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Instructions for Observing with the Spigot

Postscript and PDF versions available

Old start-up instructions available here

A. Before your run

- Copy the configuration file(s) which comes closest to matching your desired observing mode into your home directory
- Modify the files as desired, so that they match your observing needs.
- Configuration files are available here

B. 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

C. Start up the BCPM **(Needed only if you are running the BCPM)**

- Log into "vortex" as yourself (ssh vortex)
- Log into "BCPM2" as "bcpm2" (ssh bcpm2@bcpm2)
  - Choose "I" (the normal unix login)
  - Type "ui"
  - Hit return when asked for your login name

D. Configure front end, IF paths, etc.

In an xterm window do the following:

- Type "source /home/gbt/gbt.bash" or "source /home/gbt/gbt.sh" (for bash or csh)
- Type "config_tool < *config.py*", where *config.py* is the name of the configuration file you made in step A
- Ignore the various messages on the screen
- If "Configuration Complete" is the last line, everything is set.

E. Balance the IF Rack & Spectrometer

In an xterm window do the following:

- 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()".

- 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 has "duty cycle" 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.

G. 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

H. Point & Focus - For Higher Frequencies Only

- 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)
- 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 "Real Time Display" to "Python"
  - Change the"Offset Mode" to "Encoder"
  - 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'	

  - 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"

I. Move to your first 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

J. Starting the BCPM

If you are running the BCPM as well as the spigot, you can now open up the GO_LITE BCPM window now (under "Backends, etc. at the bottom left of the screen). You can now start your monitor and observing scans with the BCPM. Firing the cal with the BCPM, slewing the telescope, and changing the power levels at the IF rack will affect both your BCPM and Spigot data. All other BCPM operations are independent of what the spigot is doing. Further information on the BCPM is available here.

K. 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. You may be asked for your password after running this command.*
		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	

L. 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		*Begins taking calibration data*
	stopSpigot		*Completes taking calibration data*
		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 starts data taking for the calibration*
	stopSpigot		*This stops data taking for the calibration*
		parallel_load_calib -r calib.fits OR load_calib -r calib.fits	*Loads the newly created calibration file. The parallel_load_calib command should be used for the summed polarization (even) modes*

M. 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)*

N. 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.*

O. 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).

P. 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 on get_spigot_data command:

- "-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.

Q. 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.shtml

- **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*

R. Contact Information

Click here *(Available only from within NRAO)*