

PRELIMINARY COOLING LOAD ESTIMATES FOR MMA RECEIVERS

LRD 971121, rev 980121

Total of 10 separate receivers on different bands:

3 HEMT amplifier + 7 SIS mixer, or

2 HEMT amplifier + 8 SIS mixer

One feed horn per receiver, cold.

HEMT receivers: Two channels (both polarizations); about 5 stages/chan.

SIS mixer receivers (only one active at a time):

Two mixers (both polarizations)

Four IF channels (both polarizations, both sidebands)

Two IF amplifier stages per channel integrated w/ mixers

REFRIGERATION STAGES:

at mixer mounting stage
 4.0K nominal with good stability:

10mK p-p in 1 minute

100mK p-p in 1 day

4.5K maximum before maintenance; 1 year desired.

*BIMA: 200mK at cold head
 20mK at mixer - bad for stability
 at a few % gain
 2mK rms over days*

"Warm" stages: one or two stages at temperatures TBD,
 somewhere between 15K and 80K.

REFRIGERATION LOADS: Very rough guesses, from experience

Heat Source	Warm Stage	4K Stage
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Radiation shields, intercepting 300K	10 W	0
Radiation, 80K shields to 4K		16 mW
Windows: leakage past IR blocks		*50 mW
Electrical dissipation:		
HEMT amplifiers - 2 rcvrs x 2 chans		
2 stages 4K @5mW		40 mW
3 stages warm @10mW	0.12 W	
SIS IF amplifiers - 1 rcvr, 4 chans		
2 stages 4K @5mW		40 mW
3 stages warm @10mW	0.12 W	
LO multipliers or photo mixers	0.5 W	0
Conduction: Waveguides, coax	*2.0 W	50 mW
Conduction: JT circuit parts, if any	1.5 W	10 mW
Miscellaneous, margin	1.0 W	50 mW
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TOTALS	15.24 W	256 mW
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* These estimates may be subject to especially large errors.