

# VLBA ACQUISITION MEMO #167

## IF AND SAMPLER CONNECTIONS IN THE 14-BASEBAND-CONVERTER DAR CONFIGURATION

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The 14-BBC (baseband converter) configuration of the DAR (data acquisition rack) is required for experiments in which a VLBA recording system is used to make Mark III recordings with 14 independently tunable baseband channels. The layout of the modules in the rack is shown in VLBA Data Acquisition Memo No. 89 by Alan Rogers. Two details of the 14-BBC configuration require further consideration.

In the standard VLBA DAR the 8-way power splitters on the four IF outputs of the IF Distributor provide for distribution of all four IF signals to as many as 8 BBC's. With 14 BBC's, not all of these units will have all four IF signals connected to their inputs. The IF signals are designated A, B, C, and D, and the proposed distribution scheme is as follows:

- (a) BBC's 1 and 2 receive IF inputs A, B, C, and D
- (b) BBC's 3 through 8 receive IF inputs A and C
- (c) BBC's 9 through 14 receive IF inputs B and D.

Fig. 1 is a diagram showing these interconnections. In the normal switch configurations in the VLBA receiving system, IF's A and B carry left circularly polarized signals for two frequency bands, and C and D carry right circularly polarized for the same two bands. The scheme outlined above allows 6 BBC's on one frequency and 8 on the other, or 7 on each. Also, each BBC can select either polarization. If other distributions of signals are required, they can in many cases be achieved by modifying the IF input lines to the rack. For example, if rack inputs A and B are both fed with the RCP signal for one frequency band and inputs C and D are fed with the RCP signal for the other band, than any desired distribution of BBC's between bands is possible, but for right circular polarization only.

An observing configuration of particular importance in geodesy is simultaneous S (2.3 GHz) and X (8.4 GHz) band observations in which the X band channels cover an RF range greater than 500 MHz. In the VLBA receiving system this is handled by bringing down three IF signals from the antenna, one for S band and two for X band (for the upper and lower parts of the band), all for RCP. The DAR would then be connected with one X-band signal fed to input A, and the other to input B, and the S band signal fed to both inputs C and D using a power splitter. Then, for example, if the numbers of channels required for the S band and the two X band signals are 6, 4, and 4 respectively, one could use BBC's 6 to 11 for S band, 1, 3, 4, and 5 for one X-band signal and 2, 12, 13, and 14 for the other. The assignment of channels to tape tracks in the formatter is selectable through the control software, so the system proposed should be sufficiently flexible to cover all requirements. (With the standard VLBA cabling system, an extra switch will be required to interchange the A and D IF cables to obtain the above interconnections. It is not proposed to include this switch in the DAR).

The second matter to be considered is the connection of the baseband outputs to the samplers. The two sampler modules provide for recording 16 baseband signals, and in the standard VLBA system these accommodate two baseband outputs from each of eight BBC's. In the 14-BBC configuration, only one sideband, usually the upper sideband, is expected to be used. The proposed distribution of BBC outputs to sampler inputs is as follows:

- (a) BBC #1, two outputs to Sampler 1, inputs 1 and 2
- (b) BBC #2, two outputs to Sampler 1, inputs 3 and 4
- (c) BBC's 3 through 6, upper sideband outputs to Sampler 1, inputs 5 to 8
- (d) BBC's 7 through 14, upper sideband outputs to Sampler 2, inputs 1 to 8.

The above scheme provides the performance required for Mark III operation and minimizes the changes in the rack wiring required to convert a standard 8-BBC DAR to the 14-BBC DAR configuration.

		<u>IF SIGNAL</u>				
		A	B	C	D	
BASEBAND CONVERTER SLOT NUMBER	}	1	x	x	x	x
		2	x	x	x	x
		3	x		x	
		4	x		x	
		5	x		x	
		6	x		x	
		7	x		x	
		8	x		x	
		9		x		x
		10		x		x
		11		x		x
		12		x		x
		13		x		x
		14		x		x

Fig. 1 Crosses indicate interconnections between IF signals and inputs of baseband converters, as proposed in this memorandum.