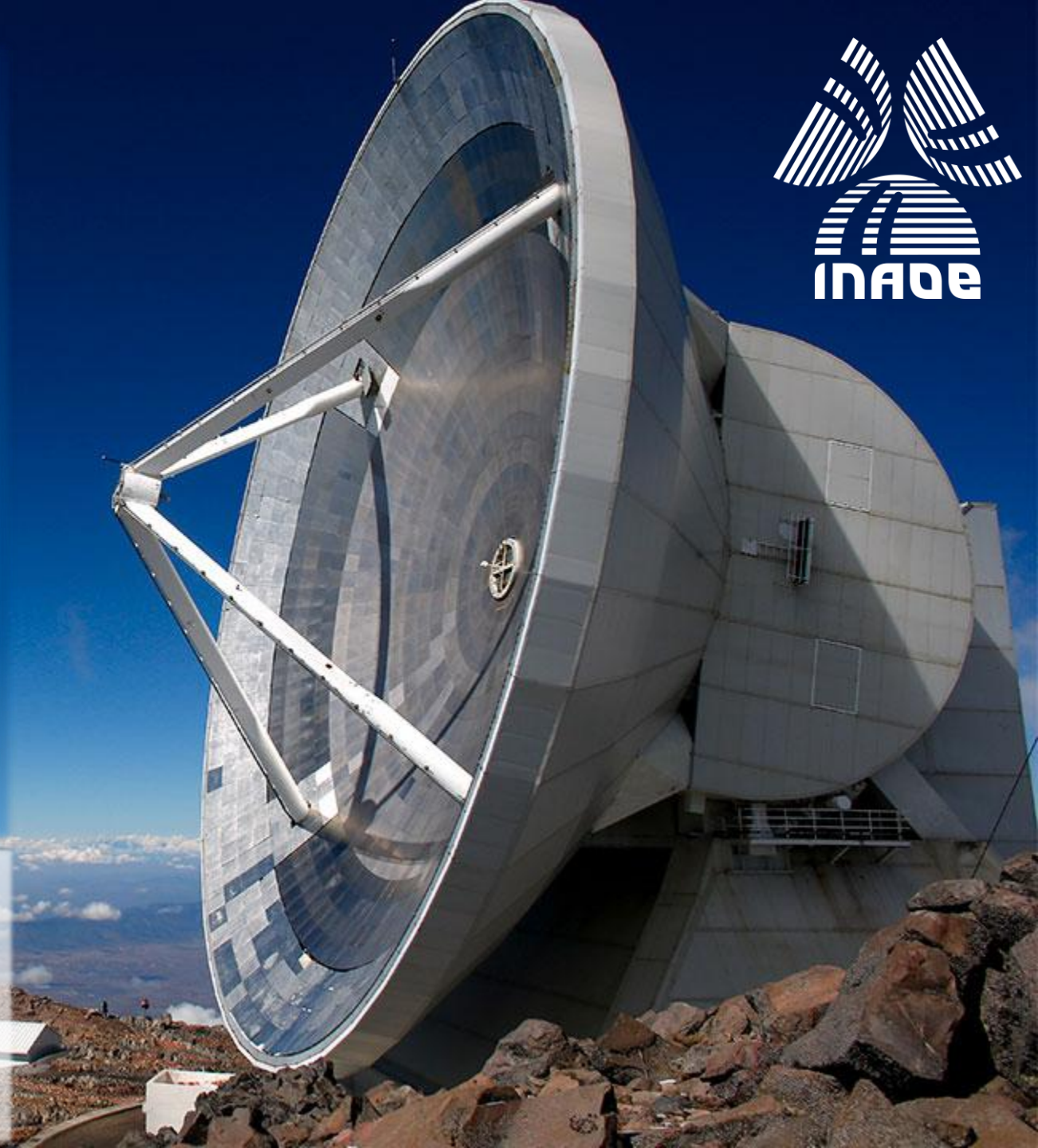


SuperSpec on the horizon: On-Chip Prototyping for MUSCAT and LIM simulations at the LMT



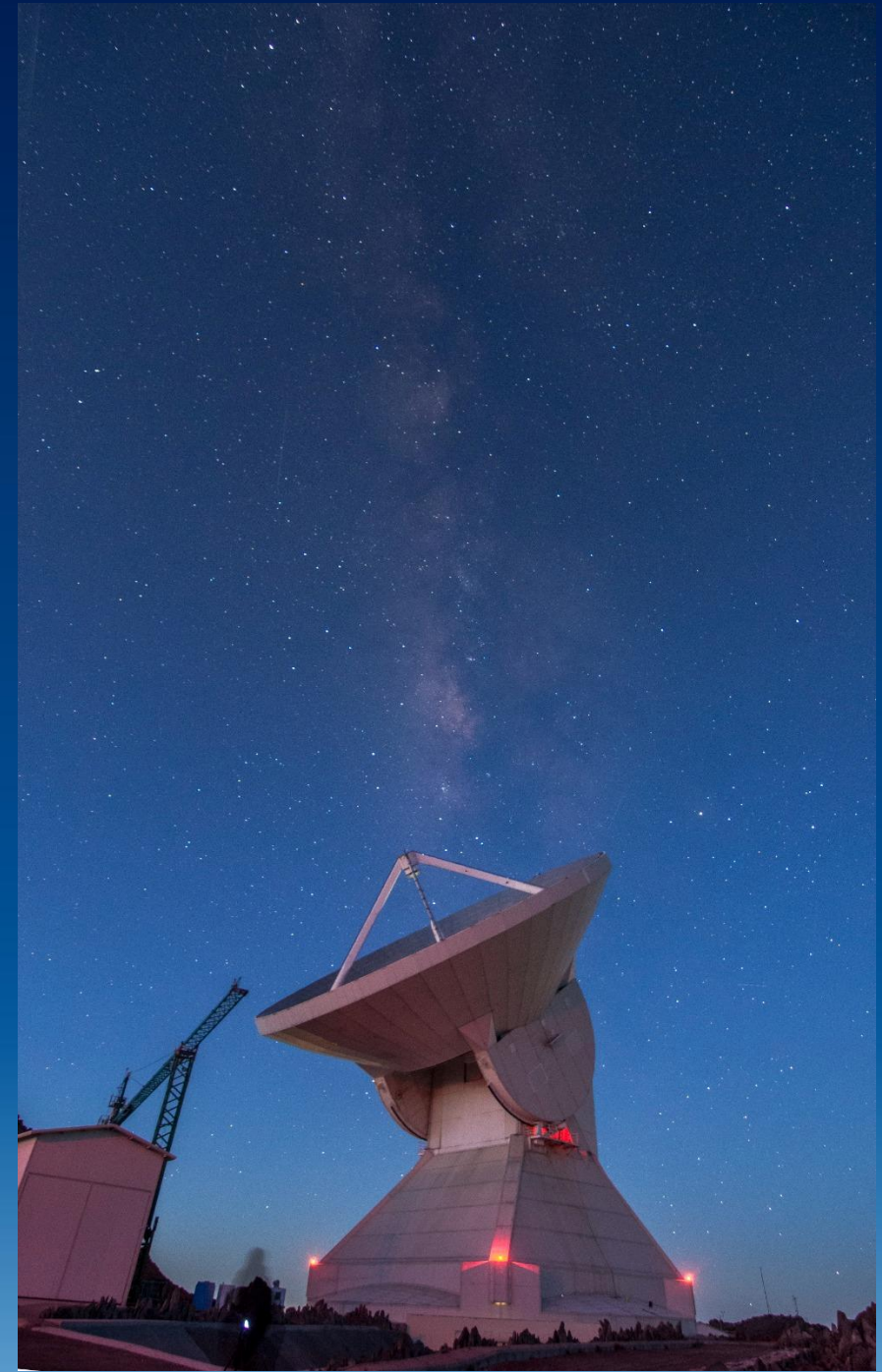
Jair Vega¹, I. Rodríguez¹, P. Barry², M. Becerril², M. Bradford³, S. Doyle², V. Gómez-Rivera¹, R. Gonzales⁴, S. Hailey-Dunsheath⁵, D. Hughes¹, K. Karkare⁶, J. Redford⁷

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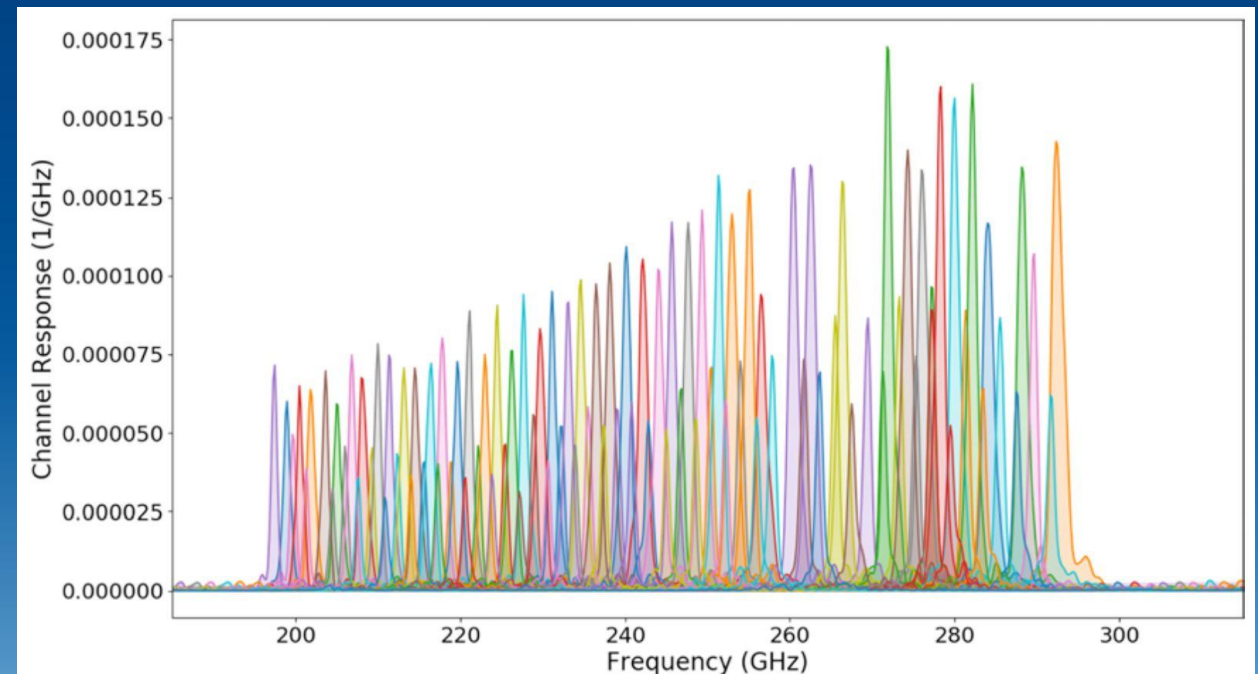
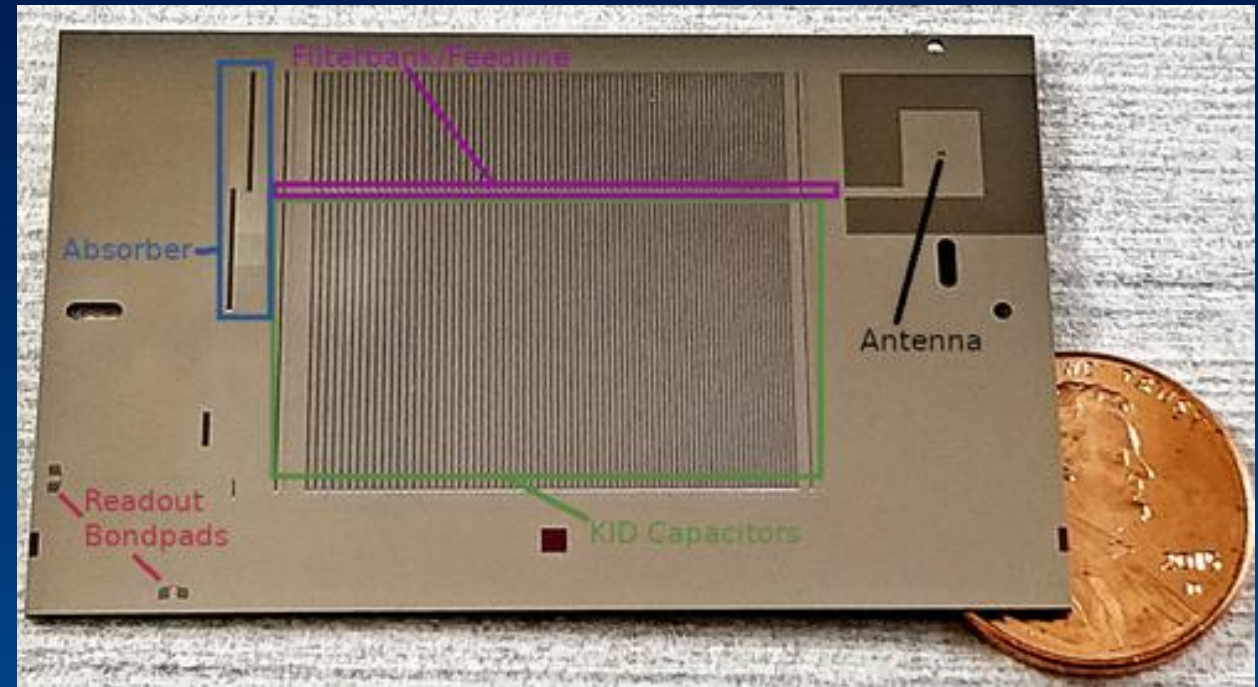
LMT

- 50m single dish antenna
- Altitude of 4600 m
- 4 arcmin FoV
- Angular resolution of 4-18 arcsec for the 1-4 mm range



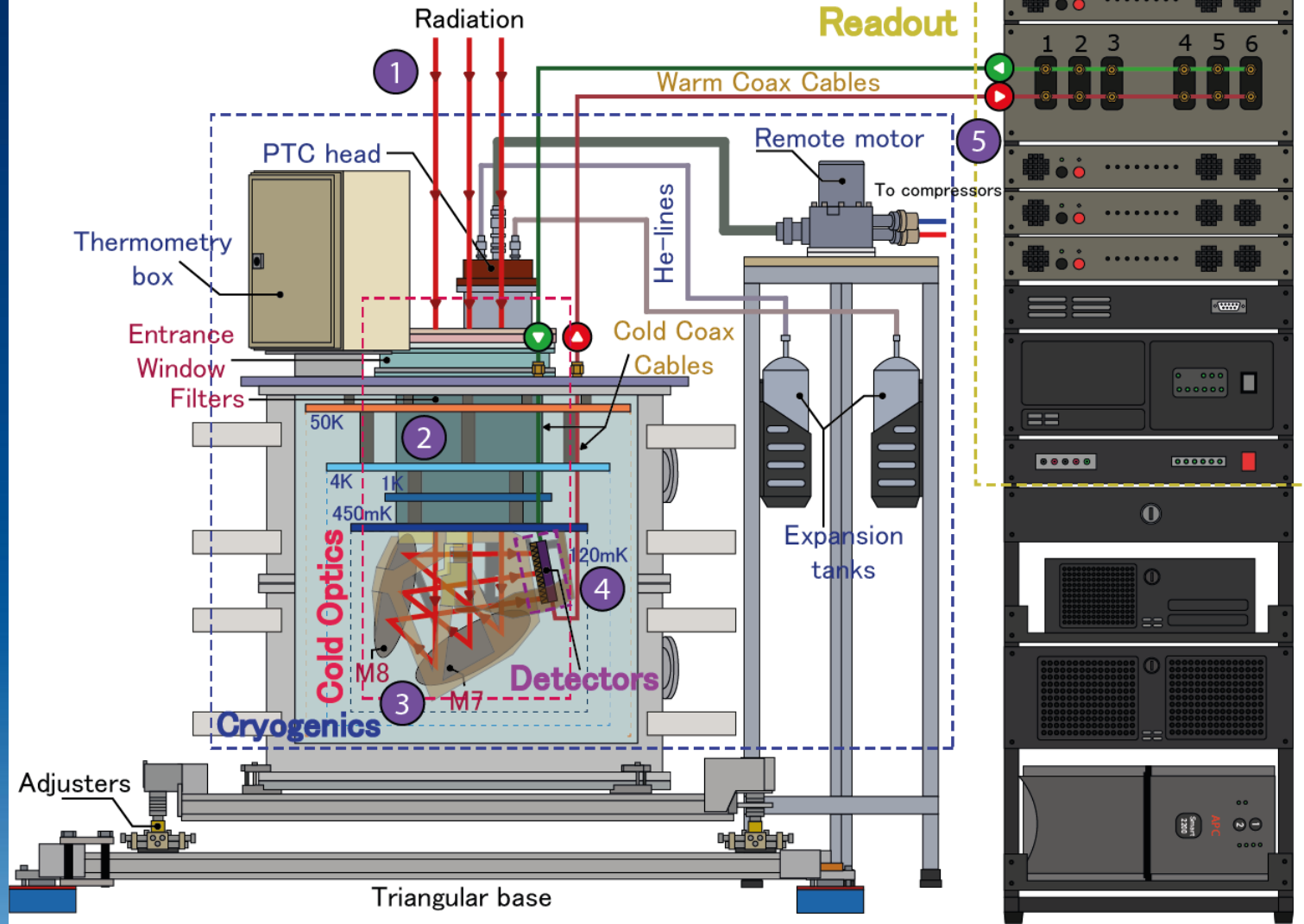
SuperSpec

- On-chip spectrometer based on 110 TiN LEKIDs channel filter banks
- Operating at 217 mK it has a $R \sim 270 - 290$ in the 1mm atmospheric window (200-300 GHz)
- Sensible to the $158 \mu m$ [CII] line ($z=5.66-8.49$), and several CO rotational lines spanning $z=1-4$



MUSCAT

- Continuum camera for wide fields in 1mm
- 1458 aluminum LEKIDs detectors operating at 120 mK
- Adaptable for Superspec detectors with simple electronic modifications and external chopper system.



Thank you

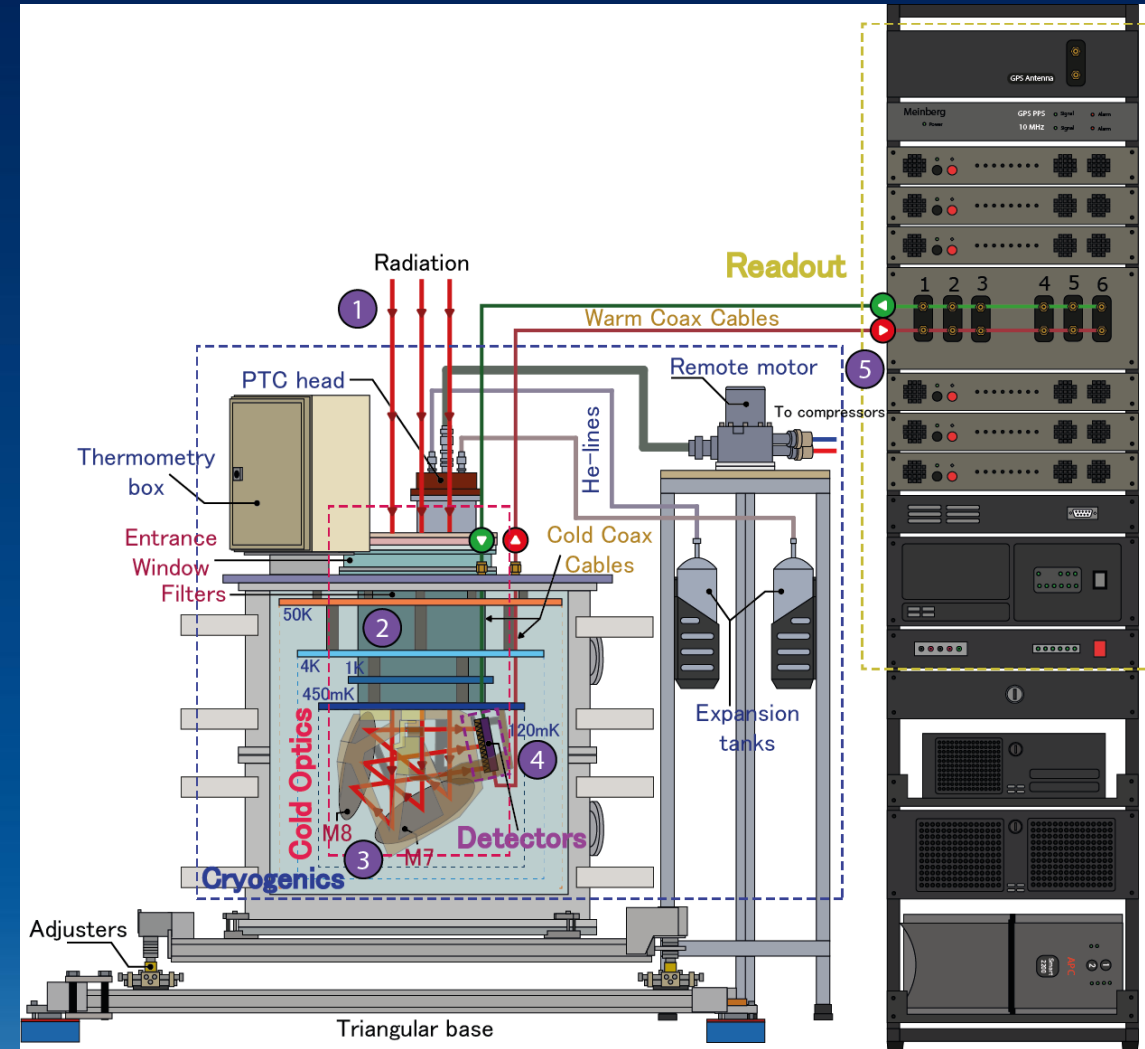


Back up slides

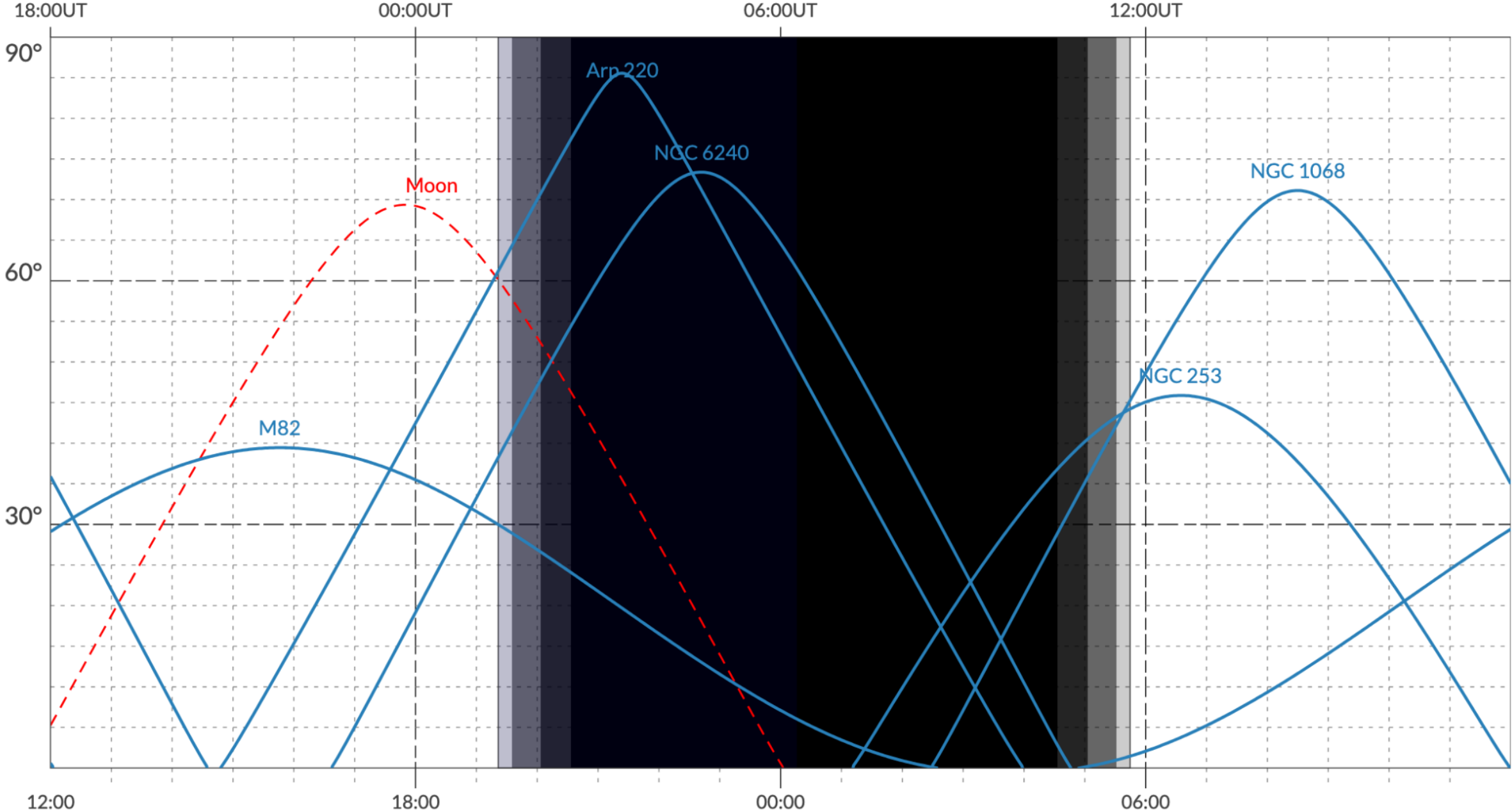


Schedule

- Hardware installation
- Cooldown, readout modifications, and chopper installation
- Initial array characterization
- Initial On-Sky Characterization
- Point source observations



Daily chart, 1 Jul 2025 [\[?\]](#) [\[↓\]](#)



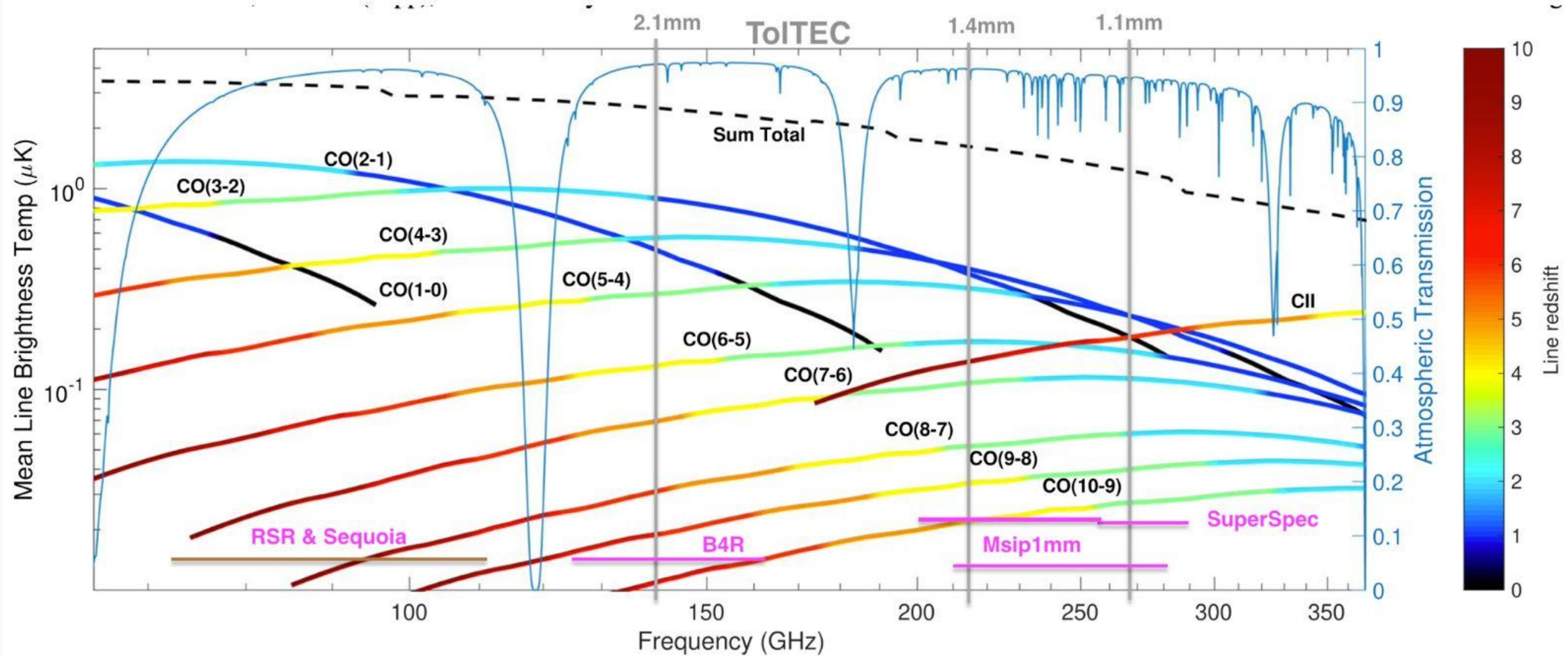


Table 3.1: General properties of the MUSCAT detection subsystem.

Detection band	1.1 mm
Operating temperature	120 mK
Detector dimensions	2.9×2.47 mm ²
Detector composition	Al deposited on Si wafer
Coupling quality factor Q_c	50,000
Polarization detection	Both orthogonal polarizations
Total number of detectors	1458
Number of arrays	6
Number of detectors per array	243
Detector distance centre-to-centre	3 mm
MUSCAT Developments (array #)	MD-M(1-2), MD-J(3-4), MD-F(5-6)
Resonance frequencies range (array #)	507-980(1-4) and 580-1060(5,6) MHz

Table 3.2: General characteristics of the MUSCAT cryogenics subsystem.

Coldest temperature	115 mK
Thermal stages	50 K, 4 K, 1 K, 450 mK and 120 mK
Pulse Tube Cooler	Cryomech PT 420-RM for 50 and 4 K
Sorption coolers	Chase Research Cryogenics: CC4 (1 K) and CC7 (450 mK)
Dilution fridge	Chase Research Cryogenics: CMD (120 mK)
Cooling time	69 hours (from room temperature to 115 mK)

Table 3.3: General characteristics of the MUSCAT cold optics subsystem.

Frequency bandwidth	50 GHz
Central frequency	~ 275 GHz (1.1 mm)
FOV (diameter)	4 arcmin
Single feedhorn focal ratio	f/2.8

Table 3.4: Main properties of the MUSCAT reading subsystem.

Readout channels	1(phantom), 2(clones), 3(sith), 4(hope), 5(empire), 6(jedi)
DTP clock frequency	512 MHz
Instrument sampling rate	488.28 Hz (reducible in multiples of 2)
LO range	650-750 MHz
Total gain in cryostat	-3 dB