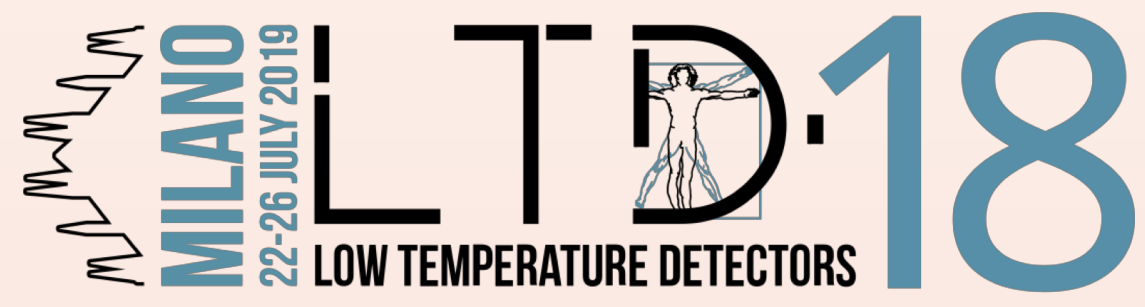
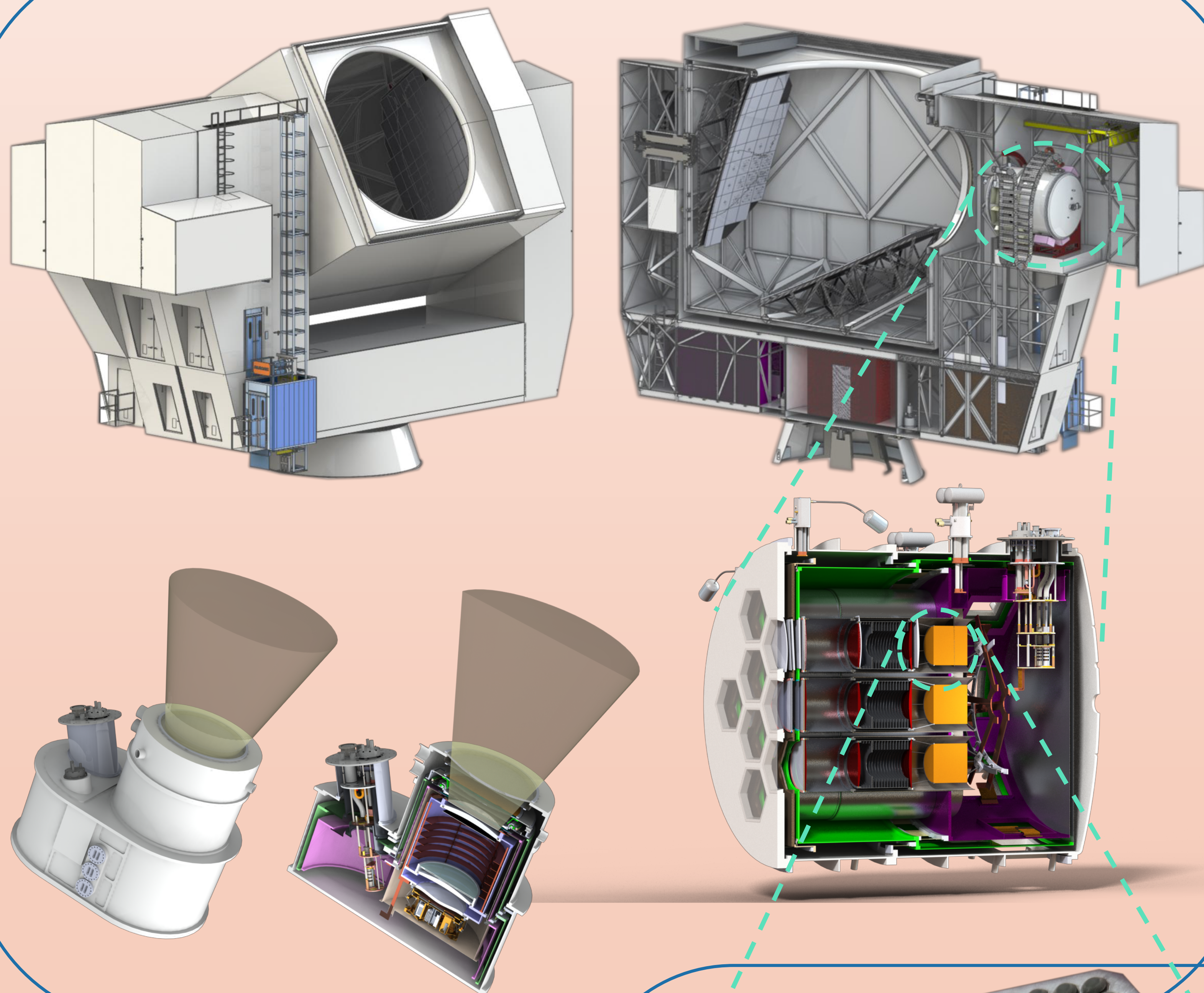


DEVELOPMENT OF NEXT GENERATION ANTENNA-COUPLED HEMISPHERICAL LENS ARRAYS FOR THE SIMONS OBSERVATORY



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INTRODUCTION

The Simons Observatory (SO) is a next generation Cosmic Microwave Background (CMB) experiment that aims to further constrain cosmological parameters with increasingly sensitive polarization measurements.

With both the Large Aperture Telescope (LAT) and Small Aperture Telescope (SAT), SO will observe six frequency bands split into three array types:

- Low Frequency (LF) - 30/40 GHz
- Mid Frequency (MF) - 90/150 GHz
- Ultra High Frequency (UHF) - 220/280 GHz

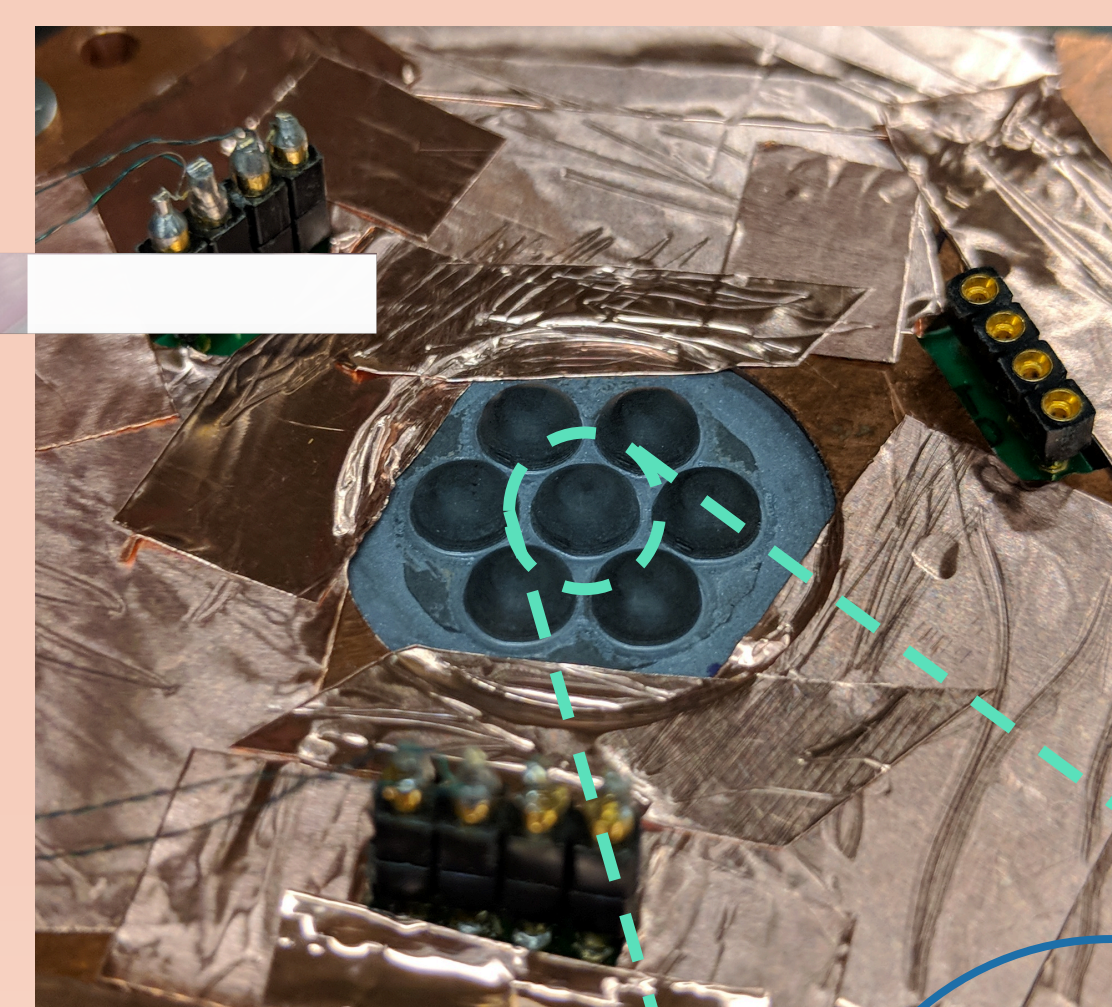
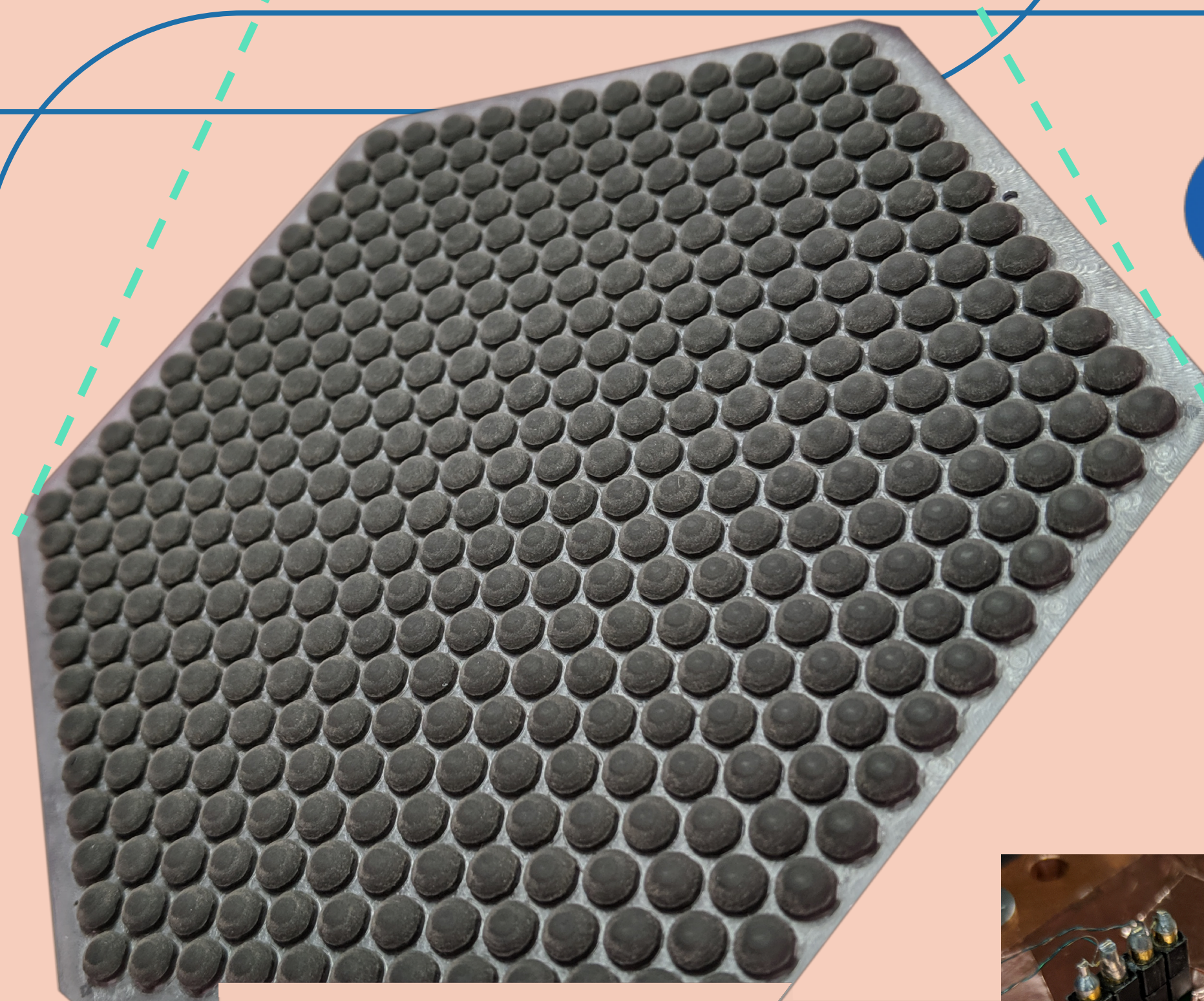
Two optical coupling configurations will be utilized to accomplish SO's frequency bands: Feedhorns coupled to orthomode transducers, and lenslets coupled to planar sinuous antennas.

MOLDED EPOXY ARRAYS

As a parallel effort, molded AR coatings have been developed for lithographed silicon wafers with alumina hemispheres.

These full-array molds have been shown to achieve an x-y-z concentricity of < 7 micron.

This is accomplished using a rulon plastic mold with an aluminum 'boss' substructure shown below.



LENSLETS FOR THE SIMONS OBSERVATORY MONOLITHIC ARRAYS

SO has selected monolithically machined, silicon lenslet arrays with a machined epoxy anti-reflection (AR) coating for its baseline lenslet technology. These arrays are fabricated in Colorado by Coldquanta inc.

Samples tested at Berkeley and have been shown to achieve optical properties consistent with proven lenslet technology.

FUTURE WORK

Full production for SO lenslet arrays is scheduled to begin in August 2019. 15 arrays will be fabricated in total.

CITATIONS

Suzuki, A., Ade, P.A.R., Akiba, Y. et al. *J Low Temp Phys* (2018) 193: 1048.

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