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Instructions for Observing with the Spigot

Postscript and PDF versions available

A. Talk to Operator

- Ask operator to put you in the gateway
- Once he/she is done with that, ask operator to slew to, and track, source

B. Start up the GBT configuration tool

- Type "source /home/gbt/gbt.bash" or "source /home/gbt/gbt.sh" (for bash or csh)
- Type "config_tool". This starts up the GBT configuration tool.
- Type "g = gbtsetup()".
- Type "g.set_manager_on('Spectrometer')".

C. Configure front end, IF Paths, etc.

- type "CONFIGGUI"
- In the blue CONFIGGUI screen, set the following:
  - Obstype = "Pulsar"
  - Backend = "BCPM/ACS"
  - SwitchMode = "tp_nc" {for no cal switching}
  - Select the receiver (on the top right. e.g. rcvr1_2 is the L-band, 1-2 GHz receiver)
  - Under "ACS mode" (far right) select desired the bandwidth (for the data, not the spigot)
  - Enter the desired center band frequncy, under "Rest Frequency"
  - Press the "set it up" button

D. Balance the IF Rack & Spectrometer

Back in the window where you are running the GBT configuration tool do the following:

- If you are going to run the 12.5 MHz or 50 MHz bandwidth modes:
  Type "balance((9,21))." This balances the IF rack and spectrometer.
- If you are going to run the 200 MHz or 800 MHz bandwidth modes:
  Type "balance((1,4))." This balances the IF rack and spectrometer.
- Check that the last lines of the screen have J9/J21 or J1/J4 values between 0.7 - 1.0
  - If not, repeat the appropriate balance command. If this still doesn't work, tell the operator you cannot get the IF & spectrometer to balance.
  - If so, the spectrometer and IF path are balanced. Keep going with these instructions.
- Type "g.set_manager_off('Spectrometer')". This turns off the spectrometer manager.

E. Turn on automatic balancing

(Optional for 16-bit and 8-bit modes, needed for 4-bit modes)

- The automatic balancing monitors the power levels going into the spigot (at the analog filter rack) and modifies the attenuators before the spectrometer (in the convertor rack) to keep the power levels the same
- The 4-bit modes will have their power levels saturate if you do not run this.
- To start, go to an xterm window and type "bash"
- Then type "source ~pulsar/scripts/spigot.sh"
- Then, type "holdInputLevel -f" for the 200 and 800 MHZ bandwidth modes, or "holdInputLevel -s" for the 12.5 and 50 MHz bandwidth modes.
- To stop the program, just hit control-D

F. Point & Focus - For Higher Frequencies Only

NOTE: If you are running remotely, you will likely want the operator to do this for you.

- In a new xterm window, type "source /home/gbt/gbt.bash" (if you are running bash) or "source /home/gbt/gbt.csh" (if you are running tcsh)
- If you have never done this before, go to your home directory and type "cp ~koneil/.sparrow ."
- Type "gfm &"
- When the gfm window appears, go to the "File" menu and click on "Work Offline"
- Check the box next to "I want to make updates to the telescope" and hit "OK"
- In the same xterm window as before, type "GO_LITE"
- Once a new (grey) window opens (be patient, it takes a bit), do the following:
  - Change "Switching Mode" to "Total Power" (left side of screen)
  - Change "Observing Type" to "Continuum" (left side of screen)
  - Change "Observing Procedure" to "Peak" (left side of screen)
  - After "Source Name" enter the name of the continuum source you wish to point on
    Good choices for pointing can be found here
  - Change the "Primary Mode" to the correct epoch for your coordinates (right side of screen)
  - Change the "AZ Length", "El Length", "AZ rate", and "El rate" as follows:

Band	AZ & EL Rate	AZ & EL Lengtha	Comments
PF			Don't bother with this
L-band	260 '/min	130'	Pointing is likely unnessary
S-band	180 '/min	90'	
C-band	80 '/min	40'	
X-band	40 '/min	20'	
Ku-band	30 '/min	15'	
K-band	18 '/min	9'	
Q-band	8 '/min	4'	

  - Change "Real Time Display" to "Python"
  - Hit "Start"
- The telescope will now slew to the continuum source you chose and do a cross-scan on it, taking a total of 4 scans. The "gfm" screen will fit the data and determine the pointing offsets. These will both be displayed on the "gfm" screen and sent to the telescope.
- Once the observations are done, you need to focus the telescope
- On the "GO_LITE" window, make the following changes:
  - Change "Observing Procedure" to "Focus subreflector"
  - Set the "Start Focus", "Stop Focus" and "Focus Rate" as follows:

Band	Focus Rate	Start/Stop Focus	Comments
PF			Don't bother with this
L-band	480 mm/min	-/+240 mm	Focus is likely unnessary
S-band	480 mm/min	-/+240 mm	
C-band	480 mm/min	-/+240 mm	
X-band	480 mm/min	-/+240 mm	
Ku-band	480 mm/min	-/+160 mm	
K-band	320 mm/min	-/+80 mm	
Q-band	160 mm/min	-/+40 mm	

  - Hit "Start"
- The telescope will now take a scan varying the position of the subreflector. The "gfm" screen will fit the data and determine the best focus. These will both be displayed on the "gfm" screen and sent to the telescope.
- On the "GO_LITE" window, make the following changes:
  - Change "Switching Mode" to "Total Power, No Cal"
  - Change "Observing Procedure" to "Track"

G. Move to your first source

If you are using the BCPM please follow the directions on the BCPM page for moving from source to source

If you are not going to be switching source often, or if you are running remotely, the easiest way to switch sources is by giving the telescope operator a source list and having him/her move to the telescope to your sources for you.

If you wish to move the telescope yourself, do the following:

- If you haven't already started a "GO_LITE" session (Step E) then you must do so: (If you already have "GO_LITE" running, skip this step.)
  - In a new xterm window, type "source /home/gbt/gbt.bash" (if you are running bash) or "source /home/gbt/gbt.csh" (if you are running tcsh)
  - Next, type "GO_LITE". This will open a grey "GO_LITE" window.
- In the GO_LITE window, do the following:
  - Change "Switching Mode" to "Total Power, No Cal" (left side of screen)
  - Change the "Observing Procedure" to "Track"
  - Enter your Source Name, RA, and Dec
    You can make a source catalog for this. Look here for more info
  - Be sure the track rates (RA/Dec or Az/El) are set to 0
  - Hit "Start" and the telescope will slew to your source

****** If you are also running the BCPM, you can start running the BCPM monitor scans at this point ******
BCPM instructions are available here.

H. Spigot Setup

First, log-in to both "earth" and "spigot2" (on different windows) as yourself.
Commands with green background only apply in certain circumstances

Description	Commands		Comments
	On Earth	On Spigot2	
Sets your environment variables	source /home/gbt/gbt.bash source /home/gbt/gbt.csh		*Choose the correct script to source for running bash or tcsh*
		source ~pulsar/scripts/spigot.sh source ~pulsar/scripts/spigot.csh	
For 50 MHz & 50MHz DN (12.5 MHz) single polarization modes only *Sets the spectrometer to have the correct samplers*	LSS_1		*For 50 MHz & 50MHz DN (12.5 MHz) single polarization modes only*
For 50 MHz & 50MHz DN (12.5 MHz) summed polarization modes only *Sets the spectrometer to have the correct samplers*	LSS_2		*For 50 MHz & 50MHz DN (12.5 MHz) summed polarization modes only*
Loads the Xilinx personalities	loadXilinx		*Only needs to be done after resetting the spectrometer*
Sets up the spigot for mode of choice	SpigotSetup *nmode*		*See table for mode options.*
Create data directory		mkdir *New_Directory* cd to your new directory	

I. Do Calibration on Spigot

Description	Commands		Comments
	On Earth	On Spigot2	
Loads default scales and offsets		OPTIONAL: [export SIGMAXBIT=N]	*set sigma of the noise for calibration: X=16, 8, or 4; If this is not run, the default values are: SIGMA16BIT=1000, SIGMA8BIT=28, SIGMA4BIT=2*
		load_vs A B	
	startSpigot -now		*This is part of a kludge - no data is really taken*
	stopSpigot		*This is the 2nd part of the kludge - no data is really taken*
		load_vs A B	
Takes a calibration data set, saving it as calib.fits.		get_spigot_data -t 2 -w -l 10 -m *nmode* [-d] -f *freq* -c calib.fits	*There are numerous other options for the get_spigot_data command. If you are having calibration problems, or are just curious, please see the full list of options. Modes are given in this table.*
	startSpigot -now		*This is part of a kludge - no data is really taken*
	stopSpigot		*This is part of a kludge - no data is really taken*
	SpigotSetup *nmode* --noload		*Needed only for even modes. See table for mode options.*
		load_calib -r calib.fits	*Loads the newly created calibration file*

J. Check Data is o.k.

Description	Commands		Comments
	On Earth	On Spigot2	
Takes 0.4s of data		get_spigot_data -t 2 -w -l 10 -m *nmode* [-d] -f *freq* -r calib.fits	*See list of get_spigot_data commands for other options and table for modes*
	startSpigot -now		*starts the actual data taking*
	stopSpigot		*Run **after** spigot2 computer says scan is done.*
Checks data is okay		spigot_rawlaghist.py *filename*	*Shows the distribution of the zero lag power (Use only on small files)*
		spigot_bandpass.py *filename*	*Shows the bandpass of the data (Use only on small files)*

K. Take real data with Spigot

Description	Commands		Comments
	On Earth	On Spigot2	
Takes data		get_spigot_data -t 2 -w -l *time* -m *nmode* [-d] -f *freq* -r calib.fits	*See list of get_spigot_data commands for other options and table for modes*
	startSpigot -now		*starts the actual data taking*
	stopSpigot		*Run **after** spigot2 computer says scan is done.*

L. Other Info

- To balance the power for the spigot, the easiest method is to simply type "bal_if()" in the "config_tool" xterm window (opened in section B). If you are running in 16-bit mode this is likely all that is needed to keep the power levels reasonable. However, if you are running in 8-bit or lower mode(s), then you should also re-calibrate the spigot (step I).

M. Additional Spigot Commands

- **resetSpigot**: (earth) Resets the spigot cards
- **serialEDT**: (earth) Returns the Spigot card serial link to the data-acq computer
- **serialEng**: (earth) Returns the Spigot card serial link to the Engineering port

Notes:

- "-l" gives length of scan in units of 0.04192 sec;
  10 ~> 0.419s, 100 ~> 4.19s ~> 1000 ~> 41.9s, 1422 ~> 60s, 7111 ~> 300s
- "-m" gives mode number.
- "-f" gives center frequency of band in MHz.
- "-d" used for double nyquist mode.

N. Looking at the Data

If you are not reducing data on the spigot2 computer, first source ~pulsar/scripts/spigot.csh or ~pulsar/scripts/spigot.sh for tcsh/bash.
More info can be found in the file reduce_data.html

- **spigot_info.py**:Displays vital info about spigot files
  Common usage: spigot_info.py *infile*
- **spigot_bandpass.py:**:Plots bandpass for samples 0..max_sample from the files provided
  Common usage: spigot_bandpass.py *infile*
- **spigot_rawlaghist.py**:Plots histogram for an unscaled lag for specified files
  *Common usage:*spigot_rawlaghist.py *infile*
- **pyhead.py**: Used to print/modify headers
  Common usage: pyhead.py -u OBJECT *PSR name* -u RA *RA* -u DEC *DEC file.fits*

- **prepdata**: PRESTO data-preparation/de-dispersal
  Common usage: prepdata -dm *dm* -shorts -o *output_name* -nobary *file.fits*

- **prepfold**: PRESTO folding software
  Common usage: prepfold -psr *pulsar_name output_from_prepdata.sdat*

P. Contact Information

Click here *(Available only from within NRAO)*