

Minutes and action items from Plan meet of 4th October 2011 :

ANR, APK, SSK, YG at GMRT
JNC, BCJ, GSS, SKG at Pune

Main agenda item was discussion of plans for 150 MHz system upgrade

The following options came up for discussion :
(see discussion doc circulated by FE group for some of the relevant details)

Option 1 : modified Kildal feed :

impedance BW : 140 to 260 (scaled from known values at 325 : 289 - 524 MHz) -- is this really true, or is it actually worse than this? observed sensitivity is not uniformly good over this full range.
E&H mismatch & cross-polar : -55 to -15 (full match to 8 dB mismatch in E&H patterns seen); it can/has shown to be improved somewhat over wider freq range by trying multiple rings.

Option 2 : cavity backed dipole :

impedance BW : 265-419 MHz -- significantly lower than options 1 & 3; E & H match is OK, but not very good. Not much scope for improvement.

Option 3 : cone dipole feed :

imp BW : 284 - 517 MHz -- unit on c06 shows good sensitivity over ~ 250 to 500 MHz; scaled to 150 MHz ==> ~ 130 to 250 should be achievable.

E&H match : is very good over almost the full freq range; observed sensitivity and beamshapes for c06 feed support this.

Option 4 : Bhalerao's dipole

changed the impedance xmer on existing 150 MHz dipoles to get better impedance match : 137-287 MHz (cf 117-247 MHz) -- however, the observed sensitivity was

very poor over the extended frequency range, probably due to poor E&H match.

Basic problem may be that, for different frequencies over a wide band, the height of the dipoles above the ground plane and the distance between them needs to be varied, which a single, fixed, broadband dipole does not allow.

Option 5 : multiple boxing ring combinations

Not clear how well these will work : will there be significant "dead bands" -- how many sets (upto 3 or more) required to cover the desired range without any dead bands? mutual coupling between adjacent sets could be a serious problem; may require a detailed study and understanding. Existing boxing ring configuration suffers from reliability and maintenance problems; multiple rings will exacerbate the problem. The electronics required will be complicated : multiple (matched) amplifiers and combining of the outputs of these (passive combiner will not work?).

Option 6 : drooping dipole designs

high impedance problem ? is it scalable? has a configuration similar to boxing ring (2 pairs of dipoles) ==> wideband versions of it will suffer from the same problem as option 4?

Best may be cone dipole in terms of electromagnetics, but mechanical issues could be difficult for this...

Mechanical issues :

Cone dipole : size top ring will be 4.x m -- clearance is enough, but issues of wind loading and scattering need to be looked at ! Truncated cone designs may mitigate some of these problems, at the cost of some performance BW ?

RFI issues : may need an extra filter for police wireless, and stay above the

civil aviation lines -- SSK to check and come back

Conclusions and action items :

Options that can be eliminate straight away : options 2 and 4

option 5 : 3 sets may work? mutual coupling, complicated processing chain -- looks like a lot of work and not really assured to work? may be taken as a student project, to first look at the feed electromagnetics first.

option 6 : take thick dipole design of RRI and scale it up in frequency? may suffer from the same problems as boxing ring design? -- looks difficult -- can be put on lower priority.

Options to carry forward :

cone dipole : to do simulations for a truncated design; how to address mechanical effects : clearance, wind loading, blockage, scattering, interaction with quadripod legs. Some of these (e.g. last item) to be simulated in WiPLD.

modified Kildal feed : to try with multiple ring design, and also reduce size of reflector plane and qunatify the effects.

FE team to discuss the above possibilities, initiate action and report back to Plan meeting in 2-3 weeks time about the strategy adopted.

RFI team to look at worst RFI lines in the 130 to 260 MHz range and report back, after 2-3 weeks.

Corollary : 250-500 cone in mesh form : to be followed up with mech and SCT.

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