SOP: Command File Generator for InPTA Observations

Instruction for running gencmdfile.py for preparing setup file and command file for pulsar observation with uGMRT (focused on InPTA)

(Updated for Cycle#40)

Introduction:

The python script gencmdfile_v3_C40.py generates both the command file and setup file for multibeam pulsar observation using GMRT. The script is written specially with keeping Indian Pulsar Timing Array (InPTA) observation in mind. For other pulsar observations, please use it with caution.

Currently the InPTA observations are done with the following configuration: Pulsars are observed simultaneously in Band 3 and Band 5 with 200 MHz bandwidth. Subarray 4 is used for Band 5 and Subarray 3 for Band 3. Band 3 observation is done in Coherent De-dispersion Pipeline (CDP) mode and Band 5 is done in Phased Array (PA) mode. These settings are hardcoded in the script (for the time being).

Necessary Files:

We need two input files 'pulsars_Sx.in' and 'setup.in' to execute the gencmdfile_v3_C40.py script, where x is either 1 or 2 depending on your observation slot. The details of those input files are given below.

setup.in:

setup.in file is fixed for one particular cycle of the InPTA observation and should not be changed by users. It can only be changed if the whole collaboration decides to change the observation setting during a cycle for some reasons.

This file contains the detailed settings of the observation. It is an ASCII file with input as a single row and 12 columns. The different columns contain different settings parameters.

1. **Project_Name:** This is the project name (e.g. 40_012) [str]

2. **Source_file:** Name of the file that contains details of all the sources to be observed (e.g. src40012.list) [str]

3. **Ref_ant_subarr4:** Reference antenna for subarray 4 (e.g. C05) [str]
4. **Ref_ant_subarr3:** Reference antenna for subarray 3 (e.g. C09) [str]

5. **Nchan_obs:** Number of channel for the pulsar observation (e.g. 1024) [int]

6. **Nchan_runsub:** Number of channel for running CD pipeline (e.g. 128) [int]

7. **Nchan_wr-cd:** Number of channel for writing CDP data (e.g. 128) [int]

8. **Nint_pa:** Number of integration for PA mode observation. (e.g. 8) [int] ~~{Sampling time = 40.96 us}~~

9. **Nint_wr-cd:** Number of integration for CDP mode observation. (e.g. 4) [int] ~~{Sampling time = 5.12 us }~~

10. **1:** Number of bits for storing the data in PA mode, Band5. (e.g. 16) [int]

11. **Nbits_subarr3:** Number of bits for storing the data in CDP mode, Band3. (e.g. 16) [int]

12. **PFB:** ON/OFF.

pulsars_Sx.in:

This is another input file that contains the list of pulsars to be observed and other observation details. **Please check whether you will be observing S1 pulsars or S2 pulsars and modify the corresponding file**. It has 6 columns and can have as many rows as possible. The columns represent the following information.

1. **Pulsar:** Name of the pulsar (e.g. J1939+2134) [str]

2. **Phasing_source:** Source name for the phasing before observing the pulsar (e.g. 1822-096) [str]

3. **DM:** DM value of the pulsar to be used for CDP (e.g. 71.0171) [float]

4. **Obs_dur:** Observation duration for the pulsar in minutes (e.g. 55) [int]

5. **Slew_time:** Expected slew time to go from previous pulsar to this one in minutes (e.g. 6) [int]

6. **Expected_starting_time:** Expected starting time of observation of that particular pulsar in 24 hour format. This is not very important but to keep track of the time and is needed for running the script without any error. (e.g. 04:10) [str]

The pulsars will be observed in the same order as given in pulsars.in file. The order has to be decided based on the rise-set time of the sources and presence of RFI. See the 'uGMRT pulsar observation manual' for details.

https://docs.google.com/document/d/1s-7dTGcEq7UyARxYhqUmd6s25eFq4135qSKscW3H6Wk/edit?usp=sharing

Running the script:

First, check the rise-set time and presence of RFI for all the sources and plan the order in which the pulsars have to be observed and modify pulsars_Sx.in accordingly.

Then check the disk space in all the machines (gwbh7, gwbh8, gwbh9 and gwbh10) and **determine which machines and disks to be used** for Band 5 - PA observation and Band 3 - CDP observation.
For Band3 CDP observation, use only gwbh8 machine, i.e., beam2

Modify the myinput.in file before running the python script.

myinput.in:

myinput.in is another ASCII file which has one row and 9 columns.

1. **Date (format: 07Dec2019):** The date of your observation. The format is: first two letters are for the date, then next three are for the month with the first letter in capital and then next four for the year. (e.g. 23Apr2020, 03Jun2020, {03June2020 is not preferred})

2. **t_start (format: 00:00):** Starting time of the observation. **Give the starting time of the feed rotation** (this is usually 1 hour before the observation slot) before the actual pulsar observation in 24 hour format. (e.g. 00:00, 06:00, 12:00, 18:00)

3. **track (write "outer" or "inner"):** Which track to use for tracking the sources (e.g. outer, inner). **Before the observation starts, check with the operator whether the used track is fine.**

4. **pa_beam (write "bm1", "bm2", "bm3" or "bm4"):** which beam to use for Band 5 - PA observation (based on disk space availability) (e.g. bm1, bm2, bm3, bm4)

5. **pa_disk (format: dataN):** The disk in which PA data will be stored (e.g. data6, data8 etc.)

6. **cdp_beam (write "bm1" or "bm2"):** which beam to use for Band 3 - CDP observation (based on disk space availability) (**Use only bm2, don't use bm1**)

7. **cdp_disk (format: dataN):** The disk in which CDP data will be stored (e.g. data6, data8 etc.)

8. **fl_cal_beg:** Name of the flux calibrator at the beginning of the observation. If you don't want to flux calibrate at the beginning, just hit enter without typing anything. (e.g. 3C286)

9. **fl_cal_end:** Name of the flux calibrator at the end of the observation. If you don't want to flux calibrate at the beginning, just hit enter without typing anything. (e.g. 3C48)

Open terminal and go to the directory in which the python script (gencmdfile_v3_C40.py) and two other input files (pulsars_Sx.in, setup.in) are located. Modify the setup.in, pulsars_Sx.in, and myinput.in file according to your observation plan as suggested above.Then execute the following command.

$ python3 gencmdfile_v3_C40.py -p pulsars_Sx.in [-i] myinput.in

If you don't give [-i] myinput.in, it will ask you to provide those details manually in the terminal.

If all the information is given correctly, it will write two files in the same directory with names “{proj_name}_setup_{date of obs}.txt” and “{proj_name}_{date of obs}.cmd.txt”.

The code can be found in the folder “InPTA_CommandFileGeneratorCycle40”
(https://drive.google.com/drive/u/1/folders/1UHsmMbbcsQs6xO4nuIf7M112XaUg1b2n)

If you have any doubt or question, feel free to ask me at lanky441@gmail.com