

The TolTEC Camera

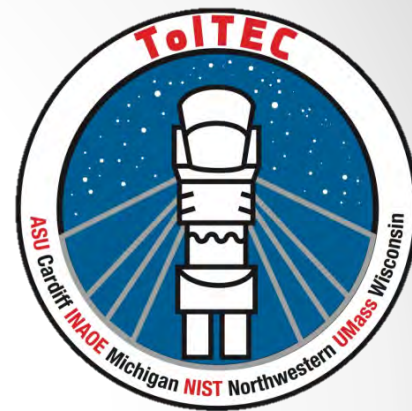
Grant Wilson
University of Massachusetts

Project Scientist: Itziar Aretxaga
Deputy Project Scientist: Alexandra Pope
Project Manager: Stephen Kuczarski



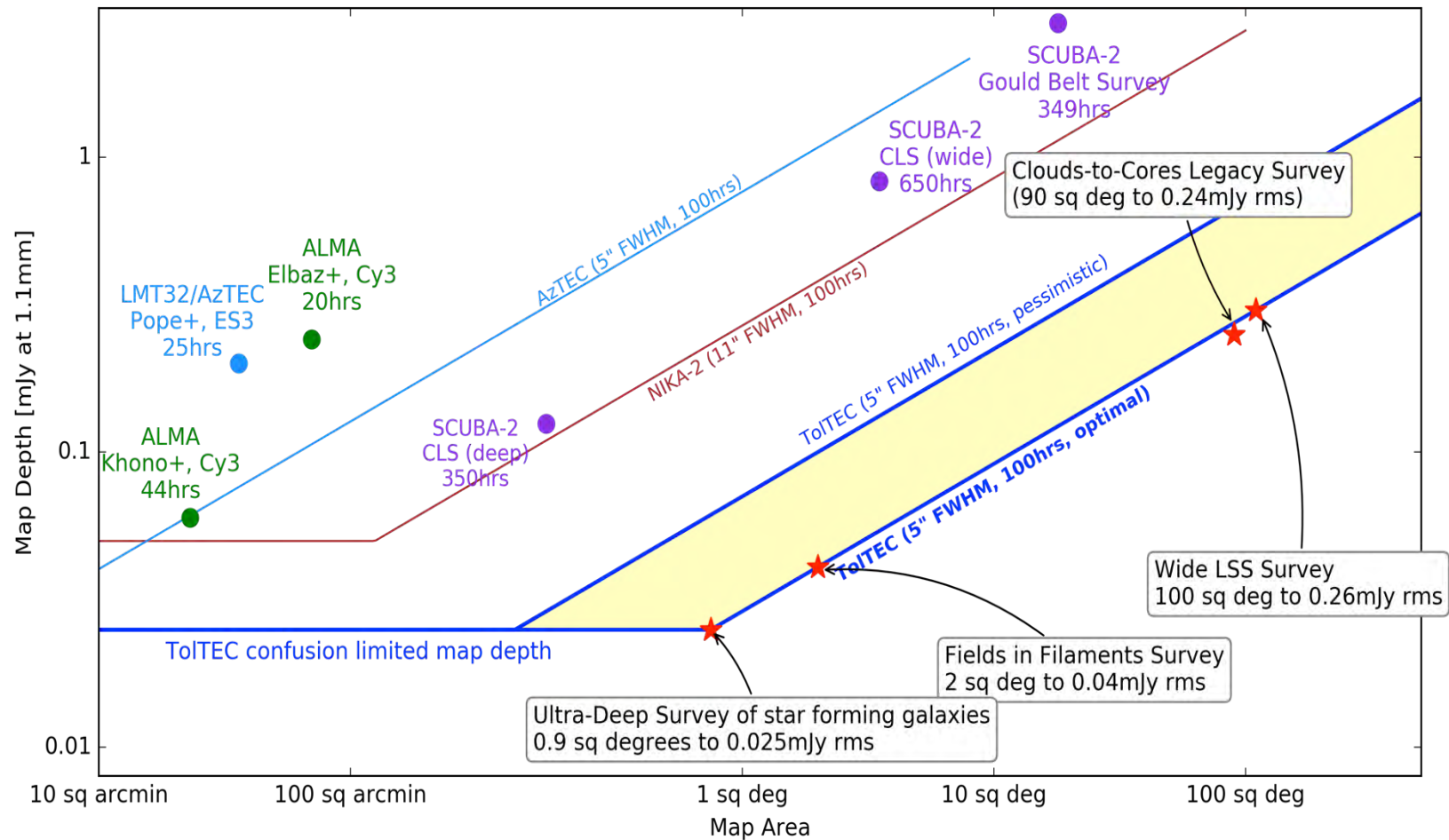
The TolTEC Imaging Polarimeter

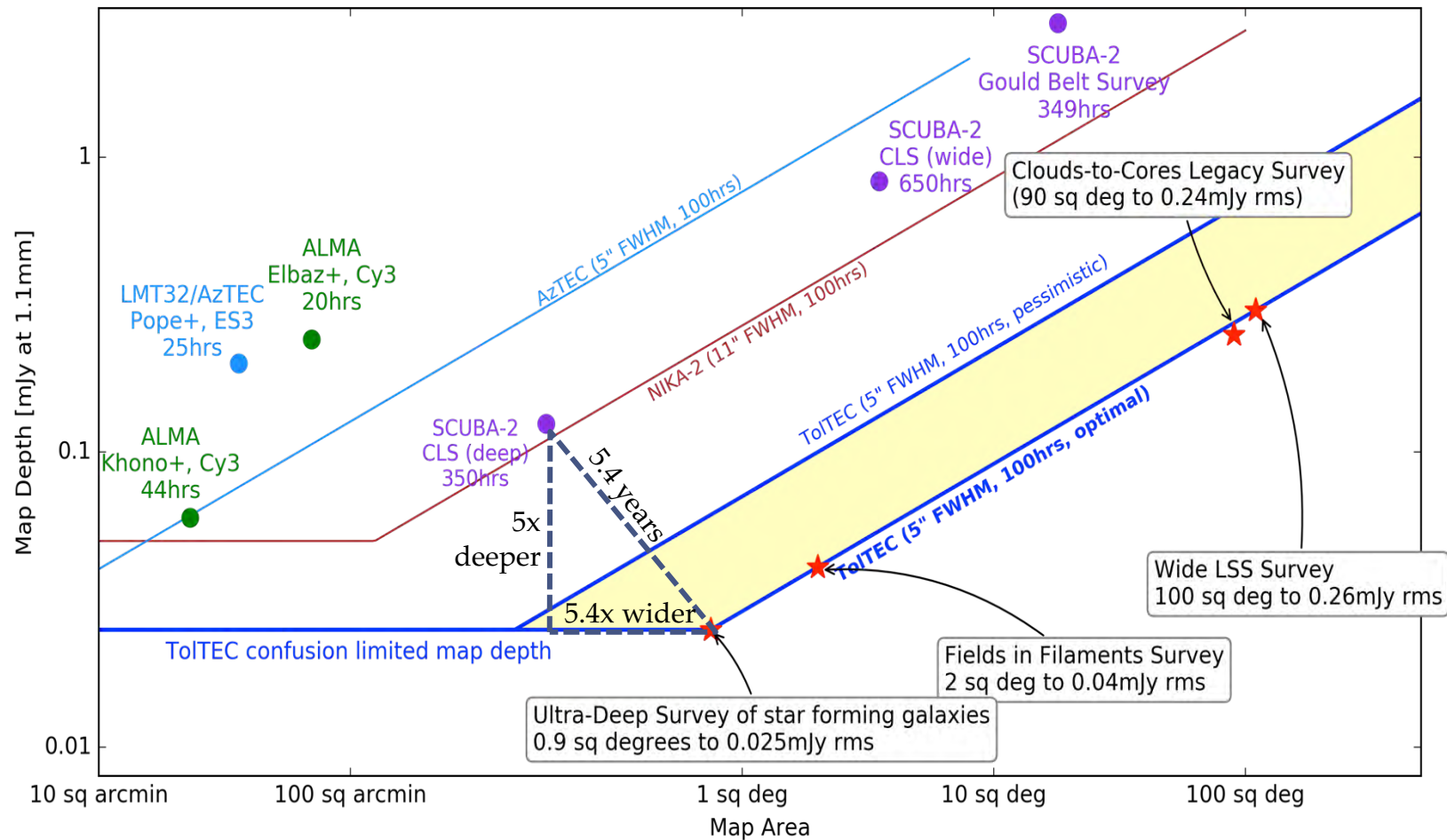
	2mm	1.4mm	1.1mm	Units
Beam Size	9.5	6.3	5.0	arcsec FWHM
NEFD	0.5	0.88	1.3	mJy sqrt(s)
# Detectors	1114	2429	3619	
Mapping Speed	11-74	3-22	2-13	Deg ² /mJy ² /hr

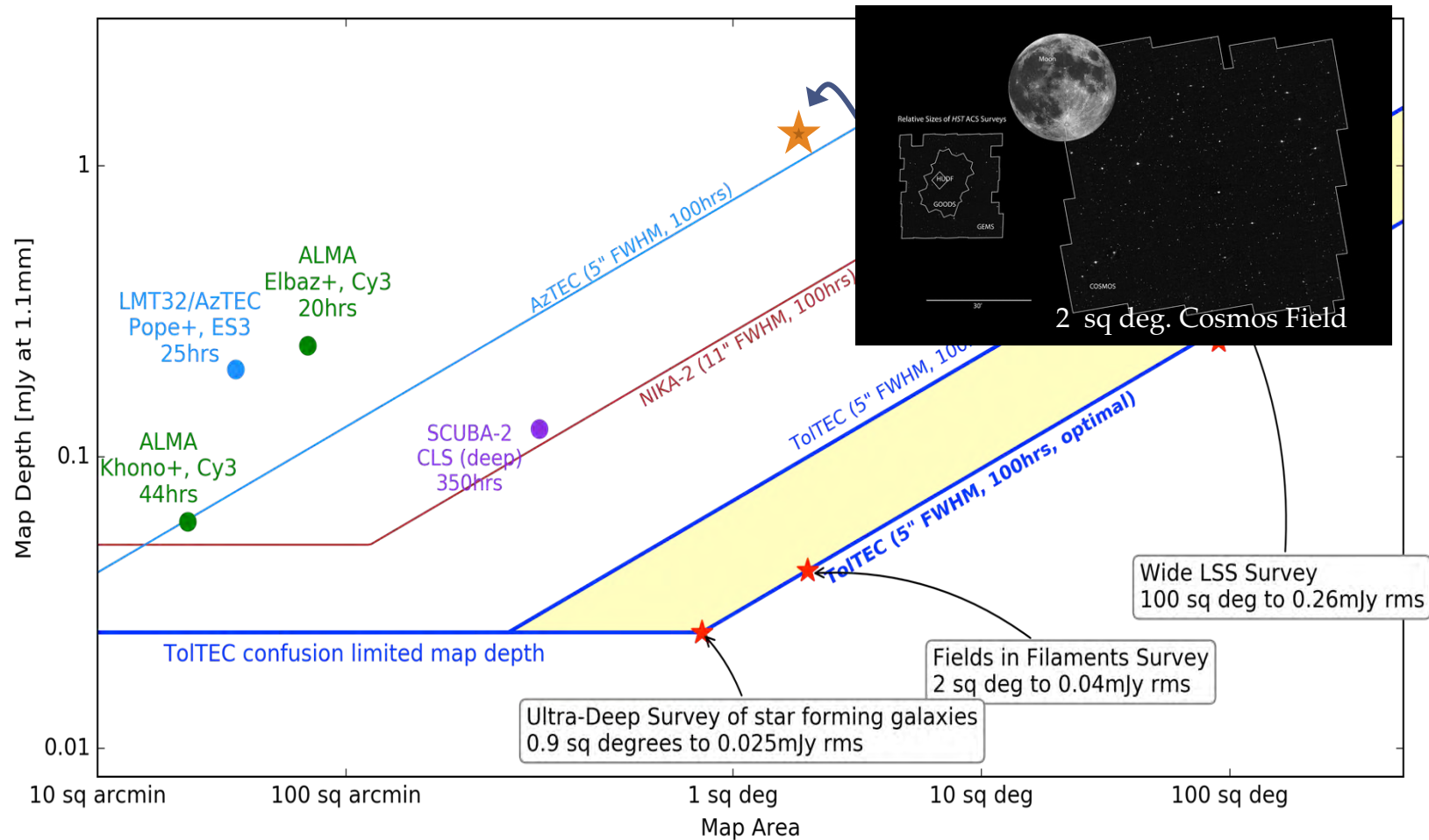


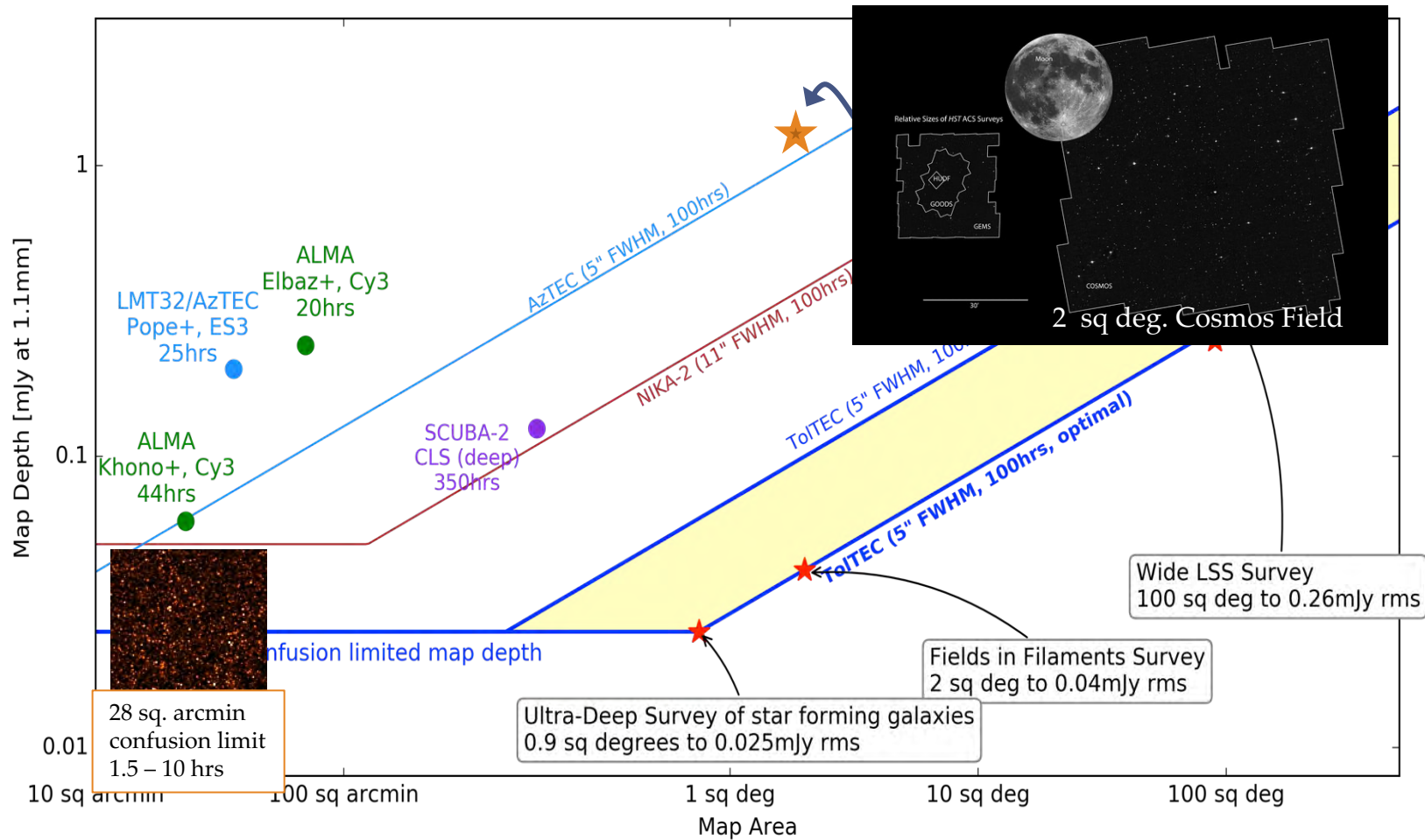
Approach/Constraints

- 10+ year facility instrument
- Minimal technology development
- Distributed work load across several institutions
- Heavy student involvement
- Parallel scientific involvement through public surveys
- Cryostat must fit in UMass elevator

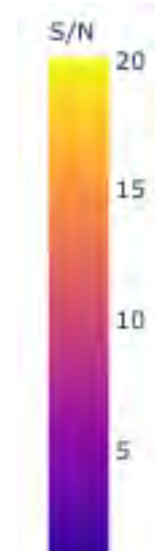
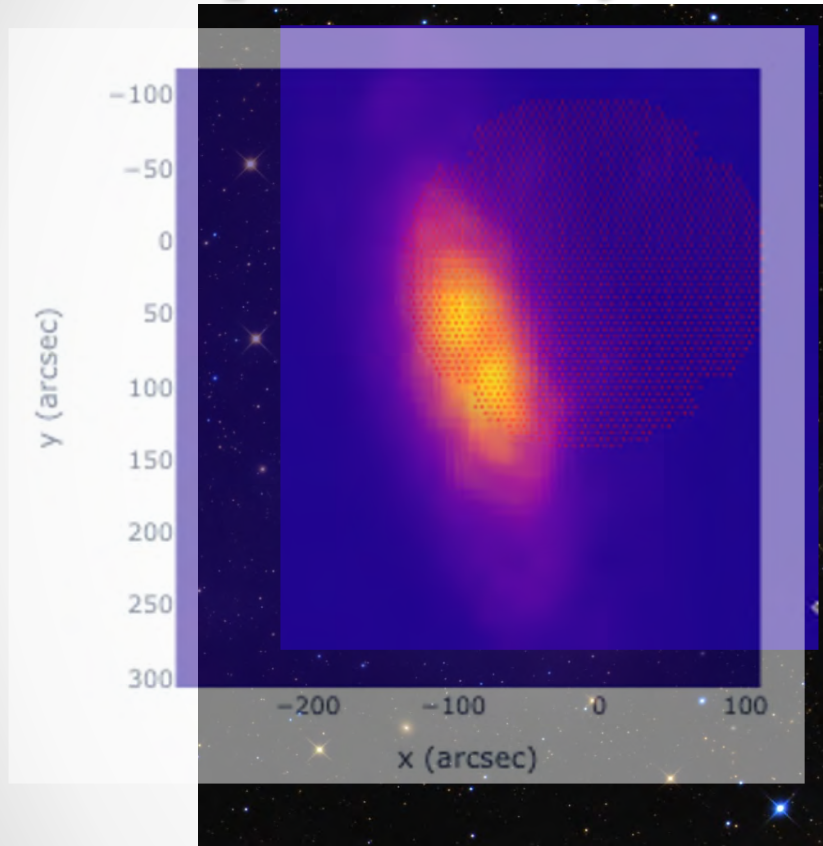






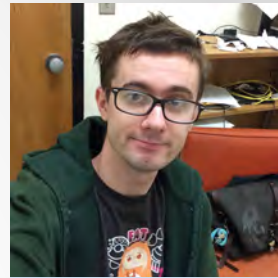
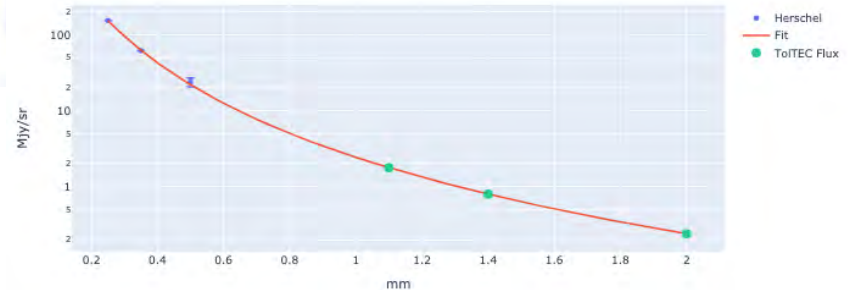


Example Nearby Galaxy Map



NGC 3521

- 1 hr
- Photometry mode

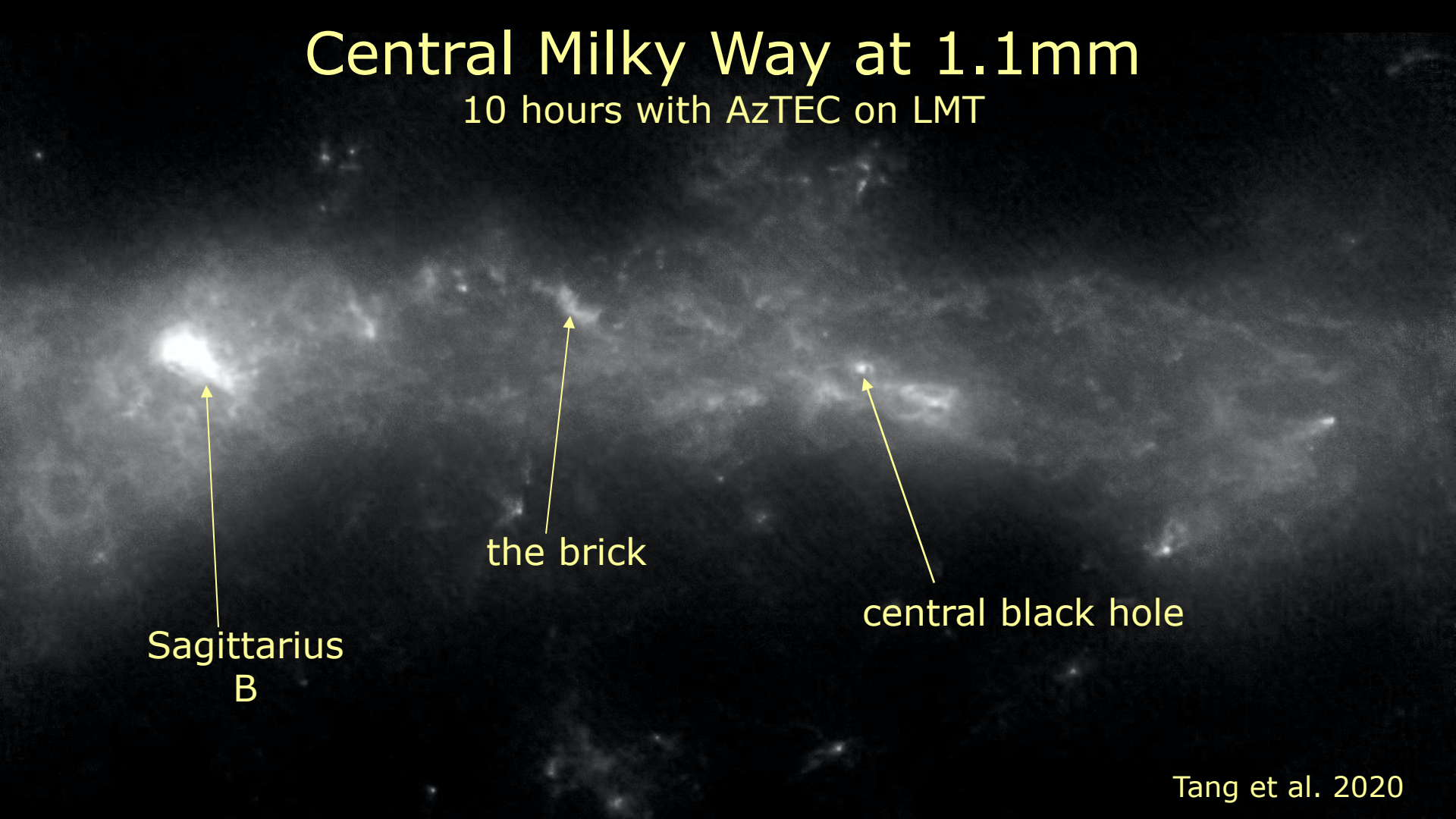


Michael McCrackan
(UMass)

Central Milky Way at 1.1mm

10 hours with AzTEC on LMT

Sagittarius
B



the brick

central black hole

Central Milky Way at 1.1mm

10 hours with AzTEC on LMT

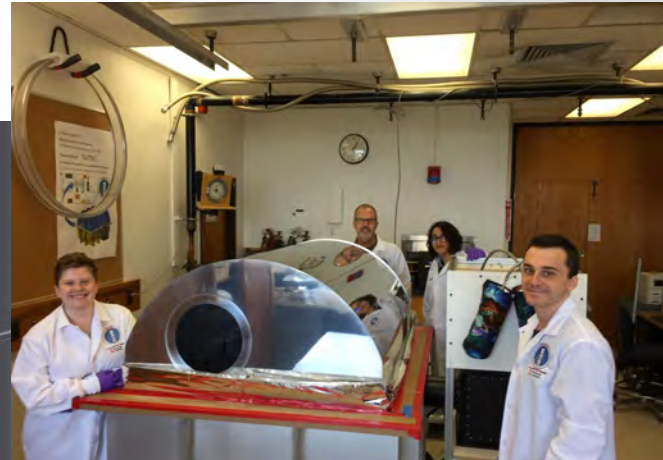
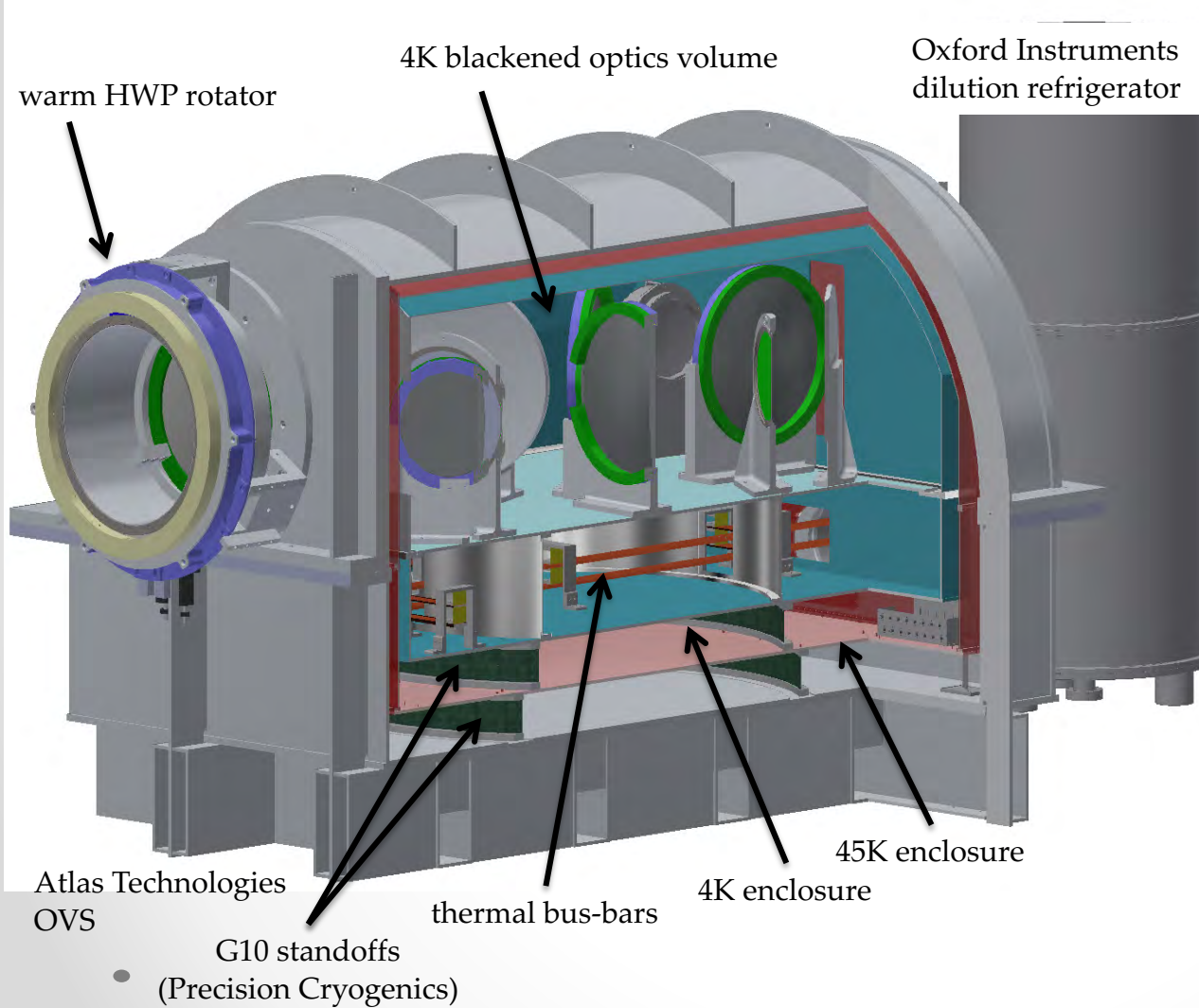


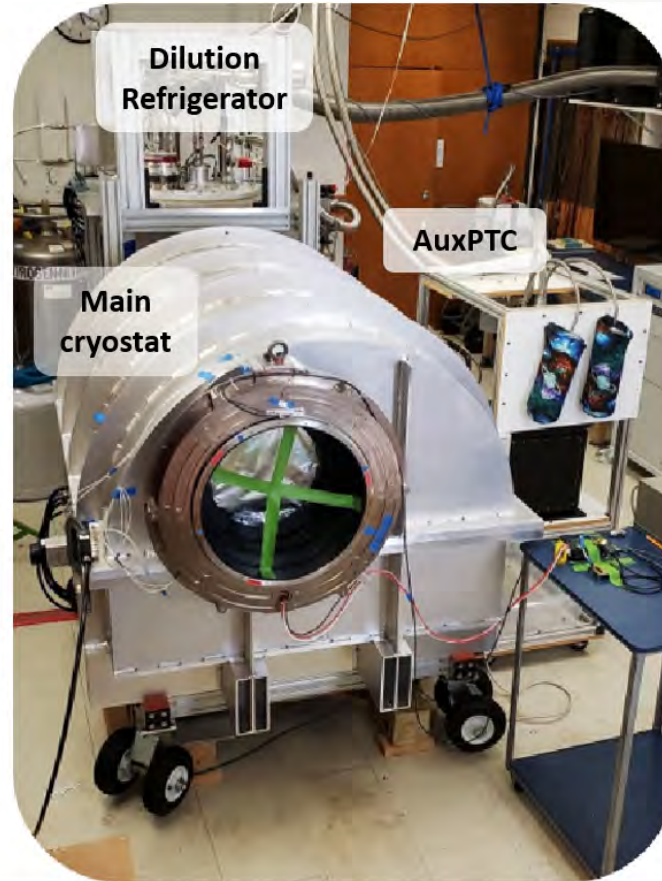
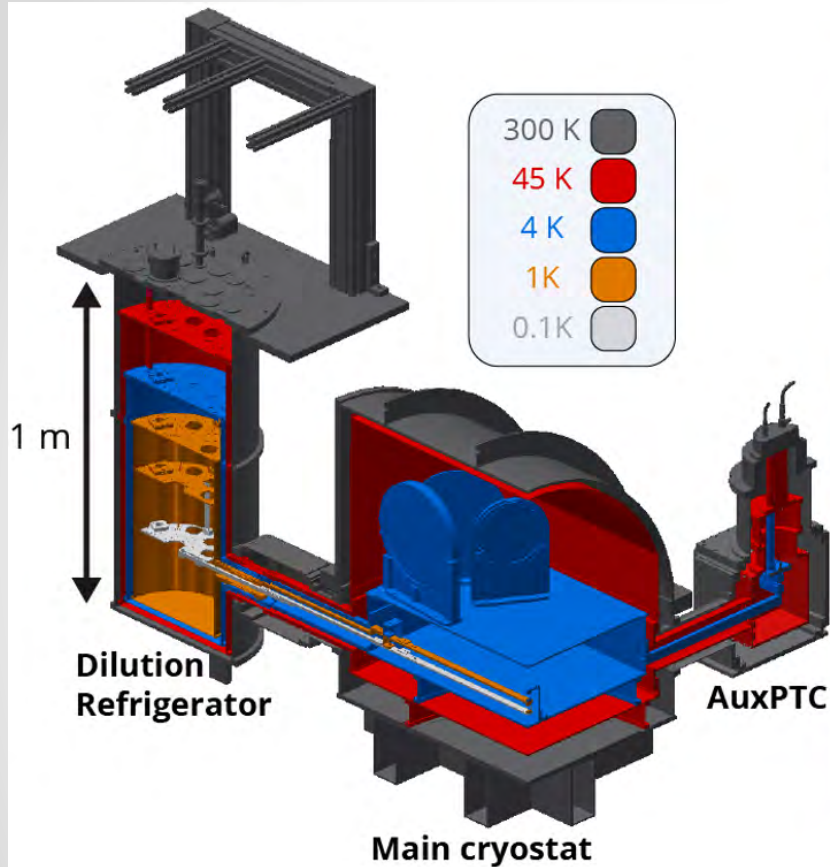
ToITEC
~15 minutes
3 colors
polarimetry

Sagittarius
B

the brick

central black hole

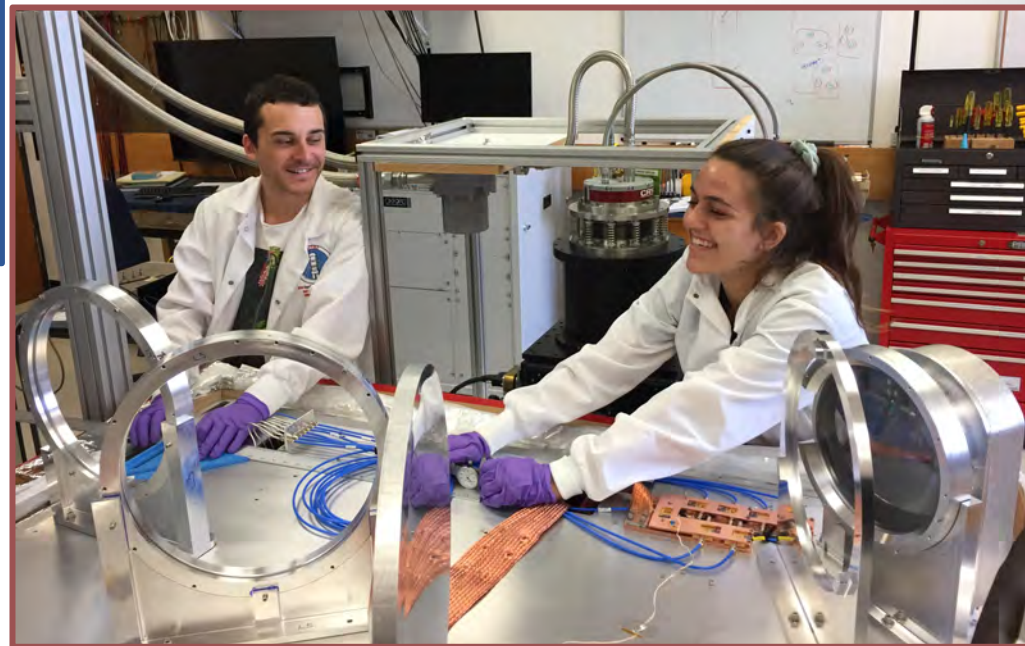
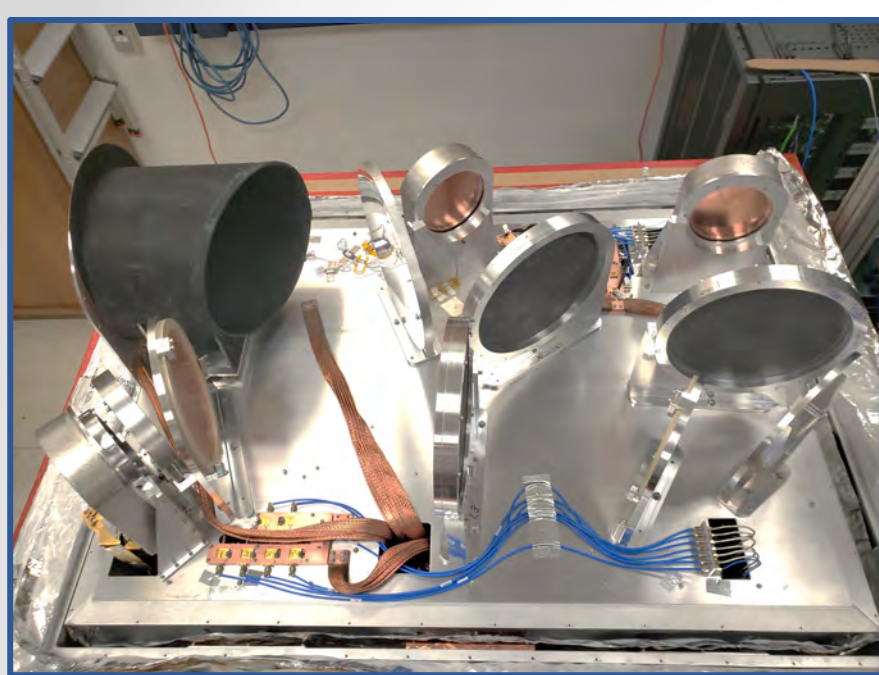




- 3 hrs to close up
- ~5 days to base temperature
- ~3 days to settle
- 7 days to warm up
- 2 hrs to open

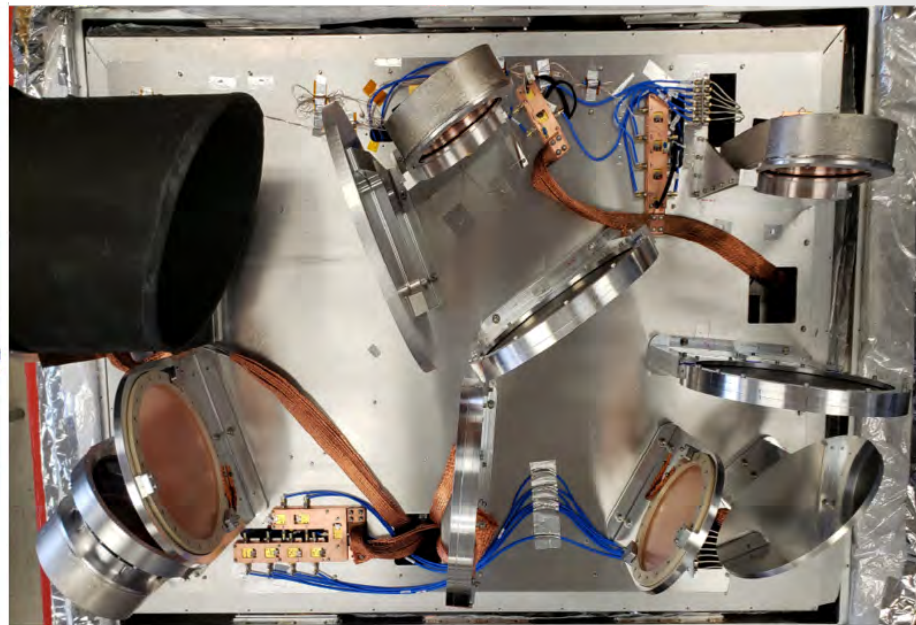
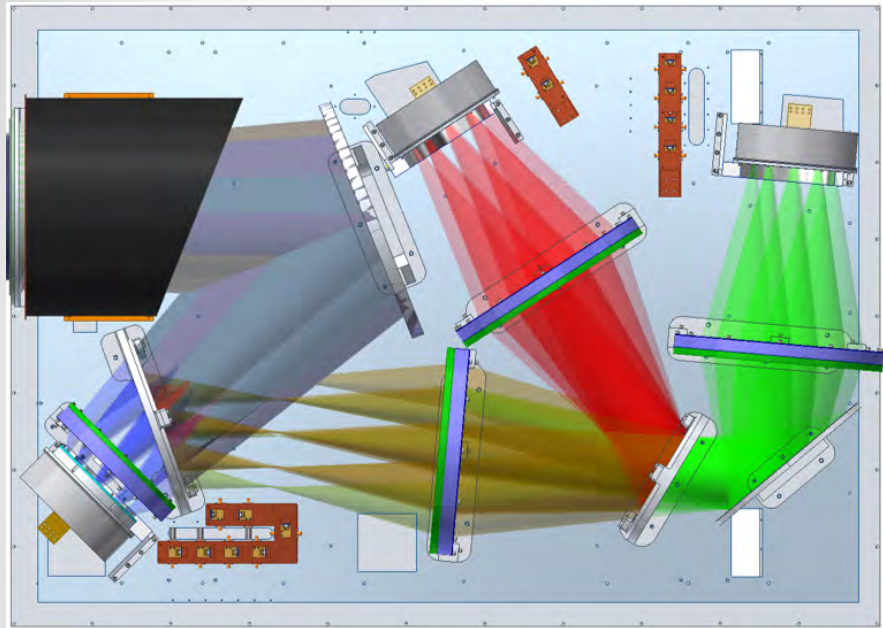


Nat DeNigris (UMass)



TolTEC 4K Optics Bench

1.4 m



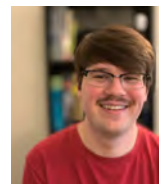
1 m



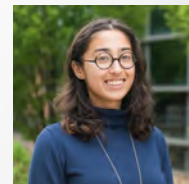
Dennis Lee (Northwestern)



Emily Lunde (ASU)



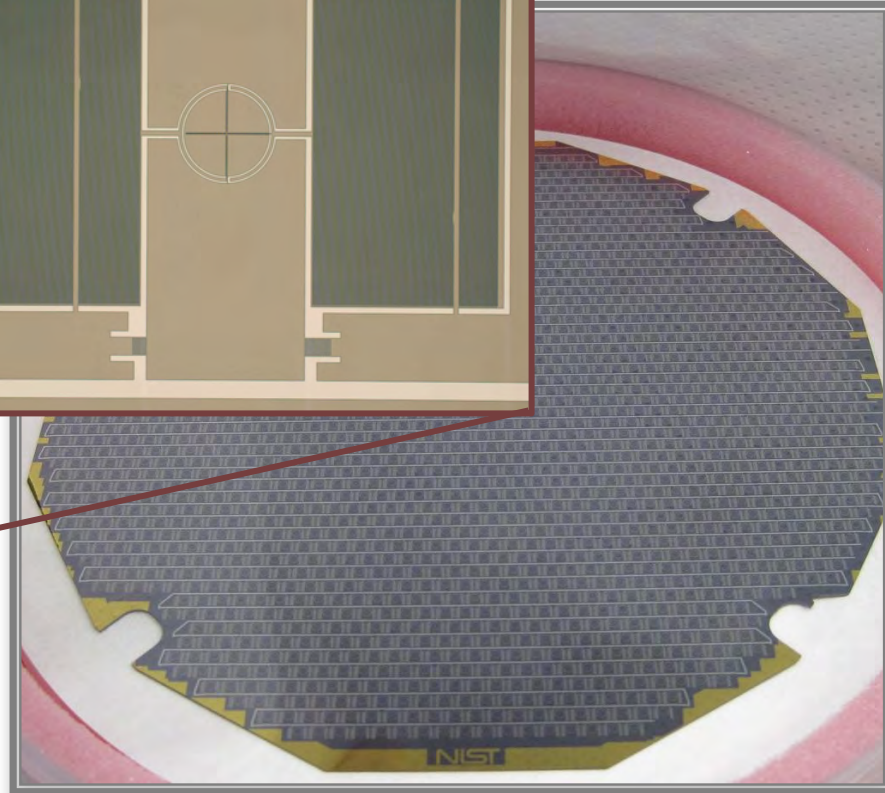
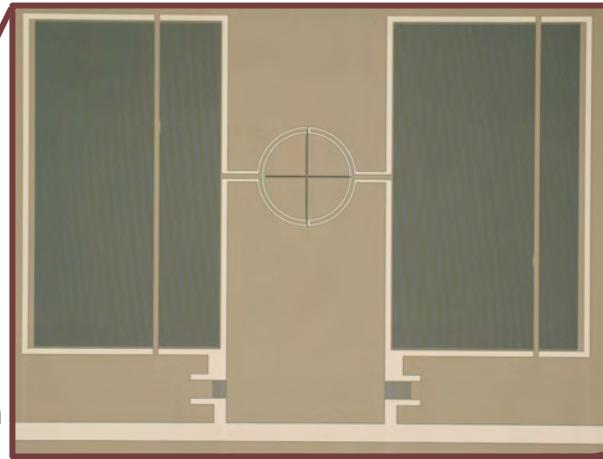
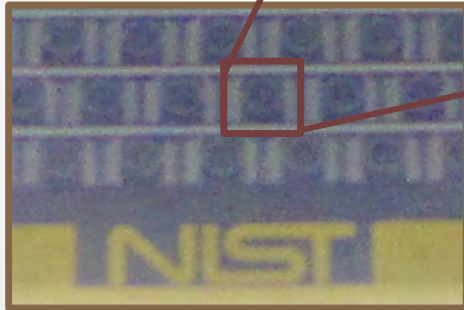
Joey Golec (U Mich.)



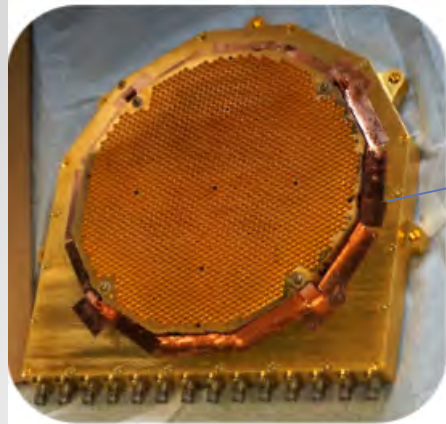
Nat DeNigris (UMass)

TolTEC 1.1mm Detector Array

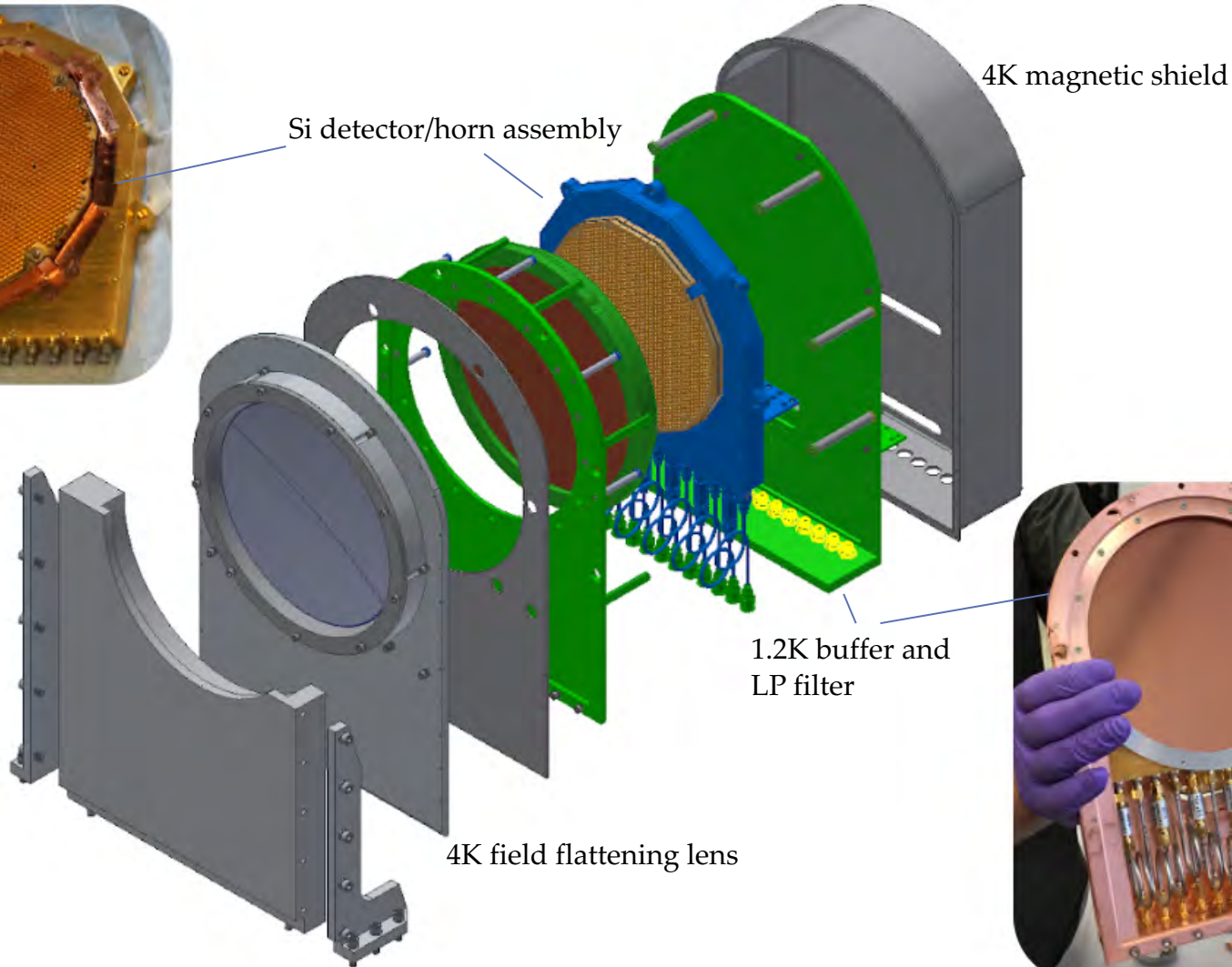
- 4012 KID detectors
- 2006 pixels
- Design & Fab by Jay Austermann at NIST Boulder



Jay Austermann
(NIST)



Si detector/horn assembly



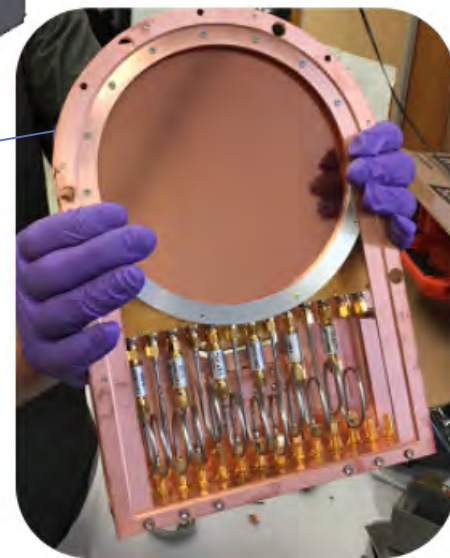
4K magnetic shield

1.2K buffer and
LP filter

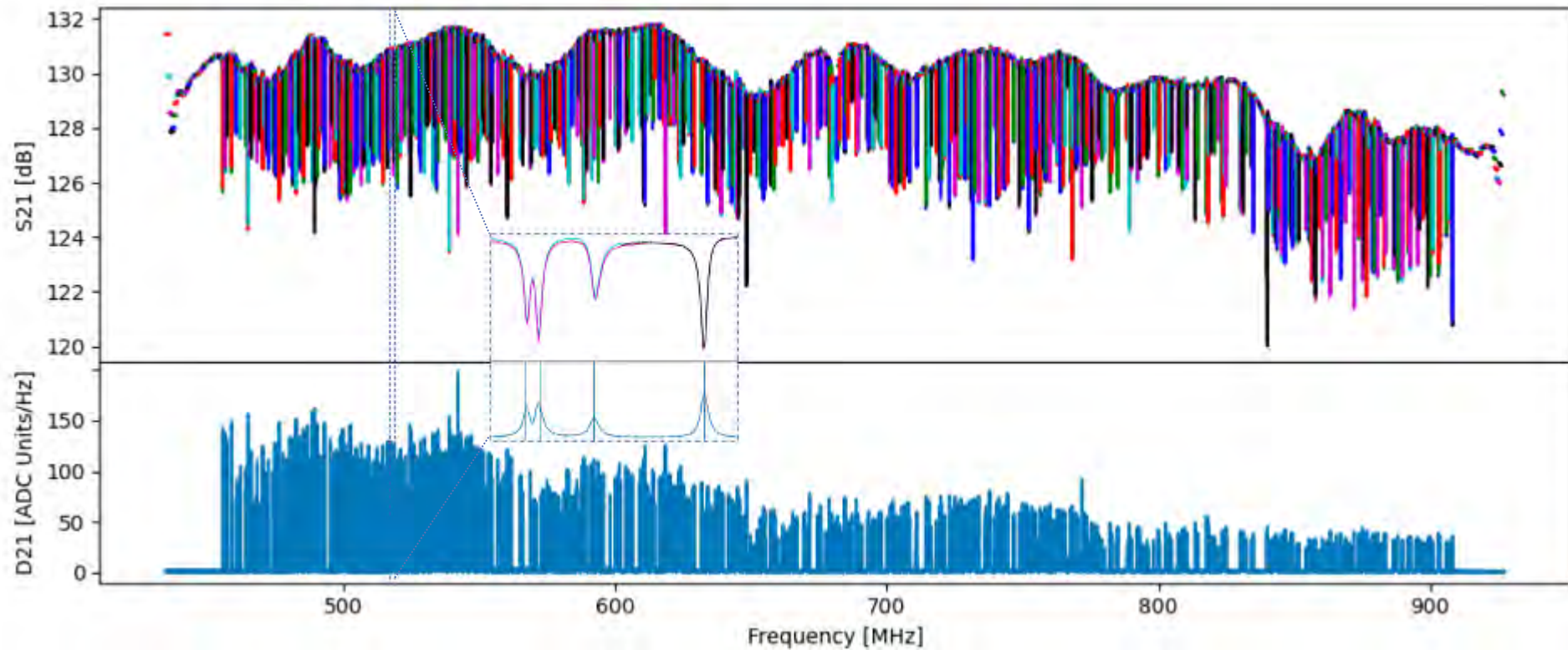
4K field flattening lens



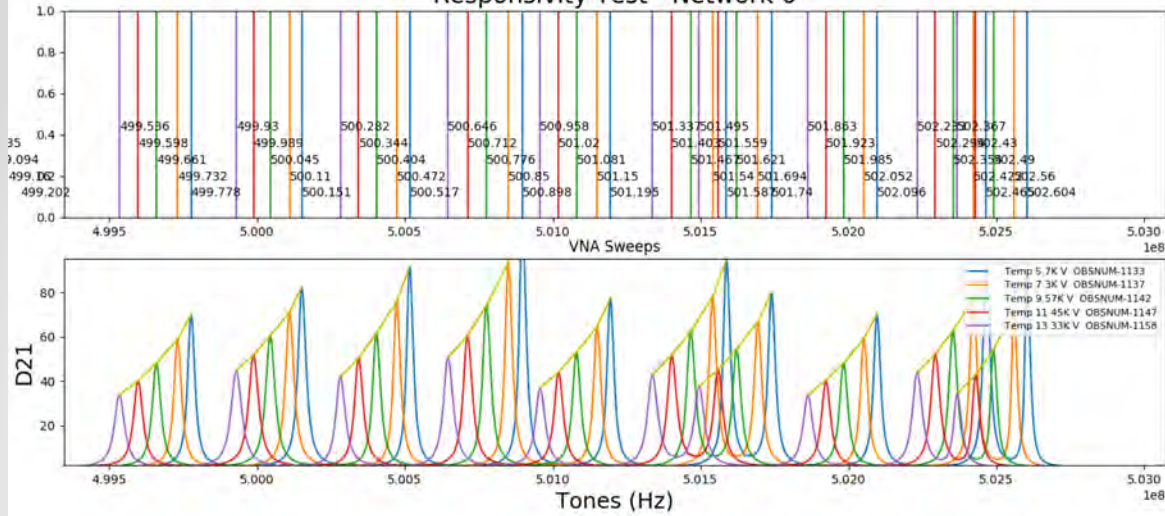
Edgar Castillo
(NISR)



Network 0 VNA Sweep (Detector Identification)



Responsivity Test - Network 0



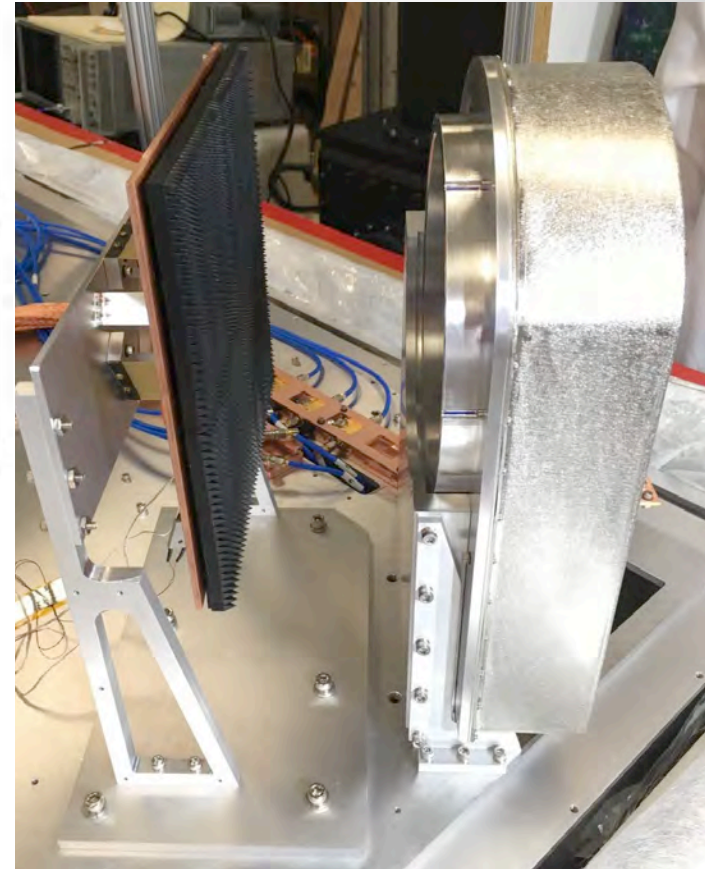
Typical data from the VNA sweeps at 5 blackbody temperatures.
The yellow line links the same KID resonance.



Nat DeNigris (UMass)



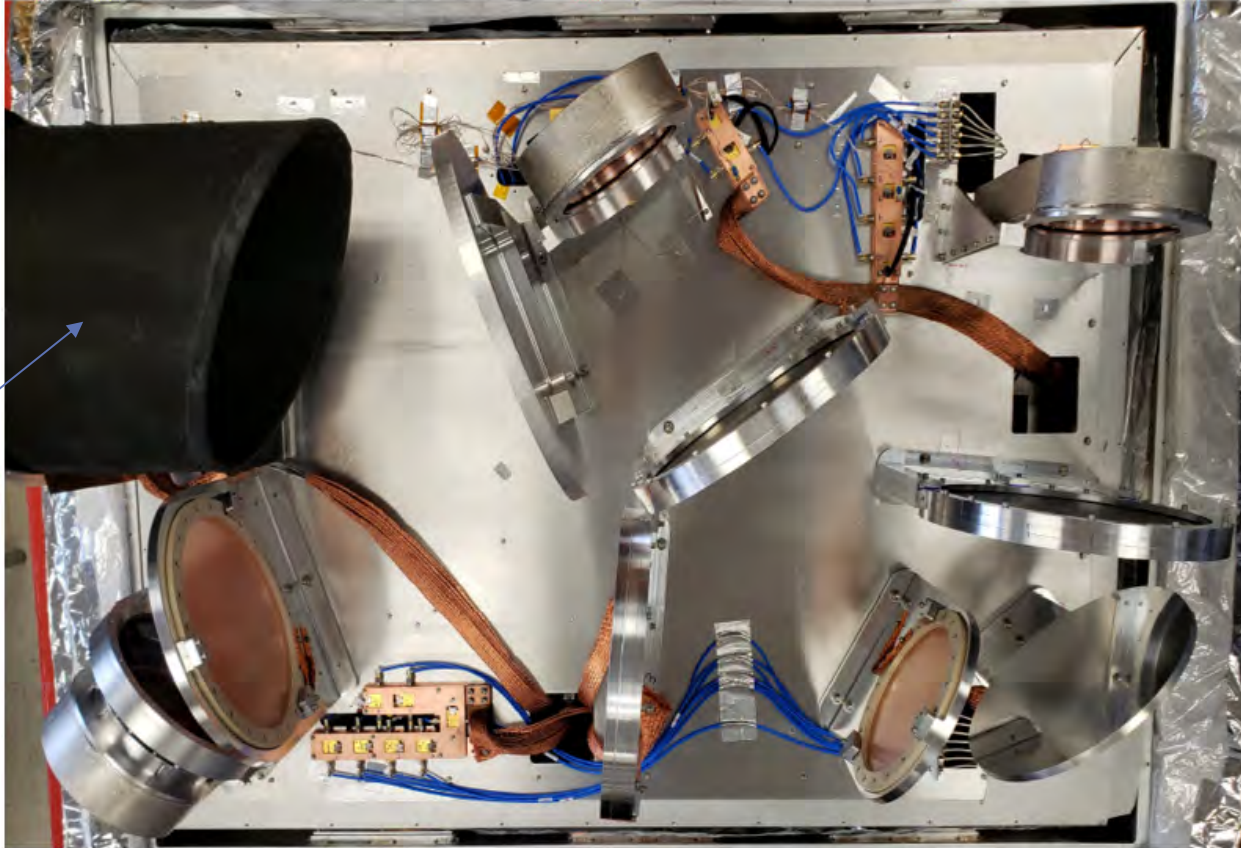
Miranda Eiben (Harvard)



Our cryogenic blackbody

TolTEC 4K Optics Bench

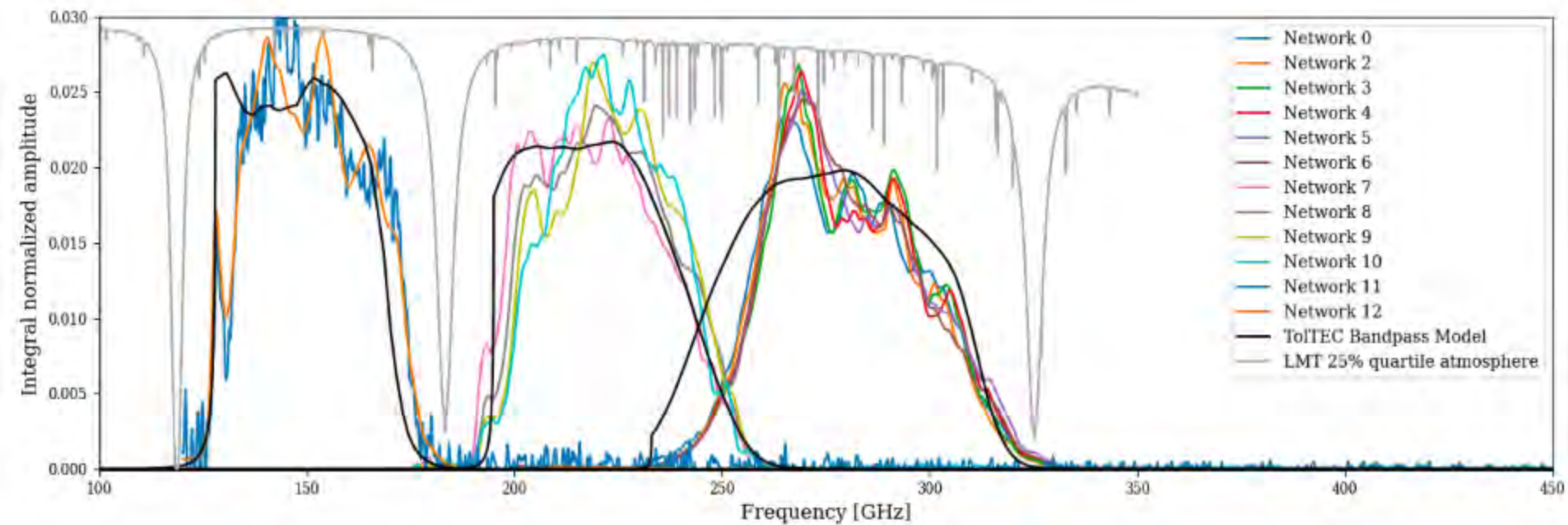
1.4 m



1 m

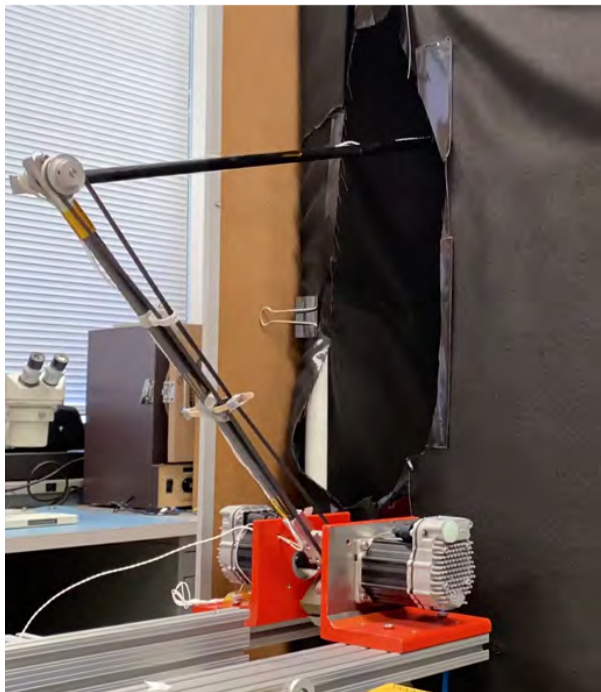
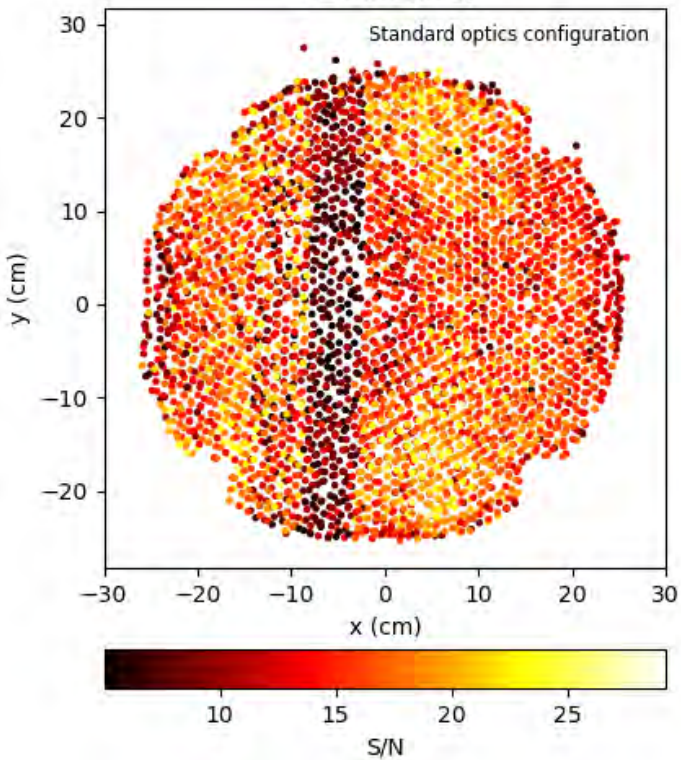
Installed
25mm dia.
aperture at
lyot stop for
in-lab optical
tests

FTS Passband Measurement

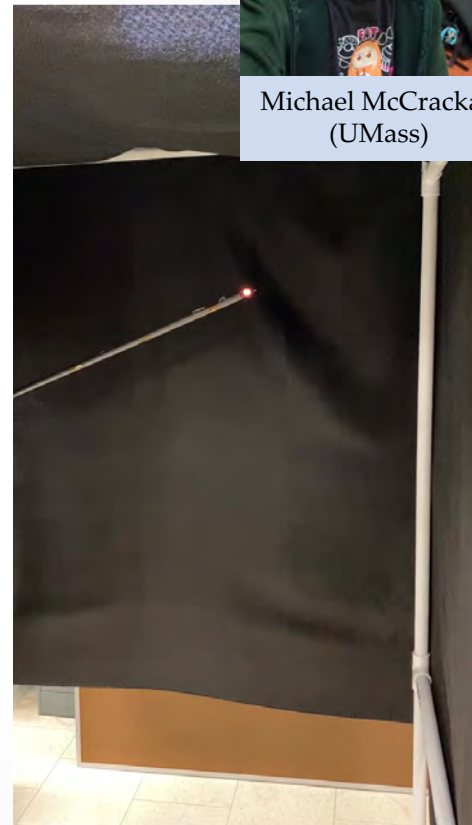


1.1 mm Array

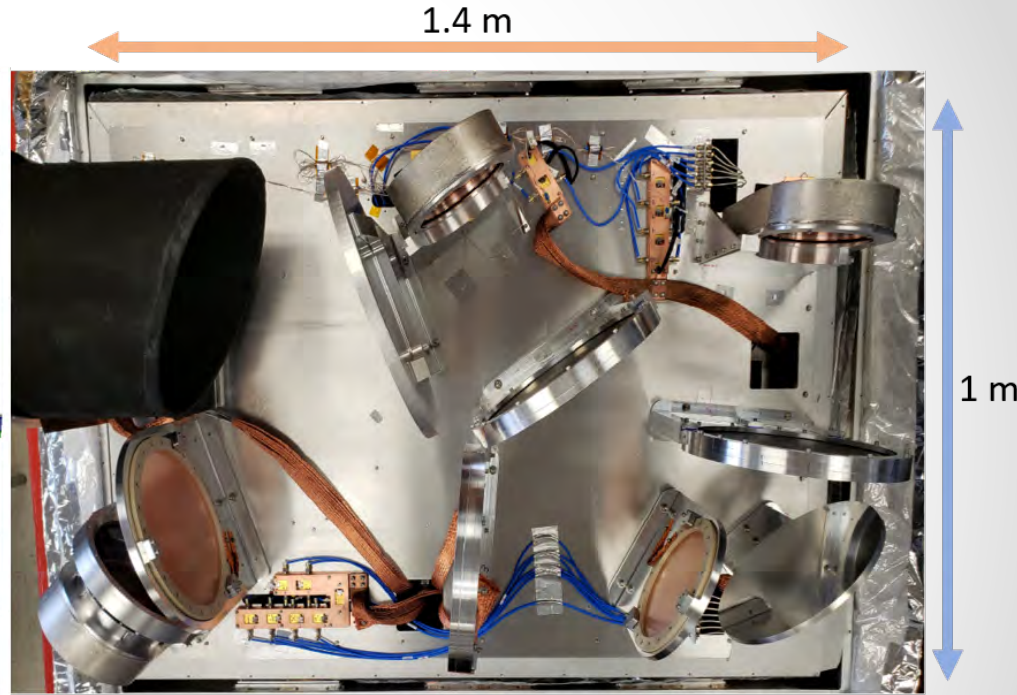
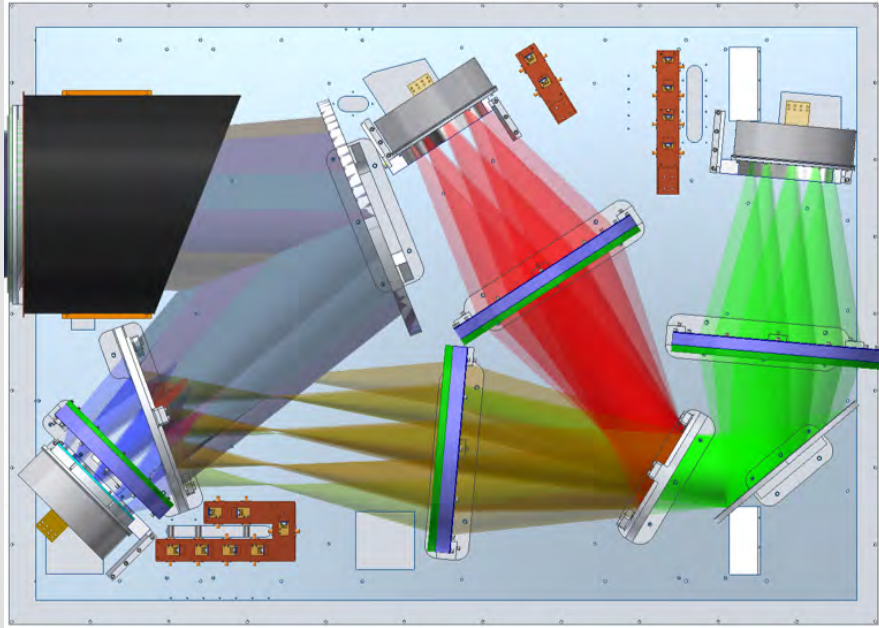
Standard optics configuration

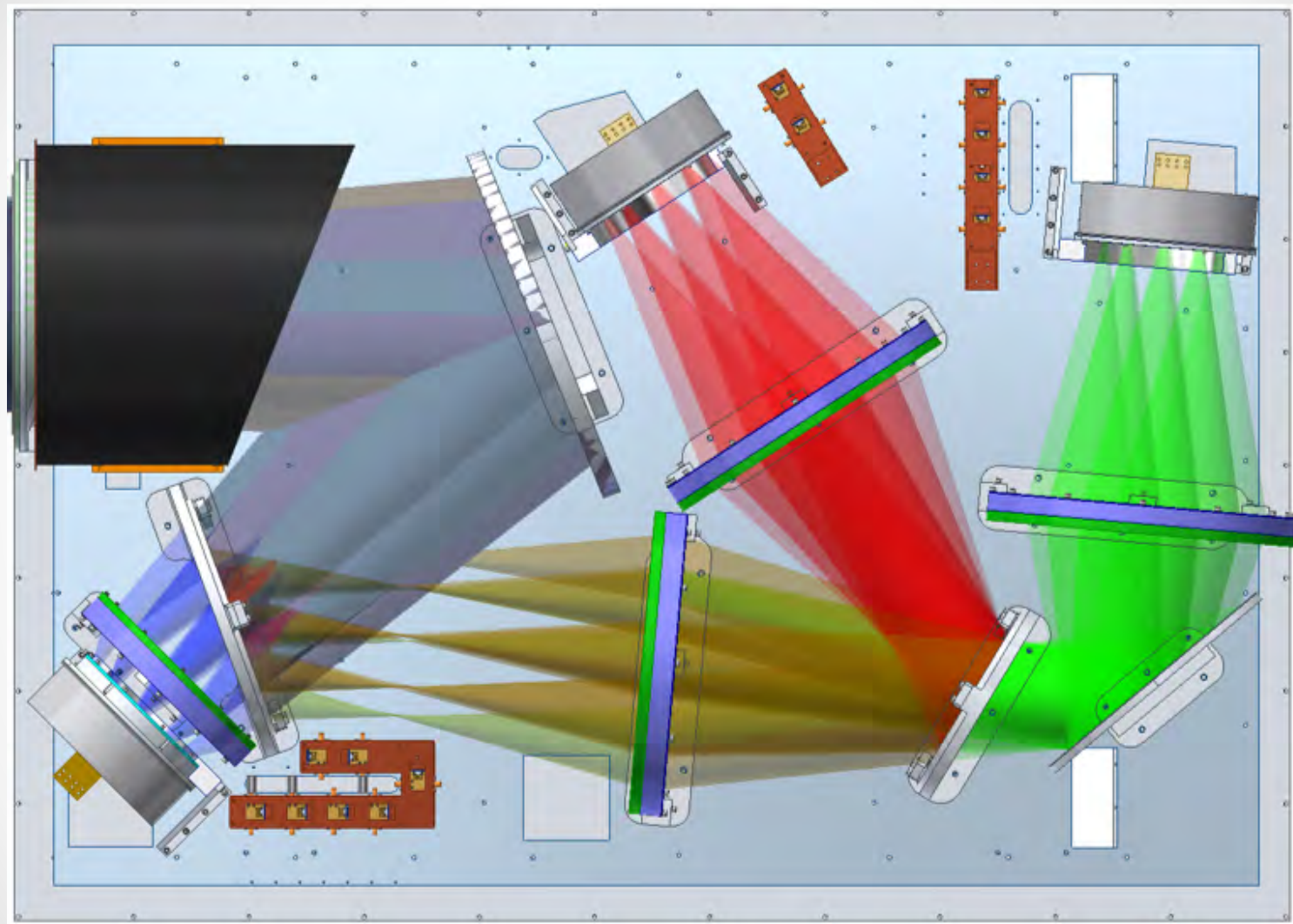


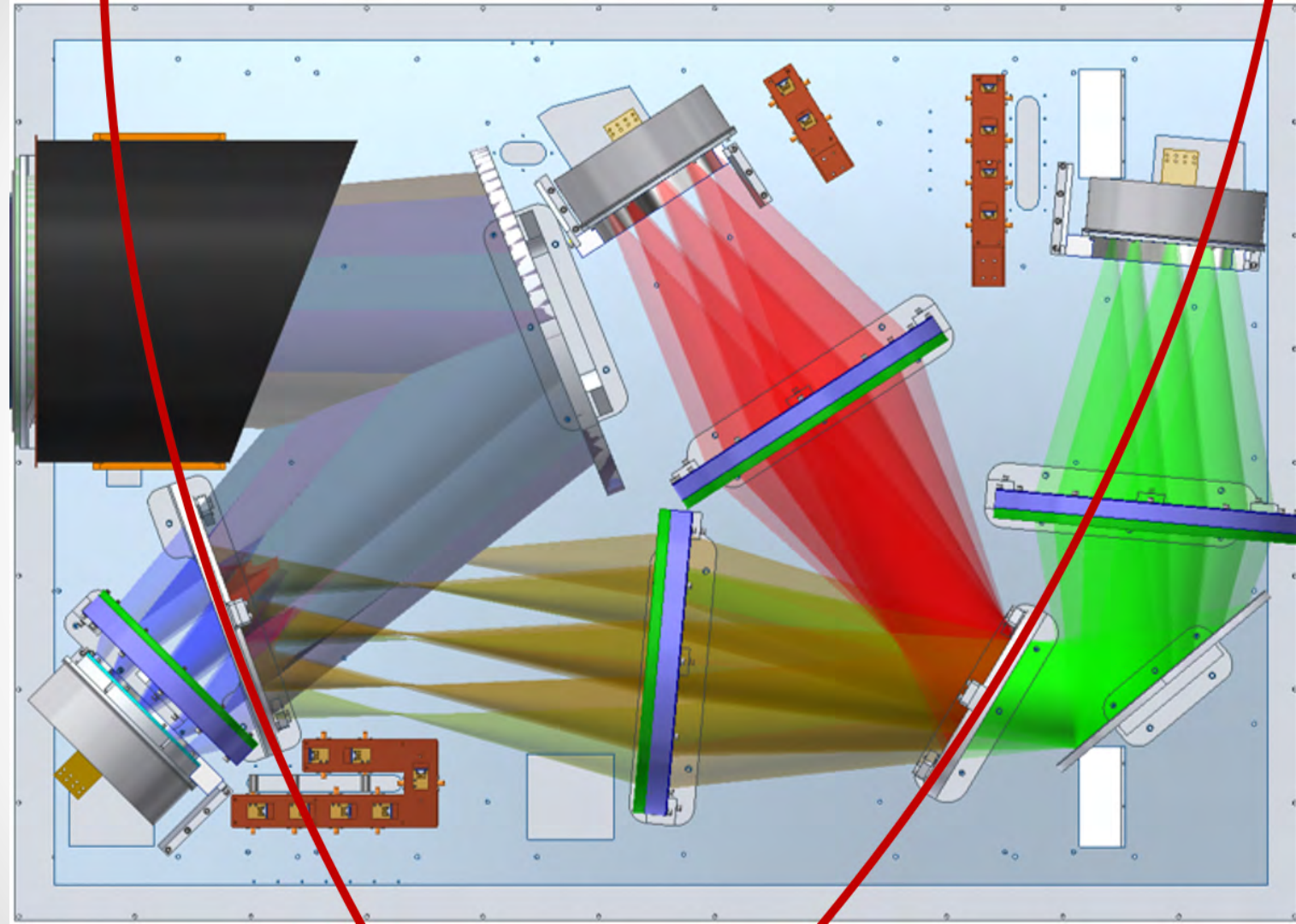
Michael McCrackan
(UMass)



TolTEC 4K Optics Bench







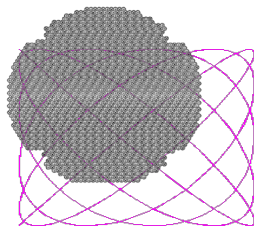
Next Steps

- Verify fix to dichroics (~1 month)
- Ship TolTEC to Mexico
- Install at the LMT
- Commission primary observing modes
- Determine mapping speeds

Observing Modes

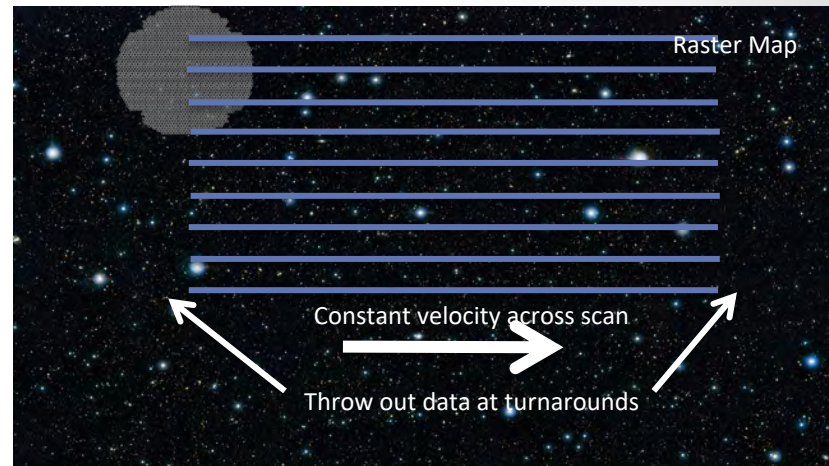
- Lissajous

- 6'-10' diameter maps
- 100% observing efficiency

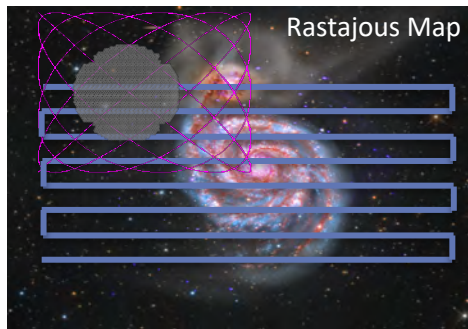


- Raster maps (large scale mapping)

- arbitrarily large maps
- turn-around time depends on scanning velocity



- Rastajous maps

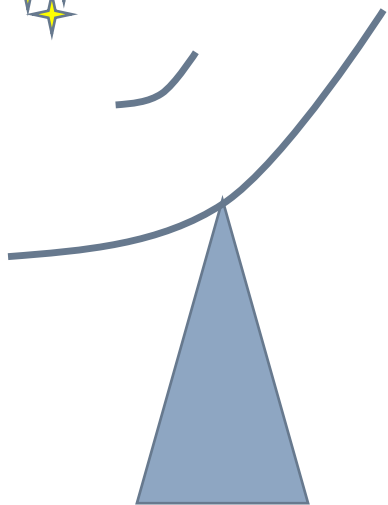


Planned Data Products

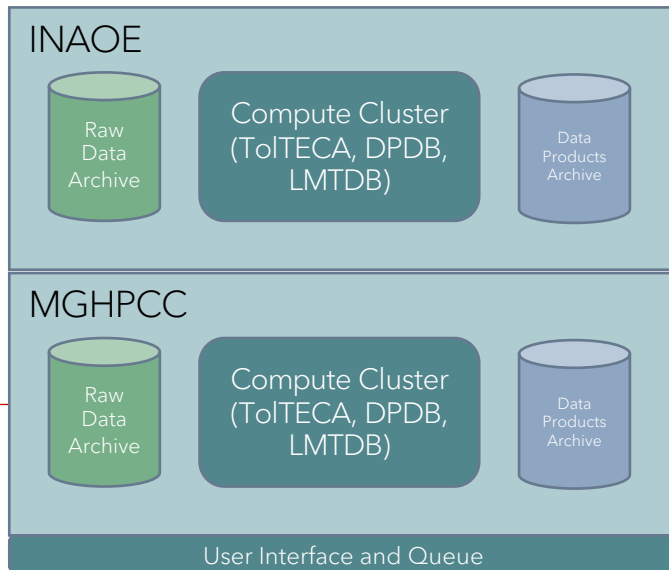
- I, Q, U maps at 1.1mm, 1.4mm, 2.0mm
- corresponding weight (noise) maps
- S/N maps
- PSF maps
- Observation logs

Raw data on request.

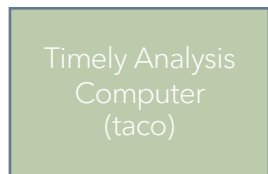
Noise realizations on request.



Zhiyuan Ma (UMass)



VO Compliant Data Products Server (to be developed)



Internet

Observer

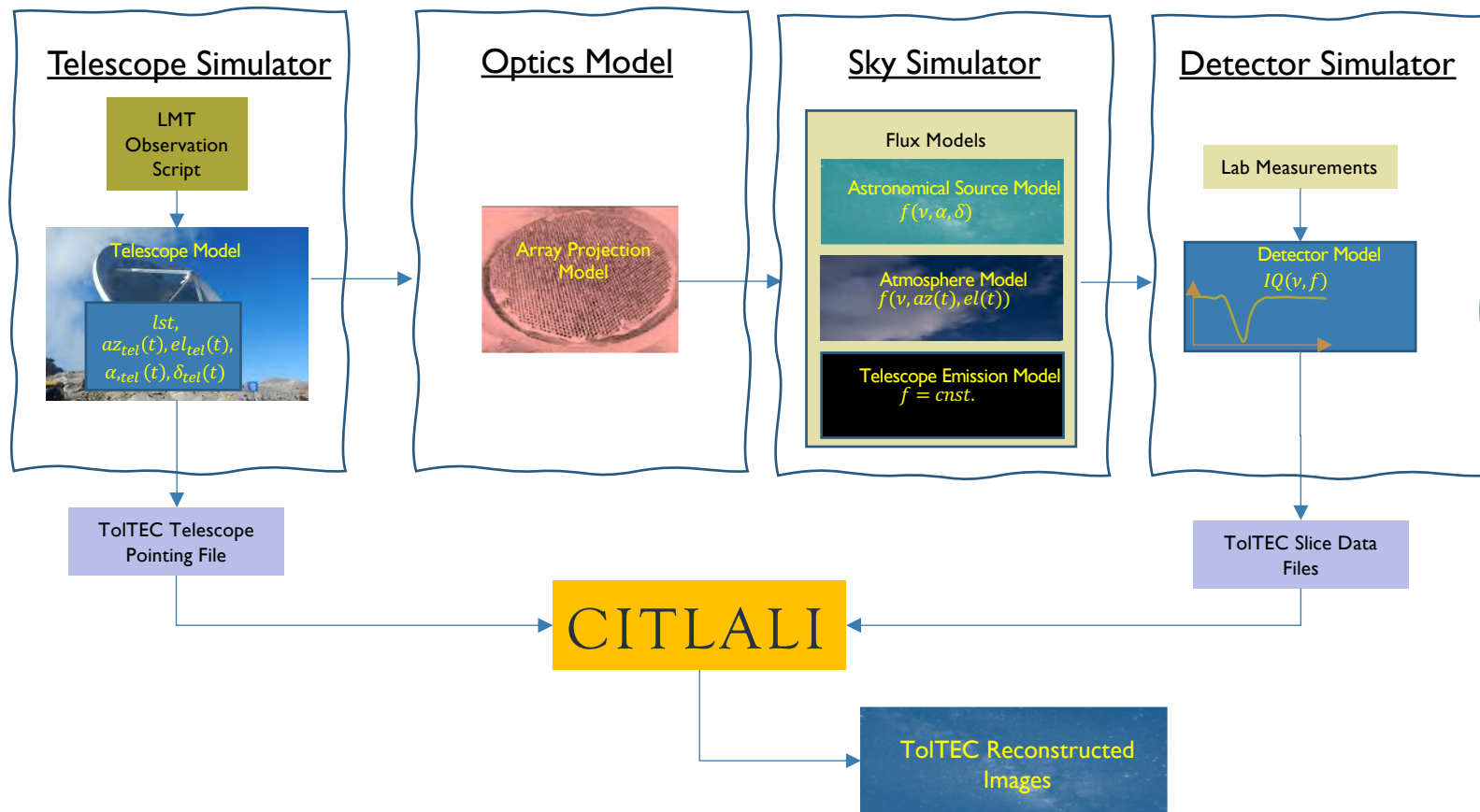
Developer Administrator

User

User

User

TOLTECA.SIMU



Zhiyuan Ma
(UMass)

TolTEC Public Legacy Surveys

- Ten-100 hour surveys with LMT
- Survey definition is ongoing in public workshops
- All legacy survey data will be public
- 4 initial surveys concepts now base-lined, new survey concepts welcome.

