

NATIONAL RADIO ASTRONOMY OBSERVATORY MEMORANDUM

DATE: August 8, 2002
TO: Addressee
FROM: Ron Maddalena
SUBJECT: Switching signal configurations (Update)

On February 20, John Ford, Roger Norrod, Mark Clark, Richard Lacasse and I met to discuss the switching signal configurations for the GBT. After the meeting, a draft of this memo was circulated to a wider audience to solicit other comments.

The following tables summarize what I believe is our consensus on how the various backends and devices can be configured for proper observing. Note that only 'standard' observing modes are considered and I am not covering the simultaneous use of two backends. The reader may also want to read Toney Minter's memo, located at:

<http://www.gb.nrao.edu/GBT/MC/doc/dataproc/gbtGOglisnScripts/gbtGOglisnScripts/>,

which gives details on how GO will control some aspects of what is described here.

In tables 1 through 3 I describe how one should set up the LO1 rest frame, phase table blanking, and switching signal parameters for the DCR (Table 1), the Spectral Processor (Table 2) and the Spectrometer (Table 3). Tables 4 through 6 describe how to setup phase tables, frequency-switching, etc. for total power (Table 4), polarization and beam switched (Table 5), and frequency switched (Table 6) observations.

Table 1: DCR Configuration

Switching Mode	Switched Device	LO1 Rest Frame	Phase Table Blanking (sec)	Switching Signal Selector		
				Master	LO Blanking	Local Blanking
Total Power with No Cal	None	Local	0.000	DCR	Disabled	Enabled
Total Power with Cal	None		0.002			
Switched Power with No Cal	Polarization or Beam		0.002			
Switched Power with Cal	Polarization or Beam		0.002			

Note: Although the DCR can accommodate Doppler tracking and frequency switching, the wide bandwidths of typical continuum observing negates any usefulness of these capabilities. The table, therefore, does not include these ignorable modes.

Table 2: Spectral Processor Configuration

Switching Mode	Switched Device	LO1 Rest Frame	Phase Table Blanking (sec)	Switching Signal Selector		
				Master	LO Blanking	Local Blanking
Total Power with No Cal (see note)	None	Local	0.002	Spectral Processor	Disabled	Enabled
		Not Local	0.030			
Total Power with Cal (see note)	None	Local	0.002			
		Not Local	0.030			
Switched Power with No Cal	Frequency	Local	0.030			
		Not Local	0.030			
	Polarization or Beam	Local	0.002			
		Not Local	0.030			
Switched Power with Cal	Frequency	Local	0.030			
		Not Local	0.030			
	Polarization or Beam	Local	0.002			
		Not Local	0.030			

Note: Mode currently has a problem when Doppler Tracking is on -- the LO1 will change frequency while the backend is taking data. Spectral Processor “Total Power with No Cal” is not yet supported; “Total Power with Cal” requires a modified phase table as described in Table 4.

Table 3: Spectrometer Configuration

Switching Mode	Switched Device	LO1 Rest Frame	Phase Table Blanking (sec)	Spectrometer External Signal Sources	Switching Signal Selector		
					Master	LO Blanking	Local Blanking
Total Power with No Cal (see note)	None	Local	0.002	All Off	Spectrometer	Disabled	Enabled
		Not Local		Blanking		Enabled	
Total Power with Cal	None	Local		Cal and Blanking		Disabled	
		Not Local		Cal and Blanking		Enabled	
Switched Power with No Cal	Frequency	Local		Sig/Ref and Blanking		Enabled	
		Not Local		Sig/Ref and Blanking		Enabled	
	Polarization or Beam	Local		Sig/Ref and Blanking		Disabled	
		Not Local		Sig/Ref and Blanking		Enabled	
Switched Power with Cal	Frequency	Local		Sig/Ref, Cal and Blanking		Enabled	
		Not Local		Sig/Ref, Cal and Blanking		Enabled	
	Polarization or Beam	Local		Sig/Ref, Cal and Blanking		Disabled	
		Not Local		Sig/Ref, Cal and Blanking		Enabled	

Note: There is a possible problem with Doppler tracking code if the software does not send out the LO blanking signal to the backend a few microseconds before the LO1 is commanded to change frequency.

Table 4: Total Power Observations

Mode	Switch Mode		Phase Table			LO1 Frequency Delta Table
	Frequency	Beam or Polarization	Phase Start	Sig/Ref	Cal	
Total Power with No Cal (All but Spectral Processor)	None	None	0	Sig	No Noise	Empty
Total Power with Cal (All but Spectral Processor)			0	Sig	No Noise	
			0.5	Sig	Noise	
Total Power with Cal (Spectral Processor)			0	Sig	No Noise	
			0.5	Ref	Noise	

Table 5: Beam- and Polarization-Switched Observations

Mode	Switching Mode		Phase Table			LO1 Frequency Delta Table
	Frequency	Beam or Polarization	Phase Start	Sig/Ref	Cal	
Switched Power with No Cal	None	Yes	0	Sig	No Noise	Empty
			0.5	Ref	No Noise	
Switched Power with Cal			0	Sig	No Noise	
			.25	Sig	Noise	
			.5	Ref	No Noise	
			.75	Ref	Noise	

Table 6: Frequency-Switched Observations

Mode	Switching Mode		Phase Table			LO1 Frequency Delta Table
	Frequency	Beam or Polarization	Phase Start	Sig/Ref	Cal	
Switched Power with No Cal	0 -> 1	None	0	Sig	No Noise	0
			0.5	Ref	No Noise	offset1
	1 -> 2		0	Sig	No Noise	offset1
			0.5	Ref	No Noise	offset2
	0 -> 1 -> 0 -> 2		0	Sig	No Noise	0
			.25	Ref	No Noise	offset1
			.5	Sig	No Noise	0
			.75	Ref	No Noise	offset2

Mode	Switching Mode		Phase Table			LO1 Frequency Delta Table
	Frequency	Beam or Polarization	Phase Start	Sig/Ref	Cal	
Switched Power with Cal	0 -> 1	None	0	Sig	No Noise	0
			.25	Sig	Noise	
			.5	Ref	No Noise	
			.75	Ref	Noise	
	1 -> 2		0	Sig	No Noise	offset1
			.25	Sig	Noise	
			.5	Ref	No Noise	
			.75	Ref	Noise	
	0 -> 1 -> 0 -> 2		0	Sig	No Noise	0
			.125	Sig	Noise	
			.25	Ref	No Noise	offset1
			.375	Ref	Noise	
.5		Sig	No Noise	0		
.625		Sig	Noise			
.75		Ref	No Noise			
.875		Ref	Noise			