

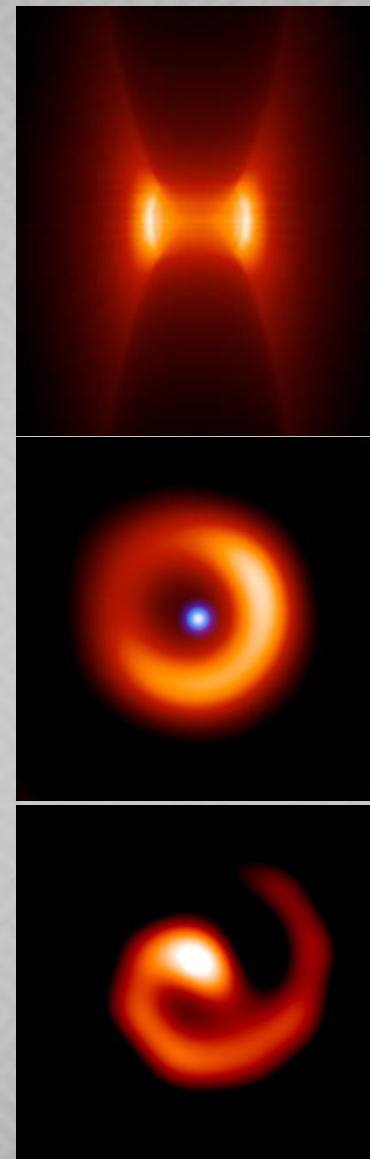
# Magdalena Ridge Observatory Interferometer

Advancing to First Light and New Science

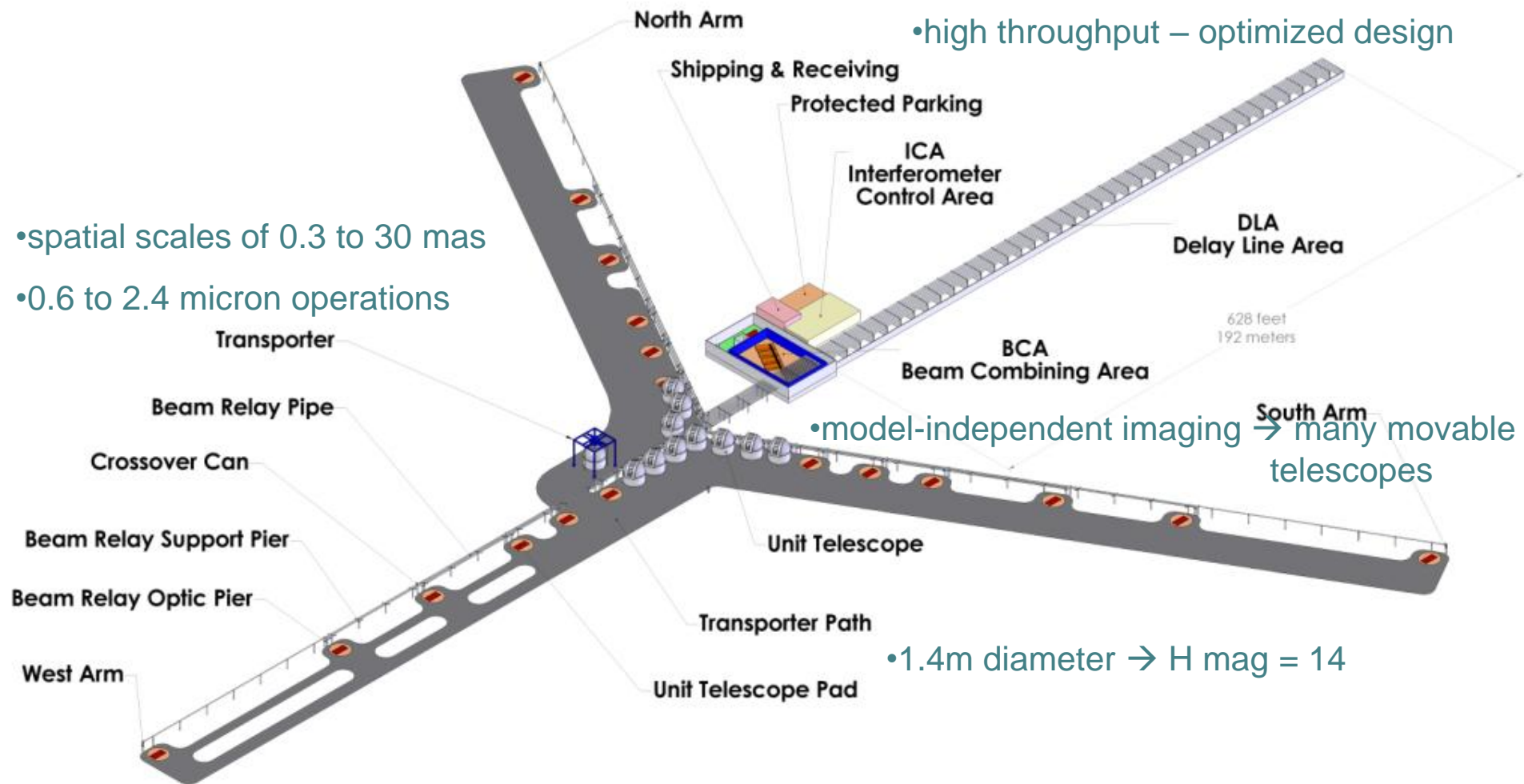
M. Creech-Eakman and the MROI team

# Interferometer: Key Science Mission

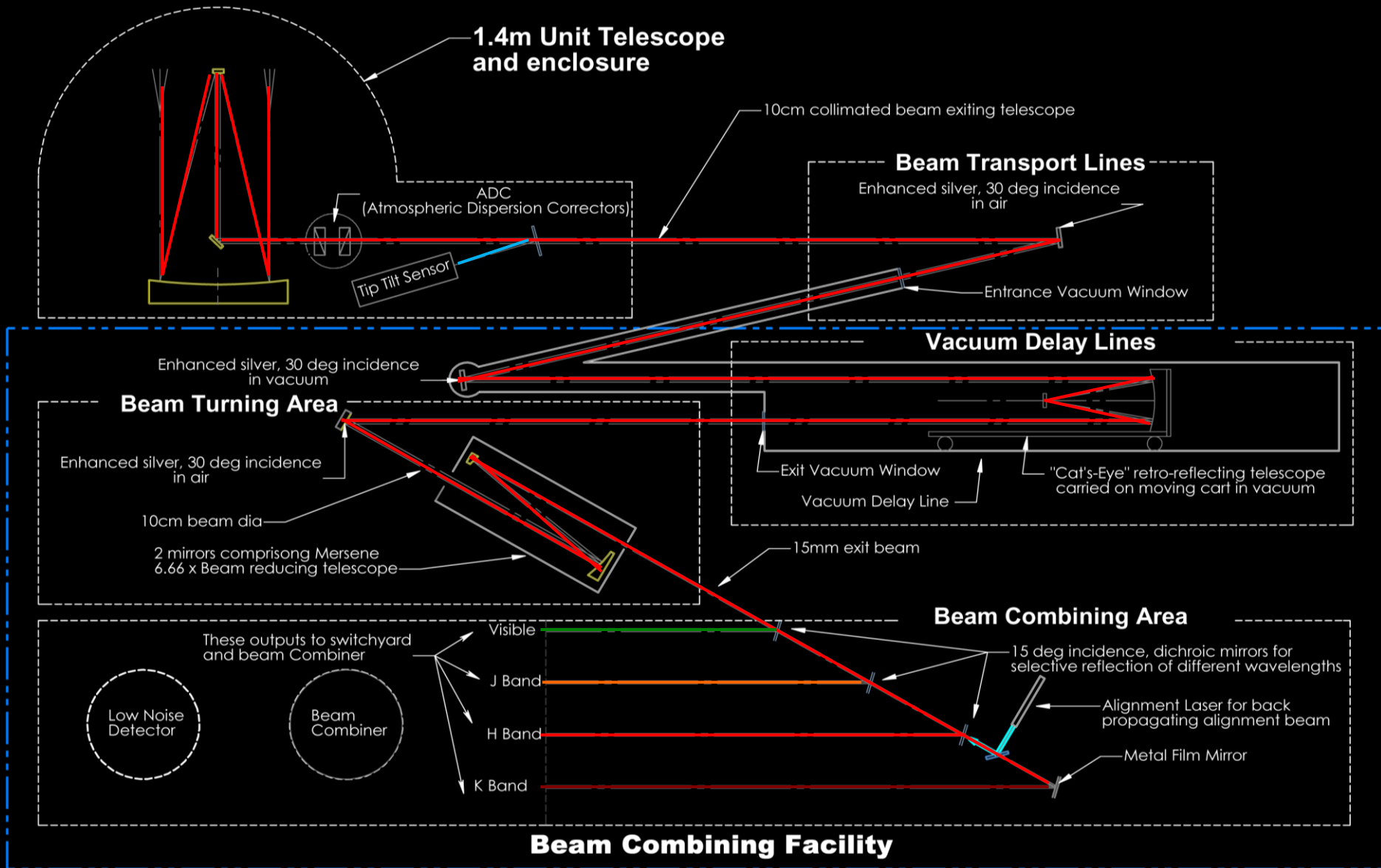
- **AGN:**
  - Investigation of unified models
  - Determination of nature of nuclear/extra-nuclear starbursts
  - $H = 14$  gives  $>100$  targets.
- **Star and planet formation:**
  - Protostellar accretion, imaging of dust disks, disk clearing as evidence for planet formation
  - Emission line imaging of jets, outflows and magnetically channeled accretion.
  - Detection of sub-stellar companions.
- **Stellar accretion and mass loss:**
  - Convection, mass loss and mass transfer in single and multi-star systems
  - Bipolarity and collimation of circumstellar material, wind and shock geometries.
  - Pulsations in Cepheids, Miras, RV Tauris, etc.



# Flow Down: Key Science to Design



# Optical Path





# Facilities

- Beam combining, control and delay line buildings
- Designed by M3 in AZ
- Completed in 2008



# Telescopes

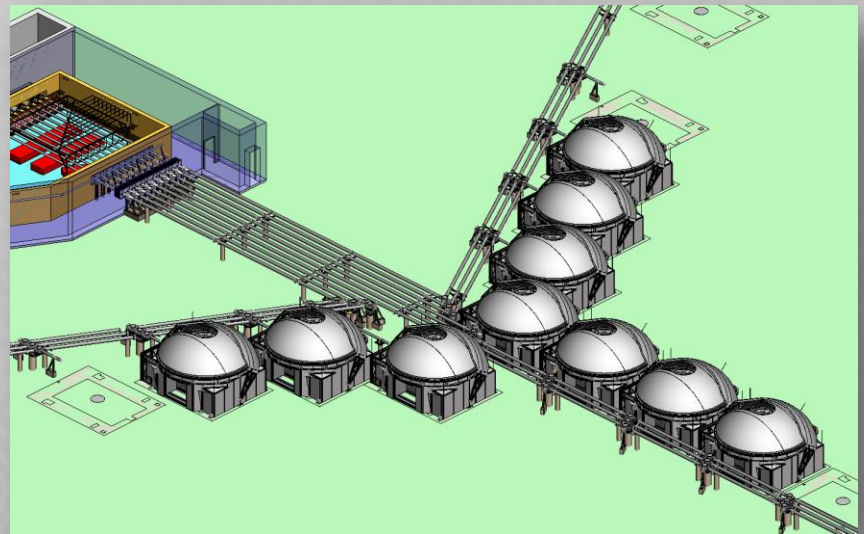
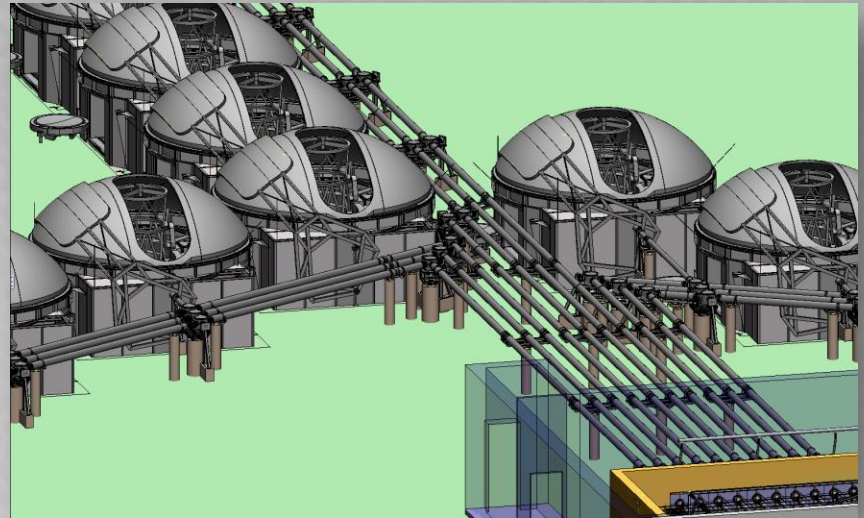
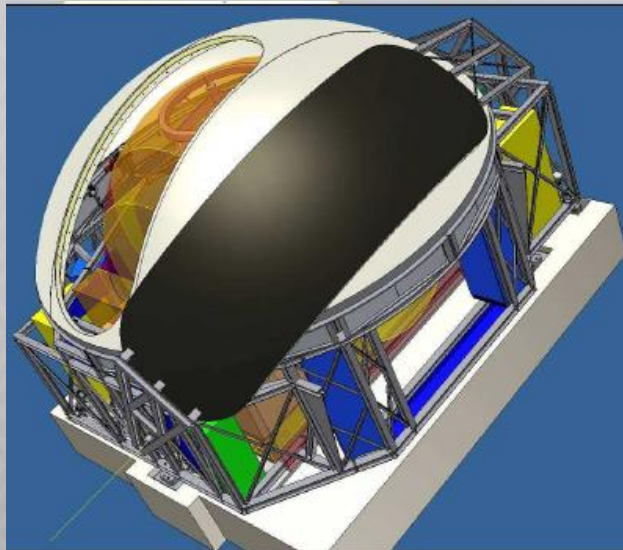
- 1.4m diameter altitude-altitude design
- Built by AMOS in Belgium
- First telescope delivered later *this year*
- Six scopes for Phase A





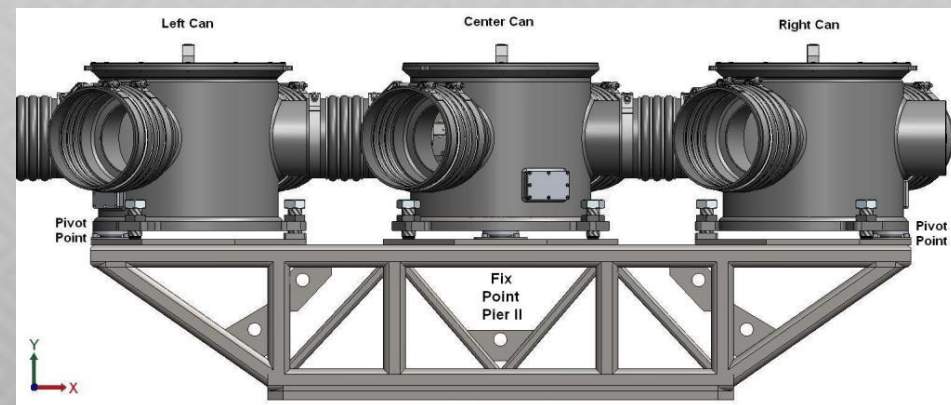
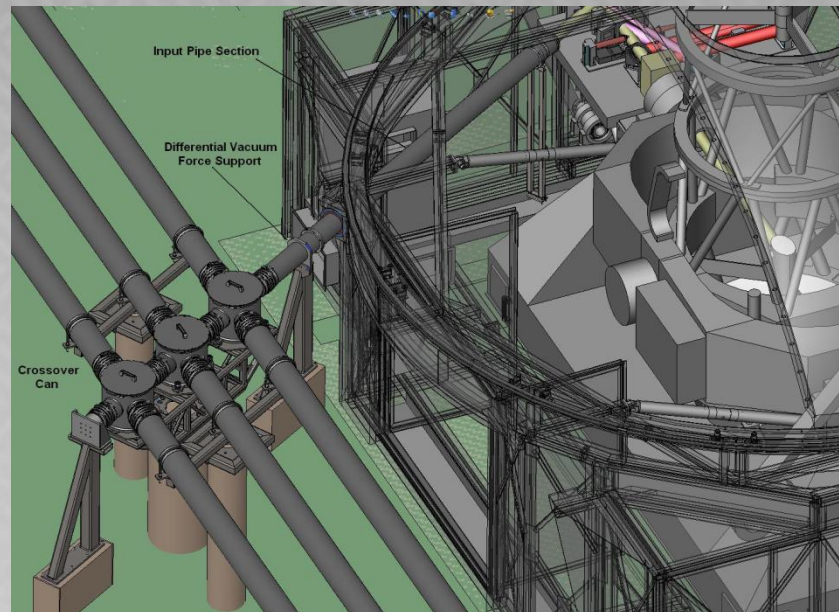
# Enclosures

- Designed to protect & transport telescopes
- Work in close-packed configuration
- Designed by EIE in Italy
- Passed FDR last fall



# Beam Relay System

- Transports the light under soft vacuum from telescopes to beam combiners
- All designed and built in house





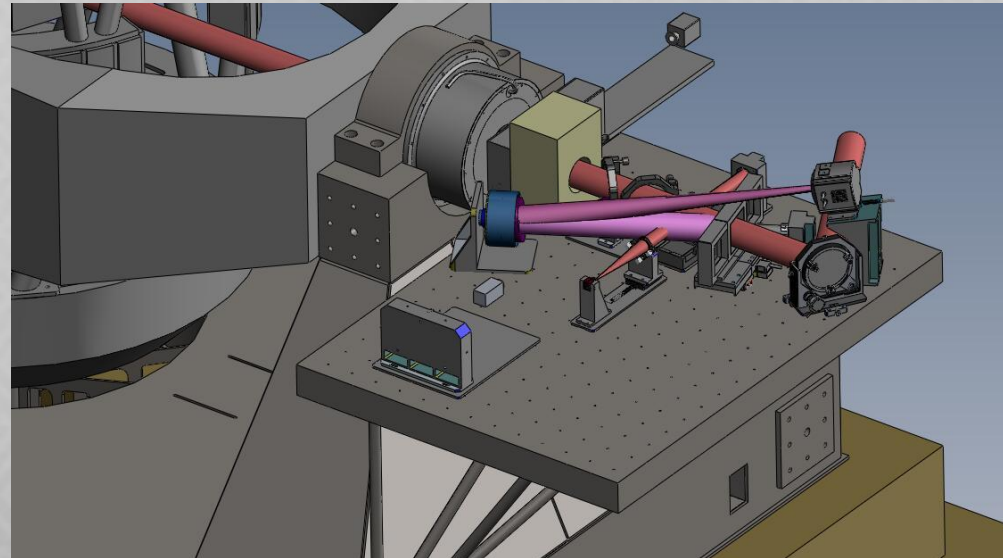
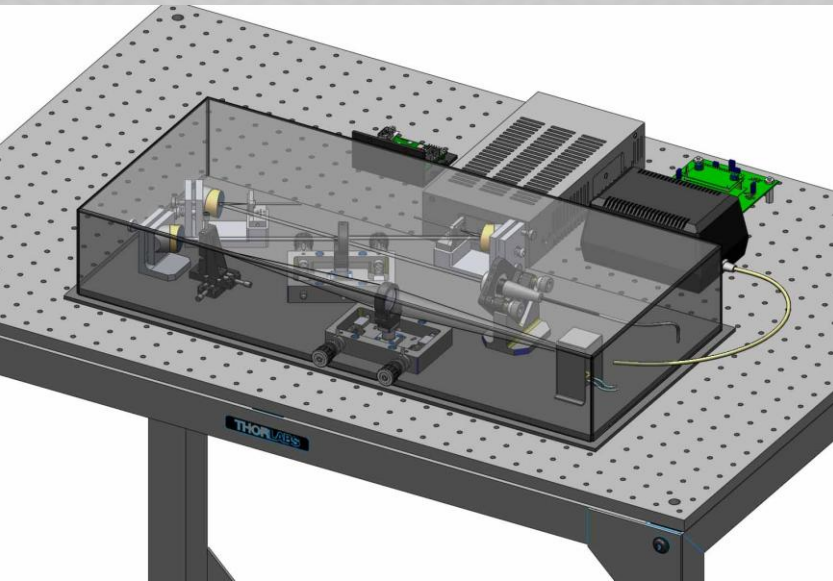
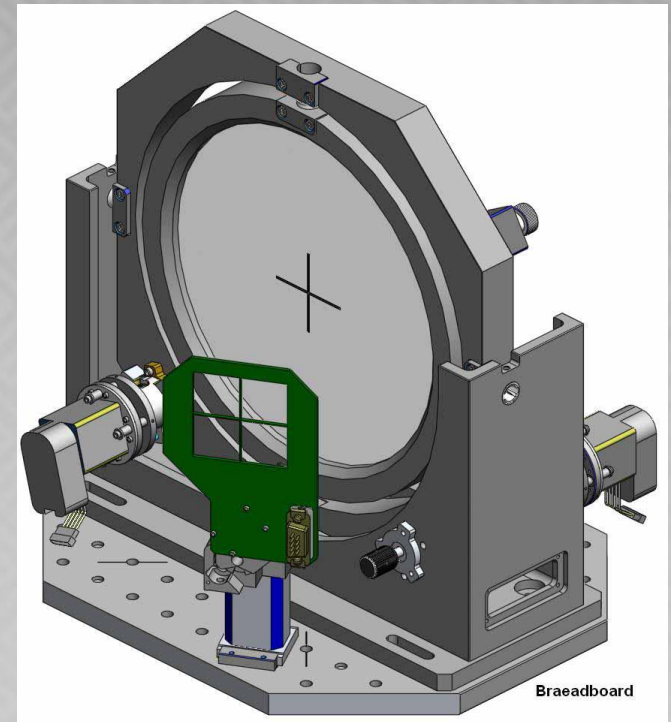
# Delay Lines

- Cat's Eye design rides on inside of vacuum pipe
- Inductive pickup and wireless control
- Orthogonal stellar and metrology beams
- Designed and built by Univ. of Cambridge



# Alignment System

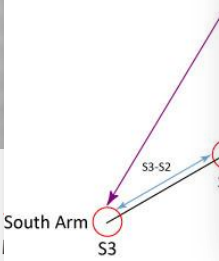
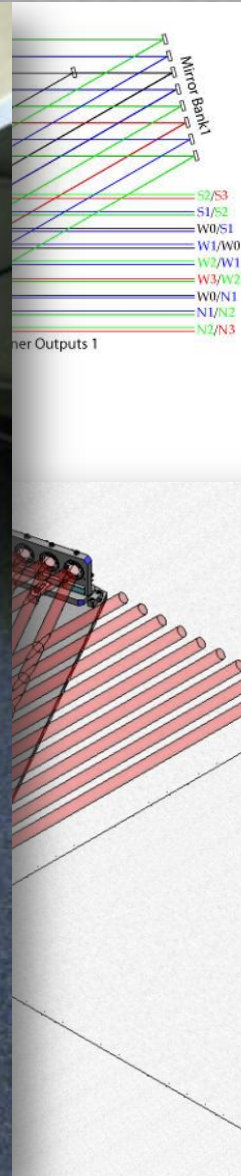
- End-to-end automated alignment
- MOB: Magic Optical Box to inject light into system
- Designed and built in-house





# Fringe Tracking Beam Combiner

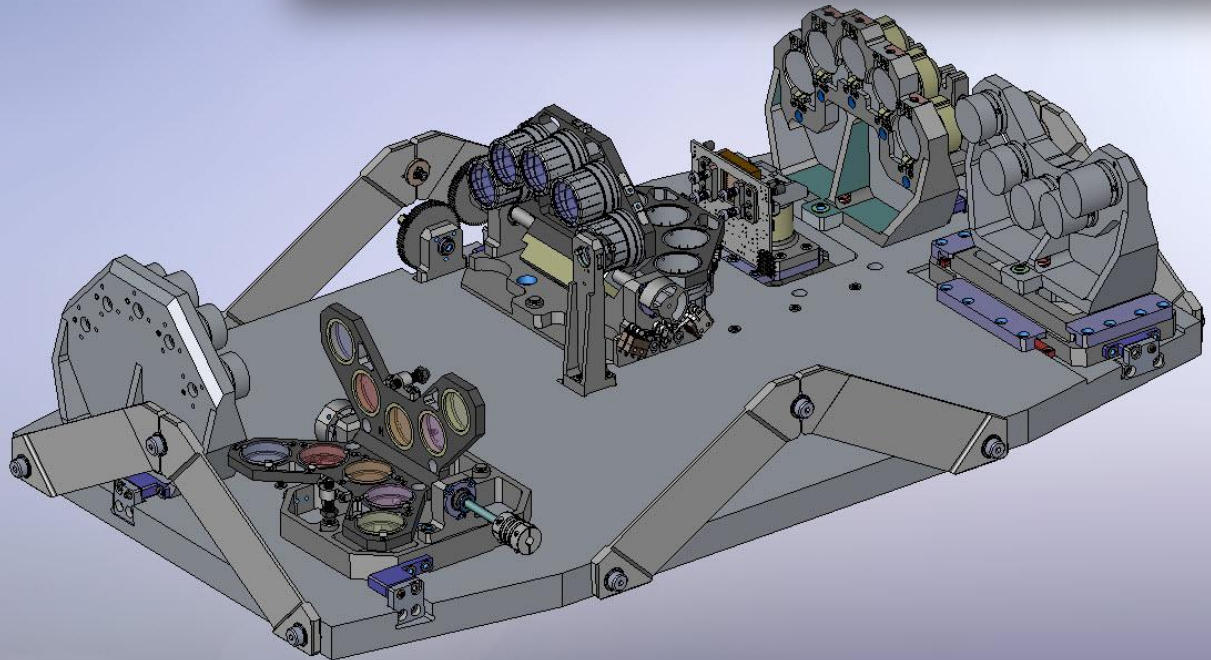
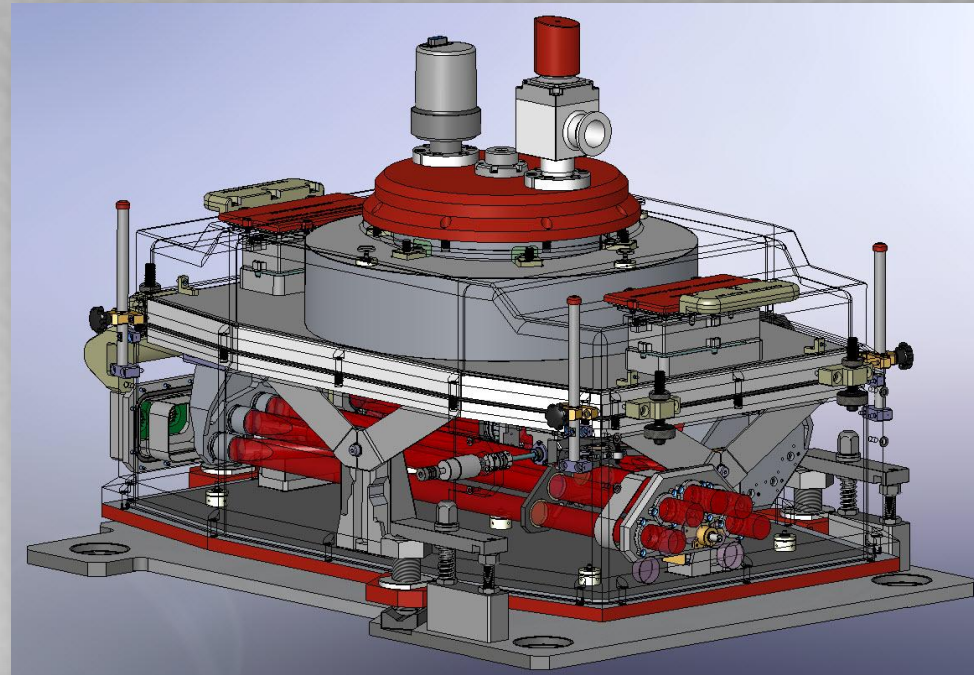
- Pair
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# Fringe Tracking Camera

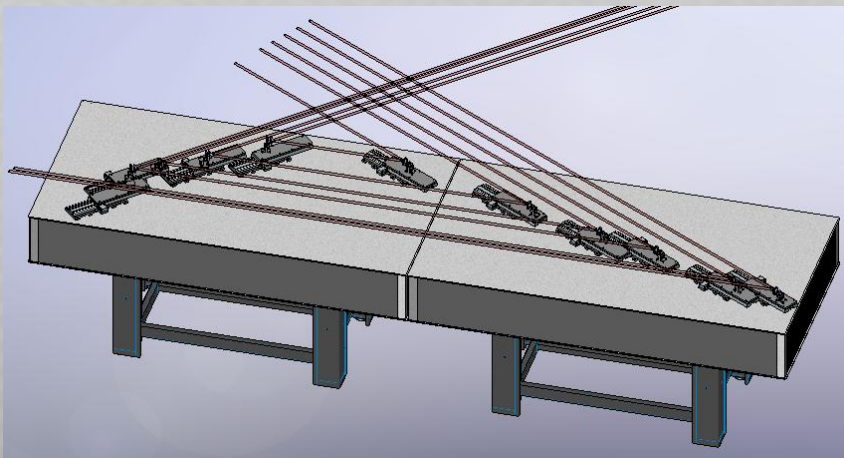
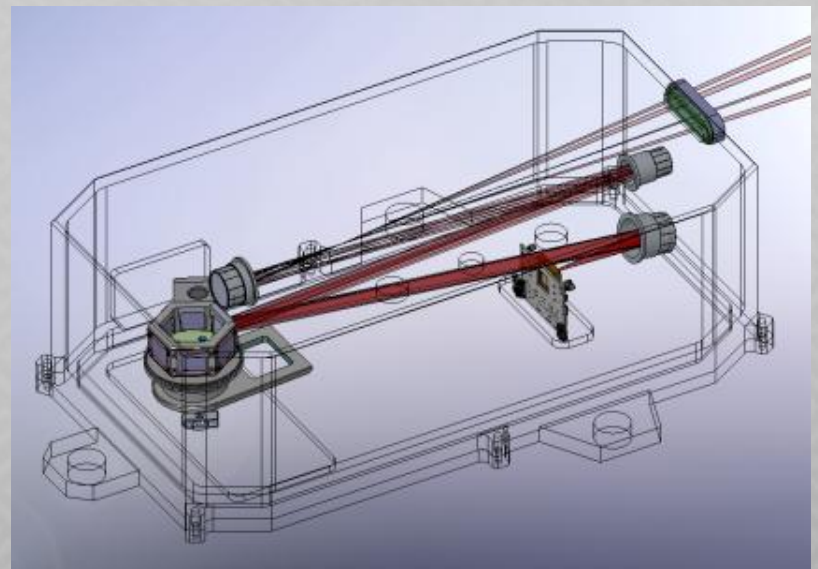
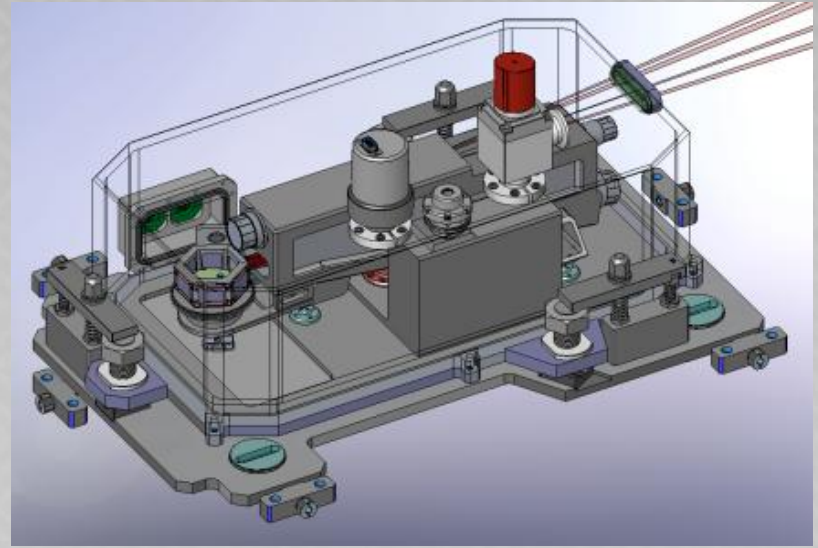
- H or K fringe tracking with science at J, H or K – accepts 4 or 5 beams
- Capable of 14<sup>th</sup> magnitude at H
- Designed and built in-house





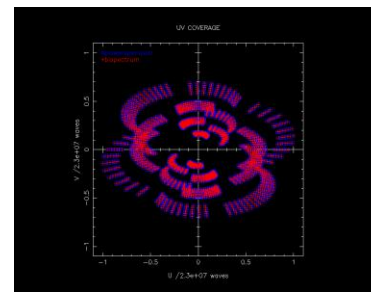
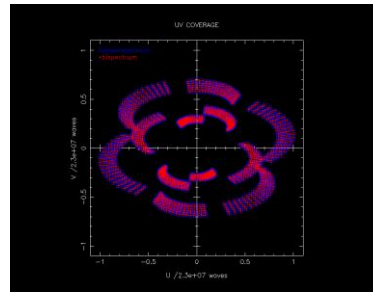
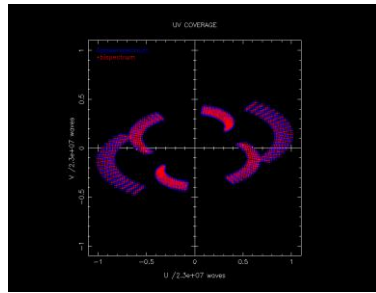
# Science Combiner: SIRCUS

- J, H or K science at  $R \sim 30$  or  $\sim 300$  modes
- Instantaneous mixing of 4 beams with fast switching
- Submitted to NSF ATI

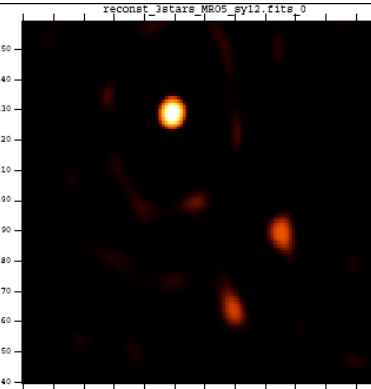
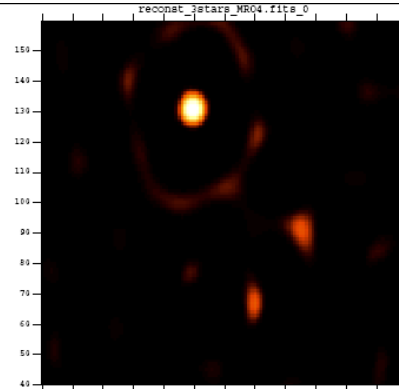
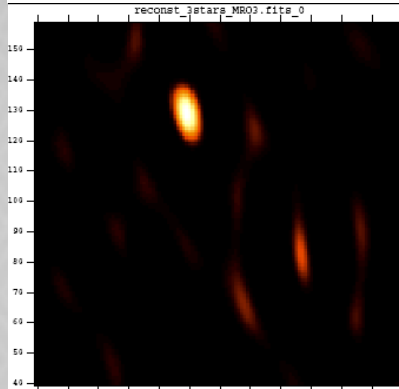


# Science Possibilities

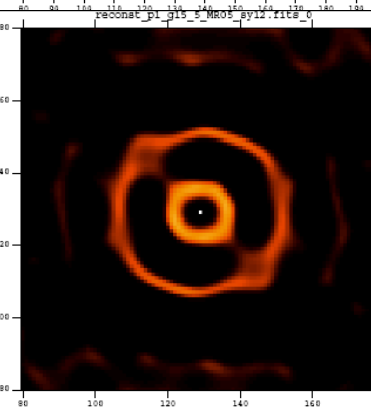
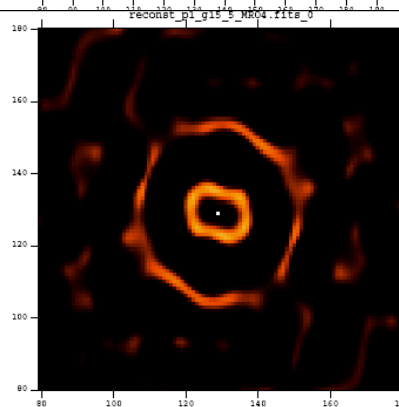
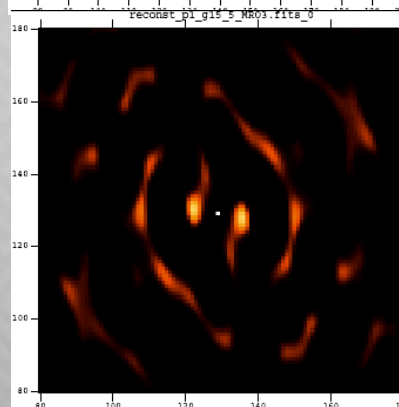
UV coverage



Multiple system



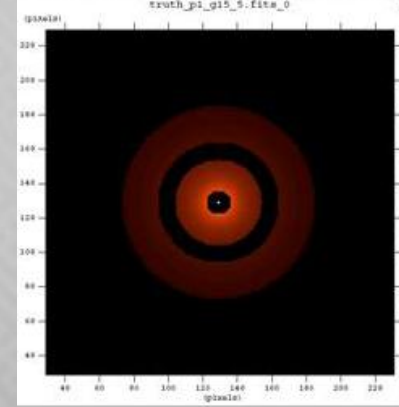
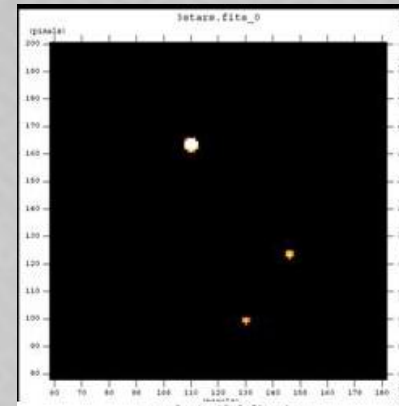
Herbig disk



Errors:

2% V2 and  $0.8^\circ$   
in 6 hours

*Truth images*



3 scopes

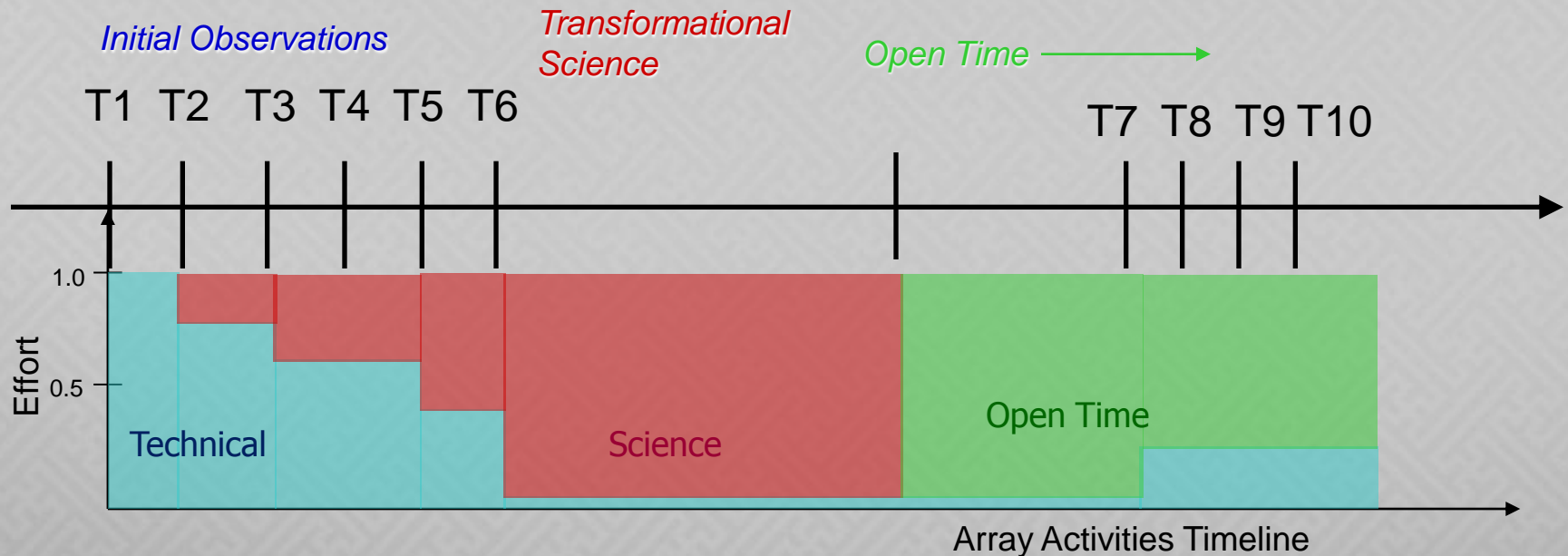
4 scopes

5 scopes



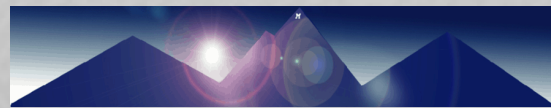
# Scientific Schedule for Interferometer

- Technical Phase – Key observations that quickly demonstrate technical competencies
- Science Phase – Scientific observations that produce transformational changes to understanding of astrophysical phenomena
- Open Time Phase – Release of facility to broader community through public funding



# Thank you for your attention!

- PI: Van Romero
- Deputy PIs: R. Cervantes, D. Westpfahl
- Prog. Director: C. Cormier
- System Architects: C. Haniff, D. Buscher
- Proj. Scientist: M. Creech-Eakman
- Administration: M. Apodaca, L. Archuleta, D. Brown, K. Crockett
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