

Update to the MROI System Design Document

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Some history

- ❑ Cambridge officially joined MRO in June 2002
- ❑ System Design Document (SDD) prepared over summer 2002 by Cambridge team
- ❑ Presented at Initial Design Review (IDR) in October 2002
- ❑ Reference version: INT-MIS-402-0000 revision 1.31, "A system design for the MRO interferometer"

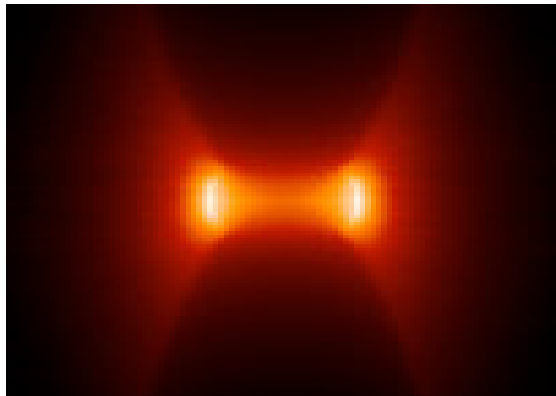
What has changed since 2002?

- Phasing:
 - Phase 1: Six telescopes, only IR science
 - Phase 2: Ten telescopes, IR + optical science
- Subsystem implementation details

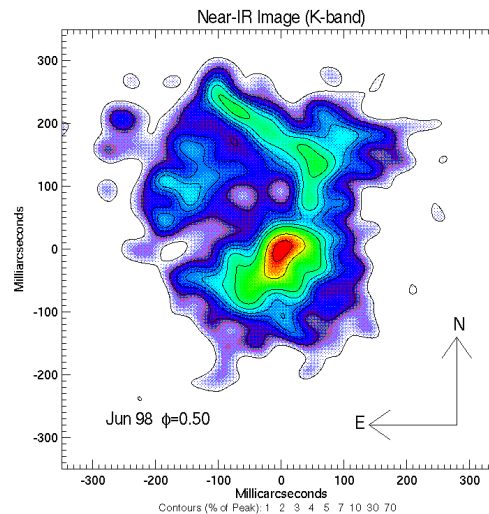
- The rest of this document concentrates on the changes to the SDD
- The following slides refer to section numbers in SDD

Section 2: Aims & objectives

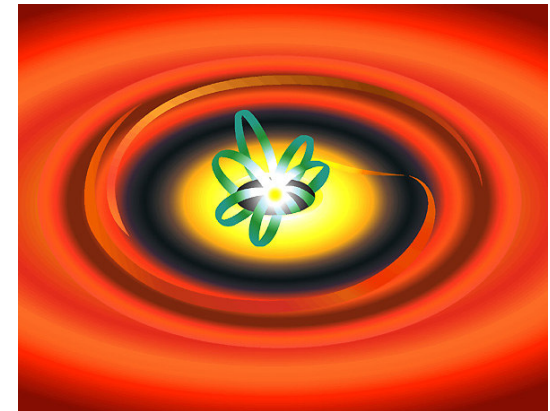
- Strategic aims basically unchanged
 - Emphasis on adaptive optics reduced in 2003
- Top-level science objectives still the same



Active Galactic Nuclei



Accretion & mass loss



Star & planet formation

Section 3: Overall concept

- Imaging of faint and complex targets
- Optical/IR interferometry
- Reconfigurable
- Moderate-sized telescopes

4: Functional requirements

- Derived from science requirements
 - Sensitivity: $H=14$
 - Science waveband: 0.6-2.4 microns (Phase 1: 1.0-2.4 microns)
 - Spectroscopic resolution \sim few 100
 - 340m maximum baseline
 - 6-10 telescopes
- Operational requirements
 - Automation
 - Service observing

5: Site

□ Seeing

- Frequent periods of < 1 arcsec seeing
- t0 analysis incomplete

□ Weather

- Large archive of data
- Clear night statistics?

□ Seismic

- 2003 survey by MS student (Rafael Alvarado)
- Very quiet: only a few events/month > 25 nm

6: Error budget

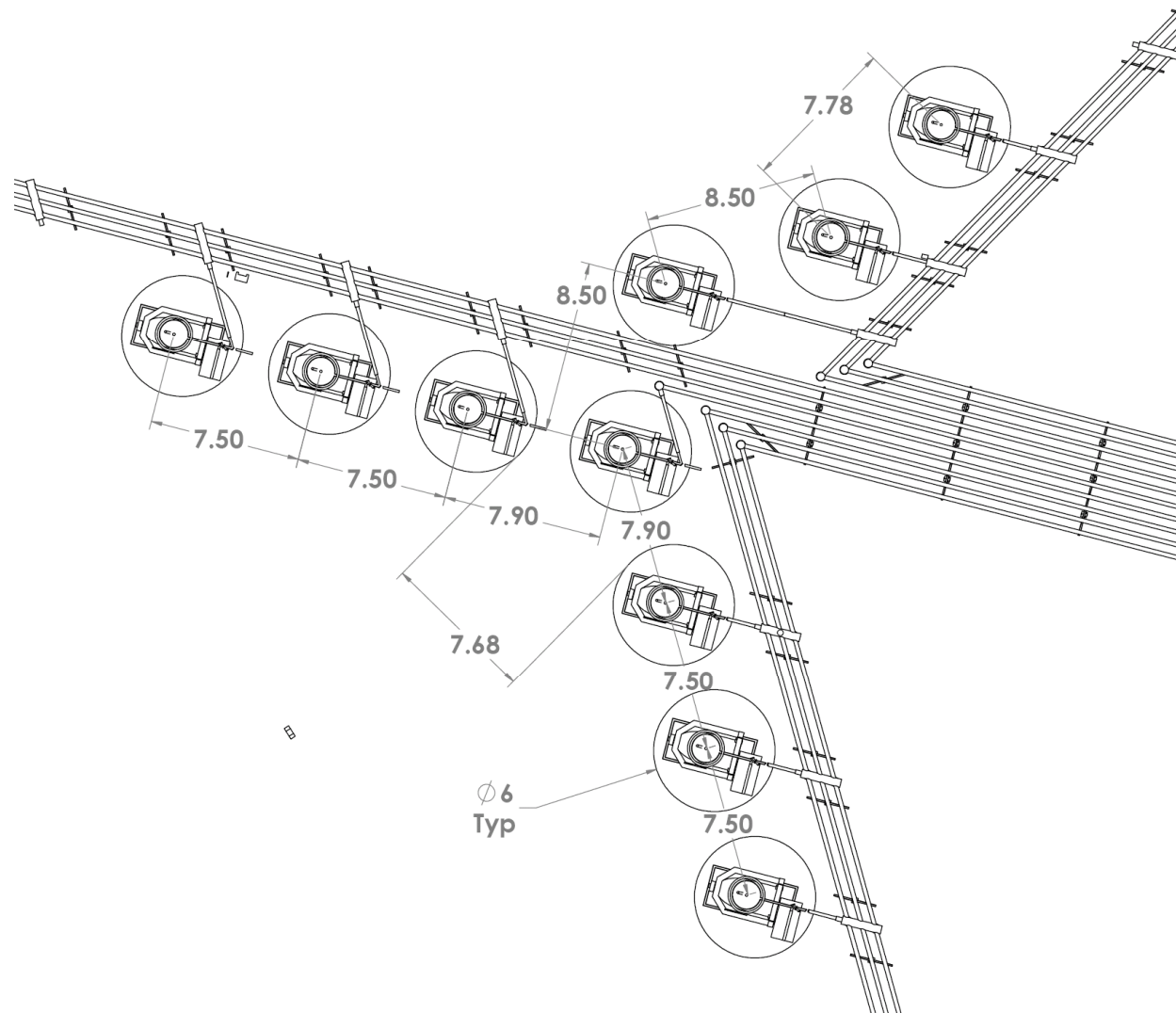
- ❑ Superseded by INT-402-TSP-0004 and -0005
- ❑ H=14 still feasible, engineering margin reduced

7: *Array layout*

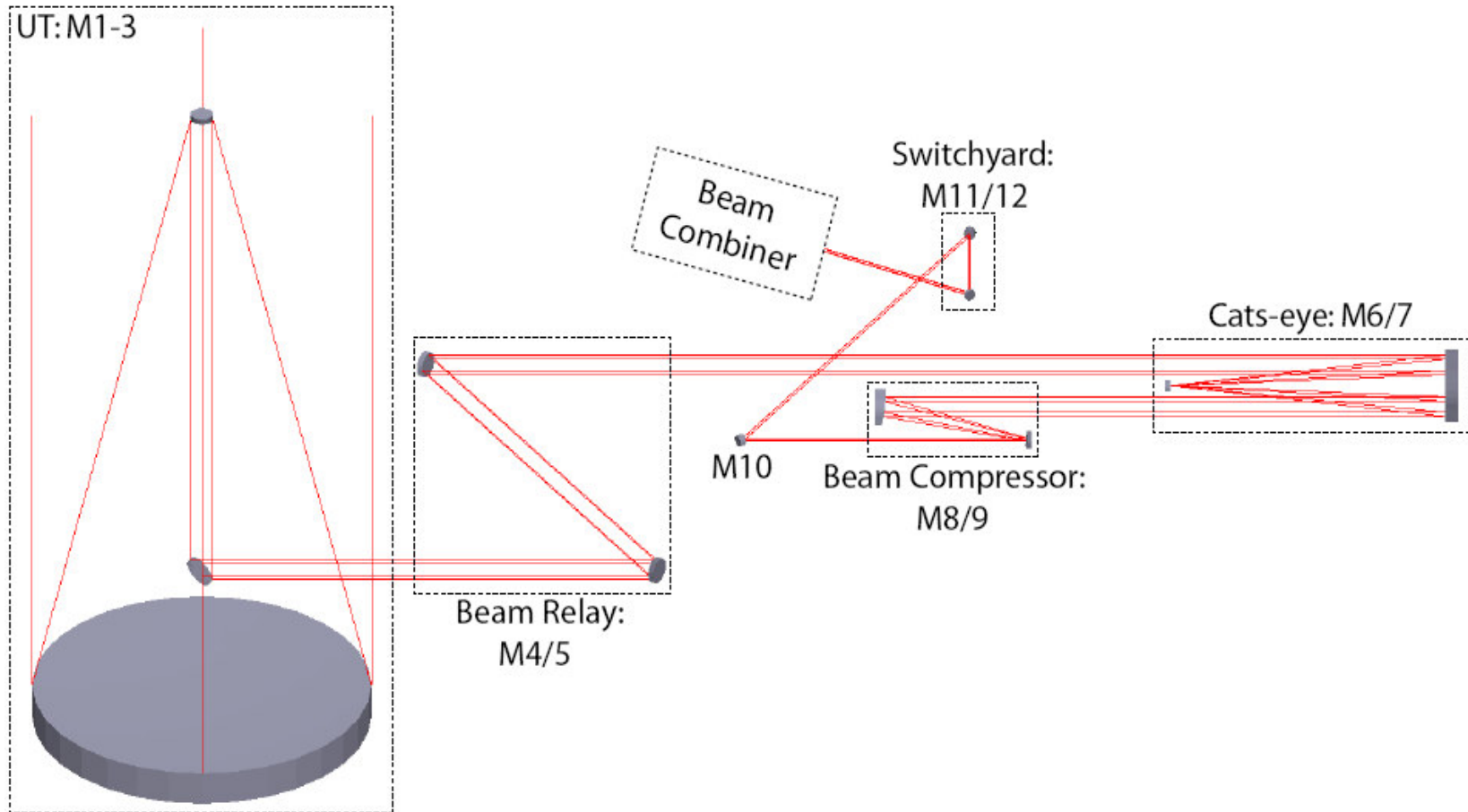
- Basic requirements unchanged
- Minimum baseline 7.5m
- Maximum baseline 340m
- 4 scaled configurations A, B, C, D
 - “Tweaked” spacings along arm reduced number of stations to 28 from 33
- TBD: 6-telescope configurations



Array center



System overview



8: Unit telescopes

- Telescope requirements superseded by INT-403-TSP-0002 and -0003
 - Downselect in 2004: 3-mirror preferred to 6-mirror design
 - No other significant changes
- Enclosure, Transporter & Foundation requirements to be finalized depending on UT design
- ADC specifications to be presented

9: Tip-tilt system

- Requirements superseded by INT-403-ENG-0001
 - No significant changes
- Proposed concept to be presented soon

10: Adaptive optics

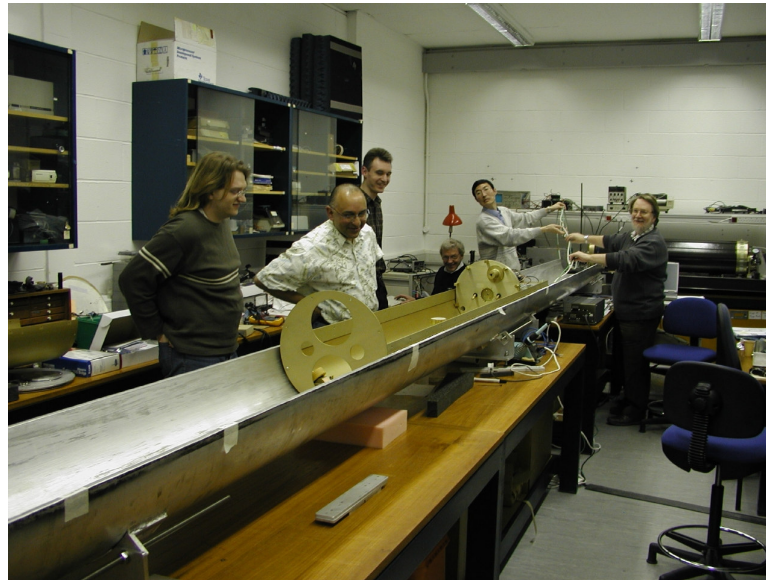
- Deferred to later stages

11: Beam transport

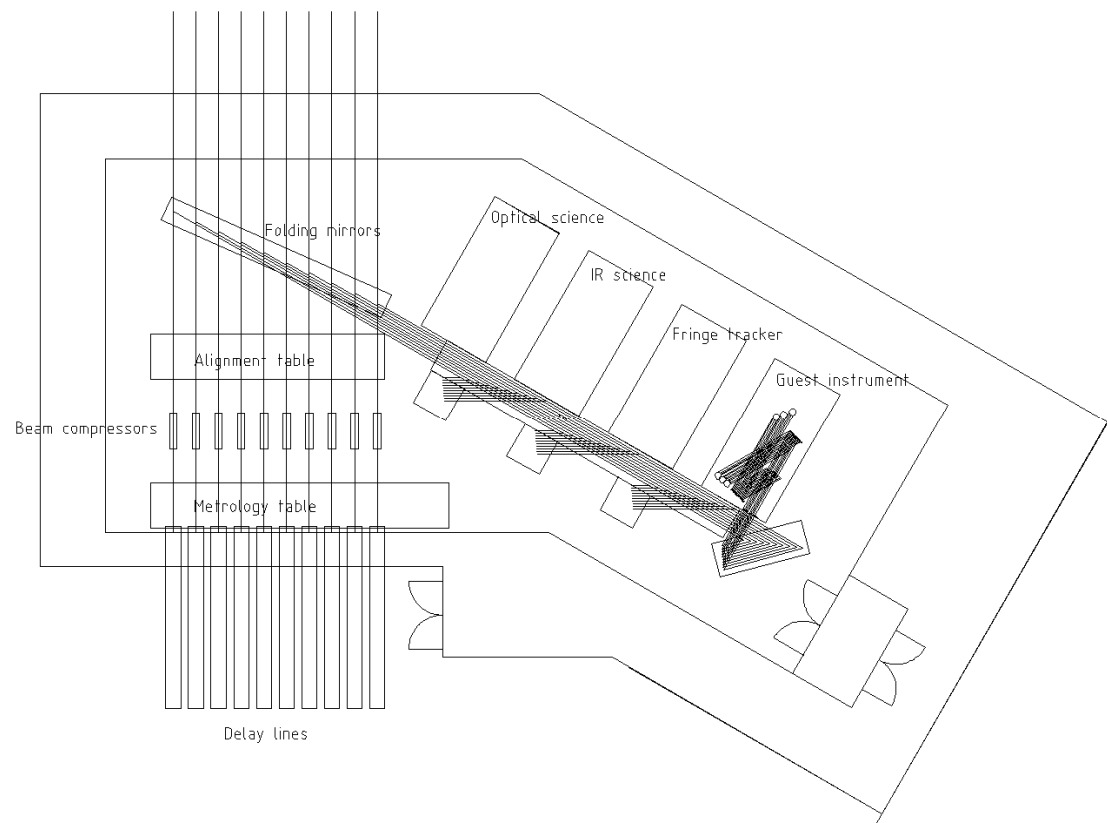
- Now called “beam relay”
- Superseded by INT-405-TSP-0005
 - No significant changes
- Beam compressors and turning mirrors now part of this subsystem

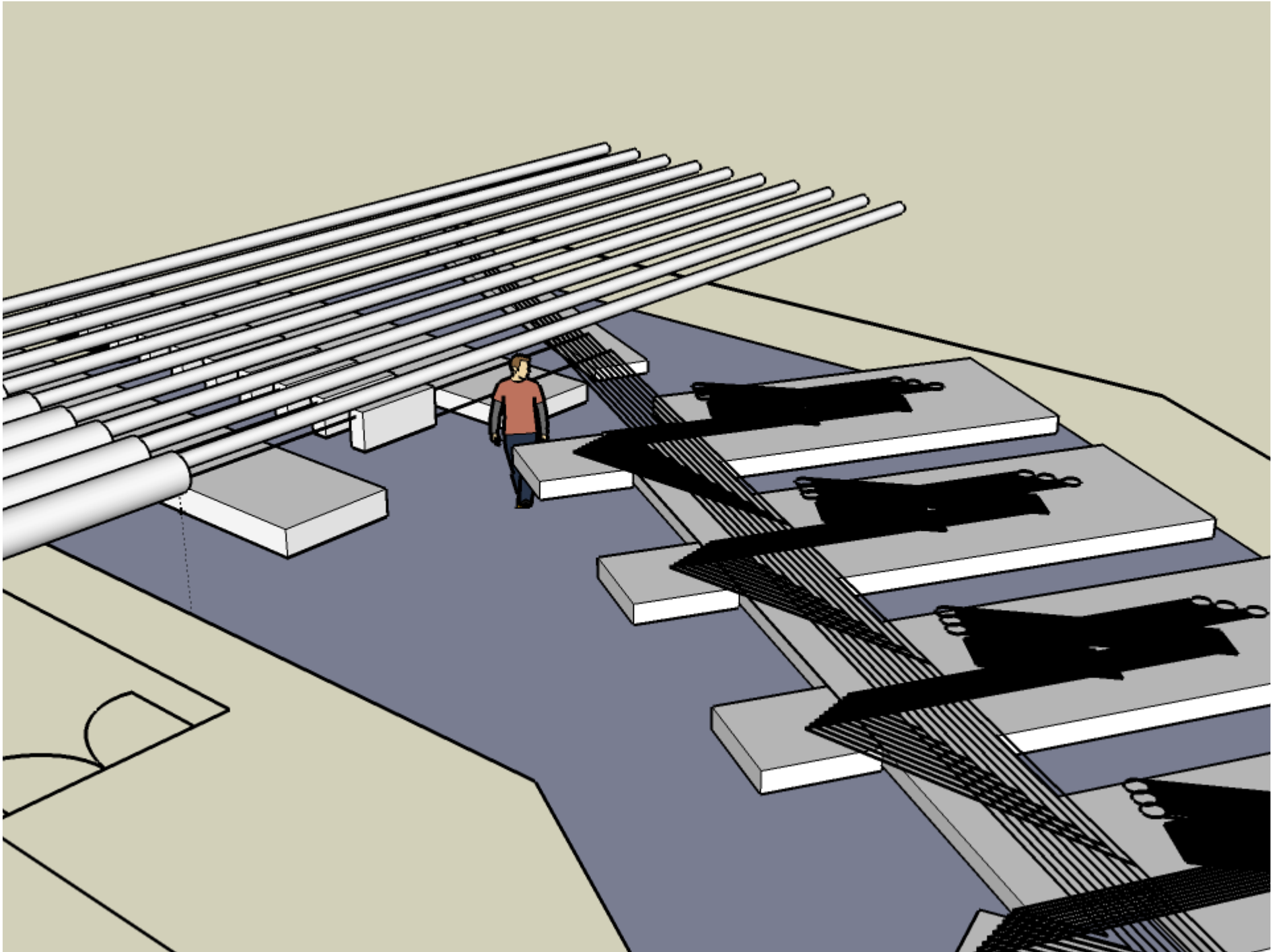
12: Delay lines

- ❑ Requirements refined but not significantly changed
- ❑ Delay line implementation is now well advanced



13: Beam combination





Beam combination

- Beam compressors moved to beam-relay
- Slow autoguider – still TBD
- Fringe tracker: superseded by INT-407-CON-0001, INT-407-ENG-0011
 - 3-way combination added
- Science instrument – superseded by INT-407-ENG-0006
 - Downselect to be presented soon
 - Restricted to 6-telescope implementation
 - Restricted to IR wavelengths

14: Detectors

- Moved to tip-tilt and beam combiner work packages
- Problem sourcing IR detectors to required specifications
 - Need to decide on interim solution

15: Alignment

- No formal requirements doc exists
- INT-410-PUB-0002 gives some elements of a possible concept
- WFS requirements to be presented soon
- A very important subsystem
 - Other interferometers are still trying to implement theirs
 - Resist the temptation to leave till last!

16: Control system

- Top-level requirements unchanged
- Phased implementation – requirements for first releases soon?
- Architecture: use of RTC (EPICS assumed in SDD)
- Much of software now reported under other sub-systems

17: Offline tools

- Some preliminary work done on this

18: Information management

- No formal requirements document
- Mostly implemented?

19: Interferometer infrastructure

- Requirements superseded by INT-412-TSP-0002
- M3 design complete & under construction

20: General infrastructure

- Now part of MRO Site Infrastructure project

Where are the biggest gaps?

- Overall project schedule
 - Detail of which subsystems arrive when
 - Details of phasing, especially software
 - Integration & commissioning plans
- Alignment system
- Slow autoguider?
- Inner BCA design
- System risk register