VLBA Acquisition Memo # 75

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To: VLBA Data Acquisition/Recorder Group

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Sujbect: VLBA Baseband Converter Tests - Status of Performance Verification II

Item	Specification	Measured Performance	See Acq. Memo #
Gain through conv (2 MHz BW):	64 ±1 dB Max	63.5 dB	64
Level control phase shift:	<Ø.5 deg	<1 deg	
Image rejection:	>26 dB	>26 dB	61
Energy in 1Ø KHz sidebands:	<4Ø dBc	~-45 dBc	61
L.O. phase noise:	<2 deg rms	<1 deg rms	7Ø
L.O. leakage into video:	<-5Ø dB	-8Ø dBm at 5ØØ MHz	64
Gain compression:	<1%	<Ø.5%	
Noise temperature:	<1ØØ,ØØØ deg K	~1ØØ,ØØØ deg K	
Temp. coeff of phase:	<1 deg/deg C/GHz	-Ø.4 deg/deg C/GHz	67
L.O. settling:	<1 sec	<3ØØ ms	64
L.O. leakage into input:	<-6Ø dBm	-73 dBm at 5ØØ MHz	64
Temp. coeff of gain:	<Ø.1 dB/deg C	-Ø.Ø5 dB deg C	74
Temp. coeff delay:	<Ø.1 ns/deg C at 8 MHz BW	~Ø.2 ns/deg C	67
4-Way input switch isolation:	<6Ø dB	~65 dB	61
Frequency range:	5ØØ - 1ØØØ MHz	49Ø - 1Ø5Ø MHz	7Ø
Bandpass response:			
Gain variation within 8Ø% of band:	<Ø.5 dB	<Ø.4 dB	74
Response at 1Ø8% of band:	<-1Ø dB	<-15 dB	74
Instrumental closure:	<Ø.1 deg	<Ø.Ø3 deg (est.)	74

Notes:

1] Level Control Phase Shift

The digital gain control produces a small phase shift with level change. Phase variations are within 0.5 degrees of the mean at 1 MHz over a 30 dB range. However, phase variations increase to 1.5 degrees at 8 MHz. Most of the variation has been traced to cross-coupling on the pc board. An improved pc layout should bring phase variations within speification for all bandwidths.

2] Gain Compression

The square law linearity (after subtraction of the zero offset - which is typically 0.5% of full scale) is better than 0.5%. The 1 dB compression point of the video output is +15 dBm (15 dB above the normal output).

3] L.O. Phase Noise and Frequency Range

The new oscillator pc board has improved the frequency range so that 500-1000 MHz is now covered without difficulty. The problem of high phase noise in some baseband converters has been solved by changing the FET bias current. Details are given in Acquisition Memo #70.

4] Noise Temperature

The noise temperature of the IFD/baseband converter has been improved by using mixers at a higher impedance (100 ohms).

5] Bandpass Response and Stability (See Acquisition Memo #74)

Several improvements have recently been made in the bandpass response, matching and stability. Instrumental closure phase error is estimated from measurements of the phase and amplitude match between bandpass responses.