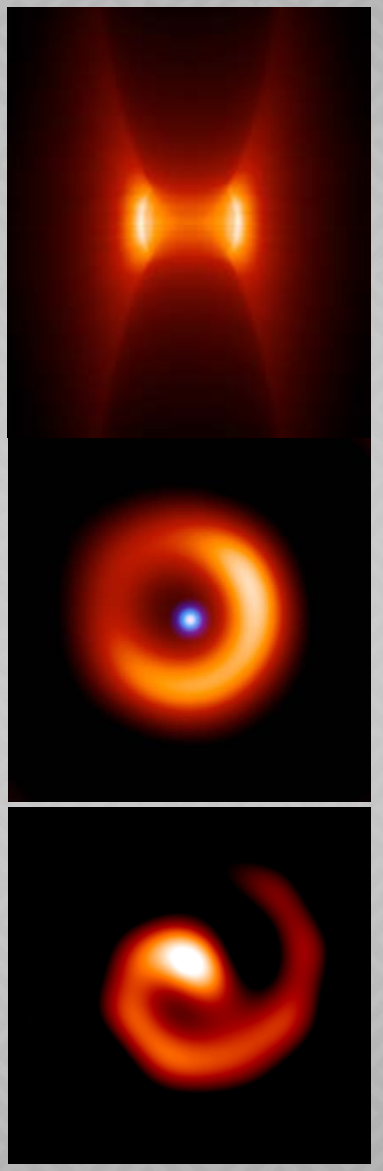
Magdalena Ridge Observatory Interferometer

Update on Status and Science Prospects

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.

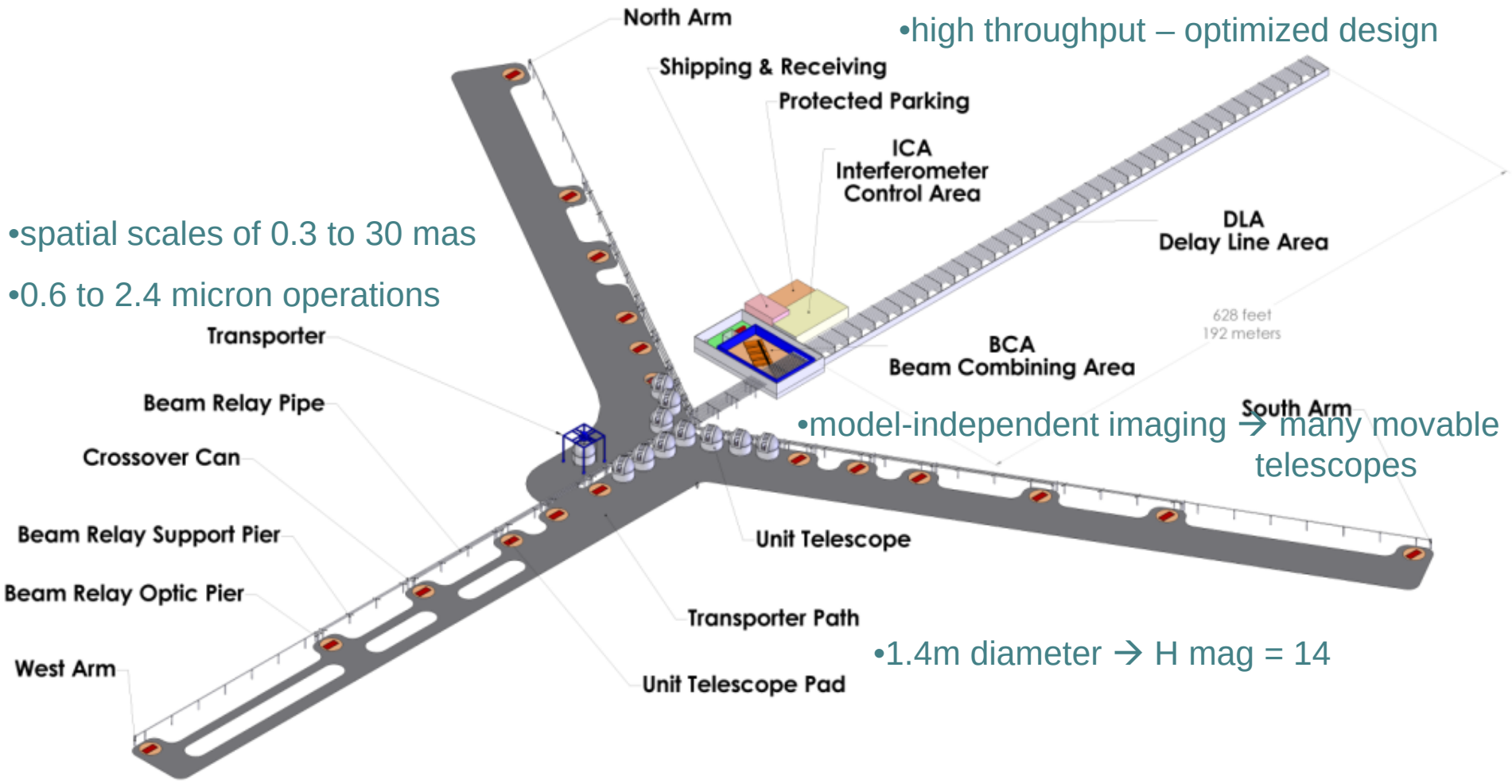


Schartman et al. (2005)

Tuthill et al (2002)

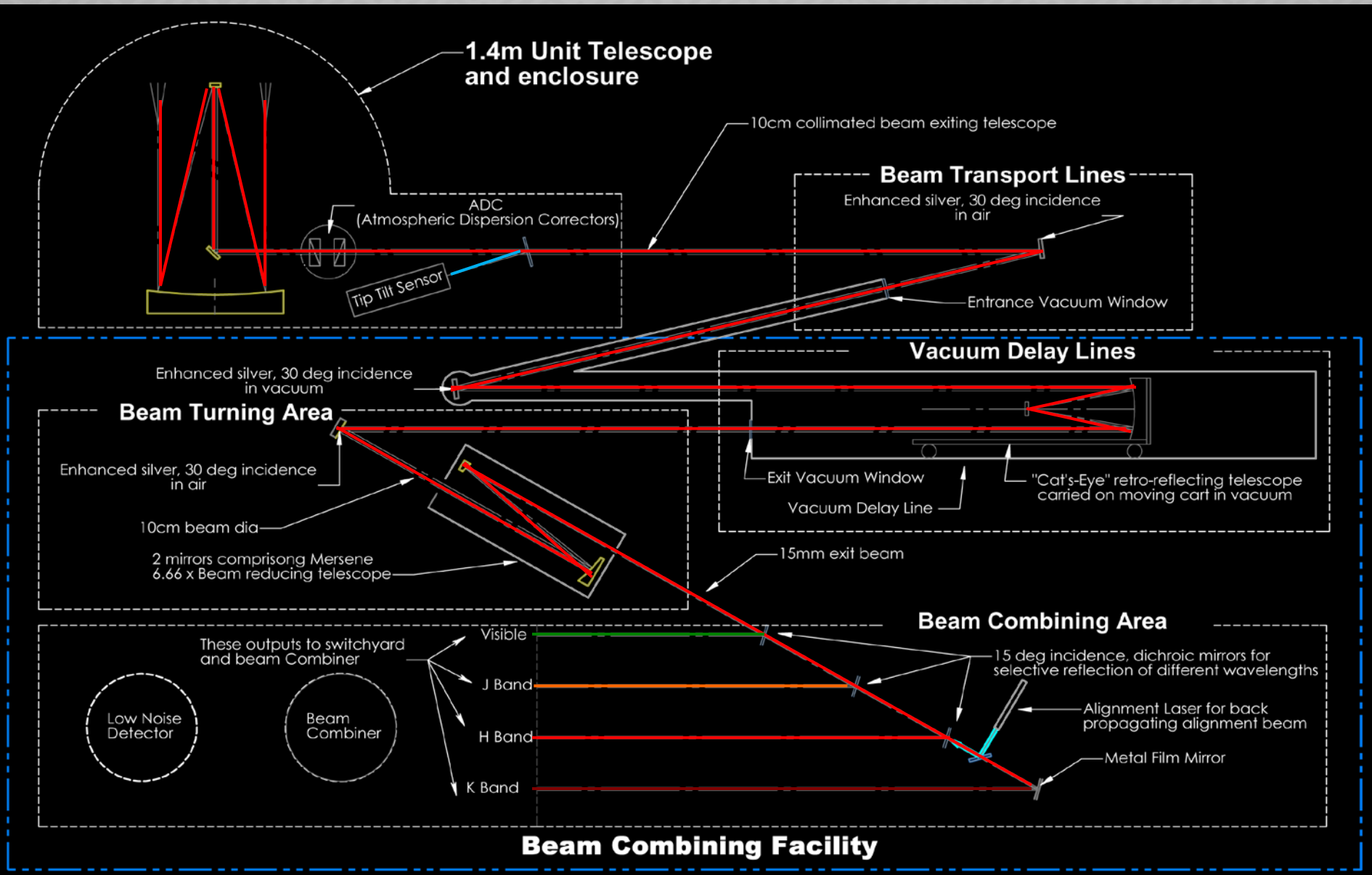
Monnier et al. (2002)

Flow Down: Key Science to Design



- high throughput – optimized design
- spatial scales of 0.3 to 30 mas
- 0.6 to 2.4 micron operations
- model-independent imaging → many movable telescopes
- 1.4m diameter → H mag = 14

Optical Path



Facilities

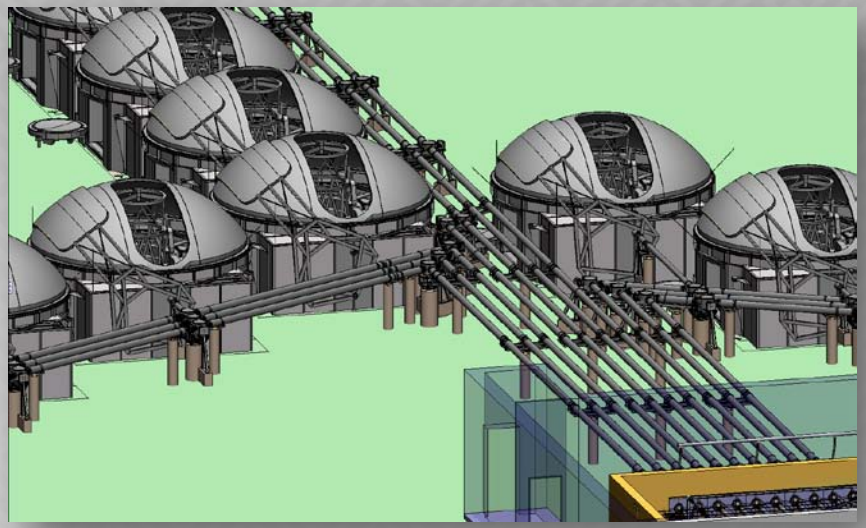
- Beam combining, control and delay line buildings
- Designed by M3 in AZ
- Completed in 2008

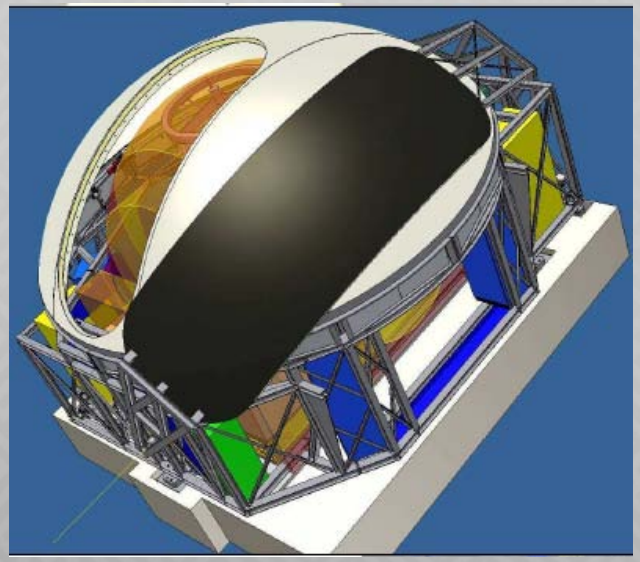
Telescopes

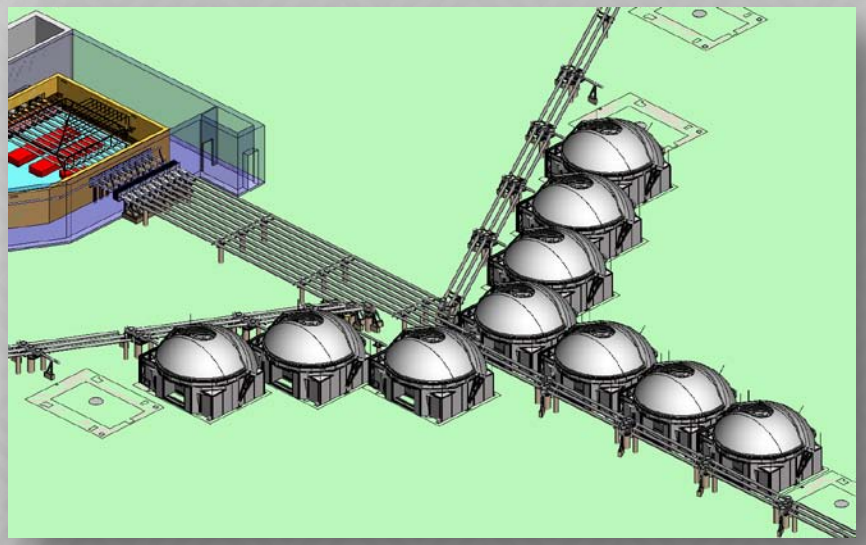
- 1.4m diameter altitude-altitude design
- Built by AMOS in Belgium
- First telescope delivered later *this year*
- Six scopes for Phase A

Enclosures

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

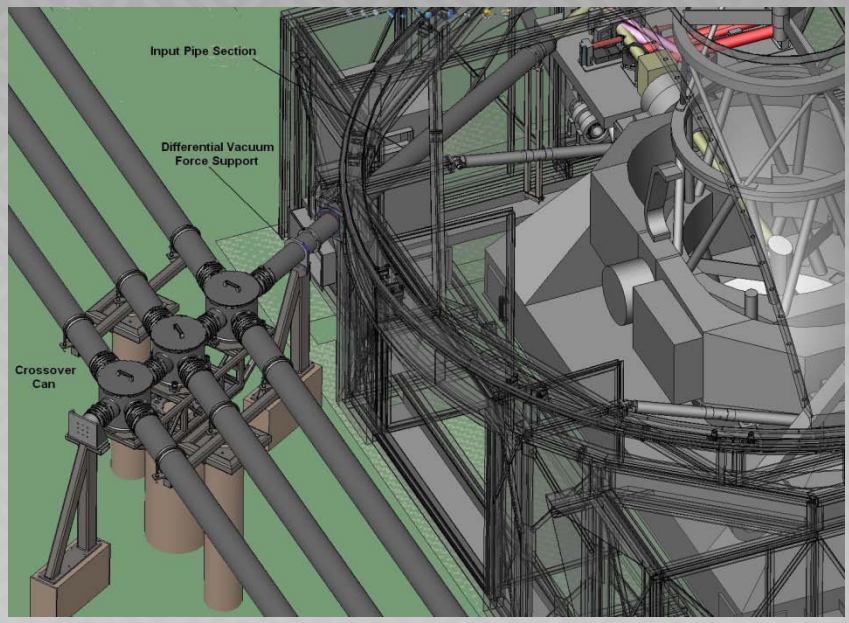


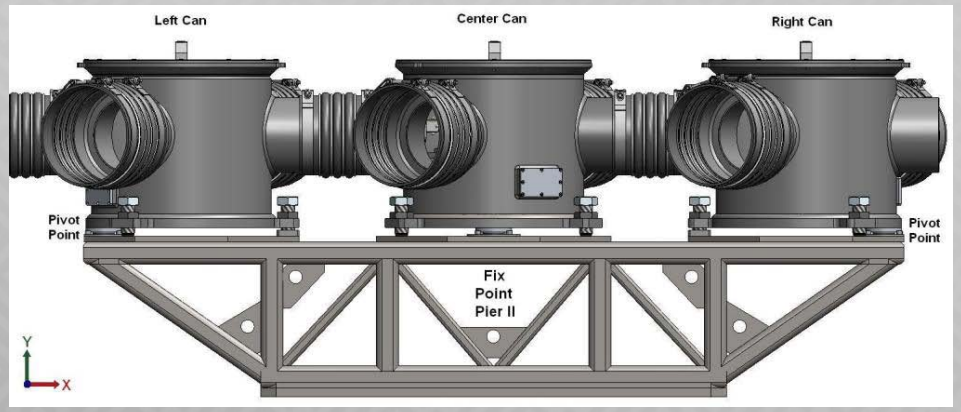




Beam Relay System

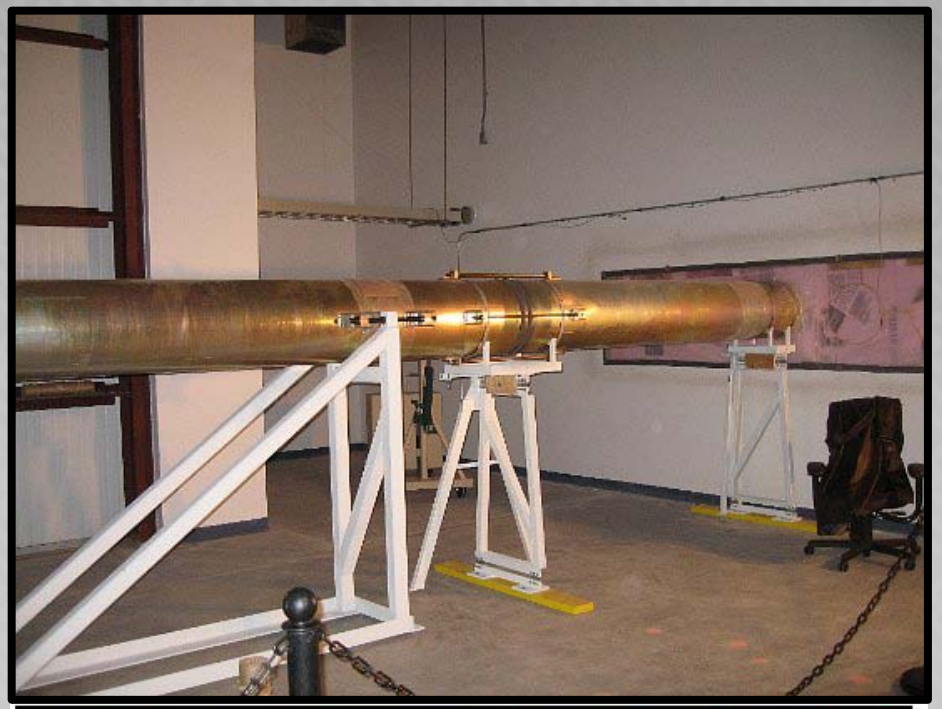
- Transports the light under soft vacuum from telescopes to beam combiners
- All designed and built in house

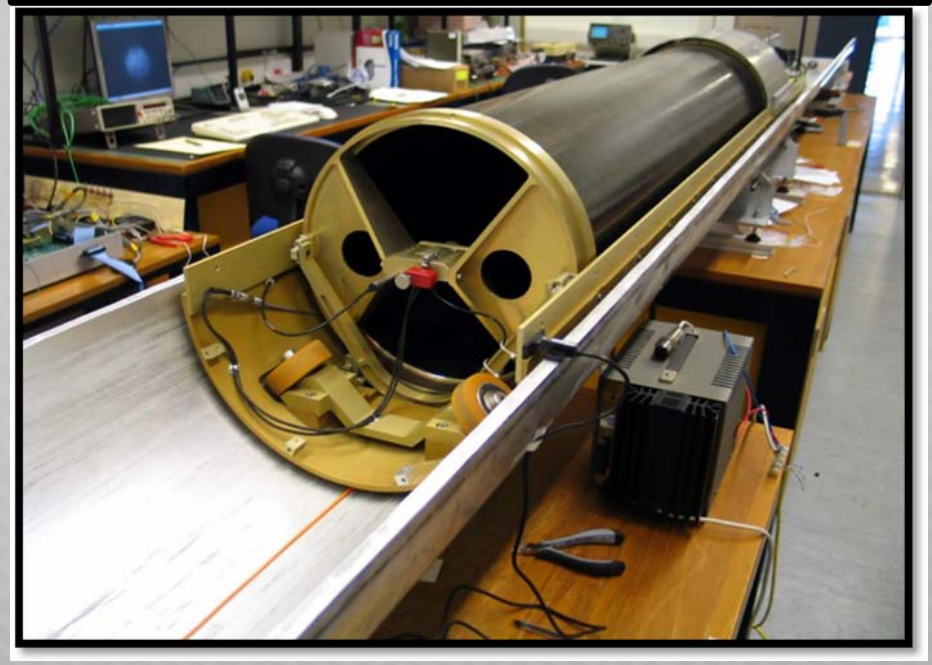




Delay Lines

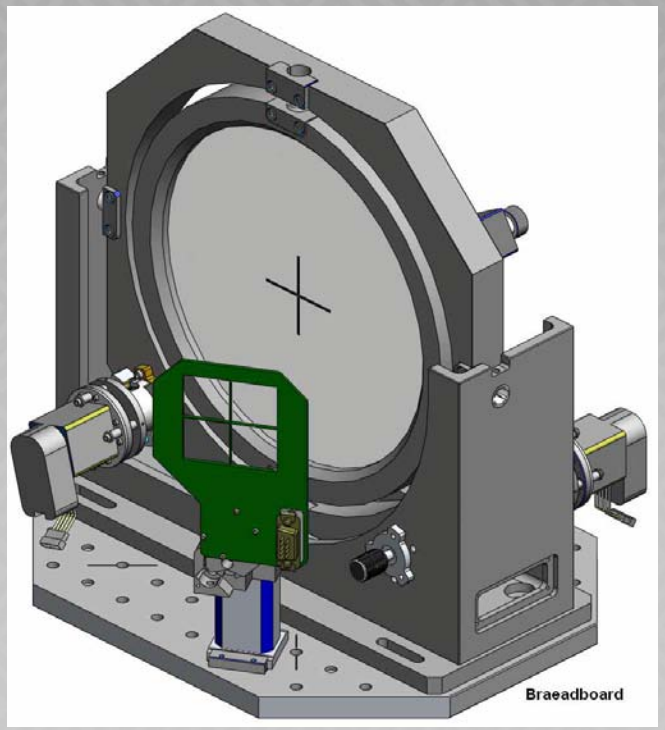
- Cat's Eye design rides on inside of vacuum pipe
- Inductive pickup and wireless control
- Orthogonal stellar and metrology beams
- Designed and built by Univ. of Cambridge

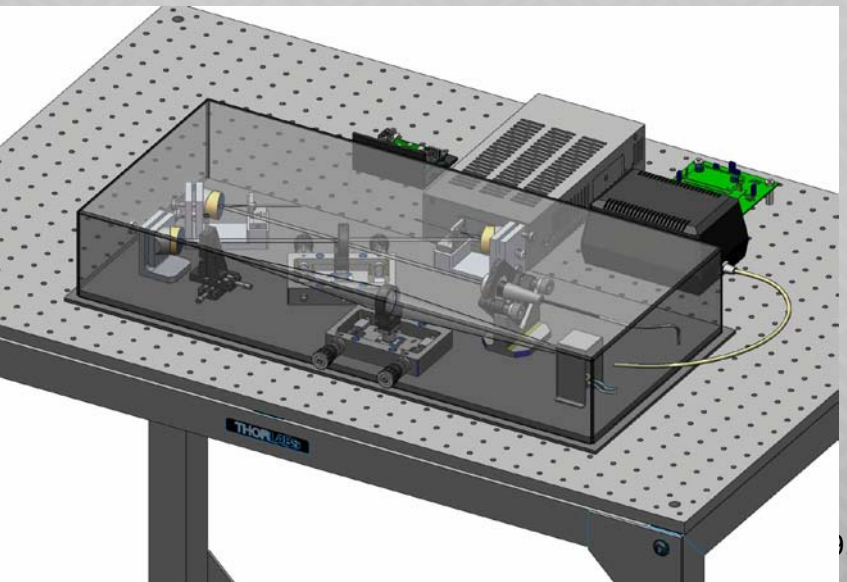


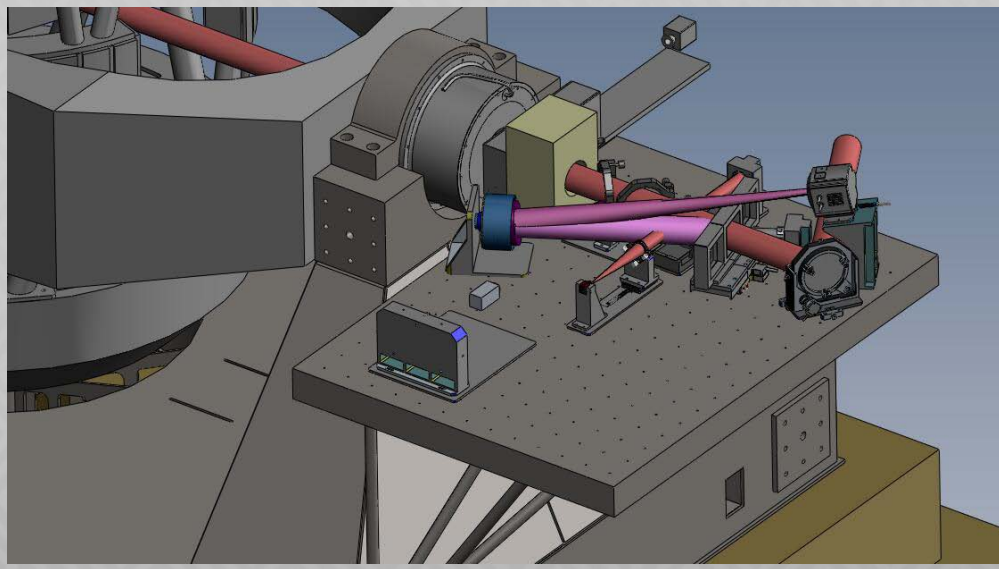


Alignment System

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







Fringe Tracking Beam Combiner

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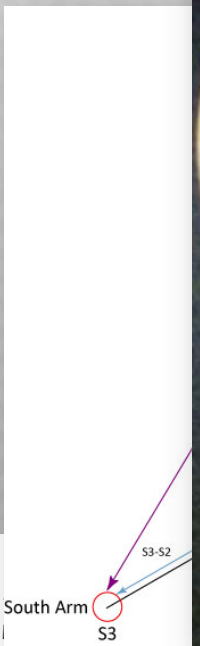
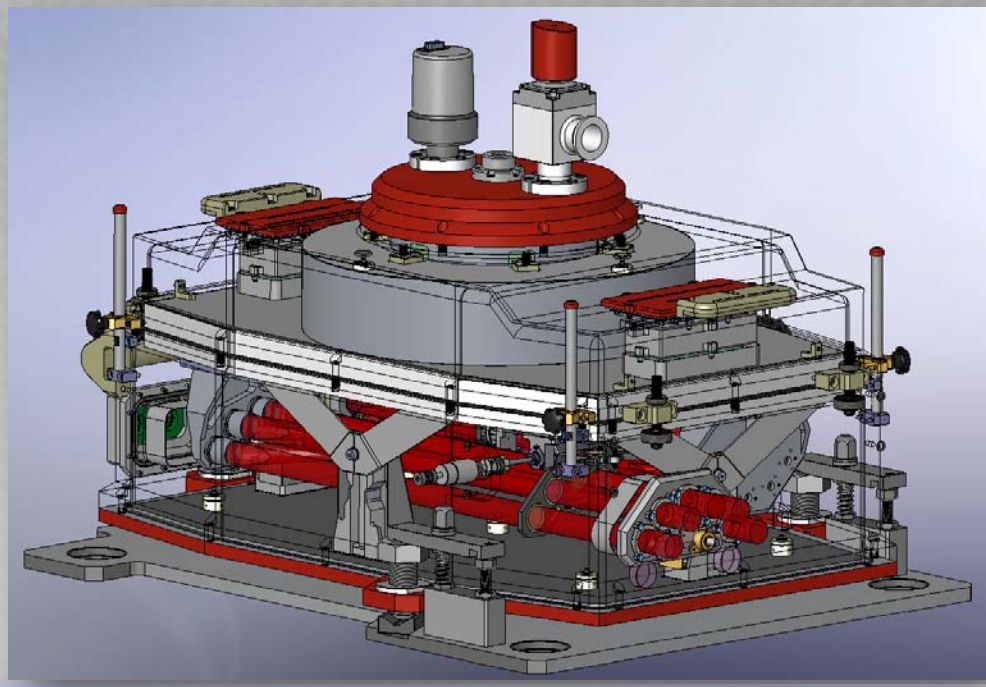
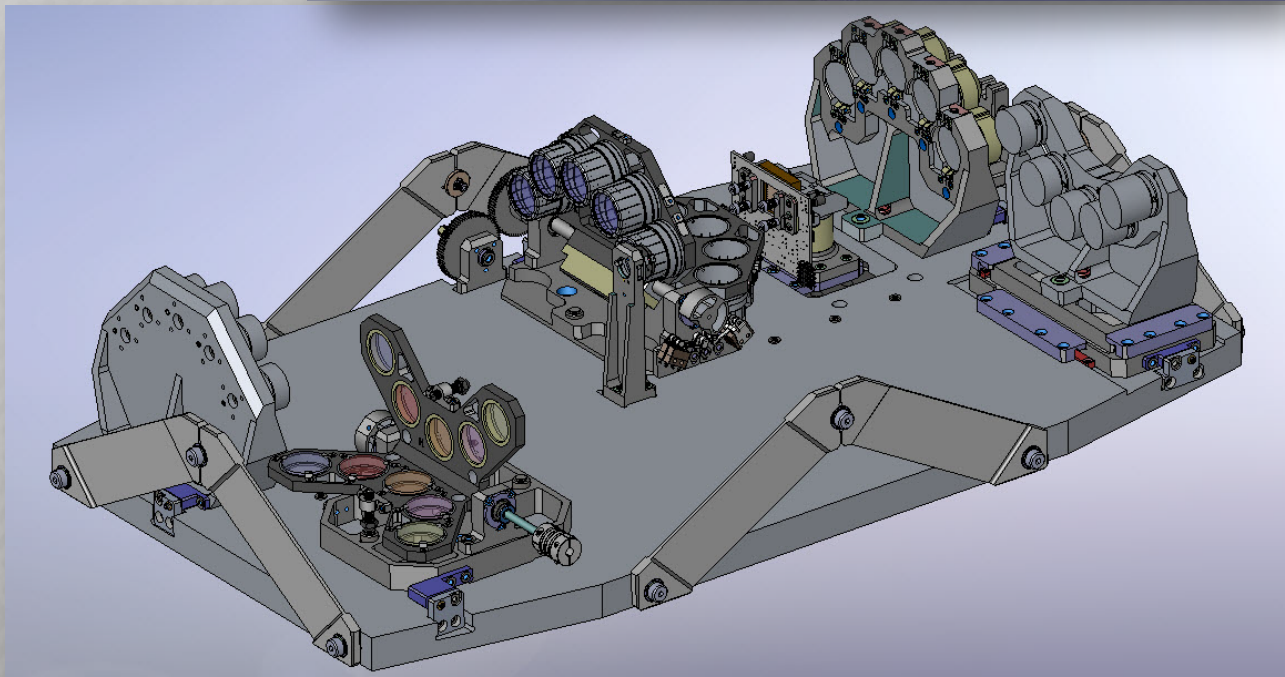


Fringe Tracking Camera

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

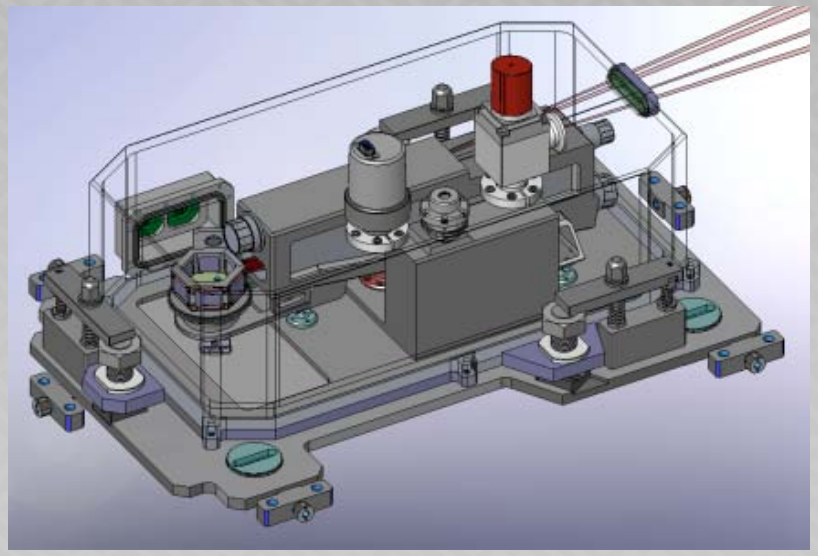


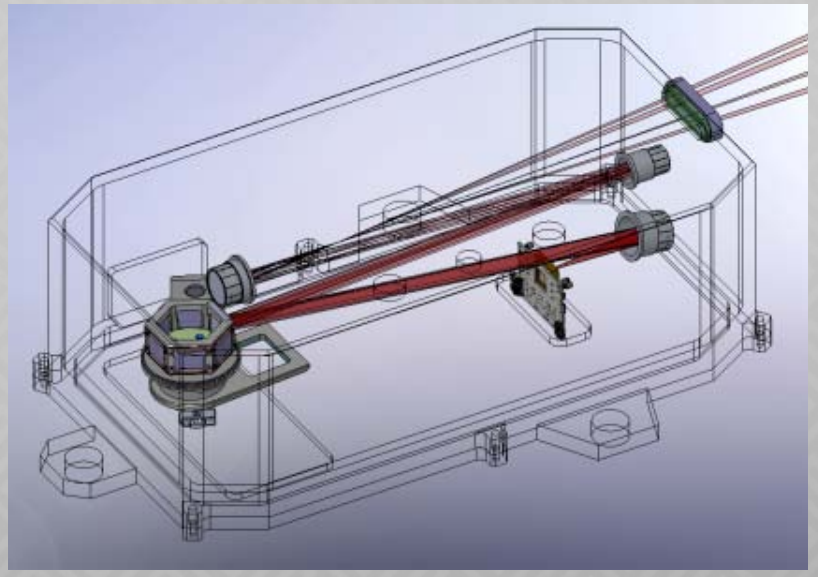


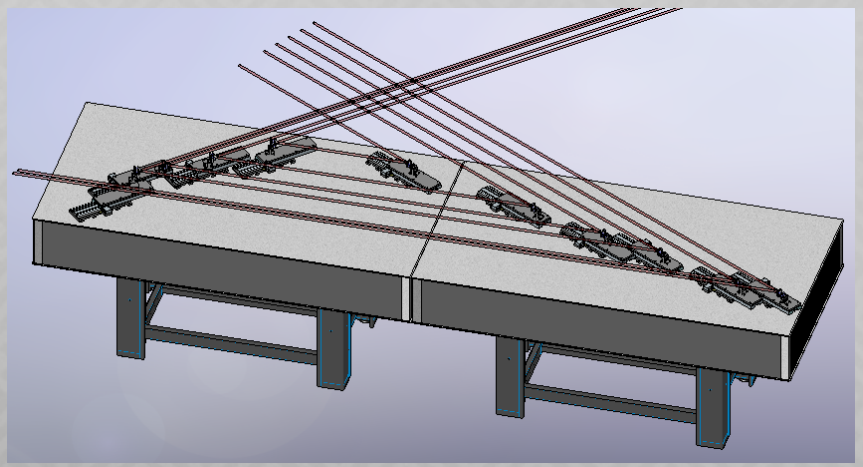
Magdalena Ridge Observatory

Science Combiner: SIRCUS

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





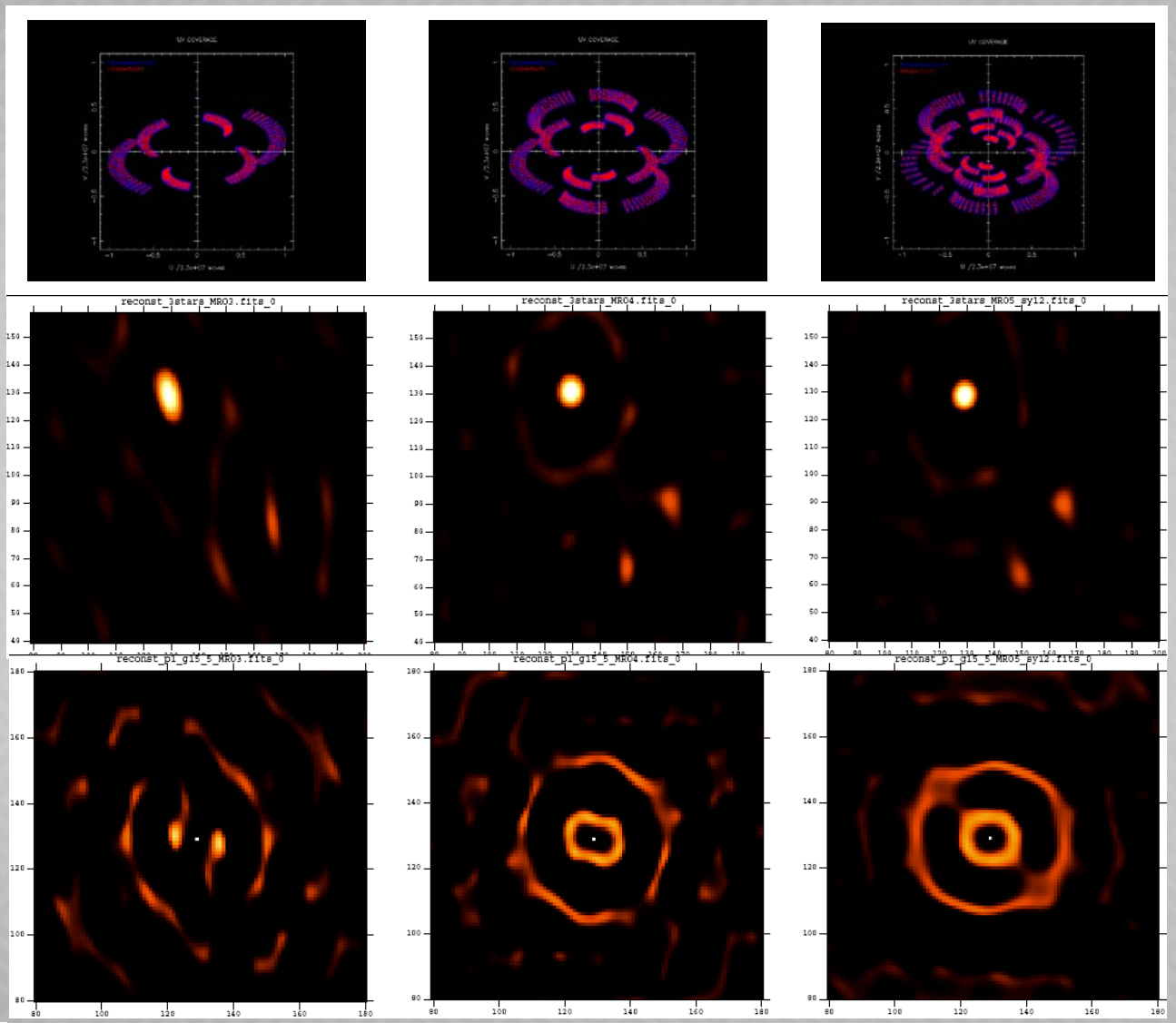


Science Possibilities

UV coverage

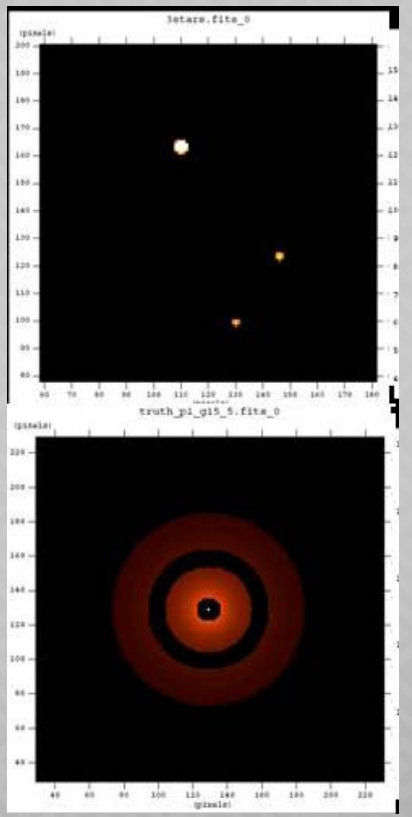
Multiple system

Herbig disk



Errors:
2% V2 and 0.8º
in 6 hours

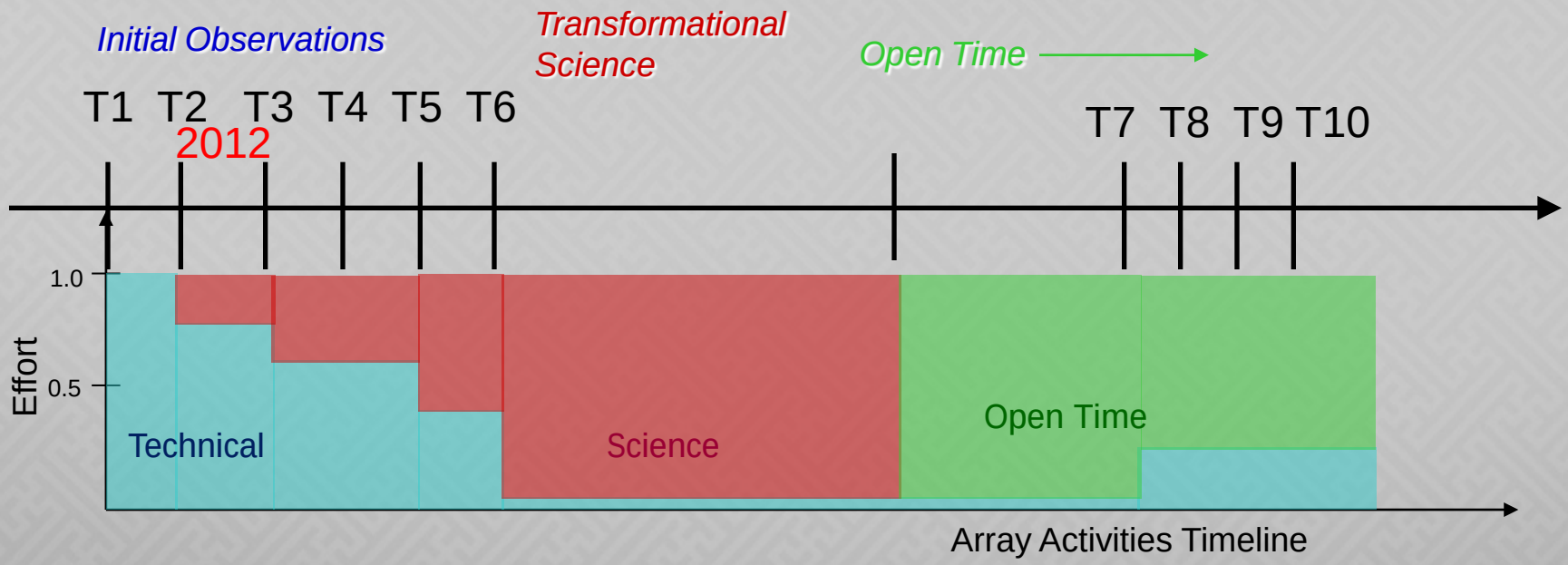
Truth images



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!

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