SOP for in-field phasing

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1 Introduction:

In-field phasing a methodoly by which an array is phased using model image of field. Model image of field is used to solve for antenna based phases. See Kudale & Chengalur, Exp Astron (2017) 44:97−112 for details. Using this method during pulsar observation, one can record lta data, solve for phases and load to GWB in background without taking break in observation and stoping scan

2 Software:

1. Master script : *fc_phasing.csh :*
   Location : gwbh6:/home/gpuuser/GWB/common/flagcal-phasing
2. *General utilities : relta, listscan, gvfits* : Location hardcoded in master script
3. *flagcal :* Gain solver, location & tuned parameters for flaging and calibration are hardcoded in master script

3 Description:

Conventional phasing need to be done once before, so that when beam data record is started, array is already phased. Another alternative is that one can run first round of in-field phasing and then start beam record. Later, in-field phasing iteration can run in background in loop as required.

4 Procedure:

- Edit master script to provide field model. It is assumed that model is already existing in the directory where master script is kept. If in-field phasing is to be executed for point source, no model is needed. Appropriate section of flagcal need to modified. See the example below

  ./flagcal-1.03-infield-fft_01Feb/flagcal num_threads=8 fits_in=TEST.FITS -r export_ph.rc casa_model=./T_RRLL_J2145__M0750.sc2.ci.model_B3_combined.tt0.fits >& fc_time_$date_Time.out
  Or

./flagcal-1.03-infield-fft_01Feb/flagcal num_threads=8 fits_in=TEST.FITS -r export_ph_nm.rc >& fc_time_$date_Time.out

- Execute in-field phasing from ONLINE or TGC
  Use the following two instructions from cmd file
  /phase_gwb.pl -s 4 -t 90 -p TEST -l flagcal
  /ld_fcphs.gwb

  An equivalent commands for TGC obs.py file are as below

  phase('0','GWB','$','$','90','$','$','flagcal','$',timeout=570)
  sysCmd("ld_fcphs.gwb")

  -t 90 is solution interval for phasing. *phase_gwb.pl* (Ref. Shri. Nilesh Raskar) is general phasing script which is commonly used for conventional and in-field phasing. An option *-l flagcal* to *phase_gwn.pl* will invoke in-field phasing master script mentioned above. Once phase solutions are obtained, these will loaded to GWB by command *ld_fcphs.gwb* without scan break. Above two commands can be looped as per requirement. On every cycle of in-field phasing, solved phases are saved in gwbh6:/home/gpuuser/GWB/common/flagcal-phasing/ as e.g. phas.130_fc.dat.ts, where 'ts' is full timestamp including date when solver started execution. Solved phases can be monitored (with gnuplot) to check of phase solution's reliability.

5 Model requirement

In-field phasing can be executed in two ways. Similar to conventioanl phasing, it can be run for external field point source, no field model image needs to be supplied. In-field phasing is faster compared to conventional phasing and especially it speeds up performance for larger number of channels. However, in-field phasing for target field needs accurate model to be provided. Models for few pulsars are already made for testing. However for new target field, one need to generate field model before in-field phasing operation. An another SOP will be provided for how to make model from visibility data.