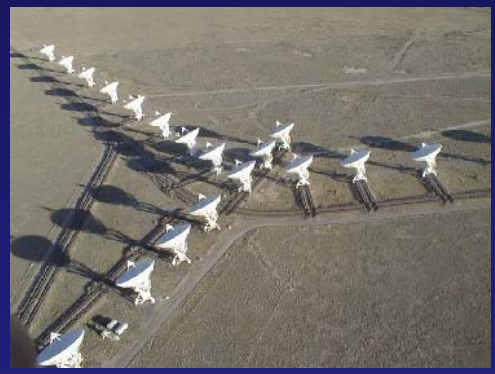

IF Downconverter

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IF Downconverter

- -Converts 8-12 GHz IF to two 2-4 GHz baseband IF's for 3-bit, 4GHz sampling
- -Converts 8-12 GHz IF to one 1-2 GHz baseband IF's for 8-bit, 2GHz sampling

IF Downconverter Specifications

ITEM	SPECIFICATION	NOTES
Number of modules	124	4 per antenna plus 12 spares
Number of IF inputs per module	1	
Input frequency range	7.5 – 12.5 GHz	

IF Downconverter Specifications

ITEM	SPECIFICATION	NOTES
Input power level	-45 dBm/GHz	
Variation of power spectral density	+/- 1.5 dB	
Headroom	> 20 dB	

IF Downconverter Specifications

ITEM	SPECIFICATION	NOTES
Number of LO per module	3	2 independently tunable, 1 fixed
Frequency range of LO	2 @ 10.8 – 14.8 GHz, 1 @ 4.096 GHz fixed	
Power level LO	+10 dBm	

IF Downconverter Specifications

ITEM	SPECIFICATION	NOTES
Spurious levels of LO	<-70 dBc for spurious, < -80 dBc for harmonics related to any reference frequency, <-40 dBc for harmonics	

IF Downconverter Specifications

ITEM	SPECIFICATION	NOTES
Number of IF outputs per module	3	
Frequency range of output	2 bands 2-4 GHz 1 band 1-2 GHz	
Power level of output	TBD	

IF Downconverter Specifications

ITEM	SPECIFICATION	NOTES
IF headroom	>20 dB	
LO 2nd harmonic spur and leakage	< -40 dBc	
IF input VSWR	< 1.5:1.0	

IF Downconverter Specifications

ITEM	SPECIFICATION	NOTES
IF input noise figure	< 12 dB	
Image rejection	< -25 dBc	
Overall amplitude flatness	2 dB / 200 MHz avg. slope	Smooth variations, no large jumps

IF Downconverter Specifications

ITEM	SPECIFICATION	NOTES
Phase/delay stability	TBD	
Isolation between channels	> 70 dB	

IF Downconverter Specifications

ITEM	SPECIFICATION	NOTES
Total power detector response time	TBD	
Phase linearity	2.8 nsec / any 2 MHz	
Interface	TBD	
M&C	TBD	

IF Downconverter

- Filters:
- Phase Linearity: < +/- 25° across any 2 GHz
- Amplitude: 0.5 dB pp
- Delay matched: < 15° across 80% centered BW
- Phase Δ w/ Temp: <20° across BW

IF Downconverter

- Variable Attenuators:
- 0.125 dB LSB, 32.875 dB max
- Phase shift with Attenuation change:

  +/- 5° to 20 dB

  +/- 10° to 32 dB, TBD

IF Downconverter

- Isolation/Isolators:
- 4096 MHz LO – 2-4 GHz path: 133 dB in Switch, Isolator, Mixer
- 2-4 GHz paths: 40 dB in Isolator, Power Divider
- 2nd LO #1 – 2nd LO #2: 100 dB in Isolators, Mixer, Power Divider
- Output: TBD

IF Downconverter

- Total Power Detectors
- Similar to or same as ALMA
- 2 ms sampled
- Servo Attenuators locally (closed loop) or attenuators servoed from MCC
- TPD and Variable Attenuators possibly served by separate MIB

IF Downconverter

- Path 1
- Converts 8-12 GHz to 2-4 GHz

IF Downconverter 8-12 GHz

Device 8-12 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Input		-34	-64	30	
Coax	-3	-37	-67	30	
Isolator	-0.6	-37.6	-67.5	29.9	
Attenuator	-5	-42.6	-72.3	29.7	
Amplifier	20	-22.6	-51.7	29.1	26.6

IF Downconverter 8-12 GHz

Device 8-12 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Attenuator	-3	-25.6	-54.7	29.1	
BP Filter	-1	-26.6	-55.7	29.1	
Attenuator	-6	-32.6	-61.7	29.1	
Dig. Attn.	-5	-37.6	-66.7	29.1	
Amplifier	12	-25.6	-54.5	28.9	21.6

IF Downconverter 8-12 GHz

Device 8-12 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Gain Eq.	-1	-26.6	-55.5	28.9	
Power Div.	-3.5	-30.1	-59	28.9	
TPD	-10	-40.1	-68.9	28.8	19.1
Power Div.	-3.5	-33.6	-62.4	28.8	
Isolator	-2	-35.6	-64.4	28.8	

IF Downconverter 2-4 GHz

Device 2-4 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Mixer 2-4	-5.5	-41.1	-69.8	28.7	24.1
Isolator	-0.4	-41.5	-70.2	28.7	
Attenuator	-3	-44.5	-73	28.5	
BP Filter	-1	-45.5	-73.9	28.4	
Attenuator	-3	-48.5	-76.5	28	

IF Downconverter 2-4 GHz

Device 2-4 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Amplifier	16.5	-32	-58.6	26.6	35
RF Switch	-1.8	-33.8	-60.4	26.6	

IF Downconverter 2-4 GHz

Device 2-4 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Attenuator	-3	-36.8	-63.4	26.6	
Amplifier	13	-23.8	-50.3	26.5	20.8

IF Downconverter 2-4 GHz

Device 1-4 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
RF Switch	-1.8	-25.6	-52.1	26.5	
Attenuator	-3	-28.6	-55.1	26.5	
LP Filter	-1	-29.6	-56.1	26.5	
Attenuator	-3	-32.6	-59.1	26.5	
Amplifier	13	-19.6	-46.1	26.5	16.6

IF Downconverter 2-4 GHz

Device 1-4 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Attenuator	-3	-22.6	-49.1	26.5	
BP Filter	-1	-23.6	-50.1	26.5	
Attenuator	-3	-26.6	-53.1	26.5	
Dig. Attn.	-8	-34.6	-61	26.4	
Amplifier	13	-21.6	-48	26.4	18.5

IF Downconverter 2-4 GHz

Device 1-4 GHz	Gain dB	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom dB
Power Div.	-3.5	-25.1	-51.5	26.4	
TPD	-10	-35.1	-61.5	26.4	18
Amplifier	0	-25.1	-51.5	26.4	22
Out to Sampler	-.1	-25.2	-51.6	26.4	

IF Downconverter

- Path 2
- Converts 8-12 GHz to 1-2 GHz

IF Downconverter 8-12 GHz

Device 8-12 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Input		-34	-64	30	
Coax	-3	-37	-67	30	
Isolator	-0.6	-37.6	-67.5	29.9	
Attenuator	-5	-42.6	-72.3	29.7	
Amplifier	20	-22.6	-51.7	29.1	26.6

IF Downconverter 8-12 GHz

Device 8-12 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Attenuator	-3	-25.6	-54.7	29.1	
BP Filter	-1	-26.6	-55.7	29.1	
Attenuator	-6	-32.6	-61.7	29.1	
Dig. Attn.	-5	-37.6	-66.7	29.1	
Amplifier	12	-25.6	-54.5	28.9	21.6

IF Downconverter 8-12 GHz

Device 8-12 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Gain Eq.	-1	-26.6	-55.5	28.9	
Power Div.	-3.5	-30.1	-59	28.9	
TPD	-10	-40.1	-68.9	28.8	19.1
Power Div.	-3.5	-33.6	-62.4	28.8	
Isolator	-2	-35.6	-64.4	28.8	

IF Downconverter 2-4 GHz

Device 2-4 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Mixer 2-4	-5.5	-41.1	-69.8	28.7	24.1
Isolator	-0.4	-41.5	-70.2	28.7	
Attenuator	-3	-44.5	-73	28.5	
BP Filter	-1	-45.5	-73.9	28.4	
Attenuator	-3	-48.5	-76.5	28	

IF Downconverter 2-4 GHz

Device 2-4 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Amplifier	16.5	-32	-58.6	26.6	35
RF Switch	-1.8	-33.8	-60.4	26.6	

IF Downconverter 1-2 GHz

Device 1-2 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Isolator	-0.8	-34.6	-61.2	26.6	
Mixer	-5	-39.6	-66.1	26.5	
Isolator	-0.6	-40.2	-66.7	26.5	
BP Filter	-1	-41.2	-67.7	26.5	
Amplifier	20	-21.2	-47.5	26.3	32.2

IF Downconverter 1-2 GHz

Device 1-4 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
RF Switch	-1.8	-23	-49.3	26.3	
Attenuator	-3	-26	-52.3	26.3	
LP Filter	-1	-27	-53.3	26.3	
Attenuator	-3	-30	-56.2	26.2	
Amplifier	13	-17	-43.2	26.2	17

IF Downconverter 1-2 GHz

Device 1-4 GHz	Gain	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom
Attenuator	-3	-20	-46.2	26.2	
BP Filter	-1	-21	-47.2	26.2	
Attenuator	-3	-24	-50.2	26.2	
Dig. Attn.	-8	-32	-58.2	26.2	
Amplifier	13	-19	-45.2	26.2	18.9

IF Downconverter 1-2 GHz

Device 1-4 GHz	Gain dB	Signal dBm/GHz	Noise dBm/GHz	Spectral SNR	Headroom dB
Power Div.	-3.5	-22.5	-48.7	26.2	
TPD	-10	-32.5	-58.7	26.2	18.4
Amplifier	0	-22.5	-48.7	26.2	22.4
Out to Sampler	-.1	-22.6	-48.8	26.2	