

ALMA 2G Correlator: specifications of the European design

Version
1.2

AB 111202

SYSTEM SPECIFICATIONS

Number of antennas	64+16
Number of polarizations per base band	2
Number of basebands per polarization	4
Bandwidth per baseband and polarization	2 GHz
Number of subbands per baseband and polarization	34
Bandwidth per subband	2000/32=62.5 MHz
Number spectral points per subband and polarization	32
Phase switching modes	90+180 deg

Selected correlator modes

#digitizers	bandwidth/ digitizer	cross pol products	channels/ product	At 230 GHz in velocity space (km/sec)			
				Range	Resolution		
8	2 GHz	Yes	1024	9391	2,55		
8	2 GHz	No	2048	18783	1,27		
8	1 GHz	No	2048	(4096)	9391	0,64	(0.32)
8	500 MHz	Yes	1024	(4096)	2348	0,64	(0.16)
8	250 MHz	No	2048	(16384)	2348	0,16	(0.04)
4	2 GHz	Yes	2048	(4096)	4696	1,27	(0.64)
4	1GHz	No	4096	(16384)	4696	0,32	(0.08)
4	500 MHz	Yes	2048	(16384)	1174	0,32	(0.04)
4	250 MHz	No	4096	(32768)	1174	0,08	(0.01)
2	2 GHz	Yes	4096	(16384)	2348	0,64	(0.16)
2	1 GHz	No	8192	(65536)	2348	0,16	(0.02)
2	500 MHz	Yes	4096	(32768)	587	0,16	(0.02)
2	250 MHz	No	8192	(65536)	587	0,04	(0.005)

The numbers between brackets refer to the values obtained by using recirculation

Table format identical to Table 3.10 in chapter 2 in the Alma project book.

ADC SUBSYSTEM

Input signal band	2-4 GHz
Input signal level	tbd
Number of analog input signals	8
Location	at antennas
Number of units	80(+ spares)

Sampler

Input level range	tbd dBm
Automatic gain control level tracking accuracy	< 1 %
Reference level tracking (1 sec integration time)	< 10**-4
Automatic gain control and reference level tracking on/off option	yes
Sampling rate per baseband	4 GHz
Number of bits per sample	3

Clock jitter	< 1/32 th sample
Aperture time	< 50 ps
Passband amplitude stability	tbd
Passband phase stability	tbd
Fine delay	
Accuracy	< 1/32 th sample
Range	+/- 0.5 sample
Location	in sampling clock
Total power detector	
Range	tbd
Linearity	0,10%
Stability	< 1%
Header injection	
Number of bits	tbd

FILTER BANK + DELAY SUBSYSTEM

Number of units	80(+spares)
Number of inputs per unit	8
Input clock rate	4 GHz
Number of bits per sample	3
Filterbank	
Type	2 stage FIR, fully tunable
Number of of subbands	34
Overlap	6%
Subband bandwidth	7.8125/15.625/31.25/62.5 MHz
Subband tuning range	2 GHz
Bandwidth and tuning per subband independent	yes
Bandpass ripple	< 0.17 dB
Out of band attenuation	> 40 dB
Spurious signal suppression	> 60 dB
90-degrees phase switch	double buffered
Programming time	< 1sec
Delay tracking	
Delay resolution	1 sample = 250 ps
Delay range	30 km = 100 usec
Control parameters	delay offset+ delay rate
Control parameter update period	~1 sec
Recirculation	
Switching procedure	over antennas and/or subbands
Max number of cycles	8
Cycle time	1-10 ms
Header injection	
Number of of bits	tbd

CORRELATOR SUBSYSTEM

Maximum number of antenna inputs (max allowed by system architecture: 96)	80
Maximum number of baselines per subband	3 160

Maximum number of Stokes parameters per baseline	4
Maximum number of cross-correlations per subband, 4 Stokes	12 720
Maximum number of auto-correlations per subband	160
Minimum number of lags per cross-correlation	65
Minimum number of lags per auto-correlation	32
Maximum number of lags per cross-correlation (system design goal: 294,912)	204 801
Maximum number of lags per auto-correlation (system design goal: 147,456)	102 400
Total number of lags (system design goal: 162.925.824)	113 141 120
Clock frequency	125 MHz
Correlator chip integration cycle	1-11 ms
Board integration time	1 ms - 10 sec
Number of subarrays	8-128
Tied array adder	
Per subband	yes
Number of antennas added (max allowed by system architecture: 96)	2-80
Number of subarrays	>= 4
Outputs to correlator	yes

FLEXIBILITY

Stokes parameters	1,2,4
Basebands	1,2,3,4
Subbands	1-34
Antennas (max allowed by system architecture: 96)	8-80
Number of points per spectrum	32-262,144
Pulsar gating	yes