MUSCAT
Results from final-stage lab commissioning

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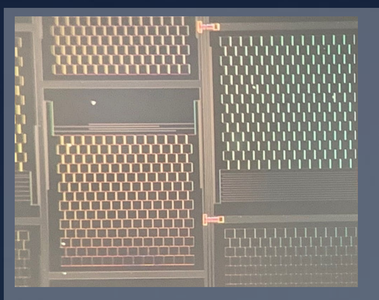
About

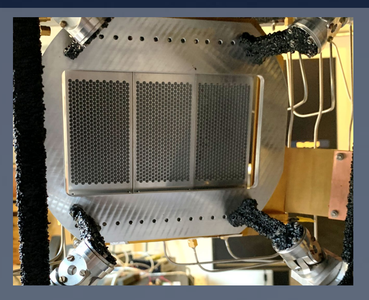
MUSCAT is a 1.1-mm receiver which will be installed on the LMT (Sierra Negra, Mexico) for the 2019/20 good-weather season.[1,2] The receiver consists of 1,500 LEKIDs cooled to approximately 100 mK continuously via a novel combination of sorption and dilution cooling systems. The optics design is fully reflective and diffraction-limited down to 850 μm.[2]

Detectors

The 1,500 LEKIDs are horn-coupled and include an inter-pixel absorber on the backside to minimise optical crosstalk. SiO_2 bridges ensure feedline uniformity. The design is corrected for aluminium film thickness variation.



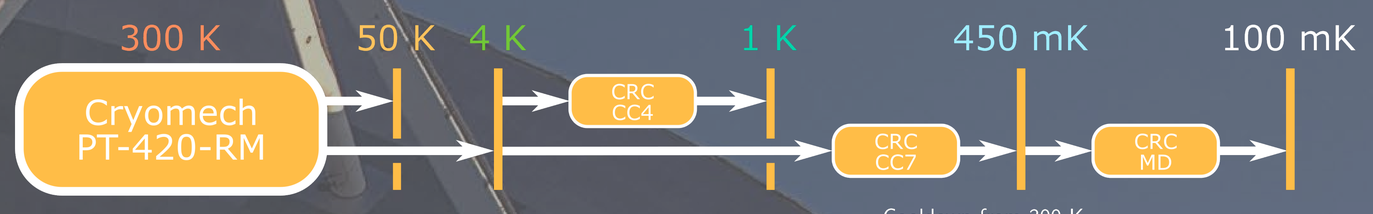
MUSCAT pixels and SiO_2 bridges

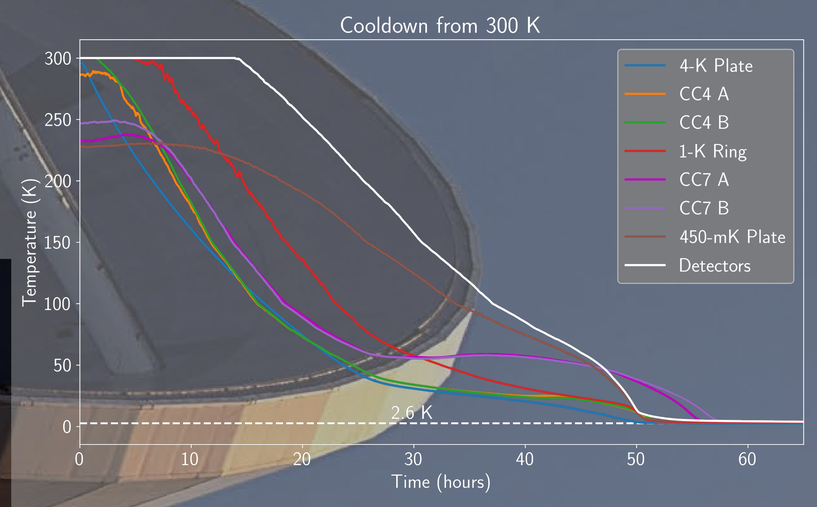


Fully populated focal plane

Cryogenics

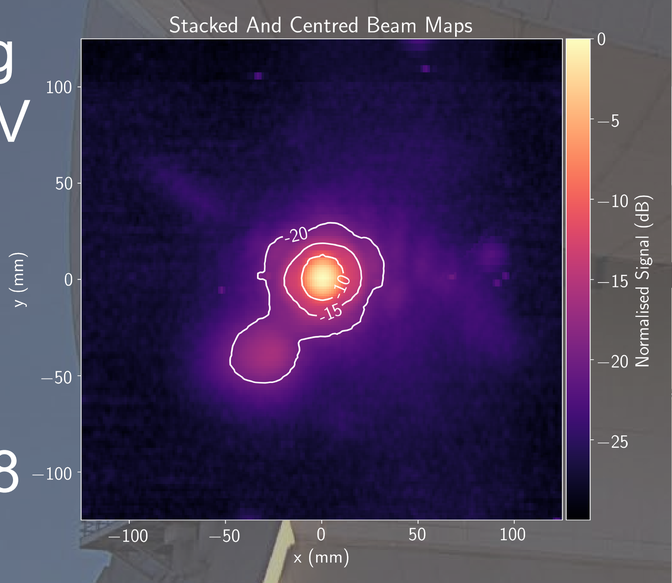
- Initial cooling via Cryomech PT-420
- Chase Research continuous sorption coolers and miniature dilutor[3]
- T_{min} = 140 mK continuous
- Continuous stages also at 1 and 0.45 K

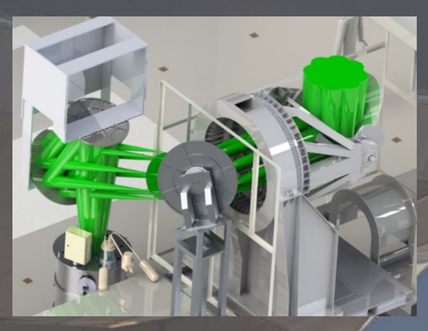


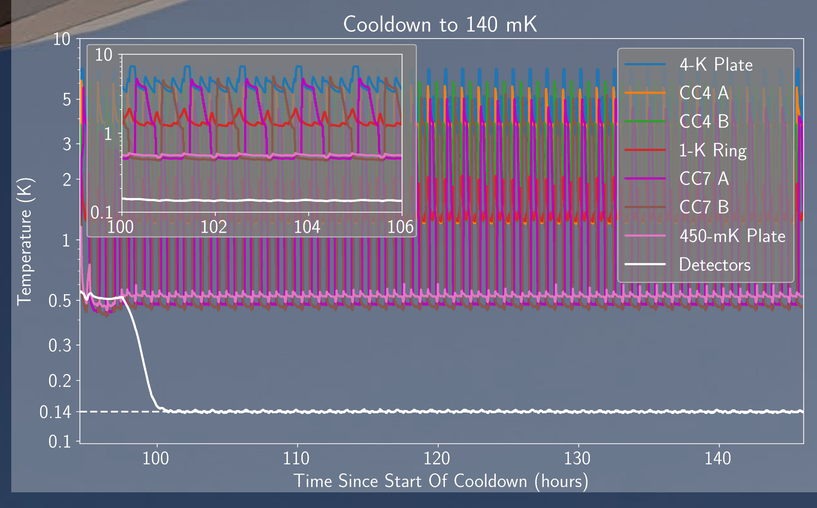


Optics

- *f*/2.8 design filling 95 % of LMT FOV
- Fully baffled[2]
- Horn-coupled detectors fully beam mapped
- Beam ecc. = 0.18







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References
[1] Castillo-Dominguez, J Low Temp Phys. (2018); arXiv:1806.10400
[2] Brien, Proc. SPIE (2018); arXiv:1807.08637
[3] Brien, J Low Temp Phys (2018); arXiv:1801.07442
Background picture credit: LMT 2019, used with permission

Current Status

- Instrument design and build complete
- Deployment arrays installed and undergoing final characterisation
- Site preparation nearing completion
- Plan to ship to Mexico end of August
- On sky for good weather from November