SOP for running Gated GWB

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Introduction :

Gated GWB mode records visibility in two distinct lta file, with gates defined for ON & OFF-pulse region. This method needs pulsar to be observed, processed to make profile and gates for ON & Off-pulsar region to be obtained from profile. Once the gates are defined and put in proper place in GWB host, next scan will implement the gates to GWB. Before every scan start, a gate defination will be read from a file, path of which is hardcoded in GWB software and in profile analysis software. If the target source is getting repeated for many scans, one need not run beam data gptool analysis and gate generation for every scan. The one already generated can be re-used, with the assumption that the pulsar period and the gates do not change much over observation duration. Gate definition for for calibrator and target source are different, and the provision of putting relevant gate before source (calibrator or target) observation has been taken care of during cmd file generation.

Generating observation setup :

1. Make selection of “Gates = 2” in web based tool, check pulsar observation is “ON”, prefered in PA mode, but IA mode for strong pulsar is also fine.

2. Use regular converter software, (i.e. new_cmd.py) as in default observation

3. When user generates the observation setup/plan (cmd file etc.), do as below

a. First part will contain phasing + target pulsar recording. Beam data recorded in this loop will be analysed to produce profile of pulsar and the gate file for observation (procedure below in section 3b). ‘cmd’ file to be kept on hold untill analysis in 3b is finished, then resume cmd file.

b. Second part will have regular phase cal (without phasing) + target observation, which will record visibility for phase calibrator (for about 4-5 minutes as per regular practice) + target source. User to note that target pulsar beam data recording is ON. If beam data is not needed, it can be commented in cmd file, otherwise make sure phasing is carried out before target scan if PA beam recording is required.

Profile and gate file making (SOP for control room, can be tried on recorded data from other tests/observation for learning purpose):

After the 3(a) above is done, and beam data is ready, suspend execution of cmd file and go to processing of beam data to make gate file, procedure below.

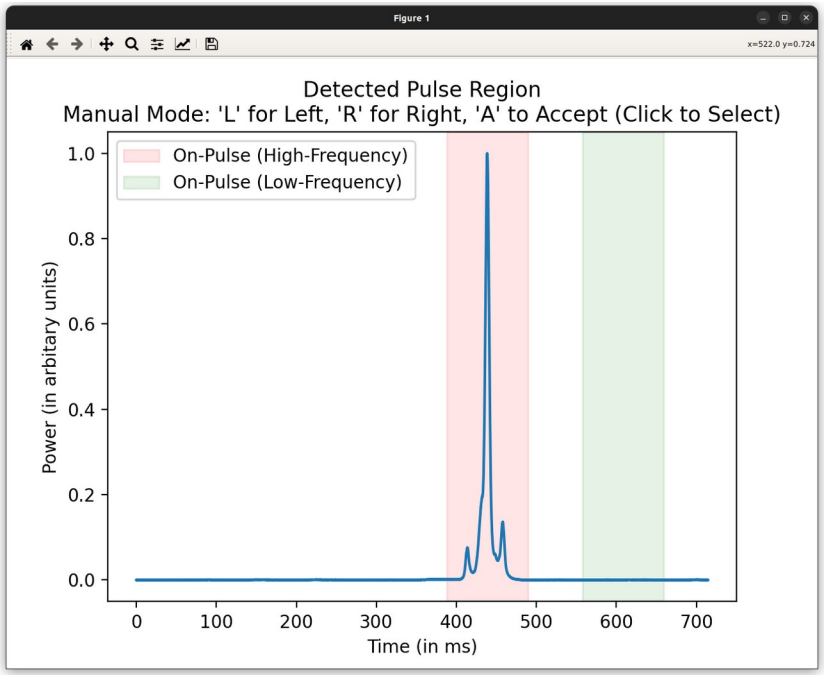
Pulsar profile making is carried out by gptool analysis by automated software, which takes various inputs, runs gptool, execute pulse-detection software to generate gate file and scp to proper place in gwbh6 where GWB software reads and apply gates to visibility. Assuming pulsar beam data is recorded following analysis is to be done on beam data. Analysis software is installed in gwbh7/8 & 9, so make sure the beamhost to select one of these.

software : ~/gtgwb/gmrt_gtgwb_tool.py (try --help option to get brief help)
All options are parsed to gptool.

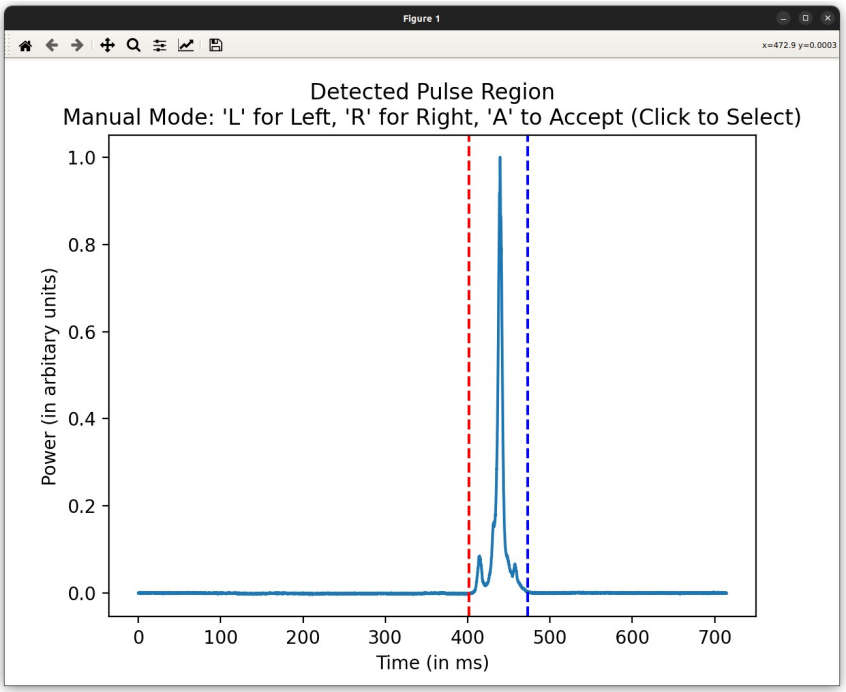
See example : ~/gtgwb/gmrt_pulsar_tool.py -r psr.raw -b 200 -e 700 -f 2.5 -t 3

where -r is raw file name (recorded by regular method, i.e. filename.ahdr file exists)
-b is number of channels to be flagged in begging,
-e is number of channels to be flagged in end
-f frequency flagging threshold
-t time flagging threshold (give higher threshold, e.g. 900, if pulsar is very strong, e.g. B0329+54, check if pulse is not flagged by RFI filtering feature of gptool)

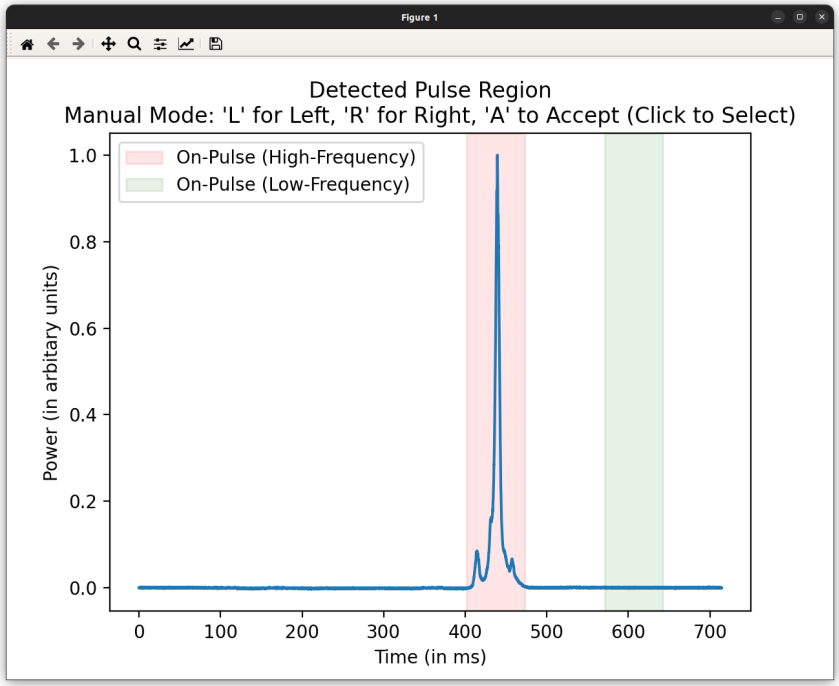
This will run gptool with above parameters, and generate profile. On profile it'll run another software for pulse detection, which will show a pulsar profile on matplotlib ploting device with automatic pulse ON window (another calculated window for its dispersed pulse at lower freq), as below.



If the automatically generated ON-gate window does not look like covering ON-pulse properly, a manual gate selection is possible by following procedure/instructions on plotting device.



Use key ‘l’ to click by mouse pointer at left border of ON-pulse, ‘r’ to click at right border of ON-pulse, ‘a’ to accept these borders (see figure above). The manual selection can be repeated as long as you want. Once you are done through it, quit plot window (by killing it or pressing ‘q’ key on plot), and then again ‘q’ key on terminal, which will generate the gates in in fig below.



Once gates defined (either manually or automatically) it’ll generate gate files (for calibrator and target sources) and scp these to the desired location in gwbh6 host.

Important notes :

1. 'record' will record two lta files, structure of which is compatible with regular GWB lta file, and all utilities will work on it.

2. Recorded lta file will have extension "G0" & "G1" : Always fixed for pulsar ON and OFF gate respectively.

3. Currently Gated GWB does not have provision to work with High Time Visibility mode and decimated GWB mode.