discussion for closure, within next 2 weeks.

(ii) need to cross-check mismatch of values for band-3 (250-500);

30 Nov : will check and update, including referring to some existing literature

21 Dec : some work has been done, but needs an internal cross-check & then discussion.

22 Mar : new doc has the updated values for this.

(iii) need to see if QH losses have been incorporated into the calculations;

30 Nov : GP has done some of the work; need to circulate and get agreement.

8 Mar : report circulated; feedback awaited  
22 Mar : new doc has the updated values for this also.  
(iv) does the study cover all the uGMRT bands.  
30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.  
16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.  
21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in Tsys) -- TBC.  
22 Mar : new doc covers all the bands, except for 120-250 (Band-2) as measured feed radiation pattern is not available (standard 65% across the full band has been assumed).  
12 Apr : measured radiation pattern not yet available; will be done after finishing work on Band-4 (550-850 MHz).  
26 Apr : radiation pattern (550-850 MHz) has been given to Swagoto  
(v) can it be extended to deriving the final beam pattern for feed + antenna; this is being looked into :  
21 Dec : first version doc has been sent by SC -- needs follow-up  
4 & 18 Jan : feedback awaited on this item.  
15 Feb : to try to find a slot when all concerned are present to get to the finer points and close the matters.  
22 Mar : can be presented this Friday in the polarisation meeting, and then taken up for follow-up discussion.  
12 Apr : see discussion from last week's meeting; action items have been identified there, under polarisation calibration work, and this topic can be followed up there.

#### 1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document  
30 Nov : yet to be completed.  
21 Dec : updated & internally circulated;  
15 Feb : GP to follow-up on internal clearance.  
12 Apr : SSK to check and follow-up on clearing the report  
26 Apr : Report has been finalised and circulated.  
(ii) results from recent tests  
30 Nov : running of tests has conflict with online system (JPK is looking into this)  
21 Dec : all x30 Ae data collection leads to 'online' ssystem hanging; planning with x15 Ae (29Dec);  
18 Jan : 'online' issue remained for '15' antenna also (after '30' antenna case failed); now suggested to repeat for '10' antenna case; test planned for a future wednesday;  
15 Feb : to try with smaller number of antennas for now; need discussion with Ops group about the limitation and how it would get overcome.  
08 Mar : GP & Jitendra following up today  
12 Apr : 15 antenna test with online now successful; trying for 30 antenna this week.  
26 Apr : 30 antenna test was done during MTAC; needs to be repeated now.  
==> last week, 6 antennas were available and they were tested; monitoring scheme is working; test with all 30 antennas needs white slot booking -- to be done.  
(iii) labeling scheme for keeping track of the units to be taken up for refinement and implementation  
16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.  
30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular



back-up of the files to be worked out.

12 Apr : additional disks made available for back-up of the units; in-house development by Sanjeet ongoing -- can review in about 2 weeks.

26 Apr : software is ready; tested locally; need to feed real data & test.

(iv) Lband system does NOT have total power monitoring at present : prototype scheme being worked out by Ramesh and may be available shortly; will include basic temp monitor (for the box; not for LNA).

26 Apr : new scheme has been tested ok in lab; chassis may need modifications for final implementation.

====> the software has been tested; implementation is expected after STP joins; boxes are using proper numbering scheme.

1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system

30 Nov : same as above

21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)

18 Jan : data showed 'flat' value over 24 hrs; C3 & E2 to be tried again today.

15 Feb : not clear about the above problem (needs follow-up with Ops group); to check with 4 antenna test and report back.

12 Apr : monitoring goes hand in hand with power monitoring.

(ii) status of prototype for temp and power monitoring at OF rack at antenna base

16 Nov : sample data set taken but not long enough; to wait for next round of tests; prototype unit installed at C2 and connected to M&C system, but not being monitoring regularly; would like to do some more test and development before finalising the scheme.

30 Nov : (ii) is on-hold after prototype development; to be taken up only after Rabbit card based system is in place.

12 Apr : no change in status

1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares

30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.

4 Jan : 4 complete sets of spares available now (ready for installation at antenna)

15 Feb : 4 spares available.

08 Mar : 5th L-band spare has been assembled - currently under test

22 Mar : now down to four spares (due to C14 problem).

12 Apr : 2 complete sets still available; 3 units under repair

26 Apr : 3rd unit was found to have some issues -- under investigation.

(ii) finalisation of report by VBB

16 Nov : same status as last week.

30 Nov : report pending with SSK

18 Jan : report to be ready by 25 Jan.

12 Apr : updated report had been circulated; can take it up for brief discussion next time and try to close.

====> working on mechanical mounting for the new LNA for L-band feed (as the size is different now); 3 spares are being maintained.

1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs

30 Nov : some failed units are being retuned...

08 Mar : all spares available

(ii) status of new 2-stage design installed on 2 antennas : working ok ?

30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.

(ii) status of new 3-stage design : optimisation of RL was being attempted

16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better than 10 dB across the band; Tlna ~ 20 K (by old noise comm calibration scheme); to try improve further, while assembling second unit.

30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna (2 units to be made ready).

21 Dec : 2 K improvement seen (< 20 K) ; report to be available in 1 week

4 Jan : second unit has been assembled; overlapping plots show good repeatability; report will be ready by 6 Jan.

18 Jan : report already circulated last week [ ~ 20-25 K over full band; gain ~ 44 dB flat; return loss better than -11dB over entire band (-14/-15 dB most places); worst case -11 dB near lower freq band edge]

08 Mar : x6 new PCBs (x2 circuits assembled; awaiting chassis; expected next week)

22 Mar : above new units have been assembled and tested -- results look ok, will be circulated shortly.

12 Apr : 4 units of 3-stage amplifier built and compared for performance : getting good repeatability; completely dynamic range measurement and stability inside env chamber; agreed to put 4 units on 2 antennas (CSQ) and check for the performance, including change in power levels and hence change in OF attn etc.

====> tests remaining are dynamic range and stability with temperature (in chamber); these may get done next week.

## 1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB problem and W5 -- problem not identified); C14 showing poor deflection and falling at high freq -- checked for pointing and OF attn, now to try changing the feed.

4 Jan : results from tests on 13 Dec discussed : 21 antennas available; dip seen for L-band vanished after replacing common box (which antenna?), but unit appears to be ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2; W5 poor bandshape; C14 noise deflection discussed.

18 Jan : 06-Jan-2017 tests reported; (only 15 antennas were available); E6 showed ripples in CH1 (but could be cable twist; as today NOT noticed); E6 CH2 deflection HIGHER than expected (red dots) !! "measurement" error? 'naming' of file ? similarly W5 CH2; resuts show MAJOR drift in defelction (~ 15 dB spread !) -- BUT NO CORRECTIVE ACTION TAKEN !! Primary purpose of monitoring is LOST ! SKR was 'un-sure' about this responsibility - now clarified; henceforth, he will follow up on errant antennas.

15 Feb : E6 ripple in Ch1 fixed (bad cable); C14 feed needs to be replaced (tbd soon); tests at antenna base for selected set of antennas shows ~6-8 dB variations -- this needs to be investigated and understood.

08 Mar : ripples were due to cables; C14 slope in deflection was possibly due to feed issue -- now new feed has been put; tests awaited

22 Mar : C14 brought down and being looked into by S Ramesh; about 10-12 dB spread in off-source values (but deflection is reasonable stable) -- needs joint follow-up with FE and OF persons.

12 Apr : new result show similar as above : deflection is mostly all right, but off levels still have a large spread;

====> last measurements were without any pointing correction (!); so need to be repeated; meanwhile, problem antennas fixed at antenna base (how?); equal power tuning exercise is currently underway.

Note1 : some antennas have old notch filter (about 5 antennas?) -- need to change these to new notch filters...

Note2 : to try sample 1000 to 1400 MHz BPF on trial basis.

### 1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring in control room

30 Nov : this is now available under the standard monitoring tools; control part has some problem and needs login to control PC -- SOP for this to be provided to control room.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue.

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

### 1.10 Mass production of Band-4 (550-850) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow; 12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.

30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity units are available).

18 Jan : system for 12th antenna will be ready by Monday 23 Jan (lab tests are in progress now); by April x16 system target can still be met.

15 Feb : 13th antenna (C03) installed this week (2 weeks since last one);

08 Mar : dipole shortage; 14th antenna to be completed by ~ 15-Mar-2017; QC issue with dipole units fabricated by outsourced party; dipoles need to be fabricated in-house;

22 Mar : 15 antennas completed; issue of dipoles not having Nickel coated -- will come by Sat. (meanwhile, one has gone without coating and will be replaced later on); for future orders, to do the dipole in-house and send for coating and deliver.

12 Apr : 6 nos of coated dipoles now available (small mech adjustment needed to match the holes -- need to cross-check; agreed for modifying 2 nos by putting a compensating offset holes on the cavity -- this can be tested for proper performance; meanwhile, to expedite the completion of 3 nos of in-house made dipoles and deliver at the earliest by next week.

26 Apr : x3 dipoles delivered by mech team; x1 of these gone to E5; now total x16 Ae done; remaining x2 will go next week, by 03-May-2017.

====> completing 17th antenna (W02) today

## 2. RFI related :

### 2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting to be completed

30 Nov : YG + PAR to work on this final version.

12 Apr : needs to be actioned asap.

(ii) study of RFI environment, including internally generated RFI in main building

30 Nov : tests of individual labs : with AC units and otherwise -- shows different labs in different light; agreed to identify the worst culprits by kind of equipment etc and provide an update.

12 Apr : this is due, but has not started yet due to other activities.

(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests

16 Nov & 30 Nov & 21 Dec : no updates.

26 Apr : two experiments done :

(A) expt done using GMRT Ae as RX, & log-periodic Ae as TX; D = 100m & 300m measurements displayed GMRT Ae elev 18/45/90 deg; feed rotation done over 0/45/-45 deg

(B) between x2 GMRT Ae (C1 , C8) ; one as TX & another as RX; D=375m with function generator directly feeding RF to GMRT 325MHz FEED as TX; results displayed; 78 deg (3dB) HPBW

====> awaiting further discussion

(iv) absolute calibration of measurement set-up for RFI testing : to translate levels measured there to levels expected at antenna focus.

26 Apr : power calibrated for any lab equipment emission limit (upto what allowed) -- plots displayed

## 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database

(ii) response to pending requests for clearance e.g. Serum Institute...

21 Dec : awaiting call from Serum Institute for the next visit; asked all technical details of their planned equipments;

30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to their location for looking at specific instruments.

21 Dec : one site visited.

4 Jan : awaiting call for visit to site of the party.

15 Feb : one round of discussions have happened with Serum institute -- they would like to finish the installation and then call for testing and possible modifications; our response should be that we would like to test the existing set-up and indicate the mods to be done and these should be implemented in both existing and new setup and then taken up for testing.

Another party wanting to set-up unit for DC control drives in Junnar / Ambegaon area.

12 Apr : RFI tests planned at Serum Inst premises next week.

26 Apr : test planned on 02-May-2017 at Serum Inst premises

====> tests done on 2 May 17 : RFI measurements done with manufacturing units ON (full campus operational); largest increase : -63 dBm at 75 MHz -- 30 dB rise in noise floor compared to all-off condition (-93 dBm); cold room giving discrete lines in 150 to 250 MHz range (-75 dBm peak); shielding measures need to be advised to Serum Institute; detailed report by later today.

(iii) work out new action plan, given the current government policies

08 Mar : MIDC people from Chakan came to GMRT for exploring possible sites for new industry zones; following discussions, agreed to our request to avoid heavy industry in GMRT area -- maybe IT related in Peth etc; also about help in surveying sites for level of RFI etc -- how is this to be formalised -- we should send a letter from our side; check with JKS.

similarly, there is a note from DAE asking for things that need protection -- to see if JKS can follow-up on this.

## 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters

30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems (they are the only one to have got license in this range) -- it is strong enough to cause saturation in spite of filter; need to find the specific towers and then follow-up with Reliance.

18 Jan : measurements happening this week; update by next week.

15 Feb : completed survey of 82 towers around Y-array : 14 towers in 850 band (Reliance Jio) and 6 towers in 950 GSM band; rest are in 1800 band. Max power in 850 band ~ -16 dBm (at ~ 100 m distance) for few towers. Follow-up for both 850 and 950 being

pursued, including dialogue with Reliance Jio to see if they can switch to 1800 band.  
08 Mar : draft letter circulated (vendor is generally positive; but formal communication needs to go soon)  
15 Mar : New results : characterisation of mobile phone RFI in the GMRT campus -- some interesting plots; using JIO CDMA uplinks and their effect can be seen.

#### 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems

30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need to identify which make is coming finally.

21 Dec : no updates.

15 Feb : 33 nos (Voltas instead of BlueStar) have arrived; need to finalise the locations and the specific schemes for installation; need to make shielded units for all 33 nos; components for 25 units are available; boxes for 10 nos are in hand except for back plate and chromatisation (expected to take one week); work request for next 10 has been given (repeat order); some difference in wiring for Voltas unit -- needs some rework of the design / layout; also one type of connector is different and this also needs to be resolved; PAR to send an email explaining the steps to be taken to complete the RFI shielding work, and expected timelines for the same.

Regarding installation : there is a table giving the locations for 31 units (including replacements of 5 existing units) -- to check if outgoing lines can be behind the unit; to install sample one unit in canteen annexe, test the RFI shielding.

08 Mar : one set of measurement done (without shielding) - under analysis; by next week shielded case will be measured & compared; RFI group designed shielding box pictures displayed; uses many cables with RFI shielded interface connectors; it includes high current carrying (220V AC) lines, needing shielded connectors !

12 Apr : 10 AC units have been installed; only 3 have the RFI shielding installed (are the other 7 being used !); 3 more RFI units are getting ready; to speed-up the remaining RFI units; and then go for the next batch of AC units; meanwhile, one bump of RFI remains at around 325 MHz -- may be coming from blower assembly : to disassemble on unit and check for source of RFI.

==> 12 units are now in operation with RFI shielding; prototype box from new vendor has come and not found suitable -- modifications told to vendor, corrected unit may come in few days.

### 3. Operations related :

#### 3.1 Interfacing of FE with new M&C system :

(i) latest status of testing with Rabbit card in common box at antenna base

16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).

30 Nov : no new updates on this

21 Dec : antenna control part is working; FE monitoring still not working; Charu is looking into this...

18 Jan : trying with different delay to see if it solves the problem, but not yet working with online control..

(ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus

16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration and testing in 2 weeks time and put on first antenna with RS-232 cable driving;

later to convert that to ethernet over fibre; mass production may need only new plates to be made by workshop -- other aspects are in-house in FE lab.

30 Nov : item also being discussed under FE agenda item (in alternate week)

18 Jan : final status is Box #1 was made functional at antenna base and was taken up to antenna focus as Box #2 does not work reliably -- hangs and needs power reset (has been tested with a couple of different Rabbit cards?); problem not solved; agreed to try the option of swapping the Rabbit cards between Box #1 and Box #2 and seeing what is the outcome. To report this by tomorrow and then decide if a 3rd box needs to be made ready.

25 Jan : testing of common box with Rabbit card : new clue related to grounding of enable signal of decoder IC may provide the breakthrough -- tested in lab and will take to antenna base now.

15 Feb : email update from Raj Upgrade : One rabbit MCM has been installed at C01 antenna dish focus; MCM communication is proper but needs to give hardware reset while changing frequency band.

08 Mar : it is working only for some bands (C01); needs rethink on strategy.

22 Mar : problems persist; long discussion about what may be the cause; need to get a proper wiring diagram to check the grounding of the system for possible loopholes that may be causing the flaky behaviour...

5 Apr : useful discussion alongwith wiring diagrams; two possible causes identified : old FE power supplies may be having more noise (200 mV) than the new ABR power supply (50 mV) -- to try C01 with the new supply; Rabbit card has ground to common box chassis (unlike MCM-5 card) -- can try to isolate this in the second box being made ready and take to another antenna.

12 Apr : common box on C1 now working properly (!) -- problem was in sequence of commands sent from control room -- there was a monitor command sequence in the cmdfile that was the culprit.

Agreed that only main bottleneck remaining is monitoring of FE system -- this can continue in parallel, even as we go ahead with mass installation of the Rabbit based common box; third stream of activity to be initiated is lab test of ethernet based control of Rabbit card in common box, via optical fibre link (bypassing cable ethernet).

26 Apr : update on monitoring aspect : problem found with 4 lines on interface card that appear to be picking up spurious signals; isolated by connecting straps directly from IC pin to destination point and solved the problem; to confirm that problem clearly identified and solved; and then agree on changes to be made to PCB via straps (after cutting the offending tracks) and implement in mass production.

====> above solution implemented for 2nd box also and found working ok; put up in place of original common box on C01 (due to low fringe call sheet due noise-gen all the time); to test the failed unit to see if cause is in new M&C system or in some aspect of common box; for the PCB, agreed to make a new version, but work in parallel with modifying existing versions with straps to keep the production rolling; same strategy for modification to accommodate OF receiver.

### 3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgetary quote; formal quote expected shortly.

4 Jan : folder cleared ; PO should be done shortly.

18 Jan : Order has been released; full delivery time is 3 months; first box to be supplied earlier and tested...

15 Feb : email update from Raj Upgrade : expecting the delivery of one Miltec machine shortly; also initiated talk with Miltec to supply it as early as possible.

08 Mar : one unit has come; will be tested & feedback given to Miltech

22 Mar : new Miltech PC put through RFI test; informal report : looks ok; formal report may take some time.

12 Apr : go ahead given to Miltech for full delivery.

26 Apr : CPK to call and check the status.

====> CPK yet to call.

Addition item : issue of Windows software licences discussed (with MSU present) -- agreed to go ahead with ~ 20 stand-alone licenses for use by tech groups.

====> MSU reported that he is looking into it.

### 3.3 GMRT M&C system Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal meeting.

4 Jan : internal lab meeting held on 3 Jan (now every Tuesday)

08 Mar : all team members are clear on their respective roles & are contributing

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans

30 Nov : discussions ongoing; kick-off meeting planned.

21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.

4 Jan : regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary' etc shared with TCS.

18 Jan : work ongoing; need more regular interactions of TCS with GMRT team members.

15 Feb : email update from Raj Uprade : 2 CMC and 6 LMC machines are UP & running; team members are now very much familiar with CMC, LMC installation, features, testing and can carry independent tasks.

08 Mar : interim review held; schedule is 6 weeks slippage/ delayed; mitigation planned for that delay;

22 Mar : work progressing; may test sub-array and tracking in coming MTAC.

26 Apr : could not meet the above target due to modifications for A&A issues and other things; work is ongoing at present.

====> tracking routine completed; LMC, A&A and data-base schema work not yet converged.

### 3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for material for review committee started

30 Nov : discussions and work ongoing, including preparations for discussions with TM review panel.

21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase : requirement compatibility; architecture explanation given; scalability etc; need many upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;

4 Jan : preparation of docs in progress; ph-2 work now beginning...

18 Jan : aim to have 6+ antenna set-up with PC + switch + Rabbit talking to Sentinel + OF + Servo (to check if existing PC104 will work directly) or not; to check enough Miltech PCs available -- Sumit and Mangesh to look into it.; need to move from Fedora to Ubuntu; aim to start testing at antenna base by 23/24. Additionally, need some temporary space (couple of months) for working on 2 PCs in or near control room...

15 Feb : Last week 6 antennae Control & monitoring system was set-up and demonstrated to SKA reviewer (Nick Rees) and SKA India team.

08 Mar : SKA committee is reviewing our work; cost estimate proposal from India was

submitted to SKA claiming 50% saving on TM work using Indian scheme;  
26 Apr : discussions ongoing; need to prepare an updated response to new version of report expected by tomorrow or so.  
====> all done and completed.

#### 4. Back-ends related :

##### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh paper needs to be looked into for revision; nothing really pending, except for the report on the attenuation values : new set of tests done and results look ok and will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed); may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?

4 Jan : To follow-up on GWB refereeing process.

18 Jan : GWB response received, relatively minor modifications are needed and SHR is looking into this; for Walsh, waiting for response -- can check after 20 days (end of this week / early next week).

26 Apr : no new issues here.

##### 4.2 Updates on existing GWB-3 system :

(i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

4, 11 & 18 Jan : no progress since last time.

25 Jan & 15 Feb : still pending.

22 Feb & 08 Mar : band shape correction yet to be implemented -- can be taken up now.

15 Mar : SHR has not yet gone back to this topic.

12 Apr : still pending

26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious

lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction :

geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.

17 May : DDC related updates :

(i) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and release for users.

(ii) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.

(ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes; for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be



closed ?

14 Dec : problem perhaps in AIPS settings? matter can be closed?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated;

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT lose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

08 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); but, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of

observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready; appears to be satisfactory (though no improvements in ambient temp recorded ?).

11 Jan : no further work on GWB; plan is to have similar hcngae for GBS during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

08 Mar : plans for work on GSB during upcoming mTAC -- needs a discussion.

3 May : nearly closed; hot air sucking mechanism needed (being explored with Nandi's help).

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (may come earlier)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep looks like resulting in some speed-up in delivery; to follow-up closely.

11 Jan : YG to contact nvidia and micropoint persons.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

3 May : waiting for adapters to arrive;

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : need to plan the code optimisation that will be needed.

14 Dec : need a discussion to decide the way forward on this.

4, 18 Jan 17 : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

15 Feb : SSK to try and restart the old 16-antenna CD pipeline code using the SOPs etc from Kishalay...

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion of long-term issues to be taken up next week (22 Mar).

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K channels for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working;

calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

19 Apr : for ver 4.5, calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).

3 May : SOP already released (v 4.5)

====> trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.

4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :

(i) refinements of the first draft of the note

(ii) plans for getting first unit connected and tested

(iii) plans for testing high speed recording to disks

16 Nov : lab set-up for grabbing and recoding has been done; while continuing with this, need to work on the set-up for sending parallel copy of the data, including procurement of longer CX4 cables.

30 Nov & 21 Dec : not discussed.

4 Jan 17 : basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.

18 Jan : to test the dual copy design for correlations using existing 16-antenna corr with dummy inputs; then to connect to one machine where tests can be done for raw voltage recording and a single node correlator with flexible beamforming.

15 Feb : no updates.

08 Mar : 374 MBps speed acheived; but need slightly higher speed

26 Apr : old gwbh9 (T630 m/c) removed and T620 m/c put in for doing the further work; length of cables -- 3m may be enough for using existing slot in the racks; to look into modifications of FPGA code for more eth cores; simple code for correlation of limited number of antenna etc... longer-term plan with longer cables, more racks, more nodes etc to be thought about.

====> expanded design tried with 8+ disks using gulp and can be tried with GWB

signals; to be tried with digital copy scheme using resurrected earlier design with 4 10 Gbe cores.

#### 4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)

16 Nov : some changes have been made by SHR, but the sub-microsec correction still needs to be done; also to follow-up about h4k file.

21 Dec : modified code has been made, but not yet tested; can try to see if it can be made available in the current release.

4 & 18 Jan 17 : agreed to defer to next release.

15 Feb : deferred as above.

08 Mar : current release has this 'sub-microsec correction' ENABLED; it is now possible to send those values to header files;

26 Apr : updated timestamp with higher accuracy is coming now; needs to be verified for correctness; CDP vs PA timestamping still to be resolved.

===> one buffer offset confirmed; need to be checked for different modes

#### 4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans

(ii) spectral domain RFI filtering : current status and plans

(iii) beamformer RFI filtering : current status and plans

16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.

30 Nov : not discussed in detail.

21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file..

emulator has some changes and improvements, including random location of the RFI.

4 Jan 17 : for (i) modifications in simulator; counter mode now working -- can have 2 different modes, tested at module level, now integrated into the design, will be testing in next few days; fractional thld done in simulation, to convert to design and test. (ii) to try and run the filter in real-time from shm data.

18 Jan : not discussed, but summary of offline discussions is as follows : (i) some additional features added to RFI simulator unit; fractional threshold and counter mode now available for use in the voltage filtering unit; cumulative experience shows that we may be not using the optimal filtering technique for voltage mode -- should try the alternative approach of conversion to intensity and integration to desired time constant -- closer to a true matched filter.

08 Mar : some updates from Kaushal about looking at options for more optimised filtering of broadband time domain data :

Modified the design to support 16K window size - this is the default design now;

Fractional threshold available (tested with antenna signals) - default option now;

Made the DDC mode design compatible with the ongoing changes;

RFI Counter design ready - format to read the data including timestamp from a single ROACH complete, undergoing more tests before release;

Supporting regular tests - spectral line (Nissim), continuum (Ruta, Dharam, Ishwar);

Handling longer duration RFI using median of MAD technique - initial results are

encouraging, detailed tests going on;

Looking at likely causes of missing RFI during real-time excision and at possible alternate methods for time-domain filtering;

Ongoing: Updating SOP with changes made till date;

====> 2 different options for MAD based filtering released -- normal MAD vs MoM of MAD; some user level tests done -- need to see the output from these for comparison; can be taken up once spectral filtering tasks with Swapnil are concluded.

RFI emulator: (last update email - Jan) :

Last development: Adding facility for random insertion and random amplitude of RFI

Understanding the GUI and MCM control program - backup from Rahul Bhor;

Narrowband RFI filtering: (updates email sent periodically) :

Initial version of the code has been timed; optimized for computing faster sorting for median computation, is now much better;

Moving towards expected version of filtering code - with optimized functions to meet real-time requirements (0.671s) and necessary functionality;

Ongoing: Testing the code on recorded data and timing the code for all 60 self outputs;

Looking at synchronization between the data path and RFI filter (along with Sanjay);

Looking at merging of lta file and flags for the FITS file format (along with Sanjay).

08 Mar : now optimizing real time filtering; all bands filtering on recorded; Broad band RFI filtering : emulator tested; other techniques being explored; SOP updated; to be released next week.

====> code for spectral filtering of single self has been developed with spectral flags needed as per format specified by SSK and he is to modify this for multiple selfs (all antennas, working real-time) and passing flags appropriately to LTA file.

4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and tests ongoing; also tested by sending digitised packets to antenna and loop back; using GWB2 for doing all the correlations.

18 Jan : feasibility study done using C09 antenna with noise sources & real signal -- needs a fixed delay correction of 1.5 km to get maximum correlation; trying setup with E5; meanwhile, a few different tests can be tried with the C09 set-up; comparison of scheme running on GWB2 and GWB3 tried out.

08 Mar : C9 & E5 setups faced problems (ethernet card issue); now fixed; GWB2 (early digitization) & GWB3 being used for comparison; delay requirement has reduced (due to early digitization)

12 Apr : new test has been carried out with C9 and E5 on actual on-source observation and brief comparison.

26 Apr : some updates from recent tests to be available by next week; detailed report of recent work being prepared.

====> trying some tests with single antenna early digitisation (as only one is working).

4.8 Time-Frequency Standards (BAK) :

(i) procurement of Maser units

(ii) planning for kind of environmental set-up required for Maser units

(iii) planning for long-term maintenance and development

16 Nov : most of the issues have been resolved, waiting for one party to complete the payment terms; pending issue about performance bank guarantee for different amounts

of periods.

30 Nov : work is ongoing, but item not discussed.

4 Jan 17 : TEC clearance ok; recommendation to open price bids -- to check the status.

To contact Prof Sen Gupta for a discussion.

18 Jan : final TEC documents done and sent for next step; to follow-up and check status.

15 Feb : activities ongoing...

08 Mar : Negotiating committee met the vendor (no reduction on price; but add modules 'FREE'; payment terms as per NCRA conditions); Dr Sengupta will be visiting next week; first unit delivery after 5 months; second unit 4 months after 1st delivery;

12 Apr : to take up next time.

26 Apr : to confirm date of expiry of validity and follow-up with TIFR for the folder; to check about vibration damping mechanisms available with the system and otherwise; to make a draft note for selection of the room and suggestion modifications to be taken up.

## 5. Other items :

### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need to agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

12 Apr : sample unit getting ready -- length needs to be reduced; do asap and get hose assembled and then install on C03.

=====

## Minutes for the Plan meeting of 24 May 2017

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### 1. FE & OF related :

#### 1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in  $T_{lna}$  for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

22 Feb : first results of variation of  $T_{sys}$  for Band-4 FE unit of QH + DC + LNA

(which goes next to the hood) -- absolute value of Temp is higher than  $T_{lna}$  at ambient and also the variation of  $T_{sys}$  with ambient (0 to 60 deg C) is larger than for  $T_{lna}$  alone. To cross-check whether known loss of QH and DC at room temp can explain the room temp values and then extrapolate from there for different ambient temps.

15 Mar : new test done with QH + LNA only (compared with QH + DC + LNA) -- shows lower variation of  $T_{sys}$  over 60 deg range of chamber (35-40 instead of 55-60 seen earlier); agreed to try to estimate the loss of QH and DC with temperature and use theoretical formula along with  $T_{lna}$  as fn of temp to predict the observed  $T_{sys}$  vs temp curves and compare with the measurements.

5 Apr : new results of  $T_{sys}$  vs temp for just LNA, LNA+QH, LNA+DC, LNA+QH+DC : appears to show reasonably flat variation of  $T_{lna}$  with temp; more variation for LNA+QH; but some of the curves cross each other (and have offsets) with temp -- bit difficult to understand; agreed to try S-params for each device as fn of temp, for same RF (610); meanwhile, theoretical calculations ongoing.

19 Apr : new update, which measures loss of QH with temp, shows change from 0.1 to 0.2 dB over 60 deg and can explain the observed variation of  $T_{sys}$  with temp. To check if any info is available about loss of QH with temp; second is the mystery about lines crossing each other -- needs to be understood; then can check about extending the study to Band-3 also.

====> no fresh activity due to engagement in mass production work.

#### 1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible.

22 Feb 17 : only 5 antennas completed by January; request for next set of 5 feeds has been given to mechanical approx beginning of Jan -- expecting 2 dipoles shortly, but reflector and BFRs will take some time; meanwhile one FE box is ready; to get if possible 2 more to be ready, so that 2-3 antennas can be done in quick succession. Need to have enough QH + DC (is matter of cutting right length of material and assembly); for LNA : have all PCBs, need chassis (ordered in sets of 20); same situation for BPF; however, request for new stools (with modified height) has not been given (!!); due to some rethink about optimal stool height (!); follow-up

action on this : to discuss with mechanical to see if existing or spare stools can be modified / cut to meet the height requirement and use for the next 2-3 antennas.

15 Mar : HRB had requested for 5 feeds (DRF 130-260 MHz) out of which 5 dipoles arrived and reflectors + BFRs will arrive by 18 Mar; mounting stools (1190 mm), 30 nos. requested, out of which, 2 stools will arrive on 18 Mar; hence, new installation only by next week;

5 Apr : 2 nos of feed + reflector + BFRs + stool in hand; 1 box ready; one more can be ready in next few days; can target 2 antennas in MTAC period; to see if 3 can be tried.

19 Apr : no progress now, as attention has shifted to common box for some time; now tasks have been reassigned and work on this will pick up now.

3 May : 6th box is ready in lab; will go to antenna by next week (12-May-2017)

====> 6th antenna done; one more can be done; after that feeds, stools etc needed; FE box for 2 more available -- more are needed. FE team to check with mechanical and get back.

### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

(i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months should be enough to complete the tasks i.e. April 2017.

11 Jan 17 : 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

25 Jan : needs combined tuning of filters to fix the problem; work ongoing.

22 Feb : successful in tuning the integrated unit (for 2 boxes, both channels); and

23 antennas are completed, and work is ongoing; next antenna in about 2 weeks.

15 Mar : one more box was made ready, but gave trouble after exhibit at Science Day (!); has been made ready again (all the cables were changed). Will go up shortly.

Meanwhile, next set is getting ready.

5 Apr : 25th antenna done to ver2 level; some issues related to tuning of the integrated filters (assigned to SC).

19 Apr : 26th antenna also completed; going reasonably smoothly.

3 May : next box (incorporating new filters) will be ready this week & go to antenna [~ 12-May-2017]

====> 27th antenna is done; generally going ok.

(ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good : comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

11 Jan : analysis of Jan data awaited.

25 Jan : analysis of new data (on CasA) -- appears to be systematic 1-1.5 dB less deflection than predicted and control room values -- needs to be checked and followed up in consultation with ICH, DVL, SC & GP; few antennas with some odd behaviour e.g. E3 and maybe E2.

15 Mar : no updates as Ankur is not available

5 Apr : updates from new data; 2 antennas showing less deflection in ch 1 only -- to be investigated; not much other issues.

19 Apr : no updates this meeting.

3 May : data available, but no plots (laptop crash)

(iii) Summary of phase centre measurements and decision about future plans

25 Jan : no action yet.



15 Mar : still pending.

19 Apr : still pending

(iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

11 Jan : data collected, report expected within 2-3 days.

25 Jan : Sougata + Ankur will provide update next time.

22 Feb : SC will send update within a week.

15 Mar : some work is still pending; SC will complete and send within a week.

5 Apr : some tests done using OF monitoring system (seems not all antennas working and also varying behaviour) : summary from 10-12 antennas, 3 sub-bands (one corrupted by RFI) : some cases show narrower BW, and some show wider BW; for narrower BW cases, coating the PCB appears to correct for most of the discrepancy -- needs a short report on this; last 5 antennas have gone up with the coating -- should be able to cross-check the performance; need to find a solution for broader BW case !

19 Apr : quality check on 24 antennas done; about 4-5 antennas showing discrepant band for most sub-bands; FE team feels confident that this can be fixed with the coating option; to make a table for all antennas all sub-bands for user to decide what to be done; to fix as and when FE box comes down for other work.

3 May : report circulated; worst affected antenna identified; after ~ 3 months will be taken up;

====> no new updates; can check around July.

(v) LO settings for all sub-bands etc to be finalised.

14 Dec : 250-500 LO setting document / table already finalized;

28 Dec : no updates; person on leave.

11 Jan : astronomer feedback awaited (to check if final table shared with control room).

25 Jan : Not yet shared with control room; to refine based on : 6 dB point for main BPF and 10 dB for subband filters, for the default BW.

22 Feb : draft document has been circulated to DVL & YG for trials, for 3 bands (Band-3, 4 & 5); for Band-3 which shows max variation of sub-band responses, the basic response is taken as the one found in majority of units and 10 dB criteria is applied to that response to get the LO values; either lower or higher or both side LOs are recommended depending on the situation, and some justification has been given for all the cases; YG to check with DVL etc if this can be released to control room and all users.

15 Mar : some responses from DVL + Nilesh etal -- some clarifications sent; some more tests to be carried out this week.

5 Apr : no updates for this time.

19 Apr : DVL and co to provide update by next week; can discuss 2 weeks later.

#### 1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus

14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01);

box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)

28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).

11 Jan : box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.

3 May : box #2 MCM reset option & monitoring finished; to go to C01 antenna tomorrow (04-May-2017);

====> replacement on C01 working ok; older one traced to interface card problem -- to be fully debugged; meanwhile spare new card will be put and made ready for installation

(ii) Plans for mass production

30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.

25 Jan : one box tested at antenna focus and working ok; 2nd box not yet tested at focus; even for the 1st box, repeatability is not there.

19 Apr : ready to start the mass production and installation; may be able to achieve 2-3 weeks per box in long run after first 2-3 boxes; to coordinate with Ops group for supply of Rabbit in shielded box. Also to do the R&D for getting the ethernet control option tested and going and put it into mass production -- this needs an extra input port on common box -- agreed to use 50 MHz port for immediate and redesign the plate for additional input port and put into new boxes as and when ready, without affecting the rate of mass production of common boxes.

3 May : x2 boxes in wiring stage; x1 box per month initially (later one box every 3 weeks); redesign of band-selector & interface card completed; mass production can begin now

====> to go ahead with the plans, introduce new cards into system as and when ready; and retrofit the new cards in older systems later on; transobs PCB also to be included in the above.

### 1.5 Apex radiation scheme (PAR/SRoy) :

(i) Current status of measurements and interpretations

(ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

11 Jan : no updates, though there has been some email discussion between SRoy and PAR

25 Jan : need to check with SRoy and PAR.

15 Mar : PAR and SRoy yet to have a detailed discussion; meanwhile another round of tests done on C1 -- showing a different pattern than C10. Need to summarise and circulate and then take up for discussion.

19 Apr : no updates, though some ongoing email dialogue between SRoy and PAR...

====> discussion between SRoy and PAR -- some conclusions have been reached and some action plan has been worked out between them : to circulate a brief note summarising these (as well as dynamic range measurements summary and plans), while follow-up action continues.

### 1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) :

Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of

health of Walsh switching.

11 Jan : there is some confusion about what is being done, and what has been achieved !  
For 10 antennas which have new 1st LO system (LOFSW based units), it should NOT be possible to have Walsh modulation at present !

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh...

22 Feb : now clear that only those antennas (20 ?) which DO NOT have the new synth units can be tested for Walsh; latest tests on these (done in Jan), showed ok results for 19 out of 20 (one antenna was down due to mech problems).

15 Mar : no immediate action here; need to work out with analog BE team.

### 1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

22 Feb : SC to check with JPK about the progress on implementation of the SOP for use by control room in normal PMQC type of tests and generation of stats to report to FE team.

15 Mar : control room people (JPK and SNK) are looking into the code written for GSB to see if it can be done for GWB.

5 Apr : SC to follow-up with JPK on the matter.

19 Apr : code has been obtained and possible issues in it have been identified; to see if the job can be taken over by control room colleague.

====> to see if a discussion with JPK + SN + ICH can be had on this matter.

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

22 Feb : to plan for the discussion.

15 Mar : agreed to make a presentation on 20th in the poln meeting.

5 Apr : presentation showed reasonable results; action items : to compare feed response with WiPLD results of HRB; compute 3 dB BW vs freq for Band-3 for feed + dish and compare with observed results; need a software with finite element method approach for this simulation -- Antsys or Fecko; to check availability in different places in and around Pune.

19 Apr : no new updates right now.

====> SC to follow-up and report back.

### 1.8 New filters for L-band (AP) :

(i) status update on installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing

16 Nov : arm antenna installation to be resumed;

14 Dec : all west arm will be completed by 16-Dec-2016;

28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.

11 Jan : S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).

25 Jan : only 2 antennas W-arm remaining to be done.

3 May : only one antenna (W2) remaining

====> to confirm if all antennas completed or not.

(ii) delivery of remaining units of main L-band BPF from Epitome

16 Nov : BPF completed and handed over to BE team -- this can be closed.

28 Dec 16 : can be closed.

1.9 OF system updates :

(i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.

11 Jan : current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.

15 Mar : this is status quo; few extra high power lasers at 1310 nm for forward link have been procured; cards being made ready; will be used as and when loss becomes too large in far away antennas.

3 May : high power lasers (5-6 nos made ready) and available for use; for, W6 & S6 such lasers already installed about one year ago;

====> some evidence of loss of power of laser transmitter (1310 nm) at Rx room causing problem in telemetry link; needs retuning of laser circuitry; will be taken up one by one -- this is in addition to need of high power lasers for far away antennas.

(ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates

28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.

11 Jan : cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.

15 Mar : expected by end of this month.

5 Apr : OTDR not arrived yet; second fibre bundle ordered but not yet delivered.

3 May : OTDR has arrived; second fiber bundle has also come;

====> OTDR working well; 2 km fibre bundle arrived; 20 km spools : 3 nos were found bad and have been sent back to the vendor in US -- need to follow-up on it.

New item : contract with BSNL for dedicated GMRT to NCRA fibre to be renewed as it is 5 yrs old. OF team to circulate the preliminary docs to all concerned in NCRA for clearance before sending ok to BSNL.

(iii) 8 Gbps GMRT to Pune link : it was found that only 1 or 2 Gbps was working;

25 Jan : detailed debugging has been done by OF team and now it appears all the 4 wavelengths and hence 8 gbps lines are functional -- only one wavelength is marginal (to order spares for taking care of such issues); also remote monitoring facility at Rajgurunagar with SMS facility to be activated.

15 Mar : spares have been ordered; monitoring unit is ready -- small change needed in software and then can be installed.

5 Apr : not yet installed, waiting for Rahul Bhor.

====> spares for the links have arrived and are available; monitoring unit is now ready for use; some changes in IP address needed in units at Rajgurunagar to activate the system; also some spare cards are needed to make things fully functional at all locations.

2. RFI related :

2.1 Spectral line RFI (PAR/SSK) :

(i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks

28 Dec : RFI team visited Junnar cable TV operator for getting response to letter that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.  
25 Jan : discussed with Jondhale -- he will speak to the party and see if some progress can be made; otherwise to escalate the matter; also to estimate the number of splitters etc that can be provided to W-arm operator to mitigate the problem.

(ii) Digital TV follow-up

23 Nov : letter is still pending !

25 Jan : need to expedite the matter !

(iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source

11 Jan : 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.

25 Jan : need a site visit to understand better.

3 May : new RFI line (set of lines) observed at 467 MHz ! (need to identify the source)

====> for 402 MHz line : trying to identify any relevant weather station that fits the bill (!) -- needs some more work; for 467 MHz lines, still no clue.

2.2 Satellite RFI monitoring & avoidance system (PAR/SNK) :

(i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and ,, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)

25 Jan : need to follow-up on identifying for LEOS.

(ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)

25 Jan : new limit is about 8 deg -- to cross-check if ok and close.

(iii) Plans for sending information to back-end receiver chain

25 Jan : to check with Santaji about the plans for this

(iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week

28 Dec : no updates.

25 Jan : to include in the plans for visit by Nick Rees in week of 6th Feb.

====> some of the pending jobs : need to characterise some of the remaining satellites.

2.3 RFI from power lines and transformers (PAR/RVS) :

(i) review current status

(ii) specific follow-up actions

23 Nov : not discussed

25 Jan : no updates.

====> this activity needs to be revived.

2.4 RFI from LED lamps (PAR/RVS) :

(i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

(ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

25 Jan : report has been circulated; solution looks promising; to try for compact version of the solution; working with workshop to mechanical items; will need to order some components for bulk production.

08 Mar : LED panel/ tube light shielding : report generated on tests - broad band radiation from commercial units (x4 units in one box) - shielding is ~ 75 dB ; results appear encouraging; Syska (x1 22W), Philips (X4 20W); -150 dBm final number arrived at. high failure rate of LEDs due to voltage fluctuations;

11 Apr : new model of LED light identified with very low level of RFI (none at all !?) Hi-Lite 15 W; sample unit of this LED panel displayed; agreed to procure a few units and do a thorough follow-up.

26 Apr : demo of RFI free LED lamp 15W done (in lab, x5 units have been assembled); plots of RFI from LED lamp displayed : 15W (5 units) ; 26W (1 unit) HI-LITE 15W unit's RFI (ON & OFF) identical noise floors; similarly 26W lamp also shows RFI same noise floor for ON or OFF; also tested at all GMRT band : clean (no lines); upto -130 dBm level; conclusion : 15W units can be used for corridor lighting

3 May : x5 LED lamp (15 W) units installed in corridor

====> no RFI seen when 5 nos of 15W lights used together; can we decide about this? main question is about establishing best levels and also absolute calibration; for the first, can try with higher gain amplifier; for the second, to complete the exercise of mapping the power levels to antennas.

### 2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested; 8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.

4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified units -- all are ok. Need follow-up as mentioned on 28 Dec.

18 Jan 17 : all 10 units tested and cleared; now OK to use this 2nd batch of 10 units in antennas; need follow-up on status of ordering last batch of 14 units.

25 Jan : matter closed for now from RFI team side; to take up when next lot comes.

12 Apr : indent process for the last lot was held up due to issue of exact specs for RFI related properties (!); finally, agreed to go ahead with the existing clause as likely there will be one round of modifications needed if some specific part is changed by the vendor. Electrical team to expedite the paper work.

====> to check status with RVS

### 3. Operations related :

### 3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) :

#### (i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.

28 Nov : still waiting for 80 nos PCBs to come.

11 Jan : 84 PCBs received; can go ahead with further assembly now.

25 Jan : this can be closed.

#### (ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);

28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.

11 Jan : 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.

25 Jan : Rabbit card enclosure now going smoothly : about 2-3 per week; to send some samples for RFI testing.

22 Feb : 18 are done; 19th ongoing.

15 Mar : 23 completed; one unit given to RFI team for measuring shielding.

5 Apr : going on track, will finish all 30 by April end.

19 Apr : Ops group to talk to FE group to start regular supply of Rabbit + shielded enclosure for installation and commissioning of common boxes for antennas.

3 May : x28 boxes are ready & tested; can be handed over to FE whenever asked.

#### (iii) status of mass production of network switch enclosure

23 Nov : 28 units ready (need total of 35)

14 Dec : now 32 (of 35) ready;

28 Dec : same status of 32 out of 35.

25 Jan : 32 out of 35 completed; remaining 3 are in use and will be done when free; meanwhile, to send a few samples for RFI testing.

22 Feb : some sample unit(s) has been given to RFI team for testing -- Raj to confirm; to check if all shielded connectors are procured or not.

15 Mar : samples have been given and tests are being carried out today.

19 Apr : confirmed that all 32 boxes have shielded connectors; to check with RFI team about results from RFI tests of integrated system.

### 3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

#### (i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing

23 Nov : C00 & C10 are mostly complete (item could be closed?)

28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.

#### (ii) plans for going beyond 2 antennas

23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)

28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?;

elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.

11 Jan : mechanical completed for 10 antennas; electrical completed for 13 antennas;

Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.

25 Jan : mechanical has resumed work; same for electrical; will be updating spreadsheet; column for servo has been added in spreadsheet -- to remind them to start updating;

15 Mar : mech has completed 13 antennas; electrical has installed all the UPS units (23), other changes need to be checked; servo has completed 10 antennas.

5 Apr : 8 antennas completed for M&C systems; 3 extra Miltec to be tested; 4 are non working -- being looked into (total of 15 Miltechs); apparently no change in status of other systems (mech, elec, servo) -- JPK to check and follow-up.

19 Apr : servo has completed 15, electrical has completed 23, and mechanical has done 13 antennas; M&C system on 8 antennas, 2 more are ready + 1 in testing in lab; Ops group needs 5 nos of 2 TB disks and comp group has provided 2 nos -- to arrange for ~ 10 nos of 2 TB disks.

3 May : x5 total disks (2 TB each) were given to OPR group; x2 used to replace old disks ; x3 available for any application

====> 10 antennas completed for M&C system installation (+1 in lab), including putting the new disks into use -- can go ahead for useful testing with this system (see alternative week agenda).

(iii) update on improved RFI shielding at antenna shell

23 Nov : shielding test measurements done for present configuration; awaiting finger-lines to be added before repeating the tests (which antenna?)

28 Dec : folder in process for placing order for the finger-lines.

5 Apr : no updates.

3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems

28 Dec : Ops team has a plan for this; can be discussed in detail next time.

11 Jan : final plan placed on web portal (for lab people)

19 Apr : 8 + 2 + 1 units as given above; further growth constrained by availability of Miltech PCs only.

====> now populated on 10 antennas and using 2 Rabbits at antenna base for controlling servo, FPS, OF, FE, sentinel (tested concept) to test shortly with new version of LMC s'ware (but old CMC s'ware); need some cooperation from servo for changing PC104 from serial to ethernet upon choice (discussed with SS and he will discuss with Thyagarajan); for parallel connections to other systems, some further planning is needed.

(ii) plans for switch-over -- to make it as seamless as possible.

30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.

28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.

25 Jan : can defer till after the demo.

22 Feb : Ops team appears to prefer scenario 1 -- incremental approach; to generate a note within next 4 weeks on this.

15 Mar : still pending for team to send a draft doc.

5 Apr : still pending.

19 Apr : can check again with Ops group next week, for a possible discussion 2 weeks later.

26 Apr : discussed draft document produced by Ops team on long-term plans for installation of new M&C system; general agreement for incremental approach noted; next level points to be addressed discussed -- doc to be updated with these and taken up for discussion...

3 May : incorporating points that came out from discussion into the change-over-plan note.

====> updated doc has been circulated; can be taken up for detailed discussion next week; meanwhile useful discussion on how to coexist between MCMs on RS485 bus and new system;



### 3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)

14 Dec : HP layer3 switch finalized; budgetary quote Rs 3.5 lakh; indent prepared.

11 Jan : item can be closed.

(ii) Plans for procurement

23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.

28 Dec : indent raised.

25 Jan : procedural issues related to advance payment etc...

22 Feb : not clear if this matter has been resolved before Charu went on leave...

15 Mar : need to check with Charu.

5 Apr : HP make layer-3 switch has no issues about advance payment and order has been placed and delivery expected by end of this month; the advance payment problem was for SFP adapter -- this needs to be resolved.

19 Apr : matter is resolved and delivery is expected by end of this month.

3 May : switch has arrived at Pune

====> item has been tested ok; can initiate the plan to put this in the M&C rack and shift antenna eth connections to this switch (instead of OF group's switch) and start using this arrangement.

### 3.5 Interfacing and control of new systems such as Noise Cal & Walsh :

For 10 antennas which have new 1st LO system (LOFSW based units), need to be clear about the control path; also 2 of these antennas have independent MCM for driving the new CPLD; need a wider discussion about M&C for new system for these aspects related to Noise Cal and Walsh.

22 Feb : need 2 CPLDs in new set-up : one for new FSW LO, one for Walsh + Noise on-off etc, and both can't be connected to MCM 2 and hence an additional MCM is needed. To find out a way around this issue, so that progress can be made...

15 Mar : 2 options are being explored by BE team without increasing the number of MCMs from present count; some prototypes are being tested and will be reported upon shortly. For the longer term, need to see if antenna based Rabbit card can fulfill these roles.

3 May : tests with different interfaces done; avoiding additional MCM (beyond x2 MCM) successful [but with OLD MCMs]; in new MCM, use of control pins of MCM used for sentinel will suffice.

====> summary issues : if any M&C system takes control of the RS485 bus then it can meet any MCM requirements -- this may be the way to go for the final M&C system; finally, the functions that are needed for uGMRT only (noise and Walsh related) will have to shift to Rabbit card -- whether capability exists in the single Rabbit at antenna base needs to be confirmed.

### 3.6 Update on Rabbit Card in Common Box : follow-up from discussion of last week to track the progress and latest situation...

19 Apr : FE team plans for roll-out discussed above; Ops group to provide required number of Rabbit in shielded card; main remaining task is to get the FE monitoring working on the Rabbit interface to FE system : CPK has been doing some debugging to get to the bottom of the problem; JPK and CPK to sit together to see if earlier work done on 15m with Labjack for similar control of FE system can help.

3 May : points closed; new box being out on C01 (at the antenna base tests were successful; now going to turret (today itself; 03-May-2017).

## 4. Back-ends related :

#### 4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

11 Jan : one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

25 Jan : s'ware work for the above is still in progress.

15 Mar : still in progress, no new update.

3 May : x1 ADF-4350 system ready (tested in lab) with switchable freq & power level attenuator; characterization in progress with web-browser (from ONLINE); but need command line functionality (Jitendra had to do); next, ADF-4351-s needed for individual antennas.

====> only new command in online has to be created -- JPK will look into it next week; meanwhile, option to switch DDC LO to achieve the freq offset is also being developed and cmd line interface for this has been made ready; both options can be released together in few weeks to the user; team can now start thinking about soln for 1st LO for the antennas.

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

11 Jan : one rack modified (4 antennas) and systems being tested; will report shortly, and if everything ok, will go ahead with the mods for all the 8 racks.

25 Jan : same status as above; test report has been circulated internally.

15 Mar : will complete the modifications for all racks in MTAC; meanwhile, the filters can be used with unequal gain in different antennas; command is available to control room and can be tried.

5 Apr : phase jump problem requires use of 4350 IC circuit -- this has been tested in GAB on one antenna both pols and found to work OK; need to repeat same test with 4351 IC also and then bulk order of 4351 IC can be done (will take about 2 months); will need modified CPLD based ckt + software for using 4350/51 at antenna base as 1st LO for legacy system.

12 Apr : follow-up discussion with users like NK indicates that higher priority for having GAB + GWB uGMRT working without phase jump on switching, and solving the problem for legacy GMRT can be lower priority; accordingly, 2 possible solution options discussed for uGMRT : (a) have 2 signal generators set for the 2 frequencies needed and switch their output to the common LO signal line on the switching command (b) have one unit of the new 4351 IC completed with proper control logic to act as the single source of common LO; agreed to aim for option (b) on time scales ~ month or so.

3 May : closed now ?

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.

14 Dec : changes to DRAFT report in progress;

11 Jan : still in progress -- not ready yet.

25 Jan : no new updates.

15 Mar : no new updates; BAK to check.

#### 4.2 Power equalisation scheme and relate topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

11 Jan : still pending

25 Jan : revised version circulated internally.

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

15 Mar : BAK to check and get back.

5 Apr : Atul has initiated the discussion with control room colleagues; SRoy + Nilesh discussion now has the basic code working and SRoy is doing some testing and debugging and will report the result in few weeks, after which one could talk about releasing the package with the different modes.

3 May : only plot routine remains (discussion pending - may happen today itself)

#### 4.3 Updates on existing GWB-3 system :

(i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

4, 11 & 18 Jan : no progress on this upto now, due to work on release of 30 antenna system.

25 Jan & 15 Feb : still pending.

15 Mar : SHR has not yet gone back to this topic.

5 Apr : new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

12 Apr : agreed for BE team to repeat noise source tests and check carefully for spurious lines; then repeat with sky signal as needed.

26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction : geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.

17 May : DDC related updates :

(a) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and releasea for users.

(b) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.

====> for shape equalisation, some fine tuning being done by SHR; for spurious lines, not clear what is the best way forward -- need to check if it is part of

the ADC related effect or not and whether maintaining higher input levels can help mitigate the problem..

(ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?

14 Dec : problem perhaps in AIPS settings; matter can be closed ?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov 16 : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated; this is completed.

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT lose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations

from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

8 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); But, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.

11 Jan : no further work on GWB; plan is to have similar change for GSB during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

8 Mar : plans for work on GSB during upcoming MTAC -- needs a discussion.

3 May : nearly closed; hot air sucking mechanism needed (being explored with Nandi's help).

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (but may come earlier?)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up in delivery; to follow-up closely.

11 Jan : YG to follow-up with nvidia and micropoint.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

3 May : waiting for adapters to arrive;

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : no specific updates, except that code optimisation will need to be done.

14 Dec : need a discussion to decide the way forward on this.

4, 11 & 18 Jan : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with

2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion on long-term issues to be taken up next week.

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working;

calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

19 Apr : for ver 4.5 : calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).

3 May : SOP already released (v 4.5)

17 May : 17 May : trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.

4.5 Network related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half sytem

4 Jan 17 : this is done -- to confirm and close.

(ii) updated IP table for .4 n/w to be made available by computer group

4 Jan 17 : work onging -- to check status with comp group.

3 May : completed

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.

3 May : GSB & GWB diagrams available ; completed

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines is possibe with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together to NCRA end; comp group to set up the test, alongwith VVS at Pune end.

11 Jan : 3 connections made to gwbh1-3, and live test demo done; it appears that only 2 of the 8 x 1Gbps links from switch to aggregator are woking ! This needs to be debugged between comp group and OF group.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

4 Jan 17 : comp group agreed to look for options.

15 Mar : can be taken up next time.

#### 4.6 Longer term plans for GWB-4 (SHR/GJS/ICH/SSK/BAK) :

List of tasks going forward (needs to be prioritised) :

(i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link (GJS+MGU)

(ii) Disks for data recording, including trials with SSD options (GJS)

3 May : restarted the tests on normal disks

(iii) investigating next gen GPUs -- to benchmark sample Pascal units from nvidia (SHR)

19 Apr : to be tried next week.

(iv) migration to next version of CUDA (7.5 and beyond) -- to decide the steps

23 Nov : CUDA 7.5 is being tried in the new version of GWB -- confirm present status

19 Apr : confirmed that all v4.5 is on CUDA 7.5 and no upgrade in near future.

3 May : installed CUDA 7.5 on all machines; next cycle may go for 8.0 which is now available

(v) DUT correction and timestamp related issues : to confirm present status and decide future course of action (SSK)

19 Apr : still pending.

(vi) towards PFB option : resurrect old code into new GWB5 & compute the overheads (SHR)

(vii) towards a gated interferometer : to look at the MAC code that can do the gated integration; to send the gate information to the GPU from CPU (SHR/SSK/YG)

(viii) improving availability of beams by reducing beam I/O : 16 bits to 8 bits for IA/PA beams and 8 bits to 4 bits for voltage beams (SHR/YG)

(ix) options for an additional network for even better I/O capabilities (SHR/GJS)

(x) PA - IA beam mode as an additional option with IA or PA modes (SHR/SSK/YG)

(xi) making 4 PA (or voltage) beams point in 4 different directions -- SSK to look into the change in code needed for this, starting with astrocal

19 Apr : SSK has done initial study and plan for generating parameters for all 4 beams from same call to astrocal and then pass to the beamformer; beamformer code needs a change to do one extra multiply by complex number whose phase is calculated on the fly based on antenna, channel, time and beam number.

3 May : initial note from SSK;

(xii) towards more general multi-beaming in the long run

(xiii) archiving of beamformer data : better header and also finding what metadata is required -- SSK to look into this, in consultation with Deepak Bhong.

19 Apr : to follow-up with DB in next few days.

(xiv) getting second copy of data to separate cluster going : for both raw voltage recording, as well as for multi-beaming kind of work (GJS/BAK)

19 Apr : to see if one node (with new disks) can be made ready and put in one rack and connected to Roach board -- can grow to one m/c per rack with separate IB switch...

(xv) decide on 2 vs 4 inputs per Roach board for final configuration

(xvi) net-sign correction -- confirm current status and decide if further action is needed (SSK)

19 Apr : current status is that adhoc sign flip has been introduced for both corr and beamformer header info; proper modification in code needs to be decided : when & how.

(xvii) full backward compatibility of off-line utilities (SSK)

23 Nov 16 : some work has been done, but not clear if this meets / works for all requirements.

19 Apr : has been done and released and users have used it.

#### 4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

(i) Summary of current status for temperature monitoring

3 May : cacti released to control room;

(ii) Plans for future enhancement and release for regular use

### (iii) Monitoring of other health parameters

14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack (uses DAQ card);

28 Dec : not discussed.

11 Jan : no significant new updates.

25 Jan : no new updates, but plans for collecting the temp data and bringing to common m/c that is accessible to control room is being planned. installation of cacti also to be taken up.

15 Mar : machine has been made ready; cacti has been installed; gradually adding nodes to the list and making them ready for monitoring; a separate home-grown product (using cgiplot) also being made ready for monitoring IB network.

19 Apr : cacti for temp monitoring for all GWB nodes (temp of cores) -- available on web browser; to release to control room and users and add in GWB SOP; cgiplot -- home grown version that allows to read the raw data and display using cgiplot in a more flexible manner (right now on hold); for IB monitoring : collectl was being used for IB monitoring (right now on hold); for disk usage, cacti has an option, can be released alongwith the temp monitoring. Additional homegrown tool (IMH + others?) also available -- need to check and see what should be the final form.

3 May : during MTAC, temp displays in CORR room added; (plot facility etc); control room can always see display of temps : inlet air & outlet air

## 4.8 Other issues :

### (i) Cross-coupling tests in GAB + GWB

14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?

28 Dec : some issues need a bit more of discussion before reaching a final conclusion.

11 Jan : ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%

25 Jan : no updates; needs a discussion.

### (ii) Walsh related work.

14 Dec : some tests in progress; porting to GWB (Python package being modified);

28 Dec : work is still ongoing.

11 Jan : porting work is nearing completion.

25 Jan : now in testing phase (on GWB2).

19 Apr : some corrections done for accommodating existing connectivity of GWB of pols with nodes; second correction done for drift of Walsh pattern due to digital bug; will proceed for noise source and astro tests using GWB2.

3 May : delay hunting programme has some bugs, being fixed; debugging in progress.

## 5. Other items :

### 5.1 Python assembly work (HSK/SSK) :

#### (i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

#### (ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been



provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need ot agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

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## Minutes for the Plan meeting of 31 May 2017

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### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov 16 to 8 Mar : offset was fixed (with help from mechanical) and some tests were also carried out (in the interim) for band-4 feed (results looked basically ok) and were shared with SC.

8 Mar : offsets have been corrected; 610 MHz measurements done; other freq being done now; report awaited; method for cross-polar measurements needs review before executing.

22 Mar : new results presented : from ~ 600 to 800 MHz in ~ 50 MHz steps; to see if we can get closer to 550 and 850 MHz and repeat. Also to try Band-2 (120-250) feed and see if re-measurement of Band-3 (250-500) is useful.

26 Apr : Completed measurements for 1 polarization 550-850 MHz (in 25 MHz step). Second polarization has been partially completed : 550-725 MHz; the remaining frequency range to be covered on 28th Apr.

====> completed expt with new transmitting antenna (Aronia, better alignment etc); results show reasonably good agreement with simulated pattern for ~ 650 to 800 MHz range with some droop off at the edges (more so at 850); to confirm the final physical configuration of the transmitter antenna location to see if some of the smaller variations may be due to that; to check repeatability with one more feed of Band-4; to see if the set-up is more accurate now, then Band-2 feed can be retested; finally, to see if some retuning of feed can be done to improve the match between measured and simulated pattern.

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

18 Jan : manual 'digitization' of plot (hard copy) is agreed [rather than indefinitely 'waiting' for a machine readable data file to become available somehow];

15 Feb : no updates, can check recent emails for updates.

22 Mar : no updates, can keep pending for some time.

12 Apr : status quo

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

4 Jan : awaiting feedback

22 Mar : ICH and DVL reminded; will get back in next few days with comments and then possible follow-up and closure can be explored.

12 Apr : to schedule a final joint discussion for closure, within next 2 weeks.

(ii) need to cross-check mismatch of values for band-3 (250-500);  
30 Nov : will check and update, including referring to some existing literature  
21 Dec : some work has been done, but needs an internal cross-check & then discussion.  
22 Mar : new doc has the updated values for this.

(iii) need to see if QH losses have been incorporated into the calculations;  
30 Nov : GP has done some of the work; need to circulate and get agreement.  
8 Mar : report circulated; feedback awaited  
22 Mar : new doc has the updated values for this also.

(iv) does the study cover all the uGMRT bands.  
30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.  
16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.  
21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in Tsys) -- TBC.  
22 Mar : new doc covers all the bands, except for 120-250 (Band-2) as measured feed radiation pattern is not available (standard 65% across the full band has been assumed).  
12 Apr : measured radiation pattern not yet available; will be done after finishing work on Band-4 (550-850 MHz).  
26 Apr : radiation pattern (550-850 MHz) has been given to Swagoto

(v) can it be extended to deriving the final beam pattern for feed + antenna; this is being looked into :  
21 Dec : first version doc has been sent by SC -- needs follow-up  
4 & 18 Jan : feedback awaited on this item.  
15 Feb : to try to find a slot when all concerned are present to get to the finer points and close the matters.  
22 Mar : can be presented this Friday in the polarisation meeting, and then taken up for follow-up discussion.  
12 Apr : see discussion from last week's meeting; action items have been identified there, under polarisation calibration work, and this topic can be followed up there.

#### 1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document  
30 Nov : yet to be completed.  
21 Dec : updated & internally circulated;  
15 Feb : GP to follow-up on internal clearance.  
12 Apr : SSK to check and follow-up on clearing the report  
26 Apr : Report has been finalised and circulated.

(ii) results from recent tests  
30 Nov : running of tests has conflict with online system (JPK is looking into this)  
21 Dec : all x30 Ae data collection leads to 'online' ssystem hanging; planning with x15 Ae (29Dec);  
18 Jan : 'online' issue remained for '15' antenna also (after '30' antenna case failed); now suggested to repeat for '10' antenna case; test planned for a future wednesday;  
15 Feb : to try with smaller number of antennas for now; need discussion with Ops group about the limitation and how it would get overcome.  
08 Mar : GP & Jitendra following up today  
12 Apr : 15 antenna test with online now successful; trying for 30 antenna this week.  
26 Apr : 30 antenna test was done during MTAC; needs to be repeated now.  
17 May : last week, 6 antennas were available and they were tested; monitoring scheme is working; test with all 30 antennas needs white slot booking -- to be done.

(iii) labeling scheme for keeping track of the units to be taken up for refinement

and implementation

16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.

30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular back-up of the files to be worked out.

12 Apr : additional disks made available for back-up of the units; in-house development by Sanjeet ongoing -- can review in about 2 weeks.

26 Apr : software is ready; tested locally; need to feed real data & test.

(iv) Lband system does NOT have total power monitoring at present : prototype scheme being worked out by Ramesh and may be available shortly; will include basic temp monitor (for the box; not for LNA).

26 Apr : new scheme has been tested ok in lab; chassis may need modifications for final implementation.

17 May : the software has been tested; implementation is expected after STP joins; boxes are using proper numbering scheme.

1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system

30 Nov : same as above

21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)

18 Jan : data showed 'flat' value over 24 hrs; C3 & E2 to be tried again today.

15 Feb : not clear about the above problem (needs follow-up with Ops group); to check with 4 antenna test and report back.

12 Apr : monitoring goes hand in hand with power monitoring.

(ii) status of prototype for temp and power monitoring at OF rack at antenna base

16 Nov : sample data set taken but not long enough; to wait for next round of tests; prototype unit installed at C2 and connected to M&C system, but not being monitoring regularly; would like to do some more test and development before finalising the scheme.

30 Nov : (ii) is on-hold after prototype development; to be taken up only after Rabbit card based system is in place.

12 Apr : no change in status

====> GP to be asked for updates in 1.4 and 1.5 via email.

1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares

30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.

4 Jan : 4 complete sets of spares available now (ready for installation at antenna)

15 Feb : 4 spares available.

08 Mar : 5th L-band spare has been assembled - currently under test

22 Mar : now down to four spares (due to C14 problem).

12 Apr : 2 complete sets still available; 3 units under repair

26 Apr : 3rd unit was found to have some issues -- under investigation.

17 May : working on mechanical mounting for the new LNA for L-band feed (as the size is different now); 3 spares are being maintained.

====> 4 units of original design ready, but 3 need verification (including temp & power monitor) before final packing; 1 new unit being made ready with new 3 stage LNAs.

(ii) finalisation of report by VBB

30 Nov : report pending with SSK

12 Apr : updated report had been circulated; can take it up for brief discussion next time and try to close.

====> do it next time.

## 1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs

30 Nov : some failed units are being returned...

08 Mar : all spares available

(ii) status of new 2-stage design installed on 2 antennas : working ok ?

30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.

(ii) status of new 3-stage design : optimisation of RL was being attempted

16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better than 10 dB across the band; Tlna ~ 20 K (by old noise comm calibration scheme); to try improve further, while assembling second unit.

30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna (2 units to be made ready).

21 Dec : 2 K improvement seen (< 20 K) ; report to be available in 1 week

4 Jan : second unit has been assembled; overlapping plots show good repeatability; report will be ready by 6 Jan.

18 Jan : report already circulated last week [ ~ 20-25 K over full band; gain ~ 44 dB flat; return loss better than -11dB over entire band (-14/-15 dB most places); worst case -11 dB near lower freq band edge]

08 Mar : x6 new PCBs (x2 circuits assembled; awaiting chassis; expected next week)

22 Mar : above new units have been assembled and tested -- results look ok, will be circulated shortly.

12 Apr : 4 units of 3-stage amplifier built and compared for performance : getting good repeatability; completely dynamic range measurement and stability inside env chamber; agreed to put 4 units on 2 antennas (CSQ) and check for the performance, including change in power levels and hence change in OF attn etc.

17 May : tests remaining are dynamic range and stability with temperature (in chamber); these may get done next week.

===> dynamic range testing done -- prelim result is ~ 58 dB SFDR and CDR ~ 80 dB -- to be confirmed, and cross-checked against values for earlier designs; temp stability test to be done shortly.

## 1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB problem and W5 -- problem not identified); C14 showing poor deflection and falling at high freq -- checked for pointing and OF attn, now to try changing the feed.

4 Jan : results from tests on 13 Dec discussed : 21 antennas available; dip seen for L-band vanished after replacing common box (which antenna?), but unit appears to be ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2; W5 poor bandshape; C14 noise deflection discussed.

18 Jan : 06-Jan-2017 tests reported; (only 15 antennas were available); E6 showed ripples in CH1 (but could be cable twist; as today NOT noticed); E6 CH2 deflection HIGHER than expected (red dots) !! "measurement" error? 'naming' of file ? similarly W5 CH2; results show MAJOR drift in deflection (~ 15 dB spread !) -- BUT NO CORRECTIVE ACTION TAKEN !! Primary purpose of monitoring is LOST ! SKR was 'un-sure' about this responsibility - now clarified; henceforth, he will follow up on errant antennas.

15 Feb : E6 ripple in Ch1 fixed (bad cable); C14 feed needs to be replaced (tbd soon); tests at antenna base for selected set of antennas shows ~6-8 dB variations -- this needs to be investigated and understood.

08 Mar : ripples were due to cables; C14 slope in deflection was possibly due to feed issue -- now new feed has been put; tests awaited

22 Mar : C14 brought down and being looked into by S Ramesh; about 10-12 dB spread in off-source values (but deflection is reasonable stable) -- needs joint follow-up with FE and OF persons.

12 Apr : new result show similar as above : deflection is mostly all right, but off levels still have a large spread;

17 May : last measurements were without any pointing correction (!); so need to be repeated; meanwhile, problem antennas fixed at antenna base (how?); equal power tuning exercise is currently underway.

====> no updates as Sanjit on leave.

Note1 : some antennas have old notch filter (about 5 antennas?) -- need to change these to new notch filters...

Note2 : to try sample 1000 to 1400 MHz BPF on trial basis.

1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring in control room

30 Nov : this is now available under the standard monitoring tools; control part has some problem and needs login to control PC -- SOP for this to be provided to control room.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue.

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

1.10 Mass production of Band-4 (550-850) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow; 12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.

30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity units are available).

18 Jan : system for 12th antenna will be ready by Monday 23 Jan (lab tests are in progress now); by April x16 system target can still be met.

15 Feb : 13th antenna (C03) installed this week (2 weeks since last one);

08 Mar : dipole shortage; 14th antenna to be completed by ~ 15-Mar-2017; QC issue with dipole units fabricated by outsourced party; dipoles need to be fabricated in-house;

22 Mar : 15 antennas completed; issue of dipoles not having Nickel coated -- will come by Sat. (meanwhile, one has gone without coating and will be replaced later on); for future orders, to do the dipole in-house and send for coating and deliver.

12 Apr : 6 nos of coated dipoles now available (small mech adjustment needed to match the holes -- need to cross-check; agreed for modifying 2 nos by putting a compensating offset holes on the cavity -- this can be tested for proper performance; meanwhile, to expedite the completion of 3 nos of in-house made dipoles and deliver at the earliest by next week.

26 Apr : x3 dipoles delivered by mech team; x1 of these gone to E5; now total x16 Ae done; remaining x2 will go next week, by 03-May-2017.

17 May : completing 17th antenna (W02) today

====> feeds + stools available for 5 more antennas; 18th is almost ready; after that, problem is with the mobile band filter availability due to delays with Argus !

Need to see if this can converge quickly; also initiate parallel exercise with another vendor; enough boxes are there for continuing assembly.

Additional point : live demo of switchable notch filter at Rx room (in C09 antenna path) -- can switch in different filters -- appeared to work fine; in the process discovered that mobile signal is coming through quite strong in the Band-3 signal (!!); needs to be checked and understood.

## 2. RFI related :

### 2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting to be completed

30 Nov : YG + PAR to work on this final version.

12 Apr : needs to be actioned asap.

(ii) study of RFI environment, including internally generated RFI in main building

30 Nov : tests of individual labs : with AC units and otherwise -- shows different labs in different light; agreed to identify the worst culprits by kind of equipment etc and provide an update.

12 Apr : this is due, but has not started yet due to other activities.

(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests

16 Nov & 30 Nov & 21 Dec : no updates.

26 Apr : two experiments done :

(A) expt done using GMRT Ae as RX, & log-periodic Ae as TX; D = 100m & 300m measurements displayed GMRT Ae elev 18/45/90 deg; feed rotation done over 0/45/-45 deg

(B) between x2 GMRT Ae (C1 , C8) ; one as TX & another as RX; D=375m with function generator directly feeding RF to GMRT 325MHz FEED as TX; results displayed; 78 deg (3dB) HPBW

17 May : awaiting further discussion

(iv) absolute calibration of measurement set-up for RFI testing : to translate levels measured there to levels expected at antenna focus.

26 Apr : power calibrated for any lab equipment emission limit (upto what allowed) -- plots displayed

### 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database

(ii) response to pending requests for clearance e.g. Serum Institute...

21 Dec : awaiting call from Serum Institute for the next visit; asked all technical details of their planned equipments;

30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to their location for looking at specific instruments.

21 Dec : one site visited.

4 Jan : awaiting call for visit to site of the party.

15 Feb : one round of discussions have happened with Serum institute -- they would like to finish the installation and then call for testing and possible modifications; our response should be that we would like to test the existing set-up and indicate the mods to be done and these should be implemented in both existing and new setup and then taken up for testing.

Another party wanting to set-up unit for DC control drives in Junnar / Ambegaon area.

12 Apr : RFI tests planned at Serum Inst premises next week.

26 Apr : test planned on 02-May-2017 at Serum Inst premises

17 May : tests done on 2 May 17 : RFI measurements done with manufacturing units ON (full campus operational); largest increase : -63 dBm at 75 MHz -- 30 dB rise in

noise floor compared to all-off condition (-93 dBm); cold room giving discrete lines in 150 to 250 MHz range (-75 dBm peak); shielding measures need to be advised to Serum Institute; detailed report by later today.

(iii) work out new action plan, given the current government policies

08 Mar : MIDC people from Chakan came to GMRT for exploring possible sites for new industry zones; following discussions, agreed to our request to avoid heavy industry in GMRT area -- maybe IT related in Peth etc; also about help in surveying sites for level of RFI etc -- how is this to be formalised -- we should send a letter from our side; check with JKS.

similarly, there is a note from DAE asking for things that need protection -- to see if JKS can follow-up on this.

### 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters

30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems (they are the only one to have got license in this range) -- it is strong enough to cause saturation in spite of filter; need to find the specific towers and then follow-up with Reliance.

18 Jan : measurements happening this week; update by next week.

15 Feb : completed survey of 82 towers around Y-array : 14 towers in 850 band (Reliance Jio) and 6 towers in 950 GSM band; rest are in 1800 band. Max power in 850 band ~ -16 dBm (at ~ 100 m distance) for few towers. Follow-up for both 850 and 950 being pursued, including dialogue with Reliance Jio to see if they can switch to 1800 band.

08 Mar : draft letter circulated (vendor is generally positive; but formal communication needs to go soon)

15 Mar : New results : characterisation of mobile phone RFI in the GMRT campus -- some interesting plots; using JIO CDMA uplinks and their effect can be seen.

### 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems

30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need to identify which make is coming finally.

21 Dec : no updates.

15 Feb : 33 nos (Voltas instead of BlueStar) have arrived; need to finalise the locations and the specific schemes for installation; need to make shielded units for all 33 nos; components for 25 units are available; boxes for 10 nos are in hand except for back plate and chromatisation (expected to take one week); work request for next 10 has been given (repeat order); some difference in wiring for Voltas unit -- needs some rework of the design / layout; also one type of connector is different and this also needs to be resolved; PAR to send an email explaining the steps to be taken to complete the RFI shielding work, and expected timelines for the same.

Regarding installation : there is a table giving the locations for 31 units (including replacements of 5 existing units) -- to check if outgoing lines can be behind the unit; to install sample one unit in canteen annexe, test the RFI shielding.

08 Mar : one set of measurement done (without shielding) - under analysis; by next week shielded case will be measured & compared; RFI group designed shielding box pictures displayed; uses many cables with RFI shielded interface connectors; it includes high current carrying (220V AC) lines, needing shielded connectors !

12 Apr : 10 AC units have been installed; only 3 have the RFI shielding installed (are the other 7 being used !); 3 more RFI units are getting ready; to speed-up the remaining RFI units; and then go for the next batch of AC units; meanwhile, one bump of RFI remains at around 325 MHz -- may be coming from blower assembly : to disassemble on unit and check for source of RFI.

17 May : 12 units are now in operation with RFI shielding; prototype box from new



vendor has come and not found suitable -- modifications told to vendor, corrected unit may come in few days.

### 3. Operations related :

#### 3.1 Interfacing of FE with new M&C system :

(i) latest status of testing with Rabbit card in common box at antenna base

16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).

30 Nov : no new updates on this

21 Dec : antenna control part is working; FE monitoring still not working; Charu is looking into this...

18 Jan : trying with different delay to see if it solves the problem, but not yet working with online control...

(ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus

16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration and testing in 2 weeks time and put on first antenna with RS-232 cable driving; later to convert that to ethernet over fibre; mass production may need only new plates to be made by workshop -- other aspects are in-house in FE lab.

30 Nov : item also being discussed under FE agenda item (in alternate week)

18 Jan : final status is Box #1 was made functional at antenna base and was taken up to antenna focus as Box #2 does not work reliably -- hangs and needs power reset (has been tested with a couple of different Rabbit cards?); problem not solved; agreed to try the option of swapping the Rabbit cards between Box #1 and Box #2 and seeing what is the outcome. To report this by tomorrow and then decide if a 3rd box needs to be made ready.

25 Jan : testing of common box with Rabbit card : new clue related to grounding of enable signal of decoder IC may provide the breakthrough -- tested in lab and will take to antenna base now.

15 Feb : email update from Raj Upgrade : One rabbit MCM has been installed at C01 antenna dish focus; MCM communication is proper but needs to give hardware reset while changing frequency band.

08 Mar : it is working only for some bands (C01); needs rethink on strategy.

22 Mar : problems persist; long discussion about what may be the cause; need to get a proper wiring diagram to check the grounding of the system for possible loopholes that may be causing the flaky behaviour...

5 Apr : useful discussion alongwith wiring diagrams; two possible causes identified : old FE power supplies may be having more noise (200 mV) than the new ABR power supply (50 mV) -- to try C01 with the new supply; Rabbit card has ground to common box chassis (unlike MCM-5 card) -- can try to isolate this in the second box being made ready and take to another antenna.

12 Apr : common box on C1 now working properly (!) -- problem was in sequence of commands sent from control room -- there was a monitor command sequence in the cmdfile that was the culprit.

Agreed that only main bottleneck remaining is monitoring of FE system -- this can continue in parallel, even as we go ahead with mass installation of the Rabbit based common box; third stream of activity to be initiated is lab test of ethernet based control of Rabbit card in common box, via optical fibre link (bypassing cable ethernet).

26 Apr : update on monitoring aspect : problem found with 4 lines on interface card

that appear to be picking up spurious signals; isolated by connecting straps directly from IC pin to destination point and solved the problem; to confirm that problem clearly identified and solved; and then agree on changes to be made to PCB via straps (after cutting the offending tracks) and implement in mass production.

17 May : above solution implemented for 2nd box also and found working ok; put up in place of original common box on C01 (due to low fringe call sheet due noise-gen all the time); to test the failed unit to see if cause is in new M&C system or in some aspect of common box; for the PCB, agreed to make a new version, but work in parallel with modifying existing versions with straps to keep the production rolling; same strategy for modification to accommodate OF receiver.

====> new box on C01 is working fine; older version that had come down has problems identified (not related to Rabbit control) and are being rectified (change of one interface PCB; old one to be debugged by SC) -- to find the spare cards and use for now; in addition, wiring for 2 more boxes is underway. To check separately about OF work on common box.

### 3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgeetary quote; formal quote expected shortly.

4 Jan : folder cleared ; PO should be done shortly.

18 Jan : Order has been released; full delivery time is 3 months; first box to be supplied earlier and tested...

15 Feb : email update from Raj Uprade : expecting the delivery of one Miltec machine shortly; also initiated talk with Miltec to supply it as early as possible.

08 Mar : one unit has come; will be tested & feedback given to Miltech

22 Mar : new Miltech PC put through RFI test; informal report : looks ok; formal report may take some time.

12 Apr : go ahead given to Miltech for full delivery.

26 Apr : CPK to call and check the status.

17 May : CPK yet to call.

====> Party had confirmed plans for delivery in 2-3 months time scale -- to check if it can be expedited and/or delivered in batches; meanwhile, out of 16 existing, 14 are working (10 in antennas, 4 in lab); more disks being ordered for Miltech PCs.

Addition item : issue of Windows software licences discussed (with MSU present) -- agreed to go ahead with ~ 20 stand-alone licenses for use by tech groups.

17 May : MSU reported that he is looking into it.

====> MSU presented some confusing feedback from different vendors -- yearly license cost, with terms and conditions; MSU to assemble the possible options and report back.

### 3.3 GMRT M&C sytem Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal meeting.

4 Jan : internal lab meeting held on 3 Jan (now every Tuesday)

08 Mar : all team members are clear on their respective roles & are contributing

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans

30 Nov : discussions ongoing; kick-off meeting planned.

21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.

4 Jan : regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary'

etc shared with TCS.

18 Jan : work ongoing; need more regular interactions of TCS with GMRT team members.

15 Feb : email update from Raj Upgrade : 2 CMC and 6 LMC machines are UP & running; team members are now very much familiar with CMC, LMC installation, features, testing and can carry independent tasks.

08 Mar : interim review held; schedule is 6 weeks slippage/ delayed; mitigation planned for that delay;

22 Mar : work progressing; may test sub-array and tracking in coming MTAC.

26 Apr : could not meet the above target due to modifications for A&A issues and other things; work is ongoing at present.

17 May : tracking routine completed; LMC, A&A and data-base schema work not yet converged.

====> new ver 2.2 released last week -- tested and feedback given; further tests to be done this week.

### 3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for material for review committee started

30 Nov : dicussions and work ongoing, including preparations for discussions with TM review panel.

21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase : requirement compatibility; architecture explanation given; scalability etc; need many upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;

4 Jan : preparation of docs in progress; ph-2 work now beginning...

18 Jan : aim to have 6+ antenna set-up with PC + switch + Rabbit talking to Sentinel + OF + Servo (to check if existing PC104 will work directly) or not; to check enough Miltech PCs available -- Sumit and Mangesh to look into it.; need to move from Fedora to Ubuntu; aim to start testing at antenna base by 23/24. Additionally, need some temporary space (couple of months) for working on 2 PCs in or near control room...

15 Feb : Last week 6 antennae Control & monitoring system was set-up and demonstrated to SKA reviewer (Nick Rees) and SKA India team.

08 Mar : SKA committee is reviewing our work; cost estimate proposal from India was submitted to SKA claiming 50% saving on TM work using Indian scheme;

26 Apr : discussions ongoing; need to prepare an updated response to new version of report expected by tomorrow or so.

17 May : all done and completed.

Back-up of interferometry data from GWB : some issues when switching over from gwbh1 to gwbh6, but appear to be resolved now.

## 4. Back-ends related :

### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh paper needs to be looked into for revision; nothing really pending, except for the report on the attenuation values : new set of tests done and results look ok and will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed); may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?  
4 Jan : To follow-up on GWB refereeing process.  
18 Jan : GWB response received, relatively minor modifications are needed and SHR is looking into this; for Walsh, waiting for response -- can check after 20 days (end of this week / early next week).  
26 Apr : no new issues here.

#### 4.2 Updates on existing GWB-3 system :

(i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;  
28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

4, 11 & 18 Jan : no progress since last time.

25 Jan & 15 Feb : still pending.

22 Feb & 08 Mar : band shape correction yet to be implemented -- can be taken up now.

15 Mar : SHR has not yet gone back to this topic.

12 Apr : still pending

26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction : geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.

17 May : DDC related updates :

(a) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and release for users.

(b) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.

24 May : for shape equalisation, some fine tuning being done by SHR; for spurious lines, not clear what is the best way forward -- need to check if it is part of the ADC related effect or not and whether maintaining higher input levels can help mitigate the problem...

====> agreed that the latest version of bandshape correction looks ok and can be released in the next version of GWB; for spurious spikes, some further tests suggested, also to look into optimising the power levels at input for the narrow band modes.

(ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes; for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be closed ?

14 Dec : problem perhaps in AIPS settings? matter can be closed?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

#### 4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated; this is completed.

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT lose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

08 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); but, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.  
4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready; appears to be satisfactory (though no improvements in ambient temp recorded ?).  
11 Jan : no further work on GWB; plan is to have similar hcnage for GBS during next MTAC -- preparations for this are on-going.  
18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.  
08 Mar : plans for work on GSB during upcoming mTAC -- needs a discussion.  
3 May : nearly closed; hot air sucking mechanism needed (being explored with Nandi's help).  
(iv) availability of components esp GPUs :  
23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.  
14 Dec : delayed further by 30 days (may come earlier)  
21 Dec : this is a serious matter and needs follow-up !!  
4 Jan 17 : direct contact with nvidia rep looks like resulting in some speed-up in delivery; to follow-up closely.  
11 Jan : YG to contact nvidia and micropoint persons.  
25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.  
08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come  
15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.  
12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.  
26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.  
3 May : waiting for adapters to arrive;  
(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :  
target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.  
23 Nov : need to plan the code optimisation that will be needed.  
14 Dec : need a discussion to decide the way forward on this.  
4, 18 Jan 17 : deferred for some more time, till 30-antenna system is released.  
25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.  
15 Feb : SSK to try and restart the old 16-antenna CD pipeline code using the SOPs etc from Kishalay...  
22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.  
08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.  
15 Mar : discussion of long-term issues to be taken up next week (22 Mar).  
22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).  
5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved

performance e.g. 400 MHz full polar 16K channels for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working;

calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

19 Apr : for ver 4.5, calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).

3 May : SOP already released (v 4.5)

17 May : trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.

4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :

(i) refinements of the first draft of the note

(ii) plans for getting first unit connected and tested

(iii) plans for testing high speed recording to disks

16 Nov : lab set-up for grabbing and recoding has been done; while continuing with this, need to work on the set-up for sending parallel copy of the data, including procurement of longer CX4 cables.

30 Nov & 21 Dec : not discussed.

4 Jan 17 : basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.

18 Jan : to test the dual copy design for correlations using existing 16-antenna corr with dummy inputs; then to connect to one machine where tests can be done for raw voltage recording and a single node correlator with flexible beamforming.

15 Feb : no updates.

08 Mar : 374 MBps speed achieved; but need slightly higher speed

26 Apr : old gwbh9 (T630 m/c) removed and T620 m/c put in for doing the further work; length of cables -- 3m may be enough for using existing slot in the racks; to look into modifications of FPGA code for more eth cores; simple code for correlation of limited number of antenna etc... longer-term plan with longer cables, more racks, more nodes etc to be thought about.

17 May : expanded design tried with 8+ disks using gulp and can be tried with GWB signals; to be tried with digital copy scheme using resurrected earlier design with 4 10 Gbe cores.

4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)

16 Nov : some changes have been made by SHR, but the sub-microsec correction still needs to be done; also to follow-up about h4k file.

21 Dec : modified code has been made, but not yet tested; can try to see if it

can be made available in the current release.

4 & 18 Jan 17 : agreed to defer to next release.

15 Feb : deferred as above.

08 Mar : current release has this 'sub-microsec correction' ENABLED; it is now possible to send those values to header files;

26 Apr : updated timestamp with higher accuracy is coming now; needs to be verified for correctness; CDP vs PA timestamping still to be resolved.

17 May : one buffer offset confirmed; need to be checked for different modes

4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans

(ii) spectral domain RFI filtering : current status and plans

(iii) beamformer RFI filtering : current status and plans

16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.

30 Nov : not discussed in detail.

21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file..

emulator has some changes and improvements, including random location of the RFI.

4 Jan 17 : for (i) modifications in simulator; counter mode now working -- can have 2 different modes, tested at module level, now integrated into the design, will be testing in next few days; fractional thld done in simulation, to convert to design and test. (ii) to try and run the filter in real-time from shm data.

18 Jan : not discussed, but summary of offline discussions is as follows : (i) some additional features added to RFI simulator unit; fractional threshold and counter mode now available for use in the voltage filtering unit; cumulative experience shows that we may be not using the optimal filtering technique for voltage mode -- should try the alternative approach of conversion to intensity and integration to desired time constant -- closer to a true matched filter.

08 Mar : some updates from Kaushal about looking at options for more optimised filtering of broadband time domain data :

Modified the design to support 16K window size - this is the default design now;

Fractional threshold available (tested with antenna signals) - default option now;

Made the DDC mode design compatible with the ongoing changes;

RFI Counter design ready - format to read the data including timestamp from a single ROACH complete, undergoing more tests before release;

Supporting regular tests - spectral line (Nissim), continuum (Ruta, Dharam, Ishwar);

Handling longer duration RFI using median of MAD technique - initial results are encouraging, detailed tests going on;

Looking at likely causes of missing RFI during real-time excision and at possible alternate methods for time-domain filtering;

Ongoing: Updating SOP with changes made till date;

17 May : 2 different options for MAD based filtering released -- normal MAD vs MoM of MAD; some user level tests done -- need to see the output from these for comparison; can be taken up once spectral filtering tasks with Swapnil are concluded.



RFI emulator: (last update email - Jan) :

Last development: Adding facility for random insertion and random amplitude of RFI  
Understanding the GUI and MCM control program - backup from Rahul Bhor;

Narrowband RFI filtering: (updates email sent periodically) :

Initial version of the code has been timed; optimized for computing faster sorting for median computation, is now much better;

Moving towards expected version of filtering code - with optimized functions to meet real-time requirements (0.671s) and necessary functionality;

Ongoing: Testing the code on recorded data and timing the code for all 60 self outputs;

Looking at synchronization between the data path and RFI filter (along with Sanjay);

Looking at merging of lta file and flags for the FITS file format (along with Sanjay).

08 Mar : now optimizing real time filtering; all bands filtering on recorded; Broad band RFI filtering : emulator tested; other techniques being explored; SOP updated; to be released next week.

17 May : code for spectral filtering of single self has been developed with spectral flags needed as per format specified by SSK and he is to modify this for multiple selfs (all antennas, working real-time) and passing flags appropriately to LTA file.

4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and tests ongoing; also tested by sending digitised packets to antenna and loop back; using GWB2 for doing all the correlations.

18 Jan : feasibility study done using C09 antenna with noise sources & real signal -- needs a fixed delay correction of 1.5 km to get maximum correlation; trying setup with E5; meanwhile, a few different tests can be tried with the C09 set-up; comparison of scheme running on GWB2 and GWB3 tried out.

08 Mar : C9 & E5 setups faced problems (ethernet card issue); now fixed; GWB2 (early digitization) & GWB3 being used for comparison; delay requirement has reduced (due to early digitization)

12 Apr : new test has been carried out with C9 and E5 on actual on-source observation and brief comparison.

26 Apr : some updates from recent tests to be available by next week; detailed report of recent work being prepared.

17 May : trying some tests with single antenna early digitisation (as only one is working).

4.8 Time-Frequency Standards (BAK) :

(i) procurement of Maser units

(ii) planning for kind of environmental set-up required for Maser units

(iii) planning for long-term maintenance and development

16 Nov : most of the issues have been resolved, waiting for one party to complete the payment terms; pending issue about performance bank guarantee for different amounts of periods.

30 Nov : work is ongoing, but item not discussed.

4 Jan 17 : TEC clearance ok; recommendation to open price bids -- to check the status. To contact Prof Sen Gupta for a discussion.

18 Jan : final TEC documents done and sent for next step; to follow-up and check status.

15 Feb : activities ongoing...

08 Mar : Negotiating committee met the vendor (no reduction on price; but add modules 'FREE'; payment terms as per NCRA conditions); Dr Sengupta will be visiting next week;

first unit delivery after 5 months; second unit 4 months after 1st delivery;

12 Apr : to take up next time.

26 Apr : to confirm date of expiry of validity and follow-up with TIFR for the folder;  
to check about vibration damping mechanisms available with the system and otehrwise;  
to make a draft note for selection of the room and suggestion modifications to be  
taken up.

## 5. Other items :

### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python  
(what is its configuration?) will be ready by 7 Dec, and will be installed on  
antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear  
and conclusive for the fact that the Finolex pipe with modified E06 arrangement  
(running on W1 for more than one year) is better than Igus pipe with same as E6  
arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been  
provided to FE team (to check how many of these have been used) -- overall statistics  
to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose  
to take care of extra cable requirements for future use. Current version is 30 mm  
ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been  
procured from a party in Mumbai and sample assembly is being made ready -- may go  
on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to  
decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been  
working fine since July 2015 and appears to be better than existing Finolex option  
(even with mech modification like E6 and C4); agreed to adopt the new scheme (cost  
goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need ot agree upon the diameter;  
current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one  
antenna (along with 2 dummy optical fibres) for test for ~ one month and then take  
a call for mass production.

12 Apr : sample unit getting ready -- length needs to be reduced; do asap and get hose  
assembled and then install on C03.

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## Minutes for the Plan meeting of 7 June 2017

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### 1. FE & OF related :

#### 1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in  $T_{lna}$  for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

22 Feb : first results of variation of  $T_{sys}$  for Band-4 FE unit of QH + DC + LNA

(which goes next to the hood) -- absolute value of Temp is higher than  $T_{lna}$  at ambient and also the variation of  $T_{sys}$  with ambient (0 to 60 deg C) is larger than for  $T_{lna}$  alone. To cross-check whether known loss of QH and DC at room temp can explain the room temp values and then extrapolate from there for different ambient temps.

15 Mar : new test done with QH + LNA only (compared with QH + DC + LNA) -- shows lower variation of  $T_{sys}$  over 60 deg range of chamber (35-40 instead of 55-60 seen earlier); agreed to try to estimate the loss of QH and DC with temperature and use theoretical formula along with  $T_{lna}$  as fn of temp to predict the observed  $T_{sys}$  vs temp curves and compare with the measurements.

5 Apr : new results of  $T_{sys}$  vs temp for just LNA, LNA+QH, LNA+DC, LNA+QH+DC : appears to show reasonably flat variation of  $T_{lna}$  with temp; more variation for LNA+QH; but some of the curves cross each other (and have offsets) with temp -- bit difficult to understand; agreed to try S-params for each device as fn of temp, for same RF (610); meanwhile, theoretical calculations ongoing.

19 Apr : new update, which measures loss of QH with temp, shows change from 0.1 to 0.2 dB over 60 deg and can explain the observed variation of  $T_{sys}$  with temp. To check if any info is available about loss of QH with temp; second is the mystery about lines crossing each other -- needs to be understood; then can check about extending the study to Band-3 also.

24 May : no fresh activity due to engagement in mass production work.

====> new test done for the new 3-stage LNA for Lband -- shows few (~6 deg) variation over 20 to 60 deg change in temp -- similar to Band-4 LNA; to try with typical cable length in front of the LNA. Riddle of crossing curves remains (here also); to try for Band-3 LNA.

#### 1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible.

22 Feb 17 : only 5 antennas completed by January; request for next set of 5 feeds has been given to mechanical approx beginning of Jan -- expecting 2 dipoles shortly, but reflector and BFRs will take some time; meanwhile one FE box is ready; to get if possible 2 more to be ready, so that 2-3 antennas can be done in quick succession.

Need to have enough QH + DC (is matter of cutting right length of material and assembly); for LNA : have all PCBs, need chassis (ordered in sets of 20); same situation for BPF; however, request for new stools (with modified height) has not been given (!!); due to some rethink about optimal stool height (!); follow-up action on this : to discuss with mechanical to see if existing or spare stools can be modified / cut to meet the height requirement and use for the next 2-3 antennas.  
15 Mar : HRB had requested for 5 feeds (DRF 130-260 MHz) out of which 5 dipoles arrived and reflectors + BFRs will arrive by 18 Mar; mounting stools (1190 mm), 30 nos. requested, out of which, 2 stools will arrive on 18 Mar; hence, new installation only by next week;

5 Apr : 2 nos of feed + reflector + BFRs + stool in hand; 1 box ready; one more can be ready in next few days; can target 2 antennas in MTAC period; to see if 3 can be tried.

19 Apr : no progress now, as attention has shifted to common box for some time; now tasks have been reassigned and work on this will pick up now.

3 May : 6th box is ready in lab; will go to antenna by next week (12-May-2017)

24 May : 6th antenna done; one more can be done; after that feeds, stools etc needed; FE box for 2 more available -- more are needed. FE team to check with mechanical and get back.

====> some delay to move to the next (7th) antenna, though the units are ready -- maybe next week after HRB is back; for further units, boxes awaited after powder coating (10 nos); feeds + stools are available for next 3 antennas. May need to introduce check list for quality assurance for all the units before they are installed (can be done for all other bands as we are increasing the pace of mass production).

### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

(i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months should be enough to complete the tasks i.e. April 2017.

11 Jan 17 : 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

25 Jan : needs combined tuning of filters to fix the problem; work ongoing.

22 Feb : successful in tuning the integrated unit (for 2 boxes, both channels); and 23 antennas are completed, and work is ongoing; next antenna in about 2 weeks.

15 Mar : one more box was made ready, but gave trouble after exhibit at Science Day (!); has been made ready again (all the cables were changed). Will go up shortly. Meanwhile, next set is getting ready.

5 Apr : 25th antenna done to ver2 level; some issues related to tuning of the integrated filters (assigned to SC).

19 Apr : 26th antenna also completed; going reasonably smoothly.

3 May : next box (incorporating new filters) will be ready this week & go to antenna [~ 12-May-2017]

24 May : 27th antenna is done; generally going ok.

====> still at 27 due to some maintenance issues with C02 -- need feedback about the oscillation problem.

(ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good : comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

11 Jan : analysis of Jan data awaited.

25 Jan : analysis of new data (on CasA) -- appears to be systematic 1-1.5 dB less deflection than predicted and control room values -- needs to be checked and followed up in consultation with ICH, DVL, SC & GP; few antennas with some odd behaviour e.g. E3 and maybe E2.

15 Mar : no updates as Ankur is not available

5 Apr : updates from new data; 2 antennas showing less deflection in ch 1 only -- to be investigated; not much other issues.

19 Apr : no updates this meeting.

3 May : data available, but no plots (laptop crash)

====> work has resumed, and some tests done last week (Ankur not available); to check about CO2 oscillation problem.

(iii) Summary of phase centre measurements and decision about future plans

25 Jan : no action yet.

15 Mar : still pending.

19 Apr : still pending

(iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

11 Jan : data collected, report expected within 2-3 days.

25 Jan : Sougata + Ankur will provide update next time.

22 Feb : SC will send update within a week.

15 Mar : some work is still pending; SC will complete and send within a week.

5 Apr : some tests done using OF monitoring system (seems not all antennas working and also varying behaviour) : summary from 10-12 antennas, 3 sub-bands (one corrupted by RFI) : some cases show narrower BW, and some show wider BW; for narrower BW cases, coating the PCB appears to correct for most of the discrepancy -- needs a short report on this; last 5 antennas have gone up with the coating -- should be able to cross-check the performance; need to find a solution for broader BW case !

19 Apr : quality check on 24 antennas done; about 4-5 antennas showing discrepant band for most sub-bands; FE team feels confident that this can be fixed with the coating option; to make a table for all antennas all sub-bands for user to decide what to be done; to fix as and when FE box comes down for other work.

3 May : report circulated; worst affected antenna identified; after ~ 3 months will be taken up;

24 May : no new updates; can check around July.

(v) LO settings for all sub-bands etc to be finalised.

14 Dec : 250-500 LO setting document / table already finalized;

28 Dec : no updates; person on leave.

11 Jan : astronomer feedback awaited (to check if final table shared with control room).

25 Jan : Not yet shared with control room; to refine based on : 6 dB point for main BPF and 10 dB for subband filters, for the default BW.

22 Feb : draft document has been circulated to DVL & YG for trials, for 3 bands (Band-3, 4 & 5); for Band-3 which shows max variation of sub-band responses, the basic response is taken as the one found in majority of units and 10 dB criteria is applied to that response to get the LO values; either lower or higher or both side LOs are recommended depending on the situation, and some justification has been given for all the cases; YG to check with DVL etc if this can be released to control room and all users.

15 Mar : some responses from DVL + Nilesh etal -- some clarifications sent; some more tests to be carried out this week.

5 Apr : no updates for this time.

19 Apr : DVL and co to provide update by next week; can discuss 2 weeks later.

====> FE team to check with JPK if control room is following a standard, recommended procedure.

#### 1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus

14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01); box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)  
28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).

11 Jan : box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.

3 May : box #2 MCM reset option & monitoring finished; to go to C01 antenna tomorrow (04-May-2017);

24 May : replacement on C01 working ok; older one traced to interface card problem -- to be fully debugged; meanwhile spare new card will be put and made ready for installation

====> faulty unit requires one IC base to be changed and can be used again; meanwhile waiting for new PCBs to come -- to see which vendor can do this.

(ii) Plans for mass production

30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.

25 Jan : one box tested at antenna focus and working ok; 2nd box not yet tested at focus; even for the 1st box, repeatability is not there.

19 Apr : ready to start the mass production and installation; may be able to achieve 2-3 weeks per box in long run after first 2-3 boxes; to coordinate with Ops group for supply of Rabbit in shielded box. Also to do the R&D for getting the ethernet control option tested and going and put it into mass production -- this needs an extra input port on common box -- agreed to use 50 MHz port for immediate and redesign the plate for additional input port and put into new boxes as and when ready, without affecting the rate of mass production of common boxes.

3 May : x2 boxes in wiring stage; x1 box per month initially (later one box every 3 weeks); redesign of band-selector & interface card completed; mass production can begin now

24 May : to go ahead with the plans, introduce new cards into system as and when ready; and retrofit the new cards in older systems later on; transobs PCB also to be included in the above.

====> to get the set-up going and then decide on the priority.

#### 1.5 Apex radiation scheme (PAR/SRoy) :

(i) Current status of measurements and interpretations

(ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

11 Jan : no updates, though there has been some email discussion between SRoy and PAR

25 Jan : need to check with SRoy and PAR.

15 Mar : PAR and SRoy yet to have a detailed discussion; meanwhile another round of tests done on C1 -- showing a different pattern than C10. Need to summarise and circulate and then take up for discussion.

19 Apr : no updates, though some ongoing email dialogue between SRoy and PAR...

24 May : discussion between SRoy and PAR -- some conclusions have been reached and some action plan has been worked out between them : to circulate a brief note summarising these (as well as dynamic range measurements summary and plans), while follow-up action continues.

#### 1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) : Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of health of Walsh switching.

11 Jan : there is some confusion about what is being done, and what has been achieved ! For 10 antennas which have new 1st LO system (LOFSW based units), it should NOT be possible to have Walsh modulation at present !

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh...

22 Feb : now clear that only those antennas (20 ?) which DO NOT have the new synth units can be tested for Walsh; latest tests on these (done in Jan), showed ok results for 19 out of 20 (one antenna was down due to mech problems).

15 Mar : no immediate action here; need to work out with analog BE team.

#### 1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

22 Feb : SC to check with JPK about the progress on implementation of the SOP for use by control room in normal PMQC type of tests and generation of stats to report to FE team.

15 Mar : control room people (JPK and SNK) are looking into the code written for GSB to see if it can be done for GWB.

5 Apr : SC to follow-up with JPK on the matter.

19 Apr : code has been obtained and possible issues in it have been identified; to see if the job can be taken over by control room colleague.

24 May : to see if a discussion with JPK + SN + ICH can be had on this matter. ==> to organise a joint meeting, maybe week after next.

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

22 Feb : to plan for the discussion.

15 Mar : agreed to make a presentation on 20th in the poln meeting.  
5 Apr : presentation showed reasonable results; action items : to compare feed response with WiPLD results of HRB; compute 3 dB BW vs freq for Band-3 for feed + dish and compare with observed results; need a software with finite element method approach for this simulation -- Antsys or Fecko; to check availability in different places in and around Pune.  
19 Apr : no new updates right now.  
24 May : SC to follow-up and report back.  
====> no updates.

#### 1.8 New filters for L-band (AP) :

(i) status update on installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing

16 Nov : arm antenna installation to be resumed;

14 Dec : all west arm will be completed by 16-Dec-2016;

28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.

11 Jan : S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).

25 Jan : only 2 antennas W-arm remaining to be done.

3 May : only one antenna (W2) remaining

24 May : to confirm if all antennas completed or not.

(ii) delivery of remaining units of main L-band BPF from Epitome

16 Nov : BPF completed and handed over to BE team -- this can be closed.

28 Dec 16 : can be closed.

#### 1.9 OF system updates :

(i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.

11 Jan : current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.

15 Mar : this is status quo; few extra high power lasers at 1310 nm for forward link have been procured; cards being made ready; will be used as and when loss becomes too large in far away antennas.

3 May : high power lasers (5-6 nos made ready) and available for use; for, W6 & S6 such lasers already installed about one year ago;

24 May : some evidence of loss of power of laser transmitter (1310 nm) at Rx room causing problem in telemetry link; needs retuning of laser circuitry; will be taken up one by one -- this is in addition to need of high power lasers for far away antennas.

(ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates

28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.

11 Jan : cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.

15 Mar : expected by end of this month.

5 Apr : OTDR not arrived yet; second fibre bundle ordered but not yet delivered.

3 May : OTDR has arrived; second fiber bundle has also come;

24 May : OTDR working well; 2 km fibre bundle arrived; 20 km spools : 3 nos were found bad and have been sent back to the vendor in US -- need to follow-up on it.

====>

New item : contract with BSNL for dedicated GMRT to NCRA fibre to be renewed as it



is 5 yrs old. OF team to circulate the preliminary docs to all concerned in NCRA for clearance before sending ok to BSNL.

(iii) 8 Gbps GMRT to Pune link : it was found that only 1 or 2 Gbps was working;  
25 Jan : detailed debugging has been done by OF team and now it appears all the 4 wavelengths and hence 8 gbps lines are functional -- only one wavelength is marginal (to order spares for taking care of such issues); also remote monitoring facility at Rajgurunagar with SMS facility to be activated.  
15 Mar : spares have been ordered; monitoring unit is ready -- small change needed in software and then can be installed.  
5 Apr : not yet installed, waiting for Rahul Bhor.  
24 May : spares for the links have arrived and are available; monitoring unit is now ready for use; some changes in IP address needed in units at Rajgurunagar to activate the system; also some spare cards are needed to make things fully functional at all locations.

## 2. RFI related :

### 2.1 Spectral line RFI (PAR/SSK) :

#### (i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks  
28 Dec : RFI team visited Junnar cable TV operator for getting response to letter that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.  
25 Jan : discussed with Jondhale -- he will speak to the party and see if some progress can be made; otherwise to escalate the matter; also to estimate the number of splitters etc that can be provided to W-arm operator to mitigate the problem.

#### (ii) Digital TV follow-up

23 Nov : letter is still pending !  
25 Jan : need to expedite the matter !

#### (iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source  
11 Jan : 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.  
25 Jan : need a site visit to understand better.  
3 May : new RFI line (set of lines) observed at 467 MHz ! (need to identify the source)  
24 May : for 402 MHz line : trying to identify any relevant weather station that fits the bill (!) -- needs some more work; for 467 MHz lines, still no clue.

### 2.2 Satellite RFI monitoring & avoidance system (PAR/SNK) :

#### (i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and ,, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)  
25 Jan : need to follow-up on identifying for LEOS.

#### (ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)  
25 Jan : new limit is about 8 deg -- to cross-check if ok and close.

#### (iii) Plans for sending information to back-end receiver chain

25 Jan : to check with Santaji about the plans for this

#### (iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week  
28 Dec : no updates.

25 Jan : to include in the plans for visit by Nick Rees in week of 6th Feb.  
24 May : some of the pending jobs : need to characterise some of the remaining satellites.

### 2.3 RFI from power lines and transformers (PAR/RVS) :

- (i) review current status
- (ii) specific follow-up actions

23 Nov : not discussed

25 Jan : no updates.

24 May : this activity needs to be revived.

### 2.4 RFI from LED lamps (PAR/RVS) :

- (i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

- (ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

25 Jan : report has been circulated; solution looks promising; to try for compact version of the solution; working with workshop to mechanical items; will need to order some components for bulk production.

08 Mar : LED panel/ tube light shielding : report generated on tests - broad band radiation from commercial units (x4 units in one box) - shielding is ~ 75 dB ; results appear encouraging; Syska (x1 22W), Philips (X4 20W); -150 dBm final number arrived at. high failure rate of LEDs due to voltage fluctuations;

11 Apr : new model of LED light identified with very low level of RFI (none at all !!?) Hi-Lite 15 W; sample unit of this LED panel displayed; agreed to procure a few units and do a thorough follow-up.

26 Apr : demo of RFI free LED lamp 15W done (in lab, x5 units have been assembled); plots of RFI from LED lamp displayed : 15W (5 units) ; 26W (1 unit) HI-LITE 15W unit's RFI (ON & OFF) identical noise floors; similarly 26W lamp also shows RFI same noise floor for ON or OFF; also tested at all GMRT band : clean (no lines); upto -130 dBm level; conclusion : 15W units can be used for corridor lighting

3 May : x5 LED lamp (15 W) units installed in corridor

24 May : no RFI seen when 5 nos of 15W lights used together; can we decide about this? main question is about establishing best levels and also absolute calibration; for the first, can try with higher gain amplifier; for the second, to complete the exercise of mapping the power levels to antennas.

## 2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested; 8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.

4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified units -- all are ok. Need follow-up as mentioned on 28 Dec.

18 Jan 17 : all 10 units tested and cleared; now OK to use this 2nd batch of 10 units in antennas; need follow-up on status of ordering last batch of 14 units.

25 Jan : matter closed for now from RFI team side; to take up when next lot comes.

12 Apr : indent process for the last lot was held up due to issue of exact specs for RFI related properties (!); finally, agreed to go ahead with the existing clause as likely there will be one round of modifications needed if some specific part is changed by the vendor. Electrical team to expedite the paper work.

24 May : to check status with RVS

## 3. Operations related :

### 3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) :

#### (i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.

28 Nov : still waiting for 80 nos PCBs to come.

11 Jan : 84 PCBs received; can go ahead with further assembly now.

25 Jan : this can be closed.

#### (ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);

28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.

11 Jan : 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.

25 Jan : Rabbit card enclosure now going smoothly : about 2-3 per week; to send some samples for RFI testing.

22 Feb : 18 are done; 19th ongoing.

15 Mar : 23 completed; one unit given to RFI team for measuring shielding.

5 Apr : going on track, will finish all 30 by April end.

19 Apr : Ops group to talk to FE group to start regular supply of Rabbit + shielded enclosure for installation and commissioning of common boxes for antennas.

3 May : x28 boxes are ready & tested; can be handed over to FE whenever asked.

#### (iii) status of mass production of network switch enclosure

23 Nov : 28 units ready (need total of 35)

14 Dec : now 32 (of 35) ready;

28 Dec : same status of 32 out of 35.

25 Jan : 32 out of 35 completed; remaining 3 are in use and will be done when free; meanwhile, to send a few samples for RFI testing.

22 Feb : some sample unit(s) has been given to RFI team for testing -- Raj to confirm; to check if all shielded connectors are procured or not.

15 Mar : samples have been given and tests are being carried out today.

19 Apr : confirmed that all 32 boxes have shielded connectors; to check with RFI team about results from RFI tests of integrated system.

====> to confirm with PAR about the report.

### 3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

(i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing

23 Nov : C00 & C10 are mostly complete (item could be closed?)

28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.

(ii) plans for going beyond 2 antennas

23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)

28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?;

elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.

11 Jan : mechanical completed for 10 antennas; electrical completed for 13 antennas; Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.

25 Jan : mechanical has resumed work; same for electrical; will be updating spreadsheet; column for servo has been added in spreadsheet -- to remind them to start updating;

15 Mar : mech has completed 13 antennas; electrical has installed all the UPS units (23), other changes need to be checked; servo has completed 10 antennas.

5 Apr : 8 antennas completed for M&C systems; 3 extra Miltec to be tested; 4 are non working -- being looked into (total of 15 Miltechs); apparently no change in status of other systems (mech, elec, servo) -- JPK to check and follow-up.

19 Apr : servo has completed 15, electrical has completed 23, and mechanical has done 13 antennas; M&C system on 8 antennas, 2 more are ready + 1 in testing in lab; Ops group needs 5 nos of 2 TB disks and comp group has provided 2 nos -- to arrange for ~ 10 nos of 2 TB disks.

3 May : x5 total disks (2 TB each) were given to OPR group; x2 used to replace old disks ; x3 available for any application

24 May : 10 antennas completed for M&C system installation (+1 in lab), including putting the new disks into use -- can go ahead for useful testing with this system (see alternative week agenda).

====> 15 antennas servo to UPS rewiring completed; mechanical will pick-up after 15 June; M&C installation still at 10 nos.

(iii) update on improved RFI shielding at antenna shell

23 Nov : shielding test measurements done for present configuration; awaiting finger-lines to be added before repeating the tests (which antenna?)

28 Dec : folder in process for placing order for the finger-lines.

5 Apr : no updates.

### 3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems

28 Dec : Ops team has a plan for this; can be discussed in detail next time.

11 Jan : final plan placed on web portal (for lab people)

19 Apr : 8 + 2 + 1 units as given above; further growth constrained by availability of Miltech PCs only.

24 May : now populated on 10 antennas and using 2 Rabbits at antenna base for controlling servo, FPS, OF, FE, sentinel (tested concept) to test shortly with

new version of LMC s'ware (but old CMC s'ware); need some cooperation from servo for changing PC104 from serial to ethernet upon choice (discussed with SS and he will discuss with Thyagarajan); for parallel connections to other systems, some further planning is needed.

(ii) plans for switch-over -- to make it as seamless as possible.

30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.

28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.

25 Jan : can defer till after the demo.

22 Feb : Ops team appears to prefer scenario 1 -- incremental approach; to generate a note within next 4 weeks on this.

15 Mar : still pending for team to send a draft doc.

5 Apr : still pending.

19 Apr : can check again with Ops group next week, for a possible discussion 2 weeks later.

26 Apr : discussed draft document produced by Ops team on long-term plans for installation of new M&C system; general agreement for incremental approach noted; next level points to be addressed discussed -- doc to be updated with these and taken up for discussion...

3 May : incorporating points that came out from discussion into the change-over-plan note.

24 May : updated doc has been circulated; can be taken up for detailed discussion next week; meanwhile useful discussion on how to coexist between MCMs on RS485 bus and new system;

==> updates about the discussions and outcomes from GSG meeting; more discussions about

### 3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)

14 Dec : HP layer3 switch finalized; budget quote Rs 3.5 lakh; indent prepared.

11 Jan : item can be closed.

(ii) Plans for procurement

23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.

28 Dec : indent raised.

25 Jan : procedural issues related to advance payment etc...

22 Feb : not clear if this matter has been resolved before Charu went on leave...

15 Mar : need to check with Charu.

5 Apr : HP make layer-3 switch has no issues about advance payment and order has been placed and delivery expected by end of this month; the advance payment problem was for SFP adapter -- this needs to be resolved.

19 Apr : matter is resolved and delivery is expected by end of this month.

3 May : switch has arrived at Pune

24 May : item has been tested ok; can initiate the plan to put this in the M&C rack and shift antenna eth connections to this switch (instead of OF group's switch) and start using this arrangement.

### 3.5 Interfacing and control of new systems such as Noise Cal & Walsh :

For 10 antennas which have new 1st LO system (LOFSW based units), need to be clear about the control path; also 2 of these antennas have independent MCM for driving the new CPLD; need a wider discussion about M&C for new system for these aspects related to Noise Cal and Walsh.

22 Feb : need 2 CPLDs in new set-up : one for new FSW LO, one for Walsh + Noise on-off

etc, and both can't be connected to MCM 2 and hence an additional MCM is needed. To find out a way around this issue, so that progress can be made...

15 Mar : 2 options are being explored by BE team without increasing the number of MCMs from present count; some prototypes are being tested and will be reported upon shortly. For the longer term, need to see if antenna based Rabbit card can fulfill these roles.

3 May : tests with different interfaces done; avoiding additional MCM (beyond x2 MCM) successful [but with OLD MCMs]; in new MCM, use of control pins of MCM used for sentinel will suffice.

24 May : summary issues : if any M&C system takes control of the RS485 bus then it can meet any MCM requirements -- this may be the way to go for the final M&C system; finally, the functions that are needed for uGMRT only (noise and Walsh related) will have to shift to Rabbit card -- whether capability exists in the single Rabbit at antenna base needs to be confirmed.

3.6 Update on Rabbit Card in Common Box : follow-up from discussion of last week to track the progress and latest situation...

19 Apr : FE team plans for roll-out discussed above; Ops group to provide required number of Rabbit in shielded card; main remaining task is to get the FE monitoring working on the Rabbit interface to FE system : CPK has been doing some debugging to get to the bottom of the problem; JPK and CPK to sit together to see if earlier work done on 15m with Labjack for similar control of FE system can help.

3 May : points closed; new box being out on C01 (at the antenna base tests were successful; now going to turret (today itself; 03-May-2017).

#### 4. Back-ends related :

##### 4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

11 Jan : one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

25 Jan : s'ware work for the above is still in progress.

15 Mar : still in progress, no new update.

3 May : x1 ADF-4350 system ready (tested in lab) with switchable freq & power level attenuator; characterization in progress with web-browser (from ONLINE); but need command line functionality (Jitendra had to do); next, ADF-4351-s needed for individual antennas.

24 May : only new command in online has to be created -- JPK will look into it next week; meanwhile, option to switch DDC LO to achieve the freq offset is also being developed and cmd line interface for this has been made ready; both options can be released together in few weeks to the user; team can now start thinking about soln for 1st LO for the antennas.

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in

progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

11 Jan : one rack modified (4 antennas) and systems being tested; will report shortly, and if everything ok, will go ahead with the mods for all the 8 racks.

25 Jan : same status as above; test report has been circulated internally.

15 Mar : will complete the modifications for all racks in MTAC; meanwhile, the filters can be used with unequal gain in different antennas; command is available to control room and can be tried.

5 Apr : phase jump problem requires use of 4350 IC circuit -- this has been tested in GAB on one antenna both pols and found to work OK; need to repeat same test with 4351 IC also and then bulk order of 4351 IC can be done (will take about 2 months); will need modified CPLD based ckt + software for using 4350/51 at antenna base as 1st LO for legacy system.

12 Apr : follow-up discussion with users like NK indicates that higher priority for having GAB + GWB uGMRT working without phase jump on switching, and solving the problem for legacy GMRT can be lower priority; accordingly, 2 possible solution options discussed for uGMRT : (a) have 2 signal generators set for the 2 frequencies needed and switch their output to the common LO signal line on the switching command (b) have one unit of the new 4351 IC completed with proper control logic to act as the single source of common LO; agreed to aim for option (b) on time scales ~ month or so.

3 May : closed now ?

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.

14 Dec : changes to DRAFT report in progress;

11 Jan : still in progress -- not ready yet.

25 Jan : no new updates.

15 Mar : no new updates; BAK to check.

4.2 Power equalisation scheme and relate topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

11 Jan : still pending

25 Jan : revised version circulated internally.

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

15 Mar : BAK to check and get back.

5 Apr : Atul has initiated the discussion with control room colleagues; SRoy + Nilesh discussion now has the basic code working and SRoy is doing some testing and debugging and will report the result in few weeks, after which one could talk about releasing the package with the different modes.

3 May : only plot routine remains (discussion pending - may happen today itself)

4.3 Updates on existing GWB-3 system :

(i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

4, 11 & 18 Jan : no progress on this upto now, due to work on release of 30 antenna system.

25 Jan & 15 Feb : still pending.

15 Mar : SHR has not yet gone back to this topic.

5 Apr : new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

12 Apr : agreed for BE team to repeat noise source tests and check carefully for spurious lines; then repeat with sky signal as needed.

26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction : geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.

17 May : DDC related updates :

(a) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and release for users.

(b) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.

24 May : for shape equalisation, some fine tuning being done by SHR; for spurious lines, not clear what is the best way forward -- need to check if it is part of the ADC related effect or not and whether maintaining higher input levels can help mitigate the problem..

31 May : agreed that the latest version of bandshape correction looks ok and can be released in the next version of GWB; for spurious spikes, some further tests suggested, also to look into optimising the power levels at input for the narrow band modes.

(ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?

14 Dec : problem perhaps in AIPS settings; matter can be closed ?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov 16 : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated; this is completed.

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on

1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate;



maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT lose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

8 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); But, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain  
(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.

11 Jan : no further work on GWB; plan is to have similar change for GSB during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

8 Mar : plans for work on GSB during upcoming MTAC -- needs a discussion.

3 May : nearly closed; hot air sucking mechanism needed (being explored with

Nandi's help).

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (but may come earlier?)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up in delivery; to follow-up closely.

11 Jan : YG to follow-up with nvidia and micropoint.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

3 May : waiting for adapters to arrive;

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : no specific updates, except that code optimisation will need to be done.

14 Dec : need a discussion to decide the way forward on this.

4, 11 & 18 Jan : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion on long-term issues to be taken up next week.

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working;

calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

19 Apr : for ver 4.5 : calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).

3 May : SOP already released (v 4.5)

17 May : trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.

#### 4.5 Network related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half system

4 Jan 17 : this is done -- to confirm and close.

(ii) updated IP table for .4 n/w to be made available by computer group

4 Jan 17 : work ongoing -- to check status with comp group.

3 May : completed

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.

3 May : GSB & GWB diagrams available ; completed

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines is possible with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together to NCRA end; comp group to set up the test, alongwith VVS at Pune end.

11 Jan : 3 connections made to gwbh1-3, and live test demo done; it appears that only 2 of the 8 x 1Gbps links from switch to aggregator are working ! This needs to be debugged between comp group and OF group.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

4 Jan 17 : comp group agreed to look for options.

15 Mar : can be taken up next time.

#### 4.6 Longer term plans for GWB-4 (SHR/GJS/ICH/SSK/BAK) :

List of tasks going forward (needs to be prioritised) :

(i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link (GJS+MGU)

(ii) Disks for data recording, including trials with SSD options (GJS)

3 May : restarted the tests on normal disks

(iii) investigating next gen GPUs -- to benchmark sample Pascal units from nvidia (SHR)

19 Apr : to be tried next week.

(iv) migration to next version of CUDA (7.5 and beyond) -- to decide the steps

23 Nov : CUDA 7.5 is being tried in the new version of GWB -- confirm present status

19 Apr : confirmed that all v4.5 is on CUDA 7.5 and no upgrade in near future.

3 May : installed CUDA 7.5 on all machines; next cycle may go for 8.0 which is now available

(v) DUT correction and timestamp related issues : to confirm present status and decide future course of action (SSK)

19 Apr : still pending.

(vi) towards PFB option : resurrect old code into new GWB5 & compute the overheads (SHR)

(vii) towards a gated interferometer : to look at the MAC code that can do the gated integration; to send the gate information to the GPU from CPU (SHR/SSK/YG)

(viii) improving availability of beams by reducing beam I/O : 16 bits to 8 bits for

IA/PA beams and 8 bits to 4 bits for voltage beams (SHR/YG)

(ix) options for an additional network for even better I/O capabilities (SHR/GJS)

(x) PA - IA beam mode as an additional option with IA or PA modes (SHR/SSK/YG)

(xi) making 4 PA (or voltage) beams point in 4 different directions -- SSK to look into the change in code needed for this, starting with astrocal

19 Apr : SSK has done initial study and plan for generating parameters for all 4 beams from same call to astrocal and then pass to the beamformer; beamformer code needs a change to do one extra multiply by complex number whose phase is calculated on the fly based on antenna, channel, time and beam number.

3 May : initial note from SSK;

(xii) towards more general multi-beaming in the long run

(xiii) archiving of beamformer data : better header and also finding what metadata is required -- SSK to look into this, in consultation with Deepak Bhong.

19 Apr : to follow-up with DB in next few days.

(xiv) getting second copy of data to separate cluster going : for both raw voltage recording, as well as for multi-beaming kind of work (GJS/BAK)

19 Apr : to see if one node (with new disks) can be made ready and put in one rack and connected to Roach board -- can grow to one m/c per rack with separate IB switch...

(xv) decide on 2 vs 4 inputs per Roach board for final configuration

(xvi) net-sign correction -- confirm current status and decide if further action is needed (SSK)

19 Apr : current status is that adhoc sign flip has been introduced for both corr and beamformer header info; proper modification in code needs to be decided : when & how.

(xvii) full backward compatibility of off-line utilities (SSK)

23 Nov 16 : some work has been done, but not clear if this meets / works for all requirements.

19 Apr : has been done and released and users have used it.

4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

(i) Summary of current status for temperature monitoring

3 May : cacti released to control room;

(ii) Plans for future enhancement and release for regular use

(iii) Monitoring of other health parameters

14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack (uses DAQ card);

28 Dec : not discussed.

11 Jan : no significant new updates.

25 Jan : no new updates, but plans for collecting the temp data and bringing to common m/c that is accessible to control room is being planned. installation of cacti also to be taken up.

15 Mar : machine has been made ready; cacti has been installed; gradually adding nodes to the list and making them ready for monitoring; a separate home-grown product (using cgiplot) also being made ready for monitoring IB network.

19 Apr : cacti for temp monitoring for all GWB nodes (temp of cores) -- available on web browser; to release to control room and users and add in GWB SOP; cgiplot -- home grown version that allows to read the raw data and display using cgiplot in a more flexible manner (right now on hold); for IB monitoring : collectl was being used for IB monitoring (right now on hold); for disk usage, cacti has an option, can be released alongwith the temp monitoring. Additional homegrown tool (IMH + others?) also available -- need to check and see what should be the final form.

3 May : during MTAC, temp displays in CORR room added; (plot facility etc); control room can always see display of temps : inlet air & outlet air

4.8 Other issues :

(i) Cross-coupling tests in GAB + GWB

14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?

28 Dec : some issues need a bit more of discussion before reaching a final conclusion.

11 Jan : ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%

25 Jan : no updates; needs a discussion.

(ii) Walsh related work.

14 Dec : some tests in progress; porting to GWB (Python package being modified);

28 Dec : work is still ongoing.

11 Jan : porting work is nearing completion.

25 Jan : now in testing phase (on GWB2).

19 Apr : some corrections done for accommodating existing connectivity of GWB of pols with nodes; second correction done for drift of Walsh pattern due to digital bug; will proceed for noise source and astro tests using GWB2.

3 May : delay hunting programme has some bugs, being fixed; debugging in progress.

5. Other items :

5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need to agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

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## Updates from the Plan meeting of 14 June 2017

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(in lines beginning with '==>')

### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov 16 to 8 Mar : offset was fixed (with help from mechanical) and some tests were also carried out (in the interim) for band-4 feed (results looked basically ok) and were shared with SC.

8 Mar : offsets have been corrected; 610 MHz measurements done; other freq being done now; report awaited; method for cross-polar measurements needs review before executing.

22 Mar : new results presented : from ~ 600 to 800 MHz in ~ 50 MHz steps; to see if we can get closer to 550 and 850 MHz and repeat. Also to try Band-2 (120-250) feed and see if re-measurement of Band-3 (250-500) is useful.

26 Apr : Completed measurements for 1 polarization 550-850 MHz (in 25 MHz step). Second polarization has been partially completed : 550-725 MHz; the remaining frequency range to be covered on 28th Apr.

31 May : completed expt with new transmitting antenna (Aronia, better alignment etc); results show reasonably good agreement with simulated pattern for ~ 650 to 800 MHz range with some droop off at the edges (more so at 850); to confirm the final physical configuration of the transmitter antenna location to see if some of the smaller variations may be due to that; to check repeatability with one more feed of Band-4; to see if the set-up is more accurate now, then Band-2 feed can be retested; finally, to see if some retuning of feed can be done to improve the match between measured and simulated pattern.

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

18 Jan : manual 'digitization' of plot (hard copy) is agreed [rather than indefinitely 'waiting' for a machine readable data file to become available somehow];

15 Feb : no updates, can check recent emails for updates.

22 Mar : no updates, can keep pending for some time.

12 Apr : status quo

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

4 Jan : awaiting feedback

22 Mar : ICH and DVL reminded; will get back in next few days with comments and

then possible follow-up and closure can be explored.

12 Apr : to schedule a final joint discussion for closure, within next 2 weeks.

(ii) need to cross-check mismatch of values for band-3 (250-500);

30 Nov : will check and update, including referring to some existing literature

21 Dec : some work has been done, but needs an internal cross-check & then discussion.

22 Mar : new doc has the updated values for this.

(iii) need to see if QH losses have been incorporated into the calculations;

30 Nov : GP has done some of the work; need to circulate and get agreement.

8 Mar : report circulated; feedback awaited

22 Mar : new doc has the updated values for this also.

(iv) does the study cover all the uGMRT bands.

30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.

16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.

21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in Tsys) -- TBC.

22 Mar : new doc covers all the bands, except for 120-250 (Band-2) as measured feed radiation pattern is not available (standard 65% across the full band has been assumed).

12 Apr : measured radiation pattern not yet available; will be done after finishing work on Band-4 (550-850 MHz).

26 Apr : radiation pattern (550-850 MHz) has been given to Swagoto

(v) can it be extended to deriving the final beam pattern for feed + antenna; this is being looked into :

21 Dec : first version doc has been sent by SC -- needs follow-up

4 & 18 Jan : feedback awaited on this item.

15 Feb : to try to find a slot when all concerned are present to get to the finer points and close the matters.

22 Mar : can be presented this Friday in the polarisation meeting, and then taken up for follow-up discussion.

12 Apr : see discussion from last week's meeting; action items have been identified there, under polarisation calibration work, and this topic can be followed up there.

#### 1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document

30 Nov : yet to be completed.

21 Dec : updated & internally circulated;

15 Feb : GP to follow-up on internal clearance.

12 Apr : SSK to check and follow-up on clearing the report

26 Apr : Report has been finalised and circulated.

(ii) results from recent tests

30 Nov : running of tests has conflict with online system (JPK is looking into this)

21 Dec : all x30 Ae data collection leads to 'online' ssystem hanging; planning with x15 Ae (29Dec);

18 Jan : 'online' issue remained for '15' antenna also (after '30' antenna case failed); now suggested to repeat for '10' antenna case; test planned for a future wednesday;

15 Feb : to try with smaller number of antennas for now; need discussion with Ops group about the limitation and how it would get overcome.

08 Mar : GP & Jitendra following up today

12 Apr : 15 antenna test with online now successful; trying for 30 antenna this week.

26 Apr : 30 antenna test was done during MTAC; needs to be repeated now.

17 May : last week, 6 antennas were available and they were tested; monitoring scheme

is working; test with all 30 antennas needs white slot booking -- to be done.

==> tried with all x30 antenna : monitoring working = no hanging  
==> (results need to be checked / interpreted)

(iii) labeling scheme for keeping track of the units to be taken up for refinement and implementation

16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.

30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular back-up of the files to be worked out.

12 Apr : additional disks made available for back-up of the units; in-house development by Sanjeet ongoing -- can review in about 2 weeks.

26 Apr : software is ready; tested locally; need to feed real data & test.

(iv) Lband system does NOT have total power monitoring at present : prototype scheme being worked out by Ramesh and may be available shortly; will include basic temp monitor (for the box; not for LNA).

26 Apr : new scheme has been tested ok in lab; chassis may need modifications for final implementation.

17 May : the software has been tested; implementation is expected after STP joins; boxes are using proper numbering scheme.

==> implemented in x3 L-band systems in lab

1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system

30 Nov : same as above

21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)

18 Jan : data showed 'flat' value over 24 hrs; C3 & E2 to be tried again today.

15 Feb : not clear about the above problem (needs follow-up with Ops group); to check with 4 antenna test and report back.

12 Apr : monitoring goes hand in hand with power monitoring.

(ii) status of prototype for temp and power monitoring at OF rack at antenna base

16 Nov : sample data set taken but not long enough; to wait for next round of tests; prototype unit installed at C2 and connected to M&C system, but not being monitoring regularly; would like to do some more test and development before finalising the scheme.

30 Nov : (ii) is on-hold after prototype development; to be taken up only after Rabbit card based system is in place.

12 Apr : no change in status

31 May : GP to be asked for updates in 1.4 and 1.5 via email.

1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares

30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.

4 Jan : 4 complete sets of spares available now (ready for installation at antenna)

15 Feb : 4 spares available.

08 Mar : 5th L-band spare has been assembled - currently under test

22 Mar : now down to four spares (due to C14 problem).

12 Apr : 2 complete sets still available; 3 units under repair

26 Apr : 3rd unit was found to have some issues -- under investigation.

17 May : working on mechanical mounting for the new LNA for L-band feed (as the size



is different now); 3 spares are being maintained.

31 May : 4 units of original design ready, but 3 need verification (including temp & power monitor) before final packing; 1 new unit being made ready with new 3 stage LNAs.

(ii) finalisation of report by VBB

30 Nov : report pending with SSK

12 Apr : updated report had been circulated; can take it up for brief discussion next time and try to close.

31 May : do it next time.

### 1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs

30 Nov : some failed units are being retuned...

08 Mar : all spares available

(ii) status of new 2-stage design installed on 2 antennas : working ok ?

30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.

(ii) status of new 3-stage design : optimisation of RL was being attempted

16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better than 10 dB across the band;  $T_{na} \sim 20$  K (by old noise comm calibration scheme); to try improve further, while assembling second unit.

30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna (2 units to be made ready).

21 Dec : 2 K improvement seen ( $< 20$  K) ; report to be available in 1 week

4 Jan : second unit has been assembled; overlapping plots show good repeatability; report will be ready by 6 Jan.

18 Jan : report already circulated last week [  $\sim 20$ - $25$  K over full band; gain  $\sim 44$  dB flat; return loss better than  $-11$  dB over entire band ( $-14$ / $-15$  dB most places); worst case  $-11$  dB near lower freq band edge]

08 Mar : x6 new PCBs (x2 circuits assembled; awaiting chassis; expected next week)

22 Mar : above new units have been assembled and tested -- results look ok, will be circulated shortly.

12 Apr : 4 units of 3-stage amplifier built and compared for performance : getting good repeatability; completely dynamic range measurement and stability inside env chamber; agreed to put 4 units on 2 antennas (CSQ) and check for the performance, including change in power levels and hence change in OF attn etc.

17 May : tests remaining are dynamic range and stability with temperature (in chamber); these may get done next week.

31 May : dynamic range testing done -- prelim result is  $\sim 58$  dB SFDR and CDR  $\sim 80$  dB -- to be confirmed, and cross-checked against values for earlier designs; temp stability test to be done shortly.

### 1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB problem and W5 -- problem not identified); C14 showing poor deflection and falling at high freq -- checked for pointing and OF attn, now to try changing the feed.

4 Jan : results from tests on 13 Dec discussed : 21 antennas available; dip seen for L-band vanished after replacing common box (which antenna?), but unit appears to be ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2; W5 poor bandshape; C14 noise deflection discussed.

18 Jan : 06-Jan-2017 tests reported; (only 15 antennas were available); E6 showed ripples in CH1 (but could be cable twist; as today NOT noticed); E6 CH2 deflection HIGHER than expected (red dots) !! "measurement" error? 'naming' of file ? similarly W5 CH2; results show MAJOR drift in deflection ( $\sim 15$  dB spread !) -- BUT

NO CORRECTIVE ACTION TAKEN !! Primary purpose of monitoring is LOST ! SKR was 'un-sure' about this responsibility - now clarified; henceforth, he will follow up on errant antennas.

15 Feb : E6 ripple in Ch1 fixed (bad cable); C14 feed needs to be replaced (tbd soon); tests at antenna base for selected set of antennas shows ~6-8 dB variations -- this needs to be investigated and understood.

08 Mar : ripples were due to cables; C14 slope in deflection was possibly due to feed issue -- now new feed has been put; tests awaited

22 Mar : C14 brought down and being looked into by S Ramesh; about 10-12 dB spread in off-source values (but deflection is reasonable stable) -- needs joint follow-up with FE and OF persons.

12 Apr : new result show similar as above : deflection is mostly all right, but off levels still have a large spread;

17 May : last measurements were without any pointing correction (!); so need to be repeated; meanwhile, problem antennas fixed at antenna base (how?); equal power tuning exercise is currently underway.

31 May : no updates as Sanjit on leave.

==> 25-May-2017 data plotted (deflections) & displayed

==> CH-1 & 2 variation within +-2 dB (4 dB p-p);

==> E03 showing lower power (wrt -55 dBm)

Note1 : some antennas have old notch filter (about 5 antennas?) -- need to change these to new notch filters...

Note2 : to try sample 1000 to 1400 MHz BPF on trial basis.

1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring in control room

30 Nov : this is now available under the standard monitoring tools; control part has some problem and needs login to control PC -- SOP for this to be provided to control room.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue.

==> PC being procured (enquiry gone)

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

1.10 Mass production of Band-4 (550-850) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow; 12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.

30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity units are available).

18 Jan : system for 12th antenna will be ready by Monday 23 Jan (lab tests are in

progress now); by April x16 system target can still be met.

15 Feb : 13th antenna (C03) installed this week (2 weeks since last one);

08 Mar : dipole shortage; 14th antenna to be completed by ~ 15-Mar-2017; QC issue with dipole units fabricated by outsourced party; dipoles need to be fabricated in-house;

22 Mar : 15 antennas completed; issue of dipoles not having Nickel coated -- will come by Sat. (meanwhile, one has gone without coating and will be replaced later on);

for future orders, to do the dipole in-house and send for coating and deliver.

12 Apr : 6 nos of coated dipoles now available (small mech adjustment needed to match the holes -- need to cross-check; agreed for modifying 2 nos by putting a compensating offset holes on the cavity -- this can be tested for proper performance; meanwhile, to expedite the completion of 3 nos of in-house made dipoles and deliver at the earliest by next week.

26 Apr : x3 dipoles delivered by mech team; x1 of these gone to E5; now total x16 Ae done; remaining x2 will go next week, by 03-May-2017.

17 May : completing 17th antenna (W02) today

31 May : feeds + stools available for 5 more antennas; 18th is almost ready; after that, problem is with the mobile band filter availability due to delays with Argus ! Need to see if this can converge quickly; also initiate parallel exercise with another vendor; enough boxes are there for continuing assembly.

==> 17 completed; 18th being installed tomorrow 15Jun2017 (W03);

==> so same status as 1 month back;

Additional point : live demo of switchable notch filter at Rx room (in C09 antenna path) -- can switch in different filters -- appeared to work fine; in the process discovered that mobile signal is coming through quite strong in the Band-3 signal (!!); needs to be checked and understood.

## 2. RFI related :

### 2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting to be completed

30 Nov : YG + PAR to work on this final version.

12 Apr : needs to be actioned asap.

(ii) study of RFI environment, including internally generated RFI in main building

30 Nov : tests of individual labs : with AC units and otherwise -- shows different labs in different light; agreed to identify the worst culprits by kind of equipment etc and provide an update.

12 Apr : this is due, but has not started yet due to other activities.

(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests

16 Nov & 30 Nov & 21 Dec : no updates.

26 Apr : two experiments done :

(A) expt done using GMRT Ae as RX, & log-periodic Ae as TX; D = 100m & 300m measurements displayed GMRT Ae elev 18/45/90 deg; feed rotation done over 0/45/-45 deg (B) between x2 GMRT Ae (C1, C8) ; one as TX & another as RX; D=375m with function generator directly feeding RF to GMRT 325MHz FEED as TX; results displayed; 78 deg (3dB) HPBW

17 May : awaiting further discussion

(iv) absolute calibration of measurement set-up for RFI testing : to translate levels measured there to levels expected at antenna focus.

26 Apr : power calibrated for any lab equipment emission limit (upto what allowed) -- plots displayed

## 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database

(ii) response to pending requests for clearance e.g. Serum Institute...

21 Dec : awaiting call from Serum Institute for the next visit; asked all technical details of their planned equipments;

30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to their location for looking at specific instruments.

21 Dec : one site visited.

4 Jan : awaiting call for visit to site of the party.

15 Feb : one round of discussions have happened with Serum institute -- they would like to finish the installation and then call for testing and possible modifications; our response should be that we would like to test the existing set-up and indicate the mods to be done and these should be implemented in both existing and new setup and then taken up for testing.

Another party wanting to set-up unit for DC control drives in Junnar / Ambegaon area.

12 Apr : RFI tests planned at Serum Inst premises next week.

26 Apr : test planned on 02-May-2017 at Serum Inst premises

17 May : tests done on 2 May 17 : RFI measurements done with manufacturing units ON (full campus operational); largest increase : -63 dBm at 75 MHz -- 30 dB rise in noise floor compared to all-off condition (-93 dBm); cold room giving discrete lines in 150 to 250 MHz range (-75 dBm peak); shielding measures need to be advised to Serum Institute; detailed report by later today.

==> communicated about need for improvements in shielding

(iii) work out new action plan, given the current government policies

08 Mar : MIDC people from Chakan came to GMRT for exploring possible sites for new industry zones; following discussions, agreed to our request to avoid heavy industry in GMRT area -- maybe IT related in Peth etc; also about help in surveying sites for level of RFI etc -- how is this to be formalised -- we should send a letter from our side; check with JKS.

similarly, there is a note from DAE asking for things that need protection -- to see if JKS can follow-up on this.

## 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters

30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems (they are the only one to have got license in this range) -- it is strong enough to cause saturation in spite of filter; need to find the specific towers and then follow-up with Reliance.

18 Jan : measurements happening this week; update by next week.

15 Feb : completed survey of 82 towers around Y-array : 14 towers in 850 band (Reliance Jio) and 6 towers in 950 GSM band; rest are in 1800 band. Max power in 850 band ~ -16 dBm (at ~ 100 m distance) for few towers. Follow-up for both 850 and 950 being pursued, including dialogue with Reliance Jio to see if they can switch to 1800 band.

08 Mar : draft letter circulated (vendor is generally positive; but formal communication needs to go soon)

15 Mar : New results : characterisation of mobile phone RFI in the GMRT campus -- some interesting plots; using JIO CDMA uplinks and their effect can be seen.

==> letter to JIO CDMA sent already; Doordarshan is being sent shortly

## 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems

30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need to identify which make is coming finally.

21 Dec : no updates.

15 Feb : 33 nos (Voltas instead of BlueStar) have arrived; need to finalise the locations and the specific schemes for installation; need to make shielded units for all 33 nos; components for 25 units are available; boxes for 10 nos are in hand except for back plate and chromatisation (expected to take one week); work request for next 10 has been given (repeat order); some difference in wiring for Voltas unit -- needs some rework of the design / layout; also one type of connector is different and this also needs to be resolved; PAR to send an email explaining the steps to be taken to complete the RFI shielding work, and expected timelines for the same.

Regarding installation : there is a table giving the locations for 31 units (including replacements of 5 existing units) -- to check if outgoing lines can be behind the unit; to install sample one unit in canteen annexe, test the RFI shielding.

08 Mar : one set of measurement done (without shielding) - under analysis; by next week shielded case will be measured & compared; RFI group designed shielding box pictures displayed; uses many cables with RFI shielded interface connectors; it includes high current carrying (220V AC) lines, needing shielded connectors !

12 Apr : 10 AC units have been installed; only 3 have the RFI shielding installed (are the other 7 being used !); 3 more RFI units are getting ready; to speed-up the remaining RFI units; and then go for the next batch of AC units; meanwhile, one bump of RFI remains at around 325 MHz -- may be coming from blower assembly : to disassemble on unit and check for source of RFI.

17 May : 12 units are now in operation with RFI shielding; prototype box from new vendor has come and not found suitable -- modifications told to vendor, corrected unit may come in few days.

==> x20 new units arrived at Pune campus; sent for yellow chromatisation;

==> NEW points : shielded ethernet enclosure x35 units placed workorder

==> aluminium C-channel based unit (at Pune W/S)

### 3. Operations related :

#### 3.1 Interfacing of FE with new M&C system :

(i) latest status of testing with Rabbit card in common box at antenna base

16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).

30 Nov : no new updates on this

21 Dec : antenna control part is working; FE monitoring still not working; Charu is looking into this...

18 Jan : trying with different delay to see if it solves the problem, but not yet working with online control...

(ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus

16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration and testing in 2 weeks time and put on first antenna with RS-232 cable driving; later to convert that to ethernet over fibre; mass production may need only new plates to be made by workshop -- other aspects are in-house in FE lab.

30 Nov : item also being discussed under FE agenda item (in alternate week)

18 Jan : final status is Box #1 was made functional at antenna base and was taken up to antenna focus as Box #2 does not work reliably -- hangs and needs power reset (has been tested with a couple of different Rabbit cards?); problem not solved; agreed to try the option of swapping the Rabbit cards between Box #1 and Box #2 and seeing what is the outcome. To report this by tomorrow and then decide if a 3rd box needs to be made ready.

25 Jan : testing of common box with Rabbit card : new clue related to grounding of enable signal of decoder IC may provide the breakthrough -- tested in lab and will take to antenna base now.

15 Feb : email update from Raj Upgrade : One rabbit MCM has been installed at C01 antenna dish focus; MCM communication is proper but needs to give hardware reset while changing frequency band.

08 Mar : it is working only for some bands (C01); needs rethink on strategy.

22 Mar : problems persist; long discussion about what may be the cause; need to get a proper wiring diagram to check the grounding of the system for possible loopholes that may be causing the flaky behaviour...

5 Apr : useful discussion alongwith wiring diagrams; two possible causes identified : old FE power supplies may be having more noise (200 mV) than the new ABR power supply (50 mV) -- to try C01 with the new supply; Rabbit card has ground to common box chassis (unlike MCM-5 card) -- can try to isolate this in the second box being made ready and take to another antenna.

12 Apr : common box on C1 now working properly (!) -- problem was in sequence of commands sent from control room -- there was a monitor command sequence in the cmdfile that was the culprit.

Agreed that only main bottleneck remaining is monitoring of FE system -- this can continue in parallel, even as we go ahead with mass installation of the Rabbit based common box; third stream of activity to be initiated is lab test of ethernet based control of Rabbit card in common box, via optical fibre link (bypassing cable ethernet).

26 Apr : update on monitoring aspect : problem found with 4 lines on interface card that appear to be picking up spurious signals; isolated by connecting straps directly from IC pin to destination point and solved the problem; to confirm that problem clearly identified and solved; and then agree on changes to be made to PCB via straps (after cutting the offending tracks) and implement in mass production.

17 May : above solution implemented for 2nd box also and found working ok; put up in place of original common box on C01 (due to low fringe call sheet due noise-gen all the time); to test the failed unit to see if cause is in new M&C system or in some aspect of common box; for the PCB, agreed to make a new version, but work in parallel with modifying existing versions with straps to keep the production rolling; same strategy for modification to accommodate OF receiver.

31 May : new box on C01 is working fine; older version that had come down has problems identified (not related to Rabbit control) and are being rectified (change of one interface PCB; old one to be debugged by SC) -- to find the spare cards and use for now; in addition, wiring for 2 more boxes is underway. To check separately about OF work on common box.

==> C01 has been working for last one month; FE group wiring x2 more boxes;

3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgeetary quote; formal quote expected shortly.

4 Jan : folder cleared ; PO should be done shortly.

18 Jan : Order has been released; full delivery time is 3 months; first box to be supplied earlier and tested...

15 Feb : email update from Raj Upgrade : expecting the delivery of one Miltec machine shortly; also initiated talk with Miltec to supply it as early as possible.

08 Mar : one unit has come; will be tested & feedback given to Miltech

22 Mar : new Miltech PC put through RFI test; informal report : looks ok; formal report may take some time.

12 Apr : go ahead given to Miltech for full delivery.

26 Apr : CPK to call and check the status.

17 May : CPK yet to call.

31 May : Party had confirmed plans for delivery in 2-3 months time scale -- to check if it can be expedited and/or delivered in batches; meanwhile, out of 16 existing,

14 are working (10 in antennas, 4 in lab); more disks being ordered for Miltech PCs.

==> Miltek said under production; no speedy delivery possible; usual delivery schedule;

Addition item : issue of Windows software licences discussed (with MSU present) -- agreed to go ahead with ~ 20 stand-alone licenses for use by tech groups.

17 May : MSU reported that he is looking into it.

31 May : MSU presented some confusing feedback from different vendors -- yearly license cost, with terms and conditions; MSU to assemble the possible options and report back.

### 3.3 GMRT M&C sytem Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal meeting.

4 Jan : internal lab meeting held on 3 Jan (now every Tuesday)

08 Mar : all team members are clear on their respective roles & are contributing

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans

30 Nov : discussions ongoing; kick-off meeting planned.

21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.

4 Jan : regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary' etc shared with TCS.

18 Jan : work ongoing; need more regular interactions of TCS with GMRT team members.

15 Feb : email update from Raj Upgrade : 2 CMC and 6 LMC machines are UP & running; team members are now very much familiar with CMC, LMC installation, features, testing and can carry independent tasks.

08 Mar : interim review held; schedule is 6 weeks slippage/ delayed; mitigation planned for that delay;

22 Mar : work progressing; may test sub-array and tracking in coming MTAC.

26 Apr : could not meet the above target due to modifications for A&A issues and other things; work is ongoing at present.

17 May : tracking routine completed; LMC, A&A and data-base schema work not yet converged.

31 May : new ver 2.2 released last week -- tested and feedback given; further tests to be done this week.

==> LMC v 2.3 expected now but power shutdown led to delay (Friday 16Jun2017)

==> CMC v 2

==> after tests are successful (~ 1 week), phase-2 delivery will be over;

### 3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for material for review committee started

30 Nov : dicussions and work ongoing, including preparations for discussions with TM review panel.

21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase : requirement compatibility; architecture explanation given; scalability etc; need many upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;

4 Jan : preparation of docs in progress; ph-2 work now beginning...

18 Jan : aim to have 6+ antenna set-up with PC + switch + Rabbit talking to Sentinel + OF + Servo (to check if existing PC104 will work directly) or not; to check enough Miltech PCs available -- Sumit and Mangesh to look into it.; need to move from Fedora to Ubuntu; aim to start testing at antenna base by 23/24. Additionally, need some temporary space (couple of months) for working on 2 PCs in or near control room...

15 Feb : Last week 6 antennae Control & monitoring system was set-up and demonstrated to SKA reviewer (Nick Rees) and SKA India team.

08 Mar : SKA committee is reviewing our work; cost estimate proposal from India was submitted to SKA claiming 50% saving on TM work using Indian scheme;

26 Apr : discussions ongoing; need to prepare an updated response to new version of report expected by tomorrow or so.

17 May : all done and completed.

Back-up of interferometry data from GWB : some issues when switching over from gwbh1 to gwbh6, but appear to be resolved now.

#### 4. Back-ends related :

##### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh paper needs to be looked into for revision; nothing really pending, except for the report on the attenuation values : new set of tests done and results look ok and will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed); may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?

4 Jan : To follow-up on GWB refereeing process.

18 Jan : GWB response received, relatively minor modifications are needed and SHR is looking into this; for Walsh, waiting for response -- can check after 20 days (end of this week / early next week).

26 Apr : no new issues here.

##### 4.2 Updates on existing GWB-3 system :

(i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

4, 11 & 18 Jan : no progress since last time.

25 Jan & 15 Feb : still pending.



22 Feb & 08 Mar : band shape correction yet to be implemented -- can be taken up now.  
15 Mar : SHR has not yet gone back to this topic.  
12 Apr : still pending  
26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.  
3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction : geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.  
17 May : DDC related updates :  
(a) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and release for users.  
(b) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.  
24 May : for shape equalisation, some fine tuning being done by SHR; for spurious lines, not clear what is the best way forward -- need to check if it is part of the ADC related effect or not and whether maintaining higher input levels can help mitigate the problem..  
31 May : agreed that the latest version of bandshape correction looks ok and can be released in the next version of GWB; for spurious spikes, some further tests suggested, also to look into optimising the power levels at input for the narrow band modes.

==> released (bandshape correction) in the current version itself  
==> spikes issue no update

(ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes; for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?  
30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be closed ?  
14 Dec : problem perhaps in AIPS settings? matter can be closed?  
4 Jan 17 : to keep open for some time till ICH confirms with one more data set.  
15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated; this is completed.

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT lose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

08 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); but, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain

==> providing the 'log' at the end of observation for now

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready; appears to be satisfactory (though no improvements in ambient temp recorded ?).

11 Jan : no further work on GWB; plan is to have similar hcnage for GBS during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of IU nodes hosting ADCs may be needed.

08 Mar : plans for work on GSB during upcoming mTAC -- needs a discussion.

3 May : nearly closed; hot air sucking mechanism needed (being explored with Nandi's help).

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (may come earlier)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep looks like resulting in some speed-up in delivery; to follow-up closely.

11 Jan : YG to contact nvidia and micropoint persons.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

3 May : waiting for adapters to arrive;

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : need to plan the code optimisation that will be needed.

14 Dec : need a discussion to decide the way forward on this.

4, 18 Jan 17 : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

15 Feb : SSK to try and restart the old 16-antenna CD pipeline code using the SOPs etc from Kishalay...

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion of long-term issues to be taken up next week (22 Mar).

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working; calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

19 Apr : for ver 4.5, calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).

3 May : SOP already released (v 4.5)

17 May : trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.

==> trial and release : documents (directory structure OK as per circulated version)

==> finalized; need to creat directories etc

4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :

(i) refinements of the first draft of the note

(ii) plans for getting first unit connected and tested

(iii) plans for testing high speed recording to disks

16 Nov : lab set-up for grabbing and recoding has been done; while continuing with this, need to work on the set-up for sending parallel copy of the data, including procurement of longer CX4 cables.

30 Nov & 21 Dec : not discussed.

4 Jan 17 : basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.

18 Jan : to test the dual copy design for correlations using existing 16-antenna corr with dummy inputs; then to connect to one machine where tests can be done for raw voltage recording and a single node correlator with flexible beamforming.

15 Feb : no updates.

08 Mar : 374 MBps speed acheived; but need slightly higher speed

26 Apr : old gwbh9 (T630 m/c) removed and T620 m/c put in for doing the further work; length of cables -- 3m may be enough for using existing slot in the racks; to look into modifications of FPGA code for more eth cores; simple code for correlation of limited number of antenna etc... longer-term plan with longer cables, more racks, more nodes etc to be thought about.

17 May : expanded design tried with 8+ disks using gulp and can be tried with GWB signals; to be tried with digital copy scheme using resurrected earlier design with 4 10 Gbe cores.

==> machine installed; code compiled in FPGA; delays being tuned for sync;

4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)

16 Nov : some changes have been made by SHR, but the sub-microsec correction still needs to be done; also to follow-up about h4k file.

21 Dec : modified code has been made, but not yet tested; can try to see if it can be made available in the current release.

4 & 18 Jan 17 : agreed to defer to next release.

15 Feb : deferred as above.

08 Mar : current release has this 'sub-microsec correction' ENABLED; it is now possible to send those values to header files;

26 Apr : updated timestamp with higher accuracy is coming now; needs to be verified for correctness; CDP vs PA timestamping still to be resolved.

17 May : one buffer offset confirmed; need to be checked for different modes

==> sending side time stamps are fine; offset must be getting introduced during processing;

4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans

(ii) spectral domain RFI filtering : current status and plans

(iii) beamformer RFI filtering : current status and plans

16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.

30 Nov : not discussed in detail.

21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file..

emulator has some changes and improvements, including random location of the RFI.

4 Jan 17 : for (i) modifications in simulator; counter mode now working -- can have 2 different modes, tested at module level, now integrated into the design, will be testing in next few days; fractional thld done in simulation, to convert to design and test. (ii) to try and run the filter in real-time from shm data.

18 Jan : not discussed, but summary of offline discussions is as follows : (i) some additional features added to RFI simulator unit; fractional threshold and counter mode now available for use in the voltage filtering unit; cumulative experience shows that we may be not using the optimal filtering technique for voltage mode -- should try the alternative approach of conversion to intensity and integration to desired time constant -- closer to a true matched filter.

08 Mar : some updates from Kaushal about looking at options for more optimised filtering of broadband time domain data :

Modified the design to support 16K window size - this is the default design now;

Fractional threshold available (tested with antenna signals) - default option now;

Made the DDC mode design compatible with the ongoing changes;

RFI Counter design ready - format to read the data including timestamp from a single ROACH complete, undergoing more tests before release;

Supporting regular tests - spectral line (Nissim), continuum (Ruta, Dharam, Ishwar);

Handling longer duration RFI using median of MAD technique - initial results are encouraging, detailed tests going on;

Looking at likely causes of missing RFI during real-time excision and at possible alternate methods for time-domain filtering;

Ongoing: Updating SOP with changes made till date;

17 May : 2 different options for MAD based filtering released -- normal MAD vs MoM of MAD; some user level tests done -- need to see the output from these for comparison; can be taken up once spectral filtering tasks with Swapnil are concluded.

==> some results displayed : comparison between MAD vs MoM techniques -  
==> MoM much better than MAD 250-500 (426 MHz);  
==> but identical (both equally good) performance at 610 MHz  
==> need user feedback now

RFI emulator: (last update email - Jan) :

Last development: Adding facility for random insertion and random amplitude of RFI  
Understanding the GUI and MCM control program - backup from Rahul Bhor;

Narrowband RFI filtering: (updates email sent periodically) :

Initial version of the code has been timed; optimized for computing faster sorting for median computation, is now much better;

Moving towards expected version of filtering code - with optimized functions to meet real-time requirements (0.671s) and necessary functionality;

Ongoing: Testing the code on recorded data and timing the code for all 60 self outputs;

Looking at synchronization between the data path and RFI filter (along with Sanjay);

Looking at merging of lta file and flags for the FITS file format (along with Sanjay).

08 Mar : now optimizing real time filtering; all bands filtering on recorded; Broad band RFI filtering : emulator tested; other techniques being explored; SOP updated; to be released next week.

17 May : code for spectral filtering of single self has been developed with spectral flags needed as per format specified by SSK and he is to modify this for multiple selfs (all antennas, working real-time) and passing flags appropriately to LTA file.

==> algo done; working on recorded data; extend to real time

==> release in few weeks;

#### 4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and tests ongoing; also tested by sending digitised packets to antenna and loop back; using GWB2 for doing all the correlations.

18 Jan : feasibility study done using C09 antenna with noise sources & real signal -- needs a fixed delay correction of 1.5 km to get maximum correlation; trying setup with E5; meanwhile, a few different tests can be tried with the C09 set-up; comparison of scheme running on GWB2 and GWB3 tried out.

08 Mar : C9 & E5 setups faced problems (ethernet card issue); now fixed; GWB2 (early digitization) & GWB3 being used for comparison; delay requirement has reduced (due to early digitization)

12 Apr : new test has been carried out with C9 and E5 on actual on-source observation and brief comparison.

26 Apr : some updates from recent tests to be available by next week; detailed report of recent work being prepared.

17 May : trying some tests with single antenna early digitisation (as only one is working).

==> summary of tests circulated; stuck with C9/SFC module (need 10 days)

#### 4.8 Time-Frequency Standards (BAK) :

(i) procurement of Maser units

(ii) planning for kind of environmental set-up required for Maser units

(iii) planning for long-term maintenance and development

16 Nov : most of the issues have been resolved, waiting for one party to complete the payment terms; pending issue about performance bank guarantee for different amounts of periods.

30 Nov : work is ongoing, but item not discussed.

4 Jan 17 : TEC clearance ok; recommendation to open price bids -- to check the status. To contact Prof Sen Gupta for a discussion.

18 Jan : final TEC documents done and sent for next step; to follow-up and check status.

15 Feb : activities ongoing...

08 Mar : Negotiating committee met the vendor (no reduction on price; but add modules 'FREE'; payment terms as per NCRA conditions); Dr Sengupta will be visiting next week; first unit delivery after 5 months; second unit 4 months after 1st delivery;

12 Apr : to take up next time.

26 Apr : to confirm date of expiry of validity and follow-up with TIFR for the folder; to check about vibration damping mechanisms available with the system and otherwise; to make a draft note for selection of the room and suggestion modifications to be taken up.

==> order yet to go (file still in Bombay)

==> need to plan room A/C shielding : ask civil dept;

==> beam steering developed; tested using GWB (calib source & pulsar)

==> working fine;

## 5. Other items :

### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

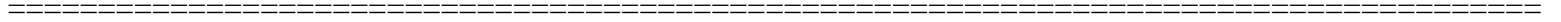
21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need to agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

12 Apr : sample unit getting ready -- length needs to be reduced; do asap and get hose

assembled and then install on C03.





swarna's inputs (in lines beginning with '==>')

1. FE & OF related :

1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in  $T_{lna}$  for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

22 Feb : first results of variation of  $T_{sys}$  for Band-4 FE unit of QH + DC + LNA

(which goes next to the hood) -- absolute value of Temp is higher than  $T_{lna}$  at ambient and also the variation of  $T_{sys}$  with ambient (0 to 60 deg C) is larger than for  $T_{lna}$  alone. To cross-check whether known loss of QH and DC at room temp can explain the room temp values and then extrapolate from there for different ambient temps.

15 Mar : new test done with QH + LNA only (compared with QH + DC + LNA) -- shows lower variation of  $T_{sys}$  over 60 deg range of chamber (35-40 instead of 55-60 seen earlier); agreed to try to estimate the loss of QH and DC with temperature and use theoretical formula along with  $T_{lna}$  as fn of temp to predict the observed  $T_{sys}$  vs temp curves and compare with the measurements.

5 Apr : new results of  $T_{sys}$  vs temp for just LNA, LNA+QH, LNA+DC, LNA+QH+DC : appears to show reasonably flat variation of  $T_{lna}$  with temp; more variation for LNA+QH; but some of the curves cross each other (and have offsets) with temp -- bit difficult to understand; agreed to try S-params for each device as fn of temp, for same RF (610); meanwhile, theoretical calculations ongoing.

19 Apr : new update, which measures loss of QH with temp, shows change from 0.1 to 0.2 dB over 60 deg and can explain the observed variation of  $T_{sys}$  with temp. To check if any info is available about loss of QH with temp; second is the mystery about lines crossing each other -- needs to be understood; then can check about extending the study to Band-3 also.

24 May : no fresh activity due to engagement in mass production work.

7 Jun : new test done for the new 3-stage LNA for Lband -- shows few (~6 deg) variation over 20 to 60 deg change in temp -- similar to Band-4 LNA; to try with typical cable length in front of the LNA. Riddle of crossing curves remains (here also); to try for Band-3 LNA.

1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible.

22 Feb 17 : only 5 antennas completed by January; request for next set of 5 feeds has been given to mechanical approx beginning of Jan -- expecting 2 dipoles shortly,

but reflector and BFRs will take some time; meanwhile one FE box is ready; to get if possible 2 more to be ready, so that 2-3 antennas can be done in quick succession. Need to have enough QH + DC (is matter of cutting right length of material and assembly); for LNA : have all PCBs, need chassis (ordered in sets of 20); same situation for BPF; however, request for new stools (with modified height) has not been given (!!); due to some rethink about optimal stool height (!); follow-up action on this : to discuss with mechanical to see if existing or spare stools can be modified / cut to meet the height requirement and use for the next 2-3 antennas.  
15 Mar : HRB had requested for 5 feeds (DRF 130-260 MHz) out of which 5 dipoles arrived and reflectors + BFRs will arrive by 18 Mar; mounting stools (1190 mm), 30 nos. requested, out of which, 2 stools will arrive on 18 Mar; hence, new installation only by next week;

5 Apr : 2 nos of feed + reflector + BFRs + stool in hand; 1 box ready; one more can be ready in next few days; can target 2 antennas in MTAC period; to see if 3 can be tried.

19 Apr : no progress now, as attention has shifted to common box for some time; now tasks have been reassigned and work on this will pick up now.

3 May : 6th box is ready in lab; will go to antenna by next week (12-May-2017)

24 May : 6th antenna done; one more can be done; after that feeds, stools etc needed; FE box for 2 more available -- more are needed. FE team to check with mechanical and get back.

7 Jun : some delay to move to the next (7th) antenna, though the units are ready -- maybe next week after HRB is back; for further units, boxes awaited after powder coating (10 nos); feeds + stools are available for next 3 antennas. May need to introduce check list for quality assurance for all the units before they are installed (can be done for all other bands as we are increasing the pace of mass production).

==> 7th & 8th antenna installation completed; next 2 antennas can be ready  
==> by ~ 15-Jul-2017; (feed availability is the bottleneck thereafter)

### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

(i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months should be enough to complete the tasks i.e. April 2017.

11 Jan 17 : 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

25 Jan : needs combined tuning of filters to fix the problem; work ongoing.

22 Feb : successful in tuning the integrated unit (for 2 boxes, both channels); and

23 antennas are completed, and work is ongoing; next antenna in about 2 weeks.

15 Mar : one more box was made ready, but gave trouble after exhibit at Science Day (!); has been made ready again (all the cables were changed). Will go up shortly.

Meanwhile, next set is getting ready.

5 Apr : 25th antenna done to ver2 level; some issues related to tuning of the integrated filters (assigned to SC).

19 Apr : 26th antenna also completed; going reasonably smoothly.

3 May : next box (incorporating new filters) will be ready this week & go to antenna [~ 12-May-2017]

24 May : 27th antenna is done; generally going ok.

7 Jun : still at 27 due to some maintenance issues with C02 -- need feedback about the oscillation problem.

==> C02 box replaced due to oscillation problem - now fine;  
==> one more antenna : so total 29 antennas completed;  
==> W03 - last (30th) will be done in a week (05Jul17);

(ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good : comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

11 Jan : analysis of Jan data awaited.

25 Jan : analysis of new data (on CasA) -- appears to be systematic 1-1.5 dB less deflection than predicted and control room values -- needs to be checked and followed up in consultation with ICH, DVL, SC & GP; few antennas with some odd behaviour e.g. E3 and maybe E2.

15 Mar : no updates as Ankur is not available

5 Apr : updates from new data; 2 antennas showing less deflection in ch 1 only -- to be investigated; not much other issues.

19 Apr : no updates this meeting.

3 May : data available, but no plots (laptop crash)

7 Jun : work has resumed, and some tests done last week (Ankur not available); to check about C02 oscillation problem.

(iii) Summary of phase centre measurements and decision about future plans

25 Jan : no action yet.

15 Mar : still pending.

19 Apr : still pending

(iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

11 Jan : data collected, report expected within 2-3 days.

25 Jan : Sougata + Ankur will provide update next time.

22 Feb : SC will send update within a week.

15 Mar : some work is still pending; SC will complete and send within a week.

5 Apr : some tests done using OF monitoring system (seems not all antennas working and also varying behaviour) : summary from 10-12 antennas, 3 sub-bands (one corrupted by RFI) : some cases show narrower BW, and some show wider BW; for narrower BW cases, coating the PCB appears to correct for most of the discrepancy -- needs a short report on this; last 5 antennas have gone up with the coating -- should be able to cross-check the performance; need to find a solution for broader BW case !

19 Apr : quality check on 24 antennas done; about 4-5 antennas showing discrepant band for most sub-bands; FE team feels confident that this can be fixed with the coating option; to make a table for all antennas all sub-bands for user to decide what to be done; to fix as and when FE box comes down for other work.

3 May : report circulated; worst affected antenna identified; after ~ 3 months will be taken up;

24 May : no new updates; can check around July.

(v) LO settings for all sub-bands etc to be finalised.

14 Dec : 250-500 LO setting document / table already finalized;

28 Dec : no updates; person on leave.

11 Jan : astronomer feedback awaited (to check if final table shared with control room).

25 Jan : Not yet shared with control room; to refine based on : 6 dB point for main BPF and 10 dB for subband filters, for the default BW.

22 Feb : draft document has been circulated to DVL & YG for trials, for 3 bands (Band-3, 4 & 5); for Band-3 which shows max variation of sub-band responses, the basic response is taken as the one found in majority of units and 10 dB criteria is

applied to that response to get the LO values; either lower or higher or both side LOs are recommended depending on the situation, and some justification has been given for all the cases; YG to check with DVL etc if this can be released to control room and all users.

15 Mar : some responses from DVL + Nilesh et al -- some clarifications sent; some more tests to be carried out this week.

5 Apr : no updates for this time.

19 Apr : DVL and co to provide update by next week; can discuss 2 weeks later.

7 Jun : FE team to check with JPK if control room is following a standard, recommended procedure.

#### 1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus

14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01); box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)

28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).

11 Jan : box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.

3 May : box #2 MCM reset option & monitoring finished; to go to C01 antenna tomorrow (04-May-2017);

24 May : replacement on C01 working ok; older one traced to interface card problem -- to be fully debugged; meanwhile spare new card will be put and made ready for installation

7 Jun : faulty unit requires one IC base to be changed and can be used again; meanwhile waiting for new PCBs to come -- to see which vendor can do this.

==> IC bases replaced with better ones - now that unit is working (unit used as spare & ==> template for other ones)

(ii) Plans for mass production

30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.

25 Jan : one box tested at antenna focus and working ok; 2nd box not yet tested at focus; even for the 1st box, repeatability is not there.

19 Apr : ready to start the mass production and installation; may be able to achieve 2-3 weeks per box in long run after first 2-3 boxes; to coordinate with Ops group for supply of Rabbit in shielded box. Also to do the R&D for getting the ethernet control option tested and going and put it into mass production -- this needs an extra input port on common box -- agreed to use 50 MHz port for immediate and redesign the plate for additional input port and put into new boxes as and when ready, without affecting the rate of mass production of common boxes.

3 May : x2 boxes in wiring stage; x1 box per month initially (later one box every 3 weeks); redesign of band-selector & interface card completed; mass production can begin now

24 May : to go ahead with the plans, introduce new cards into system as and when ready; and retrofit the new cards in older systems later on; transobs PCB also to be

included in the above.

7 Jun : to get the set-up going and then decide on the priority.

### 1.5 Apex radiation scheme (PAR/SRoy) :

(i) Current status of measurements and interpretations

(ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

11 Jan : no updates, though there has been some email discussion between SRoy and PAR

25 Jan : need to check with SRoy and PAR.

15 Mar : PAR and SRoy yet to have a detailed discussion; meanwhile another round of tests done on C1 -- showing a different pattern than C10. Need to summarise and circulate and then take up for discussion.

19 Apr : no updates, though some ongoing email dialogue between SRoy and PAR...

24 May : discussion between SRoy and PAR -- some conclusions have been reached and some action plan has been worked out between them : to circulate a brief note summarising these (as well as dynamic range measurements summary and plans), while follow-up action continues.

==> report summarizing all the work carried out so far has been prepared; yet to

==> be circulated; report displayed during the Plan meeting

==> sensitivity 250-500 MHz -147 dBm (cone dipole)

==> 1dB compression point (P1dB) : 1dBm (old); 10dBm (new)

==> temp effect 0.2dB (amp) & 2 deg (phase) due to FES & RF (stability);

==> transmitting RF power recommended :  $\geq -40$  dBm &  $< -10$  dBm

==> ELV /AZM dependence : 0.5 dB (amp) & 8-10 deg (phase)

==> (tests done on 5 antennas total)

==> another report for log-periodic antenna set up (separately)

==> report on possible limits for RFI from GMRT lab equipment displayed

==> actual levels now quantified based on details tests with Tx & antennas;

### 1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) :

Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of health of Walsh switching.

11 Jan : there is some confusion about what is being done, and what has been achieved ! For 10 antennas which have new 1st LO system (LOFSW based units), it should NOT be possible to have Walsh modulation at present !

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh...

22 Feb : now clear that only those antennas (20 ?) which DO NOT have the new synth

units can be tested for Walsh; latest tests on these (done in Jan), showed ok results for 19 out of 20 (one antenna was down due to mech problems).

15 Mar : no immediate action here; need to work out with analog BE team.

#### 1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

22 Feb : SC to check with JPK about the progress on implementation of the SOP for use by control room in normal PMQC type of tests and generation of stats to report to FE team.

15 Mar : control room people (JPK and SNK) are looking into the code written for GSB to see if it can be done for GWB.

5 Apr : SC to follow-up with JPK on the matter.

19 Apr : code has been obtained and possible issues in it have been identified; to see if the job can be taken over by control room colleague.

24 May : to see if a discussion with JPK + SN + ICH can be had on this matter.

7 Jun : to organise a joint meeting, maybe week after next.

==> programme for narrow band system needs to be edited for broad band system

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

22 Feb : to plan for the discussion.

15 Mar : agreed to make a presentation on 20th in the poln meeting.

5 Apr : presentation showed reasonable results; action items : to compare feed response with WiPLD results of HRB; compute 3 dB BW vs freq for Band-3 for feed + dish and compare with observed results; need a software with finite element method approach for this simulation -- Antsys or Fecko; to check availability in different places in and around Pune.

19 Apr : no new updates right now.

24 May : SC to follow-up and report back.

7 Jun : no updates.

#### 1.8 New filters for L-band (AP) :

(i) status update on installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing

16 Nov : arm antenna installation to be resumed;

14 Dec : all west arm will be completed by 16-Dec-2016;

28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.

11 Jan : S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).

25 Jan : only 2 antennas W-arm remaining to be done.

3 May : only one antenna (W2) remaining

24 May : to confirm if all antennas completed or not.

(ii) delivery of remaining units of main L-band BPF from Epitome

16 Nov : BPF completed and handed over to BE team -- this can be closed.  
28 Dec 16 : can be closed.

### 1.9 OF system updates :

#### (i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.

11 Jan : current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.

15 Mar : this is status quo; few extra high power lasers at 1310 nm for forward link have been procured; cards being made ready; will be used as and when loss becomes too large in far away antennas.

3 May : high power lasers (5-6 nos made ready) and available for use; for, W6 & S6 such lasers already installed about one year ago;

24 May : some evidence of loss of power of laser transmitter (1310 nm) at Rx room causing problem in telemetry link; needs retuning of laser circuitry; will be taken up one by one -- this is in addition to need of high power lasers for far away antennas.

#### (ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates

28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.

11 Jan : cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.

15 Mar : expected by end of this month.

5 Apr : OTDR not arrived yet; second fibre bundle ordered but not yet delivered.

3 May : OTDR has arrived; second fiber bundle has also come;

24 May : OTDR working well; 2 km fibre bundle arrived; 20 km spools : 3 nos were found bad and have been sent back to the vendor in US -- need to follow-up on it.

==> bad cables being sent back to vendor in US

New item : contract with BSNL for dedicated GMRT to NCRA fibre to be renewed as it is 5 yrs old. OF team to circulate the preliminary docs to all concerned in NCRA for clearance before sending ok to BSNL.

#### (iii) 8 Gbps GMRT to Pune link : it was found that only 1 or 2 Gbps was working;

25 Jan : detailed debugging has been done by OF team and now it appears all the 4 wavelengths and hence 8 gbps lines are functional -- only one wavelength is marginal (to order spares for taking care of such issues); also remote monitoring facility at Rajgurunagar with SMS facility to be activated.

15 Mar : spares have been ordered; monitoring unit is ready -- small change needed in software and then can be installed.

5 Apr : not yet installed, waiting for Rahul Bhor.

24 May : spares for the links have arrived and are available; monitoring unit is now ready for use; some changes in IP address needed in units at Rajgurunagar to activate the system; also some spare cards are needed to make things fully functional at all locations.

## 2. RFI related :

### 2.1 Spectral line RFI (PAR/SSK) :

#### (i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks

28 Dec : RFI team visited Junnar cable TV operator for getting response to letter

that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.

25 Jan : discussed with Jondhale -- he will speak to the party and see if some progress can be made; otherwise to escalate the matter; also to estimate the number of splitters etc that can be provided to W-arm operator to mitigate the problem.

==> shielded cage designed for laser Tx & RF amp devices : field test in progress;

(ii) Digital TV follow-up

23 Nov : letter is still pending !

25 Jan : need to expedite the matter !

(iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source

11 Jan : 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.

25 Jan : need a site visit to understand better.

3 May : new RFI line (set of lines) observed at 467 MHz ! (need to identify the source)

24 May : for 402 MHz line : trying to identify any relevant weather station that fits the bill (!) -- needs some more work; for 467 MHz lines, still no clue.

==> initiated dialog with IMD : letter requesting tests at their premise

2.2 Satellite RFI monitoring & avoidance system (PAR/SNK) :

(i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and ,, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)

25 Jan : need to follow-up on identifying for LEOS.

(ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)

25 Jan : new limit is about 8 deg -- to cross-check if ok and close.

(iii) Plans for sending information to back-end receiver chain

25 Jan : to check with Santaji about the plans for this

(iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week

28 Dec : no updates.

25 Jan : to include in the plans for visit by Nick Rees in week of 6th Feb.

24 May : some of the pending jobs : need to characterise some of the remaining satellites.

2.3 RFI from power lines and transformers (PAR/RVS) :

(i) review current status

(ii) specific follow-up actions

23 Nov : not discussed

25 Jan : no updates.

24 May : this activity needs to be revived.

2.4 RFI from LED lamps (PAR/RVS) :

(i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

(ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify



units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight

driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

25 Jan : report has been circulated; solution looks promising; to try for compact version of the solution; working with workshop to mechanical items; will need to order some components for bulk production.

08 Mar : LED panel/ tube light shielding : report generated on tests - broad band radiation from commercial units (x4 units in one box) - shielding is ~ 75 dB ; results appear encouraging; Syska (x1 22W), Philips (X4 20W); -150 dBm final number arrived at. high failure rate of LEDs due to voltage fluctuations;

11 Apr : new model of LED light identified with very low level of RFI (none at all !?) Hi-Lite 15 W; sample unit of this LED panel displayed; agreed to procure a few units and do a thorough follow-up.

26 Apr : demo of RFI free LED lamp 15W done (in lab, x5 units have been assembled); plots of RFI from LED lamp displayed : 15W (5 units) ; 26W (1 unit) HI-LITE 15W unit's RFI (ON & OFF) identical noise floors; similarly 26W lamp also shows RFI same noise floor for ON or OFF; also tested at all GMRT band : clean (no lines); upto -130 dBm level; conclusion : 15W units can be used for corridor lighting

3 May : x5 LED lamp (15 W) units installed in corridor

24 May : no RFI seen when 5 nos of 15W lights used together; can we decide about this? main question is about establishing best levels and also absolute calibration; for the first, can try with higher gain amplifier; for the second, to complete the exercise of mapping the power levels to antennas.

==> pending acceptance of LED lamps (already used in corridor), bulk order can be placed;

2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested; 8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.

4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified units -- all are ok. Need follow-up as mentioned on 28 Dec.

18 Jan 17 : all 10 units tested and cleared; now OK to use this 2nd batch of 10 units in antennas; need follow-up on status of ordering last batch of 14 units.

25 Jan : matter closed for now from RFI team side; to take up when next lot comes.

12 Apr : indent process for the last lot was held up due to issue of exact specs

for RFI related properties (!); finally, agreed to go ahead with existing clause as likely there will be one round of modifications needed if some specific part is changed by the vendor. Electrical team to expedite the paper work.

24 May : to check status with RVS

### 3. Operations related :

#### 3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) :

##### (i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.

28 Nov : still waiting for 80 nos PCBs to come.

11 Jan : 84 PCBs received; can go ahead with further assembly now.

25 Jan : this can be closed.

##### (ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);

28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.

11 Jan : 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.

25 Jan : Rabbit card enclosure now going smoothly : about 2-3 per week; to send some samples for RFI testing.

22 Feb : 18 are done; 19th ongoing.

15 Mar : 23 completed; one unit given to RFI team for measuring shielding.

5 Apr : going on track, will finish all 30 by April end.

19 Apr : Ops group to talk to FE group to start regular supply of Rabbit + shielded enclosure for installation and commissioning of common boxes for antennas.

3 May : x28 boxes are ready & tested; can be handed over to FE whenever asked.

==> stock of tested MCM cards was over; 1 new card tested

##### (iii) status of mass production of network switch enclosure

23 Nov : 28 units ready (need total of 35)

14 Dec : now 32 (of 35) ready;

28 Dec : same status of 32 out of 35.

25 Jan : 32 out of 35 completed; remaining 3 are in use and will be done when free; meanwhile, to send a few samples for RFI testing.

22 Feb : some sample unit(s) has been given to RFI team for testing -- Raj to confirm; to check if all shielded connectors are procured or not.

15 Mar : samples have been given and tests are being carried out today.

19 Apr : confirmed that all 32 boxes have shielded connectors; to check with RFI team about results from RFI tests of integrated system.

7 Jun : to confirm with PAR about the report.

==> 3 have been used in lab;

#### 3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

##### (i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing

23 Nov : C00 & C10 are mostly complete (item could be closed?)

28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.

##### (ii) plans for going beyond 2 antennas

23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)

28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?; elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.

11 Jan : mechanical completed for 10 antennas; electrical completed for 13 antennas; Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.

25 Jan : mechanical has resumed work; same for electrical; will be updating spreadsheet; column for servo has been added in spreadsheet -- to remind them to start updating;

15 Mar : mech has completed 13 antennas; electrical has installed all the UPS units (23), other changes need to be checked; servo has completed 10 antennas.

5 Apr : 8 antennas completed for M&C systems; 3 extra Miltec to be tested; 4 are non working -- being looked into (total of 15 Miltechs); apparently no change in status of other systems (mech, elec, servo) -- JPK to check and follow-up.

19 Apr : servo has completed 15, electrical has completed 23, and mechanical has done 13 antennas; M&C system on 8 antennas, 2 more are ready + 1 in testing in lab; Ops group needs 5 nos of 2 TB disks and comp group has provided 2 nos -- to arrange for ~ 10 nos of 2 TB disks.

3 May : x5 total disks (2 TB each) were given to OPR group; x2 used to replace old disks ; x3 available for any application

24 May : 10 antennas completed for M&C system installation (+1 in lab), including putting the new disks into use -- can go ahead for useful testing with this system (see alternative week agenda).

7 Jun : 15 antennas servo to UPS rewiring completed; mechanical will pick-up after 15 June; M&C installation still at 10 nos.

==> x16 units with servo UPS connected; x14 units with Meachncial connected;  
==> M&C still has x10 systems;

(iii) update on improved RFI shielding at antenna shell

23 Nov : shielding test measurements done for present configuration; awaiting finger-lines to be added before repeating the tests (which antenna?)

28 Dec : folder in process for placing order for the finger-lines.

5 Apr : no updates.

3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems

28 Dec : Ops team has a plan for this; can be discussed in detail next time.

11 Jan : final plan placed on web portal (for lab people)

19 Apr : 8 + 2 + 1 units as given above; further growth constrained by availability of Miltech PCs only.

24 May : now populated on 10 antennas and using 2 Rabbits at antenna base for controlling servo, FPS, OF, FE, sentinel (tested concept) to test shortly with new version of LMC s'ware (but old CMC s'ware); need some cooperation from servo for changing PC104 from serial to ethernet upon choice (discussed with SS and he will discuss with Thyiagarajan); for parallel connections to other systems, some further planning is needed.

==> see above

(ii) plans for switch-over -- to make it as seamless as possible.

30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.

28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.

25 Jan : can defer till after the demo.

22 Feb : Ops team appears to prefer scenario 1 -- incremental approach; to generate a note within next 4 weeks on this.

15 Mar : still pending for team to send a draft doc.

5 Apr : still pending.

19 Apr : can check again with Ops group next week, for a possible discussion 2 weeks later.

26 Apr : discussed draft document produced by Ops team on long-term plans for installation of new M&C system; general agreement for incremental approach noted; next level points to be addressed discussed -- doc to be updated with these and taken up for discussion...

3 May : incorporating points that came out from discussion into the change-over-plan note.

24 May : updated doc has been circulated; can be taken up for detailed discussion next week; meanwhile useful discussion on how to coexist between MCMs on RS485 bus and new system;

7 Jun : updates about the discussions and outcomes from GSG meeting; more discussions about details of the plans going forward are needed.

### 3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)

14 Dec : HP layer3 switch finalized; bidgetry quote Rs 3.5 lakh; indent prepared.

11 Jan : item can be closed.

(ii) Plans for procurement

23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.

28 Dec : indent raised.

25 Jan : procedural issues related to advance payment etc...

22 Feb : not clear if this matter has been resolved before Charu went on leave...

15 Mar : need to check with Charu.

5 Apr : HP make layer-3 switch has no issues about advance payment and order has been placed and delivery expected by end of this month; the advance payment problem was for SFP adapter -- this needs to be resolved.

19 Apr : matter is resolved and delivery is expected by end of this month.

3 May : switch has arrived at Pune

24 May : item has been tested ok; can initiate the plan to put this in the M&C rack and shift antenna eth connections to this switch (instead of OF group's switch) and start using this arrangement.

==> under test in Rx room (by Santaji)

### 3.5 Interfacing and control of new systems such as Noise Cal & Walsh :

For 10 antennas which have new 1st LO system (LOFSW based units), need to be clear about the control path; also 2 of these antennas have independent MCM for driving the new CPLD; need a wider discussion about M&C for new system for these aspects related to Noise Cal and Walsh.

22 Feb : need 2 CPLDs in new set-up : one for new FSW LO, one for Walsh + Noise on-off etc, and both can't be connected to MCM 2 and hence an additional MCM is needed. To find out a way around this issue, so that progress can be made...

15 Mar : 2 options are being explored by BE team without increasing the number of MCMs from present count; some prototypes are being tested and will be reported upon shortly. For the longer term, need to see if antenna based Rabbit card can fulfill these roles.

3 May : tests with different interfaces done; avoiding additional MCM (beyond x2 MCM) successful [but with OLD MCMs]; in new MCM, use of control pins of MCM used for sentinel will suffice.

24 May : summary issues : if any M&C system takes control of the RS485 bus then it can meet any MCM requirements -- this may be the way to go for the final M&C system; finally, the functions that are needed for uGMRT only (noise and Walsh related) will have to shift to Rabbit card -- whether capability exists in the single Rabbit at antenna base needs to be confirmed.

==> agreement reached to use existing rabbit card instead of MCM2

3.6 Update on Rabbit Card in Common Box : follow-up from discussion of last week to track the progress and latest situation...

19 Apr : FE team plans for roll-out discussed above; Ops group to provide required number of Rabbit in shielded card; main remaining task is to get the FE monitoring working on the Rabbit interface to FE system : CPK has been doing some debugging to get to the bottom of the problem; JPK and CPK to sit together to see if earlier work done on 15m with Labjack for similar control of FE system can help.

3 May : points closed; new box being out on C01 (at the antenna base tests were successful; now going to turret (today itself; 03-May-2017).

==> replicating other boxes; x2 boxes to be ready [& then to be shifted to antennas]

==> Delivery-1 Phase-2 happened; under test - reporting faults : expected to be

==> resolved within 2 days;

#### 4. Back-ends related :

##### 4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

11 Jan : one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

25 Jan : s'ware work for the above is still in progress.

15 Mar : still in progress, no new update.

3 May : x1 ADF-4350 system ready (tested in lab) with switchable freq & power level attenuator; characterization in progress with web-browser (from ONLINE); but need command line functionality (Jitendra had to do); next, ADF-4351-s needed for individual antennas.

24 May : only new command in online has to be created -- JPK will look into it next week; meanwhile, option to switch DDC LO to achieve the freq offset is also being developed and cmd line interface for this has been made ready; both options can be released together in few weeks to the user; team can now start thinking about

soln for 1st LO for the antennas.

==> DDC LO switching has been developed & tested;

==> samples for components needed for 1st LO have been received;

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

11 Jan : one rack modified (4 antennas) and systems being tested; will report shortly, and if everything ok, will go ahead with the mods for all the 8 racks.

25 Jan : same status as above; test report has been circulated internally.

15 Mar : will complete the modifications for all racks in MTAC; meanwhile, the filters can be used with unequal gain in different antennas; command is available to control room and can be tried.

5 Apr : phase jump problem requires use of 4350 IC circuit -- this has been tested in GAB on one antenna both pols and found to work OK; need to repeat same test with 4351 IC also and then bulk order of 4351 IC can be done (will take about 2 months); will need modified CPLD based ckt + software for using 4350/51 at antenna base as 1st LO for legacy system.

12 Apr : follow-up discussion with users like NK indicates that higher priority for having GAB + GWB uGMRT working without phase jump on switching, and solving the problem for legacy GMRT can be lower priority; accordingly, 2 possible solution options discussed for uGMRT : (a) have 2 signal generators set for the 2 frequencies needed and switch their output to the common LO signal line on the switching command (b) have one unit of the new 4351 IC completed with proper control logic to act as the single source of common LO; agreed to aim for option (b) on time scales ~ month or so.

3 May : closed now ?

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.

14 Dec : changes to DRAFT report in progress;

11 Jan : still in progress -- not ready yet.

25 Jan : no new updates.

15 Mar : no new updates; BAK to check.

4.2 Power equalisation scheme and relate topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

11 Jan : still pending

25 Jan : revised version circulated internally.

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

15 Mar : BAK to check and get back.

5 Apr : Atul has initiated the discussion with control room colleagues; SRoy + Nilesh

discussion now has the basic code working and SRoy is doing some testing and debugging and will report the result in few weeks, after which one could talk about releasing the package with the different modes.

3 May : only plot routine remains (discussion pending - may happen today itself)

==> SRoy : gave gain tables, which need to be merged into FITS file (by SSK) ;

4.3 Updates on existing GWB-3 system :

(i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

4, 11 & 18 Jan : no progress on this upto now, due to work on release of 30 antenna system.

25 Jan & 15 Feb : still pending.

15 Mar : SHR has not yet gone back to this topic.

5 Apr : new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

12 Apr : agreed for BE team to repeat noise source tests and check carefully for spurious lines; then repeat with sky signal as needed.

26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction : geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.

17 May : DDC related updates :

(a) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and release for users.

==> edge effect handling now completed & released;

==> closed now

(b) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.

24 May : for shape equalisation, some fine tuning being done by SHR; for spurious lines, not clear what is the best way forward -- need to check if it is part of the ADC related effect or not and whether maintaining higher input levels can help mitigate the problem...

31 May : agreed that the latest version of bandshape correction looks ok and can be released in the next version of GWB; for spurious spikes, some further tests suggested, also to look into optimising the power levels at input for the narrow band modes.

==> tests imply spikes originate from ADC itself; need to change the clock & see;

==> other repeatability tests (same spikes from same ADC card) etc remain to be

==> carried out;

(ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?  
30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?  
14 Dec : problem perhaps in AIPS settings; matter can be closed ?  
4 Jan 17 : to keep open for some time till ICH confirms with one more data set.  
15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

#### 4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov 16 : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated; this is completed.

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT loose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

8 Mar : option added for logging packet loss; NOT after each scan (very high I/O



overhead); But, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.

11 Jan : no further work on GWB; plan is to have similar change for GSB during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

8 Mar : plans for work on GSB during upcoming MTAC -- needs a discussion.

3 May : nearly closed; hot air sucking mechanism needed (being explored with Nandi's help).

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (but may come earlier?)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up in delivery; to follow-up closely.

11 Jan : YG to follow-up with nvidia and micropoint.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

3 May : waiting for adapters to arrive;

==> adapters arrived; team visited GMRT; GPU installed on one T630 (for raw voltage

==> recording); to quantify improvements thru benchmarking;

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : no specific updates, except that code optimisation will need to be done.

14 Dec : need a discussion to decide the way forward on this.

4, 11 & 18 Jan : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion on long-term issues to be taken up next week.

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working;

calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

19 Apr : for ver 4.5 : calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).

3 May : SOP already released (v 4.5)

17 May : trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.

==> antenna testing scheduled today/tomorrow; next SOP release planned

==> CD pipeline : GPU has possibilities as per manuals ..

==> release of trial mode : all above incorporate

4.5 Network related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half sytem

4 Jan 17 : this is done -- to confirm and close.

(ii) updated IP table for .4 n/w to be made available by computer group

4 Jan 17 : work ongoing -- to check status with comp group.

3 May : completed

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.

3 May : GSB & GWB diagrams available ; completed

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines

is possibe with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together

to NCRA end; comp group to set up the test, alongwith VVS at Pune end.

11 Jan : 3 connections made to gwbh1-3, and live test demo done; it appears that only 2 of the 8 x 1Gbps links from switch to aggregator are working ! This needs to be debugged between comp group and OF group.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

4 Jan 17 : comp group agreed to look for options.

15 Mar : can be taken up next time.

4.6 Longer term plans for GWB-4 (SHR/GJS/ICH/SSK/BAK) :

List of tasks going forward (needs to be prioritised) :

(i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link (GJS+MGU)

==> GMRT side network provided; Pune side status need to be checked;

(ii) Disks for data recording, including trials with SSD options (GJS)

3 May : restarted the tests on normal disks

(iii) investigating next gen GPUs -- to benchmark sample Pascal units from nvidia (SHR)

19 Apr : to be tried next week.

==> they have arrived; installed; need to be benchmarked;

(iv) migration to next version of CUDA (7.5 and beyond) -- to decide the steps

23 Nov : CUDA 7.5 is being tried in the new version of GWB -- confirm present status

19 Apr : confirmed that all v4.5 is on CUDA 7.5 and no upgrade in near future.

3 May : installed CUDA 7.5 on all machines; next cycle may go for 8.0 which is now available

==> CUDA 8.0 also available now; next cycle to move to 8.0

(v) DUT correction and timestamp related issues : to confirm present status and decide future course of action (SSK)

19 Apr : still pending.

==> today it will be addressed;

(vi) towards PFB option : resurrect old code into new GWB5 & compute the overheads (SHR)

(vii) towards a gated interferometer : to look at the MAC code that can do the gated integration; to send the gate information to the GPU from CPU (SHR/SSK/YG)

(viii) improving availability of beams by reducing beam I/O : 16 bits to 8 bits for IA/PA beams and 8 bits to 4 bits for voltage beams (SHR/YG)

(ix) options for an additional network for even better I/O capabilities (SHR/GJS)

(x) PA - IA beam mode as an additional option with IA or PA modes (SHR/SSK/YG)

(xi) making 4 PA (or voltage) beams point in 4 different directions -- SSK to look into the change in code needed for this, starting with astrocal

19 Apr : SSK has done initial study and plan for generating parameters for all 4 beams from same call to astrocal and then pass to the beamformer; beamformer code needs a change to do one extra multiply by complex number whose phase is calculated on the fly based on antenna, channel, time and beam number.

3 May : initial note from SSK;

==> beam steering implemented; tests in progress;

==> basic thing works; plots 'identical'; needs repeated tests;

(xii) towards more general multi-beaming in the long run

(xiii) archiving of beamformer data : better header and also finding what metadata is required -- SSK to look into this, in consultation with Deepak Bhong.

19 Apr : to follow-up with DB in next few days.

==> header has all necessary metadata inputs;

==> higher level s/w need to incorporate their usage;

(xiv) getting second copy of data to separate cluster going : for both raw voltage recording, as well as for multi-beaming kind of work (GJS/BAK)

19 Apr : to see if one node (with new disks) can be made ready and put in one rack and connected to Roach board -- can grow to one m/c per rack with separate IB switch...

==> raw voltage goes to one machine; but now that machine taken off for Pascal testing;

==> GJS : FPGA design for making second copy (adding delays to synchronization);

(xv) decide on 2 vs 4 inputs per Roach board for final configuration

(xvi) net-sign correction -- confirm current status and decide if further action is needed (SSK)

19 Apr : current status is that adhoc sign flip has been introduced for both corr and beamformer header info; proper modification in code needes to be decided : when & how.

==> fix is working (LSB, USB)

(xvii) full backward compatibility of off-line utilities (SSK)

23 Nov 16 : some work has been done, but not clear if this meets / works for all requirements.

19 Apr : has been done and released and users have used it.

==> need better coordination with users to avoid confusion;

==> responsibilities of individuals also need to be precisely fixed;

4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

(i) Summary of current status for temperature monitoring

3 May : cacti released to control room;

(ii) Plans for future enhancemenst and release for regular use

(iii) Monitoring of other health parameters

14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack (uses DAQ card);

28 Dec : not discussed.

11 Jan : no significant new updates.

25 Jan : no new updates, but plans for collecting the temp data and bringing to common m/c that is accessible to control room is being planned. installation of cacti also to be taken up.

15 Mar : machine has been made ready; cactii has been installed; gradually adding nodes to the list and making them ready for monitoring; a separate home-grown product (using cgiplot) also being made ready for monitoring IB network.

19 Apr : cacti for temp monitoring for all GWB nodes (temp of cores) -- available on web browser; to release to control room and users and add in GWB SOP; cgiplot -- home grown version that allows to read the raw data and display using cgiplot in a more flexible manner (right now on hold); for IB monitoring : collectl was being used for IB monitoring (right now on hold); for disk usage, cacti has an option, can be released alongwith the temp monitoring. Additional homegrown tool (IMH + others?) also available -- need to check and see what should be the final form.

3 May : during MTAC, temp displays in CORR room added; (plot facility etc); control

room can always see display of temps : inlet air & outlet air

==> better information sharing : control room people need to be made aware formally;  
==> formal note needed;

#### 4.8 Other issues :

##### (i) Cross-coupling tests in GAB + GWB

14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?

28 Dec : some issues need a bit more of discussion before reaching a final conclusion.

11 Jan : ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%

25 Jan : no updates; needs a discussion.

##### (ii) Walsh related work.

14 Dec : some tests in progress; porting to GWB (Python package being modified);

28 Dec : work is still ongoing.

11 Jan : porting work is nearing completion.

25 Jan : now in testing phase (on GWB2).

19 Apr : some corrections done for accommodating existing connectivity of GWB of pols with nodes; second correction done for drift of Walsh pattern due to digital bug; will proceed for noise source and astro tests using GWB2.

3 May : delay hunting programme has some bugs, being fixed; debugging in progress.

==> parallelly new package for delay configuration + Walsh being made forward compatible;

==> to be ported to GWB-3 as well

#### 5. Other items :

##### 5.1 Python assembly work (HSK/SSK) :

###### (i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

###### (ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need ot agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one

antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.



## Minutes for the Plan meeting of 5 July 2017

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### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov 16 to 8 Mar : offset was fixed (with help from mechanical) and some tests were also carried out (in the interim) for band-4 feed (results looked basically ok) and were shared with SC.

8 Mar : offsets have been corrected; 610 MHz measurements done; other freq being done now; report awaited; method for cross-polar measurements needs review before executing.

22 Mar : new results presented : from ~ 600 to 800 MHz in ~ 50 MHz steps; to see if we can get closer to 550 and 850 MHz and repeat. Also to try Band-2 (120-250) feed and see if re-measurement of Band-3 (250-500) is useful.

26 Apr : Completed measurements for 1 polarization 550-850 MHz (in 25 MHz step). Second polarization has been partially completed : 550-725 MHz; the remaining frequency range to be covered on 28th Apr.

31 May : completed expt with new transmitting antenna (Aronia, better alignment etc); results show reasonably good agreement with simulated pattern for ~ 650 to 800 MHz range with some droop off at the edges (more so at 850); to confirm the final physical configuration of the transmitter antenna location to see if some of the smaller variations may be due to that; to check repeatability with one more feed of Band-4; to see if the set-up is more accurate now, then Band-2 feed can be retested; finally, to see if some retuning of feed can be done to improve the match between measured and simulated pattern.

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

18 Jan : manual 'digitization' of plot (hard copy) is agreed [rather than indefinitely 'waiting' for a machine readable data file to become available somehow];

15 Feb : no updates, can check recent emails for updates.

22 Mar : no updates, can keep pending for some time.

12 Apr : status quo

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

4 Jan : awaiting feedback

22 Mar : ICH and DVL reminded; will get back in next few days with comments and then possible follow-up and closure can be explored.

12 Apr : to schedule a final joint discussion for closure, within next 2 weeks.

(ii) need to cross-check mismatch of values for band-3 (250-500);

30 Nov : will check and update, including referring to some existing literature  
21 Dec : some work has been done, but needs an internal cross-check & then discussion.  
22 Mar : new doc has the updated values for this.  
(iii) need to see if QH losses have been incorporated into the calculations;  
30 Nov : GP has done some of the work; need to circulate and get agreement.  
8 Mar : report circulated; feedback awaited  
22 Mar : new doc has the updated values for this also.  
(iv) does the study cover all the uGMRT bands.  
30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.  
16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.  
21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in T<sub>sys</sub>) -- TBC.  
22 Mar : new doc covers all the bands, except for 120-250 (Band-2) as measured feed radiation pattern is not available (standard 65% across the full band has been assumed).  
12 Apr : measured radiation pattern not yet available; will be done after finishing work on Band-4 (550-850 MHz).  
26 Apr : radiation pattern (550-850 MHz) has been given to Swagoto  
(v) can it be extended to deriving the final beam pattern for feed + antenna; this is being looked into :  
21 Dec : first version doc has been sent by SC -- needs follow-up  
4 & 18 Jan : feedback awaited on this item.  
15 Feb : to try to find a slot when all concerned are present to get to the finer points and close the matters.  
22 Mar : can be presented this Friday in the polarisation meeting, and then taken up for follow-up discussion.  
12 Apr : see discussion from last week's meeting; action items have been identified there, under polarisation calibration work, and this topic can be followed up there.

#### 1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document  
30 Nov : yet to be completed.  
21 Dec : updated & internally circulated;  
15 Feb : GP to follow-up on internal clearance.  
12 Apr : SSK to check and follow-up on clearing the report  
26 Apr : Report has been finalised and circulated.  
(ii) results from recent tests  
30 Nov : running of tests has conflict with online system (JPK is looking into this)  
21 Dec : all x30 Ae data collection leads to 'online' ssystem hanging; planning with x15 Ae (29Dec);  
18 Jan : 'online' issue remained for '15' antenna also (after '30' antenna case failed); now suggested to repeat for '10' antenna case; test planned for a future wednesday;  
15 Feb : to try with smaller number of antennas for now; need discussion with Ops group about the limitation and how it would get overcome.  
08 Mar : GP & Jitendra following up today  
12 Apr : 15 antenna test with online now successful; trying for 30 antenna this week.  
26 Apr : 30 antenna test was done during MTAC; needs to be repeated now.  
17 May : last week, 6 antennas were available and they were tested; monitoring scheme is working; test with all 30 antennas needs white slot booking -- to be done.  
14 Jun : tried with all x30 antenna : monitoring working = no hanging (results need to be checked / interpreted)



====> confirmed working for 30 antennas; more detailed test results awaited.

(iii) labeling scheme for keeping track of the units to be taken up for refinement and implementation

16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.

30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular back-up of the files to be worked out.

12 Apr : additional disks made available for back-up of the units; in-house development by Sanjeet ongoing -- can review in about 2 weeks.

26 Apr : software is ready; tested locally; need to feed real data & test.

(iv) Lband system does NOT have total power monitoring at present : prototype scheme being worked out by Ramesh and may be available shortly; will include basic temp monitor (for the box; not for LNA).

26 Apr : new scheme has been tested ok in lab; chassis may need modifications for final implementation.

17 May : the software has been tested; implementation is expected after STP joins; boxes are using proper numbering scheme.

14 Jun : implemented in x3 L-band systems in lab

1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system

30 Nov : same as above

21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)

18 Jan : data showed 'flat' value over 24 hrs; C3 & E2 to be tried again today.

15 Feb : not clear about the above problem (needs follow-up with Ops group); to check with 4 antenna test and report back.

12 Apr : monitoring goes hand in hand with power monitoring.

(ii) status of prototype for temp and power monitoring at OF rack at antenna base

16 Nov : sample data set taken but not long enough; to wait for next round of tests; prototype unit installed at C2 and connected to M&C system, but not being monitoring regularly; would like to do some more test and development before finalising the scheme.

30 Nov : (ii) is on-hold after prototype development; to be taken up only after Rabbit card based system is in place.

12 Apr : no change in status

31 May : GP to be asked for updates in 1.4 and 1.5 via email.

1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares

30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.

4 Jan : 4 complete sets of spares available now (ready for installation at antenna)

15 Feb : 4 spares available.

08 Mar : 5th L-band spare has been assembled - currently under test

22 Mar : now down to four spares (due to C14 problem).

12 Apr : 2 complete sets still available; 3 units under repair

26 Apr : 3rd unit was found to have some issues -- under investigation.

17 May : working on mechanical mounting for the new LNA for L-band feed (as the size is different now); 3 spares are being maintained.

31 May : 4 units of original design ready, but 3 need verification (including temp & power monitor) before final packing; 1 new unit being made ready with new 3 stage LNAs.

====> 3 units available; 4th unit ready with new 3 stage LNA, but need to confirm

dynamic range achieved.

(ii) finalisation of report by VBB

30 Nov : report pending with SSK

12 Apr : updated report had been circulated; can take it up for brief discussion next time and try to close.

31 May : do it next time.

1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs

30 Nov : some failed units are being retuned...

08 Mar : all spares available

(ii) status of new 2-stage design installed on 2 antennas : working ok ?

30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.

(ii) status of new 3-stage design : optimisation of RL was being attempted

16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better than 10 dB across the band; Tlna ~ 20 K (by old noise comm calibration scheme); to try improve further, while assembling second unit.

30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna (2 units to be made ready).

21 Dec : 2 K improvement seen (< 20 K) ; report to be available in 1 week

4 Jan : second unit has been assembled; overlapping plots show good repeatability; report will be ready by 6 Jan.

18 Jan : report already circulated last week [ ~ 20-25 K over full band; gain ~ 44 dB flat; return loss better than -11dB over entire band (-14/-15 dB most places); worst case -11 dB near lower freq band edge]

08 Mar : x6 new PCBs (x2 circuits assembled; awaiting chassis; expected next week)

22 Mar : above new units have been assembled and tested -- results look ok, will be circulated shortly.

12 Apr : 4 units of 3-stage amplifier built and compared for performance : getting good repeatability; completely dynamic range measurement and stability inside env chamber; agreed to put 4 units on 2 antennas (CSQ) and check for the performance, including change in power levels and hence change in OF attn etc.

17 May : tests remaining are dynamic range and stability with temperature (in chamber); these may get done next week.

31 May : dynamic range testing done -- prelim result is ~ 58 dB SFDR and CDR ~ 80 dB -- to be confirmed, and cross-checked against values for earlier designs; temp stability test to be done shortly.

====> comparison with old LNA -- needs a repeat measurement; temp stability test yet to be done (VBB on medical leave).

1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB problem and W5 -- problem not identified); C14 showing poor deflection and falling at high freq -- checked for pointing and OF attn, now to try changing the feed.

4 Jan : results from tests on 13 Dec discussed : 21 antennas available; dip seen for L-band vanished after replacing common box (which antenna?), but unit appears to be ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2; W5 poor bandshape; C14 noise deflection discussed.

18 Jan : 06-Jan-2017 tests reported; (only 15 antennas were available); E6 showed ripples in CH1 (but could be cable twist; as today NOT noticed); E6 CH2 deflection HIGHER than expected (red dots) !! "measurement" error? 'naming' of file ? similarly W5 CH2; results show MAJOR drift in deflection (~ 15 dB spread !) -- BUT

NO CORRECTIVE ACTION TAKEN !! Primary purpose of monitoring is LOST ! SKR was 'un-sure' about this responsibility - now clarified; henceforth, he will follow up on errant antennas.

15 Feb : E6 ripple in Ch1 fixed (bad cable); C14 feed needs to be replaced (tbd soon); tests at antenna base for selected set of antennas shows ~6-8 dB variations -- this needs to be investigated and understood.

08 Mar : ripples were due to cables; C14 slope in deflection was possibly due to feed issue -- now new feed has been put; tests awaited

22 Mar : C14 brought down and being looked into by S Ramesh; about 10-12 dB spread in off-source values (but deflection is reasonable stable) -- needs joint follow-up with FE and OF persons.

12 Apr : new result show similar as above : deflection is mostly all right, but off levels still have a large spread;

17 May : last measurements were without any pointing correction (!); so need to be repeated; meanwhile, problem antennas fixed at antenna base (how?); equal power tuning exercise is currently underway.

31 May : no updates as Sanjit on leave.

14 Jun : 25-May-2017 data plotted (deflections) & displayed; CH-1 & 2 variation within +-2 dB (4 dB p-p); E03 showing lower power (wrt -55 dBm)

Note1 : some antennas have old notch filter (about 5 antennas?) -- need to change these to new notch filters...

Note2 : to try sample 1000 to 1400 MHz BPF on trial basis.

#### 1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring in control room

30 Nov : this is now available under the standard monitoring tools; control part has some problem and needs login to control PC -- SOP for this to be provided to control room.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue.

14 Jun : PC being procured (enquiry gone)

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

#### 1.10 Mass production of Band-4 (550-850) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow; 12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.

30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity units are available).

18 Jan : system for 12th antenna will be ready by Monday 23 Jan (lab tests are in progress now); by April x16 system target can still be met.

15 Feb : 13th antenna (C03) installed this week (2 weeks since last one);

08 Mar : dipole shortage; 14th antenna to be completed by ~ 15-Mar-2017; QC issue with dipole units fabricated by outsourced party; dipoles need to be fabricated in-house;

22 Mar : 15 antennas completed; issue of dipoles not having Nickel coated -- will come by Sat. (meanwhile, one has gone without coating and will be replaced later on);

for future orders, to do the dipole in-house and send for coating and deliver.

12 Apr : 6 nos of coated dipoles now available (small mech adjustment needed to match the holes -- need to cross-check; agreed for modifying 2 nos by putting a compensating offset holes on the cavity -- this can be tested for proper performance; meanwhile, to expedite the completion of 3 nos of in-house made dipoles and deliver at the earliest by next week.

26 Apr : x3 dipoles delivered by mech team; x1 of these gone to E5; now total x16 Ae done; remaining x2 will go next week, by 03-May-2017.

17 May : completing 17th antenna (W02) today

31 May : feeds + stools available for 5 more antennas; 18th is almost ready; after that, problem is with the mobile band filter availability due to delays with Argus ! Need to see if this can converge quickly; also initiate parallel exercise with another vendor; enough boxes are there for continuing assembly.

14 Jun : 17 completed; 18th being installed tomorrow 15Jun2017 (W03); so same status as 1 month back;

====> 19 antennas are now complete and going smoothly.

Additional point : live demo of switchable notch filter at Rx room (in C09 antenna path) -- can switch in different filters -- appeared to work fine; in the process discovered that mobile signal is coming through quite strong in the Band-3 signal (!!); needs to be checked and understood.

## 2. RFI related :

### 2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting to be completed

30 Nov : YG + PAR to work on this final version.

12 Apr : needs to be actioned asap.

(ii) study of RFI environment, including internally generated RFI in main building

30 Nov : tests of individual labs : with AC units and otherwise -- shows different labs in different light; agreed to identify the worst culprits by kind of equipment etc and provide an update.

12 Apr : this is due, but has not started yet due to other activities.

(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests

16 Nov & 30 Nov & 21 Dec : no updates.

26 Apr : two experiments done :

(A) expt done using GMRT Ae as RX, & log-periodic Ae as TX; D = 100m & 300m measurements displayed GMRT Ae elev 18/45/90 deg; feed rotation done over 0/45/-45 deg

(B) between x2 GMRT Ae (C1 , C8) ; one as TX & another as RX; D=375m with function generator directly feeding RF to GMRT 325MHz FEED as TX; results displayed; 78 deg (3dB) HPBW

17 May : awaiting further discussion

(iv) absolute calibration of measurement set-up for RFI testing : to translate levels measured there to levels expected at antenna focus.

26 Apr : power calibrated for any lab equipment emission limit (upto what allowed) -- plots displayed

====> report on possible limits for RFI from GMRT lab equipment has been circulated (was discussed in detail last week) -- actual levels now quantified based on details tests with Tx & antennas; need a detailed follow-up.

### 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database

(ii) response to pending requests for clearance e.g. Serum Institute...

21 Dec : awaiting call from Serum Institute for the next visit; asked all technical details of their planned equipments;

30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to their location for looking at specific instruments.

21 Dec : one site visited.

4 Jan : awaiting call for visit to site of the party.

15 Feb : one round of discussions have happened with Serum institute -- they would like to finish the installation and then call for testing and possible modifications; our response should be that we would like to test the existing set-up and indicate the mods to be done and these should be implemented in both existing and new setup and then taken up for testing.

Another party wanting to set-up unit for DC control drives in Junnar / Ambegaon area.

12 Apr : RFI tests planned at Serum Inst premises next week.

26 Apr : test planned on 02-May-2017 at Serum Inst premises

17 May : tests done on 2 May 17 : RFI measurements done with manufacturing units ON (full campus operational); largest increase : -63 dBm at 75 MHz -- 30 dB rise in noise floor compared to all-off condition (-93 dBm); cold room giving discrete lines in 150 to 250 MHz range (-75 dBm peak); shielding measures need to be advised to Serum Institute; detailed report by later today.

14 Jun : communicated about need for improvements in shielding

(iii) work out new action plan, given the current government policies

08 Mar : MIDC people from Chakan came to GMRT for exploring possible sites for new industry zones; following discussions, agreed to our request to avoid heavy industry in GMRT area -- maybe IT related in Peth etc; also about help in surveying sites for level of RFI etc -- how is this to be formalised -- we should send a letter from our side; check with JKS.

similarly, there is a note from DAE asking for things that need protection -- to see if JKS can follow-up on this.

### 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters

30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems (they are the only one to have got license in this range) -- it is strong enough to cause saturation in spite of filter; need to find the specific towers and then follow-up with Reliance.

18 Jan : measurements happening this week; update by next week.

15 Feb : completed survey of 82 towers around Y-array : 14 towers in 850 band (Reliance Jio) and 6 towers in 950 GSM band; rest are in 1800 band. Max power in 850 band ~ -16 dBm (at ~ 100 m distance) for few towers. Follow-up for both 850 and 950 being pursued, including dialogue with Reliance Jio to see if they can switch to 1800 band.

08 Mar : draft letter circulated (vendor is generally positive; but formal communication needs to go soon)

15 Mar : New results : characterisation of mobile phone RFI in the GMRT campus -- some interesting plots; using JIO CDMA uplinks and their effect can be seen.

14 Jun : letter to JIO CDMA sent already; Doordarshan is being sent shortly

### 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems

30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need to identify which make is coming finally.

21 Dec : no updates.

15 Feb : 33 nos (Voltas instead of BlueStar) have arrived; need to finalise the locations and the specific schemes for installation; need to make shielded units

for all 33 nos; components for 25 units are available; boxes for 10 nos are in hand except for back plate and chromatisation (expected to take one week); work request for next 10 has been given (repeat order); some difference in wiring for Voltas unit -- needs some rework of the design / layout; also one type of connector is different and this also needs to be resolved; PAR to send an email explaining the steps to be taken to complete the RFI shielding work, and expected timelines for the same.

Regarding installation : there is a table giving the locations for 31 units (including replacements of 5 existing units) -- to check if outgoing lines can be behind the unit; to install sample one unit in canteen annexe, test the RFI shielding.

08 Mar : one set of measurement done (without shielding) - under analysis; by next week shielded case will be measured & compared; RFI group designed shielding box pictures displayed; uses many cables with RFI shielded interface connectors; it includes high current carrying (220V AC) lines, needing shielded connectors !

12 Apr : 10 AC units have been installed; only 3 have the RFI shielding installed (are the other 7 being used !); 3 more RFI units are getting ready; to speed-up the remaining RFI units; and then go for the next batch of AC units; meanwhile, one bump of RFI remains at around 325 MHz -- may be coming from blower assembly : to disassemble on unit and check for source of RFI.

17 May : 12 units are now in operation with RFI shielding; prototype box from new vendor has come and not found suitable -- modifications told to vendor, corrected unit may come in few days.

14 Jun : x20 new units arrived at Pune campus; sent for yellow chromatisation; ==> now 21 units available; work can restart.

NEW points : shielded ethernet enclosure (x35 units) -- placed work order; it is aluminium C-channel based unit (at Pune W/S)

### 3. Operations related :

#### 3.1 Interfacing of FE with new M&C system :

(i) latest status of testing with Rabbit card in common box at antenna base

16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).

30 Nov : no new updates on this

21 Dec : antenna control part is working; FE monitoring still not working; Charu is looking into this...

18 Jan : trying with different delay to see if it solves the problem, but not yet working with online control..

(ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus

16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration and testing in 2 weeks time and put on first antenna with RS-232 cable driving; later to convert that to ethernet over fibre; mass production may need only new plates to be made by workshop -- other aspects are in-house in FE lab.

30 Nov : item also being discussed under FE agenda item (in alternate week)

18 Jan : final status is Box #1 was made functional at antenna base and was taken up to antenna focus as Box #2 does not work reliably -- hangs and needs power reset (has been tested with a couple of different Rabbit cards?); problem not solved; agreed to try the option of swapping the Rabbit cards between Box #1 and Box #2 and seeing what is the outcome. To report this by tomorrow and then decide if

a 3rd box needs to be made ready.

25 Jan : testing of common box with Rabbit card : new clue related to grounding of enable signal of decoder IC may provide the breakthrough -- tested in lab and will take to antenna base now.

15 Feb : email update from Raj Upgrade : One rabbit MCM has been installed at C01 antenna dish focus; MCM communication is proper but needs to give hardware reset while changing frequency band.

08 Mar : it is working only for some bands (C01); needs rethink on strategy.

22 Mar : problems persist; long discussion about what may be the cause; need to get a proper wiring diagram to check the grounding of the system for possible loopholes that may be causing the flaky behaviour...

5 Apr : useful discussion alongwith wiring diagrams; two possible causes identified : old FE power supplies may be having more noise (200 mV) than the new ABR power supply (50 mV) -- to try C01 with the new supply; Rabbit card has ground to common box chassis (unlike MCM-5 card) -- can try to isolate this in the second box being made ready and take to another antenna.

12 Apr : common box on C1 now working properly (!) -- problem was in sequence of commands sent from control room -- there was a monitor command sequence in the cmdfile that was the culprit.

Agreed that only main bottleneck remaining is monitoring of FE system -- this can continue in parallel, even as we go ahead with mass installation of the Rabbit based common box; third stream of activity to be initiated is lab test of ethernet based control of Rabbit card in common box, via optical fibre link (bypassing cable ethernet).

26 Apr : update on monitoring aspect : problem found with 4 lines on interface card that appear to be picking up spurious signals; isolated by connecting straps directly from IC pin to destination point and solved the problem; to confirm that problem clearly identified and solved; and then agree on changes to be made to PCB via straps (after cutting the offending tracks) and implement in mass production.

17 May : above solution implemented for 2nd box also and found working ok; put up in place of original common box on C01 (due to low fringe call sheet due noise-gen all the time); to test the failed unit to see if cause is in new M&C system or in some aspect of common box; for the PCB, agreed to make a new version, but work in parallel with modifying existing versions with straps to keep the production rolling; same strategy for modification to accommodate OF receiver.

31 May : new box on C01 is working fine; older version that had come down has problems identified (not related to Rabbit control) and are being rectified (change of one interface PCB; old one to be debugged by SC) -- to find the spare cards and use for now; in addition, wiring for 2 more boxes is underway. To check separately about OF work on common box.

14 Jun : C01 has been working for last one month; FE group wiring x2 more boxes;

### 3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgeetary quote; formal quote expected shortly.

4 Jan : folder cleared ; PO should be done shortly.

18 Jan : Order has been released; full delivery time is 3 months; first box to be supplied earlier and tested...

15 Feb : email update from Raj Upgrade : expecting the delivery of one Miltec machine shortly; also initiated talk with Miltec to supply it as early as possible.

08 Mar : one unit has come; will be tested & feedback given to Miltech

22 Mar : new Miltech PC put through RFI test; informal report : looks ok; formal report may take some time.

12 Apr : go ahead given to Miltech for full delivery.

26 Apr : CPK to call and check the status.

17 May : CPK yet to call.

31 May : Party had confirmed plans for delivery in 2-3 months time scale -- to check if it can be expedited and/or delivered in batches; out of 16 existing, 14 are working (10 in antennas, 4 in lab); more disks being ordered for Miltech PCs.

14 Jun : Miltek said under production; no speedy delivery possible; usual delivery schedule.

Addition item : issue of Windows software licences discussed (with MSU present) -- agreed to go ahead with ~ 20 stand-alone licenses for use by tech groups.

17 May : MSU reported that he is looking into it.

31 May : MSU presented some confusing feedback from different vendors -- yearly license cost, with terms and conditions; MSU to assemble the possible options and report back.

### 3.3 GMRT M&C sytem Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal meeting.

4 Jan : internal lab meeting held on 3 Jan (now every Tuesday)

08 Mar : all team members are clear on their respective roles & are contributing

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans

30 Nov : discussions ongoing; kick-off meeting planned.

21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.

4 Jan : regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary' etc shared with TCS.

18 Jan : work ongoing; need more regular interactions of TCS with GMRT team members.

15 Feb : email update from Raj Upgrade : 2 CMC and 6 LMC machines are UP & running; team members are now very much familiar with CMC, LMC installation, features, testing and can carry independent tasks.

08 Mar : interim review held; schedule is 6 weeks slippage/ delayed; mitigation planned for that delay;

22 Mar : work progressing; may test sub-array and tracking in coming MTAC.

26 Apr : could not meet the above target due to modifications for A&A issues and other things; work is ongoing at present.

17 May : tracking routine completed; LMC, A&A and data-base schema work not yet converged.

31 May : new ver 2.2 released last week -- tested and feedback given; further tests to be done this week.

14 Jun : LMC v2.3 expected now but power shutdown led to delay (Friday 16Jun2017); CMC v2 after tests are successful (~ 1 week), phase-2 delivery will be over.

====> Delivery-1 of Phase-2 has been done; most bugs fixed; some more work is remaining, but can start on Delivery-2 related items.

### 3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for material for review committee started

30 Nov : dicussions and work ongoing, including preparations for discussions with TM review panel.



21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase : requirement compatibility; architecture explanation given; scalability etc; need many upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;  
4 Jan : preparation of docs in progress; ph-2 work now beginning...  
18 Jan : aim to have 6+ antenna set-up with PC + switch + Rabbit talking to Sentinel + OF + Servo (to check if existing PC104 will work directly) or not; to check enough Miltech PCs available -- Sumit and Mangesh to look into it.; need to move from Fedora to Ubuntu; aim to start testing at antenna base by 23/24. Additionally, need some temporary space (couple of months) for working on 2 PCs in or near control room...  
15 Feb : Last week 6 antennae Control & monitoring system was set-up and demonstrated to SKA reviewer (Nick Rees) and SKA India team.  
08 Mar : SKA committee is reviewing our work; cost estimate proposal from India was submitted to SKA claiming 50% saving on TM work using Indian scheme;  
26 Apr : discussions ongoing; need to prepare an updated response to new version of report expected by tomorrow or so.  
17 May : all done and completed.

Back-up of interferometry data from GWB : some issues when switching over from gwbh1 to gwbh6, but appear to be resolved now.

#### 4. Back-ends related :

##### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh paper needs to be looked into for revision; nothing really pending, except for the report on the attenuation values : new set of tests done and results look ok and will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed); may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?

4 Jan : To follow-up on GWB refereeing process.

18 Jan : GWB response received, relatively minor modifications are needed and SHR is looking into this; for Walsh, waiting for response -- can check after 20 days (end of this week / early next week).

26 Apr : no new issues here.

##### 4.2 Updates on existing GWB-3 system :

(i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

4 Jan -- 12 Apr : no progress on this, due to work on release of 30 antenna system.

5 Apr : meanwhile, new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

12 Apr : agreed for BE team to repeat noise source tests and check carefully for spurious lines; then repeat with sky signal as needed.

26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction :

geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.

17 May : DDC related updates :

(a) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and release for users.

(b) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.

24 May : for shape equalisation, some fine tuning being done by SHR; for spurious lines, not clear what is the best way forward -- need to check if it is part of the ADC related effect or not and whether maintaining higher input levels can help mitigate the problem...

31 May : agreed that the latest version of bandshape correction looks ok and can be released in the next version of GWB; for spurious spikes, some further tests suggested, also to look into optimising the power levels at input for the narrow band modes.

14 Jun : released (bandshape correction) in the current version itself spikes issue no update

(ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes; for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be closed ?

14 Dec : problem perhaps in AIPS settings? matter can be closed?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated; this is completed.

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT lose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs;

IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace

old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

08 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); but, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain

14 Jun : providing the 'log' at the end of observation for now

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready; appears to be satisfactory (though no improvements in ambient temp recorded ?).

11 Jan : no further work on GWB; plan is to have similar hcnage for GBS during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

08 Mar : plans for work on GSB during upcoming mTAC -- needs a discussion.

3 May : nearly closed; hot air sucking mechanism needed (being explored with Nandi's help).

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (may come earlier)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep looks like resulting in some speed-up in delivery; to follow-up closely.

11 Jan : YG to contact nvidia and micropoint persons.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

3 May : waiting for adapters to arrive;

28 Jun : adapters arrived; nvidia team visited GMRT; GPU installed on one T630 (for raw voltage recording); to quantify improvements thru benchmarking.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : need to plan the code optimisation that will be needed.

14 Dec : need a discussion to decide the way forward on this.

4, 18 Jan 17 : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

15 Feb : SSK to try and restart the old 16-antenna CD pipeline code using the SOPs etc from Kishalay...

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion of long-term issues to be taken up next week (22 Mar).

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working;

calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

19 Apr : for ver 4.5, calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in

UI to support all modes (including CDP).

3 May : SOP already released (v 4.5)

17 May : trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.

14 Jun : trial and release : documents (directory structure OK as per circulated version) finalized; need to create directories etc.

28 Jun : antenna testing scheduled today/tomorrow; next SOP release planned  
CD pipeline : GPU has possibilities as per manuals; release of trial mode : all above incorporated.

4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :

(i) refinements of the first draft of the note

(ii) plans for getting first unit connected and tested

(iii) plans for testing high speed recording to disks

16 Nov : lab set-up for grabbing and recording has been done; while continuing with this, need to work on the set-up for sending parallel copy of the data, including procurement of longer CX4 cables.

30 Nov & 21 Dec : not discussed.

4 Jan 17 : basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.

18 Jan : to test the dual copy design for correlations using existing 16-antenna corr with dummy inputs; then to connect to one machine where tests can be done for raw voltage recording and a single node correlator with flexible beamforming.

15 Feb : no updates.

08 Mar : 374 MBps speed achieved; but need slightly higher speed

26 Apr : old gwbn9 (T630 m/c) removed and T620 m/c put in for doing the further work; length of cables -- 3m may be enough for using existing slot in the racks; to look into modifications of FPGA code for more eth cores; simple code for correlation of limited number of antenna etc... longer-term plan with longer cables, more racks, more nodes etc to be thought about.

17 May : expanded design tried with 8+ disks using gulp and can be tried with GWB signals; to be tried with digital copy scheme using resurrected earlier design with 4 10 Gbe cores.

14 Jun : machine installed; code compiled in FPGA; delays being tuned for sync.

4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)

16 Nov : some changes have been made by SHR, but the sub-microsec correction still needs to be done; also to follow-up about h4k file.

21 Dec : modified code has been made, but not yet tested; can try to see if it can be made available in the current release.

4 & 18 Jan 17 : agreed to defer to next release.

15 Feb : deferred as above.

08 Mar : current release has this 'sub-microsec correction' ENABLED; it is now possible to send those values to header files;

26 Apr : updated timestamp with higher accuracy is coming now; needs to be verified for correctness; CDP vs PA timestamping still to be resolved.

17 May : one buffer offset confirmed; need to be checked for different modes

14 Jun : sending side time stamps are fine; offset must be getting introduced during processing.

New items to be added : (i) single node correlation (a) off-line for many antennas

(for better profiling and benchmarking) (b) on-line for limited inputs (2 to 4 antennas) for testing and new developments

(ii) new options for speeding up overall I/O for voltage beam modes : (a) different BWs (or chans) for different beams (b) 4 bit voltage beam and (c) turn off IFR or BFR data selectively during a scan.

(iii) testing of P100 based node and related follow-up with nvidia team

#### 4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans

(ii) spectral domain RFI filtering : current status and plans

(iii) beamformer RFI filtering : current status and plans

16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.

30 Nov : not dicussed in detail.

21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file...

emulator has some changes and improvements, including random location of the RFI.

4 Jan 17 : for (i) modifications in simulator; counter mode now working -- can have 2 different modes, tested at module level, now integrated into the design, will be testing in next few days; fractional thld done in simulation, to convert to design and test. (ii) to try and run the filter in real-time from shm data.

18 Jan : not discussed, but summary of offline discussions is as follows : (i) some additional features added to RFI simulator unit; fractional threshold and counter mode now available for use in the voltage filtering unit; cumuative experience shows that we may be not using the optimal filtering technique for voltage mode -- should try the alternative approach of conversion to intensity and integration to desired time constant -- closer to a true matched filter.

08 Mar : some updates from Kaushal about looking at options for more optimised filtering of broadband time domain data :

Modified the design to support 16K window size - this is the default design now;

Fractional threshold available (tested with antenna signals) - default option now;

Made the DDC mode design compatible with the ongoing changes;

RFI Counter design ready - format to read the data including timestamp from a single ROACH complete, undergoing more tests before release;

Supporting regular tests - spectral line (Nissim), continuum (Ruta, Dharam, Ishwar);

Handling longer duration RFI using median of MAD technique - initial results are encouraging, detailed tests going on;

Looking at likely causes of missing RFI during real-time excision and at possible alternate methods for time-domain filtering;

Ongoing: Updating SOP with changes made till date;

17 May : 2 different options for MAD based filtering released -- normal MAD vs MoM of MAD; some user level tests done -- need to see the output from these for comparison; can be taken up once spectral filtering tasks with Swapnil are concluded.

14 Jun : some results displayed : comparison between MAD vs MoM techniques; MoM much better than MAD 250-500 (426 MHz); but identical (both equally good) performance at 610 MHz need user feedback now.

RFI emulator: (last update email - Jan) :

Last development: Adding facility for random insertion and random amplitude of RFI  
Understanding the GUI and MCM control program - backup from Rahul Bhor;

Narrowband RFI filtering: (updates email sent periodically) :

Initial version of the code has been timed; optimized for computing faster sorting  
for median computation, is now much better;

Moving towards expected version of filtering code - with optimized functions to meet  
real-time requirements (0.671s) and necessary functionality;

Ongoing: Testing the code on recorded data and timing the code for all 60 self outputs;

Looking at synchronization between the data path and RFI filter (along with Sanjay);

Looking at merging of lta file and flags for the FITS file format (along with Sanjay).

08 Mar : now optimizing real time filtering; all bands filtering on recorded; Broad  
band RFI filtering : emulator tested; other techniques being explored; SOP updated;  
to be released next week.

17 May : code for spectral filtering of single self has been developed with spectral  
flags needed as per format specified by SSK and he is to modify this for multiple  
selfs (all antennas, working real-time) and passing flags appropriately to LTA file.

14 Jun : algo done; working on recorded data; extend to real time release in few  
weeks;

4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and  
tests ongoing; also tested by sending digitised packets to antenna and loop back;  
using GWB2 for doing all the correlations.

18 Jan : feasibility study done using C09 antenna with noise sources & real signal --  
needs a fixed delay correction of 1.5 km to get maximum correlation; trying setup  
with E5; meanwhile, a few different tests can be tried with the C09 set-up; comparison  
of scheme running on GWB2 and GWB3 tried out.

08 Mar : C9 & E5 setups faced problems (ethernet card issue); now fixed; GWB2 (early  
digitization) & GWB3 being used for comparison; delay requirement has reduced (due to  
early digitization)

12 Apr : new test has been carried out with C9 and E5 on actual on-source observation  
and brief comparison.

26 Apr : some updates from recent tests to be available by next week; detailed report  
of recent work being prepared.

17 May : trying some tests with single antenna early digitisation (as only one is  
working).

14 Jun : summary of tests circulated; stuck with C9/SFC module (need 10 days)

4.8 Time-Frequency Standards (BAK) :

(i) procurement of Maser units

(ii) planning for kind of environmental set-up required for Maser units

(iii) planning for long-term maintenance and development

16 Nov : most of the issues have been resolved, waiting for one party to complete the  
payment terms; pending issue about performance bank guarantee for different amounts  
of periods.

30 Nov : work is ongoing, but item not discussed.

4 Jan 17 : TEC clearance ok; recommendation to open price bids -- to check the status.  
To contact Prof Sen Gupta for a discussion.

18 Jan : final TEC documents done and sent for next step; to follow-up and check status.  
15 Feb : activities ongoing...  
08 Mar : Negotiating committee met the vendor (no reduction on price; but add modules 'FREE'; payment terms as per NCRA conditions); Dr Sengupta will be visiting next week; first unit delivery after 5 months; second unit 4 months after 1st delivery;  
12 Apr : to take up next time.  
26 Apr : to confirm date of expiry of validity and follow-up with TIFR for the folder; to check about vibration damping mechanisms available with the system and otherwise; to make a draft note for selection of the room and suggestion modifications to be taken up.  
14 Jun : order yet to go (file still in Bombay); need to plan room A/C shading : ask civil dept.

## 5. Other items :

### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need to agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

12 Apr : sample unit getting ready -- length needs to be reduced; do asap and get hose assembled and then install on C03.

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## Updates from the Plan meeting held on 19-July-2017

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[updates in lines beginning with '==>' as usual]

### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov 16 to 8 Mar : offset was fixed (with help from mechanical) and some tests were also carried out (in the interim) for band-4 feed (results looked basically ok) and were shared with SC.

8 Mar : offsets have been corrected; 610 MHz measurements done; other freq being done now; report awaited; method for cross-polar measurements needs review before executing.

22 Mar : new results presented : from ~ 600 to 800 MHz in ~ 50 MHz steps; to see if we can get closer to 550 and 850 MHz and repeat. Also to try Band-2 (120-250) feed and see if re-measurement of Band-3 (250-500) is useful.

26 Apr : Completed measurements for 1 polarization 550-850 MHz (in 25 MHz step). Second polarization has been partially completed : 550-725 MHz; the remaining frequency range to be covered on 28th Apr.

31 May : completed expt with new transmitting antenna (Aronia, better alignment etc); results show reasonably good agreement with simulated pattern for ~ 650 to 800 MHz range with some droop off at the edges (more so at 850); to confirm the final physical configuration of the transmitter antenna location to see if some of the smaller variations may be due to that; to check repeatability with one more feed of Band-4; to see if the set-up is more accurate now, then Band-2 feed can be retested; finally, to see if some retuning of feed can be done to improve the match between measured and simulated pattern.

==> tests planned next week

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

18 Jan : manual 'digitization' of plot (hard copy) is agreed [rather than indefinitely 'waiting' for a machine readable data file to become available somehow];

15 Feb : no updates, can check recent emails for updates.

22 Mar : no updates, can keep pending for some time.

12 Apr : status quo

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

4 Jan : awaiting feedback  
22 Mar : ICH and DVL reminded; will get back in next few days with comments and then possible follow-up and closure can be explored.  
12 Apr : to schedule a final joint discussion for closure, within next 2 weeks.  
(ii) need to cross-check mismatch of values for band-3 (250-500);  
30 Nov : will check and update, including referring to some existing literature  
21 Dec : some work has been done, but needs an internal cross-check & then discussion.  
22 Mar : new doc has the updated values for this.  
(iii) need to see if QH losses have been incorporated into the calculations;  
30 Nov : GP has done some of the work; need to circulate and get agreement.  
8 Mar : report circulated; feedback awaited  
22 Mar : new doc has the updated values for this also.  
(iv) does the study cover all the uGMRT bands.  
30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.  
16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.  
21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in Tsys) -- TBC.  
22 Mar : new doc covers all the bands, except for 120-250 (Band-2) as measured feed radiation pattern is not available (standard 65% across the full band has been assumed).  
12 Apr : measured radiation pattern not yet available; will be done after finishing work on Band-4 (550-850 MHz).  
26 Apr : radiation pattern (550-850 MHz) has been given to Swagoto  
(v) can it be extended to deriving the final beam pattern for feed + antenna; this is being looked into :  
21 Dec : first version doc has been sent by SC -- needs follow-up  
4 & 18 Jan : feedback awaited on this item.  
15 Feb : to try to find a slot when all concerned are present to get to the finer points and close the matters.  
22 Mar : can be presented this Friday in the polarisation meeting, and then taken up for follow-up discussion.  
12 Apr : see discussion from last week's meeting; action items have been identified there, under polarisation calibration work, and this topic can be followed up there.

==> polarisation calibration forum will discuss on 24-Jul-2017

#### 1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document  
30 Nov : yet to be completed.  
21 Dec : updated & internally circulated;  
15 Feb : GP to follow-up on internal clearance.  
12 Apr : SSK to check and follow-up on clearing the report  
26 Apr : Report has been finalised and circulated.  
(ii) results from recent tests  
30 Nov : running of tests has conflict with online system (JPK is looking into this)  
21 Dec : all x30 Ae data collection leads to 'online' ssystem hanging; planning with x15 Ae (29Dec);  
18 Jan : 'online' issue remained for '15' antenna also (after '30' antenna case failed); now suggested to repeat for '10' antenna case; test planned for a future wednesday;  
15 Feb : to try with smaller number of antennas for now; need discussion with Ops group about the limitation and how it would get overcome.

08 Mar : GP & Jitendra following up today  
12 Apr : 15 antenna test with online now successful; trying for 30 antenna this week.  
26 Apr : 30 antenna test was done during MTAC; needs to be repeated now.  
17 May : last week, 6 antennas were available and they were tested; monitoring scheme is working; test with all 30 antennas needs white slot booking -- to be done.  
14 Jun : tried with all x30 antenna : monitoring working = no hanging (results need to be checked / interpreted)  
5 Jul : confirmed working for 30 antennas; more detailed test results awaited.  
(iii) labeling scheme for keeping track of the units to be taken up for refinement and implementation  
16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.  
30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular back-up of the files to be worked out.  
12 Apr : additional disks made available for back-up of the units; in-house development by Sanjeet ongoing -- can review in about 2 weeks.  
26 Apr : software is ready; tested locally; need to feed real data & test.  
(iv) Lband system does NOT have total power monitoring at present : prototype scheme being worked out by Ramesh and may be available shortly; will include basic temp monitor (for the box; not for LNA).  
26 Apr : new scheme has been tested ok in lab; chassis may need modifications for final implementation.  
17 May : the software has been tested; implementation is expected after STP joins; boxes are using proper numbering scheme.  
14 Jun : implemented in x3 L-band systems in lab

#### 1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system  
30 Nov : same as above  
21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)  
18 Jan : data showed 'flat' value over 24 hrs; C3 & E2 to be tried again today.  
15 Feb : not clear about the above problem (needs follow-up with Ops group); to check with 4 antenna test and report back.  
12 Apr : monitoring goes hand in hand with power monitoring.  
(ii) status of prototype for temp and power monitoring at OF rack at antenna base  
16 Nov : sample data set taken but not long enough; to wait for next round of tests; prototype unit installed at C2 and connected to M&C system, but not being monitoring regularly; would like to do some more test and development before finalising the scheme.  
30 Nov : (ii) is on-hold after prototype development; to be taken up only after Rabbit card based system is in place.  
12 Apr : no change in status  
31 May : GP to be asked for updates in 1.4 and 1.5 via email.

#### 1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares  
30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.  
4 Jan : 4 complete sets of spares available now (ready for installation at antenna)  
15 Feb : 4 spares available.  
08 Mar : 5th L-band spare has been assembled - currently under test  
22 Mar : now down to four spares (due to C14 problem).  
12 Apr : 2 complete sets still available; 3 units under repair

26 Apr : 3rd unit was found to have some issues -- under investigation.

17 May : working on mechanical mounting for the new LNA for L-band feed (as the size is different now); 3 spares are being maintained.

31 May : 4 units of original design ready, but 3 need verification (including temp & power monitor) before final packing; 1 new unit being made ready with new 3 stage LNAs.

5 Jul : 3 units available; 4th unit ready with new 3 stage LNA, but need to confirm dynamic range achieved.

==> dynamic range tests carried out; results to be circulated next week

(ii) finalisation of report by VBB

30 Nov : report pending with SSK

12 Apr : updated report had been circulated; can take it up for brief discussion next time and try to close.

31 May : do it next time.

1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs

30 Nov : some failed units are being retuned...

08 Mar : all spares available

(ii) status of new 2-stage design installed on 2 antennas : working ok ?

30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.

(ii) status of new 3-stage design : optimisation of RL was being attempted

16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better than 10 dB across the band;  $T_{na} \sim 20$  K (by old noise comm calibration scheme); to try improve further, while assembling second unit.

30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna (2 units to be made ready).

21 Dec : 2 K improvement seen ( $< 20$  K) ; report to be available in 1 week

4 Jan : second unit has been assembled; overlapping plots show good repeatability; report will be ready by 6 Jan.

18 Jan : report already circulated last week [  $\sim 20$ - $25$  K over full band; gain  $\sim 44$  dB flat; return loss better than  $-11$  dB over entire band ( $-14$ / $-15$  dB most places); worst case  $-11$  dB near lower freq band edge]

08 Mar : x6 new PCBs (x2 circuits assembled; awaiting chassis; expected next week)

22 Mar : above new units have been assembled and tested -- results look ok, will be circulated shortly.

12 Apr : 4 units of 3-stage amplifier built and compared for performance : getting good repeatability; completely dynamic range measurement and stability inside env chamber; agreed to put 4 units on 2 antennas (CSQ) and check for the performance, including change in power levels and hence change in OF attn etc.

17 May : tests remaining are dynamic range and stability with temperature (in chamber); these may get done next week.

31 May : dynamic range testing done -- prelim result is  $\sim 58$  dB SFDR and CDR  $\sim 80$  dB -- to be confirmed, and cross-checked against values for earlier designs; temp stability test to be done shortly.

5 Jul : comparison with old LNA -- needs a repeat measurement; temp stability test yet to be done (VBB on medical leave).

1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB

problem and W5 -- problem not identified); C14 showing poor deflection and falling at high freq -- checked for pointing and OF attn, now to try changing the feed.

4 Jan : results from tests on 13 Dec discussed : 21 antennas available; dip seen for L-band vanished after replacing common box (which antenna?), but unit appears to be ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2; W5 poor bandshape; C14 noise deflection discussed.

18 Jan : 06-Jan-2017 tests reported; (only 15 antennas were available); E6 showed ripples in CH1 (but could be cable twist; as today NOT noticed); E6 CH2 deflection HIGHER than expected (red dots) !! "measurement" error? 'naming' of file ? similarly W5 CH2; resuts show MAJOR drift in defelction (~ 15 dB spread !) -- BUT NO CORRECTIVE ACTION TAKEN !! Primary purpose of monitoring is LOST ! SKR was 'un-sure' about this responsibility - now clarified; henceforth, he will follow up on errant antennas.

15 Feb : E6 ripple in Ch1 fixed (bad cable); C14 feed needs to be replaced (tbd soon); tests at antenna base for selected set of antennas shows ~6-8 dB variations -- this needs to be investigated and understood.

08 Mar : ripples were due to cables; C14 slope in deflection was possibly due to feed issue -- now new feed has been put; tests awaited

22 Mar : C14 brought down and being looked into by S Ramesh; about 10-12 dB spread in off-source values (but deflection is reasonable stable) -- needs joint follow-up with FE and OF persons.

12 Apr : new result show similar as above : deflection is mostly all right, but off levels still have a large spread;

17 May : last measurements were without any pointing correction (!); so need to be repeated; meanwhile, problem antennas fixed at antenna base (how?); equal power tuning exercise is currently underway.

31 May : no updates as Sanjit on leave.

14 Jun : 25-May-2017 data plotted (deflections) & displayed; CH-1 & 2 variation within +-2 dB (4 dB p-p); E03 showing lower power (wrt -55 dBm)

Note1 : some antennas have old notch filter (about 5 antennas?) -- need to change these to new notch filters...

Note2 : to try sample 1000 to 1400 MHz BPF on trial basis.

==> SKR preparing for review

1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring in control room

30 Nov : this is now available under the standard monitoring tools; control part has some problem and needs login to control PC -- SOP for this to be provided to control room.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue.

14 Jun : PC being procured (enquiry gone)

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

1.10 Mass production of Band-4 (550-850) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow; 12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.

30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity units are available).

18 Jan : system for 12th antenna will be ready by Monday 23 Jan (lab tests are in progress now); by April x16 system target can still be met.

15 Feb : 13th antenna (C03) installed this week (2 weeks since last one);

08 Mar : dipole shortage; 14th antenna to be completed by ~ 15-Mar-2017; QC issue with dipole units fabricated by outsourced party; dipoles need to be fabricated in-house;

22 Mar : 15 antennas completed; issue of dipoles not having Nickel coated -- will come by Sat. (meanwhile, one has gone without coating and will be replaced later on);

for future orders, to do the dipole in-house and send for coating and deliver.

12 Apr : 6 nos of coated dipoles now available (small mech adjustment needed to match the holes -- need to cross-check; agreed for modifying 2 nos by putting a compensating offset holes on the cavity -- this can be tested for proper performance; meanwhile, to expedite the completion of 3 nos of in-house made dipoles and deliver at the earliest by next week.

26 Apr : x3 dipoles delivered by mech team; x1 of these gone to E5; now total x16 Ae done; remaining x2 will go next week, by 03-May-2017.

17 May : completing 17th antenna (W02) today

31 May : feeds + stools available for 5 more antennas; 18th is almost ready; after that, problem is with the mobile band filter availability due to delays with Argus ! Need to see if this can converge quickly; also initiate parallel exercise with another vendor; enough boxes are there for continuing assembly.

14 Jun : 17 completed; 18th being installed tomorrow 15Jun2017 (W03); so same status as 1 month back;

5 Jul : 19 antennas are now complete and going smoothly.

==> 20th Ae installation held up due to rains; to be attempted shortly

Additional point : live demo of switchable notch filter at Rx room (in C09 antenna path) -- can switch in different filters -- appeared to work fine; in the process discovered that mobile signal is coming through quite strong in the Band-3 signal (!!); needs to be checked and understood.

==> Ankur busy for review

## 2. RFI related :

### 2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting to be completed

30 Nov : YG + PAR to work on this final version.

12 Apr : needs to be actioned asap.

(ii) study of RFI environment, including internally generated RFI in main building

30 Nov : tests of individual labs : with AC units and otherwise -- shows different labs in different light; agreed to identify the worst culprits by kind of equipment etc and provide an update.

12 Apr : this is due, but has not started yet due to other activities.

(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests

16 Nov & 30 Nov & 21 Dec : no updates.

26 Apr : two experiments done :

(A) expt done using GMRT Ae as RX, & log-periodic Ae as TX; D = 100m & 300m

measurements displayed GMRT Ae elev 18/45/90 deg; feed rotation done over 0/45/-45 deg (B) between x2 GMRT Ae (C1 , C8) ; one as TX & another as RX; D=375m with function generator directly feeding RF to GMRT 325MHz FEED as TX; results displayed; 78 deg (3dB) HPBW

17 May : awaiting further discussion

(iv) absolute calibration of measurement set-up for RFI testing : to translate levels measured there to levels expected at antenna focus.

26 Apr : power calibrated for any lab equipment emission limit (upto what allowed) -- plots displayed

5 Jul : report on possible limits for RFI from GMRT lab equipment has been circulated (was discussed in detail last week) -- actual levels now quantified based on details tests with Tx & antennas; need a detailed follow-up.

## 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database

(ii) response to pending requests for clearance e.g. Serum Institute...

21 Dec : awaiting call from Serum Institute for the next visit; asked all technical details of their planned equipments;

30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to their location for looking at specific instruments.

21 Dec : one site visited.

4 Jan : awaiting call for visit to site of the party.

15 Feb : one round of discussions have happened with Serum institute -- they would like to finish the installation and then call for testing and possible modifications; our response should be that we would like to test the existing set-up and indicate the mods to be done and these should be implemented in both existing and new setup and then taken up for testing.

Another party wanting to set-up unit for DC control drives in Junnar / Ambegaon area.

12 Apr : RFI tests planned at Serum Inst premises next week.

26 Apr : test planned on 02-May-2017 at Serum Inst premises

17 May : tests done on 2 May 17 : RFI measurements done with manufacturing units ON (full campus operational); largest increase : -63 dBm at 75 MHz -- 30 dB rise in noise floor compared to all-off condition (-93 dBm); cold room giving discrete lines in 150 to 250 MHz range (-75 dBm peak); shielding measures need to be advised to Serum Institute; detailed report by later today.

14 Jun : communicated about need for improvements in shielding

(iii) work out new action plan, given the current government policies

08 Mar : MIDC people from Chakan came to GMRT for exploring possible sites for new industry zones; following discussions, agreed to our request to avoid heavy industry in GMRT area -- maybe IT related in Peth etc; also about help in surveying sites for level of RFI etc -- how is this to be formalised -- we should send a letter from our side; check with JKS.

similarly, there is a note from DAE asking for things that need protection -- to see if JKS can follow-up on this.

## 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters

30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems (they are the only one to have got license in this range) -- it is strong enough to cause saturation in spite of filter; need to find the specific towers and then follow-up with Reliance.

18 Jan : measurements happening this week; update by next week.

15 Feb : completed survey of 82 towers around Y-array : 14 towers in 850 band (Reliance Jio) and 6 towers in 950 GSM band; rest are in 1800 band. Max power in 850 band

~ -16 dBm (at ~ 100 m distance) for few towers. Follow-up for both 850 and 950 being pursued, including dialogue with Reliance Jio to see if they can switch to 1800 band.

08 Mar : draft letter circulated (vendor is generally positive; but formal communication needs to go soon)

15 Mar : New results : characterisation of mobile phone RFI in the GMRT campus -- some interesting plots; using JIO CDMA uplinks and their effect can be seen.

14 Jun : letter to JIO CDMA sent already; Doordarshan is being sent shortly

#### 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems

30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need to identify which make is coming finally.

21 Dec : no updates.

15 Feb : 33 nos (Voltas instead of BlueStar) have arrived; need to finalise the locations and the specific schemes for installation; need to make shielded units for all 33 nos; components for 25 units are available; boxes for 10 nos are in hand except for back plate and chromatisation (expected to take one week); work request for next 10 has been given (repeat order); some difference in wiring for Voltas unit -- needs some rework of the design / layout; also one type of connector is different and this also needs to be resolved; PAR to send an email explaining the steps to be taken to complete the RFI shielding work, and expected timelines for the same.

Regarding installation : there is a table giving the locations for 31 units (including replacements of 5 existing units) -- to check if outgoing lines can be behind the unit; to install sample one unit in canteen annexe, test the RFI shielding.

08 Mar : one set of measurement done (without shielding) - under analysis; by next week shielded case will be measured & compared; RFI group designed shielding box pictures displayed; uses many cables with RFI shielded interface connectors; it includes high current carrying (220V AC) lines, needing shielded connectors !

12 Apr : 10 AC units have been installed; only 3 have the RFI shielding installed (are the other 7 being used !); 3 more RFI units are getting ready; to speed-up the remaining RFI units; and then go for the next batch of AC units; meanwhile, one bump of RFI remains at around 325 MHz -- may be coming from blower assembly : to disassemble on unit and check for source of RFI.

17 May : 12 units are now in operation with RFI shielding; prototype box from new vendor has come and not found suitable -- modifications told to vendor, corrected unit may come in few days.

14 Jun : x20 new units arrived at Pune campus; sent for yellow chromatisation;

5 Jul : now 21 units available; work can restart.

NEW points : shielded ethernet enclosure (x35 units) -- placed work order; it is aluminium C-channel based unit (at Pune W/S)

### 3. Operations related :

#### 3.1 Interfacing of FE with new M&C system :

(i) latest status of testing with Rabbit card in common box at antenna base

16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).

30 Nov : no new updates on this

21 Dec : antenna control part is working; FE monitoring still not working; Charu is



looking into this...

18 Jan : trying with different delay to see if it solves the problem, but not yet working with online control...

==> last 2 months has been working satisfactorily on C-01 antenna;

==> one instance of problem : hanging (needed power reset to be normal again);

==> 2 more units being made ready by FE

(ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus

16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration and testing in 2 weeks time and put on first antenna with RS-232 cable driving; later to convert that to ethernet over fibre; mass production may need only new plates to be made by workshop -- other aspects are in-house in FE lab.

30 Nov : item also being discussed under FE agenda item (in alternate week)

18 Jan : final status is Box #1 was made functional at antenna base and was taken up to antenna focus as Box #2 does not work reliably -- hangs and needs power reset (has been tested with a couple of different Rabbit cards?); problem not solved; agreed to try the option of swapping the Rabbit cards between Box #1 and Box #2 and seeing what is the outcome. To report this by tomorrow and then decide if a 3rd box needs to be made ready.

25 Jan : testing of common box with Rabbit card : new clue related to grounding of enable signal of decoder IC may provide the breakthrough -- tested in lab and will take to antenna base now.

15 Feb : email update from Raj Uprade : One rabbit MCM has been installed at C01 antenna dish focus; MCM communication is proper but needs to give hardware reset while changing frequency band.

08 Mar : it is working only for some bands (C01); needs rethink on strategy.

22 Mar : problems persist; long discussion about what may be the cause; need to get a proper wiring diagram to check the grounding of the system for possible loopholes that may be causing the flaky behaviour...

5 Apr : useful discussion alongwith wiring diagrams; two possible causes identified : old FE power supplies may be having more noise (200 mV) than the new ABR power supply (50 mV) -- to try C01 with the new supply; Rabbit card has ground to common box chassis (unlike MCM-5 card) -- can try to isolate this in the second box being made ready and take to another antenna.

12 Apr : common box on C1 now working properly (!) -- problem was in sequence of commands sent from control room -- there was a monitor command sequence in the cmdfile that was the culprit.

Agreed that only main bottleneck remaining is monitoring of FE system -- this can continue in parallel, even as we go ahead with mass installation of the Rabbit based common box; third stream of activity to be initiated is lab test of ethernet based control of Rabbit card in common box, via optical fibre link (bypassing cable ethernet).

26 Apr : update on monitoring aspect : problem found with 4 lines on interface card that appear to be picking up spurious signals; isolated by connecting straps directly from IC pin to destination point and solved the problem; to confirm that problem clearly identified and solved; and then agree on changes to be made to PCB via straps (after cutting the offending tracks) and implement in mass production.

17 May : above solution implemented for 2nd box also and found working ok; put up in place of original common box on C01 (due to low fringe call sheet due noise-gen all the time); to test the failed unit to see if cause is in new M&C system or in some aspect of common box; for the PCB, agreed to make a new version, but work in parallel with modifying existing versions with straps to keep the production rolling; same strategy for modification to accommodate OF receiver.

31 May : new box on C01 is working fine; older version that had come down has problems identified (not related to Rabbit control) and are being rectified (change of one interface PCB; old one to be debugged by SC) -- to find the spare cards and use for now; in addition, wiring for 2 more boxes is underway. To check separately about OF work on common box.

14 Jun : C01 has been working for last one month; FE group wiring x2 more boxes;

==> one of these 2 boxes can go to antenna;

### 3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgetary quote; formal quote expected shortly.

4 Jan : folder cleared ; PO should be done shortly.

18 Jan : Order has been released; full delivery time is 3 months; first box to be supplied earlier and tested...

15 Feb : email update from Raj Upgrade : expecting the delivery of one Miltec machine shortly; also initiated talk with Miltec to supply it as early as possible.

08 Mar : one unit has come; will be tested & feedback given to Miltech

22 Mar : new Miltech PC put through RFI test; informal report : looks ok; formal report may take some time.

12 Apr : go ahead given to Miltech for full delivery.

26 Apr : CPK to call and check the status.

17 May : CPK yet to call.

31 May : Party had confirmed plans for delivery in 2-3 months time scale -- to check if it can be expedited and/or delivered in batches; out of 16 existing, 14 are working (10 in antennas, 4 in lab); more disks being ordered for Miltech PCs.

14 Jun : Miltek said under production; no speedy delivery possible; usual delivery schedule.

==> end Aug'17 all units expected;

Addition item : issue of Windows software licences discussed (with MSU present) -- agreed to go ahead with ~ 20 stand-alone licenses for use by tech groups.

17 May : MSU reported that he is looking into it.

31 May : MSU presented some confusing feedback from different vendors -- yearly license cost, with terms and conditions; MSU to assemble the possible options and report back.

### 3.3 GMRT M&C sytem Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal meeting.

4 Jan : internal lab meeting held on 3 Jan (now every Tuesday)

08 Mar : all team members are clear on their respective roles & are contributing

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans

30 Nov : discussions ongoing; kick-off meeting planned.

21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.

4 Jan : regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary' etc shared with TCS.

18 Jan : work ongoing; need more regular interactions of TCS with GMRT team members.

15 Feb : email update from Raj Upgrade : 2 CMC and 6 LMC machines are UP & running;

team members are now very much familiar with CMC, LMC installation, features, testing and can carry independent tasks.

08 Mar : interim review held; schedule is 6 weeks slippage/ delayed; mitigation planned for that delay;

22 Mar : work progressing; may test sub-array and tracking in coming MTAC.

26 Apr : could not meet the above target due to modifications for A&A issues and other things; work is ongoing at present.

17 May : tracking routine completed; LMC, A&A and data-base schema work not yet converged.

31 May : new ver 2.2 released last week -- tested and feedback given; further tests to be done this week.

14 Jun : LMC v2.3 expected now but power shutdown led to delay (Friday 16Jun2017); CMC v2 after tests are successful (~ 1 week), phase-2 delivery will be over.

5 Jul : Delivery-1 of Phase-2 has been done; most bugs fixed; some more work is remaining, but can start on Delivery-2 related items.

==> improved version of Delivery-1 of Phase-2 expected today;

==> Delivery-2 work has started;

### 3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for material for review committee started

30 Nov : discussions and work ongoing, including preparations for discussions with TM review panel.

21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase : requirement compatibility; architecture explanation given; scalability etc; need many upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;

4 Jan : preparation of docs in progress; ph-2 work now beginning...

18 Jan : aim to have 6+ antenna set-up with PC + switch + Rabbit talking to Sentinel + OF + Servo (to check if existing PC104 will work directly) or not; to check enough Miltech PCs available -- Sumit and Mangesh to look into it.; need to move from Fedora to Ubuntu; aim to start testing at antenna base by 23/24. Additionally, need some temporary space (couple of months) for working on 2 PCs in or near control room...

15 Feb : Last week 6 antennae Control & monitoring system was set-up and demonstrated to SKA reviewer (Nick Rees) and SKA India team.

08 Mar : SKA committee is reviewing our work; cost estimate proposal from India was submitted to SKA claiming 50% saving on TM work using Indian scheme;

26 Apr : discussions ongoing; need to prepare an updated response to new version of report expected by tomorrow or so.

17 May : all done and completed.

Back-up of interferometry data from GWB : some issues when switching over from gwbh1 to gwbh6, but appear to be resolved now.

==> Additional item : x10 hard drive (2TB each) - arrived at NCRA stores;

==> Next week will be in use

==> end-July x4 LMCs (Local Monitoring Switch) at antenna

==> Layer-3 s/w has been configured in Rx room; one test LMC put on it;

==> slowly move to new L3 s/w

#### 4. Back-ends related :

##### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh paper needs to be looked into for revision; nothing really pending, except for the report on the attenuation values : new set of tests done and results look ok and will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed); may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?

4 Jan : To follow-up on GWB refereeing process.

18 Jan : GWB response received, relatively minor modifications are needed and SHR is looking into this; for Walsh, waiting for response -- can check after 20 days (end of this week / early next week).

26 Apr : no new issues here.

##### 4.2 Updates on existing GWB-3 system :

(i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

4 Jan -- 12 Apr : no progress on this, due to work on release of 30 antenna system.

5 Apr : meanwhile, new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

12 Apr : agreed for BE team to repeat noise source tests and check carefully for spurious lines; then repeat with sky signal as needed.

26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction : geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.

17 May : DDC related updates :

(a) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and releasea for users.

(b) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.

24 May : for shape equalisation, some fine tuning being done by SHR; for spurious lines, not clear what is the best way forward -- need to check if it is part of the ADC related effect or not and whether maintaining higher input levels can help mitigate the problem...

31 May : agreed that the latest version of bandshape correction looks ok and can be released in the next version of GWB; for spurious spikes, some further tests suggested, also to look into optimising the power levels at input for the narrow band modes.

14 Jun : released (bandshape correction) in the current version itself spikes issue no update

==> still analysing (reason for spikes in DDC mode)

(ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes; for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be closed ?

14 Dec : problem perhaps in AIPS settings? matter can be closed?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated; this is completed.

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT loose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to

be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

08 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); but, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain

14 Jun : providing the 'log' at the end of observation for now

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready; appears to be satisfactory (though no improvements in ambient temp recorded ?).

11 Jan : no further work on GWB; plan is to have similar hcngae for GBS during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

08 Mar : plans for work on GSB during upcoming mTAC -- needs a discussion.

3 May : nearly closed; hot air sucking mechanism needed (being explored with Nandi's help).

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (may come earlier)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep looks like resulting in some speed-up in delivery; to follow-up closely.

11 Jan : YG to contact nvidia and micropoint persons.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

3 May : waiting for adapters to arrive;

28 Jun : adapters arrived; nvidia team visited GMRT; GPU installed on one T630 (for raw voltage recording); to quantify improvements thru benchmarking.

==> benchmarking needs single node : software changes for single node, done;

==> initial tests imply x2 improvement in performance in Pascal wrt K40;

==> individual block comparison to be completed by next week;

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful

ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work

for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.  
23 Nov : need to plan the code optimisation that will be needed.  
14 Dec : need a discussion to decide the way forward on this.  
4, 18 Jan 17 : deferred for some more time, till 30-antenna system is released.  
25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.  
15 Feb : SSK to try and restart the old 16-antenna CD pipeline code using the SOPs etc from Kishalay...  
22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.  
08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.  
15 Mar : discussion of long-term issues to be taken up next week (22 Mar).  
22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).  
5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.  
12 Apr : ready to release ver4.5 -- basic things seem to be working; calculator for what combination is possible is also available; full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority); timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam; regular tests for all modes under PMQC : can this be defined ? changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file. zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.  
19 Apr : for ver 4.5, calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).  
3 May : SOP already released (v 4.5)  
17 May : trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.  
14 Jun : trial and release : documents (directory structure OK as per circulated version) finalized; need to creat directories etc.  
28 Jun : antenna testing scheduled today/tomorrow; next SOP release planned  
CD pipeline : GPU has possibilities as per manuals; release of trial mode : all above incorporated.

==> antenna testing were OK; SOP released  
==> control room using it as 'trial' mode

#### 4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :

(i) refinements of the first draft of the note

(ii) plans for getting first unit connected and tested

(iii) plans for testing high speed recording to disks

16 Nov : lab set-up for grabbing and recoding has been done; while continuing with this, need to work on the set-up for sending parallel copy of the data, including procurement of longer CX4 cables.

30 Nov & 21 Dec : not discussed.

4 Jan 17 : basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.

18 Jan : to test the dual copy design for correlations using existing 16-antenna corr with dummy inputs; then to connect to one machine where tests can be done for raw voltage recording and a single node correlator with flexible beamforming.

15 Feb : no updates.

08 Mar : 374 MBps speed achieved; but need slightly higher speed

26 Apr : old gwbh9 (T630 m/c) removed and T620 m/c put in for doing the further work; length of cables -- 3m may be enough for using existing slot in the racks; to look into modifications of FPGA code for more eth cores; simple code for correlation of limited number of antenna etc... longer-term plan with longer cables, more racks, more nodes etc to be thought about.

17 May : expanded design tried with 8+ disks using gulp and can be tried with GWB signals; to be tried with digital copy scheme using resurrected earlier design with 4 10 Gbe cores.

14 Jun : machine installed; code compiled in FPGA; delays being tuned for sync.

==> in 1-2 week will be completed

#### 4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)

16 Nov : some changes have been made by SHR, but the sub-microsec correction still needs to be done; also to follow-up about h4k file.

21 Dec : modified code has been made, but not yet tested; can try to see if it can be made available in the current release.

4 & 18 Jan 17 : agreed to defer to next release.

15 Feb : deferred as above.

08 Mar : current release has this 'sub-microsec correction' ENABLED; it is now possible to send those values to header files;

26 Apr : updated timestamp with higher accuracy is coming now; needs to be verified for correctness; CDP vs PA timestamping still to be resolved.

17 May : one buffer offset confirmed; need to be checked for different modes

14 Jun : sending side time stamps are fine; offset must be getting introduced during processing.

New items to be added : (i) single node correlation (a) off-line for many antennas (for better profiling and benchmarking) (b) on-line for limited inputs (2 to 4 antennas) for testing and new developments

==> offline benchmarking work is useful here too

(ii) new options for speeding up overall I/O for voltage beam modes : (a) different BWs (or chans) for different beams (b) 4 bit voltage beam and (c) turn off IFR or BFR data selectively during a scan.



(iii) testing of P100 based node and related follow-up with nvidia team

==> x2 times improvement reported to nvidia; more work planned ;

==> some optimization suggested by nvidia;

#### 4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans

(ii) spectral domain RFI filtering : current status and plans

(iii) beamformer RFI filtering : current status and plans

16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.

30 Nov : not dicussed in detail.

21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file...

emulator has some changes and improvements, including random location of the RFI.

4 Jan 17 : for (i) modifications in simulator; counter mode now working -- can have 2 different modes, tested at module level, now integrated into the design, will be testing in next few days; fractional thld done in simulation, to convert to design and test. (ii) to try and run the filter in real-time from shm data.

18 Jan : not discussed, but summary of offline discussions is as follows : (i) some additional features added to RFI simulator unit; fractional threshold and counter mode now available for use in the voltage filtering unit; cumuative experience shows that we may be not using the optimal filtering technique for voltage mode -- should try the alternative approach of conversion to intensity and integration to desired time constant -- closer to a true matched filter.

08 Mar : some updates from Kaushal about looking at options for more optimised filtering of broadband time domain data :

Modified the design to support 16K window size - this is the default design now;

Fractional threshold available (tested with antenna signals) - default option now;

Made the DDC mode design compatible with the ongoing changes;

RFI Counter design ready - format to read the data including timestamp from a single ROACH complete, undergoing more tests before release;

Supporting regular tests - spectral line (Nissim), continuum (Ruta, Dharam, Ishwar);

Handling longer duration RFI using median of MAD technique - initial results are encouraging, detailed tests going on;

Looking at likely causes of missing RFI during real-time excision and at possible alternate methods for time-domain filtering;

Ongoing: Updating SOP with changes made till date;

17 May : 2 different options for MAD based filtering released -- normal MAD vs MoM of MAD; some user level tests done -- need to see the output from these for comparison; can be taken up once spectral filtering tasks with Swapnil are concluded.

14 Jun : some results displayed : comparison between MAD vs MoM techniques; MoM much better than MAD 250-500 (426 MHz); but identical (both equally good) performance at 610 MHz need user feedback now.

==> poor SNR at input leading to better GPTOOL performance ?  
==>  
==> plots showed : comparison of MAD, MoM & GPTOOL at different  
==> thresholds ( $2.7 \cdot \sigma$  vs  $3.0 \cdot \sigma$ ); for data at different RF frequencies;  
==> need for astronomers to test (by generating sky images) & give feedback

RFI emulator: (last update email - Jan) :

Last development: Adding facility for random insertion and random amplitude of RFI  
Understanding the GUI and MCM control program - backup from Rahul Bhor;

Narrowband RFI filtering: (updates email sent periodically) :

Initial version of the code has been timed; optimized for computing faster sorting  
for median computation, is now much better;

Moving towards expected version of filtering code - with optimized functions to meet  
real-time requirements (0.671s) and necessary functionality;

Ongoing: Testing the code on recorded data and timing the code for all 60 self outputs;

Looking at synchronization between the data path and RFI filter (along with Sanjay);

Looking at merging of lta file and flags for the FITS file format (along with Sanjay).

08 Mar : now optimizing real time filtering; all bands filtering on recorded; Broad  
band RFI filtering : emulator tested; other techniques being explored; SOP updated;  
to be released next week.

17 May : code for spectral filtering of single self has been developed with spectral  
flags needed as per format specified by SSK and he is to modify this for multiple  
selfs (all antennas, working real-time) and passing flags appropriately to LTA file.

14 Jun : algo done; working on recorded data; extend to real time release in few  
weeks;

==> shared memory to algo done;

==> final integration within 1-2 weeks (ready for real time tests);

4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and  
tests ongoing; also tested by sending digitised packets to antenna and loop back;  
using GWB2 for doing all the correlations.

18 Jan : feasibility study done using C09 antenna with noise sources & real signal --  
needs a fixed delay correction of 1.5 km to get maximum correlation; trying setup  
with E5; meanwhile, a few different tests can be tried with the C09 set-up; comparison  
of scheme running on GWB2 and GWB3 tried out.

08 Mar : C9 & E5 setups faced problems (ethernet card issue); now fixed; GWB2 (early  
digitization) & GWB3 being used for comparison; delay requirement has reduced (due to  
early digitization)

12 Apr : new test has been carried out with C9 and E5 on actual on-source observation  
and brief comparison.

26 Apr : some updates from recent tests to be available by next week; detailed report  
of recent work being prepared.

17 May : trying some tests with single antenna early digitisation (as only one is  
working).

14 Jun : summary of tests circulated; stuck with C9/SFC module (need 10 days)

==> comparative study of dynamic range (old vs new early digitization) in progress

#### 4.8 Time-Frequency Standards (BAK) :

(i) procurement of Maser units

(ii) planning for kind of environmental set-up required for Maser units

(iii) planning for long-term maintenance and development

16 Nov : most of the issues have been resolved, waiting for one party to complete the payment terms; pending issue about performance bank guarantee for different amounts of periods.

30 Nov : work is ongoing, but item not discussed.

4 Jan 17 : TEC clearance ok; recommendation to open price bids -- to check the status.

To contact Prof Sen Gupta for a discussion.

18 Jan : final TEC documents done and sent for next step; to follow-up and check status.

15 Feb : activities ongoing...

08 Mar : Negotiating committee met the vendor (no reduction on price; but add modules 'FREE'; payment terms as per NCRA conditions); Dr Sengupta will be visiting next week; first unit delivery after 5 months; second unit 4 months after 1st delivery;

12 Apr : to take up next time.

26 Apr : to confirm date of expiry of validity and follow-up with TIFR for the folder; to check about vibration damping mechanisms available with the system and otherwise; to make a draft note for selection of the room and suggestion modifications to be taken up.

14 Jun : order yet to go (file still in Bombay); need to plan room A/C shielding : ask civil dept.

==> x2 Maser orders went ;

==> Actions needed from electrical group : UPS, A/C, wall panel for signal cables ;

==> room (already identified) needs RFI shielding ;

#### 5. Other items :

##### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been

working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need to agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

12 Apr : sample unit getting ready -- length needs to be reduced; do asap and get hose assembled and then install on C03.

==> x4 sets of Python of SS make available with Mechanical group;  
==> FE team should plan using them & give feedbacks;

==> other items from Mechanical group:  
==> x3 sets 130-260 MHz feed completed (being sent to GMRT on 21Jul2017)  
==> new work for FE : chassis to hold multiple optical fibres being designed;

=====

## Minutes for the Plan meeting of 26 July 2017

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### 1. FE & OF related :

#### 1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in  $T_{lna}$  for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

22 Feb : first results of variation of  $T_{sys}$  for Band-4 FE unit of QH + DC + LNA

(which goes next to the hood) -- absolute value of Temp is higher than  $T_{lna}$  at ambient and also the variation of  $T_{sys}$  with ambient (0 to 60 deg C) is larger than for  $T_{lna}$  alone. To cross-check whether known loss of QH and DC at room temp can explain the room temp values and then extrapolate from there for different ambient temps.

15 Mar : new test done with QH + LNA only (compared with QH + DC + LNA) -- shows lower variation of  $T_{sys}$  over 60 deg range of chamber (35-40 instead of 55-60 seen earlier); agreed to try to estimate the loss of QH and DC with temperature and use theoretical formula along with  $T_{lna}$  as fn of temp to predict the observed  $T_{sys}$  vs temp curves and compare with the measurements.

5 Apr : new results of  $T_{sys}$  vs temp for just LNA, LNA+QH, LNA+DC, LNA+QH+DC : appears to show reasonably flat variation of  $T_{lna}$  with temp; more variation for LNA+QH; but some of the curves cross each other (and have offsets) with temp -- bit difficult to understand; agreed to try S-params for each device as fn of temp, for same RF (610); meanwhile, theoretical calculations ongoing.

19 Apr : new update, which measures loss of QH with temp, shows change from 0.1 to 0.2 dB over 60 deg and can explain the observed variation of  $T_{sys}$  with temp. To check if any info is available about loss of QH with temp; second is the mystery about lines crossing each other -- needs to be understood; then can check about extending the study to Band-3 also.

24 May : no fresh activity due to engagement in mass production work.

7 Jun : new test done for the new 3-stage LNA for Lband -- shows few (~6 deg) variation over 20 to 60 deg change in temp -- similar to Band-4 LNA; to try with typical cable length in front of the LNA. Riddle of crossing curves remains (here also); to try for Band-3 LNA.

#### 1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible.

22 Feb 17 : only 5 antennas completed by January; request for next set of 5 feeds has been given to mechanical approx beginning of Jan -- expecting 2 dipoles shortly, but reflector and BFRs will take some time; meanwhile one FE box is ready; to get if possible 2 more to be ready, so that 2-3 antennas can be done in quick succession.

Need to have enough QH + DC (is matter of cutting right length of material and assembly); for LNA : have all PCBs, need chassis (ordered in sets of 20); same situation for BPF; however, request for new stools (with modified height) has not been given (!!); due to some rethink about optimal stool height (!); follow-up action on this : to discuss with mechanical to see if existing or spare stools can be modified / cut to meet the height requirement and use for the next 2-3 antennas.

15 Mar : HRB had requested for 5 feeds (DRF 130-260 MHz) out of which 5 dipoles arrived and reflectors + BFRs will arrive by 18 Mar; mounting stools (1190 mm), 30 nos. requested, out of which, 2 stools will arrive on 18 Mar; hence, new installation only by next week;

5 Apr : 2 nos of feed + reflector + BFRs + stool in hand; 1 box ready; one more can be ready in next few days; can target 2 antennas in MTAC period; to see if 3 can be tried.

19 Apr : no progress now, as attention has shifted to common box for some time; now tasks have been reassigned and work on this will pick up now.

3 May : 6th box is ready in lab; will go to antenna by next week (12-May-2017)

24 May : 6th antenna done; one more can be done; after that feeds, stools etc needed; FE box for 2 more available -- more are needed. FE team to check with mechanical and get back.

7 Jun : some delay to move to the next (7th) antenna, though the units are ready -- maybe next week after HRB is back; for further units, boxes awaited after powder coating (10 nos); feeds + stools are available for next 3 antennas. May need to introduce check list for quality assurance for all the units before they are installed (can be done for all other bands as we are increasing the pace of mass production).

28 Jun : 7th & 8th antenna installation completed; next 2 antennas can be ready by ~ 15-Jul-2017; (feed availability is the bottleneck thereafter)

12 Jul : 9th unit has gone; 10th will be ready shortly -- maybe next week; expecting more feeds to come in 10 days time (needed for 11th onwards).

====> 10th unit has been ready for some days, but not gone up due to weather.

### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

(i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months should be enough to complete the tasks i.e. April 2017.

11 Jan 17 : 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

25 Jan : needs combined tuning of filters to fix the problem; work ongoing.

22 Feb : successful in tuning the integrated unit (for 2 boxes, both channels); and

23 antennas are completed, and work is ongoing; next antenna in about 2 weeks.

15 Mar : one more box was made ready, but gave trouble after exhibit at Science Day (!); has been made ready again (all the cables were changed). Will go up shortly.

Meanwhile, next set is getting ready.

5 Apr : 25th antenna done to ver2 level; some issues related to tuning of the integrated filters (assigned to SC).

19 Apr : 26th antenna also completed; going reasonably smoothly.

3 May : next box (incorporating new filters) will be ready this week & go to antenna [~ 12-May-2017]

24 May : 27th antenna is done; generally going ok.

7 Jun : still at 27 due to some maintenance issues with C02 -- need feedback about the oscillation problem.

28 Jun : C02 box replaced due to oscillation problem - now fine; one more antenna : so

total 29 antennas completed; W03 - last (30th) will be done in a week (05Jul17).

12 Jul : all 30 antennas completed for v2 !! will aim for 5 spares in the long run, but 2 spares to be made ready in short run; to get full 30 antenna statistics for main and sub-band widths.

====> to take up the above actions, but can be at lower priority.

(ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good : comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

11 Jan : analysis of Jan data awaited.

25 Jan : analysis of new data (on CasA) -- appears to be systematic 1-1.5 dB less deflection than predicted and control room values -- needs to be checked and followed up in consultation with ICH, DVL, SC & GP; few antennas with some odd behaviour e.g. E3 and maybe E2.

15 Mar : no updates as Ankur is not available

5 Apr : updates from new data; 2 antennas showing less deflection in ch 1 only -- to be investigated; not much other issues.

19 Apr : no updates this meeting.

3 May : data available, but no plots (laptop crash)

7 Jun : work has resumed, and some tests done last week (Ankur not available); to check about C02 oscillation problem.

====> C02 problem : LNA replaced and unit ok; LNA works ok in isolation. no other updates.

(iii) Summary of phase centre measurements and decision about future plans

25 Jan : no action yet.

15 Mar : still pending.

19 Apr : still pending

(iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

11 Jan : data collected, report expected within 2-3 days.

25 Jan : Sougata + Ankur will provide update next time.

22 Feb : SC will send update within a week.

15 Mar : some work is still pending; SC will complete and send within a week.

5 Apr : some tests done using OF monitoring system (seems not all antennas working and also varying behaviour) : summary from 10-12 antennas, 3 sub-bands (one corrupted by RFI) : some cases show narrower BW, and some show wider BW; for narrower BW cases, coating the PCB appears to correct for most of the discrepancy -- needs a short report on this; last 5 antennas have gone up with the coating -- should be able to cross-check the performance; need to find a solution for broader BW case !

19 Apr : quality check on 24 antennas done; about 4-5 antennas showing discrepant band for most sub-bands; FE team feels confident that this can be fixed with the coating option; to make a table for all antennas all sub-bands for user to decide what to be done; to fix as and when FE box comes down for other work.

3 May : report circulated; worst affected antenna identified; after ~ 3 months will be taken up;

24 May : no new updates; can check around July.

====> see item (i) above.

(v) LO settings for all sub-bands etc to be finalised.

14 Dec : 250-500 LO setting document / table already finalized;

28 Dec : no updates; person on leave.

11 Jan : astronomer feedback awaited (to check if final table shared with control room).

25 Jan : Not yet shared with control room; to refine based on : 6 dB point for main

BPF and 10 dB for subband filters, for the default BW.

22 Feb : draft document has been circulated to DVL & YG for trials, for 3 bands (Band-3, 4 & 5); for Band-3 which shows max variation of sub-band responses, the basic response is taken as the one found in majority of units and 10 dB criteria is applied to that response to get the LO values; either lower or higher or both side LOs are recommended depending on the situation, and some justification has been given for all the cases; YG to check with DVL etc if this can be released to control room and all users.

15 Mar : some responses from DVL + Nilesh etal -- some clarifications sent; some more tests to be carried out this week.

5 Apr : no updates for this time.

19 Apr : DVL and co to provide update by next week; can discuss 2 weeks later.

7 Jun : FE team to check with JPK if control room is following a standard, recommended procedure.

====> YG to check with DVL

#### 1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus

14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01); box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)

28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).

11 Jan : box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.

3 May : box #2 MCM reset option & monitoring finished; to go to C01 antenna tomorrow (04-May-2017);

24 May : replacement on C01 working ok; older one traced to interface card problem -- to be fully debugged; meanwhile spare new card will be put and made ready for installation

7 Jun : faulty unit requires one IC base to be changed and can be used again; meanwhile waiting for new PCBs to come -- to see which vendor can do this.

28 Jun : IC bases replaced with better ones - now that unit is working (unit used as spare & template for other ones)

(ii) Plans for mass production

30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.

25 Jan : one box tested at antenna focus and working ok; 2nd box not yet tested at focus; even for the 1st box, repeatability is not there.

19 Apr : ready to start the mass production and installation; may be able to achieve 2-3 weeks per box in long run after first 2-3 boxes; to coordinate with Ops group for supply of Rabbit in shielded box. Also to do the R&D for getting the ethernet control option tested and going and put it into mass production -- this needs an extra input port on common box -- agreed to use 50 MHz port for immediate and redesign the plate for additional input port and put into new boxes as and when ready, without affecting the rate of mass production of common boxes.

3 May : x2 boxes in wiring stage; x1 box per month initially (later one box every 3 weeks); redesign of band-selector & interface card completed; mass production can



begin now

24 May : to go ahead with the plans, introduce new cards into system as and when ready; and retrofit the new cards in older systems later on; transobs PCB also to be included in the above.

7 Jun : to get the set-up going and then decide on the priority.

12 Jul : one box was made ready and taken to C02; stopped working after some amount of testing at antenna base -- brought back to lab and being debugged; agreed to put some additional manpower (Vishal) from Band-3 team into this work (esp as VBB not available).

====> current status : original unit on C01 is down with "band not setting" problem (stuck at Lband) -- to be debugged in the lab; meanwhile old MCM based CB is being put on C01; unit for C02 : problem traced to bad cable (external); unit now ready to go back to C02 (waiting for better weather); unit #3 waiting to be tested with interface card; additional person (Santosh) to help in the work.

1.5 Apex radiation scheme (PAR/SRoy) :

(i) Current status of measurements and interpretations

(ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

11 Jan : no updates, though there has been some email discussion between SRoy and PAR

25 Jan : need to check with SRoy and PAR.

15 Mar : PAR and SRoy yet to have a detailed discussion; meanwhile another round of tests done on C1 -- showing a different pattern than C10. Need to summarise and circulate and then take up for discussion.

19 Apr : no updates, though some ongoing email dialogue between SRoy and PAR...

24 May : discussion between SRoy and PAR -- some conclusions have been reached and some action plan has been worked out between them : to circulate a brief note summarising these (as well as dynamic range measurements summary and plans), while follow-up action continues.

28 Jun : report summarizing all the work carried out so far has been prepared; yet to be circulated; report displayed and discussed : sensitivity 250-500 MHz -147 dBm (cone dipole); 1dB compression point (P1dB) : 1dBm (old); 10dBm (new); temp effect 0.2dB (amp) & 2 deg (phase) due to FES & RF (stability);

transmitting RF power recommended :  $\geq -40$  dBm &  $< -10$  dBm;

ELV /AZM dependence : 0.5 dB (amp) & 8-10 deg (phase) (tests done on 5 antennas total); another report for log-periodic antenna set up (separately)

====> need to follow-up on the short summary circulated by FE team (check SRoy).

1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) :

Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of health of Walsh switching.

11 Jan : there is some confusion about what is being done, and what has been achieved !  
For 10 antennas which have new 1st LO system (LOFSW based units), it should NOT be possible to have Walsh modulation at present !

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh...

22 Feb : now clear that only those antennas (20 ?) which DO NOT have the new synth units can be tested for Walsh; latest tests on these (done in Jan), showed ok results for 19 out of 20 (one antenna was down due to mech problems).

15 Mar : no immediate action here; need to work out with analog BE team.

### 1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

22 Feb : SC to check with JPK about the progress on implementation of the SOP for use by control room in normal PMQC type of tests and generation of stats to report to FE team.

15 Mar : control room people (JPK and SNK) are looking into the code written for GSB to see if it can be done for GWB.

5 Apr : SC to follow-up with JPK on the matter.

19 Apr : code has been obtained and possible issues in it have been identified; to see if the job can be taken over by control room colleague.

24 May : to see if a discussion with JPK + SN + ICH can be had on this matter.

7 Jun : to organise a joint meeting, maybe week after next.

28 Jun : programme for narrow band system needs to be edited for broad band system  
==> SC is looking into modifying the code himself.

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

22 Feb : to plan for the discussion.

15 Mar : agreed to make a presentation on 20th in the poln meeting.

5 Apr : presentation showed reasonable results; action items : to compare feed response with WiPLD results of HRB; compute 3 dB BW vs freq for Band-3 for feed + dish and compare with observed results; need a software with finite element method approach for this simulation -- Antsys or Fecko; to check availability in different places in and around Pune.

19 Apr : no new updates right now.

24 May : SC to follow-up and report back.

7 Jun : no updates.

==> no new updates.

### 1.8 New filters for L-band (AP) :

(i) status update on installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing

16 Nov : arm antenna installation to be resumed;

14 Dec : all west arm will be completed by 16-Dec-2016;

28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.

11 Jan : S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).

25 Jan : only 2 antennas W-arm remaining to be done.

3 May : only one antenna (W2) remaining

24 May : to confirm if all antennas completed or not.

(ii) delivery of remaining units of main L-band BPF from Epitome

16 Nov : BPF completed and handed over to BE team -- this can be closed.

28 Dec 16 : can be closed.

1.9 OF system updates :

(i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.

11 Jan : current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.

15 Mar : this is status quo; few extra high power lasers at 1310 nm for forward link have been procured; cards being made ready; will be used as and when loss becomes too large in far away antennas.

3 May : high power lasers (5-6 nos made ready) and available for use; for, W6 & S6 such lasers already installed about one year ago;

24 May : some evidence of loss of power of laser transmitter (1310 nm) at Rx room causing problem in telemetry link; needs retuning of laser circuitry; will be taken up one by one -- this is in addition to need of high power lasers for far away antennas.

(ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates

28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.

11 Jan : cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.

15 Mar : expected by end of this month.

5 Apr : OTDR not arrived yet; second fibre bundle ordered but not yet delivered.

3 May : OTDR has arrived; second fiber bundle has also come;

24 May : OTDR working well; 2 km fibre bundle arrived; 20 km spools : 3 nos were found bad and have been sent back to the vendor in US -- need to follow-up on it.

28 Jun : bad cables being sent back to vendor in US

====> for the spools : vendor is sending the 3 replacement units; new OTDR is working fine -- item can be closed.

New item : contract with BSNL for dedicated GMRT to NCRA fibre to be renewed as it is 5 yrs old. OF team to circulate the preliminary docs to all concerned in NCRA for clearance before sending ok to BSNL.

====> SSK need to check with admin about (i) clearing of bill and (ii) signing of new agreement.

(iii) 8 Gbps GMRT to Pune link : it was found that only 1 or 2 Gbps was working;

25 Jan : detailed debugging has been done by OF team and now it appears all the 4 wavelengths and hence 8 gbps lines are functional -- only one wavelength is marginal (to order spares for taking care of such issues); also remote monitoring facility at Rajgurunagar with SMS facility to be activated.

15 Mar : spares have been ordered; monitoring unit is ready -- small change needed in software and then can be installed.

5 Apr : not yet installed, waiting for Rahul Bhor.

24 May : spares for the links have arrived and are available; monitoring unit is now ready for use; some changes in IP address needed in units at Rajgurunagar to activate the system; also some spare cards are needed to make things fully functional at all

locations.

====> new unit for remote monitoring not yet installed; spares issue may be ok.

## 2. RFI related :

### 2.1 Spectral line RFI (PAR/SSK) :

#### (i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks

28 Dec : RFI team visited Junnar cable TV operator for getting response to letter that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.

25 Jan : discussed with Jondhale -- he will speak to the party and see if some progress can be made; otherwise to escalate the matter; also to estimate the number of splitters etc that can be provided to W-arm operator to mitigate the problem.

28 Jun : shielded cage designed for laser Tx & RF amp devices : field test in progress.

#### (ii) Digital TV follow-up

23 Nov : letter is still pending !

25 Jan : need to expedite the matter !

#### (iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source

11 Jan : 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.

25 Jan : need a site visit to understand better.

3 May : new RFI line (set of lines) observed at 467 MHz ! (need to identify the source)

24 May : for 402 MHz line : trying to identify any relevant weather station that fits the bill (!) -- needs some more work; for 467 MHz lines, still no clue.

28 Jun : initiated dialog with IMD : letter requesting tests at their premise

====> 402 MHz RFI : current understanding is that the offending transmitters are from the weather stations in the west direction (rather than SW) -- RFI team suspects it to be coming from Mumbai (!); transmit is only at some times of the day; discussion with IMD Mumbai --> IMD Pune (to follow-up) and also to ISRO for more details about the tx system. 467 MHz : no clue (appears to come from all directions).

### 2.2 Satellite RFI monitoring & avoidance system (PAR/SNK) :

#### (i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and ,, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)

25 Jan : need to follow-up on identifying for LEOS.

#### (ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)

25 Jan : new limit is about 8 deg -- to cross-check if ok and close.

#### (iii) Plans for sending information to back-end receiver chain

25 Jan : to check with Santaji about the plans for this

#### (iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week

28 Dec : no updates.

25 Jan : to include in the plans for visit by Nick Rees in week of 6th Feb.

24 May : some of the pending jobs : need to characterise some of the remaining satellites.

====> no new updates.

### 2.3 RFI from power lines and transformers (PAR/RVS) :

#### (i) review current status

(ii) specific follow-up actions

23 Nov : not discussed

25 Jan : no updates.

24 May : this activity needs to be revived.

2.4 RFI from LED lamps (PAR/RVS) :

(i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

(ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

25 Jan : report has been circulated; solution looks promising; to try for compact version of the solution; working with workshop to mechanical items; will need to order some components for bulk production.

08 Mar : LED panel/ tube light shielding : report generated on tests - broad band radiation from commercial units (x4 units in one box) - shielding is ~ 75 dB ; results appear encouraging; Syska (x1 22W), Philips (X4 20W); -150 dBm final number arrived at. high failure rate of LEDs due to voltage fluctuations;

11 Apr : new model of LED light identified with very low level of RFI (none at all !?!) Hi-Lite 15 W; sample unit of this LED panel displayed; agreed to procure a few units and do a thorough follow-up.

26 Apr : demo of RFI free LED lamp 15W done (in lab, x5 units have been assembled); plots of RFI from LED lamp displayed : 15W (5 units) ; 26W (1 unit) HI-LITE 15W unit's RFI (ON & OFF) identical noise floors; similarly 26W lamp also shows RFI same noise floor for ON or OFF; also tested at all GMRT band : clean (no lines); upto -130 dBm level; conclusion : 15W units can be used for corridor lighting

3 May : x5 LED lamp (15 W) units installed in corridor

24 May : no RFI seen when 5 nos of 15W lights used together; can we decide about this? main question is about establishing best levels and also absolute calibration; for the first, can try with higher gain amplifier; for the second, to complete the exercise of mapping the power levels to antennas.

28 Jun : pending acceptance of LED lamps (already used in corridor), bulk order can be placed.

====> 5 units have been in use for ~ 3 months; agreed to do one more test to see if any degradation is there; and then take a final decision, folding in estimates of absolute power level.

2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested; 8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.

4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified units -- all are ok. Need follow-up as mentioned on 28 Dec.

18 Jan 17 : all 10 units tested and cleared; now OK to use this 2nd batch of 10 units in antennas; need follow-up on status of ordering last batch of 14 units.

25 Jan : matter closed for now from RFI team side; to take up when next lot comes.

12 Apr : indent process for the last lot was held up due to issue of exact specs for RFI related properties (!); finally, agreed to go ahead with the existing clause as likely there will be one round of modifications needed if some specific part is changed by the vendor. Electrical team to expedite the paper work.

24 May : to check status with RVS.

### 3. Operations related :

#### 3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) :

##### (i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.

28 Nov : still waiting for 80 nos PCBs to come.

11 Jan : 84 PCBs received; can go ahead with further assembly now.

25 Jan : this can be closed.

##### (ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);

28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.

11 Jan : 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.

25 Jan : Rabbit card enclosure now going smoothly : about 2-3 per week; to send some samples for RFI testing.

22 Feb : 18 are done; 19th ongoing.

15 Mar : 23 completed; one unit given to RFI team for measuring shielding.

5 Apr : going on track, will finish all 30 by April end.

19 Apr : Ops group to talk to FE group to start regular supply of Rabbit + shielded enclosure for installation and commissioning of common boxes for antennas.

3 May : x28 boxes are ready & tested; can be handed over to FE whenever asked.

28 Jun : stock of tested MCM cards was over; 1 new card tested

12 Jul : 30 units are ready now. MCM cards are being tested in Lab.

====> testing of Rabbit MCM cards ongoing (4 out of 30 are completed).

##### (iii) status of mass production of network switch enclosure

23 Nov : 28 units ready (need total of 35)

14 Dec : now 32 (of 35) ready;

28 Dec : same status of 32 out of 35.

25 Jan : 32 out of 35 completed; remaining 3 are in use and will be done when free; meanwhile, to send a few samples for RFI testing.

22 Feb : some sample unit(s) has been given to RFI team for testing -- Raj to confirm; to check if all shielded connectors are procured or not.

15 Mar : samples have been given and tests are being carried out today.

19 Apr : confirmed that all 32 boxes have shielded connectors; to check with RFI team about results from RFI tests of integrated system.

7 Jun : to confirm with PAR about the report.

28 Jun : 3 have been used in lab.

12 Jul : still waiting for report from PAR.

====> reminder to PAR.

3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

(i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing

23 Nov : C00 & C10 are mostly complete (item could be closed?)

28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.

(ii) plans for going beyond 2 antennas

23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)

28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?;

elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.

11 Jan : mechanical completed for 10 antennas; electrical completed for 13 antennas; Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.

25 Jan : mechanical has resumed work; same for electrical; will be updating spreadsheet; column for servo has been added in spreadsheet -- to remind them to start updating;

15 Mar : mech has completed 13 antennas; electrical has installed all the UPS units (23), other changes need to be checked; servo has completed 10 antennas.

5 Apr : 8 antennas completed for M&C systems; 3 extra Miltec to be tested; 4 are non working -- being looked into (total of 15 Miltechs); apparently no change in status of other systems (mech, elec, servo) -- JPK to check and follow-up.

19 Apr : servo has completed 15, electrical has completed 23, and mechanical has done 13 antennas; M&C system on 8 antennas, 2 more are ready + 1 in testing in lab; Ops group needs 5 nos of 2 TB disks and comp group has provided 2 nos -- to arrange for ~ 10 nos of 2 TB disks.

3 May : x5 total disks (2 TB each) were given to OPR group; x2 used to replace old disks ; x3 available for any application

24 May : 10 antennas completed for M&C system installation (+1 in lab), including putting the new disks into use -- can go ahead for useful testing with this system (see alternative week agenda).

7 Jun : 15 antennas servo to UPS rewiring completed; mechanical will pick-up after 15 June; M&C installation still at 10 nos.

28 June : x16 units with servo UPS connected; x14 units with Meachncial connected; M&C still has x10 systems;

12 Jul : S02, C03 and C04 have been completed by Mechanical group. Very soon we will install our hardware in those antennas.

====> electrical, no progress after 23 antennas (2-3 months); mech has completed 17; servo has done 19; Ops group has 7 antennas with all sub-systems and trying various tests; Miltech in 10 antennas, will grow to 13 soon; remaining supply of Miltechs will come by end of Aug. 1 Miltech to be used for correlator LMC.

(iii) update on improved RFI shielding at antenna shell

23 Nov : shielding test measurements done for present configuration; awaiting finger-lines to be added before repeating the tests (which antenna?)

28 Dec : folder in process for placing order for the finger-lines.

5 Apr : no updates.

====> finger-lines have come and being assembled on door of one sample antenna and then comparative test for leakage to be done; then next target is connections going from shell to antenna focus (non-RF connections).

3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems

28 Dec : Ops team has a plan for this; can be discussed in detail next time.

11 Jan : final plan placed on web portal (for lab people)

19 Apr : 8 + 2 + 1 units as given above; further growth constrained by availability of Miltech PCs only.

24 May : now populated on 10 antennas and using 2 Rabbits at antenna base for controlling servo, FPS, OF, FE, sentinel (tested concept) to test shortly with new version of LMC s'ware (but old CMC s'ware); need some cooperation from servo for changing PC104 from serial to ethernet upon choice (discussed with SS and he will discuss with Thyiagarajan); for parallel connections to other systems, some further planning is needed.

28 Jun : see above

====> servo modification is working fine; see above for other details.

(ii) plans for switch-over -- to make it as seamless as possible.

30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.

28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.

25 Jan : can defer till after the demo.

22 Feb : Ops team appears to prefer scenario 1 -- incremental approach; to generate a note within next 4 weeks on this.

15 Mar : still pending for team to send a draft doc.

5 Apr : still pending.

19 Apr : can check again with Ops group next week, for a possible discussion 2 weeks later.

26 Apr : discussed draft document produced by Ops team on long-term plans for installation of new M&C system; general agreement for incremental approach noted; next level points to be addressed discussed -- doc to be updated with these and taken up for discussion...

3 May : incorporating points that came out from discussion into the change-over-plan note.

24 May : updated doc has been circulated; can be taken up for detailed discussion next week; meanwhile useful discussion on how to coexist between MCMs on RS485 bus and new system;

7 Jun : updates about the discussions and outcomes from GSG meeting; more discussions about details of the plans going forward are needed.

12 Jul : Points will be added to the documents, whenever new things will come up.

====> may need to flesh out some of the points in due course.

3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)

14 Dec : HP layer3 switch finalized; bidgetry quote Rs 3.5 lakh; indent prepared.

11 Jan : item can be closed.

(ii) Plans for procurement



23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.

28 Dec : indent raised.

25 Jan : procedural issues related to advance payment etc...

22 Feb : not clear if this matter has been resolved before Charu went on leave...

15 Mar : need to check with Charu.

5 Apr : HP make layer-3 switch has no issues about advance payment and order has been placed and delivery expected by end of this month; the advance payment problem was for SFP adapter -- this needs to be resolved.

19 Apr : matter is resolved and delivery is expected by end of this month.

3 May : switch has arrived at Pune

24 May : item has been tested ok; can initiate the plan to put this in the M&C rack and shift antenna eth connections to this switch (instead of OF group's switch) and start using this arrangement.

28 Jun : under test in Rx room (by Santaji)

12 Jul : Testing has been completed for the switch. We will first put one test LMC on that switch.

====> tested switch configured and allotted 40 sub-nets.

### 3.5 Interfacing and control of new systems such as Noise Cal & Walsh :

For 10 antennas which have new 1st LO system (LOFSW based units), need to be clear about the control path; also 2 of these antennas have independent MCM for driving the new CPLD; need a wider discussion about M&C for new system for these aspects related to Noise Cal and Walsh.

22 Feb : need 2 CPLDs in new set-up : one for new FSW LO, one for Walsh + Noise on-off etc, and both can't be connected to MCM 2 and hence an additional MCM is needed. To find out a way around this issue, so that progress can be made...

15 Mar : 2 options are being explored by BE team without increasing the number of MCMs from present count; some prototypes are being tested and will be reported upon shortly. For the longer term, need to see if antenna based Rabbit card can fulfill these roles.

3 May : tests with different interfaces done; avoiding additional MCM (beyond x2 MCM) successful [but with OLD MCMs]; in new MCM, use of control pins of MCM used for sentinel will suffice.

24 May : summary issues : if any M&C system takes control of the RS485 bus then it can meet any MCM requirements -- this may be the way to go for the final M&C system; finally, the functions that are needed for uGMRT only (noise and Walsh related) will have to shift to Rabbit card -- whether capability exists in the single Rabbit at antenna base needs to be confirmed.

28 Jun : agreement reached to use existing rabbit card instead of MCM2

12 Jul : Documents has been shared by JPK regarding Rabbit IO pins.

### 3.6 Update on Rabbit Card in Common Box : follow-up from discussion of last week to track the progress and latest situation...

19 Apr : FE team plans for roll-out discussed above; Ops group to provide required number of Rabbit in shielded card; main remaining task is to get the FE monitoring working on the Rabbit interface to FE system : CPK has been doing some debugging to get to the bottom of the problem; JPK and CPK to sit together to see if earlier work done on 15m with Labjack for similar control of FE system can help.

3 May : points closed; new box being out on C01 (at the antenna base tests were successful; now going to turret (today itself; 03-May-2017).

28 Jun : replicating other boxes; x2 boxes to be ready [& then to be shifted to antennas]

12 Jul : Two Boxes are ready. FE people are testing boxes in lab.

====> no new updates from Ops group.

#### 4. Back-ends related :

##### 4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

11 Jan : one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

25 Jan : s'ware work for the above is still in progress.

15 Mar : still in progress, no new update.

3 May : x1 ADF-4350 system ready (tested in lab) with switchable freq & power level attenuator; characterization in progress with web-browser (from ONLINE); but need command line functionality (Jitendra had to do); next, ADF-4351-s needed for individual antennas.

24 May : only new command in online has to be created -- JPK will look into it next week; meanwhile, option to switch DDC LO to achieve the freq offset is also being developed and cmd line interface for this has been made ready; both options can be released together in few weeks to the user; team can now start thinking about soln for 1st LO for the antennas.

28 Jun : DDC LO switching has been developed & tested; samples for components needed for 1st LO have been received.

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

11 Jan : one rack modified (4 antennas) and systems being tested; will report shortly, and if everything ok, will go ahead with the mods for all the 8 racks.

25 Jan : same status as above; test report has been circulated internally.

15 Mar : will complete the modifications for all racks in MTAC; meanwhile, the filters can be used with unequal gain in different antennas; command is available to control room and can be tried.

5 Apr : phase jump problem requires use of 4350 IC circuit -- this has been tested in GAB on one antenna both pols and found to work OK; need to repeat same test with 4351 IC also and then bulk order of 4351 IC can be done (will take about 2 months); will need modified CPLD based ckt + software for using 4350/51 at antenna base as 1st LO for legacy system.

12 Apr : follow-up discussion with users like NK indicates that higher priority for having GAB + GWB uGMRT working without phase jump on switching, and solving the problem for legacy GMRT can be lower priority; accordingly, 2 possible solution options discussed for uGMRT : (a) have 2 signal generators set for the 2 frequencies needed and switch their output to the common LO signal line on the switching command (b) have one unit of the new 4351 IC completed with proper control logic to act as the single source of common LO; agreed to aim for option (b) on time scales ~ month or so.

3 May : closed now ?

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.  
14 Dec : changes to DRAFT report in progress;  
11 Jan : still in progress -- not ready yet.  
25 Jan : no new updates.  
15 Mar : no new updates; BAK to check.  
12 Jul : 4350-based system available for 1st LO for GWB with web-based control; work ongoing to have option for cmdline control; 4351-based system : 5 units are ready; 100 ICs have come; modification of the s'ware required for this unit is going on; also CPLD s'ware needed for control of this unit at antenna base.  
====> for cmdline control of 1st LO with 4350-based system -- DKN to talk with JPK to understand the simple solution and try to implement.

#### 4.2 Power equalisation scheme and related topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

11 Jan : still pending

25 Jan : revised version circulated internally.

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

15 Mar : BAK to check and get back.

5 Apr : Atul has initiated the discussion with control room colleagues; SRoy + Nilesh discussion now has the basic code working and SRoy is doing some testing and debugging and will report the result in few weeks, after which one could talk about releasing the package with the different modes.

3 May : only plot routine remains (discussion pending - may happen today itself)

28 Jun : SRoy : gave gain tables, which need to be merged into FITS file (by SSK).

12 Jul : SRoy has made an option made ready for plotting the total power o/p for last 4 hrs in a running mode -- will try to release shortly for use; 2nd update is about the update of attenuator values to GAB : response time for setting has now come down from ~ 2 mins to ~ 30 secs, after the changes made by JPK; however, there is a problem of occasional failure of the setting algo and the ack not coming (quickly enough) from the GAB controller.

#### 4.3 Updates on existing GWB-3 system :

(i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

4 Jan -- 12 Apr : no progress on this, due to work on release of 30 antenna system.

5 Apr : meanwhile, new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

12 Apr : agreed for BE team to repeat noise source tests and check carefully for spurious lines; then repeat with sky signal as needed.

26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction : geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.

17 May : DDC related updates :

(a) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and release for users.

(b) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.

24 May : for shape equalisation, some fine tuning being done by SHR; for spurious lines, not clear what is the best way forward -- need to check if it is part of the ADC related effect or not and whether maintaining higher input levels can help mitigate the problem...

31 May : agreed that the latest version of bandshape correction looks ok and can be released in the next version of GWB; for spurious spikes, some further tests suggested, also to look into optimising the power levels at input for the narrow band modes.

14 Jun : released (bandshape correction) in the current version itself spikes issue no update.

28 Jun : for bandshape correction : edge effect handling now completed & released; this can be closed now.

For spurious spikes : tests imply spikes originate from ADC itself; need to change the clock & see; other repeatability tests (same spikes from same ADC card) etc remain to be carried out;

12 Jul : repeatability : in 200 MHz mode, seems to be good repeatability of channels for same ADC, with some fluctuation in ampl and confirmed that all are  $2^n$  locations; trying 100 MHz mode with DDC (even for 100 MHz o/p) shows some additional lines, not at  $2^n$  location but of comparable strength (!) -- needs to be looked into more carefully to understand the nature and cause of these.

(ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?

14 Dec : problem perhaps in AIPS settings; matter can be closed ?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov 16 : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated; this is completed.

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and

does NOT loose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

8 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); But, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain

14 Jun : providing the 'log' at the end of observation for now

12 Jul : this is still pending.

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.

11 Jan : no further work on GWB; plan is to have similar change for GSB during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

8 Mar : plans for work on GSB during upcoming MTAC -- needs a discussion.  
3 May : nearly closed; hot air sucking mechanism needed (being explored with Nandi's help).

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (but may come earlier?)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up in delivery; to follow-up closely.

11 Jan : YG to follow-up with nvidia and micropoint.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

3 May : waiting for adapters to arrive;

28 Jun : adapters arrived; nvidia team visited GMRT; GPU installed on one T630 (for raw voltage recording); to quantify improvements thru benchmarking.

19 Jul : benchmarking needs single node : software changes for single node, done; initial tests imply x2 improvement in performance in Pascal wrt K40; individual block comparison to be completed by next week.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : no specific updates, except that code optimisation will need to be done.

14 Dec : need a discussion to decide the way forward on this.

4, 11 & 18 Jan : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion on long-term issues to be taken up next week.

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K channels for 16 or 32 s integration is

possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working;

calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

19 Apr : for ver 4.5 : calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).

3 May : SOP already released (v 4.5)

17 May : trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.

14 Jun : trial and release : documents (directory structure OK as per circulated version) finalized; need to creat directories etc.

28 Jun : antenna testing scheduled today/tomorrow; next SOP release planned  
CD pipeline : GPU has possibilities as per manuals; release of trial mode : all above incorporated.

12 Jul : some white slot testing needed for new release ver before replacing the existing GTAC use version. CD pipeline : tested for 2 beams 200 MHz also; waiting for cmdline interface for 2 beam mdoe.

19 Jul : antenna testing were OK; SOP released; control room using it as 'trial' mode.

4.5 Network related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half sytem

4 Jan 17 : this is done -- to confirm and close.

(ii) updated IP table for .4 n/w to be made available by computer group

4 Jan 17 : work onging -- to check status with comp group.

3 May : completed

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.

3 May : GSB & GWB diagrams available ; completed

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines is possibe with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together to NCRA end; comp group to set up the test, alongwith VVS at Pune end.

11 Jan : 3 connections made to gwbh1-3, and live test demo done; it appears that only 2 of the 8 x 1Gbps links from switch to aggregator are woking ! This needs to be debugged between comp group and OF group.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

4 Jan 17 : comp group agreed to look for options.

15 Mar : can be taken up next time.

4.6 Longer term plans for GWB-4 (SHR/GJS/ICH/SSK/BAK) :

List of tasks going forward (needs to be prioritised) :

(i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link (GJS+MGU)

28 Jun : GMRT side network provided; Pune side status need to be checked.

(ii) Disks for data recording, including trials with SSD options (GJS)

3 May : restarted the tests on normal disks

(iii) investigating next gen GPUs -- to benchmark sample Pascal units from nvidia (SHR)

19 Apr : to be tried next week.

28 Jun : they have arrived; installed; need to be benchmarked.

(iv) migration to next version of CUDA (7.5 and beyond) -- to decide the steps

23 Nov : CUDA 7.5 is being tried in the new version of GWB -- confirm present status

19 Apr : confirmed that all v4.5 is on CUDA 7.5 and no upgrade in near future.

3 May : installed CUDA 7.5 on all machines; next cycle may go for 8.0 which is now available

28 Jun : CUDA 8.0 also available now; next cycle to move to 8.0

(v) DUT correction and timestamp related issues : to confirm present status and decide future course of action (SSK)

19 Apr : still pending.

28 Jun : today it will be addressed;

(vi) towards PFB option : resurrect old code into new GWB5 & compute the overheads (SHR)

(vii) towards a gated interferometer : to look at the MAC code that can do the gated integration; to send the gate information to the GPU from CPU (SHR/SSK/YG)

(viii) improving availability of beams by reducing beam I/O : 16 bits to 8 bits for IA/PA beams and 8 bits to 4 bits for voltage beams (SHR/YG)

(ix) options for an additional network for even better I/O capabilities (SHR/GJS)

(x) PA - IA beam mode as an additional option with IA or PA modes (SHR/SSK/YG)

(xi) making 4 PA (or voltage) beams point in 4 different directions -- SSK to look into the change in code needed for this, starting with astrocal

19 Apr : SSK has done initial study and plan for generating parameters for all 4 beams from same call to astrocal and then pass to the beamformer; beamformer code needs a change to do one extra multiply by complex number whose phase is calculated on the fly based on antenna, channel, time and beam number.

3 May : initial note from SSK;

28 Jun : beam steering implemented; tests in progress; basic thing works; plots 'identical'; needs repeated tests;

(xii) towards more general multi-beaming in the long run

(xiii) archiving of beamformer data : better header and also finding what metadata is required -- SSK to look into this, in consultation with Deepak Bhong.

19 Apr : to follow-up with DB in next few days.

28 Jun : header has all necessary metadata inputs; higher level s/w need to incorporate their usage;

(xiv) getting second copy of data to separate cluster going : for both raw voltage recording, as well as for multi-beaming kind of work (GJS/BAK)

19 Apr : to see if one node (with new disks) can be made ready and put in one rack and connected to Roach board -- can grow to one m/c per rack with separate IB switch...

28 Jun : raw voltage goes to one machine; but now that machine taken off for Pascal testing; GJS : FPGA design for making second copy (adding delays to synchronization);

(xv) decide on 2 vs 4 inputs per Roach board for final configuration

(xvi) net-sign correction -- confirm current status and decide if further action is needed (SSK)

19 Apr : current status is that adhoc sign flip has been introduced for both corr and beamformer header info; proper modification in code needs to be decided : when & how.

28 Jun : fix is working (LSB, USB)

(xvii) full backward compatibility of off-line utilities (SSK)

23 Nov 16 : some work has been done, but not clear if this meets / works for all



requirements.

19 Apr : has been done and released and users have used it.

28 Jun : need better coordination with users to avoid confusion; responsibilities of individuals also need to be precisely fixed.

#### 4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

(i) Summary of current status for temperature monitoring

3 May : cacti released to control room;

(ii) Plans for future enhancement and release for regular use

(iii) Monitoring of other health parameters

14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack (uses DAQ card);

28 Dec : not discussed.

11 Jan : no significant new updates.

25 Jan : no new updates, but plans for collecting the temp data and bringing to common m/c that is accessible to control room is being planned. installation of cacti also to be taken up.

15 Mar : machine has been made ready; cacti has been installed; gradually adding nodes to the list and making them ready for monitoring; a separate home-grown product (using cgiplot) also being made ready for monitoring IB network.

19 Apr : cacti for temp monitoring for all GWB nodes (temp of cores) -- available on web browser; to release to control room and users and add in GWB SOP; cgiplot -- home grown version that allows to read the raw data and display using cgiplot in a more flexible manner (right now on hold); for IB monitoring : collectl was being used for IB monitoring (right now on hold); for disk usage, cacti has an option, can be released alongwith the temp monitoring. Additional homegrown tool (IMH + others?) also available -- need to check and see what should be the final form.

3 May : during MTAC, temp displays in CORR room added; (plot facility etc); control room can always see display of temps : inlet air & outlet air

28 Jun : better information sharing : control room people need to be made aware formally; formal note needed;

#### 4.8 Other issues :

(i) Cross-coupling tests in GAB + GWB

14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?

28 Dec : some issues need a bit more of discussion before reaching a final conclusion.

11 Jan : ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%

25 Jan : no updates; needs a discussion.

(ii) Walsh related work.

14 Dec : some tests in progress; porting to GWB (Python package being modified);

28 Dec : work is still ongoing.

11 Jan : porting work is nearing completion.

25 Jan : now in testing phase (on GWB2).

19 Apr : some corrections done for accommodating existing connectivity of GWB of pols with nodes; second correction done for drift of Walsh pattern due to digital bug; will proceed for noise source and astro tests using GWB2.

3 May : delay hunting programme has some bugs, being fixed; debugging in progress.

28 Jun : parallelly new package for delay configuration + Walsh being made forward compatible; to be ported to GWB-3 as well.

#### 5. Other items :

##### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need ot agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

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## MoM for the Plan meeting of 9 Aug 2017

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### 1. FE & OF related :

#### 1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in  $T_{lna}$  for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

22 Feb : first results of variation of  $T_{sys}$  for Band-4 FE unit of QH + DC + LNA

(which goes next to the hood) -- absolute value of Temp is higher than  $T_{lna}$  at ambient and also the variation of  $T_{sys}$  with ambient (0 to 60 deg C) is larger than for  $T_{lna}$  alone. To cross-check whether known loss of QH and DC at room temp can explain the room temp values and then extrapolate from there for different ambient temps.

15 Mar : new test done with QH + LNA only (compared with QH + DC + LNA) -- shows lower variation of  $T_{sys}$  over 60 deg range of chamber (35-40 instead of 55-60 seen earlier); agreed to try to estimate the loss of QH and DC with temperature and use theoretical formula along with  $T_{lna}$  as fn of temp to predict the observed  $T_{sys}$  vs temp curves and compare with the measurements.

5 Apr : new results of  $T_{sys}$  vs temp for just LNA, LNA+QH, LNA+DC, LNA+QH+DC : appears to show reasonably flat variation of  $T_{lna}$  with temp; more variation for LNA+QH; but some of the curves cross each other (and have offsets) with temp -- bit difficult to understand; agreed to try S-params for each device as fn of temp, for same RF (610); meanwhile, theoretical calculations ongoing.

19 Apr : new update, which measures loss of QH with temp, shows change from 0.1 to 0.2 dB over 60 deg and can explain the observed variation of  $T_{sys}$  with temp. To check if any info is available about loss of QH with temp; second is the mystery about lines crossing each other -- needs to be understood; then can check about extending the study to Band-3 also.

24 May : no fresh activity due to engagement in mass production work.

7 Jun : new test done for the new 3-stage LNA for Lband -- shows few (~6 deg) variation over 20 to 60 deg change in temp -- similar to Band-4 LNA; to try with typical cable length in front of the LNA. Riddle of crossing curves remains (here also); to try for Band-3 LNA.

#### 1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible.

22 Feb 17 : only 5 antennas completed by January; request for next set of 5 feeds has been given to mechanical approx beginning of Jan -- expecting 2 dipoles shortly, but reflector and BFRs will take some time; meanwhile one FE box is ready; to get if possible 2 more to be ready, so that 2-3 antennas can be done in quick succession.

Need to have enough QH + DC (is matter of cutting right length of material and assembly); for LNA : have all PCBs, need chassis (ordered in sets of 20); same situation for BPF; however, request for new stools (with modified height) has not been given (!!); due to some rethink about optimal stool height (!); follow-up action on this : to discuss with mechanical to see if existing or spare stools can be modified / cut to meet the height requirement and use for the next 2-3 antennas.

15 Mar : HRB had requested for 5 feeds (DRF 130-260 MHz) out of which 5 dipoles arrived and reflectors + BFRs will arrive by 18 Mar; mounting stools (1190 mm), 30 nos. requested, out of which, 2 stools will arrive on 18 Mar; hence, new installation only by next week;

5 Apr : 2 nos of feed + reflector + BFRs + stool in hand; 1 box ready; one more can be ready in next few days; can target 2 antennas in MTAC period; to see if 3 can be tried.

19 Apr : no progress now, as attention has shifted to common box for some time; now tasks have been reassigned and work on this will pick up now.

3 May : 6th box is ready in lab; will go to antenna by next week (12-May-2017)

24 May : 6th antenna done; one more can be done; after that feeds, stools etc needed; FE box for 2 more available -- more are needed. FE team to check with mechanical and get back.

7 Jun : some delay to move to the next (7th) antenna, though the units are ready -- maybe next week after HRB is back; for further units, boxes awaited after powder coating (10 nos); feeds + stools are available for next 3 antennas. May need to introduce check list for quality assurance for all the units before they are installed (can be done for all other bands as we are increasing the pace of mass production).

28 Jun : 7th & 8th antenna installation completed; next 2 antennas can be ready by ~ 15-Jul-2017; (feed availability is the bottleneck thereafter)

12 Jul : 9th unit has gone; 10th will be ready shortly -- maybe next week; expecting more feeds to come in 10 days time (needed for 11th onwards).

26 Jul : 10th unit has been ready for some days, but not gone up due to weather. ==> 10 antennas done; 11th one can go up in a week or so; box to be made ready for 12th unit.

### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

(i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months should be enough to complete the tasks i.e. April 2017.

11 Jan 17 : 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

25 Jan : needs combined tuning of filters to fix the problem; work ongoing.

22 Feb : successful in tuning the integrated unit (for 2 boxes, both channels); and 23 antennas are completed, and work is ongoing; next antenna in about 2 weeks.

15 Mar : one more box was made ready, but gave trouble after exhibit at Science Day (!); has been made ready again (all the cables were changed). Will go up shortly. Meanwhile, next set is getting ready.

5 Apr : 25th antenna done to ver2 level; some issues related to tuning of the integrated filters (assigned to SC).

19 Apr : 26th antenna also completed; going reasonably smoothly.

3 May : next box (incorporating new filters) will be ready this week & go to antenna [~ 12-May-2017]

24 May : 27th antenna is done; generally going ok.

7 Jun : still at 27 due to some maintenance issues with C02 -- need feedback about

the oscillation problem.

28 Jun : C02 box replaced due to oscillation problem - now fine; one more antenna : so total 29 antennas completed; W03 - last (30th) will be done in a week (05Jul17).

12 Jul : all 30 antennas completed for v2 !! will aim for 5 spares in the long run, but 2 spares to be made ready in short run; to get full 30 antenna statistics for main and sub-band widths.

26 Jul : to take up the above actions, but can be at lower priority.

(ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good : comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

11 Jan : analysis of Jan data awaited.

25 Jan : analysis of new data (on CasA) -- appears to be systematic 1-1.5 dB less deflection than predicted and control room values -- needs to be checked and followed up in consultation with ICH, DVL, SC & GP; few antennas with some odd behaviour e.g. E3 and maybe E2.

15 Mar : no updates as Ankur is not available

5 Apr : updates from new data; 2 antennas showing less deflection in ch 1 only -- to be investigated; not much other issues.

19 Apr : no updates this meeting.

3 May : data available, but no plots (laptop crash)

7 Jun : work has resumed, and some tests done last week (Ankur not available); to check about C02 oscillation problem.

26 Jul : C02 problem : LNA replaced and unit ok; LNA works ok in isolation. no other updates.

(iii) Summary of phase centre measurements and decision about future plans

25 Jan : no action yet.

15 Mar : still pending.

19 Apr : still pending

(iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

11 Jan : data collected, report expected within 2-3 days.

25 Jan : Sougata + Ankur will provide update next time.

22 Feb : SC will send update within a week.

15 Mar : some work is still pending; SC will complete and send within a week.

5 Apr : some tests done using OF monitoring system (seems not all antennas working and also varying behaviour) : summary from 10-12 antennas, 3 sub-bands (one corrupted by RFI) : some cases show narrower BW, and some show wider BW; for narrower BW cases, coating the PCB appears to correct for most of the discrepancy -- needs a short report on this; last 5 antennas have gone up with the coating -- should be able to cross-check the performance; need to find a solution for broader BW case !

19 Apr : quality check on 24 antennas done; about 4-5 antennas showing discrepant band for most sub-bands; FE team feels confident that this can be fixed with the coating option; to make a table for all antennas all sub-bands for user to decide what to be done; to fix as and when FE box comes down for other work.

3 May : report circulated; worst affected antenna identified; after ~ 3 months will be taken up;

24 May : no new updates; can check around July.

26 Jul : see item (i) above.

(v) LO settings for all sub-bands etc to be finalised.

14 Dec : 250-500 LO setting document / table already finalized;

28 Dec : no updates; person on leave.

11 Jan : astronomer feedback awaited (to check if final table shared with control room).  
25 Jan : Not yet shared with control room; to refine based on : 6 dB point for main BPF and 10 dB for subband filters, for the default BW.  
22 Feb : draft document has been circulated to DVL & YG for trials, for 3 bands (Band-3, 4 & 5); for Band-3 which shows max variation of sub-band responses, the basic response is taken as the one found in majority of units and 10 dB criteria is applied to that response to get the LO values; either lower or higher or both side LOs are recommended depending on the situation, and some justification has been given for all the cases; YG to check with DVL etc if this can be released to control room and all users.  
15 Mar : some responses from DVL + Nilesh etal -- some clarifications sent; some more tests to be carried out this week.  
5 Apr : no updates for this time.  
19 Apr : DVL and co to provide update by next week; can discuss 2 weeks later.  
7 Jun : FE team to check with JPK if control room is following a standard, recommended procedure.  
26 Jul : YG to check with DVL

#### 1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus

14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01); box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)

28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).

11 Jan : box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.

3 May : box #2 MCM reset option & monitoring finished; to go to C01 antenna tomorrow (04-May-2017);

24 May : replacement on C01 working ok; older one traced to interface card problem -- to be fully debugged; meanwhile spare new card will be put and made ready for installation

7 Jun : faulty unit requires one IC base to be changed and can be used again; meanwhile waiting for new PCBs to come -- to see which vendor can do this.

28 Jun : IC bases replaced with better ones - now that unit is working (unit used as spare & template for other ones)

(ii) Plans for mass production

30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.

25 Jan : one box tested at antenna focus and working ok; 2nd box not yet tested at focus; even for the 1st box, repeatability is not there.

19 Apr : ready to start the mass production and installation; may be able to achieve 2-3 weeks per box in long run after first 2-3 boxes; to coordinate with Ops group for supply of Rabbit in shielded box. Also to do the R&D for getting the ethernet control option tested and going and put it into mass production -- this needs an extra input port on common box -- agreed to use 50 MHz port for immediate and redesign the plate for additional input port and put into new boxes as and when ready, without affecting the rate of mass production of common boxes.

3 May : x2 boxes in wiring stage; x1 box per month initially (later one box every 3 weeks); redesign of band-selector & interface card completed; mass production can begin now

24 May : to go ahead with the plans, introduce new cards into system as and when ready; and retrofit the new cards in older systems later on; transobs PCB also to be included in the above.

7 Jun : to get the set-up going and then decide on the priority.

12 Jul : one box was made ready and taken to C02; stopped working after some amount of testing at antenna base -- brought back to lab and being debugged; agreed to put some additional manpower (Vishal) from Band-3 team into this work (esp as VBB not available).

26 Jul : current status : original unit on C01 is down with "band not setting" problem (stuck at Lband) -- to be debugged in the lab; meanwhile old MCM based CB is being put on C01; unit for C02 : problem traced to bad cable (external); unit now ready to go back to C02 (waiting for better weather); unit #3 waiting to be tested with interface card; additional person (Santosh) to help in the work.

====> original box was put back on C02 and gave same problem after 3 days of working; tried with power on-off etc; brought back to lab and working ok again -- to test more thoroughly with full load of all FE boxes etc; meanwhile, put 2nd box on C02 to see if it works stably there -- if it fails, to put it on another antenna... further, to check if further acks can be added at different stages.

### 1.5 Apex radiation scheme (PAR/SRoy) :

(i) Current status of measurements and interpretations

(ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

11 Jan : no updates, though there has been some email discussion between SRoy and PAR

25 Jan : need to check with SRoy and PAR.

15 Mar : PAR and SRoy yet to have a detailed discussion; meanwhile another round of tests done on C1 -- showing a different pattern than C10. Need to summarise and circulate and then take up for discussion.

19 Apr : no updates, though some ongoing email dialogue between SRoy and PAR...

24 May : discussion between SRoy and PAR -- some conclusions have been reached and some action plan has been worked out between them : to circulate a brief note summarising these (as well as dynamic range measurements summary and plans), while follow-up action continues.

28 Jun : report summarizing all the work carried out so far has been prepared; yet to be circulated; report displayed and discussed : sensitivity 250-500 MHz -147 dBm (cone dipole); 1dB compression point (P1dB) : 1dBm (old); 10dBm (new); temp effect 0.2dB (amp) & 2 deg (phase) due to FES & RF (stability); transmitting RF power recommended :  $\geq -40$  dBm &  $< -10$  dBm; ELV /AZM dependence : 0.5 dB (amp) & 8-10 deg (phase) (tests done on 5 antennas total); another report for log-periodic antenna set up (separately)

26 Jul : need to follow-up on the short summary circulated by FE team (check SRoy).

### 1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) :

Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of health of Walsh switching.

11 Jan : there is some confusion about what is being done, and what has been achieved ! For 10 antennas which have new 1st LO system (LOFSW based units), it should NOT be possible to have Walsh modulation at present !

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh...

22 Feb : now clear that only those antennas (20 ?) which DO NOT have the new synth units can be tested for Walsh; latest tests on these (done in Jan), showed ok results for 19 out of 20 (one antenna was down due to mech problems).

15 Mar : no immediate action here; need to work out with analog BE team.

### 1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

22 Feb : SC to check with JPK about the progress on implementation of the SOP for use by control room in normal PMQC type of tests and generation of stats to report to FE team.

15 Mar : control room people (JPK and SNK) are looking into the code written for GSB to see if it can be done for GWB.

5 Apr : SC to follow-up with JPK on the matter.

19 Apr : code has been obtained and possible issues in it have been identified; to see if the job can be taken over by control room colleague.

24 May : to see if a discussion with JPK + SN + ICH can be had on this matter.

7 Jun : to organise a joint meeting, maybe week after next.

28 Jun : programme for narrow band system needs to be edited for broad band system

26 Jul : SC is looking into modifying the code himself.

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

22 Feb : to plan for the discussion.

15 Mar : agreed to make a presentation on 20th in the poln meeting.

5 Apr : presentation showed reasonable results; action items : to compare feed response with WiPLD results of HRB; compute 3 dB BW vs freq for Band-3 for feed + dish and compare with observed results; need a software with finite element method approach for this simulation -- Antsys or Fecko; to check availability in different places in and around Pune.

19 Apr : no new updates right now.

24 May : SC to follow-up and report back.

7 Jun : no updates.

26 Jul : no new updates.

### 1.8 New filters for L-band (AP) :



(i) status update on installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing  
16 Nov : arm antenna installation to be resumed;  
14 Dec : all west arm will be completed by 16-Dec-2016;  
28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.  
11 Jan : S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).  
25 Jan : only 2 antennas W-arm remaining to be done.  
3 May : only one antenna (W2) remaining  
24 May : to confirm if all antennas completed or not.  
(ii) delivery of remaining units of main L-band BPF from Epitome  
16 Nov : BPF completed and handed over to BE team -- this can be closed.  
28 Dec 16 : can be closed.

### 1.9 OF system updates :

#### (i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.  
11 Jan : current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.  
15 Mar : this is status quo; few extra high power lasers at 1310 nm for forward link have been procured; cards being made ready; will be used as and when loss becomes too large in far away antennas.  
3 May : high power lasers (5-6 nos made ready) and available for use; for, W6 & S6 such lasers already installed about one year ago;  
24 May : some evidence of loss of power of laser transmitter (1310 nm) at Rx room causing problem in telemetry link; needs retuning of laser circuitry; will be taken up one by one -- this is in addition to need of high power lasers for far away antennas.

#### (ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates  
28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.  
11 Jan : cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.  
15 Mar : expected by end of this month.  
5 Apr : OTDR not arrived yet; second fibre bundle ordered but not yet delivered.  
3 May : OTDR has arrived; second fiber bundle has also come;  
24 May : OTDR working well; 2 km fibre bundle arrived; 20 km spools : 3 nos were found bad and have been sent back to the vendor in US -- need to follow-up on it.  
28 Jun : bad cables being sent back to vendor in US  
26 Jul : for the spools : vendor is sending the 3 replacement units; new OTDR is working fine -- item can be closed.  
====> replacement spools have not yet reached.

New item : contract with BSNL for dedicated GMRT to NCRA fibre to be renewed as it is 5 yrs old. OF team to circulate the preliminary docs to all concerned in NCRA for clearance before sending ok to BSNL.

26 Jul : SSK need to check with admin about (i) clearing of bill and (ii) signing of new agreement.

====> in touch with BSNL for new lease doc (Mar 2018 onwards) for dark fibre; meanwhile payment of charges for 2017-18 have been paid.

(iii) 8 Gbps GMRT to Pune link : it was found that only 1 or 2 Gbps was working;

25 Jan : detailed debugging has been done by OF team and now it appears all the 4 wavelengths and hence 8 gbps lines are functional -- only one wavelength is marginal (to order spares for taking care of such issues); also remote monitoring facility at Rajgurunagar with SMS facility to be activated.

15 Mar : spares have been ordered; monitoring unit is ready -- small change needed in software and then can be installed.

5 Apr : not yet installed, waiting for Rahul Bhor.

24 May : spares for the links have arrived and are available; monitoring unit is now ready for use; some changes in IP address needed in units at Rajgurunagar to activate the system; also some spare cards are needed to make things fully functional at all locations.

26 Jul : new unit for remote monitoring not yet installed; spares issue may be ok.

## 2. RFI related :

### 2.1 Spectral line RFI (PAR/SSK) :

#### (i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks

28 Dec : RFI team visited Junnar cable TV operator for getting response to letter that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.

25 Jan : discussed with Jondhale -- he will speak to the party and see if some progress can be made; otherwise to escalate the matter; also to estimate the number of splitters etc that can be provided to W-arm operator to mitigate the problem.

28 Jun : shielded cage designed for laser Tx & RF amp devices : field test in progress.

====> appears to work well; need detailed report and then follow-up action with parties.

#### (ii) Digital TV follow-up

23 Nov : letter is still pending !

25 Jan : need to expedite the matter !

====> letter had been sent some weeks ago; PAR to follow-up in person and report back.

#### (iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source

11 Jan : 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.

25 Jan : need a site visit to understand better.

3 May : new RFI line (set of lines) observed at 467 MHz ! (need to identify the source)

24 May : for 402 MHz line : trying to identify any relevant weather station that fits the bill (!) -- needs some more work; for 467 MHz lines, still no clue.

28 Jun : initiated dialog with IMD : letter requesting tests at their premise

26 Jul : 402 MHz RFI : current understanding is that the offending transmitters are from the weather stations in the west direction (rather than SW) -- RFI team suspects it to be coming from Mumbai (!); transmit is only at some times of the day; discussion with IMD Mumbai --> IMD Pune (to follow-up) and also to ISRO for more details about the tx system. 467 MHz : no clue (appears to come from all directions).

### 2.2 Satellite RFI monitoring & avoidance system (PAR/SNK) :

#### (i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and ,, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)

25 Jan : need to follow-up on identifying for LEOS.

#### (ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)

25 Jan : new limit is about 8 deg -- to cross-check if ok and close.

(iii) Plans for sending information to back-end receiver chain

25 Jan : to check with Santaji about the plans for this

(iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week

28 Dec : no updates.

25 Jan : to include in the plans for visit by Nick Rees in week of 6th Feb.

24 May : some of the pending jobs : need to characterise some of the remaining satellites.

26 Jul : no new updates.

==> problem for sources with +ve declination pointed out by YG and fixed by SNK.

2.3 RFI from power lines and transformers (PAR/RVS) :

(i) review current status

(ii) specific follow-up actions

23 Nov : not discussed

25 Jan : no updates.

24 May : this activity needs to be revived.

2.4 RFI from LED lamps (PAR/RVS) :

(i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

(ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

25 Jan : report has been circulated; solution looks promising; to try for compact version of the solution; working with workshop to mechanical items; will need to order some components for bulk production.

08 Mar : LED panel/ tube light shielding : report generated on tests - broad band radiation from commercial units (x4 units in one box) - shielding is ~ 75 dB ; results appear encouraging; Syska (x1 22W), Philips (X4 20W); -150 dBm final number arrived at. high failure rate of LEDs due to voltage fluctuations;

11 Apr : new model of LED light identified with very low level of RFI (none at all !?!) Hi-Lite 15 W; sample unit of this LED panel displayed; agreed to procure a few units and do a thorough follow-up.

26 Apr : demo of RFI free LED lamp 15W done (in lab, x5 units have been assembled); plots of RFI from LED lamp displayed : 15W (5 units) ; 26W (1 unit) HI-LITE 15W unit's RFI (ON & OFF) identical noise floors; similarly 26W lamp also shows RFI same noise floor for ON or OFF; also tested at all GMRT band : clean (no lines);

upto -130 dBm level; conclusion : 15W units can be used for corridor lighting

3 May : x5 LED lamp (15 W) units installed in corridor

24 May : no RFI seen when 5 nos of 15W lights used together; can we decide about this?

main question is about establishing best levels and also absolute calibration;

for the first, can try with higher gain amplifier; for the second, to complete the exercise of mapping the power levels to antennas.

28 Jun : pending acceptance of LED lamps (already used in corridor), bulk order can be placed.

26 Jul : 5 units have been in use for ~ 3 months; agreed to do one more test to see if any degradation is there; and then take a final decision, folding in estimates of absolute power level.

====> agreed to go in for a purchase of 5-10 more units.

### 2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested; 8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.

4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified units -- all are ok. Need follow-up as mentioned on 28 Dec.

18 Jan 17 : all 10 units tested and cleared; now OK to use this 2nd batch of 10 units in antennas; need follow-up on status of ordering last batch of 14 units.

25 Jan : matter closed for now from RFI team side; to take up when next lot comes.

12 Apr : indent process for the last lot was held up due to issue of exact specs for RFI related properties (!); finally, agreed to go ahead with the existing clause as likely there will be one round of modifications needed if some specific part is changed by the vendor. Electrical team to expedite the paper work.

24 May : to check status with RVS.

### 3. Operations related :

#### 3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) :

##### (i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.

28 Nov : still waiting for 80 nos PCBs to come.

11 Jan : 84 PCBs received; can go ahead with further assembly now.

25 Jan : this can be closed.

##### (ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);

28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.

11 Jan : 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.

25 Jan : Rabbit card enclosure now going smoothly : about 2-3 per week; to send some samples for RFI testing.

22 Feb : 18 are done; 19th ongoing.

15 Mar : 23 completed; one unit given to RFI team for measuring shielding.

5 Apr : going on track, will finish all 30 by April end.

19 Apr : Ops group to talk to FE group to start regular supply of Rabbit + shielded

enclosure for installation and commissioning of common boxes for antennas.

3 May : x28 boxes are ready & tested; can be handed over to FE whenever asked.

28 Jun : stock of tested MCM cards was over; 1 new card tested

12 Jul : 30 units are ready now. MCM cards are being tested in Lab.

26 Jul : testing of Rabbit MCM cards ongoing (4 out of 30 are completed).

(iii) status of mass production of network switch enclosure

23 Nov : 28 units ready (need total of 35)

14 Dec : now 32 (of 35) ready;

28 Dec : same status of 32 out of 35.

25 Jan : 32 out of 35 completed; remaining 3 are in use and will be done when free; meanwhile, to send a few samples for RFI testing.

22 Feb : some sample unit(s) has been given to RFI team for testing -- Raj to confirm; to check if all shielded connectors are procured or not.

15 Mar : samples have been given and tests are being carried out today.

19 Apr : confirmed that all 32 boxes have shielded connectors; to check with RFI team about results from RFI tests of integrated system.

7 Jun : to confirm with PAR about the report.

28 Jun : 3 have been used in lab.

12 Jul : still waiting for report from PAR.

26 Jul : reminder to PAR.

3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

(i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing

23 Nov : C00 & C10 are mostly complete (item could be closed?)

28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.

(ii) plans for going beyond 2 antennas

23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)

28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?;

elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.

11 Jan : mechanical completed for 10 antennas; electrical completed for 13 antennas; Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.

25 Jan : mechanical has resumed work; same for electrical; will be updating spreadsheet; column for servo has been added in spreadsheet -- to remind them to start updating;

15 Mar : mech has completed 13 antennas; electrical has installed all the UPS units (23), other changes need to be checked; servo has completed 10 antennas.

5 Apr : 8 antennas completed for M&C systems; 3 extra Miltec to be tested; 4 are non working -- being looked into (total of 15 Miltechs); apparently no change in status of other systems (mech, elec, servo) -- JPK to check and follow-up.

19 Apr : servo has completed 15, electrical has completed 23, and mechanical has done 13 antennas; M&C system on 8 antennas, 2 more are ready + 1 in testing in lab; Ops group needs 5 nos of 2 TB disks and comp group has provided 2 nos -- to arrange for ~ 10 nos of 2 TB disks.

3 May : x5 total disks (2 TB each) were given to OPR group; x2 used to replace old disks ; x3 available for any application

24 May : 10 antennas completed for M&C system installation (+1 in lab), including putting the new disks into use -- can go ahead for useful testing with this system (see alternative week agenda).  
7 Jun : 15 antennas servo to UPS rewiring completed; mechanical will pick-up after 15 June; M&C installation still at 10 nos.  
28 June : x16 units with servo UPS connected; x14 units with Mechanical connected; M&C still has x10 systems;  
12 Jul : S02, C03 and C04 have been completed by Mechanical group. Very soon we will install our hardware in those antennas.  
26 Jul : electrical, no progress after 23 antennas (2-3 months); mech has completed 17; servo has done 19; Ops group has 7 antennas with all sub-systems and trying various tests; Miltech in 10 antennas, will grow to 13 soon; remaining supply of Miltechs will come by end of Aug. 1 Miltech to be used for correlator LMC.  
===> integrated testing (in recreation hall) of final antenna base set-up shows some RFI still from new batch of media converters; to try to buy a few of another batch or another make; shielded enclosure for media converter (100 Mbps) for FE control.

(iii) update on improved RFI shielding at antenna shell

23 Nov : shielding test measurements done for present configuration; awaiting finger-lines to be added before repeating the tests (which antenna?)

28 Dec : folder in process for placing order for the finger-lines.

5 Apr : no updates.

26 Jul : finger-lines have come and being assembled on door of one sample antenna and then comparative test for leakage to be done; then next target is connections going from shell to antenna focus (non-RF connections).

===> to follow-up with Nandi for the fingers.

3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems

28 Dec : Ops team has a plan for this; can be discussed in detail next time.

11 Jan : final plan placed on web portal (for lab people)

19 Apr : 8 + 2 + 1 units as given above; further growth constrained by availability of Miltech PCs only.

24 May : now populated on 10 antennas and using 2 Rabbits at antenna base for controlling servo, FPS, OF, FE, sentinel (tested concept) to test shortly with new version of LMC s'ware (but old CMC s'ware); need some cooperation from servo for changing PC104 from serial to ethernet upon choice (discussed with SS and he will discuss with Thyiagarajan); for parallel connections to other systems, some further planning is needed.

28 Jun : see above

26 Jul : servo modification is working fine; see above for other details.

(ii) plans for switch-over -- to make it as seamless as possible.

30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.

28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.

25 Jan : can defer till after the demo.

22 Feb : Ops team appears to prefer scenario 1 -- incremental approach; to generate a note within next 4 weeks on this.

15 Mar : still pending for team to send a draft doc.

5 Apr : still pending.

19 Apr : can check again with Ops group next week, for a possible discussion 2 weeks later.

26 Apr : discussed draft document produced by Ops team on long-term plans for

installation of new M&C system; general agreement for incremental approach noted; next level points to be addressed discussed -- doc to be updated with these and taken up for discussion...

3 May : incorporating points that came out from discussion into the change-over-plan note.

24 May : updated doc has been circulated; can be taken up for detailed discussion next week; meanwhile useful discussion on how to coexist between MCMs on RS485 bus and new system;

7 Jun : updates about the discussions and outcomes from GSG meeting; more discussions about details of the plans going forward are needed.

12 Jul : Points will be added to the documents, whenever new things will come up.

26 Jul : may need to flesh out some of the points in due course.

### 3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)

14 Dec : HP layer3 switch finalized; budgetary quote Rs 3.5 lakh; indent prepared.

11 Jan : item can be closed.

(ii) Plans for procurement

23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.

28 Dec : indent raised.

25 Jan : procedural issues related to advance payment etc...

22 Feb : not clear if this matter has been resolved before Charu went on leave...

15 Mar : need to check with Charu.

5 Apr : HP make layer-3 switch has no issues about advance payment and order has been placed and delivery expected by end of this month; the advance payment problem was for SFP adapter -- this needs to be resolved.

19 Apr : matter is resolved and delivery is expected by end of this month.

3 May : switch has arrived at Pune

24 May : item has been tested ok; can initiate the plan to put this in the M&C rack and shift antenna eth connections to this switch (instead of OF group's switch) and start using this arrangement.

28 Jun : under test in Rx room (by Santaji)

12 Jul : Testing has been completed for the switch. We will first put one test LMC on that switch.

26 Jul : tested switch configured and allotted 40 sub-nets.

### 3.5 Interfacing and control of new systems such as Noise Cal & Walsh :

For 10 antennas which have new 1st LO system (LOFSW based units), need to be clear about the control path; also 2 of these antennas have independent MCM for driving the new CPLD; need a wider discussion about M&C for new system for these aspects related to Noise Cal and Walsh.

22 Feb : need 2 CPLDs in new set-up : one for new FSW LO, one for Walsh + Noise on-off etc, and both can't be connected to MCM 2 and hence an additional MCM is needed. To find out a way around this issue, so that progress can be made...

15 Mar : 2 options are being explored by BE team without increasing the number of MCMs from present count; some prototypes are being tested and will be reported upon shortly. For the longer term, need to see if antenna based Rabbit card can fulfill these roles.

3 May : tests with different interfaces done; avoiding additional MCM (beyond x2 MCM) successful [but with OLD MCMs]; in new MCM, use of control pins of MCM used for sentinel will suffice.

24 May : summary issues : if any M&C system takes control of the RS485 bus then it can meet any MCM requirements -- this may be the way to go for the final M&C

system; finally, the functions that are needed for uGMRT only (noise and Walsh related) will have to shift to Rabbit card -- whether capability exists in the single Rabbit at antenna base needs to be confirmed.

28 Jun : agreement reached to use existing rabbit card instead of MCM2

12 Jul : Documents has been shared by JPK regarding Rabbit IO pins.

3.6 Update on Rabbit Card in Common Box : follow-up from discussion of last week to track the progress and latest situation...

19 Apr : FE team plans for roll-out discussed above; Ops group to provide required number of Rabbit in shielded card; main remaining task is to get the FE monitoring working on the Rabbit interface to FE system : CPK has been doing some debugging to get to the bottom of the problem; JPK and CPK to sit together to see if earlier work done on 15m with Labjack for similar control of FE system can help.

3 May : points closed; new box being out on C01 (at the antenna base tests were successful; now going to turret (today itself; 03-May-2017).

28 Jun : replicating other boxes; x2 boxes to be ready [& then to be shifted to antennas]

12 Jul : Two Boxes are ready. FE people are testing boxes in lab.

26 Jul : no new updates from Ops group.

====> detailed discussion about the problems encountered and plans for tackling.

#### 4. Back-ends related :

##### 4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

11 Jan : one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

25 Jan : s'ware work for the above is still in progress.

15 Mar : still in progress, no new update.

3 May : x1 ADF-4350 system ready (tested in lab) with switchable freq & power level attenuator; characterization in progress with web-browser (from ONLINE); but need command line functionality (Jitendra had to do); next, ADF-4351-s needed for individual antennas.

24 May : only new command in online has to be created -- JPK will look into it next week; meanwhile, option to switch DDC LO to achieve the freq offset is also being developed and cmd line interface for this has been made ready; both options can be released together in few weeks to the user; team can now start thinking about soln for 1st LO for the antennas.

28 Jun : DDC LO switching has been developed & tested; samples for components needed for 1st LO have been received.

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

11 Jan : one rack modified (4 antennas) and systems being tested; will report shortly,



and if everything ok, will go ahead with the mods for all the 8 racks.

25 Jan : same status as above; test report has been circulated internally.

15 Mar : will complete the modifications for all racks in MTAC; meanwhile, the filters can be used with unequal gain in different antennas; command is available to control room and can be tried.

5 Apr : phase jump problem requires use of 4350 IC circuit -- this has been tested in GAB on one antenna both pols and found to work OK; need to repeat same test with 4351 IC also and then bulk order of 4351 IC can be done (will take about 2 months); will need modified CPLD based ckt + software for using 4350/51 at antenna base as 1st LO for legacy system.

12 Apr : follow-up discussion with users like NK indicates that higher priority for having GAB + GWB uGMRT working without phase jump on switching, and solving the problem for legacy GMRT can be lower priority; accordingly, 2 possible solution options discussed for uGMRT : (a) have 2 signal generators set for the 2 frequencies needed and switch their output to the common LO signal line on the switching command (b) have one unit of the new 4351 IC completed with proper control logic to act as the single source of common LO; agreed to aim for option (b) on time scales ~ month or so.

3 May : closed now ?

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.

14 Dec : changes to DRAFT report in progress;

11 Jan : still in progress -- not ready yet.

25 Jan : no new updates.

15 Mar : no new updates; BAK to check.

12 Jul : 4350-based system available for 1st LO for GWB with web-based control; work ongoing to have option for cmdline control; 4351-based system : 5 units are ready;

100 ICs have come; modification of the s'ware required for this unit is going on; also CPLD s'ware needed for control of this unit at antenna base.

26 Jul : for cmdline control of 1st LO with 4350-based system -- DKN to talk with JPK to understand the simple solution and try to implement.

#### 4.2 Power equalisation scheme and related topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

11 Jan : still pending

25 Jan : revised version circulated internally.

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

15 Mar : BAK to check and get back.

5 Apr : Atul has initiated the discussion with control room colleagues; SRoy + Nilesh discussion now has the basic code working and SRoy is doing some testing and debugging and will report the result in few weeks, after which one could talk about releasing the package with the different modes.

3 May : only plot routine remains (discussion pending - may happen today itself)

28 Jun : SRoy : gave gain tables, which need to be merged into FITS file (by SSK).

12 Jul : SRoy has made an option made ready for plotting the total power o/p for last 4

hrs in a running mode -- will try to release shortly for use; 2nd update is about the update of attenuator values to GAB : response time for setting has now come down from ~ 2 mins to ~ 30 secs, after the changes made by JPK; however, there is a problem of occasional failure of the setting algo and the ack not coming (quickly enough) from the GAB controller.

#### 4.3 Updates on existing GWB-3 system :

##### (i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

4 Jan -- 12 Apr : no progress on this, due to work on release of 30 antenna system.

5 Apr : meanwhile, new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

12 Apr : agreed for BE team to repeat noise source tests and check carefully for spurious lines; then repeat with sky signal as needed.

26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction : geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.

17 May : DDC related updates :

(a) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and release for users.

(b) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.

24 May : for shape equalisation, some fine tuning being done by SHR; for spurious lines, not clear what is the best way forward -- need to check if it is part of the ADC related effect or not and whether maintaining higher input levels can help mitigate the problem...

31 May : agreed that the latest version of bandshape correction looks ok and can be released in the next version of GWB; for spurious spikes, some further tests suggested, also to look into optimising the power levels at input for the narrow band modes.

14 Jun : released (bandshape correction) in the current version itself spikes issue no update.

28 Jun : for bandshape correction : edge effect handling now completed & released; this can be closed now.

For spurious spikes : tests imply spikes originate from ADC itself; need to change the clock & see; other repeatability tests (same spikes from same ADC card) etc remain to be carried out;

12 Jul : repeatability : in 200 MHz mode, seems to be good repeatability of channels for same ADC, with some fluctuation in ampl and confirmed that all are  $2^n$  locations; trying 100 MHz mode with DDC (even for 100 MHz o/p) shows some additional lines, not at  $2^n$  location but of comparable strength (!) -- needs to be looked into more carefully to understand the nature and cause of these.

##### (ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of

level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?

14 Dec : problem perhaps in AIPS settings; matter can be closed ?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

#### 4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov 16 : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated; this is completed.

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT lose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

8 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); But, it is logged at the end of observations (N.B. file needs renaming, or

else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain

14 Jun : providing the 'log' at the end of observation for now

12 Jul : this is still pending.

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.

11 Jan : no further work on GWB; plan is to have similar change for GSB during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

8 Mar : plans for work on GSB during upcoming MTAC -- needs a discussion.

3 May : nearly closed; hot air sucking mechanism needed (being explored with Nandi's help).

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (but may come earlier?)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up in delivery; to follow-up closely.

11 Jan : YG to follow-up with nvidia and micropoint.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

3 May : waiting for adapters to arrive;

28 Jun : adapters arrived; nvidia team visited GMRT; GPU installed on one T630 (for raw voltage recording); to quantify improvements thru benchmarking.

19 Jul : benchmarking needs single node : software changes for single node, done; initial tests imply x2 improvement in performance in Pascal wrt K40; individual block comparison to be completed by next week.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : no specific updates, except that code optimisation will need to be done.

14 Dec : need a discussion to decide the way forward on this.  
4, 11 & 18 Jan : deferred for some more time, till 30-antenna system is released.  
25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.  
22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.  
08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.  
15 Mar : discussion on long-term issues to be taken up next week.  
22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).  
5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.  
12 Apr : ready to release ver4.5 -- basic things seem to be working; calculator for what combination is possible is also available; full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority); timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam; regular tests for all modes under PMQC : can this be defined ? changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file. zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.  
19 Apr : for ver 4.5 : calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).  
3 May : SOP already released (v 4.5)  
17 May : trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.  
14 Jun : trial and release : documents (directory structure OK as per circulated version) finalized; need to creat directories etc.  
28 Jun : antenna testing scheduled today/tomorrow; next SOP release planned CD pipeline : GPU has possibilities as per manuals; release of trial mode : all above inorporated.  
12 Jul : some white slot testing needed for new release ver before replacing the existing GTAC use version. CD pipeline : tested for 2 beams 200 MHz also; waiting for cmdline interface for 2 beam mdoe.  
19 Jul : antenna testing were OK; SOP released; control room using it as 'trial' mode.

4.5 Network related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half sytem

4 Jan 17 : this is done -- to confirm and close.

(ii) updated IP table for .4 n/w to be made available by computer group

4 Jan 17 : work ongoing -- to check status with comp group.

3 May : completed

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.

3 May : GSB & GWB diagrams available ; completed

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines is possible with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together to NCRA end; comp group to set up the test, alongwith VVS at Pune end.

11 Jan : 3 connections made to gwbh1-3, and live test demo done; it appears that only 2 of the 8 x 1Gbps links from switch to aggregator are working ! This needs to be debugged between comp group and OF group.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

4 Jan 17 : comp group agreed to look for options.

15 Mar : can be taken up next time.

4.6 Longer term plans for GWB-4 (SHR/GJS/ICH/SSK/BAK) :

List of tasks going forward (needs to be prioritised) :

(i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link (GJS+MGU)

28 Jun : GMRT side network provided; Pune side status need to be checked.

(ii) Disks for data recording, including trials with SSD options (GJS)

3 May : restarted the tests on normal disks

(iii) investigating next gen GPUs -- to benchmark sample Pascal units from nvidia (SHR)

19 Apr : to be tried next week.

28 Jun : they have arrived; installed; need to be benchmarked.

(iv) migration to next version of CUDA (7.5 and beyond) -- to decide the steps

23 Nov : CUDA 7.5 is being tried in the new version of GWB -- confirm present status

19 Apr : confirmed that all v4.5 is on CUDA 7.5 and no upgrade in near future.

3 May : installed CUDA 7.5 on all machines; next cycle may go for 8.0 which is now available

28 Jun : CUDA 8.0 also available now; next cycle to move to 8.0

(v) DUT correction and timestamp related issues : to confirm present status and decide future course of action (SSK)

19 Apr : still pending.

28 Jun : today it will be addressed;

(vi) towards PFB option : resurrect old code into new GWB5 & compute the overheads (SHR)

(vii) towards a gated interferometer : to look at the MAC code that can do the gated integration; to send the gate information to the GPU from CPU (SHR/SSK/YG)

(viii) improving availability of beams by reducing beam I/O : 16 bits to 8 bits for IA/PA beams and 8 bits to 4 bits for voltage beams (SHR/YG)

(ix) options for an additional network for even better I/O capabilities (SHR/GJS)

(x) PA - IA beam mode as an additional option with IA or PA modes (SHR/SSK/YG)

(xi) making 4 PA (or voltage) beams point in 4 different directions -- SSK to look into the change in code needed for this, starting with astrocal

19 Apr : SSK has done initial study and plan for generating parameters for all 4 beams from same call to astrocal and then pass to the beamformer; beamformer code needs a change to do one extra multiply by complex number whose phase is calculated on the fly based on antenna, channel, time and beam number.

3 May : initial note from SSK;

28 Jun : beam steering implemented; tests in progress; basic thing works; plots 'identical'; needs repeated tests;

(xii) towards more general multi-beaming in the long run

(xiii) archiving of beamformer data : better header and also finding what metadata is required -- SSK to look into this, in consultation with Deepak Bhong.  
19 Apr : to follow-up with DB in next few days.  
28 Jun : header has all necessary metadata inputs; higher level s/w need to incorporate their usage;

(xiv) getting second copy of data to separate cluster going : for both raw voltage recording, as well as for multi-beaming kind of work (GJS/BAK)  
19 Apr : to see if one node (with new disks) can be made ready and put in one rack and connected to Roach board -- can grow to one m/c per rack with separate IB switch...  
28 Jun : raw voltage goes to one machine; but now that machine taken off for Pascal testing; GJS : FPGA design for making second copy (adding delays to synchronization);

(xv) decide on 2 vs 4 inputs per Roach board for final configuration

(xvi) net-sign correction -- confirm current status and decide if further action is needed (SSK)  
19 Apr : current status is that adhoc sign flip has been introduced for both corr and beamformer header info; proper modification in code needs to be decided : when & how.  
28 Jun : fix is working (LSB, USB)

(xvii) full backward compatibility of off-line utilities (SSK)  
23 Nov 16 : some work has been done, but not clear if this meets / works for all requirements.  
19 Apr : has been done and released and users have used it.  
28 Jun : need better coordination with users to avoid confusion; responsibilities of individuals also need to be precisely fixed.

#### 4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

(i) Summary of current status for temperature monitoring  
3 May : cacti released to control room;

(ii) Plans for future enhancement and release for regular use

(iii) Monitoring of other health parameters  
14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack (uses DAQ card);  
28 Dec : not discussed.  
11 Jan : no significant new updates.  
25 Jan : no new updates, but plans for collecting the temp data and bringing to common m/c that is accessible to control room is being planned. installation of cacti also to be taken up.  
15 Mar : machine has been made ready; cacti has been installed; gradually adding nodes to the list and making them ready for monitoring; a separate home-grown product (using cgiplot) also being made ready for monitoring IB network.  
19 Apr : cacti for temp monitoring for all GWB nodes (temp of cores) -- available on web browser; to release to control room and users and add in GWB SOP; cgiplot -- home grown version that allows to read the raw data and display using cgiplot in a more flexible manner (right now on hold); for IB monitoring : collectl was being used for IB monitoring (right now on hold); for disk usage, cacti has an option, can be released alongwith the temp monitoring. Additional homegrown tool (IMH + others?) also available -- need to check and see what should be the final form.  
3 May : during MTAC, temp displays in CORR room added; (plot facility etc); control room can always see display of temps : inlet air & outlet air  
28 Jun : better information sharing : control room people need to be made aware formally; formal note needed;

#### 4.8 Other issues :

(i) Cross-coupling tests in GAB + GWB  
14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?

28 Dec : some issues need a bit more of discussion before reaching a final conclusion.

11 Jan : ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%

25 Jan : no updates; needs a discussion.

(ii) Walsh related work.

14 Dec : some tests in progress; porting to GWB (Python package being modified);

28 Dec : work is still ongoing.

11 Jan : porting work is nearing completion.

25 Jan : now in testing phase (on GWB2).

19 Apr : some corrections done for accommodating existing connectivity of GWB of pols with nodes; second correction done for drift of Walsh pattern due to digital bug; will proceed for noise source and astro tests using GWB2.

3 May : delay hunting programme has some bugs, being fixed; debugging in progress.

28 Jun : parallelly new package for delay configuration + Walsh being made forward compatible; to be ported to GWB-3 as well.

## 5. Other items :

### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need to agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

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## Minutes for the Plan meeting of 16 Aug 2017

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### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov 16 to 8 Mar : offset was fixed (with help from mechanical) and some tests were also carried out (in the interim) for band-4 feed (results looked basically ok) and were shared with SC.

8 Mar : offsets have been corrected; 610 MHz measurements done; other freq being done now; report awaited; method for cross-polar measurements needs review before executing.

22 Mar : new results presented : from ~ 600 to 800 MHz in ~ 50 MHz steps; to see if we can get closer to 550 and 850 MHz and repeat. Also to try Band-2 (120-250) feed and see if re-measurement of Band-3 (250-500) is useful.

26 Apr : Completed measurements for 1 polarization 550-850 MHz (in 25 MHz step). Second polarization has been partially completed : 550-725 MHz; the remaining frequency range to be covered on 28th Apr.

31 May : completed expt with new transmitting antenna (Aronia, better alignment etc); results show reasonably good agreement with simulated pattern for ~ 650 to 800 MHz range with some droop off at the edges (more so at 850); to confirm the final physical configuration of the transmitter antenna location to see if some of the smaller variations may be due to that; to check repeatability with one more feed of Band-4; to see if the set-up is more accurate now, then Band-2 feed can be retested; finally, to see if some retuning of feed can be done to improve the match between measured and simulated pattern.

19 Jul : tests planned next week

2 Aug : no updates on use of new 550-850 data by SC; no updates on 2nd round of tests -- tbd later this week.

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

18 Jan : manual 'digitization' of plot (hard copy) is agreed [rather than indefinitely 'waiting' for a machine readable data file to become available somehow];

15 Feb : no updates, can check recent emails for updates.

22 Mar : no updates, can keep pending for some time.

12 Apr : status quo

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

4 Jan : awaiting feedback

22 Mar : ICH and DVL reminded; will get back in next few days with comments and

then possible follow-up and closure can be explored.

12 Apr : to schedule a final joint discussion for closure, within next 2 weeks.

(ii) need to cross-check mismatch of values for band-3 (250-500);

30 Nov : will check and update, including referring to some existing literature

21 Dec : some work has been done, but needs an internal cross-check & then discussion.

22 Mar : new doc has the updated values for this.

(iii) need to see if QH losses have been incorporated into the calculations;

30 Nov : GP has done some of the work; need to circulate and get agreement.

8 Mar : report circulated; feedback awaited

22 Mar : new doc has the updated values for this also.

(iv) does the study cover all the uGMRT bands.

30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.

16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.

21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in Tsys) -- TBC.

22 Mar : new doc covers all the bands, except for 120-250 (Band-2) as measured feed radiation pattern is not available (standard 65% across the full band has been assumed).

12 Apr : measured radiation pattern not yet available; will be done after finishing work on Band-4 (550-850 MHz).

26 Apr : radiation pattern (550-850 MHz) has been given to Swagoto

(v) can it be extended to deriving the final beam pattern for feed + antenna; this is being looked into :

21 Dec : first version doc has been sent by SC -- needs follow-up

4 & 18 Jan : feedback awaited on this item.

15 Feb : to try to find a slot when all concerned are present to get to the finer points and close the matters.

22 Mar : can be presented this Friday in the polarisation meeting, and then taken up for follow-up discussion.

12 Apr : see discussion from last week's meeting; action items have been identified there, under polarisation calibration work, and this topic can be followed up there.

19 Jul : polarisation calibration forum will discuss on 24-Jul-2017

#### 1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document

30 Nov : yet to be completed.

21 Dec : updated & internally circulated;

15 Feb : GP to follow-up on internal clearance.

12 Apr : SSK to check and follow-up on clearing the report

26 Apr : Report has been finalised and circulated.

(ii) results from recent tests

30 Nov : running of tests has conflict with online system (JPK is looking into this)

21 Dec : all x30 Ae data collection leads to 'online' ssystem hanging; planning with x15 Ae (29Dec);

18 Jan : 'online' issue remained for '15' antenna also (after '30' antenna case failed); now suggested to repeat for '10' antenna case; test planned for a future wednesday;

15 Feb : to try with smaller number of antennas for now; need discussion with Ops group about the limitation and how it would get overcome.

08 Mar : GP & Jitendra following up today

12 Apr : 15 antenna test with online now successful; trying for 30 antenna this week.

26 Apr : 30 antenna test was done during MTAC; needs to be repeated now.

17 May : last week, 6 antennas were available and they were tested; monitoring scheme is working; test with all 30 antennas needs white slot booking -- to be done.

14 Jun : tried with all x30 antenna : monitoring working = no hanging (results need to be checked / interpreted)

5 Jul : confirmed working for 30 antennas; more detailed test results awaited.

(iii) labeling scheme for keeping track of the units to be taken up for refinement and implementation

16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.

30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular back-up of the files to be worked out.

12 Apr : additional disks made available for back-up of the units; in-house development by Sanjeet ongoing -- can review in about 2 weeks.

26 Apr : software is ready; tested locally; need to feed real data & test.

(iv) Lband system does NOT have total power monitoring at present : prototype scheme being worked out by Ramesh and may be available shortly; will include basic temp monitor (for the box; not for LNA).

26 Apr : new scheme has been tested ok in lab; chassis may need modifications for final implementation.

17 May : the software has been tested; implementation is expected after STP joins; boxes are using proper numbering scheme.

14 Jun : implemented in x3 L-band systems in lab

1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system

30 Nov : same as above

21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)

18 Jan : data showed 'flat' value over 24 hrs; C3 & E2 to be tried again today.

15 Feb : not clear about the above problem (needs follow-up with Ops group); to check with 4 antenna test and report back.

12 Apr : monitoring goes hand in hand with power monitoring.

(ii) status of prototype for temp and power monitoring at OF rack at antenna base

16 Nov : sample data set taken but not long enough; to wait for next round of tests; prototype unit installed at C2 and connected to M&C system, but not being monitoring regularly; would like to do some more test and development before finalising the scheme.

30 Nov : (ii) is on-hold after prototype development; to be taken up only after Rabbit card based system is in place.

12 Apr : no change in status

31 May : GP to be asked for updates in 1.4 and 1.5 via email.

2 Aug : GP has carried out some tests using white slot requests (to establish the procedure for using the white slots for tests); basic behaviour of the system looks all right; can keep up the tests at a rate needed to confirm proper functioning of the units; detailed tests and data taking can be taken up with monitoring with new common box with Rabbit card.

1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares

30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.

4 Jan : 4 complete sets of spares available now (ready for installation at antenna)

15 Feb : 4 spares available.

08 Mar : 5th L-band spare has been assembled - currently under test

22 Mar : now down to four spares (due to C14 problem).  
12 Apr : 2 complete sets still available; 3 units under repair  
26 Apr : 3rd unit was found to have some issues -- under investigation.  
17 May : working on mechanical mounting for the new LNA for L-band feed (as the size is different now); 3 spares are being maintained.  
31 May : 4 units of original design ready, but 3 need verification (including temp & power monitor) before final packing; 1 new unit being made ready with new 3 stage LNAs.  
5 Jul : 3 units available; 4th unit ready with new 3 stage LNA, but need to confirm dynamic range achieved.  
19 Jul : dynamic range tests carried out; results to be circulated next week  
2 Aug : to correct some confusion / error, need to redo the test and then circulate the report; see item below.  
(ii) finalisation of report by VBB  
30 Nov : report pending with SSK  
12 Apr : updated report had been circulated; can take it up for brief discussion next time and try to close.  
31 May : do it next time.  
2 Aug : to check if this can be closed after VBB is back.  
====> to take up next time.

#### 1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs  
30 Nov : some failed units are being retuned...  
08 Mar : all spares available  
(ii) status of new 2-stage design installed on 2 antennas : working ok ?  
30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.  
2 Aug : still working fine, with no issues.  
(ii) status of new 3-stage design : optimisation of RL was being attempted  
16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better than 10 dB across the band; Tlna ~ 20 K (by old noise comm calibration scheme); to try improve further, while assembling second unit.  
30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna (2 units to be made ready).  
21 Dec : 2 K improvement seen (< 20 K) ; report to be available in 1 week  
4 Jan : second unit has been assembled; overlapping plots show good repeatability; report will be ready by 6 Jan.  
18 Jan : report already circulated last week [ ~ 20-25 K over full band; gain ~ 44 dB flat; return loss better than -11dB over entire band (-14/-15 dB most places); worst case -11 dB near lower freq band edge]  
08 Mar : x6 new PCBs (x2 circuits assembled; awaiting chassis; expected next week)  
22 Mar : above new units have been assembled and tested -- results look ok, will be circulated shortly.  
12 Apr : 4 units of 3-stage amplifier built and compared for performance : getting good repeatability; completely dynamic range measurement and stability inside env chamber; agreed to put 4 units on 2 antennas (CSQ) and check for the performance, including change in power levels and hence change in OF attn etc.  
17 May : tests remaining are dynamic range and stability with temperature (in chamber); these may get done next week.  
31 May : dynamic range testing done -- prelim result is ~ 58 dB SFDR and CDR ~ 80 dB -- to be confirmed, and cross-checked against values for earlier designs; temp stability test to be done shortly.  
5 Jul : comparison with old LNA -- needs a repeat measurement; temp stability test

yet to be done (VBB on medical leave).

2 Aug : dynamic range tests to be repeated; temp tests yet to be done (will take up soon); after that, can look at putting up on antenna.

### 1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB problem and W5 -- problem not identified); C14 showing poor deflection and falling at high freq -- checked for pointing and OF attn, now to try changing the feed.

4 Jan : results from tests on 13 Dec discussed : 21 antennas available; dip seen for L-band vanished after replacing common box (which antenna?), but unit appears to be ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2; W5 poor bandshape; C14 noise deflection discussed.

18 Jan : 06-Jan-2017 tests reported; (only 15 antennas were available); E6 showed ripples in CH1 (but could be cable twist; as today NOT noticed); E6 CH2 deflection HIGHER than expected (red dots) !! "measurement" error? 'naming' of file ? similarly W5 CH2; results show MAJOR drift in deflection (~ 15 dB spread !) -- BUT NO CORRECTIVE ACTION TAKEN !! Primary purpose of monitoring is LOST ! SKR was 'un-sure' about this responsibility - now clarified; henceforth, he will follow up on errant antennas.

15 Feb : E6 ripple in Ch1 fixed (bad cable); C14 feed needs to be replaced (tbd soon); tests at antenna base for selected set of antennas shows ~6-8 dB variations -- this needs to be investigated and understood.

08 Mar : ripples were due to cables; C14 slope in deflection was possibly due to feed issue -- now new feed has been put; tests awaited

22 Mar : C14 brought down and being looked into by S Ramesh; about 10-12 dB spread in off-source values (but deflection is reasonable stable) -- needs joint follow-up with FE and OF persons.

12 Apr : new result show similar as above : deflection is mostly all right, but off levels still have a large spread;

17 May : last measurements were without any pointing correction (!); so need to be repeated; meanwhile, problem antennas fixed at antenna base (how?); equal power tuning exercise is currently underway.

31 May : no updates as Sanjit on leave.

14 Jun : 25-May-2017 data plotted (deflections) & displayed; CH-1 & 2 variation within +-2 dB (4 dB p-p); E03 showing lower power (wrt -55 dBm)

2 Aug : some fresh data has been taken; set of antennas with low power level and low deflection -- being followed up; additional point : team finds systematically lower deflection than expected for CassA -- to summarise the evidence and then take it up for discussion with astronomer colleagues.

====> latest results from this week displayed; issues related to E05 pointed out (to update by next week); also slope of the measured deflection over the band is different from slope of theoretical values -- needs to be investigated.

Note1 : some antennas have old notch filter (about 5 antennas?) -- need to change these to new notch filters...

Note2 : to try sample 1000 to 1400 MHz BPF on trial basis.

2 Aug : sample unit gives 1000 to 1400 as 3 dB -- may need to redo; meanwhile to show comparison with original filter.

====> no update as Ankur on leave.

### 1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring in control room

30 Nov : this is now available under the standard monitoring tools; control part has some problem and needs login to control PC -- SOP for this to be provided to control room.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue.

14 Jun : PC being procured (enquiry gone)

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

2 Aug : 2 nos of new monitor PCs have arrived; to be integrated into the system.

====> required OS and softwares yet to be installed by computer group.

1.10 Mass production of Band-4 (550-850) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow; 12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.

30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity units are available).

18 Jan : system for 12th antenna will be ready by Monday 23 Jan (lab tests are in progress now); by April x16 system target can still be met.

15 Feb : 13th antenna (C03) installed this week (2 weeks since last one);

08 Mar : dipole shortage; 14th antenna to be completed by ~ 15-Mar-2017; QC issue with dipole units fabricated by outsourced party; dipoles need to be fabricated in-house;

22 Mar : 15 antennas completed; issue of dipoles not having Nickel coated -- will come by Sat. (meanwhile, one has gone without coating and will be replaced later on); for future orders, to do the dipole in-house and send for coating and deliver.

12 Apr : 6 nos of coated dipoles now available (small mech adjustment needed to match the holes -- need to cross-check; agreed for modifying 2 nos by putting a compensating offset holes on the cavity -- this can be tested for proper performance; meanwhile, to expedite the completion of 3 nos of in-house made dipoles and deliver at the earliest by next week.

26 Apr : x3 dipoles delivered by mech team; x1 of these gone to E5; now total x16 Ae done; remaining x2 will go next week, by 03-May-2017.

17 May : completing 17th antenna (W02) today

31 May : feeds + stools available for 5 more antennas; 18th is almost ready; after that, problem is with the mobile band filter availability due to delays with Argus ! Need to see if this can converge quickly; also initiate parallel exercise with another vendor; enough boxes are there for continuing assembly.

14 Jun : 17 completed; 18th being installed tomorrow 15Jun2017 (W03); so same status as 1 month back;

5 Jul : 19 antennas are now complete and going smoothly.

19 Jul : 20th Ae installation held up due to rains; to be attempted shortly

2 Aug : still held up due to weather; will do asap; next unit is also ready.

====> 20th now completed; for 21st antenna, items had to be diverted to C5 unit due to problems of water entry into the hood assembly; now cleaned up and ready to go for 21st antenna in next few days.

Additional point : live demo of switchable notch filter at Rx room (in C09 antenna path) -- can switch in different filters -- appeared to work fine; in the process discovered that mobile signal is coming through quite strong in the Band-3 signal (!!);

needs to be checked and understood.

2 Aug : agreed that the analysis needs to be done to identify the nature of the problem and then look at possible solutions;  
for longer term planning to explore options for limited installation for some (worst affected antennas).

## 2. RFI related :

### 2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting to be completed

30 Nov : YG + PAR to work on this final version.

12 Apr : needs to be actioned asap.

(ii) study of RFI environment, including internally generated RFI in main building

30 Nov : tests of individual labs : with AC units and otherwise -- shows different labs in different light; agreed to identify the worst culprits by kind of equipment etc and provide an update.

12 Apr : this is due, but has not started yet due to other activities.

(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests

16 Nov & 30 Nov & 21 Dec : no updates.

26 Apr : two experiments done :

(A) expt done using GMRT Ae as RX, & log-periodic Ae as TX; D = 100m & 300m measurements displayed GMRT Ae elev 18/45/90 deg; feed rotation done over 0/45/-45 deg

(B) between x2 GMRT Ae (C1 , C8) ; one as TX & another as RX; D=375m with function generator directly feeding RF to GMRT 325MHz FEED as TX; results displayed; 78 deg (3dB) HPBW

17 May : awaiting further discussion

(iv) absolute calibration of measurement set-up for RFI testing : to translate levels measured there to levels expected at antenna focus.

26 Apr : power calibrated for any lab equipment emission limit (upto what allowed) -- plots displayed

5 Jul : report on possible limits for RFI from GMRT lab equipment has been circulated (was discussed in detail last week) -- actual levels now quantified based on details tests with Tx & antennas; need a detailed follow-up.

### 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database

(ii) response to pending requests for clearance e.g. Serum Institute...

21 Dec : awaiting call from Serum Institute for the next visit; asked all technical details of their planned equipments;

30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to their location for looking at specific instruments.

21 Dec : one site visited.

4 Jan : awaiting call for visit to site of the party.

15 Feb : one round of discussions have happened with Serum institute -- they would like to finish the installation and then call for testing and possible modifications; our response should be that we would like to test the existing set-up and indicate the mods to be done and these should be implemented in both existing and new setup and then taken up for testing.

Another party wanting to set-up unit for DC control drives in Junnar / Ambegaon area.

12 Apr : RFI tests planned at Serum Inst premises next week.

26 Apr : test planned on 02-May-2017 at Serum Inst premises

17 May : tests done on 2 May 17 : RFI measurements done with manufacturing units ON

(full campus operational); largest increase : -63 dBm at 75 MHz -- 30 dB rise in noise floor compared to all-off condition (-93 dBm); cold room giving discrete lines in 150 to 250 MHz range (-75 dBm peak); shielding measures need to be advised to Serum Institute; detailed report by later today.

14 Jun : communicated about need for improvements in shielding.

2 Aug : to follow-up & contact Serum Institute about a visit to isolate the RFI generating unit in order to come up with design for RFI proofing it & to implement the sample units.

(iii) work out new action plan, given the current government policies

08 Mar : MIDC people from Chakan came to GMRT for exploring possible sites for new industry zones; following discussions, agreed to our request to avoid heavy industry in GMRT area -- maybe IT related in Peth etc; also about help in surveying sites for level of RFI etc -- how is this to be formalised -- we should send a letter from our side; check with JKS.

similarly, there is a note from DAE asking for things that need protection -- to see if JKS can follow-up on this.

2 Aug : no action has happened on this as yet.

### 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters

30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems (they are the only one to have got license in this range) -- it is strong enough to cause saturation in spite of filter; need to find the specific towers and then follow-up with Reliance.

18 Jan : measurements happening this week; update by next week.

15 Feb : completed survey of 82 towers around Y-array : 14 towers in 850 band (Reliance Jio) and 6 towers in 950 GSM band; rest are in 1800 band. Max power in 850 band ~ -16 dBm (at ~ 100 m distance) for few towers. Follow-up for both 850 and 950 being pursued, including dialogue with Reliance Jio to see if they can switch to 1800 band.

08 Mar : draft letter circulated (vendor is generally positive; but formal communication needs to go soon)

15 Mar : New results : characterisation of mobile phone RFI in the GMRT campus -- some interesting plots; using JIO CDMA uplinks and their effect can be seen.

14 Jun : letter to JIO CDMA sent already; Doordarshan is being sent shortly

2 Aug : response from Reliance JIO discussed (they quote that WPC stipulates that GMRT needs protection 1800 MHz Band and hence they can't switch over to 1800 !) -- to reply formally with a clarification and also ask for copy of the relevant WPC document; PAR to also talk informally with them.

### 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems

30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need to identify which make is coming finally.

21 Dec : no updates.

15 Feb : 33 nos (Voltas instead of BlueStar) have arrived; need to finalise the locations and the specific schemes for installation; need to make shielded units for all 33 nos; components for 25 units are available; boxes for 10 nos are in hand except for back plate and chromatisation (expected to take one week); work request for next 10 has been given (repeat order); some difference in wiring for Voltas unit -- needs some rework of the design / layout; also one type of connector is different and this also needs to be resolved; PAR to send an email explaining the steps to be taken to complete the RFI shielding work, and expected timelines for the same.

Regarding installation : there is a table giving the locations for 31 units (including replacements of 5 existing units) -- to check if outgoing lines can be behind the unit; to install sample one unit in canteen annexe, test the RFI shielding.



08 Mar : one set of measurement done (without shielding) - under analysis; by next week shielded case will be measured & compared; RFI group designed shielding box pictures displayed; uses many cables with RFI shielded interface connectors; it includes high current carrying (220V AC) lines, needing shielded connectors !

12 Apr : 10 AC units have been installed; only 3 have the RFI shielding installed (are the other 7 being used !); 3 more RFI units are getting ready; to speed-up the remaining RFI units; and then go for the next batch of AC units; meanwhile, one bump of RFI remains at around 325 MHz -- may be coming from blower assembly : to disassemble on unit and check for source of RFI.

17 May : 12 units are now in operation with RFI shielding; prototype box from new vendor has come and not found suitable -- modifications told to vendor, corrected unit may come in few days.

14 Jun : x20 new units arrived at Pune campus; sent for yellow chromatinization;

5 Jul : now 21 units available; work can restart.

2 Aug : 5 units in 2nd lot have been installed; all material needed for shielding is now in hand; so process can go forward at the required rate...

NEW points : shielded ethernet enclosure (x35 units) -- placed work order; it is aluminium C-channel based unit (at Pune W/S)

### 3. Operations related :

#### 3.1 Interfacing of FE with new M&C system :

(i) latest status of testing with Rabbit card in common box at antenna base

16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).

30 Nov : no new updates on this

21 Dec : antenna control part is working; FE monitoring still not working; Charu is looking into this...

18 Jan : trying with different delay to see if it solves the problem, but not yet working with online control...

19 Jul : last 2 months has been working satisfactorily on C-01 antenna; one instance of problem : hanging (needed power reset to be normal again); 2 more units being made ready by FE.

====> hardware work of installing Rabbit and making it work in common box (and be controlled with existing online) is as going on; software work for having control program in Miltech PC for talking to FE Rabbit card via serial port is getting ready -- this should also work seamlessly for antennas with MCM 5 as the control unit.

(ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus

16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration and testing in 2 weeks time and put on first antenna with RS-232 cable driving; later to convert that to ethernet over fibre; mass production may need only new plates to be made by workshop -- other aspects are in-house in FE lab.

30 Nov : item also being discussed under FE agenda item (in alternate week)

18 Jan : final status is Box #1 was made functional at antenna base and was taken up to antenna focus as Box #2 does not work reliably -- hangs and needs power reset (has been tested with a couple of different Rabbit cards?); problem not solved; agreed to try the option of swapping the Rabbit cards between Box #1 and Box #2

and seeing what is the outcome. To report this by tomorrow and then decide if a 3rd box needs to be made ready.

25 Jan : testing of common box with Rabbit card : new clue related to grounding of enable signal of decoder IC may provide the breakthrough -- tested in lab and will take to antenna base now.

15 Feb : email update from Raj Upgrade : One rabbit MCM has been installed at C01 antenna dish focus; MCM communication is proper but needs to give hardware reset while changing frequency band.

08 Mar : it is working only for some bands (C01); needs rethink on strategy.

22 Mar : problems persist; long discussion about what may be the cause; need to get a proper wiring diagram to check the grounding of the system for possible loopholes that may be causing the flaky behaviour...

5 Apr : useful discussion alongwith wiring diagrams; two possible causes identified : old FE power supplies may be having more noise (200 mV) than the new ABR power supply (50 mV) -- to try C01 with the new supply; Rabbit card has ground to common box chassis (unlike MCM-5 card) -- can try to isolate this in the second box being made ready and take to another antenna.

12 Apr : common box on C1 now working properly (!) -- problem was in sequence of commands sent from control room -- there was a monitor command sequence in the cmdfile that was the culprit.

Agreed that only main bottleneck remaining is monitoring of FE system -- this can continue in parallel, even as we go ahead with mass installation of the Rabbit based common box; third stream of activity to be initiated is lab test of ethernet based control of Rabbit card in common box, via optical fibre link (bypassing cable ethernet).

26 Apr : update on monitoring aspect : problem found with 4 lines on interface card that appear to be picking up spurious signals; isolated by connecting straps directly from IC pin to destination point and solved the problem; to confirm that problem clearly identified and solved; and then agree on changes to be made to PCB via straps (after cutting the offending tracks) and implement in mass production.

17 May : above solution implemented for 2nd box also and found working ok; put up in place of original common box on C01 (due to low fringe call sheet due noise-gen all the time); to test the failed unit to see if cause is in new M&C system or in some aspect of common box; for the PCB, agreed to make a new version, but work in parallel with modifying existing versions with straps to keep the production rolling; same strategy for modification to accommodate OF receiver.

31 May : new box on C01 is working fine; older version that had come down has problems identified (not related to Rabbit control) and are being rectified (change of one interface PCB; old one to be debugged by SC) -- to find the spare cards and use for now; in addition, wiring for 2 more boxes is underway. To check separately about OF work on common box.

14 Jun : C01 has been working for last one month; FE group wiring x2 more boxes;

19 Jul : one of these 2 boxes can go to antenna;

2 Aug : unit from C01 brought down due to bandsetting problems (see other week's item) and tested in the lab -- nothing wrong was found and after a fair bit of testing, it was installed in C02 and is working for last 2 days; 2nd unit is ready to go and will be put up on C01; 3rd box getting ready; for longer term, need to replace i/f card with new design -- almost ready to go for PCB making (waiting for VBB).

### 3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgeetary quote; formal quote expected shortly.

4 Jan : folder cleared ; PO should be done shortly.

18 Jan : Order has been released; full delivery time is 3 months; first box to be supplied earlier and tested...

15 Feb : email update from Raj Uprade : expecting the delivery of one Miltec machine shortly; also initiated talk with Miltec to supply it as early as possible.

08 Mar : one unit has come; will be tested & feedback given to Miltech

22 Mar : new Miltech PC put through RFI test; informal report : looks ok; formal report may take some time.

12 Apr : go ahead given to Miltech for full delivery.

26 Apr : CPK to call and check the status.

17 May : CPK yet to call.

31 May : Party had confirmed plans for delivery in 2-3 months time scale -- to check if it can be expedited and/or delivered in batches; out of 16 existing, 14 are working (10 in antennas, 4 in lab); more disks being ordered for Miltech PCs.

14 Jun : Miltek said under production; no speedy delivery possible; usual delivery schedule.

19 Jul : end Aug'17 all units expected;

2 Aug : to reconfirm with Miltech about date of delivery.

====> end of Aug is being given as date of delivery -- to try and ensure this date and also if batch delivery of first few units is possible earlier.

Addition item : issue of Windows software licences discussed (with MSU present) -- agreed to go ahead with ~ 20 stand-alone licenses for use by tech groups.

17 May : MSU reported that he is looking into it.

31 May : MSU presented some confusing feedback from different vendors -- yearly license cost, with terms and conditions; MSU to assemble the possible options and report back.

2 Aug : MSU has received some quotes and will summarize shortly.

### 3.3 GMRT M&C sytem Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal meeting.

4 Jan : internal lab meeting held on 3 Jan (now every Tuesday)

08 Mar : all team members are clear on their respective roles & are contributing

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans

30 Nov : discussions ongoing; kick-off meeting planned.

21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.

4 Jan : regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary' etc shared with TCS.

18 Jan : work ongoing; need more regular interactions of TCS with GMRT team members.

15 Feb : email update from Raj Uprade : 2 CMC and 6 LMC machines are UP & running; team members are now very much familiar with CMC, LMC installation, features, testing and can carry independent tasks.

08 Mar : interim review held; schedule is 6 weeks slippage/ delayed; mitigation planned for that delay;

22 Mar : work progressing; may test sub-array and tracking in coming MTAC.

26 Apr : could not meet the above target due to modifications for A&A issues and other things; work is ongoing at present.

17 May : tracking routine completed; LMC, A&A and data-base schema work not yet converged.

31 May : new ver 2.2 released last week -- tested and feedback given; further tests to be done this week.

14 Jun : LMC v2.3 expected now but power shutdown led to delay (Friday 16Jun2017);

CMC v2 after tests are successful (~ 1 week), phase-2 delivery will be over.

5 Jul : Delivery-1 of Phase-2 has been done; most bugs fixed; some more work is remaining, but can start on Delivery-2 related items.

19 Jul : improved version of Delivery-1 of Phase-2 expected today; Delivery-2 work has started

2 Aug : work on delivery-2 going ok -- completion date is mid-Oct and this will allow basic interferometry end-to-end observation to be carried out; del-3 & del-4 roughly at 3 mos; del-3 should allow almost all the features that current system provides and del-4 is the extra features.

### 3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for material for review committee started

30 Nov : dicussions and work ongoing, including preparations for discussions with TM review panel.

21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase : requirement compatibility; architecture explanation given; scalability etc; need many upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;

4 Jan : preparation of docs in progress; ph-2 work now beginning...

18 Jan : aim to have 6+ antenna set-up with PC + switch + Rabbit talking to Sentinel + OF + Servo (to check if existing PC104 will work directly) or not; to check enough Miltech PCs available -- Sumit and Mangesh to look into it.; need to move from Fedora to Ubuntu; aim to start testing at antenna base by 23/24. Additionally, need some temporary space (couple of months) for working on 2 PCs in or near control room...

15 Feb : Last week 6 antennae Control & monitoring system was set-up and demonstrated to SKA reviewer (Nick Rees) and SKA India team.

08 Mar : SKA committee is reviewing our work; cost estimate proposal from India was submitted to SKA claiming 50% saving on TM work using Indian scheme;

26 Apr : discussions ongoing; need to prepare an updated response to new version of report expected by tomorrow or so.

17 May : all done and completed.

Back-up of interferometry data from GWB : some issues when switching over from gwbh1 to gwbh6, but appear to be resolved now.

19 Jul : Additonal item : x10 hard drive (2TB each) - arrived at NCRA stores; next week will be in use; end-July x4 LMCs (Local Monitoring Switch) at antenna base; Layer-3 s/w has been configures in Rx room; one text LMC put on it; slowly move to new L3 s/w.

2 Aug : both disks and layer-3 switch appears to be ok.

## 4. Back-ends related :

### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh paper needs to be looked into for revision; nothing really pending, except for the report on the attenuation values : new set of tests done and results look ok and will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed); may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?  
4 Jan : To follow-up on GWB refereeing process.  
18 Jan : GWB response received, relatively minor modifications are needed and SHR is looking into this; for Walsh, waiting for response -- can check after 20 days (end of this week / early next week).  
26 Apr : no new issues here.

#### 4.2 Updates on existing GWB-3 system :

(i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;  
28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

4 Jan -- 12 Apr : no progress on this, due to work on release of 30 antenna system.

5 Apr : meanwhile, new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

12 Apr : agreed for BE team to repeat noise source tests and check carefully for spurious lines; then repeat with sky signal as needed.

26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction : geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.

17 May : DDC related updates :

(a) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and release for users.

(b) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.

24 May : for shape equalisation, some fine tuning being done by SHR; for spurious lines, not clear what is the best way forward -- need to check if it is part of the ADC related effect or not and whether maintaining higher input levels can help mitigate the problem...

31 May : agreed that the latest version of bandshape correction looks ok and can be released in the next version of GWB; for spurious spikes, some further tests suggested, also to look into optimising the power levels at input for the narrow band modes.

14 Jun : released (bandshape correction) in the current version itself spikes issue no update

28 Jun : for bandshape correction : edge effect handling now completed & released; this can be closed now.

For spurious spikes : tests imply spikes originate from ADC itself; need to change the clock & see; other repeatability tests (same spikes from same ADC card) etc remain to be carried out;

12 Jul : repeatability : in 200 MHz mode, seems to be good repeatability of channels for same ADC, with some fluctuation in ampl and confirmed that all are  $2^n$  locations; trying 100 MHz mode with DDC (even for 100 MHz o/p) shows some additional lines, not at  $2^n$  location but of comparable strength (!) -- needs to be looked into more carefully to understand the nature and cause of these.

19 Jul : still analysing (reason for spikes in DDC mode)

2 Aug : tests of ADC recorded data show ~ 4-6 spikes per ADC occurring in chans ~  $k \cdot 256$

and repeatable for a given ADC; need to check if DDC is producing spikes or the ADC spikes are coming through with some intermodulation ?

====> fresh tests with digitally generated noise put through the DDC chain show that the spikes do come and that they may be due to the LO signal being used in the DDC -- need to check and establish the correspondence between spikes in LO spectrum and DDC o/p spectrum; then check if going to double precisions helps or not; and cross-check with Matlab generated sine function and spectrum analyser.

(ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes; for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be closed ?

14 Dec : problem perhaps in AIPS settings? matter can be closed?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated; this is completed.

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT lose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also

beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

08 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); but, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain

14 Jun : providing the 'log' at the end of observation for now

12 Jul : this is still pending.

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready; appears to be satisfactory (though no improvements in ambient temp recorded ?).

11 Jan : no further work on GWB; plan is to have similar hcnage for GBS during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

08 Mar : plans for work on GSB during upcoming mTAC -- needs a discussion.

3 May : nearly closed; hot air sucking mechanism needed (being explored with Nandi's help).

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (may come earlier)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep looks like resulting in some speed-up in delivery; to follow-up closely.

11 Jan : YG to contact nvidia and micropoint persons.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

3 May : waiting for adapters to arrive;

28 Jun : adapters arrived; nvidia team visited GMRT; GPU installed on one T630 (for raw voltage recording); to quantify improvements thru benchmarking.

19 Jul : benchmarking needs single node : software changes for single node, done; initial tests imply x2 improvement in performance in Pascal wrt K40; individual block comparison to be completed by next week (see details in later agenda item below).

2 Aug : hard disk procurement 8 TB vs 4 TB -- being followed up; eth cables (CX4 to CX4 15 m and QSFP to CX4 5 m Cu vs fibre; also QSFP to CX4 15 m. 12 nos of T630s expected by mid-Aug.

====> ordering of components : repeat order for 20 nos of 4 TB disks ready to go; T630s (12 nos) order delivery expected anytime; CX4 to CX4 15 m Cu cable ordered 5 nos; CX4 to QSFP

5 m Cu cable 5 nos ordered; delivery for both expected by end of month; Inf cards 2 nos ordered + Inf-Inf cables (fibre) 20 nos getting ordered; GSJ to look into purchase of racks.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : need to plan the code optimisation that will be needed.

14 Dec : need a discussion to decide the way forward on this.

4, 18 Jan 17 : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

15 Feb : SSK to try and restart the old 16-antenna CD pipeline code using the SOPs etc from Kishalay...

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion of long-term issues to be taken up next week (22 Mar).

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working;

calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original



noise source test and then also the sky test at same band.

19 Apr : for ver 4.5, calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).

3 May : SOP already released (v 4.5)

17 May : trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.

14 Jun : trial and release : documents (directory structure OK as per circulated version) finalized; need to creat directories etc.

28 Jun : antenna testing scheduled today/tomorrow; next SOP release planned  
CD pipeline : GPU has possibilities as per manuals; release of trial mode : all above incorporated.

12 Jul : some white slot testing needed for new release ver before replacing the existing GTAC use version. CD pipeline : tested for 2 beams 200 MHz also; waiting for cmdline interface for 2 beam mdoe.

19 Jul : antenna testing were OK; SOP released; control room using it as 'trial' mode.

4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :

(i) refinements of the first draft of the note

(ii) plans for getting first unit connected and tested

(iii) plans for testing high speed recording to disks

16 Nov : lab set-up for grabbing and recoding has been done; while continuing with this, need to work on the set-up for sending parallel copy of the data, including procurement of longer CX4 cables.

30 Nov & 21 Dec : not discussed.

4 Jan 17 : basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.

18 Jan : to test the dual copy design for correlations using existing 16-antenna corr with dummy inputs; then to connect to one machine where tests can be done for raw voltage recording and a single node correlator with flexible beamforming.

15 Feb : no updates.

08 Mar : 374 MBps speed acheived; but need slightly higher speed

26 Apr : old gwbh9 (T630 m/c) removed and T620 m/c put in for doing the further work; length of cables -- 3m may be enough for using existing slot in the racks; to look into modifications of FPGA code for more eth cores; simple code for correlation of limited number of antenna etc... longer-term plan with longer cables, more racks, more nodes etc to be thought about.

17 May : expanded design tried with 8+ disks using gulp and can be tried with GWB signals; to be tried with digital copy scheme using resurrected earlier design with 4 10 Gbe cores.

14 Jun : machine installed; code compiled in FPGA; delays being tuned for sync.

19 Jul : in 1-2 week will be completed

2 Aug : first test of dual copy system tried out (with 2 m CX4 to CX4 connections into the same rack) -- data captured with gulp for one port; to see if psrdada based front end receiving code can be resurrected; one more rack may be needed.

====> single node correltor now working (except no online interface) -- can look into porting this on to the parallel system.

4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)

16 Nov : some changes have been made by SHR, but the sub-microsec correction still

needs to be done; also to follow-up about h4k file.

21 Dec : modified code has been made, but not yet tested; can try to see if it can be made available in the current release.

4 & 18 Jan 17 : agreed to defer to next release.

15 Feb : deferred as above.

08 Mar : current release has this 'sub-microsec correction' ENABLED; it is now possible to send those values to header files;

26 Apr : updated timestamp with higher accuracy is coming now; needs to be verified for correctness; CDP vs PA timestamping still to be resolved.

17 May : one buffer offset confirmed; need to be checked for different modes

14 Jun : sending side time stamps are fine; offset must be getting introduced during processing.

New items to be added : (i) single node correlation (a) off-line for many antennas (for better profiling and benchmarking) (b) on-line for limited inputs (2 to 4 antennas) for testing and new developments

19 Jul : offline becnhmarking work is useful here too

(ii) new options for speeding up overall I/O for voltage beam modes : (a) different BWs (or chans) for different beams (b) 4 bit voltage beam and (c) turn off IFR or BFR data selectively during a scan.

(iii) testing of P100 based node and related follow-up with nvidia team

19 Jul : x2 times improvement reported to nvidia; more work planned; some optimization suggested by nvidia.

====> code and results from single node visual profiler (for CUDA 8.0) shared with nvidia; new results showing 3-4x for MAC (changes with spectral chans) and FFT is 2x; GSJ to follow-up on what model of P100 will work on our nodes in long-term.

#### 4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans

(ii) spectral domain RFI filtering : current status and plans

(iii) beamformer RFI filtering : current status and plans

16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.

30 Nov : not dicussed in detail.

21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file...

emulator has some changes and improvements, including random location of the RFI.

4 Jan 17 : for (i) modifications in simulator; counter mode now working -- can have 2 different modes, tested at module level, now integrated into the design, will be testing in next few days; fractional thld done in simuation, to convert to design and test. (ii) to try and run the filter in real-time from shm data.

18 Jan : not discussed, but summary of offline discussions is as follows : (i) some additional features added to RFI simulator unit; fractional threshold and counter

mode now available for use in the voltage filtering unit; cumulative experience shows that we may be not using the optimal filtering technique for voltage mode -- should try the alternative approach of conversion to intensity and integration to desired time constant -- closer to a true matched filter.

08 Mar : some updates from Kaushal about looking at options for more optimised filtering of broadband time domain data :

Modified the design to support 16K window size - this is the default design now;

Fractional threshold available (tested with antenna signals) - default option now;

Made the DDC mode design compatible with the ongoing changes;

RFI Counter design ready - format to read the data including timestamp from a single ROACH complete, undergoing more tests before release;

Supporting regular tests - spectral line (Nissim), continuum (Ruta, Dharam, Ishwar);

Handling longer duration RFI using median of MAD technique - initial results are encouraging, detailed tests going on;

Looking at likely causes of missing RFI during real-time excision and at possible alternate methods for time-domain filtering;

Ongoing: Updating SOP with changes made till date;

17 May : 2 different options for MAD based filtering released -- normal MAD vs MoM of MAD; some user level tests done -- need to see the output from these for comparison; can be taken up once spectral filtering tasks with Swapnil are concluded.

14 Jun : some results displayed : comparison between MAD vs MoM techniques; MoM much better than MAD 250-500 (426 MHz); but identical (both equally good) performance at 610 MHz need user feedback now.

19 Jul : poor SNR at input leading to better GPTOOL performance ?

plots showed : comparison of MAD, MoM & GPTOOL at different;

thresholds ( $2.7 \cdot \sigma$  vs  $3.0 \cdot \sigma$ ); for data at different RF frequencies;

need for astronomers to test (by generating sky images) & give feedback.

RFI emulator: (last update email - Jan) :

Last development: Adding facility for random insertion and random amplitude of RFI

Understanding the GUI and MCM control program - backup from Rahul Bhor;

Narrowband RFI filtering: (updates email sent periodically) :

Initial version of the code has been timed; optimized for computing faster sorting for median computation, is now much better;

Moving towards expected version of filtering code - with optimized functions to meet real-time requirements (0.671s) and necessary functionality;

Ongoing: Testing the code on recorded data and timing the code for all 60 self outputs;

Looking at synchronization between the data path and RFI filter (along with Sanjay);

Looking at merging of lta file and flags for the FITS file format (along with Sanjay).

08 Mar : now optimizing real time filtering; all bands filtering on recorded; Broad band RFI filtering : emulator tested; other techniques being explored; SOP updated; to be released next week.

17 May : code for spectral filtering of single self has been developed with spectral flags needed as per format specified by SSK and he is to modify this for multiple selfs (all antennas, working real-time) and passing flags appropriately to LTA file.

14 Jun : algo done; working on recorded data; extend to real time release in few weeks;

19 Jul : shared memory to algo done; final integration within 1-2 weeks (ready for real time tests).

4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and tests ongoing; also tested by sending digitised packets to antenna and loop back; using GWB2 for doing all the correlations.

18 Jan : feasibility study done using C09 antenna with noise sources & real signal -- needs a fixed delay correction of 1.5 km to get maximum correlation; trying setup with E5; meanwhile, a few different tests can be tried with the C09 set-up; comparison of scheme running on GWB2 and GWB3 tried out.

08 Mar : C9 & E5 setups faced problems (ethernet card issue); now fixed; GWB2 (early digitization) & GWB3 being used for comparison; delay requirement has reduced (due to early digitization)

12 Apr : new test has been carried out with C9 and E5 on actual on-source observation and brief comparison.

26 Apr : some updates from recent tests to be available by next week; detailed report of recent work being prepared.

17 May : trying some tests with single antenna early digitisation (as only one is working).

14 Jun : summary of tests circulated; stuck with C9/SFC module (need 10 days)

19 Jul : comparative study of dynamic range (old vs new early digitization) in progress

2 Aug : some tests going on; replacement SFC module has arrived.

#### 4.8 Time-Frequency Standards (BAK) :

(i) procurement of Maser units

(ii) planning for kind of environmental set-up required for Maser units

(iii) planning for long-term maintenance and development

16 Nov : most of the issues have been resolved, waiting for one party to complete the payment terms; pending issue about performance bank guarantee for different amounts of periods.

30 Nov : work is ongoing, but item not discussed.

4 Jan 17 : TEC clearance ok; recommendation to open price bids -- to check the status. To contact Prof Sen Gupta for a discussion.

18 Jan : final TEC documents done and sent for next step; to follow-up and check status.

15 Feb : activities ongoing...

08 Mar : Negotiating committee met the vendor (no reduction on price; but add modules 'FREE'; payment terms as per NCRA conditions); Dr Sengupta will be visiting next week; first unit delivery after 5 months; second unit 4 months after 1st delivery;

12 Apr : to take up next time.

26 Apr : to confirm date of expiry of validity and follow-up with TIFR for the folder; to check about vibration damping mechanisms available with the system and otherwise; to make a draft note for selection of the room and suggestion modifications to be taken up.

14 Jun : order yet to go (file still in Bombay); need to plan room A/C shielding : ask civil dept.

19 Jul : x2 Maser orders now placed ; actions needed from electrical group : UPS, A/C, wall panel for signal cables ; room (already identified) needs RFI shielding.

2 Aug : pros and cons of using hot lab discussed -- BE team needs more detailed discussions with civil and mech teams and also get the vendor to visit.

#### 5. Other items :

##### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python

(what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need ot agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

12 Apr : sample unit getting ready -- length needs to be reduced; do asap and get hose assembled and then install on C03.

19 Jul : x4 sets of Python of SS make available with Mechanical group; FE team should plan using them & give feedbacks;

2 Aug : need follow-up with FE and mech groups on this.

Other items from Mechanical group:

x3 sets 130-260 MHz feed completed (being sent to GMRT on 21Jul2017); new work for FE : chassis to hold multiple optical fibres being designed;

=====

## Updates from the Plan meeting of 23 Aug 2017

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updates in lines beginning with '==>'

### 1. FE & OF related :

#### 1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in  $T_{lna}$  for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

22 Feb : first results of variation of  $T_{sys}$  for Band-4 FE unit of QH + DC + LNA

(which goes next to the hood) -- absolute value of Temp is higher than  $T_{lna}$  at ambient and also the variation of  $T_{sys}$  with ambient (0 to 60 deg C) is larger than for  $T_{lna}$  alone. To cross-check whether known loss of QH and DC at room temp can explain the room temp values and then extrapolate from there for different ambient temps.

15 Mar : new test done with QH + LNA only (compared with QH + DC + LNA) -- shows lower variation of  $T_{sys}$  over 60 deg range of chamber (35-40 instead of 55-60 seen earlier); agreed to try to estimate the loss of QH and DC with temperature and use theoretical formula along with  $T_{lna}$  as fn of temp to predict the observed  $T_{sys}$  vs temp curves and compare with the measurements.

5 Apr : new results of  $T_{sys}$  vs temp for just LNA, LNA+QH, LNA+DC, LNA+QH+DC : appears to show reasonably flat variation of  $T_{lna}$  with temp; more variation for LNA+QH; but some of the curves cross each other (and have offsets) with temp -- bit difficult to understand; agreed to try S-params for each device as fn of temp, for same RF (610); meanwhile, theoretical calculations ongoing.

19 Apr : new update, which measures loss of QH with temp, shows change from 0.1 to 0.2 dB over 60 deg and can explain the observed variation of  $T_{sys}$  with temp. To check if any info is available about loss of QH with temp; second is the mystery about lines crossing each other -- needs to be understood; then can check about extending the study to Band-3 also.

24 May : no fresh activity due to engagement in mass production work.

7 Jun : new test done for the new 3-stage LNA for Lband -- shows few (~6 deg) variation over 20 to 60 deg change in temp -- similar to Band-4 LNA; to try with typical cable length in front of the LNA. Riddle of crossing curves remains (here also); to try for Band-3 LNA.

#### 1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible.

22 Feb 17 : only 5 antennas completed by January; request for next set of 5 feeds has been given to mechanical approx beginning of Jan -- expecting 2 dipoles shortly,

but reflector and BFRs will take some time; meanwhile one FE box is ready; to get if possible 2 more to be ready, so that 2-3 antennas can be done in quick succession. Need to have enough QH + DC (is matter of cutting right length of material and assembly); for LNA : have all PCBs, need chassis (ordered in sets of 20); same situation for BPF; however, request for new stools (with modified height) has not been given (!); due to some rethink about optimal stool height (!); follow-up action on this : to discuss with mechanical to see if existing or spare stools can be modified / cut to meet the height requirement and use for the next 2-3 antennas.  
15 Mar : HRB had requested for 5 feeds (DRF 130-260 MHz) out of which 5 dipoles arrived and reflectors + BFRs will arrive by 18 Mar; mounting stools (1190 mm), 30 nos. requested, out of which, 2 stools will arrive on 18 Mar; hence, new installation only by next week;

5 Apr : 2 nos of feed + reflector + BFRs + stool in hand; 1 box ready; one more can be ready in next few days; can target 2 antennas in MTAC period; to see if 3 can be tried.

19 Apr : no progress now, as attention has shifted to common box for some time; now tasks have been reassigned and work on this will pick up now.

3 May : 6th box is ready in lab; will go to antenna by next week (12-May-2017)

24 May : 6th antenna done; one more can be done; after that feeds, stools etc needed; FE box for 2 more available -- more are needed. FE team to check with mechanical and get back.

7 Jun : some delay to move to the next (7th) antenna, though the units are ready -- maybe next week after HRB is back; for further units, boxes awaited after powder coating (10 nos); feeds + stools are available for next 3 antennas. May need to introduce check list for quality assurance for all the units before they are installed (can be done for all other bands as we are increasing the pace of mass production).

28 Jun : 7th & 8th antenna installation completed; next 2 antennas can be ready by ~ 15-Jul-2017; (feed availability is the bottleneck thereafter)

12 Jul : 9th unit has gone; 10th will be ready shortly -- maybe next week; expecting more feeds to come in 10 days time (needed for 11th onwards).

26 Jul : 10th unit has been ready for some days, but not gone up due to weather.

9 Aug : 10 antennas done; 11th one can go up in a week or so; box to be made ready for 12th unit.

==> 11th system has now gone on C6; 12th system may be ready by 31-Aug-2017

### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

(i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months should be enough to complete the tasks i.e. April 2017.

11 Jan 17 : 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

25 Jan : needs combined tuning of filters to fix the problem; work ongoing.

22 Feb : successful in tuning the integrated unit (for 2 boxes, both channels); and

23 antennas are completed, and work is ongoing; next antenna in about 2 weeks.

15 Mar : one more box was made ready, but gave trouble after exhibit at Science Day (!); has been made ready again (all the cables were changed). Will go up shortly.

Meanwhile, next set is getting ready.

5 Apr : 25th antenna done to ver2 level; some issues related to tuning of the integrated filters (assigned to SC).

19 Apr : 26th antenna also completed; going reasonably smoothly.

3 May : next box (incorporating new filters) will be ready this week & go to antenna [~ 12-May-2017]

24 May : 27th antenna is done; generally going ok.

7 Jun : still at 27 due to some maintenance issues with C02 -- need feedback about the oscillation problem.

28 Jun : C02 box replaced due to oscillation problem - now fine; one more antenna : so total 29 antennas completed; W03 - last (30th) will be done in a week (05Jul17).

12 Jul : all 30 antennas completed for v2 !! will aim for 5 spares in the long run, but 2 spares to be made ready in short run; to get full 30 antenna statistics for main and sub-band widths.

26 Jul : to take up the above actions, but can be at lower priority.

(ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good : comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

11 Jan : analysis of Jan data awaited.

25 Jan : analysis of new data (on CasA) -- appears to be systematic 1-1.5 dB less deflection than predicted and control room values -- needs to be checked and followed up in consultation with ICH, DVL, SC & GP; few antennas with some odd behaviour e.g. E3 and maybe E2.

15 Mar : no updates as Ankur is not available

5 Apr : updates from new data; 2 antennas showing less deflection in ch 1 only -- to be investigated; not much other issues.

19 Apr : no updates this meeting.

3 May : data available, but no plots (laptop crash)

7 Jun : work has resumed, and some tests done last week (Ankur not available); to check about C02 oscillation problem.

26 Jul : C02 problem : LNA replaced and unit ok; LNA works ok in isolation. no other updates.

==> Cas-A deflection less than expected for all antenna; ONLY Cas-A issue (also L-band)

==> Issues identified for a few antennas [11.7 dB expected; getting upto 10 dB]

==> C3 Ae band-shape is a problem (all the rest OK band shapewise)

==> plots displayed ; spread in deflection among Aes ~ 1.5 to 2 dB

==> Plans to 'automatize' in Linux machine in coming weeks

(iii) Summary of phase centre measurements and decision about future plans

25 Jan : no action yet.

15 Mar : still pending.

19 Apr : still pending

(iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

11 Jan : data collected, report expected within 2-3 days.

25 Jan : Sougata + Ankur will provide update next time.

22 Feb : SC will send update within a week.

15 Mar : some work is still pending; SC will complete and send within a week.

5 Apr : some tests done using OF monitoring system (seems not all antennas working and also varying behaviour) : summary from 10-12 antennas, 3 sub-bands (one corrupted by RFI) : some cases show narrower BW, and some show wider BW; for narrower BW cases, coating the PCB appears to correct for most of the discrepancy -- needs a short report on this; last 5 antennas have gone up with the coating -- should be able to cross-check the performance; need to find a solution for broader BW case !



19 Apr : quality check on 24 antennas done; about 4-5 antennas showing discrepant band for most sub-bands; FE team feels confident that this can be fixed with the coating option; to make a table for all antennas all sub-bands for user to decide what to be done; to fix as and when FE box comes down for other work.

3 May : report circulated; worst affected antenna identified; after ~ 3 months will be taken up;

24 May : no new updates; can check around July.

26 Jul : see item (i) above.

(v) LO settings for all sub-bands etc to be finalised.

14 Dec : 250-500 LO setting document / table already finalized;

28 Dec : no updates; person on leave.

11 Jan : astronomer feedback awaited (to check if final table shared with control room).

25 Jan : Not yet shared with control room; to refine based on : 6 dB point for main BPF and 10 dB for subband filters, for the default BW.

22 Feb : draft document has been circulated to DVL & YG for trials, for 3 bands (Band-3, 4 & 5); for Band-3 which shows max variation of sub-band responses, the basic response is taken as the one found in majority of units and 10 dB criteria is applied to that response to get the LO values; either lower or higher or both side LOs are recommended depending on the situation, and some justification has been given for all the cases; YG to check with DVL etc if this can be released to control room and all users.

15 Mar : some responses from DVL + Nilesh etal -- some clarifications sent; some more tests to be carried out this week.

5 Apr : no updates for this time.

19 Apr : DVL and co to provide update by next week; can discuss 2 weeks later.

7 Jun : FE team to check with JPK if control room is following a standard, recommended procedure.

26 Jul : YG to check with DVL

#### 1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus

14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01); box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)

28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).

11 Jan : box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.

3 May : box #2 MCM reset option & monitoring finished; to go to C01 antenna tomorrow (04-May-2017);

24 May : replacement on C01 working ok; older one traced to interface card problem -- to be fully debugged; meanwhile spare new card will be put and made ready for installation

7 Jun : faulty unit requires one IC base to be changed and can be used again; meanwhile waiting for new PCBs to come -- to see which vendor can do this.

28 Jun : IC bases replaced with better ones - now that unit is working (unit used as spare & template for other ones)

(ii) Plans for mass production

30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about

ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.

25 Jan : one box tested at antenna focus and working ok; 2nd box not yet tested at focus; even for the 1st box, repeatability is not there.

19 Apr : ready to start the mass production and installation; may be able to achieve 2-3 weeks per box in long run after first 2-3 boxes; to coordinate with Ops group for supply of Rabbit in shielded box. Also to do the R&D for getting the ethernet control option tested and going and put it into mass production -- this needs an extra input port on common box -- agreed to use 50 MHz port for immediate and redesign the plate for additional input port and put into new boxes as and when ready, without affecting the rate of mass production of common boxes.

3 May : x2 boxes in wiring stage; x1 box per month initially (later one box every 3 weeks); redesign of band-selector & interface card completed; mass production can begin now

24 May : to go ahead with the plans, introduce new cards into system as and when ready; and retrofit the new cards in older systems later on; transobs PCB also to be included in the above.

7 Jun : to get the set-up going and then decide on the priority.

12 Jul : one box was made ready and taken to C02; stopped working after some amount of testing at antenna base -- brought back to lab and being debugged; agreed to put some additional manpower (Vishal) from Band-3 team into this work (esp as VBB not available).

26 Jul : current status : original unit on C01 is down with "band not setting" problem (stuck at Lband) -- to be debugged in the lab; meanwhile old MCM based CB is being put on C01; unit for C02 : problem traced to bad cable (external); unit now ready to go back to C02 (waiting for better weather); unit #3 waiting to be tested with interface card; additional person (Santosh) to help in the work.

9 Aug : original box was put back on C02 and gave same problem after 3 days of working; tried with power on-off etc; brought back to lab and working ok again -- to test more thoroughly with full load of all FE boxes etc; meanwhile, put 2nd box on C02 to see if it works stably there -- if it fails, to put it on another antenna... further, to check if further acks can be added at different stages.

==> Faulty common box from C1 (which did not show any issue in lab

==> even after 'loading' fully as in Ae) will be tried on another antenna;

### 1.5 Apex radiation scheme (PAR/SRoy) :

(i) Current status of measurements and interpretations

(ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

11 Jan : no updates, though there has been some email discussion between SRoy and PAR

25 Jan : need to check with SRoy and PAR.

15 Mar : PAR and SRoy yet to have a detailed discussion; meanwhile another round of tests done on C1 -- showing a different pattern than C10. Need to summarise and circulate and then take up for discussion.

19 Apr : no updates, though some ongoing email dialogue between SRoy and PAR...

24 May : discussion between SRoy and PAR -- some conclusions have been reached and some action plan has been worked out between them : to circulate a brief note summarising these (as well as dynamic range measurements summary and plans), while follow-up action continues.

28 Jun : report summarizing all the work carried out so far has been prepared; yet to be circulated; report displayed and discussed : sensitivity 250-500 MHz -147 dBm (cone dipole); 1dB compression point (P1dB) : 1dBm (old); 10dBm (new); temp effect 0.2dB (amp) & 2 deg (phase) due to FES & RF (stability); transmitting RF power recommended :  $\geq -40$  dBm &  $< -10$  dBm; ELV /AZM dependence : 0.5 dB (amp) & 8-10 deg (phase) (tests done on 5 antennas total); another report for log-periodic antenna set up (separately)

26 Jul : need to follow-up on the short summary circulated by FE team (check SRoy).

==> still expecting astronomer feedback

#### 1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) : Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of health of Walsh switching.

11 Jan : there is some confusion about what is being done, and what has been achieved ! For 10 antennas which have new 1st LO system (LOFSW based units), it should NOT be possible to have Walsh modulation at present !

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh...

22 Feb : now clear that only those antennas (20 ?) which DO NOT have the new synth units can be tested for Walsh; latest tests on these (done in Jan), showed ok results for 19 out of 20 (one antenna was down due to mech problems).

15 Mar : no immediate action here; need to work out with analog BE team.

==> need wider discussion about MCM (> 20 Ae NOT working because of changed system) !

==> BAK, Navnath, Sweta ... + FE

==> BE inputs : completed mass production of MCM4 units dedicated for FE

==> & Walsh parameter control; Walsh functionality is fully supported in MCM4 -

==> just needs to be turned 'ON'

==> [awaiting policy decision step only]

#### 1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

22 Feb : SC to check with JPK about the progress on implementation of the SOP for use by control room in normal PMQC type of tests and generation of stats to report to FE team.

15 Mar : control room people (JPK and SNK) are looking into the code written for GSB

to see if it can be done for GWB.

5 Apr : SC to follow-up with JPK on the matter.

19 Apr : code has been obtained and possible issues in it have been identified; to see if the job can be taken over by control room colleague.

24 May : to see if a discussion with JPK + SN + ICH can be had on this matter.

7 Jun : to organise a joint meeting, maybe week after next.

28 Jun : programme for narrow band system needs to be edited for broad band system

26 Jul : SC is looking into modifying the code himself.

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

22 Feb : to plan for the discussion.

15 Mar : agreed to make a presentation on 20th in the poln meeting.

5 Apr : presentation showed reasonable results; action items : to compare feed response with WiPLD results of HRB; compute 3 dB BW vs freq for Band-3 for feed + dish and compare with observed results; need a software with finite element method approach for this simulation -- Antsys or Fecko; to check availability in different places in and around Pune.

19 Apr : no new updates right now.

24 May : SC to follow-up and report back.

7 Jun : no updates.

26 Jul : no new updates.

==> code modified; tests needed; update in ~ 3 weeks;

1.8 New filters for L-band (AP) :

(i) status update on installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing

16 Nov : arm antenna installation to be resumed;

14 Dec : all west arm will be completed by 16-Dec-2016;

28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.

11 Jan : S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).

25 Jan : only 2 antennas W-arm remaining to be done.

3 May : only one antenna (W2) remaining

24 May : to confirm if all antennas completed or not.

(ii) delivery of remaining units of main L-band BPF from Epitome

16 Nov : BPF completed and handed over to BE team -- this can be closed.

28 Dec 16 : can be closed.

1.9 OF system updates :

(i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.

11 Jan : current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.

15 Mar : this is status quo; few extra high power lasers at 1310 nm for forward link have been procured; cards being made ready; will be used as and when loss becomes too large in far away antennas.

3 May : high power lasers (5-6 nos made ready) and available for use; for, W6 & S6 such lasers already installed about one year ago;

24 May : some evidence of loss of power of laser transmitter (1310 nm) at Rx room causing problem in telemetry link; needs retuning of laser circuitry; will be

taken up one by one -- this is in addition to need of high power lasers for far away antennas.

(ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates

28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.

11 Jan : cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.

15 Mar : expected by end of this month.

5 Apr : OTDR not arrived yet; second fibre bundle ordered but not yet delivered.

3 May : OTDR has arrived; second fiber bundle has also come;

24 May : OTDR working well; 2 km fibre bundle arrived; 20 km spools : 3 nos were found bad and have been sent back to the vendor in US -- need to follow-up on it.

28 Jun : bad cables being sent back to vendor in US

26 Jul : for the spools : vendor is sending the 3 replacement units; new OTDR is working fine -- item can be closed.

9 Aug : replacement spools have not yet reached.

==> Spools have arrived;

New item : contract with BSNL for dedicated GMRT to NCRA fibre to be renewed as it is 5 yrs old. OF team to circulate the preliminary docs to all concerned in NCRA for clearance before sending ok to BSNL.

26 Jul : SSK need to check with admin about (i) clearing of bill and (ii) signing of new agreement.

9 Aug : in touch with BSNL for new lease doc (Mar 2018 onwards) for dark fibre; meanwhile payment of charges for 2017-18 have been paid.

(iii) 8 Gbps GMRT to Pune link : it was found that only 1 or 2 Gbps was working;

25 Jan : detailed debugging has been done by OF team and now it appears all the 4 wavelengths and hence 8 gbps lines are functional -- only one wavelength is marginal (to order spares for taking care of such issues); also remote monitoring facility at Rajgurunagar with SMS facility to be activated.

15 Mar : spares have been ordered; monitoring unit is ready -- small change needed in software and then can be installed.

5 Apr : not yet installed, waiting for Rahul Bhor.

24 May : spares for the links have arrived and are available; monitoring unit is now ready for use; some changes in IP address needed in units at Rajgurunagar to activate the system; also some spare cards are needed to make things fully functional at all locations.

26 Jul : new unit for remote monitoring not yet installed; spares issue may be ok.

2. RFI related :

2.1 Spectral line RFI (PAR/SSK) :

(i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks

28 Dec : RFI team visited Junnar cable TV operator for getting response to letter that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.

25 Jan : discussed with Jondhale -- he will speak to the party and see if some progress can be made; otherwise to escalate the matter; also to estimate the number

of splitters etc that can be provided to W-arm operator to mitigate the problem.

28 Jun : shielded cage designed for laser Tx & RF amp devices : field test in progress.

9 Aug : appears to work well; need detailed report and then follow-up action with parties.

(ii) Digital TV follow-up

23 Nov : letter is still pending !

25 Jan : need to expedite the matter !

9 Aug : letter had been sent some weeks ago; PAR to follow-up in person and report back.

(iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source

11 Jan : 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.

25 Jan : need a site visit to understand better.

3 May : new RFI line (set of lines) observed at 467 MHz ! (need to identify the source)

24 May : for 402 MHz line : trying to identify any relevant weather station that fits the bill (!) -- needs some more work; for 467 MHz lines, still no clue.

28 Jun : initiated dialog with IMD : letter requesting tests at their premise

26 Jul : 402 MHz RFI : current understanding is that the offending transmitters are from the weather stations in the west direction (rather than SW) -- RFI team suspects it to be coming from Mumbai (!); transmit is only at some times of the day; discussion with IMD Mumbai --> IMD Pune (to follow-up) and also to ISRO for more details about the tx system. 467 MHz : no clue (appears to come from all directions).

2.2 Satellite RFI monitoring & avoidance system (PAR/SNK) :

(i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and ,, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)

25 Jan : need to follow-up on identifying for LEOS.

(ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)

25 Jan : new limit is about 8 deg -- to cross-check if ok and close.

(iii) Plans for sending information to back-end receiver chain

25 Jan : to check with Santaji about the plans for this

(iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week

28 Dec : no updates.

25 Jan : to include in the plans for visit by Nick Rees in week of 6th Feb.

24 May : some of the pending jobs : need to characterise some of the remaining satellites.

26 Jul : no new updates.

9 Aug : problem for sources with +ve declination pointed out by YG and fixed by SNK.

2.3 RFI from power lines and transformers (PAR/RVS) :

(i) review current status

(ii) specific follow-up actions

23 Nov : not discussed

25 Jan : no updates.

24 May : this activity needs to be revived.

2.4 RFI from LED lamps (PAR/RVS) :

(i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

(ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

25 Jan : report has been circulated; solution looks promising; to try for compact version of the solution; working with workshop to mechanical items; will need to order some components for bulk production.

08 Mar : LED panel/ tube light shielding : report generated on tests - broad band radiation from commercial units (x4 units in one box) - shielding is ~ 75 dB ; results appear encouraging; Syska (x1 22W), Philips (X4 20W); -150 dBm final number arrived at. high failure rate of LEDs due to voltage fluctuations;

11 Apr : new model of LED light identified with very low level of RFI (none at all !?!) Hi-Lite 15 W; sample unit of this LED panel displayed; agreed to procure a few units and do a thorough follow-up.

26 Apr : demo of RFI free LED lamp 15W done (in lab, x5 units have been assembled); plots of RFI from LED lamp displayed : 15W (5 units) ; 26W (1 unit) HI-LITE 15W unit's RFI (ON & OFF) identical noise floors; similarly 26W lamp also shows RFI same noise floor for ON or OFF; also tested at all GMRT band : clean (no lines); upto -130 dBm level; conclusion : 15W units can be used for corridor lighting

3 May : x5 LED lamp (15 W) units installed in corridor

24 May : no RFI seen when 5 nos of 15W lights used together; can we decide about this? main question is about establishing best levels and also absolute calibration; for the first, can try with higher gain amplifier; for the second, to complete the exercise of mapping the power levels to antennas.

28 Jun : pending acceptance of LED lamps (already used in corridor), bulk order can be placed.

26 Jul : 5 units have been in use for ~ 3 months; agreed to do one more test to see if any degradation is there; and then take a final decision, folding in estimates of absolute power level.

9 Aug : agreed to go in for a purchase of 5-10 more units.

## 2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested; 8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.

4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified

units -- all are ok. Need follow-up as mentioned on 28 Dec.

18 Jan 17 : all 10 units tested and cleared; now OK to use this 2nd batch of 10 units in antennas; need follow-up on status of ordering last batch of 14 units.

25 Jan : matter closed for now from RFI team side; to take up when next lot comes.

12 Apr : indent process for the last lot was held up due to issue of exact specs for RFI related properties (!); finally, agreed to go ahead with the existing clause as likely there will be one round of modifications needed if some specific part is changed by the vendor. Electrical team to expedite the paper work.

24 May : to check status with RVS.

### 3. Operations related :

#### 3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) :

##### (i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.

28 Nov : still waiting for 80 nos PCBs to come.

11 Jan : 84 PCBs received; can go ahead with further assembly now.

25 Jan : this can be closed.

##### (ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);

28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.

11 Jan : 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.

25 Jan : Rabbit card enclosure now going smoothly : about 2-3 per week; to send some samples for RFI testing.

22 Feb : 18 are done; 19th ongoing.

15 Mar : 23 completed; one unit given to RFI team for measuring shielding.

5 Apr : going on track, will finish all 30 by April end.

19 Apr : Ops group to talk to FE group to start regular supply of Rabbit + shielded enclosure for installation and commissioning of common boxes for antennas.

3 May : x28 boxes are ready & tested; can be handed over to FE whenever asked.

28 Jun : stock of tested MCM cards was over; 1 new card tested

12 Jul : 30 units are ready now. MCM cards are being tested in Lab.

26 Jul : testing of Rabbit MCM cards ongoing (4 out of 30 are completed).

==> so far x38 units tested OK; [final number 60]

##### (iii) status of mass production of network switch enclosure

23 Nov : 28 units ready (need total of 35)

14 Dec : now 32 (of 35) ready;

28 Dec : same status of 32 out of 35.

25 Jan : 32 out of 35 completed; remaining 3 are in use and will be done when free; meanwhile, to send a few samples for RFI testing.

22 Feb : some sample unit(s) has been given to RFI team for testing -- Raj to confirm; to check if all shielded connectors are procured or not.

15 Mar : samples have been given and tests are being carried out today.

19 Apr : confirmed that all 32 boxes have shielded connectors; to check with RFI team about results from RFI tests of integrated system.

7 Jun : to confirm with PAR about the report.

28 Jun : 3 have been used in lab.

12 Jul : still waiting for report from PAR.

26 Jul : reminder to PAR.



==> report of RFI test still awaited !!

3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

(i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing

23 Nov : C00 & C10 are mostly complete (item could be closed?)

28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.

(ii) plans for going beyond 2 antennas

23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)

28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?;

elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.

11 Jan : mechanical completed for 10 antennas; electrical completed for 13 antennas; Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.

25 Jan : mechanical has resumed work; same for electrical; will be updating spreadsheet; column for servo has been added in spreadsheet -- to remind them to start updating;

15 Mar : mech has completed 13 antennas; electrical has installed all the UPS units (23), other changes need to be checked; servo has completed 10 antennas.

5 Apr : 8 antennas completed for M&C systems; 3 extra Miltec to be tested; 4 are non working -- being looked into (total of 15 Miltechs); apparently no change in status of other systems (mech, elec, servo) -- JPK to check and follow-up.

19 Apr : servo has completed 15, electrical has completed 23, and mechanical has done 13 antennas; M&C system on 8 antennas, 2 more are ready + 1 in testing in lab; Ops group needs 5 nos of 2 TB disks and comp group has provided 2 nos -- to arrange for ~ 10 nos of 2 TB disks.

3 May : x5 total disks (2 TB each) were given to OPR group; x2 used to replace old disks ; x3 available for any application

24 May : 10 antennas completed for M&C system installation (+1 in lab), including putting the new disks into use -- can go ahead for useful testing with this system (see alternative week agenda).

7 Jun : 15 antennas servo to UPS rewiring completed; mechanical will pick-up after 15 June; M&C installation still at 10 nos.

28 June : x16 units with servo UPS connected; x14 units with Mechanical connected; M&C still has x10 systems;

12 Jul : S02, C03 and C04 have been completed by Mechanical group. Very soon we will install our hardware in those antennas.

26 Jul : electrical, no progress after 23 antennas (2-3 months); mech has completed 17; servo has done 19; Ops group has 7 antennas with all sub-systems and trying various tests; Miltech in 10 antennas, will grow to 13 soon; remaining supply of Miltechs will come by end of Aug. 1 Miltech to be used for correlator LMC.

--> integrated testing (in recreation hall) of final antenna base set-up shows some RFI still from new batch of media converters; to try to buy a few of another batch or another make; shielded enclosure for media converter (100 Mbps) for FE control.

==> mechanical completed x20 Ae; servo UPS x21 Ae; Ops shielded PCs x12 Ae

==> All Miltech PCs (x19) to come by end-Aug (confirmed by supplier)

(iii) update on improved RFI shielding at antenna shell

23 Nov : shielding test measurements done for present configuration; awaiting finger-lines to be added before repeating the tests (which antenna?)

28 Dec : folder in process for placing order for the finger-lines.

5 Apr : no updates.

26 Jul : finger-lines have come and being assembled on door of one sample antenna and then comparative test for leakage to be done; then next target is connections going from shell to antenna focus (non-RF connections).

9 Aug : to follow-up with Nandi for the fingers.

3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems

28 Dec : Ops team has a plan for this; can be discussed in detail next time.

11 Jan : final plan placed on web portal (for lab people)

19 Apr : 8 + 2 + 1 units as given above; further growth constrained by availability of Miltech PCs only.

24 May : now populated on 10 antennas and using 2 Rabbits at antenna base for controlling servo, FPS, OF, FE, sentinel (tested concept) to test shortly with new version of LMC s'ware (but old CMC s'ware); need some cooperation from servo for changing PC104 from serial to ethernet upon choice (discussed with SS and he will discuss with Thyiagarajan); for parallel connections to other systems, some further planning is needed.

28 Jun : see above

26 Jul : servo modification is working fine; see above for other details.

(ii) plans for switch-over -- to make it as seamless as possible.

30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.

28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.

25 Jan : can defer till after the demo.

22 Feb : Ops team appears to prefer scenario 1 -- incremental approach; to generate a note within next 4 weeks on this.

15 Mar : still pending for team to send a draft doc.

5 Apr : still pending.

19 Apr : can check again with Ops group next week, for a possible discussion 2 weeks later.

26 Apr : discussed draft document produced by Ops team on long-term plans for installation of new M&C system; general agreement for incremental approach noted; next level points to be addressed discussed -- doc to be updated with these and taken up for discussion...

3 May : incorporating points that came out from discussion into the change-over-plan note.

24 May : updated doc has been circulated; can be taken up for detailed discussion next week; meanwhile useful discussion on how to coexist between MCMs on RS485 bus and new system;

7 Jun : updates about the discussions and outcomes from GSG meeting; more discussions about details of the plans going forward are needed.

12 Jul : Points will be added to the documents, whenever new things will come up.

26 Jul : may need to flesh out some of the points in due course.

==> Raj has circulated a note (about plan); discussion yet to happen

3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)

14 Dec : HP layer3 switch finalized; bidgetry quote Rs 3.5 lakh; indent prepared.

11 Jan : item can be closed.

(ii) Plans for procurement

23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.

28 Dec : indent raised.

25 Jan : procedural issues related to advance payment etc...

22 Feb : not clear if this matter has been resolved before Charu went on leave...

15 Mar : need to check with Charu.

5 Apr : HP make layer-3 switch has no issues about advance payment and order has been placed and delivery expected by end of htis month; the advance payment problem was for SFP adapter -- this needs to be resolved.

19 Apr : matter is resolved and delivery is expected by end of this month.

3 May : switch has arrived at Pune

24 May : item has been tested ok; can initiate the plan to put this in the M&C rack and shift antenna eth connections to this switch (instead of OF group's switch) and start using this arrangement.

28 Jun : under test in Rx room (by Santaji)

12 Jul : Testing has been completed for the switch. We will first put one test LMC on that switch.

26 Jul : tested switch configured and allotted 40 sub-nets.

==> procurement over; installed & usage in progress

3.5 Interfacing and control of new systems such as Noise Cal & Walsh :

For 10 antennas which have new 1st LO system (LOFSW based units), need to be clear about the control path; also 2 of these antennas have independent MCM for driving the new CPLD; need a wider discussion about M&C for new system for these aspects related to Noise Cal and Walsh.

22 Feb : need 2 CPLDs in new set-up : one for new FSW LO, one for Walsh + Noise on-off etc, and both can't be connected to MCM 2 and hence an additional MCM is needed. To find out a way around this issue, so that progress can be made...

15 Mar : 2 options are being explored by BE team without increasing the number of MCMs from present count; some prototypes are being tested and will be reported upon shortly. For the longer term, need to see if antenna based Rabbit card can fulfill these roles.

3 May : tests with diferent interfaces done; avoiding additional MCM (beyond x2 MCM) successful [but with OLD MCMs]; in new MCM, use of control pins of MCM used for sentinel will suffice.

24 May : summary issues : if any M&C system takes control of the RS485 bus then it can meet any MCM requirements -- this may be the way to go for the final M&C system; finally, the functions that are needed for uGMRT only (noise and Walsh related) will have to shift to Rabbit card -- whether capability exists in the single Rabbit at antenna base needs to be confirmed.

28 Jun : agreement reached to use existing rabbit card instead of MCM2

12 Jul : Documents has been shared by JPK regarding Rabbit IO pins.

3.6 Update on Rabbit Card in Common Box : follow-up from discussion of last week to track the progress and latest situation...

19 Apr : FE team plans for roll-out discussed above; Ops group to provide required number of Rabbit in shielded card; main remaining task is to get the FE monitoring working on the Rabbit interface to FE system : CPK has been doing some debugging to get to the bottom of the problem; JPK and CPK to sit together to see if earlier work

done on 15m with Labjack for similar control of FE system can help.

3 May : points closed; new box being out on C01 (at the antenna base tests were successful; now going to turret (today itself; 03-May-2017).

28 Jun : replicating other boxes; x2 boxes to be ready [& then to be shifted to antennas]

12 Jul : Two Boxes are ready. FE people are testing boxes in lab.

26 Jul : no new updates from Ops group.

9 Aug : detailed discussion about the problems encountered and plans for tackling.

==> fault traced to leaky capacitor; now fixed & working fine;

==> Rabbit MCM with upgraded Common Box installed in x2 Ae (C1 & C2);

==> No repetition of leaky capacitor issue;

#### 4. Back-ends related :

##### 4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

11 Jan : one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

25 Jan : s'ware work for the above is still in progress.

15 Mar : still in progress, no new update.

3 May : x1 ADF-4350 system ready (tested in lab) with switchable freq & power level attenuator; characterization in progress with web-browser (from ONLINE); but need command line functionality (Jitendra had to do); next, ADF-4351-s needed for individual antennas.

24 May : only new command in online has to be created -- JPK will look into it next week; meanwhile, option to switch DDC LO to achieve the freq offset is also being developed and cmd line interface for this has been made ready; both options can be released together in few weeks to the user; team can now start thinking about soln for 1st LO for the antennas.

28 Jun : DDC LO switching has been developed & tested; samples for components needed for 1st LO have been received.

==> at present : x5 units of ADF-4351 based system are under test using 'online'

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

11 Jan : one rack modified (4 antennas) and systems being tested; will report shortly, and if everything ok, will go ahead with the mods for all the 8 racks.

25 Jan : same status as above; test report has been circulated internally.

15 Mar : will complete the modifications for all racks in MTAC; meanwhile, the filters can be used with unequal gain in different antennas; command is available to control

room and can be tried.

5 Apr : phase jump problem requires use of 4350 IC circuit -- this has been tested in GAB on one antenna both pols and found to work OK; need to repeat same test with 4351 IC also and then bulk order of 4351 IC can be done (will take about 2 months); will need modified CPLD based ckt + software for using 4350/51 at antenna base as 1st LO for legacy system.

12 Apr : follow-up discussion with users like NK indicates that higher priority for having GAB + GWB uGMRT working without phase jump on switching, and solving the problem for legacy GMRT can be lower priority; accordingly, 2 possible solution options discussed for uGMRT : (a) have 2 signal generators set for the 2 frequencies needed and switch their output to the common LO signal line on the switching command (b) have one unit of the new 4351 IC completed with proper control logic to act as the single source of common LO; agreed to aim for option (b) on time scales ~ month or so.

3 May : closed now ?

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.

14 Dec : changes to DRAFT report in progress;

11 Jan : still in progress -- not ready yet.

25 Jan : no new updates.

15 Mar : no new updates; BAK to check.

12 Jul : 4350-based system available for 1st LO for GWB with web-based control; work ongoing to have option for cmdline control; 4351-based system : 5 units are ready; 100 ICs have come; modification of the s'ware required for this unit is going on; also CPLD s'ware needed for control of this unit at antenna base.

26 Jul : for cmdline control of 1st LO with 4350-based system -- DKN to talk with JPK to understand the simple solution and try to implement.

4.2 Power equalisation scheme and related topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

11 Jan : still pending

25 Jan : revised version circulated internally.

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

15 Mar : BAK to check and get back.

5 Apr : Atul has initiated the discussion with control room colleagues; SRoy + Nilesh discussion now has the basic code working and SRoy is doing some testing and debugging and will report the result in few weeks, after which one could talk about releasing the package with the different modes.

3 May : only plot routine remains (discussion pending - may happen today itself)

28 Jun : SRoy : gave gain tables, which need to be merged into FITS file (by SSK).

12 Jul : SRoy has made an option made ready for plotting the total power o/p for last 4 hrs in a running mode -- will try to release shortly for use; 2nd update is about the update of attenuator values to GAB : response time for setting has now come down from ~ 2 mins to ~ 30 secs, after the changes made by JPK; however, there is a problem of occasional failure of the setting algo and the ack not coming (quickly enough) from

the GAB controller.

#### 4.3 Updates on existing GWB-3 system :

##### (i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

4 Jan -- 12 Apr : no progress on this, due to work on release of 30 antenna system.

5 Apr : meanwhile, new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

12 Apr : agreed for BE team to repeat noise source tests and check carefully for spurious lines; then repeat with sky signal as needed.

26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction : geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.

17 May : DDC related updates :

(a) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and release for users.

(b) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.

24 May : for shape equalisation, some fine tuning being done by SHR; for spurious lines, not clear what is the best way forward -- need to check if it is part of the ADC related effect or not and whether maintaining higher input levels can help mitigate the problem...

31 May : agreed that the latest version of bandshape correction looks ok and can be released in the next version of GWB; for spurious spikes, some further tests suggested, also to look into optimising the power levels at input for the narrow band modes.

14 Jun : released (bandshape correction) in the current version itself spikes issue no update.

28 Jun : for bandshape correction : edge effect handling now completed & released; this can be closed now.

For spurious spikes : tests imply spikes originate from ADC itself; need to change the clock & see; other repeatability tests (same spikes from same ADC card) etc remain to be carried out;

12 Jul : repeatability : in 200 MHz mode, seems to be good repeatability of channels for same ADC, with some fluctuation in ampl and confirmed that all are  $2^n$  locations; trying 100 MHz mode with DDC (even for 100 MHz o/p) shows some additional lines, not at  $2^n$  location but of comparable strength (!) -- needs to be looked into more carefully to understand the nature and cause of these.

##### (ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?

14 Dec : problem perhaps in AIPS settings; matter can be closed ?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.  
15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

#### 4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov 16 : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated; this is completed.

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT loose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

8 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); But, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing

run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain

14 Jun : providing the 'log' at the end of observation for now

12 Jul : this is still pending.

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.

11 Jan : no further work on GWB; plan is to have similar change for GSB during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

8 Mar : plans for work on GSB during upcoming MTAC -- needs a discussion.

3 May : nearly closed; hot air sucking mechanism needed (being explored with Nandi's help).

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (but may come earlier?)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up in delivery; to follow-up closely.

11 Jan : YG to follow-up with nvidia and micropoint.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

3 May : waiting for adapters to arrive;

28 Jun : adapters arrived; nvidia team visited GMRT; GPU installed on one T630 (for raw voltage recording); to quantify improvements thru benchmarking.

19 Jul : benchmarking needs single node : software changes for single node, done; initial tests imply x2 improvement in performance in Pascal wrt K40; individual block comparison to be completed by next week.

==> P100 unit under test

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : no specific updates, except that code optimisation will need to be done.

14 Dec : need a discussion to decide the way forward on this.

4, 11 & 18 Jan : deferred for some more time, till 30-antenna system is released.



25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion on long-term issues to be taken up next week.

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working; calculator for what combination is possible is also available; full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority); timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam; regular tests for all modes under PMQC : can this be defined ? changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file. zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

19 Apr : for ver 4.5 : calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).

3 May : SOP already released (v 4.5)

17 May : trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.

14 Jun : trial and release : documents (directory structure OK as per circulated version) finalized; need to creat directories etc.

28 Jun : antenna testing scheduled today/tomorrow; next SOP release planned

CD pipeline : GPU has possibilities as per manuals; release of trial mode : all above incorporated.

12 Jul : some white slot testing needed for new release ver before replacing the existing GTAC use version. CD pipeline : tested for 2 beams 200 MHz also; waiting for cmdline interface for 2 beam mdoe.

19 Jul : antenna testing were OK; SOP released; control room using it as 'trial' mode.

#### 4.5 Network related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half sytem

4 Jan 17 : this is done -- to confirm and close.

(ii) updated IP table for .4 n/w to be made available by computer group

4 Jan 17 : work onging -- to check status with comp group.

3 May : completed

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.

3 May : GSB & GWB diagrams available ; completed

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines is possible with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together to NCRA end; comp group to set up the test, alongwith VVS at Pune end.

11 Jan : 3 connections made to gwbh1-3, and live test demo done; it appears that only 2 of the 8 x 1Gbps links from switch to aggregator are working ! This needs to be debugged between comp group and OF group.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

4 Jan 17 : comp group agreed to look for options.

15 Mar : can be taken up next time.

4.6 Longer term plans for GWB-4 (SHR/GJS/ICH/SSK/BAK) :

List of tasks going forward (needs to be prioritised) :

(i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link (GJS+MGU)

28 Jun : GMRT side network provided; Pune side status need to be checked.

(ii) Disks for data recording, including trials with SSD options (GJS)

3 May : restarted the tests on normal disks

==> not exploring SSD option

(iii) investigating next gen GPUs -- to benchmark sample Pascal units from nvidia (SHR)

19 Apr : to be tried next week.

28 Jun : they have arrived; installed; need to be benchmarked.

(iv) migration to next version of CUDA (7.5 and beyond) -- to decide the steps

23 Nov : CUDA 7.5 is being tried in the new version of GWB -- confirm present status

19 Apr : confirmed that all v4.5 is on CUDA 7.5 and no upgrade in near future.

3 May : installed CUDA 7.5 on all machines; next cycle may go for 8.0 which is now available

28 Jun : CUDA 8.0 also available now; next cycle to move to 8.0

(v) DUT correction and timestamp related issues : to confirm present status and decide future course of action (SSK)

19 Apr : still pending.

28 Jun : today it will be addressed;

(vi) towards PFB option : resurrect old code into new GWB5 & compute the overheads (SHR)

(vii) towards a gated interferometer : to look at the MAC code that can do the gated integration; to send the gate information to the GPU from CPU (SHR/SSK/YG)

(viii) improving availability of beams by reducing beam I/O : 16 bits to 8 bits for IA/PA beams and 8 bits to 4 bits for voltage beams (SHR/YG)

(ix) options for an additional network for even better I/O capabilities (SHR/GJS)

(x) PA - IA beam mode as an additional option with IA or PA modes (SHR/SSK/YG)

(xi) making 4 PA (or voltage) beams point in 4 different directions -- SSK to look into the change in code needed for this, starting with astrocal

19 Apr : SSK has done initial study and plan for generating parameters for all 4 beams from same call to astrocal and then pass to the beamformer; beamformer code needs a change to do one extra multiply by complex number whose phase is calculated on the fly based on antenna, channel, time and beam number.

3 May : initial note from SSK;

28 Jun : beam steering implemented; tests in progress; basic thing works; plots 'identical'; needs repeated tests;

(xii) towards more general multi-beaming in the long run

(xiii) archiving of beamformer data : better header and also finding what metadata is required -- SSK to look into this, in consultation with Deepak Bhong.

19 Apr : to follow-up with DB in next few days.

28 Jun : header has all necessary metadata inputs; higher level s/w need to incorporate their usage;

(xiv) getting second copy of data to separate cluster going : for both raw voltage recording, as well as for multi-beaming kind of work (GJS/BAK)

19 Apr : to see if one node (with new disks) can be made ready and put in one rack and connected to Roach board -- can grow to one m/c per rack with separate IB switch...

28 Jun : raw voltage goes to one machine; but now that machine taken off for Pascal testing; GJS : FPGA design for making second copy (adding delays to synchronization);

==> All FPGA related work completed; raw voltage pipe line to T630 is working

==> SHR working on x2 Ae correlator : coding over; tests to follow

(xv) decide on 2 vs 4 inputs per Roach board for final configuration

(xvi) net-sign correction -- confirm current status and decide if further action is needed (SSK)

19 Apr : current status is that adhoc sign flip has been introduced for both corr and beamformer header info; proper modification in code needs to be decided : when & how.

28 Jun : fix is working (LSB, USB)

(xvii) full backward compatibility of off-line utilities (SSK)

23 Nov 16 : some work has been done, but not clear if this meets / works for all requirements.

19 Apr : has been done and released and users have used it.

28 Jun : need better coordination with users to avoid confusion; responsibilities of individuals also need to be precisely fixed.

4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

(i) Summary of current status for temperature monitoring

3 May : cacti released to control room;

(ii) Plans for future enhancement and release for regular use

(iii) Monitoring of other health parameters

14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack (uses DAQ card);

28 Dec : not discussed.

11 Jan : no significant new updates.

25 Jan : no new updates, but plans for collecting the temp data and bringing to common m/c that is accessible to control room is being planned. installation of cacti also to be taken up.

15 Mar : machine has been made ready; cacti has been installed; gradually adding nodes to the list and making them ready for monitoring; a separate home-grown product (using cgiplot) also being made ready for monitoring IB network.

19 Apr : cacti for temp monitoring for all GWB nodes (temp of cores) -- available on web browser; to release to control room and users and add in GWB SOP; cgiplot -- home grown version that allows to read the raw data and display using cgiplot in a more flexible manner (right now on hold); for IB monitoring : collectl was being used for IB monitoring (right now on hold); for disk usage, cacti has an option, can be released alongwith the temp monitoring. Additional homegrown tool (IMH + others?) also available -- need to check and see what should be the final form.

3 May : during MTAC, temp displays in CORR room added; (plot facility etc); control room can always see display of temps : inlet air & outlet air

28 Jun : better information sharing : control room people need to be made aware formally;

formal note needed;

==> entire page available at GMRT web; email to control room sent

#### 4.8 Other issues :

##### (i) Cross-coupling tests in GAB + GWB

14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?

28 Dec : some issues need a bit more of discussion before reaching a final conclusion.

11 Jan : ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%

25 Jan : no updates; needs a discussion.

##### (ii) Walsh related work.

14 Dec : some tests in progress; porting to GWB (Python package being modified);

28 Dec : work is still ongoing.

11 Jan : porting work is nearing completion.

25 Jan : now in testing phase (on GWB2).

19 Apr : some corrections done for accommodating existing connectivity of GWB of pols with nodes; second correction done for drift of Walsh pattern due to digital bug; will proceed for noise source and astro tests using GWB2.

3 May : delay hunting programme has some bugs, being fixed; debugging in progress.

28 Jun : parallelly new package for delay configuration + Walsh being made forward compatible; to be ported to GWB-3 as well.

#### 5. Other items :

##### 5.1 Python assembly work (HSK/SSK) :

##### (i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

##### (ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

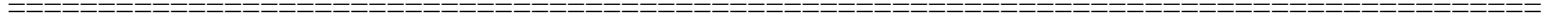
14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need ot agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take

a call for mass production.



## Minutes for the Plan meeting of 6 Sep 2017

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### 1. FE & OF related :

1.1 Update on results from test range (HRB/SSK) : need to make it fully functional again and get data for 550-900 feed.

16 Nov 16 to 8 Mar : offset was fixed (with help from mechanical) and some tests were also carried out (in the interim) for band-4 feed (results looked basically ok) and were shared with SC.

8 Mar : offsets have been corrected; 610 MHz measurements done; other freq being done now; report awaited; method for cross-polar measurements needs review before executing.

22 Mar : new results presented : from ~ 600 to 800 MHz in ~ 50 MHz steps; to see if we can get closer to 550 and 850 MHz and repeat. Also to try Band-2 (120-250) feed and see if re-measurement of Band-3 (250-500) is useful.

26 Apr : Completed measurements for 1 polarization 550-850 MHz (in 25 MHz step). Second polarization has been partially completed : 550-725 MHz; the remaining frequency range to be covered on 28th Apr.

31 May : completed expt with new transmitting antenna (Aronia, better alignment etc); results show reasonably good agreement with simulated pattern for ~ 650 to 800 MHz range with some droop off at the edges (more so at 850); to confirm the final physical configuration of the transmitter antenna location to see if some of the smaller variations may be due to that; to check repeatability with one more feed of Band-4; to see if the set-up is more accurate now, then Band-2 feed can be retested; finally, to see if some retuning of feed can be done to improve the match between measured and simulated pattern.

19 Jul : tests planned next week

2 Aug : no updates on use of new 550-850 data by SC; no updates on 2nd round of tests -- tbd later this week.

====> no updates from HRB and SC on leave.

1.2 Phase centre tests for 250-500 CDF (HRB): consolidated report on 250-500 existing measurements still awaited.

16 Nov : there is only one set of measurements -- to circulate as a simple report; and then decide if fresh measurements with adjustable stool are to be done.

30 Nov : simple report to be done within a week.

21 Dec : single plot has been circulated, for 3 stool heights -- 1180, 1280, 1380 (the selected value is 1280) alongwith theoretical curve -- this needs to be redone with the latest code by SC (HRB to provide the info to SC for this and then produce the overlay plot).

18 Jan : manual 'digitization' of plot (hard copy) is agreed [rather than indefinitely 'waiting' for a machine readable data file to become available somehow];

15 Feb : no updates, can check recent emails for updates.

22 Mar : no updates, can keep pending for some time.

12 Apr : status quo

1.3 Theoretical calculations vs observed performance for antenna sensitivity and related topics (SC/GP/ICH/DVL) :

(i) check status of updated document;

30 Nov : earlier document to be recirculated to wider audience

21 Dec : updated version has been circulated, includes Ae/Tsys for bands 2,3,4

4 Jan : awaiting feedback

22 Mar : ICH and DVL reminded; will get back in next few days with comments and then possible follow-up and closure can be explored.  
12 Apr : to schedule a final joint discussion for closure, within next 2 weeks.  
(ii) need to cross-check mismatch of values for band-3 (250-500);  
30 Nov : will check and update, including referring to some existing literature  
21 Dec : some work has been done, but needs an internal cross-check & then discussion.  
22 Mar : new doc has the updated values for this.  
(iii) need to see if QH losses have been incorporated into the calculations;  
30 Nov : GP has done some of the work; need to circulate and get agreement.  
8 Mar : report circulated; feedback awaited  
22 Mar : new doc has the updated values for this also.  
(iv) does the study cover all the uGMRT bands.  
30 Nov : right now 2 bands are included in the report (Band-3 and Band-5); for Band-4 radiation pattern values are now available and all other info is there and so it can be completed and reported.  
16 Nov : some work has been done to include measured QH losses for 250-500 and avg mean value over the band for 550-900.  
21 Dec : new doc has QH losses included (makes ~ 2-3 deg increase in Tsys) -- TBC.  
22 Mar : new doc covers all the bands, except for 120-250 (Band-2) as measured feed radiation pattern is not available (standard 65% across the full band has been assumed).  
12 Apr : measured radiation pattern not yet available; will be done after finishing work on Band-4 (550-850 MHz).  
26 Apr : radiation pattern (550-850 MHz) has been given to Swagoto  
(v) can it be extended to deriving the final beam pattern for feed + antenna; this is being looked into :  
21 Dec : first version doc has been sent by SC -- needs follow-up  
4 & 18 Jan : feedback awaited on this item.  
15 Feb : to try to find a slot when all concerned are present to get to the finer points and close the matters.  
22 Mar : can be presented this Friday in the polarisation meeting, and then taken up for follow-up discussion.  
12 Apr : see discussion from last week's meeting; action items have been identified there, under polarisation calibration work, and this topic can be followed up there.  
19 Jul : polarisation calibration forum will discuss on 24-Jul-2017

#### 1.4 Total power monitoring at antenna (GP) :

(i) confirm if latest calculations relating to unit to unit variations have been incorporated in the updated document  
30 Nov : yet to be completed.  
21 Dec : updated & internally circulated;  
15 Feb : GP to follow-up on internal clearance.  
12 Apr : SSK to check and follow-up on clearing the report  
26 Apr : Report has been finalised and circulated.  
(ii) results from recent tests  
30 Nov : running of tests has conflict with online system (JPK is looking into this)  
21 Dec : all x30 Ae data collection leads to 'online' ssystem hanging; planning with x15 Ae (29Dec);  
18 Jan : 'online' issue remained for '15' antenna also (after '30' antenna case failed); now suggested to repeat for '10' antenna case; test planned for a future wednesday;  
15 Feb : to try with smaller number of antennas for now; need discussion with Ops group about the limitation and how it would get overcome.  
08 Mar : GP & Jitendra following up today  
12 Apr : 15 antenna test with online now successful; trying for 30 antenna this week.

26 Apr : 30 antenna test was done during MTAC; needs to be repeated now.  
17 May : last week, 6 antennas were available and they were tested; monitoring scheme is working; test with all 30 antennas needs white slot booking -- to be done.  
14 Jun : tried with all x30 antenna : monitoring working = no hanging (results need to be checked / interpreted)  
5 Jul : confirmed working for 30 antennas; more detailed test results awaited.  
====> most of the testing done for 250-500; typically good data for 20 antennas -- to establish which antennas don't and follow-up with check of common box units during MTAC.  
(iii) labeling scheme for keeping track of the units to be taken up for refinement and implementation  
16 Nov : agreed to make spread-sheet per sub-system (for all antennas) and manage this manually at first and develop automated routine for it later on; generation of initial spread-sheet to be assigned to different team members for different sub-systems.  
30 Nov : 250-500 spreadsheet is in use; 550-900 is getting going etc... regular back-up of the files to be worked out.  
12 Apr : additional disks made available for back-up of the units; in-house development by Sanjeet ongoing -- can review in about 2 weeks.  
26 Apr : software is ready; tested locally; need to feed real data & test.  
17 May : the software has been tested; implementation is expected after STP joins; boxes are using proper numbering scheme.  
====> to try the software for at least one system and see how it works  
(iv) Lband system does NOT have total power monitoring at present : prototype scheme being worked out by Ramesh and may be available shortly; will include basic temp monitor (for the box; not for LNA).  
26 Apr : new scheme has been tested ok in lab; chassis may need modifications for final implementation.  
14 Jun : implemented in x3 L-band systems in lab  
====> some effect of TP monitor on the RF bandshape (!) inspite of 10 dB down coupling -- being investigated...

#### 1.5 Temperature monitoring at FE and OF at antenna (GP) :

(i) status from recent tests and measurements for FE system

30 Nov : same as above

21 Dec : x2 Ae C13 & E2 taken today : test going on (10 AM to 6PM)

18 Jan : data showed 'flat' value over 24 hrs; C3 & E2 to be tried again today.

15 Feb : not clear about the above problem (needs follow-up with Ops group); to check with 4 antenna test and report back.

12 Apr : monitoring goes hand in hand with power monitoring.

(ii) status of prototype for temp and power monitoring at OF rack at antenna base

16 Nov : sample data set taken but not long enough; to wait for next round of tests; prototype unit installed at C2 and connected to M&C system, but not being monitoring regularly; would like to do some more test and development before finalising the scheme.

30 Nov : (ii) is on-hold after prototype development; to be taken up only after Rabbit card based system is in place.

12 Apr : no change in status

31 May : GP to be asked for updates in 1.4 and 1.5 via email.

2 Aug : GP has carried out some tests using white slot requests (to establish the procedure for using the white slots for tests); basic behaviour of the system looks all right; can keep up the tests at a rate needed to confirm proper functioning of the units; detailed tests and data taking can be taken up with monitoring with new common box with Rabbit card.



## 1.6 L-band spares (VBB/SSK) :

(i) confirm current status of spares

30 Nov : 2 nos of full units as spare; 3 units have been brought down for maintenance.

4 Jan : 4 complete sets of spares available now (ready for installation at antenna)

15 Feb : 4 spares available.

08 Mar : 5th L-band spare has been assembled - currently under test

22 Mar : now down to four spares (due to C14 problem).

12 Apr : 2 complete sets still available; 3 units under repair

26 Apr : 3rd unit was found to have some issues -- under investigation.

17 May : working on mechanical mounting for the new LNA for L-band feed (as the size is different now); 3 spares are being maintained.

31 May : 4 units of original design ready, but 3 need verification (including temp & power monitor) before final packing; 1 new unit being made ready with new 3 stage LNAs.

5 Jul : 3 units available; 4th unit ready with new 3 stage LNA, but need to confirm dynamic range achieved.

====> similar status being maintained

(ii) finalisation of report by VBB

30 Nov : report pending with SSK

12 Apr : updated report had been circulated; can take it up for brief discussion next time and try to close.

31 May : do it next time.

2 Aug : to check if this can be closed after VBB is back.

16 Aug : to take up next time.

====> to check with VBB now and clear.

## 1.7 LNAs for L-band (ANR) :

(i) status of spares from existing designs

30 Nov : some failed units are being retuned...

08 Mar : all spares available

(ii) status of new 2-stage design installed on 2 antennas : working ok ?

30 Nov : working ok since Aug 2015 and Apr 2016 on 2 antennas.

2 Aug : still working fine, with no issues.

(ii) status of new 3-stage design : optimisation of RL was being attempted

16 Nov : 3-stage design appears to be working ok : 45 dB across the band; RL better than 10 dB across the band; Tlna ~ 20 K (by old noise comm calibration scheme); to try improve further, while assembling second unit.

30 Nov : want to reduce gain at freqs below 900 MHz, for improved RL in band of interest; meanwhile this ver (ver3 ; 3 stage with dir coupler) can be taken to antenna (2 units to be made ready).

21 Dec : 2 K improvement seen (< 20 K) ; report to be available in 1 week

4 Jan : second unit has been assembled; overlapping plots show good repeatability; report will be ready by 6 Jan.

18 Jan : report already circulated last week [ ~ 20-25 K over full band; gain ~ 44 dB flat; return loss better than -11dB over entire band (-14/-15 dB most places); worst case -11 dB near lower freq band edge]

08 Mar : x6 new PCBs (x2 circuits assembled; awaiting chassis; expected next week)

22 Mar : above new units have been assembled and tested -- results look ok, will be circulated shortly.

12 Apr : 4 units of 3-stage amplifier built and compared for performance : getting good repeatability; completely dynamic range measurement and stability inside env chamber; agreed to put 4 units on 2 antennas (CSQ) and check for the performance, including change in power levels and hence change in OF attn etc.

17 May : tests remaining are dynamic range and stability with temperature (in chamber);

these may get done next week.

31 May : dynamic range testing done -- prelim result is ~ 58 dB SFDR and CDR ~ 80 dB -- to be confirmed, and cross-checked against values for earlier designs; temp stability test to be done shortly.

5 Jul : comparison with old LNA -- needs a repeat measurement; temp stability test yet to be done (VBB on medical leave).

19 Jul : dynamic range tests carried out; results to be circulated next week

2 Aug : dynamic range tests to be repeated; temp tests yet to be done (will take up soon); after that, report to be circulated; can look at putting up on antenna.

====> 3 stage unit tested with feed -- showed some lines in one channel -- being debugged; report on dynamic range has been circulated ? (can discuss once SC is back)

## 1.8 Regular testing of L-band system (SKR) :

(i) update from latest round of tests

16 Nov : recent results on 11th Nov : 2 antennas with poor b'shape (S2 ch-1 -- CB problem and W5 -- problem not identified); C14 showing poor deflection and falling at high freq -- checked for pointing and OF attn, now to try changing the feed.

4 Jan : results from tests on 13 Dec discussed : 21 antennas available; dip seen for L-band vanished after replacing common box (which antenna?), but unit appears to be ok when tested in the lab (!); low power in one channel for C8 Ch1, C14 Ch2, W6 Ch2; W5 poor bandshape; C14 noise deflection discussed.

18 Jan : 06-Jan-2017 tests reported; (only 15 antennas were available); E6 showed ripples in CH1 (but could be cable twist; as today NOT noticed); E6 CH2 deflection HIGHER than expected (red dots) !! "measurement" error? 'naming' of file ? similarly W5 CH2; results show MAJOR drift in deflection (~ 15 dB spread !) -- BUT NO CORRECTIVE ACTION TAKEN !! Primary purpose of monitoring is LOST ! SKR was 'un-sure' about this responsibility - now clarified; henceforth, he will follow up on errant antennas.

15 Feb : E6 ripple in Ch1 fixed (bad cable); C14 feed needs to be replaced (tbd soon); tests at antenna base for selected set of antennas shows ~6-8 dB variations -- this needs to be investigated and understood.

08 Mar : ripples were due to cables; C14 slope in deflection was possibly due to feed issue -- now new feed has been put; tests awaited

22 Mar : C14 brought down and being looked into by S Ramesh; about 10-12 dB spread in off-source values (but deflection is reasonable stable) -- needs joint follow-up with FE and OF persons.

12 Apr : new result show similar as above : deflection is mostly all right, but off levels still have a large spread;

17 May : last measurements were without any pointing correction (!); so need to be repeated; meanwhile, problem antennas fixed at antenna base (how?); equal power tuning exercise is currently underway.

31 May : no updates as Sanjit on leave.

14 Jun : 25-May-2017 data plotted (deflections) & displayed; CH-1 & 2 variation within +-2 dB (4 dB p-p); E03 showing lower power (wrt -55 dBm)

2 Aug : some fresh data has been taken; set of antennas with low power level and low deflection -- being followed up; additional point : team finds systematically lower deflection than expected for CassA -- to summarise the evidence and then take it up for discussion with astronomer colleagues.

16 Aug : latest results from this week displayed; issues related to E05 pointed out (to update by next week); also slope of the measured deflection over the band is different from slope of theoretical values -- needs to be investigated.

====> for CasA deflection problem : reiterated the need to summarise the information for CasA vs other sources, for different antennas and different bands; for E05 problem : to confirm that it is due to uncorrected use of old GSM notch filter (since late 2014 !);

also to update full list of which antennas have what filter combinations and how it affects the bandshape and then decide what should be done about it (see Note1 below).

Note1 : some antennas have old notch filter (about 5 antennas?) -- need to change these to new notch filters...

Note2 : to try sample 1000 to 1400 MHz BPF on trial basis.

2 Aug : sample unit gives 1000 to 1400 as 3 dB -- may need to redo; meanwhile to show comparison with original filter.

16 Aug : no update as Ankur on leave.

1.9 OF output 60:1 monitoring system (PAR) :

(i) status update on completion of 30 antenna system, including facility for monitoring in control room

30 Nov : this is now available under the standard monitoring tools; control part has some problem and needs login to control PC -- SOP for this to be provided to control room.

21 Dec : older PC (OS limitation) being replaced by new PC to avoid this issue.

14 Jun : PC being procured (enquiry gone)

2 Aug : 2 nos of new monitor PCs have arrived; to be integrated into the system.

16 Aug : required OS and softwares yet to be installed by computer group.

====> monitoring program installed on new PCs and demonstrated from web-based unit; to be released to control room for trial use and feedback for additions and improvements.

(ii) status of completion of design report

16 Nov : completed for 30 antennas, can be monitored from control room, need a formal SOP for operators and users; report still under internal circulation.

30 Nov : report had been circulated; may be closed.

1.10 Mass production of Band-4 (550-850) system :

(i) status of sub-band filters, stools etc.

21 Dec : x2 stools received on 20th Dec; & x2 hoods also; 11th Ae to be done tomorrow; 12th Ae by 1st week of Jan'17.

(ii) status of number of antennas equipped with Band-4 system

16 Nov : PCBs for all 30 antennas now in hand for sub-band filters; 10th antenna still not ready; need to follow-up on availability of feed, hood and stools -- to follow-up.

30 Nov : delivery of next set of 10 nos delayed by two weeks to 20th Dec; HSK to request Fabromech for early delivery of 3-4 sets of hood + stools (4 dipole + cavity units are available).

18 Jan : system for 12th antenna will be ready by Monday 23 Jan (lab tests are in progress now); by April x16 system target can still be met.

15 Feb : 13th antenna (C03) installed this week (2 weeks since last one);

08 Mar : dipole shortage; 14th antenna to be completed by ~ 15-Mar-2017; QC issue with dipole units fabricated by outsourced party; dipoles need to be fabricated in-house;

22 Mar : 15 antennas completed; issue of dipoles not having Nickel coated -- will come by Sat. (meanwhile, one has gone without coating and will be replaced later on);

for future orders, to do the dipole in-house and send for coating and deliver.

12 Apr : 6 nos of coated dipoles now available (small mech adjustment needed to match the holes -- need to cross-check; agreed for modifying 2 nos by putting a compensating offset holes on the cavity -- this can be tested for proper performance; meanwhile, to expedite the completion of 3 nos of in-house made dipoles and deliver at the earliest by next week.

26 Apr : x3 dipoles delivered by mech team; x1 of these gone to E5; now total x16 Ae done; remaining x2 will go next week, by 03-May-2017.

17 May : completing 17th antenna (W02) today

31 May : feeds + stools available for 5 more antennas; 18th is almost ready; after

that, problem is with the mobile band filter availability due to delays with Argus !  
Need to see if this can converge quickly; also initiate parallel exercise with another vendor; enough boxes are there for continuing assembly.  
14 Jun : 17 completed; 18th being installed tomorrow 15Jun2017 (W03); so same status as 1 month back;  
5 Jul : 19 antennas are now complete and going smoothly.  
19 Jul : 20th Ae installation held up due to rains; to be attempted shortly  
2 Aug : still held up due to weather; will do asap; next unit is also ready.  
16 Aug : 20th now completed; for 21st antenna, items had to be diverted to C5 unit due to problems of water entry into the hood assembly; now cleaned up and ready to go for 21st antenna in next few days.  
==> 21 antennas done; 22nd on track; need more feeds after that -- in touch with mech group about it.

Additional point : live demo of switchable notch filter at Rx room (in C09 antenna path) -- can switch in different filters -- appeared to work fine; in the process discovered that mobile signal is coming through quite strong in the Band-3 signal (!!); needs to be checked and understood.  
2 Aug : agreed that the analysis needs to be done to identify the nature of the problem and then look at possible solutions;  
for longer term planning to explore options for limited installation for some (worst affected antennas).

## 2. RFI related :

### 2.1 Characterising RFI environment at GMRT (PAR) :

(i) document for control room and users to be released : final modifications waiting to be completed

30 Nov : YG + PAR to work on this final version.

12 Apr : needs to be actioned asap.

(ii) study of RFI environment, including internally generated RFI in main building

30 Nov : tests of individual labs : with AC units and otherwise -- shows different labs in different light; agreed to identify the worst culprits by kind of equipment etc and provide an update.

12 Apr : this is due, but has not started yet due to other activities.

(iii) absolute calibration of RFI levels at antenna : follow-up from controlled tests

16 Nov & 30 Nov & 21 Dec : no updates.

26 Apr : two experiments done :

(A) expt done using GMRT Ae as RX, & log-periodic Ae as TX; D = 100m & 300m measurements displayed GMRT Ae elev 18/45/90 deg; feed rotation done over 0/45/-45 deg

(B) between x2 GMRT Ae (C1 , C8) ; one as TX & another as RX; D=375m with function generator directly feeding RF to GMRT 325MHz FEED as TX; results displayed; 78 deg (3dB) HPBW

17 May : awaiting further discussion

(iv) absolute calibration of measurement set-up for RFI testing : to translate levels measured there to levels expected at antenna focus.

26 Apr : power calibrated for any lab equipment emission limit (upto what allowed) -- plots displayed

5 Jul : report on possible limits for RFI from GMRT lab equipment has been circulated (was discussed in detail last week) -- actual levels now quantified based on details tests with Tx & antennas; need a detailed follow-up.

### 2.2 Industrial RFI related matters (PAR/SSK) :

(i) updating our database

(ii) response to pending requests for clearance e.g. Serum Institute...

21 Dec : awaiting call from Serum Institute for the next visit; asked all technical details of their planned equipments;

30 Nov : first meeting with Serum held last week (24th) -- need follow-up visit to their location for looking at specific instruments.

21 Dec : one site visited.

4 Jan : awaiting call for visit to site of the party.

15 Feb : one round of discussions have happened with Serum institute -- they would like to finish the installation and then call for testing and possible modifications; our response should be that we would like to test the existing set-up and indicate the mods to be done and these should be implemented in both existing and new setup and then taken up for testing.

Another party wanting to set-up unit for DC control drives in Junnar / Ambegaon area.

12 Apr : RFI tests planned at Serum Inst premises next week.

26 Apr : test planned on 02-May-2017 at Serum Inst premises

17 May : tests done on 2 May 17 : RFI measurements done with manufacturing units ON (full campus operational); largest increase : -63 dBm at 75 MHz -- 30 dB rise in noise floor compared to all-off condition (-93 dBm); cold room giving discrete lines in 150 to 250 MHz range (-75 dBm peak); shielding measures need to be advised to Serum Institute; detailed report by later today.

14 Jun : communicated about need for improvements in shielding.

2 Aug : to follow-up & contact Serum Institute about a visit to isolate the RFI generating unit in order to come up with design for RFI proofing it & to implement the sample units.

====> systems responsible for RFI identified as control box for AHU -- party has agreed to remove the item; once that is done, fresh RFI test will be carried out.

(iii) work out new action plan, given the current government policies

08 Mar : MIDC people from Chakan came to GMRT for exploring possible sites for new industry zones; following discussions, agreed to our request to avoid heavy industry in GMRT area -- maybe IT related in Peth etc; also about help in surveying sites for level of RFI etc -- how is this to be formalised -- we should send a letter from our side; check with JKS.

similarly, there is a note from DAE asking for things that need protection -- to see if JKS can follow-up on this.

2 Aug : no action has happened on this as yet.

### 2.3 Mobile phone RFI (PAR) :

(i) Follow-up with BSNL and related matters

30 Nov : new line seen at 880 -- 885 range; identified as due new Reliance Jio systems (they are the only one to have got license in this range) -- it is strong enough to cause saturation in spite of filter; need to find the specific towers and then follow-up with Reliance.

18 Jan : measurements happening this week; update by next week.

15 Feb : completed survey of 82 towers around Y-array : 14 towers in 850 band (Reliance Jio) and 6 towers in 950 GSM band; rest are in 1800 band. Max power in 850 band ~ -16 dBm (at ~ 100 m distance) for few towers. Follow-up for both 850 and 950 being pursued, including dialogue with Reliance Jio to see if they can switch to 1800 band.

08 Mar : draft letter circulated (vendor is generally positive; but formal communication needs to go soon)

15 Mar : New results : characterisation of mobile phone RFI in the GMRT campus -- some interesting plots; using JIO CDMA uplinks and their effect can be seen.

14 Jun : letter to JIO CDMA sent already; Doordarshan is being sent shortly

2 Aug : response from Reliance JIO discussed (they quote that WPC stipulates that GMRT needs protection 1800 MHz Band and hence they can't switch over to 1800 !) -- to reply

formally with a clarification and also ask for copy of the relevant WPC document; PAR to also talk informally with them.

====> PAR had one conversation asking for relevant details of info given by WPC to Reliance Jio, and then follow-up reminder msg, but no response as yet; also PAR to see if contact can be established with WPC.

#### 2.4 RFI from air conditioning systems (PAR/RVS) :

(i) plans for mass production of the systems

30 Nov : PAR thinks he has adequate parts for 30 nos of units to be assembled; need to identify which make is coming finally.

21 Dec : no updates.

15 Feb : 33 nos (Voltas instead of BlueStar) have arrived; need to finalise the locations and the specific schemes for installation; need to make shielded units for all 33 nos; components for 25 units are available; boxes for 10 nos are in hand except for back plate and chromatisation (expected to take one week); work request for next 10 has been given (repeat order); some difference in wiring for Voltas unit -- needs some rework of the design / layout; also one type of connector is different and this also needs to be resolved; PAR to send an email explaining the steps to be taken to complete the RFI shielding work, and expected timelines for the same.

Regarding installation : there is a table giving the locations for 31 units (including replacements of 5 existing units) -- to check if outgoing lines can be behind the unit; to install sample one unit in canteen annexe, test the RFI shielding.

08 Mar : one set of measurement done (without shielding) - under analysis; by next week shielded case will be measured & compared; RFI group designed shielding box pictures displayed; uses many cables with RFI shielded interface connectors; it includes high current carrying (220V AC) lines, needing shielded connectors !

12 Apr : 10 AC units have been installed; only 3 have the RFI shielding installed (are the other 7 being used !); 3 more RFI units are getting ready; to speed-up the remaining RFI units; and then go for the next batch of AC units; meanwhile, one bump of RFI remains at around 325 MHz -- may be coming from blower assembly : to disassemble on unit and check for source of RFI.

17 May : 12 units are now in operation with RFI shielding; prototype box from new vendor has come and not found suitable -- modifications told to vendor, corrected unit may come in few days.

14 Jun : x20 new units arrived at Pune campus; sent for yellow chromatisation;

5 Jul : now 21 units available; work can restart.

2 Aug : 5 units in 2nd lot have been installed; all material needed for shielding is now in hand; so process can go forward at the required rate...

====> going ok, on a as and when needed basis.

NEW points : shielded ethernet enclosure (x35 units) -- placed work order; it is aluminium C-channel based unit (at Pune W/S)

====> Update on powerline RFI : new survey done in S4, S5, S6 region; 25 out of 40 of the 11 kv -- 440 v units found bad from RFI point of view; to identify the worst offenders (including nature of problem) for follow-up by electrical team; to do a comparative study with previous survey of this region and report the findings from that.

New item (6th Sep) : RFI from 1 Gbe media converter is a problem for the new batch of converters (same brand as before); need to check why there is more RFI, and if something can be done; meanwhile, in parallel, exploring other bands (2x in price); also go back to original vendor and ask for units from original batch.

### 3. Operations related :

#### 3.1 Interfacing of FE with new M&C system :

(i) latest status of testing with Rabbit card in common box at antenna base

16 Nov : Debugging of monitoring problem : still ongoing; performance appears to be partial and intermittent. Discussed various ramifications and implications : agreed to continue effort to debug antcomm to Rabbit connectivity for monitoring (at least up to common box monitoring) while going ahead with alternate approach of talking to Rabbit on serial port from other devices (e.g. another Rabbit or PC).

30 Nov : no new updates on this

21 Dec : antenna control part is working; FE monitoring still not working; Charu is looking into this...

18 Jan : trying with different delay to see if it solves the problem, but not yet working with online control...

19 Jul : last 2 months has been working satisfactorily on C-01 antenna; one instance of problem : hanging (needed power reset to be normal again); 2 more units being made ready by FE.

16 Aug : hardware work of installing Rabbit and making it work in common box (and be controlled with existing online) is as going on; software work for having control program in Miltech PC for talking to FE Rabbit card via serial port is getting ready -- this should also work seamlessly for antennas with MCM 5 as the control unit.

(ii) status of parallel activity of 2nd common box with Rabbit to go to dish focus

16 Nov : 2nd common box being modified (about 50% of rewiring done); Rabbit with shielded box will be available end of this week; can hope to complete integration and testing in 2 weeks time and put on first antenna with RS-232 cable driving; later to convert that to ethernet over fibre; mass production may need only new plates to be made by workshop -- other aspects are in-house in FE lab.

30 Nov : item also being discussed under FE agenda item (in alternate week)

18 Jan : final status is Box #1 was made functional at antenna base and was taken up to antenna focus as Box #2 does not work reliably -- hangs and needs power reset (has been tested with a couple of different Rabbit cards?); problem not solved; agreed to try the option of swapping the Rabbit cards between Box #1 and Box #2 and seeing what is the outcome. To report this by tomorrow and then decide if a 3rd box needs to be made ready.

25 Jan : testing of common box with Rabbit card : new clue related to grounding of enable signal of decoder IC may provide the breakthrough -- tested in lab and will take to antenna base now.

15 Feb : email update from Raj Upgrade : One rabbit MCM has been installed at C01 antenna dish focus; MCM communication is proper but needs to give hardware reset while changing frequency band.

08 Mar : it is working only for some bands (C01); needs rethink on strategy.

22 Mar : problems persist; long discussion about what may be the cause; need to get a proper wiring diagram to check the grounding of the system for possible loopholes that may be causing the flaky behaviour...

5 Apr : useful discussion alongwith wiring diagrams; two possible causes identified : old FE power supplies may be having more noise (200 mV) than the new ABR power supply (50 mV) -- to try C01 with the new supply; Rabbit card has ground to common box chassis (unlike MCM-5 card) -- can try to isolate this in the second box being made ready and take to another antenna.

12 Apr : common box on C1 now working properly (!) -- problem was in sequence of commands sent from control room -- there was a monitor command sequence in the cmdfile that was the culprit.

Agreed that only main bottleneck remaining is monitoring of FE system -- this can

continue in parallel, even as we go ahead with mass installation of the Rabbit based common box; third stream of activity to be initiated is lab test of ethernet based control of Rabbit card in common box, via optical fibre link (bypassing cable ethernet).

26 Apr : update on monitoring aspect : problem found with 4 lines on interface card that appear to be picking up spurious signals; isolated by connecting straps directly from IC pin to destination point and solved the problem; to confirm that problem clearly identified and solved; and then agree on changes to be made to PCB via straps (after cutting the offending tracks) and implement in mass production.

17 May : above solution implemented for 2nd box also and found working ok; put up in place of original common box on C01 (due to low fringe call sheet due noise-gen all the time); to test the failed unit to see if cause is in new M&C system or in some aspect of common box; for the PCB, agreed to make a new version, but work in parallel with modifying existing versions with straps to keep the production rolling; same strategy for modification to accommodate OF receiver.

31 May : new box on C01 is working fine; older version that had come down has problems identified (not related to Rabbit control) and are being rectified (change of one interface PCB; old one to be debugged by SC) -- to find the spare cards and use for now; in addition, wiring for 2 more boxes is underway. To check separately about OF work on common box.

14 Jun : C01 has been working for last one month; FE group wiring x2 more boxes;

19 Jul : one of these 2 boxes can go to antenna;

2 Aug : unit from C01 brought down due to bandsetting problems (see other week's item) and tested in the lab -- nothing wrong was found and after a fair bit of testing, it was installed in C02 and is working for last 2 days; 2nd unit is ready to go and will be put up on C01; 3rd box getting ready; for longer term, need to replace i/f card with new design -- almost ready to go for PCB making (waiting for VBB).

### 3.2 PC at antenna base (CPK/SN) :

(i) Follow-up with Miltech for 20 units -- can we speed-up the delivery period

16 Nov : new quote from Miltech says 3 months delivery, including phased delivery and early delivery of one unit to be explicitly mentioned in PO.

30 Nov : above was budgetary quote; formal quote expected shortly.

4 Jan : folder cleared ; PO should be done shortly.

18 Jan : Order has been released; full delivery time is 3 months; first box to be supplied earlier and tested...

15 Feb : email update from Raj Upgrade : expecting the delivery of one Miltec machine shortly; also initiated talk with Miltec to supply it as early as possible.

08 Mar : one unit has come; will be tested & feedback given to Miltech

22 Mar : new Miltech PC put through RFI test; informal report : looks ok; formal report may take some time.

12 Apr : go ahead given to Miltech for full delivery.

26 Apr : CPK to call and check the status.

17 May : CPK yet to call.

31 May : Party had confirmed plans for delivery in 2-3 months time scale -- to check if it can be expedited and/or delivered in batches; out of 16 existing, 14 are working (10 in antennas, 4 in lab); more disks being ordered for Miltech PCs.

14 Jun : Miltek said under production; no speedy delivery possible; usual delivery schedule.

19 Jul : end Aug'17 all units expected;

2 Aug : to reconfirm with Miltech about date of delivery.

16 Aug : end of Aug is being given as date of delivery -- to try and ensure this date and also if batch delivery of first few units is possible earlier.

Addition item : issue of Windows software licences discussed (with MSU present) --



agreed to go ahead with ~ 20 stand-alone licenses for use by tech groups.

17 May : MSU reported that he is looking into it.

31 May : MSU presented some confusing feedback from different vendors -- yearly license cost, with terms and conditions; MSU to assemble the possible options and report back.

2 Aug : MSU has received some quotes and will summarize shortly.

### 3.3 GMRT M&C sytem Ph-2 work :

(i) roles and responsibilities of GMRT team members

21 Dec : meeting has been held; work plan will be discussed next Tuesday internal meeting.

4 Jan : internal lab meeting held on 3 Jan (now every Tuesday)

08 Mar : all team members are clear on their respective roles & are contributing

(ii) kick-off meeting with TCS and TRDDC and subsequent follow-up

16 Nov : meeting tomorrow (17th) to finalise the plans

30 Nov : discussions ongoing; kick-off meeting planned.

21 Dec : kick-off meeting held on 25th Nov; 4 deliverables identified : 1st delivery will be telescope tracking of 10 antennas; project plan discussed; start date : 5 Dec.

4 Jan : regular meetings with TCS now scheduled; sample source catalog & 'astrolibrary' etc shared with TCS.

18 Jan : work ongoing; need more regular interactions of TCS with GMRT team members.

15 Feb : email update from Raj Upgrade : 2 CMC and 6 LMC machines are UP & running; team members are now very much familiar with CMC, LMC installation, features, testing and can carry independent tasks.

08 Mar : interim review held; schedule is 6 weeks slippage/ delayed; mitigation planned for that delay;

22 Mar : work progressing; may test sub-array and tracking in coming MTAC.

26 Apr : could not meet the above target due to modifications for A&A issues and other things; work is ongoing at present.

17 May : tracking routine completed; LMC, A&A and data-base schema work not yet converged.

31 May : new ver 2.2 released last week -- tested and feedback given; further tests to be done this week.

14 Jun : LMC v2.3 expected now but power shutdown led to delay (Friday 16Jun2017); CMC v2 after tests are successful (~ 1 week), phase-2 delivery will be over.

5 Jul : Delivery-1 of Phase-2 has been done; most bugs fixed; some more work is remaining, but can start on Delivery-2 related items.

19 Jul : improved version of Delivery-1 of Phase-2 expected today; Delivery-2 work has started

2 Aug : work on delivery-2 going ok -- completion date is mid-Oct and this will allow basic interferometry end-to-end observation to be carried out; del-3 & del-4 roughly at 3 mos; del-3 should allow almost all the features that current system provides and del-4 is the extra features.

### 3.4 GMRT M&C system as SKA prototype :

(i) updating TM repository with relevant documents

21 Dec : completed.

(ii) preparing inputs for TM review committee

16 Nov : to aim to complete the repository + announcement within next week ; work for material for review committee started

30 Nov : dicussions and work ongoing, including preparations for discussions with TM review panel.

21 Dec : review meeting held on 20Dec16; work to be done in 3 phases; 1st phase : requirement compatibility; architecture explanation given; scalability etc; need many upgradation of quality attributes; Jan17 1st week -> risk scenario to be discussed;

4 Jan : preparation of docs in progress; ph-2 work now beginning...

18 Jan : aim to have 6+ antenna set-up with PC + switch + Rabbit talking to Sentinel + OF + Servo (to check if existing PC104 will work directly) or not; to check enough Miltech PCs available -- Sumit and Mangesh to look into it.; need to move from Fedora to Ubuntu; aim to start testing at antenna base by 23/24. Additionally, need some temporary space (couple of months) for working on 2 PCs in or near control room...

15 Feb : Last week 6 antennae Control & monitoring system was set-up and demonstrated to SKA reviewer (Nick Rees) and SKA India team.

08 Mar : SKA committee is reviewing our work; cost estimate proposal from India was submitted to SKA claiming 50% saving on TM work using Indian scheme;

26 Apr : discussions ongoing; need to prepare an updated response to new version of report expected by tomorrow or so.

17 May : all done and completed.

Back-up of interferometry data from GWB : some issues when switching over from gwbh1 to gwbh6, but appear to be resolved now.

19 Jul : Additional item : x10 hard drive (2TB each) - arrived at NCRA stores; next week will be in use; end-July x4 LMCs (Local Monitoring Switch) at antenna base; Layer-3 s/w has been configured in Rx room; one text LMC put on it; slowly move to new L3 s/w.

2 Aug : both disks and layer-3 switch appears to be ok.

#### 4. Back-ends related :

##### 4.1 Documentation :

(i) any pending reports etc ?

16 Nov : GWB and RFI papers revised and submitted / getting ready to submit; Walsh paper needs to be looked into for revision; nothing really pending, except for the report on the attenuation values : new set of tests done and results look ok and will be updated shortly.

14 Dec : GWB, Walsh & RFI related paper in Journal (referee comments being addressed); may be accepted within 2 weeks.

21 Dec : RFI paper is already accepted; Walsh is in 2nd stage of revision; GWB ?

4 Jan : To follow-up on GWB refereeing process.

18 Jan : GWB response received, relatively minor modifications are needed and SHR is looking into this; for Walsh, waiting for response -- can check after 20 days (end of this week / early next week).

26 Apr : no new issues here.

##### 4.2 Updates on existing GWB-3 system :

(i) completion of DDC related works :

DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

28 Dec : sample correction curves looked at -- to try geometric mean or similar approach for seeing if overcorrection can be reduced.

4 Jan -- 12 Apr : no progress on this, due to work on release of 30 antenna system.

5 Apr : meanwhile, new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

12 Apr : agreed for BE team to repeat noise source tests and check carefully for spurious lines; then repeat with sky signal as needed.

26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction :

geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.

17 May : DDC related updates :

(a) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and releasea for users.

(b) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.

24 May : for shape equalisation, some fine tuning being done by SHR; for spurious lines, not clear what is the best way forward -- need to check if it is part of the ADC related effect or not and whether maintaining higher input levels can help mitigate the problem...

31 May : agreed that the latest version of bandshape correction looks ok and can be released in the next version of GWB; for spurious spikes, some further tests suggested, also to look into optimising the power levels at input for the narrow band modes.

14 Jun : released (bandshape correction) in the current version itself spikes issue no update

28 Jun : for bandshape correction : edge effect handling now completed & released; this can be closed now.

For spurious spikes : tests imply spikes originate from ADC itself; need to change the clock & see; other repeatability tests (same spikes from same ADC card) etc remain to be carried out;

12 Jul : repeatability : in 200 MHz mode, seems to be good repeatability of channels for same ADC, with some fluctuation in ampl and confirmed that all are  $2^n$  locations; trying 100 MHz mode with DDC (even for 100 MHz o/p) shows some additional lines, not at  $2^n$  location but of comparable strength (!) -- needs to be looked into more carefully to understand the nature and cause of these.

19 Jul : still analysing (reason for spikes in DDC mode)

2 Aug : tests of ADC recorded data show ~ 4-6 spikes per ADC occurring in chans ~  $k*256$  and repeatable for a given ADC; need to check if DDC is producing spikes or the ADC spikes are coming through with some intermodulation ?

16 Aug : fresh tests with digitally generated noise put through the DDC chain show that the spikes do come and that they may be due to the LO signal being used in the DDC -- need to check and establish the correspondence between spikes in LO spectrum and DDC o/p spectrum; then check if going to double precisions helps or not; and cross-check with Matlab generated sine function and spectrum analyser.

====> looks like single precision sinewave calculation in GPU is the limiting factor; to try for zoom mode code with double precision for the LO generation and report the results; also to investigate possible effect in fringe and fstc phase corrections...

(ii) drop-out in visibility data

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes; for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); to check if matter can be closed ?

14 Dec : problem perhaps in AIPS settings? matter can be closed?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

### 4.3 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

#### (i) assembling of racks and nodes and peripherals :

16 Nov : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated; this is completed.

#### (ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT loose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

08 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); but, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain

14 Jun : providing the 'log' at the end of observation for now  
12 Jul : this is still pending.

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready; appears to be satisfactory (though no improvements in ambient temp recorded ?).

11 Jan : no further work on GWB; plan is to have similar hcnage for GBS during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

08 Mar : plans for work on GSB during upcoming mTAC -- needs a discussion.

3 May : nearly closed; hot air sucking mechanism needed (being explored with Nandi's help).

====> to check about glass doors for GSB system.

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (may come earlier)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep looks like resulting in some speed-up in delivery; to follow-up closely.

11 Jan : YG to contact nvidia and micropoint persons.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

3 May : waiting for adapters to arrive;

28 Jun : adapters arrived; nvidia team visited GMRT; GPU installed on one T630 (for raw voltage recording); to quantify improvements thru benchmarking.

19 Jul : benchmarking needs single node : software changes for single node, done; initial tests imply x2 improvement in performance in Pascal wrt K40; individual block comparison to be completed by next week (see details in later agenda item below).

2 Aug : hard disk procurement 8 TB vs 4 TB -- being followed up; eth cables (CX4 to CX4 15 m and QSFP to CX4 5 m Cu vs fibre; also QSFP to CX4 15 m. 12 nos of T630s expected by mid-Aug.

16 Aug : ordering of components : repeat order for 20 nos of 4 TB disks ready to go; T630s (12 nos) order delivery expected anytime; CX4 to CX4 15 m Cu cable ordered 5 nos; CX4 to QSFP 5 m Cu cable 5 nos ordered; delivery for both expected by end of month; Inf cards 2 nos ordered + Inf-Inf cables (fibre) 20 nos getting ordered; GSJ to look into purchase of racks.

====> action ongoing...

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful

ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work

for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : need to plan the code optimisation that will be needed.

14 Dec : need a discussion to decide the way forward on this.

4, 18 Jan 17 : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

15 Feb : SSK to try and restart the old 16-antenna CD pipeline code using the SOPs etc from Kishalay...

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion of long-term issues to be taken up next week (22 Mar).

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working; calculator for what combination is possible is also available; full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority); timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam; regular tests for all modes under PMQC : can this be defined ? changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file. zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

19 Apr : for ver 4.5, calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).

3 May : SOP already released (v 4.5)

17 May : trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.

14 Jun : trial and release : documents (directory structure OK as per circulated version) finalized; need to creat directories etc.

28 Jun : antenna testing scheduled today/tomorrow; next SOP release planned CD pipeline : GPU has possibilities as per manuals; release of trial mode : all above incorporated.

12 Jul : some white slot testing needed for new release ver before replacing the existing GTAC use version. CD pipeline : tested for 2 beams 200 MHz also; waiting for cmdline interface for 2 beam mdoe.

19 Jul : antenna testing were OK; SOP released; control room using it as 'trial' mode.

====> some action items : (a) debugging zeros in beam output (using gptool by BE team); (b) populating 3 or 4 beam hosts with K40 (c) cross-check on amplitude scaling algorithm from ADC to beam output for IA, PA, CDP

#### 4.4 Plan for dual copy of data for various useful applications (!) (BAK+GJS) :

(i) refinements of the first draft of the note

(ii) plans for getting first unit connected and tested

(iii) plans for testing high speed recording to disks

(iv) plans for infrastructure issues : racks, placement, power (UPS), cooling etc

16 Nov : lab set-up for grabbing and recoding has been done; while continuing with this, need to work on the set-up for sending parallel copy of the data, including procurement of longer CX4 cables.

30 Nov & 21 Dec : not discussed.

4 Jan 17 : basic design for duplicating 10 Gbe block and making 2 copies has been developed. Need to check if the combined design for 4 analog inputs will fit on one Roach board. Also, to take the existing code for reading from shm and writing to disk to test the performance.

18 Jan : to test the dual copy design for correlations using existing 16-antenna corr with dummy inputs; then to connect to one machine where tests can be done for raw voltage recording and a single node correlator with flexible beamforming.

15 Feb : no updates.

08 Mar : 374 MBps speed achieved; but need slightly higher speed

26 Apr : old gwbh9 (T630 m/c) removed and T620 m/c put in for doing the further work; length of cables -- 3m may be enough for using existing slot in the racks; to look into modifications of FPGA code for more eth cores; simple code for correlation of limited number of antenna etc... longer-term plan with longer cables, more racks, more nodes etc to be thought about.

17 May : expanded design tried with 8+ disks using gulp and can be tried with GWB signals; to be tried with digital copy scheme using resurrected earlier design with 4 10 Gbe cores.

14 Jun : machine installed; code compiled in FPGA; delays being tuned for sync.

19 Jul : in 1-2 week will be completed

2 Aug : first test of dual copy system tried out (with 2 m CX4 to CX4 connections into the same rack) -- data captured with gulp for one port; to see if psrdada based front end receiving code can be resurrected; one more rack may be needed.

16 Aug : single node correlator now working (except no online interface) -- can look into porting this on to the parallel system.

====> need updates from Shelton for some of the above; meanwhile,

IMH to start looking at options for types of racks, layout and placement etc; also, need a discussion about best way for synchronisation of the parallel systems, including online interface (SSK+SHR needed).

#### 4.5 Update on time-stamping issues for GWB (SSK/SHR/YG) :

(i) follow-up on items from discussion note with YG (couple of months ago)

16 Nov : some changes have been made by SHR, but the sub-microsec correction still needs to be done; also to follow-up about h4k file.

21 Dec : modified code has been made, but not yet tested; can try to see if it can be made available in the current release.

4 & 18 Jan 17 : agreed to defer to next release.

15 Feb : deferred as above.

08 Mar : current release has this 'sub-microsec correction' ENABLED; it is now possible to send those values to header files;

26 Apr : updated timestamp with higher accuracy is coming now; needs to be verified for correctness; CDP vs PA timestamping still to be resolved.

17 May : one buffer offset confirmed; need to be checked for different modes  
14 Jun : sending side time stamps are fine; offset must be getting introduced during processing.

New items to be added : (i) single node correlation (a) off-line for many antennas (for better profiling and benchmarking) (b) on-line for limited inputs (2 to 4 antennas) for testing and new developments

19 Jul : offline benchmarking work is useful here too

(ii) new options for speeding up overall I/O for voltage beam modes : (a) different BWs (or chans) for different beams (b) 4 bit voltage beam and (c) turn off IFR or BFR data selectively during a scan.

(iii) testing of P100 based node and related follow-up with nvidia team

19 Jul : x2 times improvement reported to nvidia; more work planned; some optimization suggested by nvidia.

16 Aug : code and results from single node visual profiler (for CUDA 8.0) shared with nvidia; new results showing 3-4x for MAC (changes with spectral chans) and FFT is 2x; GSJ to follow-up on what model of P100 will work on our nodes in long-term.

====> need some follow-up here; also our code has been shared with nvidia and Vinay is trying it out on P100 node.

4.6 RFI mitigation in digital back-end (KDB/YG) :

(i) time domain impulsive RFI filtering : current status and plans

(ii) spectral domain RFI filtering : current status and plans

(iii) beamformer RFI filtering : current status and plans

16 Nov : for (i) fraction thld and generation of counter being tested; reading code needs to be done; sync vs async operation -- both can be tried to be provided; need to see what further kinds of tests to be done; also some tests for optimum thld and replacement options. for (ii) offline version is working fairly well; need a plan for the implementation of real-time version and for the propagation of the flags/weights into the visibility data into the LTA file.

30 Nov : not discussed in detail.

21 Dec : For fractional thld option is still in debug mode; async operation design is under development; sync operation option can also be developed after that; both will come with some constraints on range of parameters available to user -- TBS; no progress on the real-time freq domain filtering, as time domain is still taking up most of the time... meanwhile, looking (with Sanjay) about the possibilities for sending the flags to visibility and LTA data file...

emulator has some changes and improvements, including random location of the RFI.

4 Jan 17 : for (i) modifications in simulator; counter mode now working -- can have 2 different modes, tested at module level, now integrated into the design, will be testing in next few days; fractional thld done in simulation, to convert to design and test. (ii) to try and run the filter in real-time from shm data.

18 Jan : not discussed, but summary of offline discussions is as follows : (i) some additional features added to RFI simulator unit; fractional threshold and counter mode now available for use in the voltage filtering unit; cumulative experience shows that we may be not using the optimal filtering technique for voltage mode -- should try the alternative approach of conversion to intensity and integration to desired time constant -- closer to a true matched filter.

08 Mar : some updates from Kaushal about looking at options for more optimised filtering of broadband time domain data :

Modified the design to support 16K window size - this is the default design now;



Fractional threshold available (tested with antenna signals) - default option now;  
Made the DDC mode design compatible with the ongoing changes;  
RFI Counter design ready - format to read the data including timestamp from a single ROACH complete, undergoing more tests before release;  
Supporting regular tests - spectral line (Nissim), continuum (Ruta, Dharam, Ishwar);  
Handling longer duration RFI using median of MAD technique - initial results are encouraging, detailed tests going on;  
Looking at likely causes of missing RFI during real-time excision and at possible alternate methods for time-domain filtering;  
Ongoing: Updating SOP with changes made till date;  
17 May : 2 different options for MAD based filtering released -- normal MAD vs MoM of MAD; some user level tests done -- need to see the output from these for comparison; can be taken up once spectral filtering tasks with Swapnil are concluded.  
14 Jun : some results displayed : comparison between MAD vs MoM techniques; MoM much better than MAD 250-500 (426 MHz); but identical (both equally good) performance at 610 MHz need user feedback now.  
19 Jul : poor SNR at input leading to better GPTOOL performance ?  
plots showed : comparison of MAD, MoM & GPTOOL at different thresholds ( $2.7 \cdot \sigma$  vs  $3.0 \cdot \sigma$ ); for data at different RF frequencies; need for astronomers to test (by generating sky images) & give feedback.

RFI emulator: (last update email - Jan) :

Last development: Adding facility for random insertion and random amplitude of RFI  
Understanding the GUI and MCM control program - backup from Rahul Bhor;

Narrowband RFI filtering: (updates email sent periodically) :

Initial version of the code has been timed; optimized for computing faster sorting for median computation, is now much better;

Moving towards expected version of filtering code - with optimized functions to meet real-time requirements (0.671s) and necessary functionality;

Ongoing: Testing the code on recorded data and timing the code for all 60 self outputs;

Looking at synchronization between the data path and RFI filter (along with Sanjay);

Looking at merging of lta file and flags for the FITS file format (along with Sanjay).

08 Mar : now optimizing real time filtering; all bands filtering on recorded; Broad band RFI filtering : emulator tested; other techniques being explored; SOP updated; to be released next week.

17 May : code for spectral filtering of single self has been developed with spectral flags needed as per format specified by SSK and he is to modify this for multiple selfs (all antennas, working real-time) and passing flags appropriately to LTA file.

14 Jun : algo done; working on recorded data; extend to real time release in few weeks;

19 Jul : shared memory to algo done; final integration within 1-2 weeks (ready for real time tests).

4.7 Early digitisation work (BAK) :

(i) Update on current status

(ii) Discussion on long-term plans

30 Nov : not discussed.

21 Dec : parallel system set-up with spare GAB system (for 2 antennas) in Rx room and tests ongoing; also tested by sending digitised packets to antenna and loop back; using GWB2 for doing all the correlations.

18 Jan : feasibility study done using C09 antenna with noise sources & real signal -- needs a fixed delay correction of 1.5 km to get maximum correlation; trying setup with E5; meanwhile, a few different tests can be tried with the C09 set-up; comparison of scheme running on GWB2 and GWB3 tried out.

08 Mar : C9 & E5 setups faced problems (ethernet card issue); now fixed; GWB2 (early digitization) & GWB3 being used for comparison; delay requirement has reduced (due to early digitization)

12 Apr : new test has been carried out with C9 and E5 on actual on-source observation and brief comparison.

26 Apr : some updates from recent tests to be available by next week; detailed report of recent work being prepared.

17 May : trying some tests with single antenna early digitisation (as only one is working).

14 Jun : summary of tests circulated; stuck with C9/SFC module (need 10 days)

19 Jul : comparative study of dynamic range (old vs new early digitization) in progress

2 Aug : some tests going on; replacement SFC module has arrived.

====> some tests have been done on comparison of ampl and phase and also dynamic range; can take up for detailed discussion shortly.

#### 4.8 Time-Frequency Standards (BAK) :

(i) procurement of Maser units

(ii) planning for kind of environmental set-up required for Maser units

(iii) planning for long-term maintenance and development

16 Nov : most of the issues have been resolved, waiting for one party to complete the payment terms; pending issue about performance bank guarantee for different amounts of periods.

30 Nov : work is ongoing, but item not discussed.

4 Jan 17 : TEC clearance ok; recommendation to open price bids -- to check the status.

To contact Prof Sen Gupta for a discussion.

18 Jan : final TEC documents done and sent for next step; to follow-up and check status.

15 Feb : activities ongoing...

08 Mar : Negotiating committee met the vendor (no reduction on price; but add modules 'FREE'; payment terms as per NCRA conditions); Dr Sengupta will be visiting next week; first unit delivery after 5 months; second unit 4 months after 1st delivery;

12 Apr : to take up next time.

26 Apr : to confirm date of expiry of validity and follow-up with TIFR for the folder; to check about vibration damping mechanisms available with the system and otherwise; to make a draft note for selection of the room and suggestion modifications to be taken up.

14 Jun : order yet to go (file still in Bombay); need to plan room A/C shielding : ask civil dept.

19 Jul : x2 Maser orders now placed ; actions needed from electrical group : UPS, A/C, wall panel for signal cables ; room (already identified) needs RFI shielding.

2 Aug : pros and cons of using hot lab discussed -- BE team needs more detailed discussions with civil and mech teams and also get the vendor to visit.

====> to cross-check implications of +/- 1 vs +/- 2 deg and battery back-up without AC backup.

#### 5. Other items :

##### 5.1 Python assembly work (HSK/SSK) :

(i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement

(running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : not discussed

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need ot agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

12 Apr : sample unit getting ready -- length needs to be reduced; do asap and get hose assembled and then install on C03.

19 Jul : x4 sets of Python of SS make available with Mechanical group; FE team should plan using them & give feedbacks;

2 Aug : need follow-up with FE and mech groups on this.

Other items from Mechanical group:

x3 sets 130-260 MHz feed completed (being sent to GMRT on 21Jul2017); new work for FE : chassis to hold multiple optical fibres being designed;

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## Minutes for the Plan meeting of 20 Sep 2017

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### 1. FE & OF related :

#### 1.1 Noise temp & gain vs temperature for new LNAs (VBB/SSK) :

(i) Update on understanding the noise diode calibration issues

(ii) Update on results with low ppm resistors and comparison with existing designs

30 Nov : latest results show 2-3 deg K improvement in  $T_{lna}$  for 550-900 for low ppm vs normal resistors, and also the low ppm absolute values are slightly higher. Hence, now real improvement, in going to low ppm. To move towards repeating the test for the entire FE box.

14 Dec : repeat test will need preparation of cabling (1 month)

22 Feb : first results of variation of  $T_{sys}$  for Band-4 FE unit of QH + DC + LNA

(which goes next to the hood) -- absolute value of Temp is higher than  $T_{lna}$  at ambient and also the variation of  $T_{sys}$  with ambient (0 to 60 deg C) is larger than for  $T_{lna}$  alone. To cross-check whether known loss of QH and DC at room temp can explain the room temp values and then extrapolate from there for different ambient temps.

15 Mar : new test done with QH + LNA only (compared with QH + DC + LNA) -- shows lower variation of  $T_{sys}$  over 60 deg range of chamber (35-40 instead of 55-60 seen earlier); agreed to try to estimate the loss of QH and DC with temperature and use theoretical formula along with  $T_{lna}$  as fn of temp to predict the observed  $T_{sys}$  vs temp curves and compare with the measurements.

5 Apr : new results of  $T_{sys}$  vs temp for just LNA, LNA+QH, LNA+DC, LNA+QH+DC : appears to show reasonably flat variation of  $T_{lna}$  with temp; more variation for LNA+QH; but some of the curves cross each other (and have offsets) with temp -- bit difficult to understand; agreed to try S-params for each device as fn of temp, for same RF (610); meanwhile, theoretical calculations ongoing.

19 Apr : new update, which measures loss of QH with temp, shows change from 0.1 to 0.2 dB over 60 deg and can explain the observed variation of  $T_{sys}$  with temp. To check if any info is available about loss of QH with temp; second is the mystery about lines crossing each other -- needs to be understood; then can check about extending the study to Band-3 also.

24 May : no fresh activity due to engagement in mass production work.

7 Jun : new test done for the new 3-stage LNA for Lband -- shows few (~6 deg) variation over 20 to 60 deg change in temp -- similar to Band-4 LNA; to try with typical cable length in front of the LNA. Riddle of crossing curves remains (here also); to try for Band-3 LNA.

#### 1.2 Completion of 120-240 MHz Band-2 system (HRB) :

(i) Updates from repeat measurements of response & comparison with control room values

14 Dec : planned next week (20-Dec-2016);

(ii) Results from optimisation with adjustable stool on E02

(iii) Generation of final summary for discussion at GSG level

14 Dec : completed; follow-up needs to be taken up

(iv) Preparing for mass production

14 Dec : 3 weeks per antenna anticipated; x8 Antennas by April 2017 possible.

22 Feb 17 : only 5 antennas completed by January; request for next set of 5 feeds has been given to mechanical approx beginning of Jan -- expecting 2 dipoles shortly, but reflector and BFRs will take some time; meanwhile one FE box is ready; to get if possible 2 more to be ready, so that 2-3 antennas can be done in quick succession.

Need to have enough QH + DC (is matter of cutting right length of material and assembly); for LNA : have all PCBs, need chassis (ordered in sets of 20); same situation for BPF; however, request for new stools (with modified height) has not been given (!!); due to some rethink about optimal stool height (!); follow-up action on this : to discuss with mechanical to see if existing or spare stools can be modified / cut to meet the height requirement and use for the next 2-3 antennas.

15 Mar : HRB had requested for 5 feeds (DRF 130-260 MHz) out of which 5 dipoles arrived and reflectors + BFRs will arrive by 18 Mar; mounting stools (1190 mm), 30 nos. requested, out of which, 2 stools will arrive on 18 Mar; hence, new installation only by next week;

5 Apr : 2 nos of feed + reflector + BFRs + stool in hand; 1 box ready; one more can be ready in next few days; can target 2 antennas in MTAC period; to see if 3 can be tried.

19 Apr : no progress now, as attention has shifted to common box for some time; now tasks have been reassigned and work on this will pick up now.

3 May : 6th box is ready in lab; will go to antenna by next week (12-May-2017)

24 May : 6th antenna done; one more can be done; after that feeds, stools etc needed; FE box for 2 more available -- more are needed. FE team to check with mechanical and get back.

7 Jun : some delay to move to the next (7th) antenna, though the units are ready -- maybe next week after HRB is back; for further units, boxes awaited after powder coating (10 nos); feeds + stools are available for next 3 antennas. May need to introduce check list for quality assurance for all the units before they are installed (can be done for all other bands as we are increasing the pace of mass production).

28 Jun : 7th & 8th antenna installation completed; next 2 antennas can be ready by ~ 15-Jul-2017; (feed availability is the bottleneck thereafter)

12 Jul : 9th unit has gone; 10th will be ready shortly -- maybe next week; expecting more feeds to come in 10 days time (needed for 11th onwards).

26 Jul : 10th unit has been ready for some days, but not gone up due to weather.

9 Aug : 10 antennas done; 11th one can go up in a week or so; box to be made ready for 12th unit.

23 Aug : 11th system has now gone on C6; 12th system may be ready by 31-Aug-2017

### 1.3 Status of 250-500 MHz Band-3 system (AP/HRB/ANR/SC) :

(i) Completion of 30 antenna system, including retrofitting of first version

14 Dec : v1->v2 for 9 antennas needed (+ 5 spares); 10 boxes ordered; 2 boxes getting ready in 1 week one antenna can be done; ~ 3 weeks per antenna anticipated; 3 months should be enough to complete the tasks i.e. April 2017.

11 Jan 17 : 2 boxes undergoing changes -- problem of dip at 480 MHz in full-band response, due to mismatch, understood and being fixed now; may be ready to go antenna in 2 weeks.

25 Jan : needs combined tuning of filters to fix the problem; work ongoing.

22 Feb : successful in tuning the integrated unit (for 2 boxes, both channels); and 23 antennas are completed, and work is ongoing; next antenna in about 2 weeks.

15 Mar : one more box was made ready, but gave trouble after exhibit at Science Day (!); has been made ready again (all the cables were changed). Will go up shortly.

Meanwhile, next set is getting ready.

5 Apr : 25th antenna done to ver2 level; some issues related to tuning of the integrated filters (assigned to SC).

19 Apr : 26th antenna also completed; going reasonably smoothly.

3 May : next box (incorporating new filters) will be ready this week & go to antenna [~ 12-May-2017]

24 May : 27th antenna is done; generally going ok.

7 Jun : still at 27 due to some maintenance issues with C02 -- need feedback about the oscillation problem.

28 Jun : C02 box replaced due to oscillation problem - now fine; one more antenna : so total 29 antennas completed; W03 - last (30th) will be done in a week (05Jul17).

12 Jul : all 30 antennas completed for v2 !! will aim for 5 spares in the long run, but 2 spares to be made ready in short run; to get full 30 antenna statistics for main and sub-band widths.

26 Jul : to take up the above actions, but can be at lower priority.

(ii) Updates from recent 30 antenna monitoring measurements

14 Dec : report to be circulated by next week (20-Dec-2016)

28 Dec : recent tests on Cygnus, with 18 antennas; basic results are fairly good : comparison with theory curves and control room value at 325 MHz show reasonable agreement; 2 antennas with drop in deflection at higher freqs (C04 & E03) -- need to be checked; other antennas to be tested.

11 Jan : analysis of Jan data awaited.

25 Jan : analysis of new data (on CasA) -- appears to be systematic 1-1.5 dB less deflection than predicted and control room values -- needs to be checked and followed up in consultation with ICH, DVL, SC & GP; few antennas with some odd behaviour e.g. E3 and maybe E2.

15 Mar : no updates as Ankur is not available

5 Apr : updates from new data; 2 antennas showing less deflection in ch 1 only -- to be investigated; not much other issues.

19 Apr : no updates this meeting.

3 May : data available, but no plots (laptop crash)

7 Jun : work has resumed, and some tests done last week (Ankur not available); to check about C02 oscillation problem.

26 Jul : C02 problem : LNA replaced and unit ok; LNA works ok in isolation. no other updates.

23 Aug : Cas-A deflection less than expected for all antenna; ONLY Cas-A issue (also L-band); issues identified for a few antennas [11.7 dB expected; getting upto 10 dB]; C3 band-shape is a problem (all the rest OK band shapewise); plots displayed; spread in deflection for antennas is ~ 1.5 to 2 dB; plans to 'automatize' in Linux machine in coming weeks.

(iii) Summary of phase centre measurements and decision about future plans

25 Jan : no action yet.

15 Mar : still pending.

19 Apr : still pending

(iv) Quality check of the responses of sub-band filter and main BPF to be carried out

14 Dec : first round sub-band filter measurements done & needs to be repeated;

11 Jan : data collected, report expected within 2-3 days.

25 Jan : Sougata + Ankur will provide update next time.

22 Feb : SC will send update within a week.

15 Mar : some work is still pending; SC will complete and send within a week.

5 Apr : some tests done using OF monitoring system (seems not all antennas working and also varying behaviour) : summary from 10-12 antennas, 3 sub-bands (one corrupted by RFI) : some cases show narrower BW, and some show wider BW; for narrower BW cases, coating the PCB appears to correct for most of the discrepancy -- needs a short report on this; last 5 antennas have gone up with the coating -- should be able to cross-check the performance; need to find a solution for broader BW case !

19 Apr : quality check on 24 antennas done; about 4-5 antennas showing discrepant band for most sub-bands; FE team feels confident that this can be fixed with the coating option; to make a table for all antennas all sub-bands for user to decide what to be done; to fix as and when FE box comes down for other work.

3 May : report circulated; worst affected antenna identified; after ~ 3 months will be taken up;  
24 May : no new updates; can check around July.  
26 Jul : see item (i) above.  
(v) LO settings for all sub-bands etc to be finalised.  
14 Dec : 250-500 LO setting document / table already finalized;  
28 Dec : no updates; person on leave.  
11 Jan : astronomer feedback awaited (to check if final table shared with control room).  
25 Jan : Not yet shared with control room; to refine based on : 6 dB point for main BPF and 10 dB for subband filters, for the default BW.  
22 Feb : draft document has been circulated to DVL & YG for trials, for 3 bands (Band-3, 4 & 5); for Band-3 which shows max variation of sub-band responses, the basic response is taken as the one found in majority of units and 10 dB criteria is applied to that response to get the LO values; either lower or higher or both side LOs are recommended depending on the situation, and some justification has been given for all the cases; YG to check with DVL etc if this can be released to control room and all users.  
15 Mar : some responses from DVL + Nilesh etal -- some clarifications sent; some more tests to be carried out this week.  
5 Apr : no updates for this time.  
19 Apr : DVL and co to provide update by next week; can discuss 2 weeks later.  
7 Jun : FE team to check with JPK if control room is following a standard, recommended procedure.  
26 Jul : YG to check with DVL

#### 1.4 Common box upgrade (VBB/SSK) :

(i) Completion of box #2 with Rabbit and installation + testing at dish focus  
14 Dec : box no1 being tested today; later today planned to be put at dish focus (C-01); box no2 has CH-2 problem when monitoring turned ON (telemetry group is looking into it)  
28 Dec : one unit made ready and tested at antenna base (C01), including with online commands; then taken to the top and tested -- found one channel not being controlled for all bands (except 150 MHz); all other commands appeared to be working (to confirm if this was for both local as well as remote commands).  
11 Jan : box #1 all tests now satisfactory (only control, monitoring to be taken up later); box #2 was tested OK; delay value required to make things work is different in lab vs antenna (!) -- telemetry & control room teams making appropriate changes.  
3 May : box #2 MCM reset option & monitoring finished; to go to C01 antenna tomorrow (04-May-2017);  
24 May : replacement on C01 working ok; older one traced to interface card problem -- to be fully debugged; meanwhile spare new card will be put and made ready for installation  
7 Jun : faulty unit requires one IC base to be changed and can be used again; meanwhile waiting for new PCBs to come -- to see which vendor can do this.  
28 Jun : IC bases replaced with better ones - now that unit is working (unit used as spare & template for other ones)  
(ii) Plans for mass production  
30 Nov : for mass production, will use 2 nos for cycling; work order for mechanical plates etc to be followed up; once sample unit is shown to work at antenna focus, mass production can start; meanwhile, work request given to mech team; plans for laying fibre for eth connection also to be tried out; to check with Ops group about ability of switch between serial port and eth port (for ease of switching modes); shielded i/f connector for OF system is not available and PO folder for this is lost.  
25 Jan : one box tested at antenna focus and working ok; 2nd box not yet tested at focus; even for the 1st box, repeatability is not there.

19 Apr : ready to start the mass production and installation; may be able to achieve 2-3 weeks per box in long run after first 2-3 boxes; to coordinate with Ops group for supply of Rabbit in shielded box. Also to do the R&D for getting the ethernet control option tested and going and put it into mass production -- this needs an extra input port on common box -- agreed to use 50 MHz port for immediate and redesign the plate for additional input port and put into new boxes as and when ready, without affecting the rate of mass production of common boxes.

3 May : x2 boxes in wiring stage; x1 box per month initially (later one box every 3 weeks); redesign of band-selector & interface card completed; mass production can begin now

24 May : to go ahead with the plans, introduce new cards into system as and when ready; and retrofit the new cards in older systems later on; transobs PCB also to be included in the above.

7 Jun : to get the set-up going and then decide on the priority.

12 Jul : one box was made ready and taken to C02; stopped working after some amount of testing at antenna base -- brought back to lab and being debugged; agreed to put some additional manpower (Vishal) from Band-3 team into this work (esp as VBB not available).

26 Jul : current status : original unit on C01 is down with "band not setting" problem (stuck at Lband) -- to be debugged in the lab; meanwhile old MCM based CB is being put on C01; unit for C02 : problem traced to bad cable (external); unit now ready to go back to C02 (waiting for better weather); unit #3 waiting to be tested with interface card; additional person (Santosh) to help in the work.

9 Aug : original box was put back on C02 and gave same problem after 3 days of working; tried with power on-off etc; brought back to lab and working ok again -- to test more thoroughly with full load of all FE boxes etc; meanwhile, put 2nd box on C02 to see if it works stably there -- if it fails, to put it on another antenna... further, to check if further acks can be added at different stages.

23 Aug : Faulty common box from C1 (which did not show any issue in lab even after 'loading' fully as in Ae) will be tried on another antenna.

#### 1.5 Apex radiation scheme (PAR/SRoy) :

- (i) Current status of measurements and interpretations
- (ii) Plans for next steps to be taken

30 Nov & 14 Dec : not discussed

28 Dec : email update from PAR : measurements for ampl & phase variation wrt elevation completed for all bands using C10. There is some disagreement about interpretation of data between PAR and SRoy, as to whether there is a systematic variation with elevation or not -- need a discussion to resolve this matter. Meanwhile, PAR would like to try the measurements on another antenna to check for repeatability.

11 Jan : no updates, though there has been some email discussion between SRoy and PAR

25 Jan : need to check with SRoy and PAR.

15 Mar : PAR and SRoy yet to have a detailed discussion; meanwhile another round of tests done on C1 -- showing a different pattern than C10. Need to summarise and circulate and then take up for discussion.

19 Apr : no updates, though some ongoing email dialogue between SRoy and PAR...

24 May : discussion between SRoy and PAR -- some conclusions have been reached and some action plan has been worked out between them : to circulate a brief note summarising these (as well as dynamic range measurements summary and plans), while follow-up action continues.

28 Jun : report summarizing all the work carried out so far has been prepared; yet to be circulated; report displayed and discussed : sensitivity 250-500 MHz -147 dBm (cone dipole); 1dB compression point (P1dB) : 1dBm (old); 10dBm (new); temp effect 0.2dB (amp) & 2 deg (phase) due to FES & RF (stability); transmitting RF power recommended :  $\geq -40$  dBm &  $< -10$  dBm;



ELV /AZM dependence : 0.5 dB (amp) & 8-10 deg (phase) (tests done on 5 antennas total);  
another report for log-periodic antenna set up (separately)  
26 Jul : need to follow-up on the short summary circulated by FE team (check SRoy).  
23 Aug : still expecting astronomer feedback

#### 1.6 Walsh related matters (SC) :

(i) Confirm status on all 30 antennas (S4 & S6 were not working at last report) :

Walsh is supposed to work only for the antennas which have the old LO system and not for ones where new FSW based system is being installed. This is because the control CPLD for FE Walsh is decoupled etc etc...

(ii) Plans for regular maintenance & tests (as common box is upgraded)

30 Nov : S4 is also functional, only S6 needs to be checked; Walsh bit is checked in lab as part of standard clearance.

28 Dec : both S4 & S6 are now working (tested at L-band); agreed that all 30 antennas are now cleared; agreed to prepare a SOP for regular tests to be done by control room which can then be included in standard PMQC test set-up for long-term monitoring of health of Walsh switching.

11 Jan : there is some confusion about what is being done, and what has been achieved !  
For 10 antennas which have new 1st LO system (LOFSW based units), it should NOT be possible to have Walsh modulation at present !

Need a wider discussion about M&C for new system for these aspects related to Noise and Walsh...

22 Feb : now clear that only those antennas (20 ?) which DO NOT have the new synth units can be tested for Walsh; latest tests on these (done in Jan), showed ok results for 19 out of 20 (one antenna was down due to mech problems).

15 Mar : no immediate action here; need to work out with analog BE team (see action item below).

#### 1.7 Polarisation calibration of upgraded systems (SC/?)

(i) To set up a procedure for regular polarisation isolation tests

30 Nov : reg poln isolation tests are being done for upgraded systems also, and results have been found useful for Band-3 system;

28 Dec : part 1 is control room tests -- need SOP in discussion with Ops group; 2nd part is FE team testing for antennas reported bad; joint discussion with Jayprakash : agreed to work on modifying the existing procedure for the uGMRT band, starting with the 250-500 Band-3 system.

22 Feb : SC to check with JPK about the progress on implementation of the SOP for use by control room in normal PMQC type of tests and generation of stats to report to FE team.

15 Mar : control room people (JPK and SNK) are looking into the code written for GSB to see if it can be done for GWB.

5 Apr : SC to follow-up with JPK on the matter.

19 Apr : code has been obtained and possible issues in it have been identified; to see if the job can be taken over by control room colleague.

24 May : to see if a discussion with JPK + SN + ICH can be had on this matter.

7 Jun : to organise a joint meeting, maybe week after next.

28 Jun : programme for narrow band system needs to be edited for broad band system

26 Jul : SC is looking into modifying the code himself.

(ii) Discussion about possibility for feed + dish modeling

30 Nov : SC to prepare a short concept note about the possibilities of doing the calculation for feed + dish modeling and what can be learnt etc.

28 Dec : SC not prepared for a discussion yet -- can take it up next time.

22 Feb : to plan for the discussion.

15 Mar : agreed to make a presentation on 20th in the poln meeting.

5 Apr : presentation showed reasonable results; action items : to compare feed response with WiPLD results of HRB; compute 3 dB BW vs freq for Band-3 for feed + dish and compare with observed results; need a software with finite element method approach for this simulation -- Antsys or Fecko; to check availability in different places in and around Pune.

19 Apr : no new updates right now.

24 May : SC to follow-up and report back.

7 Jun : no updates.

26 Jul : no new updates.

23 Aug : code modified; tests needed; update in ~ 3 weeks;

1.8 Miscellaneous issues related to filters :

(i) Installation of 1650 LPF : CSQ antennas completed; arm antennas was ongoing

16 Nov : arm antenna installation to be resumed;

14 Dec : all west arm will be completed by 16-Dec-2016;

28 Dec : E-arm completed; W-arm done 3 out of 6 antennas; will finish W-arm and S-arm by end of Jan. Some discussion about characterising the improvement; can check the Lband data with range going upto 1800 MHz and compare antennas with and without filter.

11 Jan : S1 & S2 completed; remaining 3 S-arm antennas to be done by Jan-end; one antenna in W-arm is also remaining (W1).

25 Jan : only 2 antennas W-arm remaining to be done.

3 May : only one antenna (W2) remaining

24 May : to confirm if all antennas completed or not.

(ii) delivery of remaining units of main L-band BPF from Epitome

16 Nov : BPF completed and handed over to BE team -- this can be closed.

28 Dec 16 : can be closed.

(iii) Switchable notch filter at Rx room :

19 Jul : live demo of switchable notch filter at Rx room (in C09 antenna path) -- can switch in different filters -- appeared to work fine; in the process discovered that mobile signal is coming through quite strong in the Band-3 signal (!!); needs to be checked and understood.

2 Aug : agreed that the analysis needs to be done to identify the nature of the problem and then look at possible solutions;

for longer term planning to explore options for limited installation for some (worst affected antennas).

1.9 OF system updates :

(i) Pending issues with existing OF system

28 Dec : some spare units that were pending are being assembled.

11 Jan : current spare status : 5 nos RF PIUs; 3 nos OTx; 3 nos ORx.

15 Mar : this is status quo; few extra high power lasers at 1310 nm for forward link have been procured; cards being made ready; will be used as and when loss becomes too large in far away antennas.

3 May : high power lasers (5-6 nos made ready) and available for use; for, W6 & S6 such lasers already installed about one year ago;

24 May : some evidence of loss of power of laser transmitter (1310 nm) at Rx room causing problem in telemetry link; needs retuning of laser circuitry; will be taken up one by one -- this is in addition to need of high power lasers for far away antennas.

(ii) Procurement of cable, equipment etc

23 Nov & 14 Dec : no updates

28 Dec : for cables, PO is gone; delivery is expected soon (?); OTDR procurement is on-going : order has been placed.

11 Jan : cable has been delivered, tested OK; one more indented raised for additional stock; 28 Feb expected date for OTDR.  
15 Mar : expected by end of this month.  
5 Apr : OTDR not arrived yet; second fibre bundle ordered but not yet delivered.  
3 May : OTDR has arrived; second fiber bundle has also come;  
24 May : OTDR working well; 2 km fibre bundle arrived; 20 km spools : 3 nos were found bad and have been sent back to the vendor in US -- need to follow-up on it.  
28 Jun : bad cables being sent back to vendor in US  
26 Jul : for the spools : vendor is sending the 3 replacement units; new OTDR is working fine -- item can be closed.  
9 Aug : replacement spools have not yet reached.  
23 Aug : Spools have arrived;

(iii) 8 Gbps GMRT to Pune link : it was found that only 1 or 2 Gbps was working;  
25 Jan : detailed debugging has been done by OF team and now it appears all the 4 wavelengths and hence 8 gbps lines are functional -- only one wavelength is marginal (to order spares for taking care of such issues); also remote monitoring facility at Rajgurunagar with SMS facility to be activated.  
15 Mar : spares have been ordered; monitoring unit is ready -- small change needed in software and then can be installed.  
5 Apr : not yet installed, waiting for Rahul Bhor.  
24 May : spares for the links have arrived and are available; monitoring unit is now ready for use; some changes in IP address needed in units at Rajgurunagar to activate the system; also some spare cards are needed to make things fully functional at all locations.  
26 Jul : new unit for remote monitoring not yet installed; spares issue may be ok.

(iv) Contract with BSNL for dedicated GMRT to NCRA fibre to be renewed as it is 5 yrs old. OF team to circulate the preliminary docs to all concerned in NCRA for clearance before sending ok to BSNL.  
26 Jul : SSK need to check with admin about (i) clearing of bill and (ii) signing of new agreement.  
9 Aug : in touch with BSNL for new lease doc (Mar 2018 onwards) for dark fibre; meanwhile payment of charges for 2017-18 have been paid.

## 2. RFI related :

### 2.1 Spectral line RFI (PAR/SSK) :

#### (i) Update on cable TV problem

23 Nov : letters have been sent; to follow-up after couple of weeks  
28 Dec : RFI team visited Junnar cable TV operator for getting response to letter that was sent to them -- they are claiming no responsibility for actions of the local cable TV operators. This needs to be followed up with admin for appropriate action.  
25 Jan : discussed with Jondhale -- he will speak to the party and see if some progress can be made; otherwise to escalate the matter; also to estimate the number of splitters etc that can be provided to W-arm operator to mitigate the problem.  
28 Jun : shielded cage designed for laser Tx & RF amp devices : field test in progress.  
9 Aug : appears to work well; need detailed report and then follow-up action with parties.  
(ii) Digital TV follow-up  
23 Nov : letter is still pending !  
25 Jan : need to expedite the matter !  
9 Aug : letter had been sent some weeks ago; PAR to follow-up in person and report back.  
(iii) monitoring new lines

23 Nov : 402 MHz line in SW direction -- trying to locate the source  
11 Jan : 402 MHz identified as weather station Tx to s/c from Talegaon & Rajgurunagar.  
25 Jan : need a site visit to understand better.  
3 May : new RFI line (set of lines) observed at 467 MHz ! (need to identify the source)  
24 May : for 402 MHz line : trying to identify any relevant weather station that fits the bill (!) -- needs some more work; for 467 MHz lines, still no clue.  
28 Jun : initiated dialog with IMD : letter requesting tests at their premise  
26 Jul : 402 MHz RFI : current understanding is that the offending transmitters are from the weather stations in the west direction (rather than SW) -- RFI team suspects it to be coming from Mumbai (!); transmit is only at some times of the day; discussion with IMD Mumbai --> IMD Pune (to follow-up) and also to ISRO for more details about the tx system. 467 MHz : no clue (appears to come from all directions).

## 2.2 Satellite RFI monitoring & avoidance system (PAR/SNK) :

(i) Update on present status for different kinds of satellites : GEOs, GSOs, GPS, LEOS...

23 Nov : GSOs and ,, GPS (US) tbd for other GPS constellations; confirmed that regular cron job is running in control room, but need to check about alarm for LEOS (appears that alarm did show up in the log data?)

25 Jan : need to follow-up on identifying for LEOS.

(ii) Tackling MUOS satellite

23 Nov : to cross check footprint & angle of avoidance (may need 10 deg or more?)

25 Jan : new limit is about 8 deg -- to cross-check if ok and close.

(iii) Plans for sending information to back-end receiver chain

25 Jan : to check with Santaji about the plans for this

(iv) Providing the facility to other interested observatories, including SKA

23 Nov : some discussion has happened, to be followed up next week

28 Dec : no updates.

25 Jan : to include in the plans for visit by Nick Rees in week of 6th Feb.

24 May : some of the pending jobs : need to characterise some of the remaining satellites.

26 Jul : no new updates.

9 Aug : problem for sources with +ve declination pointed out by YG and fixed by SNK.

## 2.3 RFI from power lines and transformers (PAR/RVS) :

(i) review current status

(ii) specific follow-up actions

23 Nov : not discussed

25 Jan : no updates.

24 May : this activity needs to be revived.

6 Sep : Update on powerline RFI : new survey done in S4, S5, S6 region; 25 out of 40 of the 11 kv -- 440 v units found bad from RFI point of view; to identify the worst offenders (including nature of problem) for follow-up by electrical team; to do a comparative study with previous survey of this region and report the findings from that.

## 2.4 RFI from LED lamps (PAR/RVS) :

(i) Statistics of failures of existing units

14 Dec : no updates so far from electrical team.

28 Dec : electrical team reminded about it.

(ii) Follow-up on attempt to understand circuits for RFI friendly units and check with vendors.

23 Nov : appears too difficult to shield the RFI from the bad units; need to identify units with separate PCB ckt for driver, which can be shielded.

14 Dec : some dry-solder issue seen (after fixing, the LED lamp worked; in one case);

21 Dec : appears that there is no success in shielding attempt; but LED tubelight

driver has been made RFI-free -- to discuss plans for further follow-up.

28 Dec : LED tube lights (20 W) from Syska and Philips investigated : latter has less intrinsic RFI; taken up for isolating the driver circuitry and putting it inside a shielded enclosure with AC & DC filter connector arrangement -- this appears to give acceptable RFI levels. RFI team is procuring 3 more units of Philips LED tubelight for similar modification and then use in the OFC lab for checking longer term behaviour.

4 Jan 17 : 4 units of 20 W LED tubelight procured from Philips; LED driver ckt separated in a shielded box; results show acceptable levels of RFI -- almost like power off levels; units tested with upto 10 m long cable between driver box and LED lamps; scheme is suitable for labs; to ask for a formal report on the scheme, and then take up for final discussion and adoption.

25 Jan : report has been circulated; solution looks promising; to try for compact version of the solution; working with workshop to mechanical items; will need to order some components for bulk production.

08 Mar : LED panel/ tube light shielding : report generated on tests - broad band radiation from commercial units (x4 units in one box) - shielding is ~ 75 dB ; results appear encouraging; Syska (x1 22W), Philips (X4 20W); -150 dBm final number arrived at high failure rate of LEDs due to voltage fluctuations;

11 Apr : new model of LED light identified with very low level of RFI (none at all !?!) Hi-Lite 15 W; sample unit of this LED panel displayed; agreed to procure a few units and do a thorough follow-up.

26 Apr : demo of RFI free LED lamp 15W done (in lab, x5 units have been assembled); plots of RFI from LED lamp displayed : 15W (5 units) ; 26W (1 unit) HI-LITE 15W unit's RFI (ON & OFF) identical noise floors; similarly 26W lamp also shows RFI same noise floor for ON or OFF; also tested at all GMRT band : clean (no lines); upto -130 dBm level; conclusion : 15W units can be used for corridor lighting

3 May : x5 LED lamp (15 W) units installed in corridor

24 May : no RFI seen when 5 nos of 15W lights used together; can we decide about this? main question is about establishing best levels and also absolute calibration; for the first, can try with higher gain amplifier; for the second, to complete the exercise of mapping the power levels to antennas.

28 Jun : pending acceptance of LED lamps (already used in corridor), bulk order can be placed.

26 Jul : 5 units have been in use for ~ 3 months; agreed to do one more test to see if any degradation is there; and then take a final decision, folding in estimates of absolute power level.

9 Aug : agreed to go in for a purchase of 5-10 more units.

2.5 UPS RFI related (PAR/RVS) :

23 Nov & 14 Dec : not discussed

21 Dec : today (21-Dec-2016) improved UPS is under test; vendor made changes to one unit; if successful, he will make similar changes to remaining 9 units; to check current status.

28 Dec : improved unit passed the test; all 10 are now modified accordingly and tested; 8 are found to be acceptable, but 2 are still showing higher levels of RFI -- this needs to be resolved; however, shielded cable is needed at i/p and o/p for all units -- NCRA to procure and add to the installation; last batch of 10 + 4 spares to be ordered. RFI team to circulate report.

4 Jan 17 : all 10 units modified; RFI tests carried out on 8 of the 9 newly modified units -- all are ok. Need follow-up as mentioned on 28 Dec.

18 Jan 17 : all 10 units tested and cleared; now OK to use this 2nd batch of 10 units in antennas; need follow-up on status of ordering last batch of 14 units.

25 Jan : matter closed for now from RFI team side; to take up when next lot comes.

12 Apr : indent process for the last lot was held up due to issue of exact specs for RFI related properties (!); finally, agreed to go ahead with the existing clause as likely there will be one round of modifications needed if some specific part is changed by the vendor. Electrical team to expedite the paper work.

24 May : to check status with RVS.

### 3. Operations related :

#### 3.1 Mass production of shielded boxes for Rabbit card and network switch (CPK/SN) :

##### (i) procurement of problem PCB

23 Nov : 5 nos of sample PCBs received -- found OK; repeat order planned for 80 nos.

28 Nov : still waiting for 80 nos PCBs to come.

11 Jan : 84 PCBs received; can go ahead with further assembly now.

25 Jan : this can be closed.

##### (ii) status of mass production of Rabbit card enclosure

14 Dec : 6 boxes ready (70 more needed);

28 Nov : 10 boxes ready, 6 with new PCB; 4 with old PCB; further work stuck for 80 PCBs to come.

11 Jan : 6 more boxes ready (total is 12) -- old PCBs replaced with new ones.

25 Jan : Rabbit card enclosure now going smoothly : about 2-3 per week; to send some samples for RFI testing.

22 Feb : 18 are done; 19th ongoing.

15 Mar : 23 completed; one unit given to RFI team for measuring shielding.

5 Apr : going on track, will finish all 30 by April end.

19 Apr : Ops group to talk to FE group to start regular supply of Rabbit + shielded enclosure for installation and commissioning of common boxes for antennas.

3 May : x28 boxes are ready & tested; can be handed over to FE whenever asked.

28 Jun : stock of tested MCM cards was over; 1 new card tested

12 Jul : 30 units are ready now. MCM cards are being tested in Lab.

26 Jul : testing of Rabbit MCM cards ongoing (4 out of 30 are completed).

23 Aug : so far x38 units tested OK; [final number 60]

##### (iii) status of mass production of network switch enclosure

23 Nov : 28 units ready (need total of 35)

14 Dec : now 32 (of 35) ready;

28 Dec : same status of 32 out of 35.

25 Jan : 32 out of 35 completed; remaining 3 are in use and will be done when free; meanwhile, to send a few samples for RFI testing.

22 Feb : some sample unit(s) has been given to RFI team for testing -- Raj to confirm; to check if all shielded connectors are procured or not.

15 Mar : samples have been given and tests are being carried out today.

19 Apr : confirmed that all 32 boxes have shielded connectors; to check with RFI team about results from RFI tests of integrated system.

7 Jun : to confirm with PAR about the report.

28 Jun : 3 have been used in lab.

12 Jul : still waiting for report from PAR.

26 Jul : reminder to PAR.

23 Aug : report of RFI test still awaited !!

#### 3.2 Work on final configuration at antenna base for space, UPS, RFI etc (JPK/RVS/PAR) :

##### (i) status of first 2 model antennas (C00 and C10) -- what has been done and what is still missing

23 Nov : C00 & C10 are mostly complete (item could be closed?)

28 Dec : RFI related issues are pending : from RFI fingers on doors to RFI shielding

at punctures. issue of back-up from UPS discussed and plan for control room to detect time on UPS and initiate procedure to shutdown the PC.

(ii) plans for going beyond 2 antennas

23 Nov : mechanical has completed 9 or 10 antennas; 6 are complete with all changes (?)

28 Dec : mech has done total of 12 antennas -- need more antennas with UPS work done ?;

elec to check if mech can continue with xmer shifted without UPS work; electrical rewiring work and shifting of items : RVS to check and confirm how many antennas done and update the spreadsheet; FE team to confirm the shifting of FE power supply on antennas where it is relevant and update the spreadsheet; Ops group has equipment in 6 of the 12 antennas; to check the progress with servo explicitly (looks they may have done the first 10 antenna) -- to add one column for them in spreadsheet.

11 Jan : mechanical completed for 10 antennas; electrical completed for 13 antennas; Ops group has final version installed at 6 antennas; waiting for Rabbit & software upgrade (Fedora --> Ubuntu) by 1 Feb; 3 antennas stable M&C (Ph-1) to be completed.

25 Jan : mechanical has resumed work; same for electrical; will be updating spreadsheet; column for servo has been added in spreadsheet -- to remind them to start updating;

15 Mar : mech has completed 13 antennas; electrical has installed all the UPS units (23), other changes need to be checked; servo has completed 10 antennas.

5 Apr : 8 antennas completed for M&C systems; 3 extra Miltec to be tested; 4 are non working -- being looked into (total of 15 Miltechs); apparently no change in status of other systems (mech, elec, servo) -- JPK to check and follow-up.

19 Apr : servo has completed 15, electrical has completed 23, and mechanical has done 13 antennas; M&C system on 8 antennas, 2 more are ready + 1 in testing in lab; Ops group needs 5 nos of 2 TB disks and comp group has provided 2 nos -- to arrange for ~ 10 nos of 2 TB disks.

3 May : x5 total disks (2 TB each) were given to OPR group; x2 used to replace old disks ; x3 available for any application

24 May : 10 antennas completed for M&C system installation (+1 in lab), including putting the new disks into use -- can go ahead for useful testing with this system (see alternative week agenda).

7 Jun : 15 antennas servo to UPS rewiring completed; mechanical will pick-up after 15 June; M&C installation still at 10 nos.

28 June : x16 units with servo UPS connected; x14 units with Mechanical connected; M&C still has x10 systems;

12 Jul : S02, C03 and C04 have been completed by Mechanical group. Very soon we will install our hardware in those antennas.

26 Jul : electrical, no progress after 23 antennas (2-3 months); mech has completed 17; servo has done 19; Ops group has 7 antennas with all sub-systems and trying various tests; Miltech in 10 antennas, will grow to 13 soon; remaining supply of Miltechs will come by end of Aug. 1 Miltech to be used for correlator LMC.

--> integrated testing (in recreation hall) of final antenna base set-up shows some RFI still from new batch of media converters; to try to buy a few of another batch or another make; shielded enclosure for media converter (100 Mbps) for FE control.  
23 Aug : mechanical completed x20 Ae; servo UPS x21 Ae; Ops shielded PCs x12 Ae; All Miltech PCs (x19) to come by end-Aug (confirmed by supplier).

(iii) update on improved RFI shielding at antenna shell

23 Nov : shielding test measurements done for present configuration; awaiting finger-lines to be added before repeating the tests (which antenna?)

28 Dec : folder in process for placing order for the finger-lines.

5 Apr : no updates.

26 Jul : finger-lines have come and being assembled on door of one sample antenna and then comparative test for leakage to be done; then next target is connections going from shell to antenna focus (non-RF connections).

9 Aug : to follow-up with Nandi for the fingers.

### 3.3 Long-term plans for installation and release of final M&C system :

(i) growth plan for populating antennas with the systems

28 Dec : Ops team has a plan for this; can be discussed in detail next time.

11 Jan : final plan placed on web portal (for lab people)

19 Apr : 8 + 2 + 1 units as given above; further growth constrained by availability of Miltech PCs only.

24 May : now populated on 10 antennas and using 2 Rabbits at antenna base for controlling servo, FPS, OF, FE, sentinel (tested concept) to test shortly with new version of LMC s'ware (but old CMC s'ware); need some cooperation from servo for changing PC104 from serial to ethernet upon choice (discussed with SS and he will discuss with Thyiagarajan); for parallel connections to other systems, some further planning is needed.

28 Jun : see above

26 Jul : servo modification is working fine; see above for other details.

(ii) plans for switch-over -- to make it as seamless as possible.

30 Nov : two main scenarios considered at some first order detail; Ops team to generate a concept note for the 2 main scenarios with pros and cons clearly mentioned and timelines also.

28 Dec : Ops group can circulate a concept note in 2 weeks time, in time for next meet.

25 Jan : can defer till after the demo.

22 Feb : Ops team appears to prefer scenario 1 -- incremental approach; to generate a note within next 4 weeks on this.

15 Mar : still pending for team to send a draft doc.

5 Apr : still pending.

19 Apr : can check again with Ops group next week, for a possible discussion 2 weeks later.

26 Apr : discussed draft document produced by Ops team on long-term plans for installation of new M&C system; general agreement for incremental approach noted; next level points to be addressed discussed -- doc to be updated with these and taken up for discussion...

3 May : incorporating points that came out from discussion into the change-over-plan note.

24 May : updated doc has been circulated; can be taken up for detailed discussion next week; meanwhile useful discussion on how to coexist between MCMs on RS485 bus and new system;

7 Jun : updates about the discussions and outcomes from GSG meeting; more discussions about details of the plans going forward are needed.

12 Jul : Points will be added to the documents, whenever new things will come up.

26 Jul : may need to flesh out some of the points in due course.

23 Aug : Raj has circulated a note (about plan); discussion yet to happen

### 3.4 Procurement of central switch (CPK/JPK) :

(i) Specifications to be worked out (by Computer group)

14 Dec : HP layer3 switch finalized; bid getry quote Rs 3.5 lakh; indent prepared.

11 Jan : item can be closed.

(ii) Plans for procurement

23 Nov : Mangesh has identified HP make layer-3 manageable switch (48 port); specs being studied.

28 Dec : indent raised.

25 Jan : procedural issues related to advance payment etc...

22 Feb : not clear if this matter has been resolved before Charu went on leave...

15 Mar : need to check with Charu.



5 Apr : HP make layer-3 switch has no issues about advance payment and order has been placed and delivery expected by end of this month; the advance payment problem was for SFP adapter -- this needs to be resolved.

19 Apr : matter is resolved and delivery is expected by end of this month.

3 May : switch has arrived at Pune

24 May : item has been tested ok; can initiate the plan to put this in the M&C rack and shift antenna eth connections to this switch (instead of OF group's switch) and start using this arrangement.

28 Jun : under test in Rx room (by Santaji)

12 Jul : Testing has been completed for the switch. We will first put one test LMC on that switch.

26 Jul : tested switch configured and allotted 40 sub-nets.

23 Aug : procurement over; installed & usage in progress

### 3.5 Interfacing and control of new systems such as Noise Cal & Walsh :

For 10 antennas which have new 1st LO system (LOFSW based units), need to be clear about the control path; also 2 of these antennas have independent MCM for driving the new CPLD; need a wider discussion about M&C for new system for these aspects related to Noise Cal and Walsh.

22 Feb : need 2 CPLDs in new set-up : one for new FSW LO, one for Walsh + Noise on-off etc, and both can't be connected to MCM 2 and hence an additional MCM is needed. To find out a way around this issue, so that progress can be made...

15 Mar : 2 options are being explored by BE team without increasing the number of MCMs from present count; some prototypes are being tested and will be reported upon shortly. For the longer term, need to see if antenna based Rabbit card can fulfill these roles.

3 May : tests with different interfaces done; avoiding additional MCM (beyond x2 MCM) successful [but with OLD MCMs]; in new MCM, use of control pins of MCM used for sentinel will suffice.

24 May : summary issues : if any M&C system takes control of the RS485 bus then it can meet any MCM requirements -- this may be the way to go for the final M&C system; finally, the functions that are needed for uGMRT only (noise and Walsh related) will have to shift to Rabbit card -- whether capability exists in the single Rabbit at antenna base needs to be confirmed.

28 Jun : agreement reached to use existing rabbit card instead of MCM2

12 Jul : Documents has been shared by JPK regarding Rabbit IO pins.

### 3.6 Update on Rabbit Card in Common Box : follow-up from discussion of last week to track the progress and latest situation...

19 Apr : FE team plans for roll-out discussed above; Ops group to provide required number of Rabbit in shielded card; main remaining task is to get the FE monitoring working on the Rabbit interface to FE system : CPK has been doing some debugging to get to the bottom of the problem; JPK and CPK to sit together to see if earlier work done on 15m with Labjack for similar control of FE system can help.

3 May : points closed; new box being out on C01 (at the antenna base tests were successful; now going to turret (today itself; 03-May-2017).

28 Jun : replicating other boxes; x2 boxes to be ready [& then to be shifted to antennas]

12 Jul : Two Boxes are ready. FE people are testing boxes in lab.

26 Jul : no new updates from Ops group.

9 Aug : detailed discussion about the problems encountered and plans for tackling.

23 Aug : fault traced to leaky capacitor; now fixed & working fine; Rabbit MCM with upgraded Common Box installed in x2 Ae (C1 & C2); No repetition of leaky capacitor issue;

#### 4. Back-ends related :

##### 4.1 Analog Back-end related issues (NDS/SG/BAK) :

(i) Improvements in LO generation scheme -- current status and future plans

23 Nov : tested ADF-4350 system; found to be good, compared to FSW unit; test report in internal circulation; to work towards implementation for 2 antennas in GAB.

14 Dec : PIU wiring in progress - in a week to finish;

28 Dec : wiring completed; testing in progress.

11 Jan : one antenna system built and tested ok; meanwhile, identified another device (ADF-4351) which has better range on the lower side; can be used on the same PCB but needs extra software; will be testing the sample unit in the near future; accordingly, final ver of the report can be held off till the above new venture is completed.

25 Jan : s'ware work for the above is still in progress.

15 Mar : still in progress, no new update.

5 Apr : phase jump problem requires use of 4350 IC circuit -- this has been tested in GAB on one antenna both pols and found to work OK; need to repeat same test with 4351 IC also and then bulk order of 4351 IC can be done (will take about 2 months); will need modified CPLD based ckt + software for using 4350/51 at antenna base as 1st LO for legacy system.

12 Apr : follow-up discussion with users like NK indicates that higher priority for having GAB + GWB uGMRT working without phase jump on switching, and solving the problem for legacy GMRT can be lower priority; accordingly, 2 possible solution options discussed for uGMRT : (a) have 2 signal generators set for the 2 frequencies needed and switch their output to the common LO signal line on the switching command (b) have one unit of the new 4351 IC completed with proper control logic to act as the single source of common LO; agreed to aim for option (b) on time scales ~ month or so.

3 May : x1 ADF-4350 system ready (tested in lab) with switchable freq & power level attenuator; characterization in progress with web-browser (from ONLINE); but need command line functionality (Jitendra had to do); next, ADF-4351-s needed for individual antennas.

24 May : only new command in online has to be created -- JPK will look into it next week; meanwhile, option to switch DDC LO to achieve the freq offset is also being developed and cmd line interface for this has been made ready; both options can be released together in few weeks to the user; team can now start thinking about soln for 1st LO for the antennas.

28 Jun : DDC LO switching has been developed & tested; samples for components needed for 1st LO have been received.

23 Aug : at present : x5 units of ADF-4351 based system are under test using 'online' ==> GAB main LO switching (with memory) is working and released -- need user level tests and feedback; also DDC LO switching for spectral line work is available (NK is to write a user level SOP for this); for individual LOs to be replaced for (a) GAB LO for each antenna (each poln) -- need 60 units of ADF-4351 and (b) for 12 antennas 1st LO -- need 12 units only; to give priority for GAB replacement and to see if 30 nos are sufficient for doing all antennas to speed up the process.

(ii) Completion and release of input side filters

23 Nov : installation for 30 antennas (all bands) completed; testing in progress.

14 Dec : testing completed; power level adjustment for direct vs filter paths in progress (2 weeks to complete);

28 Dec : installation and testing completed (cmd is available in control room); fixed attn in GAB being reduced by 4 dB to compensate filter loss.

11 Jan : one rack modified (4 antennas) and systems being tested; will report shortly, and if everything ok, will go ahead with the mods for all the 8 racks.

25 Jan : same status as above; test report has been circulated internally.

15 Mar : will complete the modifications for all racks in MTAC; meanwhile, the filters can be used with unequal gain in different antennas; command is available to control room and can be tried.

3 May : completed and released; can be closed.

(iii) Completion of 60:1 system and release for use; final report

23 Nov : draft report in internal circulation.

14 Dec : changes to DRAFT report in progress;

11 Jan : still in progress -- not ready yet.

25 Jan : no new updates.

15 Mar : no new updates; BAK to check.

12 Jul : 4350-based system available for 1st LO for GWB with web-based control; work ongoing to have option for cmdline control; 4351-based system : 5 units are ready;

100 ICs have come; modification of the s'ware required for this unit is going on;

also CPLD s'ware needed for control of this unit at antenna base.

26 Jul : for cmdline control of 1st LO with 4350-based system -- DKN to talk with JPK to understand the simple solution and try to implement.

(iv) MCM-2 at antenna base : Originally, Full FE control via MCM2, including control of CPLD that used to take care of all aspects of noise and Walsh.

Now : would like to have an independent set up via MCM4 for control of new CPLD that does the required tasks for noise and Walsh. Already developed for all 30 antennas -- agreed to activate this.

In long run, role of MCM4 to be taken over by antenna based Rabbit -- supposed to have provision for it -- to initiate discussion with Ops group for prototyping.

23 Aug : need wider discussion about MCM (> 20 Ae NOT working because of changed system) !

BAK, Navnath, Sweta ... + FE

BE inputs : completed mass production of MCM4 units dedicated for FE & Walsh parameter control; Walsh functionality is fully supported in MCM4 -

just needs to be turned 'ON' [awaiting policy decision step only].

====> installation of new MCM-4 based units progressing smoothly; will complete all 30 antennas by this week; next step would be to try the prototype with Rabbit based control, in discussion with Ops group (BAK to coordinate with Ops group).

4.2 Power equalisation scheme and related topics (BAK/SRoy) :

(i) Completion of attenuator testing and release of report

23 Nov : report under revision

28 Dec : still pending completion.

11 Jan : still pending

25 Jan : revised version circulated internally.

(ii) Status of different modes of power monitoring & equalisation scheme, including formal release for users

23 Nov : SRoy to add options related to averaging time, ALC etc...

14 Dec : not discussed.

28 Dec : SRoy to send updates to Nilesh regarding crashing of the program; couple of weeks for SRoy to release the option for automatic correction; to look at option for efficient script (with JPK); looking at prospects for having plotting and display front-end (similar to new 60:1 monitoring) -- BAK to check with Ganla and Nilesh about the feasibility and then call for a bigger meeting with SRoy etc.

15 Mar : BAK to check and get back.

5 Apr : Atul has initiated the discussion with control room colleagues; SRoy + Nilesh discussion now has the basic code working and SRoy is doing some testing and debugging and will report the result in few weeks, after which one could talk about releasing the package with the different modes.

3 May : only plot routine remains (discussion pending - may happen today itself)

28 Jun : SRoy : gave gain tables, which need to be merged into FITS file (by SSK).

12 Jul : SRoy has made an option made ready for plotting the total power o/p for last 4 hrs in a running mode -- will try to release shortly for use; 2nd update is about the update of attenuator values to GAB : response time for setting has now come down from ~ 2 mins to ~ 30 secs, after the changes made by JPK; however, there is a problem of occasional failure of the setting algo and the ack not coming (quickly enough) from the GAB controller.

#### 4.3 Updates on existing GWB-3 system :

(i) completion of DDC related works :

16 Nov : DDC correction seems to be overcorrecting -- Reddy to share the bandshapes;

30 Nov & 14 Dec : still awaiting updates from SHR

28 Dec : sample correction curves looked at ; to try geometric mean or something similar -- somebody in the lab can help.

4 Jan -- 12 Apr : no progress on this, due to work on release of 30 antenna system.

5 Apr : meanwhile, new item that needs to be checked is report of spurious lines in the spectrum by NK; SHR to look at the data and then discussion can be had next week.

12 Apr : agreed for BE team to repeat noise source tests and check carefully for spurious lines; then repeat with sky signal as needed.

26 Apr : not much updates, except that tests are being planned next week for testing spurious lines in zoom modes.

3 May : for spurious lines : using correlated noise fed to 4 inputs : no spurious lines seen; conclusion : GWB-3 is not the culprit; for bandshape correction : geometric mean NOT used; sqrt( previous coeff) giving good results; may be finished within this week.

17 May : DDC related updates :

(a) bandshapes for sub-bands : correction scheme explained where it tries to match with the original full band bandshape to determine the correction factors (including correction for intensity to voltage domains) + very sharp cut-off at 6-dB aliasing point -- to try slight refinement of killing completely near the edges and release for users.

(b) spikes in DDC : 100 MHz noise fed to ADC directly shows no (extra) lines in DDC output; same needs to be tested with signal given at GAB input etc to rule out source of spurious spikes in digital back-ends; need to check repeatability.

24 May : for shape equalisation, some fine tuning being done by SHR; for spurious lines, not clear what is the best way forward -- need to check if it is part of the ADC related effect or not and whether maintaining higher input levels can help mitigate the problem...

31 May : agreed that the latest version of bandshape correction looks ok and can be released in the next version of GWB; for spurious spikes, some further tests suggested, also to look into optimising the power levels at input for the narrow band modes.

14 Jun : released (bandshape correction) in the current version itself spikes issue no update.

28 Jun : for bandshape correction : edge effect handling now completed & released; this can be closed now.

For spurious spikes : tests imply spikes originate from ADC itself; need to change the clock & see; other repeatability tests (same spikes from same ADC card) etc remain to be carried out;

12 Jul : repeatability : in 200 MHz mode, seems to be good repeatability of channels for same ADC, with some fluctuation in ampl and confirmed that all are  $2^n$  locations; trying 100 MHz mode with DDC (even for 100 MHz o/p) shows some additional lines, not at  $2^n$  location but of comparable strength (!) -- needs to be looked into more carefully to understand the nature and cause of these.

====> changing DDC LO to double precision solves the problem of spurious lines due to

DDC LO mixing -- MM and SHR to generate a technical note about it; new feature available in trial mode; to shift to release mode and ask for user level tests (and close the matter if possible by start of next cycle); meanwhile, to characterise the lines due to ADC as information to user; in parallel to look into the cause and see if it can be fixed. Bandshape correction already in release mode -- to get user feedback on this.

(ii) drop-out in visibility data :

for dropout problem : not clear what is happening -- is it temporal, is it a fn of level of correlations -- may want to try with artificial correlated noise source?

30 Nov : this is now established to be outside the correlator -- in the mapping of input numbers in a particular task in AIPS (UVCOMPRESS); matter can be closed ?

14 Dec : problem perhaps in AIPS settings; matter can be closed ?

4 Jan 17 : to keep open for some time till ICH confirms with one more data set.

15 Feb : ICH has updated that another data set has been checked and found ok; matter can be closed.

4.4 Completion and release of first version of GWB-4 (SHR/ICH/SSK/BAK) :

(i) assembling of racks and nodes and peripherals :

16 Nov 16 : all done except for some reorganisation of host m/cs when final 32 antenna system is being integrated; this is completed.

(ii) integration, testing and release of 2nd half 16-antenna system :

configuration of system (Nov 2016) : 8 compute nodes (T630s) with 2 nos of K20 each, 3 host m/cs (T630s) with no GPUs + 1 spare T630; connected to 8 Roach boards, each with 2 ADCs and 2 x 10 Gbe links;

initial testing (Dec 2016) : showed some packet loss (1 or 2 packets per 10 sec on 1-2 out of 16 links which changes randomly on reboot) not related to BW and data rate; maybe related to CX4 drivers; however, the code accounts for these packet drops and does NOT loose sync; agreed to leave like this for now and revisit later on.

ADC problem (Dec 2016) : many Roach boards showed false triggering though proper PPS signal is connected; finally traced down to misbehaving ADC cards; finally put 8 good ADC cards on each Roach board (2nd ADC is slave and malfunctioning card can be used in this slot!); 14 out of 16 ADCs in first 16-antenna corr are good ADCs; IMH to follow-up on debugging of ADC cards.

testing 2nd 16-antenna system : (Jan 2017) : new GUI to cater to second 16-antenna system made ready, and both systems running in parallel; tests look ok; SOP released.

integration and release of 30-antenna system (Jan-Feb 2017) : decided to integrate existing 16-antenna systems (with T620 and T630 compute m/cs with different OS) into a 30-antenna system with basic modes and release; in parallel, to get 8 new nodes (T630s) assembled with all peripherals (and K40s, as soon as they come), and replace old 8 nodes as convenient; new UI to be created; additional disks to be ordered.

18 Jan : testing of 30 antenna code using 2 different sets of m/cs is going on, with the aim to release as soon as possible; UI for 30 antenna system needs to be looked into (with NSR); matter of additional disks needs to be resolved; note for split delivery of 10 GPUs to be generated today and sent; YG to follow-up with nvidia for 4 more GPUs from R&D stock.

25 Jan : 30-antenna system for 200 MHz total intensity and full polar released for user tests; 400 MHz still gives some problem (one compute node hangs after some time); after user tests this week, 50.0final call about release to GTAC users on shared risk basis to be taken on Monday next week. Antenna connections to be hard-wired as per SOP.

15 Feb : basic modes are working for 200 MHz total intensity and full polar, and also beam mode appears to be ok now; only 400 MHz mode hanging problem is still there; one T620 node has been replaced with T630 and some improvement was seen; needs further testing to establish the stability. Meanwhile, all the remaining 7 T630s are hardware ready with 2 K40s, only software configuration remains -- need to check with the set

of instructions given by Reddy.

22 Feb : upgraded 30-antenna GWB4 with all new T630 nodes is released and appears to be working ok; more tests to be done today and then release for uGMRT GTAC observations from tomorrow onwards; SHR to add option for reporting the fraction of pkt loss, if possible for each scan.

8 Mar : option added for logging packet loss; NOT after each scan (very high I/O overhead); But, it is logged at the end of observations (N.B. file needs renaming, or else it will be overwritten by next observation !).

12 Apr : email update from SHR : Packet loss log will be available at the end of observation. Will share details about the file with control room;

26 Apr : new SOP released; packet loss reporting is available at end of each observing run (haltndas cmd) and is reported in a single place at the end -- to include option for unnatural halt also.

3 May : only writing (packet loss) log in different files remain

14 Jun : providing the 'log' at the end of observation for now

12 Jul : this is still pending.

====> SHR to check with NSR about possibility of reading the log files to a common place with the stopscan command.

(iii) power and cooling related issues :

for GWB things running ok; for GSB still has few deg higher temp -- improved cooling solution to be investigated for in-situ implementation.

23 Nov : GWB type soln for GSB planned for next MTAC -- need complete shutdown for it.

4 Jan 17 : new arrangement for evacuating warm air from existing GWB racks is ready and installed on GWB-3 racks -- to check change in temperatures of different units.

11 Jan : no further work on GWB; plan is to have similar change for GSB during next MTAC -- preparations for this are on-going.

18 Jan : some rearrangement of 1U nodes hosting ADCs may be needed.

8 Mar : plans for work on GSB during upcoming MTAC -- needs a discussion.

3 May : nearly closed; hot air sucking mechanism needed (being explored with Nandi's help).

====> to follow-up on visit of Voltas expert and then decide the further course of action.

(iv) availability of components esp GPUs :

23 Nov : still awaiting delivery of the K40 GPUs; expected by 15th Dec.

14 Dec : delayed further by 30 days (but may come earlier?)

21 Dec : this is a serious matter and needs follow-up !!

4 Jan 17 : direct contact with nvidia rep established; may result in some speed-up in delivery; to follow-up closely.

11 Jan : YG to follow-up with nvidia and micropoint.

25 Jan : 20 GPUs being shipped by Micropoint shortly. Also, 1 demo Pascal unit will be shipped shortly. Meanwhile, assembling 8 units of T630 with all software and peripherals is ongoing; once GPUs arrive and are plugged in, a self-test SOP can be prepared to check them.

08 Mar : 20 GPUs have arrived; tested OK; already in machines; (FREE) demo Pascal unit did not come

15 Mar : BAK to follow-up with nvidia for 2 samples of next gen Pascal GPU.

12 Apr : Pascal GPUs (2 nos) have come; need to be benchmarked.

26 Apr : need adapters for the Pascals, which are coming from nvidia, and then put in a machine in the lab to try.

3 May : waiting for adapters to arrive;

28 Jun : adapters arrived; nvidia team visited GMRT; GPU installed on one T630 (for raw voltage recording); to quantify improvements thru benchmarking.

19 Jul : benchmarking needs single node : software changes for single node, done; initial tests imply x2 improvement in performance in Pascal wrt K40; individual block comparison to be completed by next week.

23 Aug : P100 unit under test

====> sample cables for CX4 to CX4 15 m have come -- being tested in standalone (can put into working GWB during MTAC); sample cables for CX4 to QSFP have also come and will be tested soon, in one to one config and also with a switch being used for extending the length (!); also, to order sample dual port QSFP cards; 12 nos of new T630 have also come.

(v) targets and plans for release of full 30-antenna system : when will it be ready and what features will be available in first release :

target release date depends on progress of (ii) above; regarding modes : doubtful ones are 400 MHz total intensity, 200 MHz full polar, 4 beams -- may or may not work for 30 antennas (due to I/O restrictions); similarly voltage mode will be programmed but may not work for all 30 antenna configuration; basic DDC and zoom modes ok.

23 Nov : no specific updates, except that code optimisation will need to be done.

14 Dec : need a discussion to decide the way forward on this.

4, 11 & 18 Jan : deferred for some more time, till 30-antenna system is released.

25 Jan : as first upgrade, agreed that from next week onwards for about 2 weeks, work can be done to make new version with 4 beams, one voltage beam + CD pipeline + submicrosec timestamp + new beam header.

22 Feb : to assemble one more host to get 5 host m/cs, with at least one of them with 2 K20s or K40s.

08 Mar : full system released on 28-Feb-2017; total x5 host machines available; x4 have x2 GPUs each; additional tests are in progress on the released version.

15 Mar : discussion on long-term issues to be taken up next week.

22 Mar : email update from SHR : Work on staggered visibility collection is under progress. Basic code is working. Tested for 2k channels. Tried testing for 16k channels and found that it is hanging after 1st iteration at MPI for few seconds which is causing data acquisition to stop. Will see in to the problem; this (once completed) should enable us to test GWB4 for up to 16k channels (condition : higher integration and integration values 2,4,8,16... buffers).

5 Apr : most of the basic issues look ok; CDP on one beam is working, but timestamp issue needs to be understood... staggered I/O scheme is working and shows improved performance e.g. 400 MHz full polar 16K chanel for 16 or 32 s integration is possible; and 2 voltage beams are also possible (alongwith 2 low resolution IA & PA beams); this is now ver4.5.

12 Apr : ready to release ver4.5 -- basic things seem to be working;

calculator for what combination is possible is also available;

full polar beam mode requires corr to be in full polar mode also (!) -- to check if this can be bypassed or not (lower priority);

timestamp issue : now working till nanosec accuracy for IA and PA; need to confirm for voltage beam;

regular tests for all modes under PMQC : can this be defined ?

changes in UI to accommodate the new modes : need extra work of supplying DM etc for the CD pipeline mode -- can start with hand value in cmd file.

zoom mode corrections : (i) band shape correction -- to relook at earlier effort and see what should be done; (ii) spurious lines seen in spectrum : to redo original noise source test and then also the sky test at same band.

19 Apr : for ver 4.5 : calculator working and released in GUI; new SOP for v4.5 to be ready by next week; SSK to put changes for accurate timestamp into the existing v4.5 code in CDP section; 2 other items : polar beam vs polar corr and changes in UI to support all modes (including CDP).

3 May : SOP already released (v 4.5)

17 May : trial and release areas to be formalised; NSR to complete CD pipeline commands in GUI.

14 Jun : trial and release : documents (directory structure OK as per circulated

version) finalized; need to create directories etc.

28 Jun : antenna testing scheduled today/tomorrow; next SOP release planned

CD pipeline : GPU has possibilities as per manuals; release of trial mode : all above incorporated.

12 Jul : some white slot testing needed for new release ver before replacing the existing GTAC use version. CD pipeline : tested for 2 beams 200 MHz also; waiting for cmdline interface for 2 beam mode.

19 Jul : antenna testing were OK; SOP released; control room using it as 'trial' mode.

====> currently testing dual beam CDP via cmdfile; also amplitude scaling of CDP and PA and IA beams needs to be looked at --

4.5 Network and data backup related issues for GWB system (MSU/SM/BAK) :

(i) extra IPs needed on .4 n/w for GWB 2nd half system

4 Jan 17 : this is done -- to confirm and close.

(ii) updated IP table for .4 n/w to be made available by computer group

4 Jan 17 : work ongoing -- to check status with comp group.

3 May : completed

(iii) updated n/w diagram from GWB & GSB n/w to core switch to Pune connection to be made available by computer group

4 Jan 17 : updated diagram is now available -- to be shared with all concerned persons.

3 May : GSB & GWB diagrams available ; completed

(iv) to see if 3 1 Gbps connections can be given from gwbh1-3 to GMRT-NCRA switch

4 Jan 17 : updated diagram discussed; upto 3 nos of 1 Gbe links from gwbh machines

is possible with the current 130 n/w switch that serves the 7 Gbps link to Pune -- to make these connections and demonstrate 2 x 1 Gbe transfer from gwbh2 & gwbh3 together to NCRA end; comp group to set up the test, alongwith VVS at Pune end.

11 Jan : 3 connections made to gwbh1-3, and live test demo done; it appears that only

2 of the 8 x 1Gbps links from switch to aggregator are working ! This needs to be debugged between comp group and OF group.

(v) to explore options for upgrading the switch e.g. 3 nos of 48 port switch

4 Jan 17 : comp group agreed to look for options.

15 Mar : can be taken up next time.

(vi) NAS data storage related issues : new NAS has been installed but there appear to be some temperature related problems and extra cooling may be required.

4.6 Longer term plans for GWB-4 (SHR/GJS/ICH/SSK/BAK) :

List of tasks going forward (needs to be prioritised) :

(i) Connectivity of GWB-4 with rest of the network, including GMRT--Pune link (GJS+MGU)

28 Jun : GMRT side network provided; Pune side status need to be checked.

(ii) Disks for data recording, including trials with SSD options (GJS)

3 May : restarted the tests on normal disks

23 Aug : not exploring SSD option

(iii) investigating next gen GPUs -- to benchmark sample Pascal units from nvidia (SHR)

19 Apr : to be tried next week.

28 Jun : they have arrived; installed; need to be benchmarked.

(iv) migration to next version of CUDA (7.5 and beyond) -- to decide the steps

23 Nov : CUDA 7.5 is being tried in the new version of GWB -- confirm present status

19 Apr : confirmed that all v4.5 is on CUDA 7.5 and no upgrade in near future.

3 May : installed CUDA 7.5 on all machines; next cycle may go for 8.0 which is now available

28 Jun : CUDA 8.0 also available now; next cycle to move to 8.0

(v) DUT correction and timestamp related issues : to confirm present status and decide future course of action (SSK)

19 Apr : still pending.



28 Jun : today it will be addressed;

(vi) towards PFB option : resurrect old code into new GWB5 & compute the overheads (SHR)

(vii) towards a gated interferometer : to look at the MAC code that can do the gated

integration; to send the gate information to the GPU from CPU (SHR/SSK/YG)

(viii) improving availability of beams by reducing beam I/O : 16 bits to 8 bits for

IA/PA beams and 8 bits to 4 bits for voltage beams (SHR/YG)

(ix) options for an additional network for even better I/O capabilities (SHR/GJS)

(x) PA - IA beam mode as an additional option with IA or PA modes (SHR/SSK/YG)

(xi) making 4 PA (or voltage) beams point in 4 different directions -- SSK to look

into the change in code needed for this, starting with astrocal

19 Apr : SSK has done initial study and plan for generating parameters for all 4 beams

from same call to astrocal and then pass to the beamformer; beamformer code needs a

change to do one extra multiply by complex number whose phase is calculated on the

fly based on antenna, channel, time and beam number.

3 May : initial note from SSK;

28 Jun : beam steering implemented; tests in progress; basic thing works; plots

'identical'; needs repeated tests;

(xii) towards more general multi-beaming in the long run

(xiii) archiving of beamformer data : better header and also finding what metadata is

required -- SSK to look into this, in consultation with Deepak Bhong.

19 Apr : to follow-up with DB in next few days.

28 Jun : header has all necessary metadata inputs; higher level s/w need to incorporate

their usage;

(xiv) getting second copy of data to separate cluster going : for both raw voltage

recording, as well as for multi-beaming kind of work (GJS/BAK)

19 Apr : to see if one node (with new disks) can be made ready and put in one rack

and connected to Roach board -- can grow to one m/c per rack with separate IB switch...

28 Jun : raw voltage goes to one machine; but now that machine taken off for Pascal

testing; GJS : FPGA design for making second copy (adding delays to synchronization);

23 Aug : All FPGA related work completed; raw voltage pipe line to T630 is working; SHR

working on x2 Ae correlator : coding over; tests to follow.

(xv) decide on 2 vs 4 inputs per Roach board for final configuration

(xvi) net-sign correction -- confirm current status and decide if further action is

needed (SSK)

19 Apr : current status is that adhoc sign flip has been introduced for both corr and

beamformer header info; proper modification in code needs to be decided : when & how.

28 Jun : fix is working (LSB, USB)

(xvii) full backward compatibility of off-line utilities (SSK)

23 Nov 16 : some work has been done, but not clear if this meets / works for all

requirements.

19 Apr : has been done and released and users have used it.

28 Jun : need better coordination with users to avoid confusion; responsibilities of

individuals also need to be precisely fixed.

====> agreed to look at the gated correlator and pfb implementation.

4.7 Monitoring of temperature and other parameters of new back-ends (GJS/BAK) :

(i) Summary of current status for temperature monitoring

3 May : cacti released to control room;

(ii) Plans for future enhancement and release for regular use

(iii) Monitoring of other health parameters

14 Dec : GWB has temp monitors; actual temp monitor sensors/cards added in rack

(uses DAQ card);

28 Dec : not discussed.

11 Jan : no significant new updates.

25 Jan : no new updates, but plans for collecting the temp data and bringing to common m/c that is accessible to control room is being planned. installation of cacti also to be taken up.

15 Mar : machine has been made ready; cacti has been installed; gradually adding nodes to the list and making them ready for monitoring; a separate home-grown product (using cgiplot) also being made ready for monitoring IB network.

19 Apr : cacti for temp monitoring for all GWB nodes (temp of cores) -- available on web browser; to release to control room and users and add in GWB SOP; cgiplot -- home grown version that allows to read the raw data and display using cgiplot in a more flexible manner (right now on hold); for IB monitoring : collectl was being used for IB monitoring (right now on hold); for disk usage, cacti has an option, can be released alongwith the temp monitoring. Additional homegrown tool (IMH + others?) also available -- need to check and see what should be the final form.

3 May : during MTAC, temp displays in CORR room added; (plot facility etc); control room can always see display of temps : inlet air & outlet air

28 Jun : better information sharing : control room people need to be made aware formally; formal note needed;

23 Aug : entire page available at GMRT web; email to control room sent  
====> no further activity after release to control room; can look into possibility of monitoring GPU temperature.

#### 4.8 Other issues :

##### (i) Cross-coupling tests in GAB + GWB

14 Dec : leakage < 30 dB; acceptable? can we reach toward a conclusion on this?

28 Dec : some issues need a bit more of discussion before reaching a final conclusion.

11 Jan : ADC 2 channels on the same board ~ 3% and between boards ~ 0.25%

25 Jan : no updates; needs a discussion.

##### (ii) Walsh related work.

14 Dec : some tests in progress; porting to GWB (Python package being modified);

28 Dec : work is still ongoing.

11 Jan : porting work is nearing completion.

25 Jan : now in testing phase (on GWB2).

19 Apr : some corrections done for accommodating existing connectivity of GWB of pols with nodes; second correction done for drift of Walsh pattern due to digital bug; will proceed for noise source and astro tests using GWB2.

3 May : delay hunting programme has some bugs, being fixed; debugging in progress.

28 Jun : parallelly new package for delay configuration + Walsh being made forward compatible; to be ported to GWB-3 as well.

====> more thorough testing of GWB-2 implementation ongoing -- reaching 10 microsec accuracy for the locking; can check if better accuracy can be obtained with longer integration. To look into different aspects of implementation on GWB4.

#### 5. Other items :

##### 5.1 Python assembly work (HSK/SSK) :

###### (i) Summary of the work done so far and conclusions from the same

23 Nov : mech team to prepare a summary note; meanwhile, first assembly of new Python (what is its configuration?) will be ready by 7 Dec, and will be installed on antenna for tests.

21 Dec : earlier, report was circulated in Aug 2016, which appears to be quite clear and conclusive for the fact that the Finolex pipe with modified E06 arrangement (running on W1 for more than one year) is better than Igus pipe with same as E6 arrangement (running on C4 for more than one year, but has had one cut).

(ii) Plans to decide for the final option to be adopted

23 Nov : to be taken up after note is circulated and new version is tested.

14 Dec : separate discussion with HSK and email exchange -- need an updated version of the report.

21 Dec : The W1 solution is adopted for now and 4-6 nos of python assembly have been provided to FE team (to check how many of these have been used) -- overall statistics to be generated.

(iii) Future requirements : there was a need expressed to have have a bigger hose to take care of extra cable requirements for future use. Current version is 30 mm ID hose; need to try ~ 50 mm ID; new hose of stainless steel material has been procured from a party in Mumbai and sample assembly is being made ready -- may go on antenna by early Jan; this will be 50 mm ID. Meanwhile, need a discussion to decide the final choice of ID.

22 Mar : review of the outcomes from 2 types of hose : new type (one E3) has been working fine since July 2015 and appears to be better than existing Finolex option (even with mech modification like E6 and C4); agreed to adopt the new scheme (cost goes from ~ Rs 150 to ~ Rs 1500 which is acceptable; need ot agree upon the diameter; current E3 is 40 mm; would like to go with 52 mm -- sample is ready to go on one antenna (along with 2 dummy optical fibres) for test for ~ one month and then take a call for mass production.

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