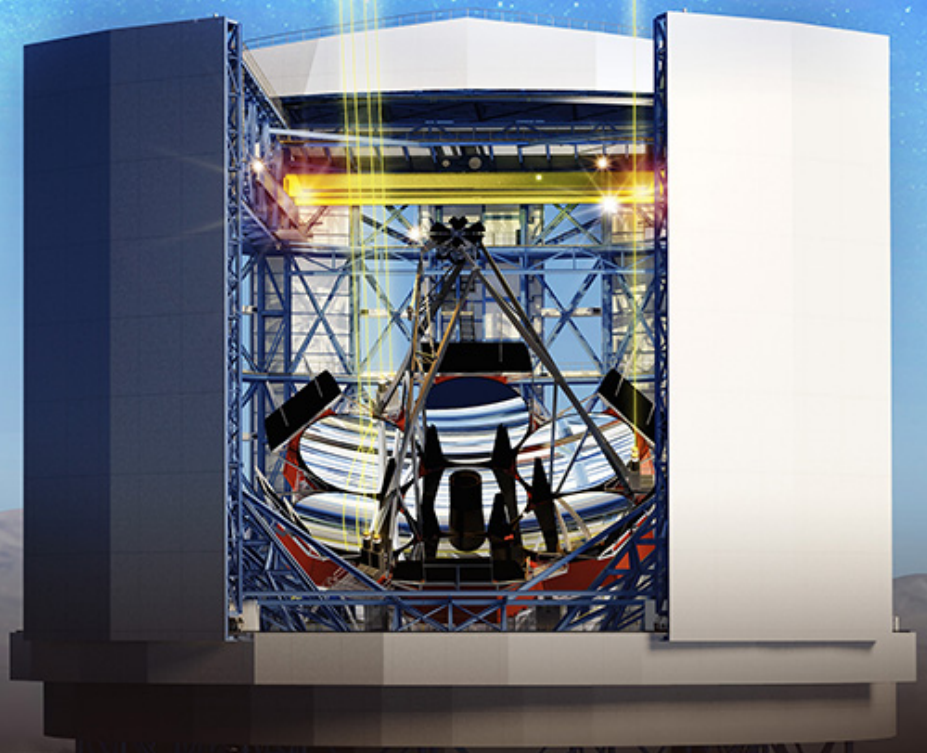
Giant Magellan Telescope
Project Status

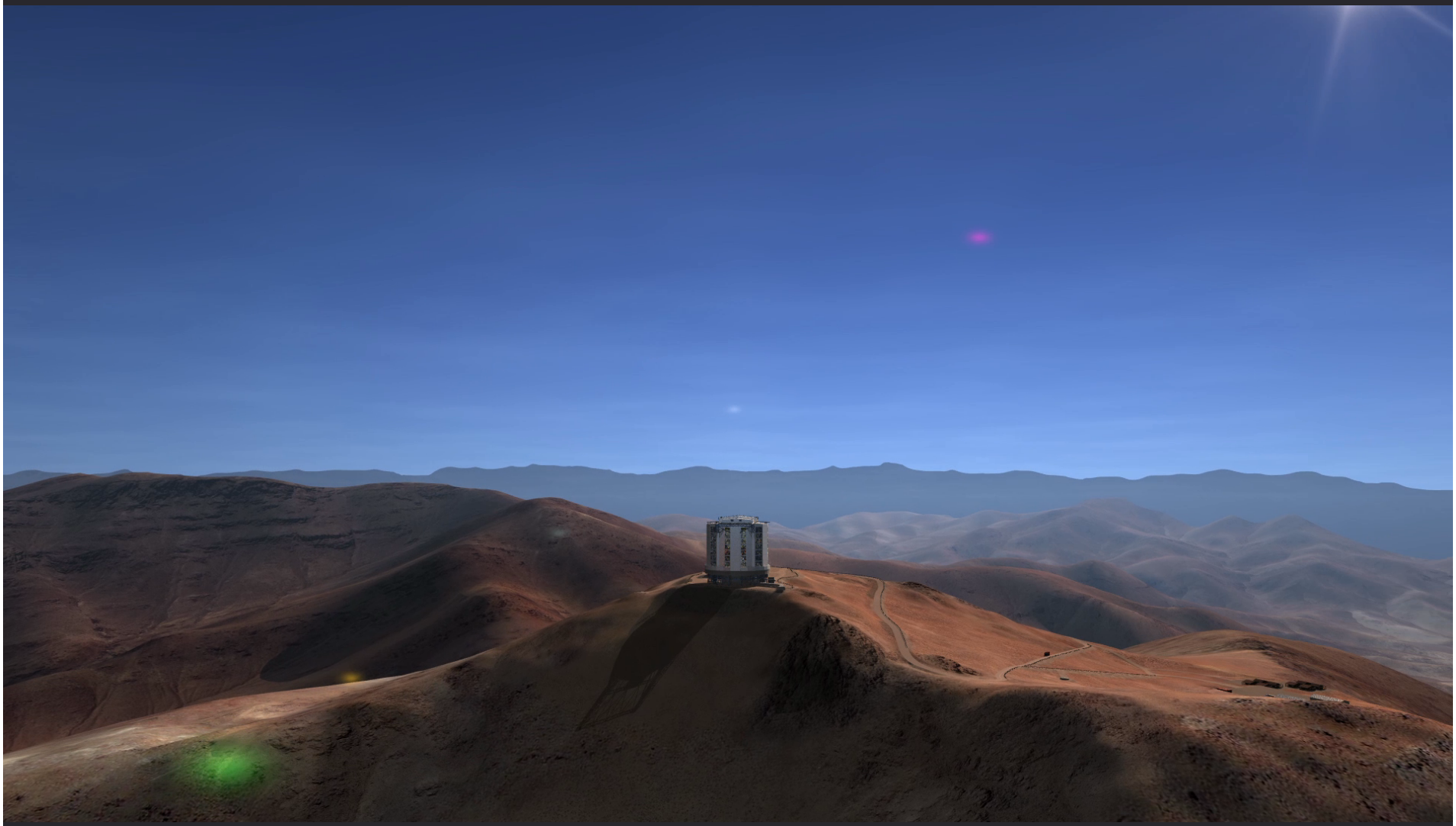


Patrick J. McCarthy
Project Director and Interim President
Taft Armandroff
Chair, GMTO Board of Directors

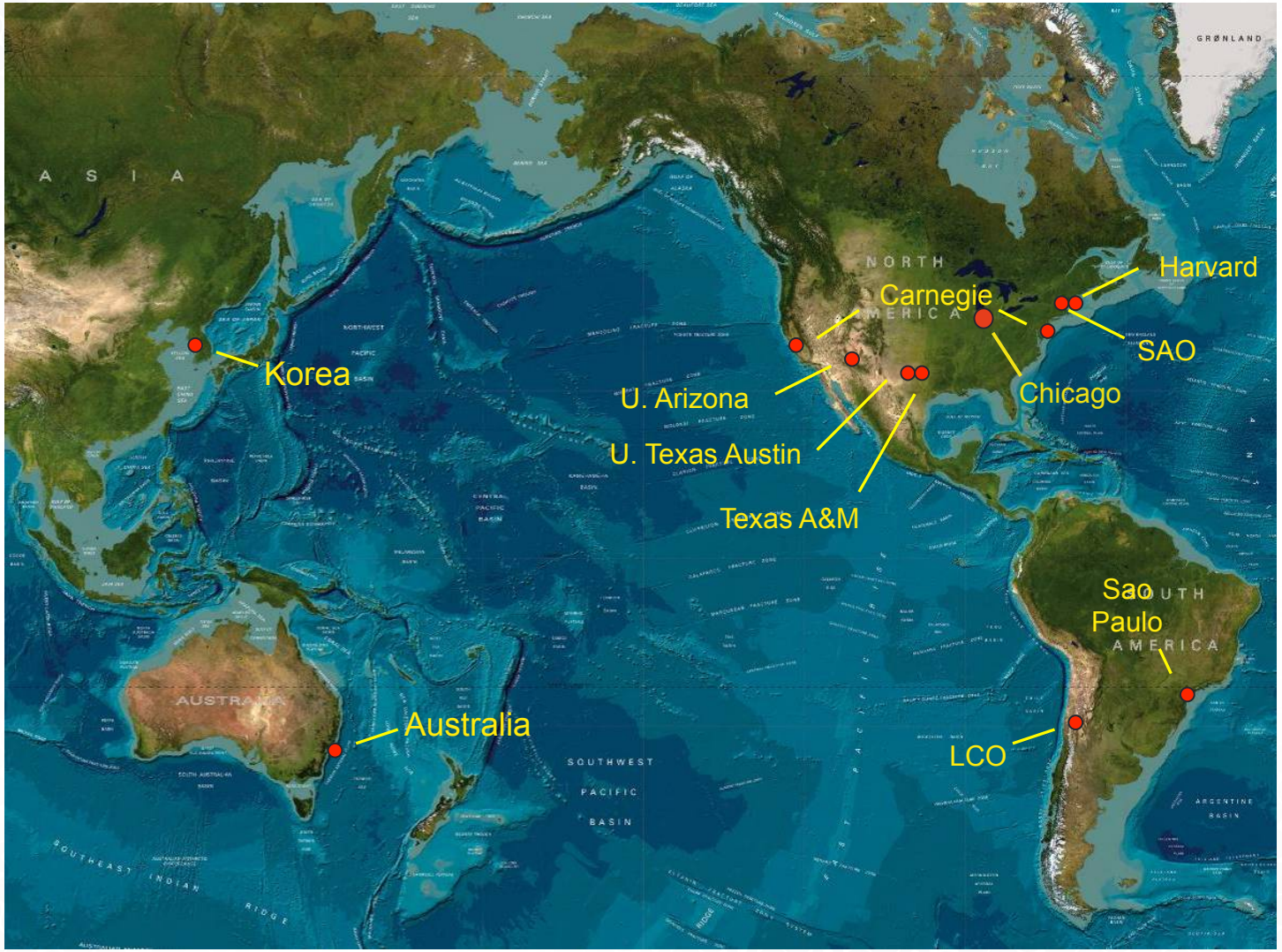
Outline of Presentation

Topics for Today's Presentation:

- Science Goals
- The Telescope
- Primary Mirror Development
- The GMT Site
- Adaptive Optics and Science Instruments
- Schedule



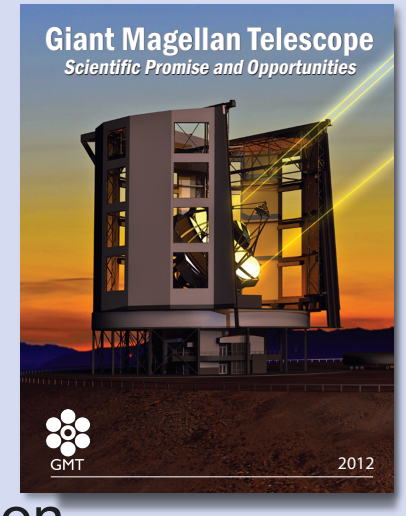
GMT Founder Institutions



Scientific Motivation

Top-Level Science Areas

- Extra-solar planets
- Stellar Populations and Chemistry
- Galaxy Building
- Black Hole Growth
- Cosmological Physics
- First-Light & Reionization



2nd edition of GMT Science Book: 2012

Three Legs of the GMT Science Case:

- ***Discovery Space***
- ***Contemporary Science Goals***
- ***Synergy***

Exploring New Worlds

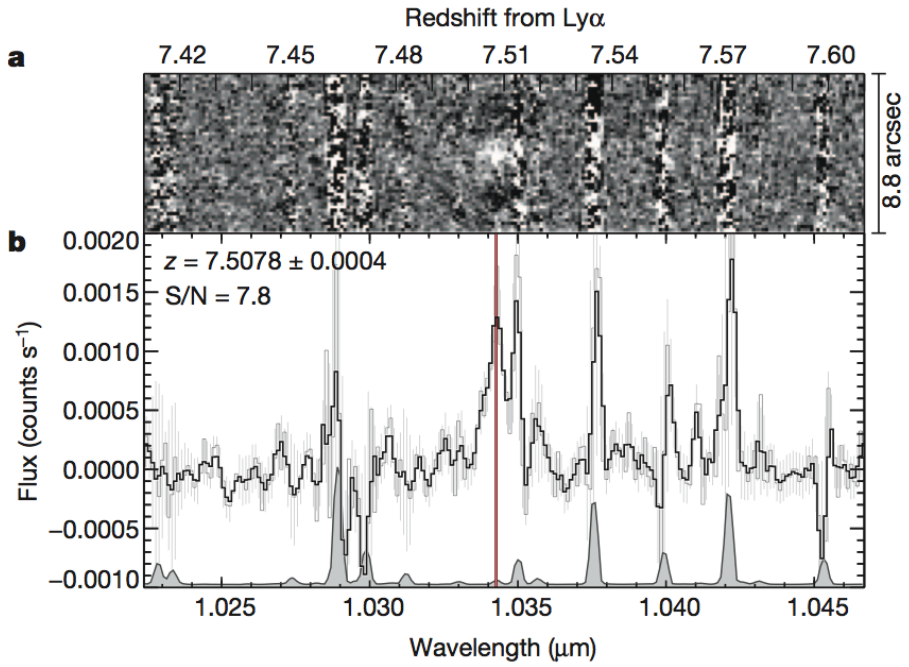
Radial velocity and transit surveys have revealed that planets are ubiquitous.

GMT will provide us with a powerful tool for exoplanet science

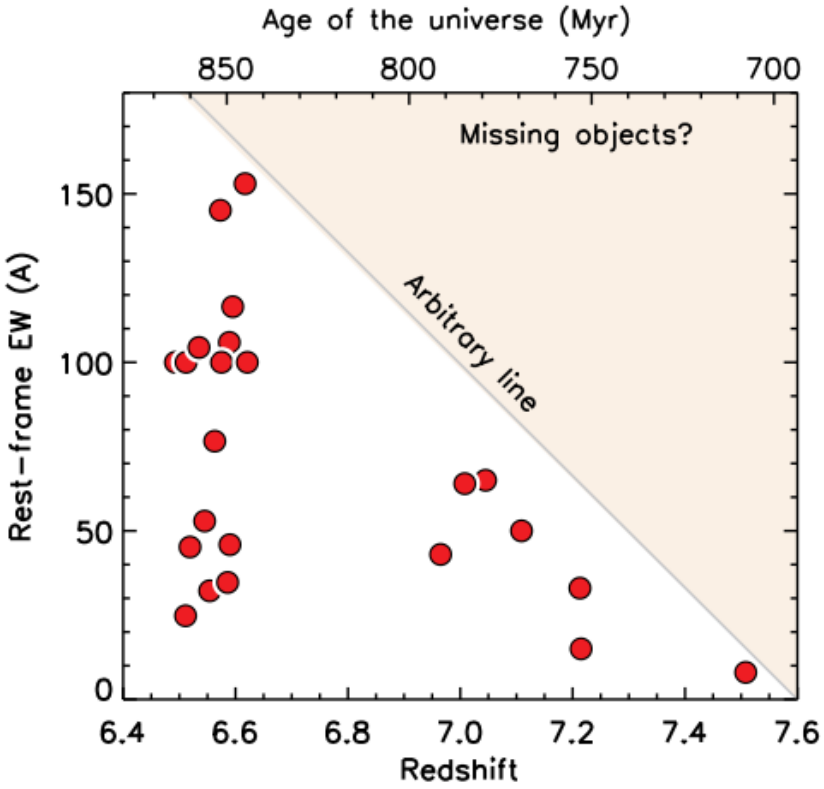
- Direct imaging
- Precision RV
- Transit spectroscopy

An exoplanet transiting a solar-type star

Probing Reionization – End of the Dark Ages?



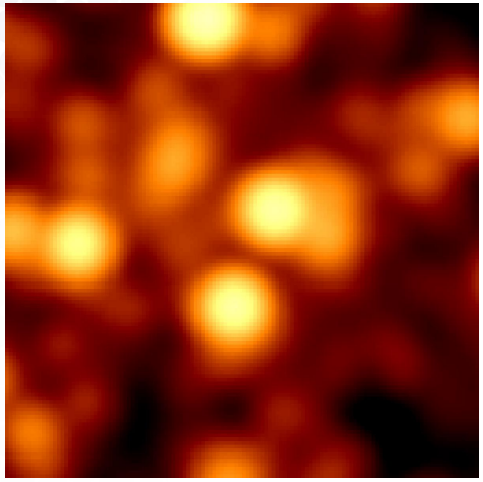
Only 1 in 40 candidates show Lyα emission



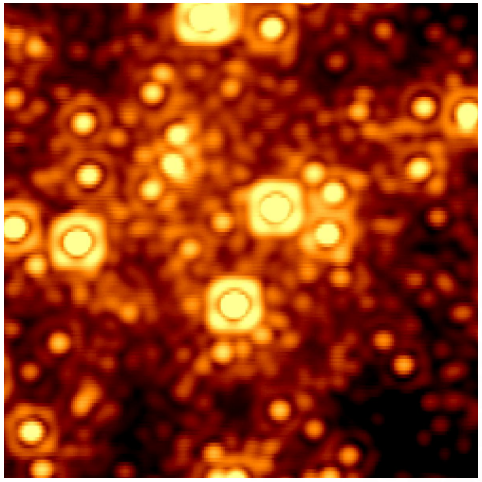
Finkelstein et al., Nature, 2013

Image Simulations – Resolved Populations

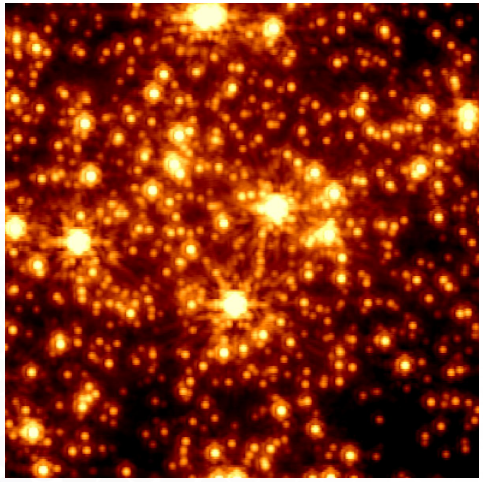
Natural Seeing 0.6”



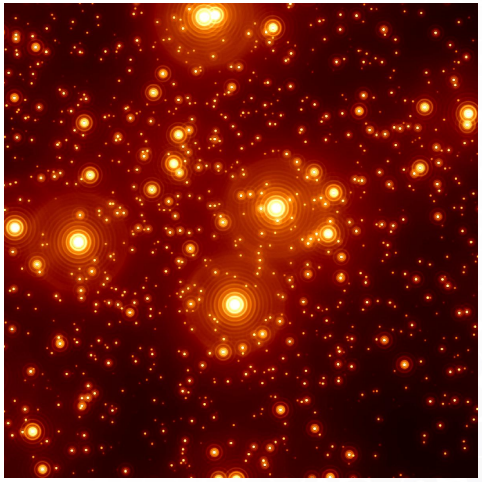
HST/NICMOS



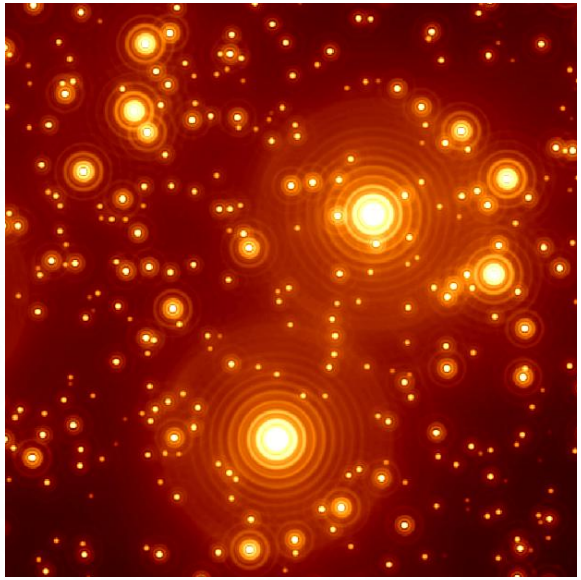
JWST NIRCAM



GMT Strehl: 80%



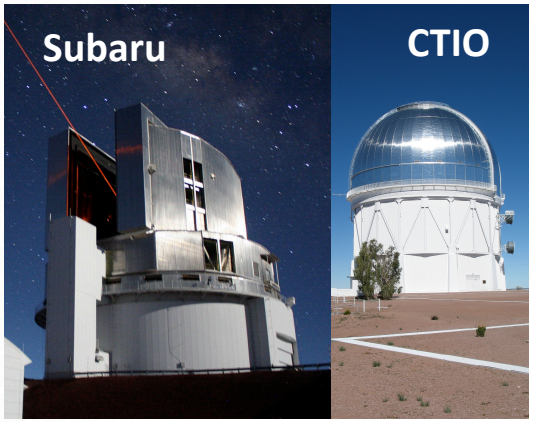
GMT Strehl: 80%

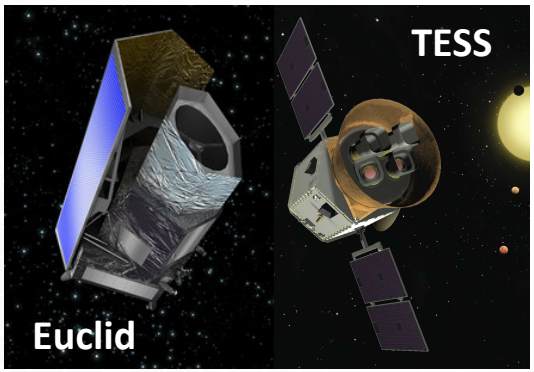


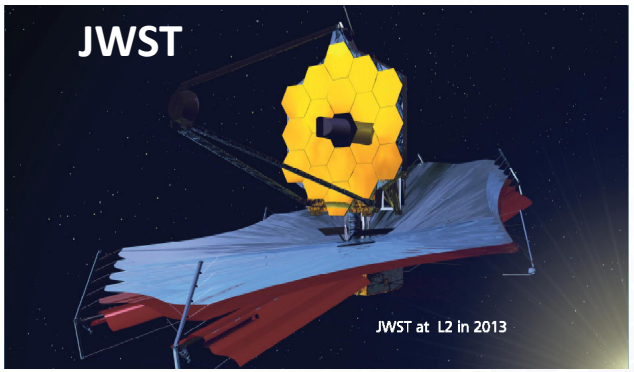
Scientific Synergy

GMT will play a major role in leveraging the potential of world-wide astronomy facilities in 2020 and beyond

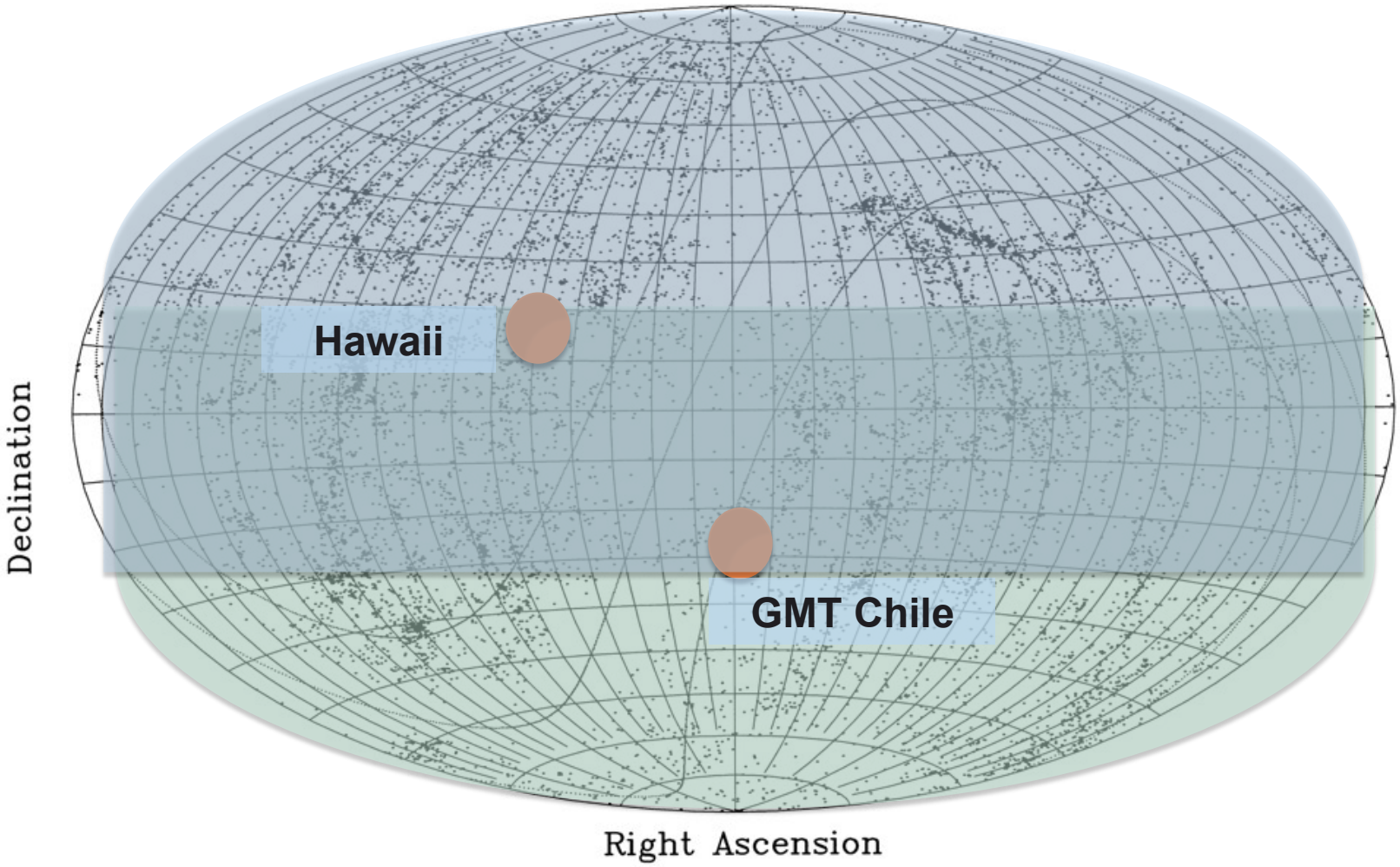
- Spectroscopy in the visible & IR ***- High spatial resolution*** ***- High sensitivity***





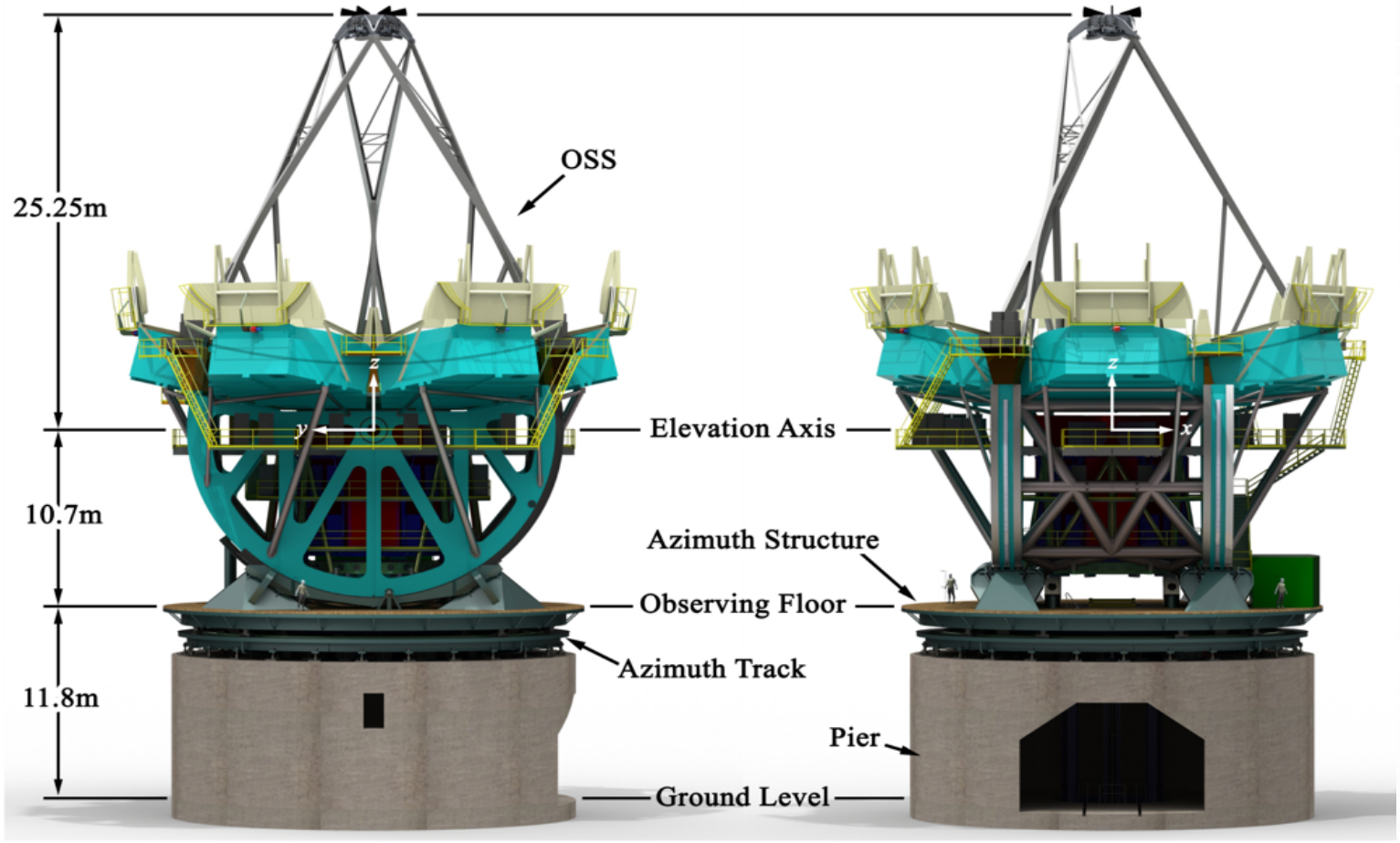


Sky Coverage from Hawaii and Chile

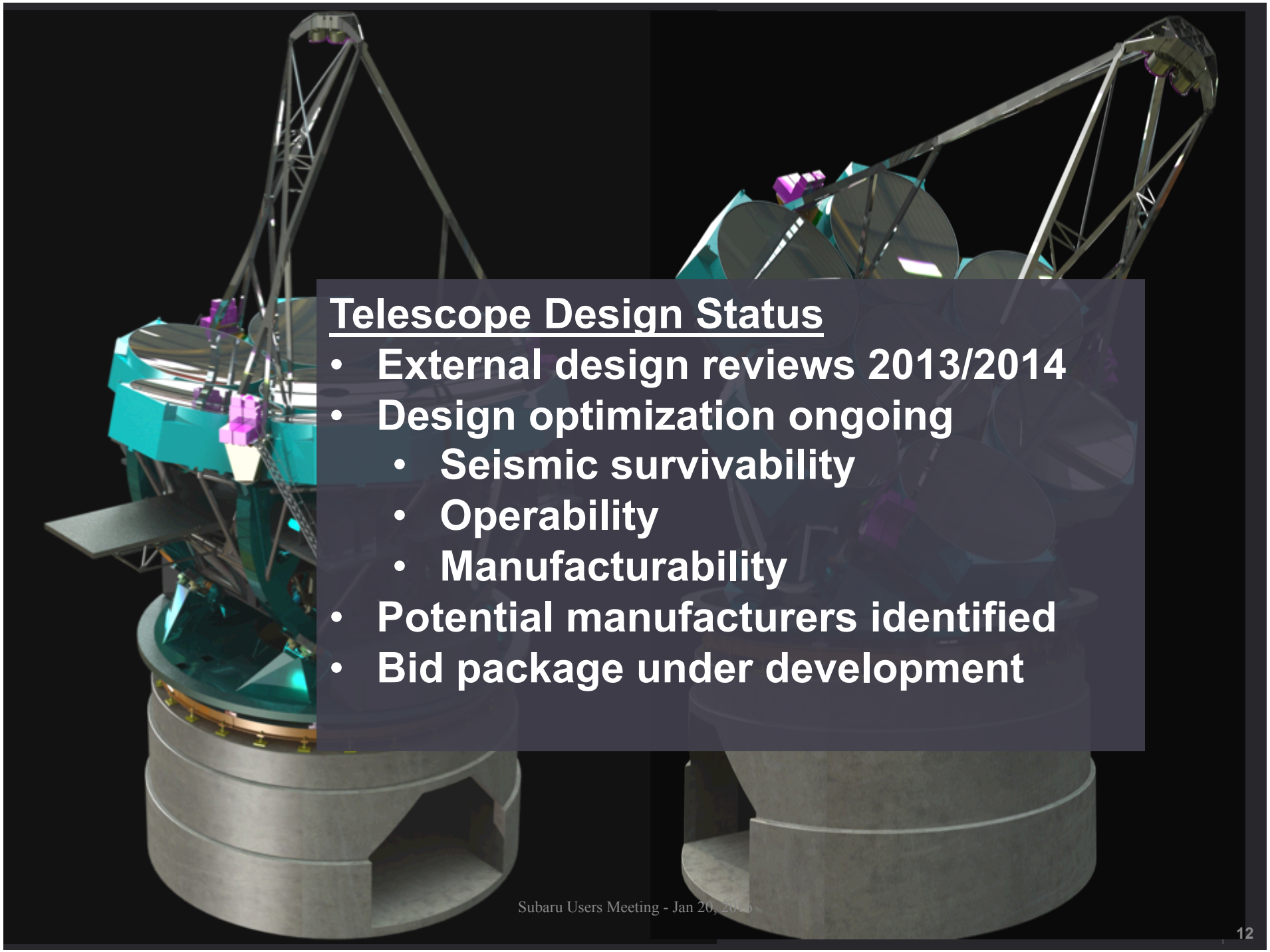


Hawaii and Chile share a large sky area

Telescope Structure



Moving mass (azimuth + elevation) = 1,261 metric tons



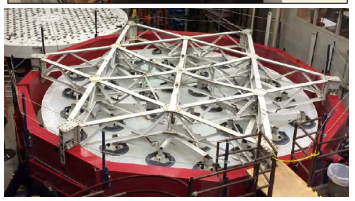
Telescope Design Status

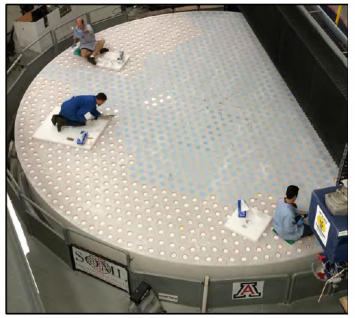
- External design reviews 2013/2014
- Design optimization ongoing
  - Seismic survivability
  - Operability
  - Manufacturability
- Potential manufacturers identified
- Bid package under development

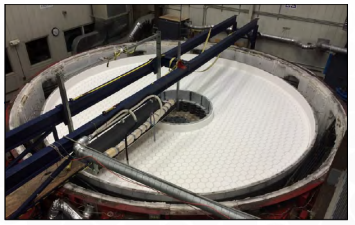
Primary Mirror Status

Seven 8.4m diameter primary mirror segments
Six are off-axis – 14mm aspheric departure!

- S1 Complete – meets all contract specifications
- S2 Front surface processing
- S3 Rear surface processing
- S4 Cast Sept 2015
- S5 Glass in hand, mold material on order
- S6 Glass on order





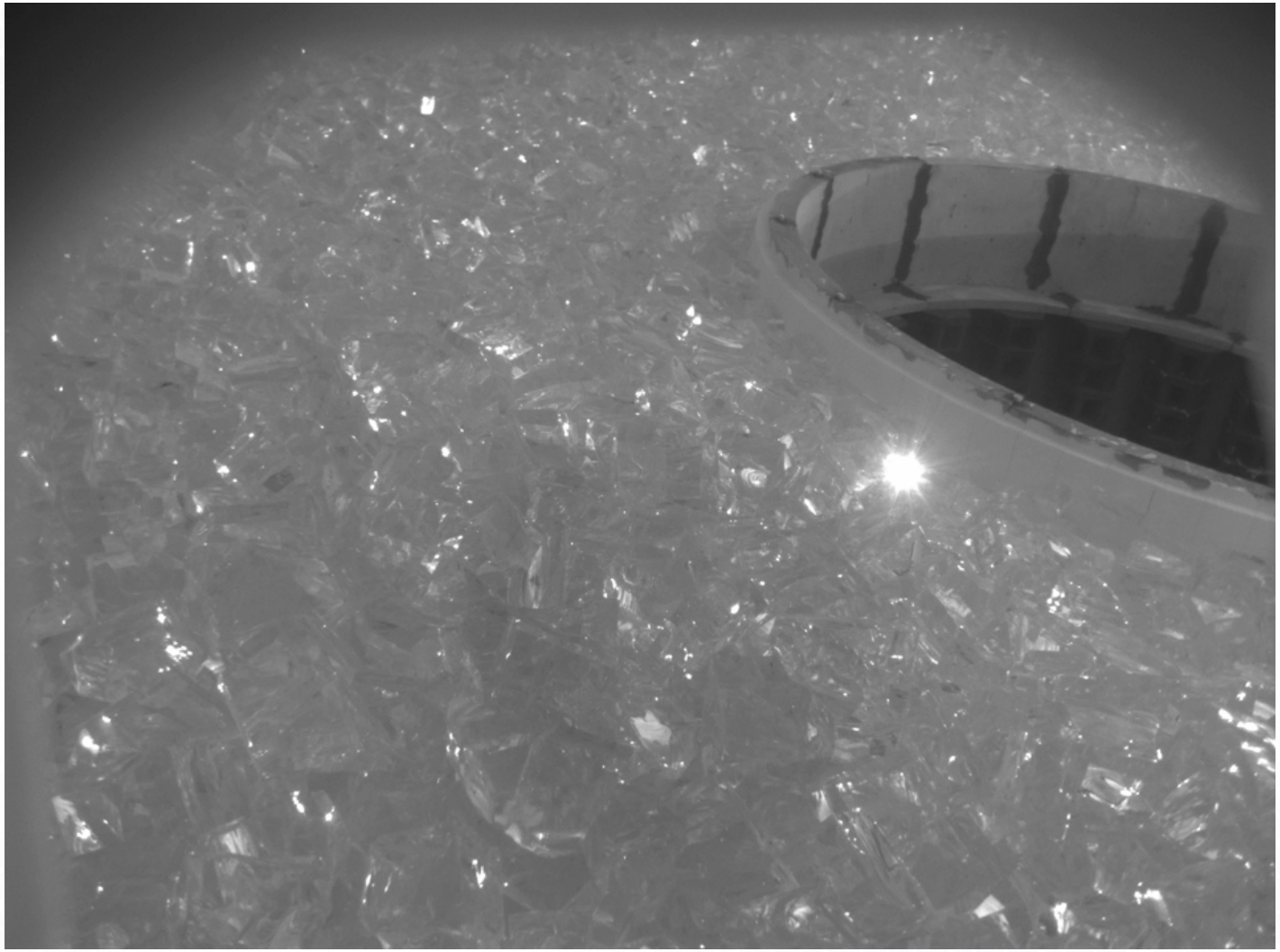


Center Segment Casting – Sept 18

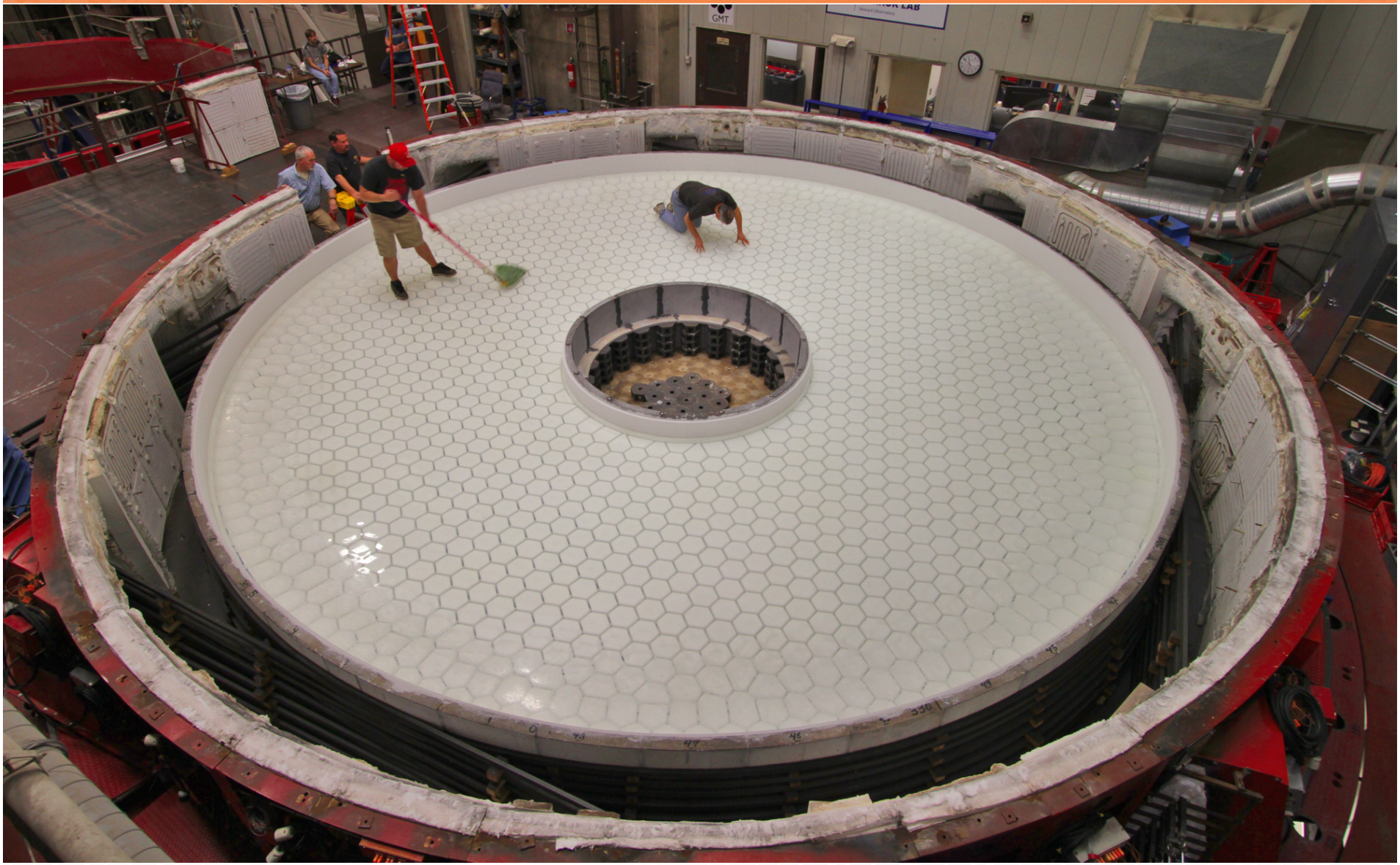
Glass from Ohara of Japan

Photo by Ray Bertram

Center Segment Casting – Sept 18

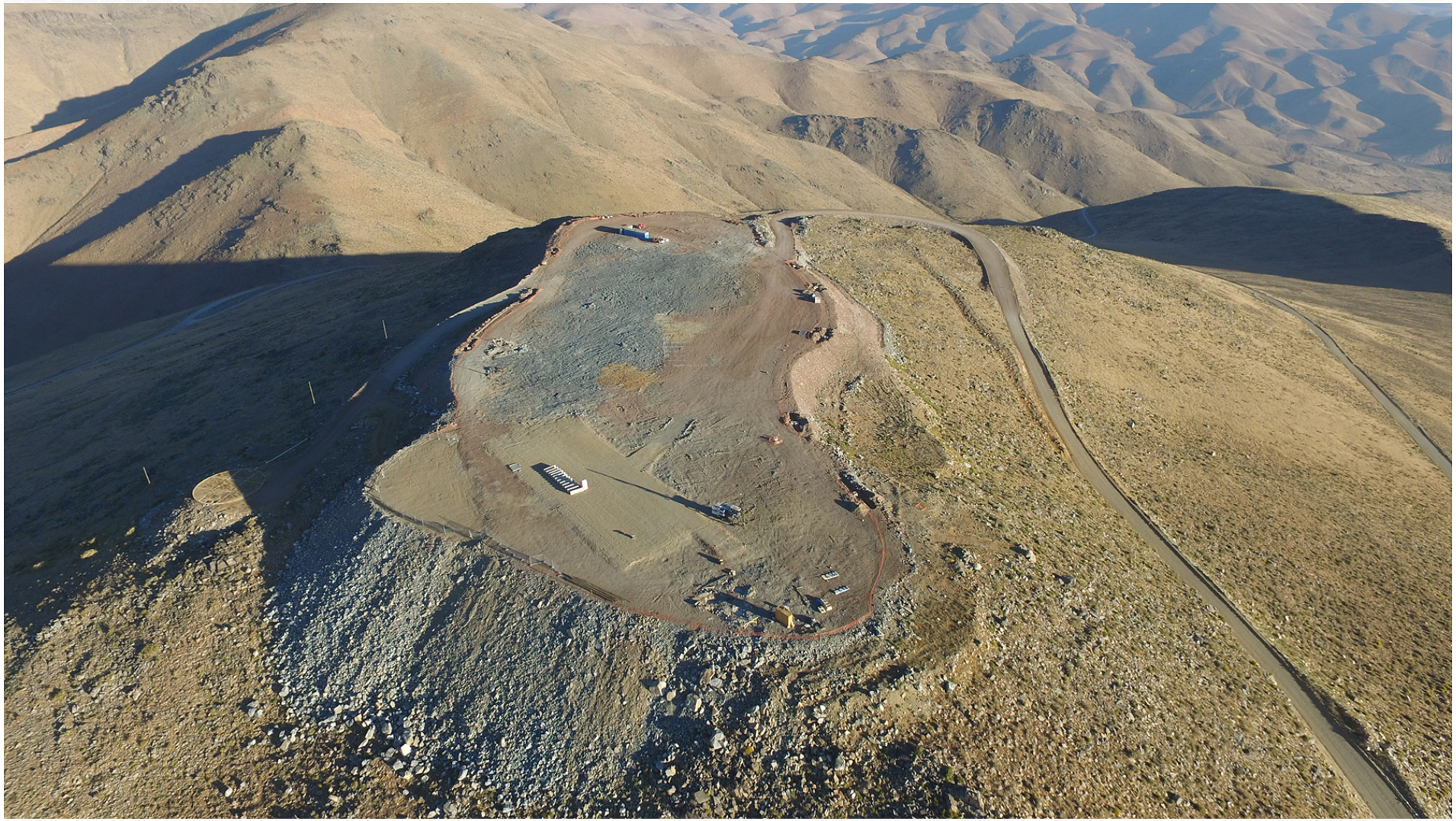


Center Segment Out of the Oven



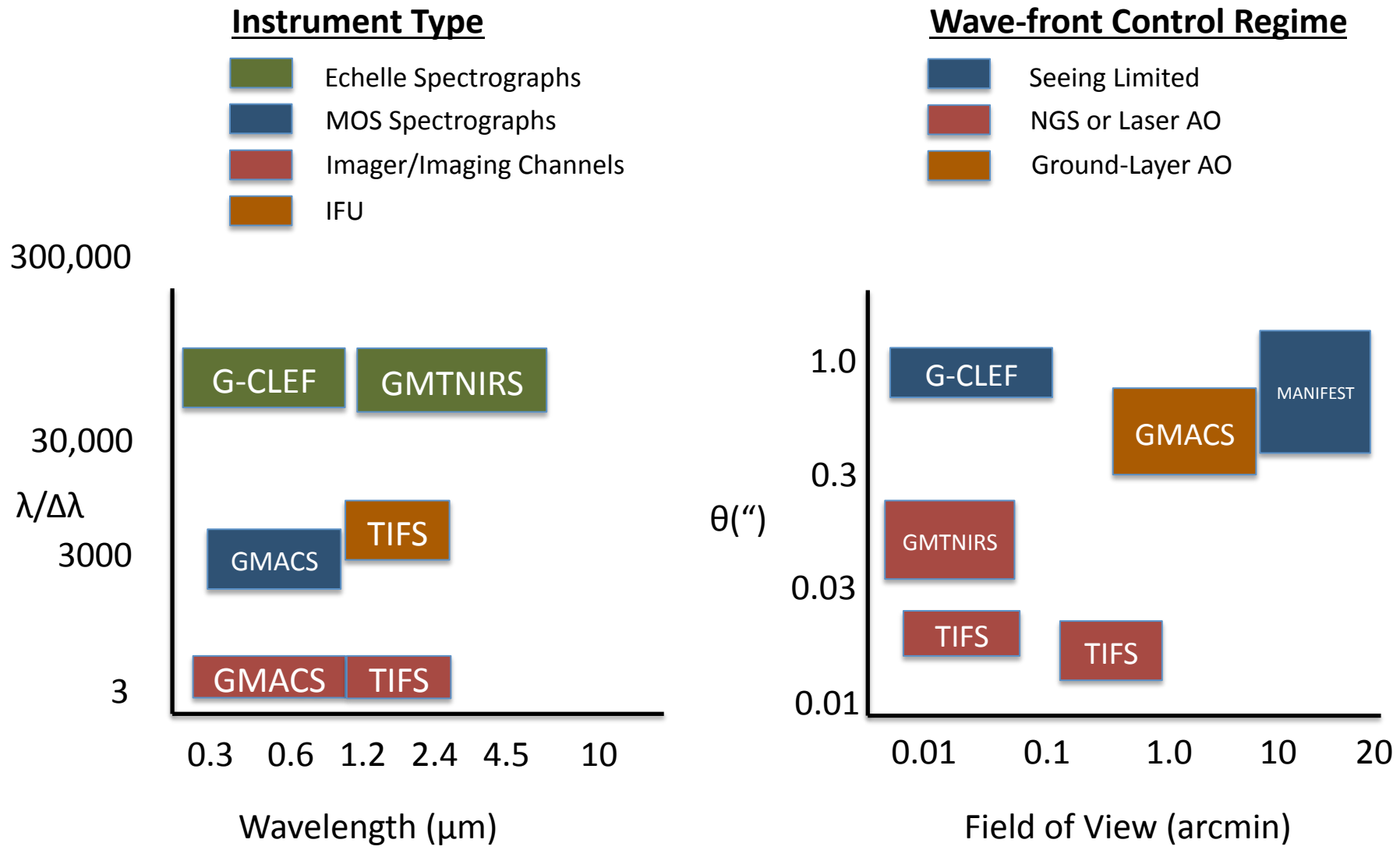
Construction Work on Site

GMT



Construction Underway

First Generation Science Instruments



G-CLEF High Resolution Spectrograph

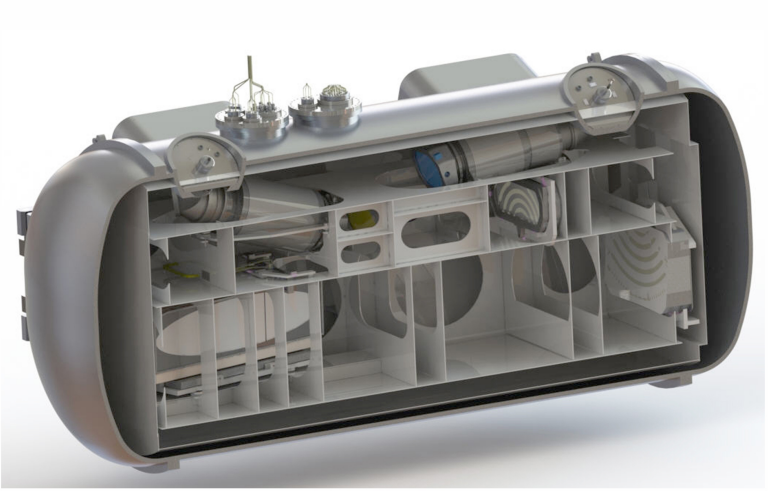
GMT

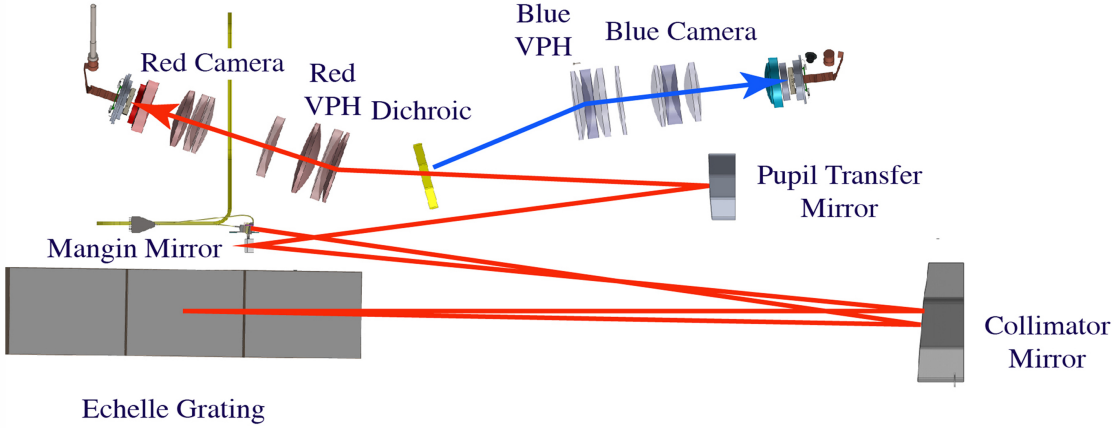
High Resolution Spectrograph and Precision Doppler Speedometer

External PDR passed in June 2015

Ready to move into critical design phase

R = 50,000 – 100,000
Spectrograph
Core Science:
PRV, Exoplanet Spectra,
Abundances, IGM/ICM





Smithsonian Astrophysical Observatory

GMACS: Visible Multi-Object Spectrograph

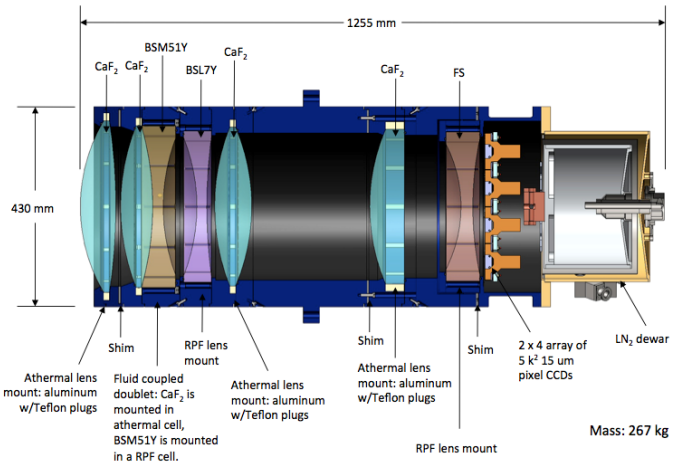
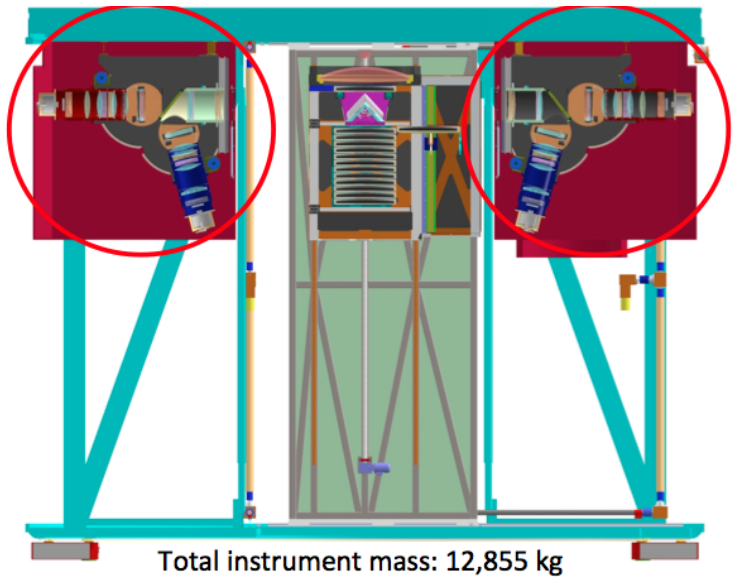


Figure 9-46. Detailed optical layout for the blue camera. The final element (labeled FS, for fused silica) serves as the window to the CCD Dewar.



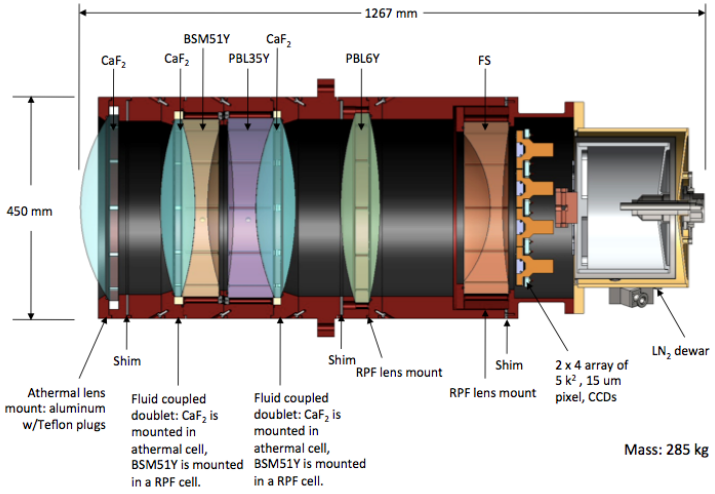
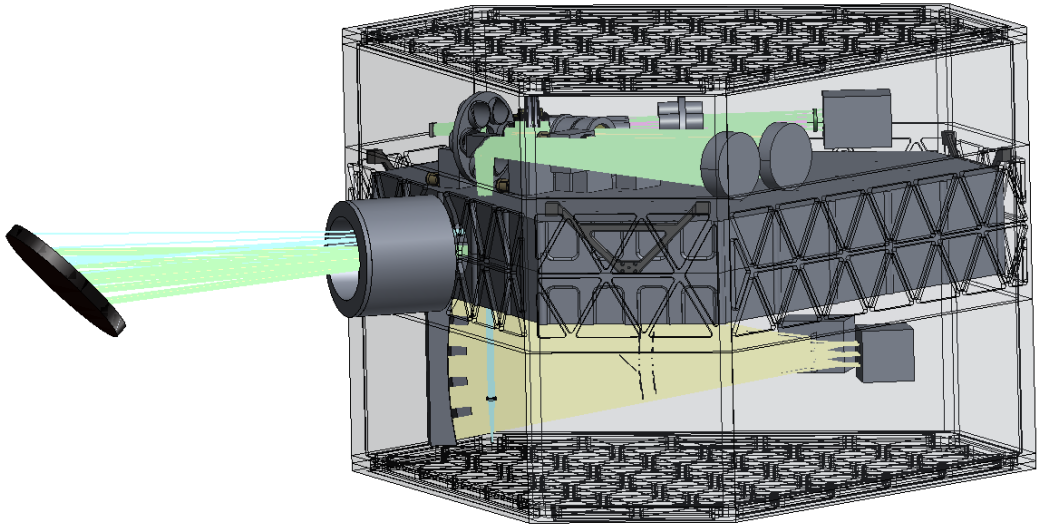


Figure 9-47. Detailed layout for the red camera. As in the blue camera, the final element (FS) is also the Dewar window.

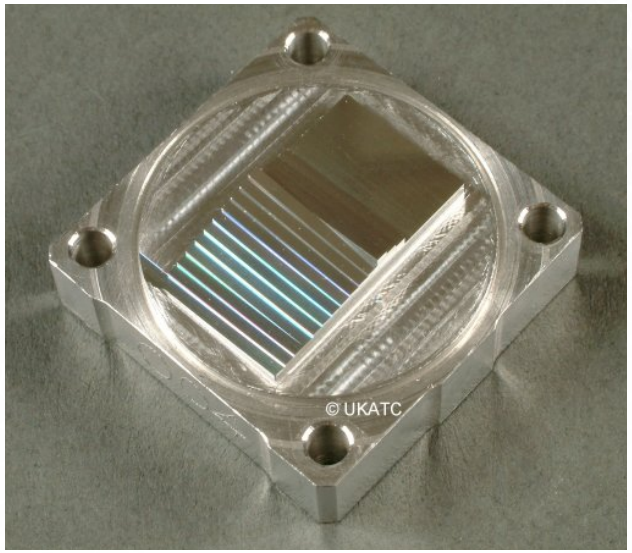
R = 1,000 – 5,000
Multi-Object Spectrograph

Core Science:
Galaxy evolution, First-light, Transient Sources, IGM/ICM, Dwarf Galaxy Dynamics

GMTIFS – AO IFU Spectrograph/Imager



Builds on successful NIFS and GSAOI instruments on Gemini



Micro-mirror image slicer

R = 5,000
IFU Spectrograph

Core Science:
First-light, Galaxy Dynamics, Black Holes/AGN, Outflows

Project Stages

GMT

Stage 3 – Full Adaptive Optics

- Remaining Adaptive Secondary Mirrors
- Second AO Instrument
- Facility Fiber Optic Feed

Stage 2 – Full Aperture

- Primary Mirrors 5 - 8
- First Adaptive Secondary Mirrors
- First AO Instrument

Stage 1 – First Light

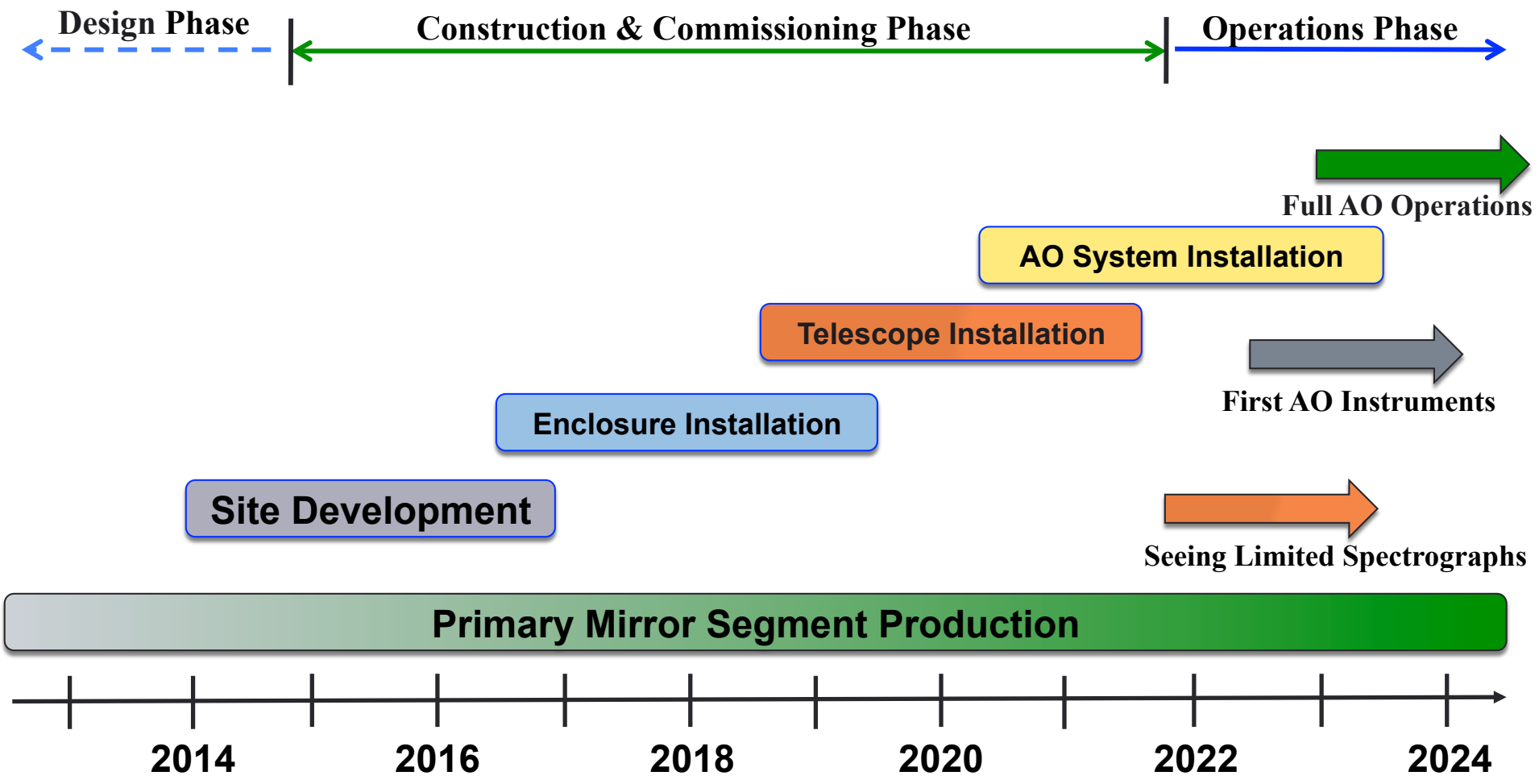
- Essential Infrastructure
- Enclosure
- Support Buildings
- Telescope Mount
- 4 Primary/Secondary Mirrors
- 2 Science Instruments

Construction Start

Commissioning Start

Close out

Schematic Schedule




Thank You