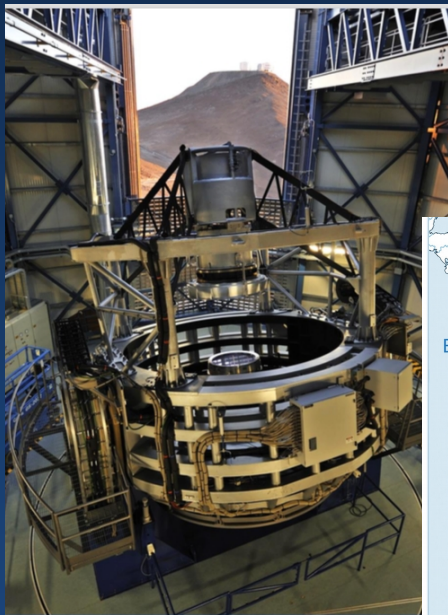


4MOST

4MOST – 4m Multi-Object Spectroscopic Telescope

4MOST – an update Wolfgang Gaessler (MPIA)



2017/11/10



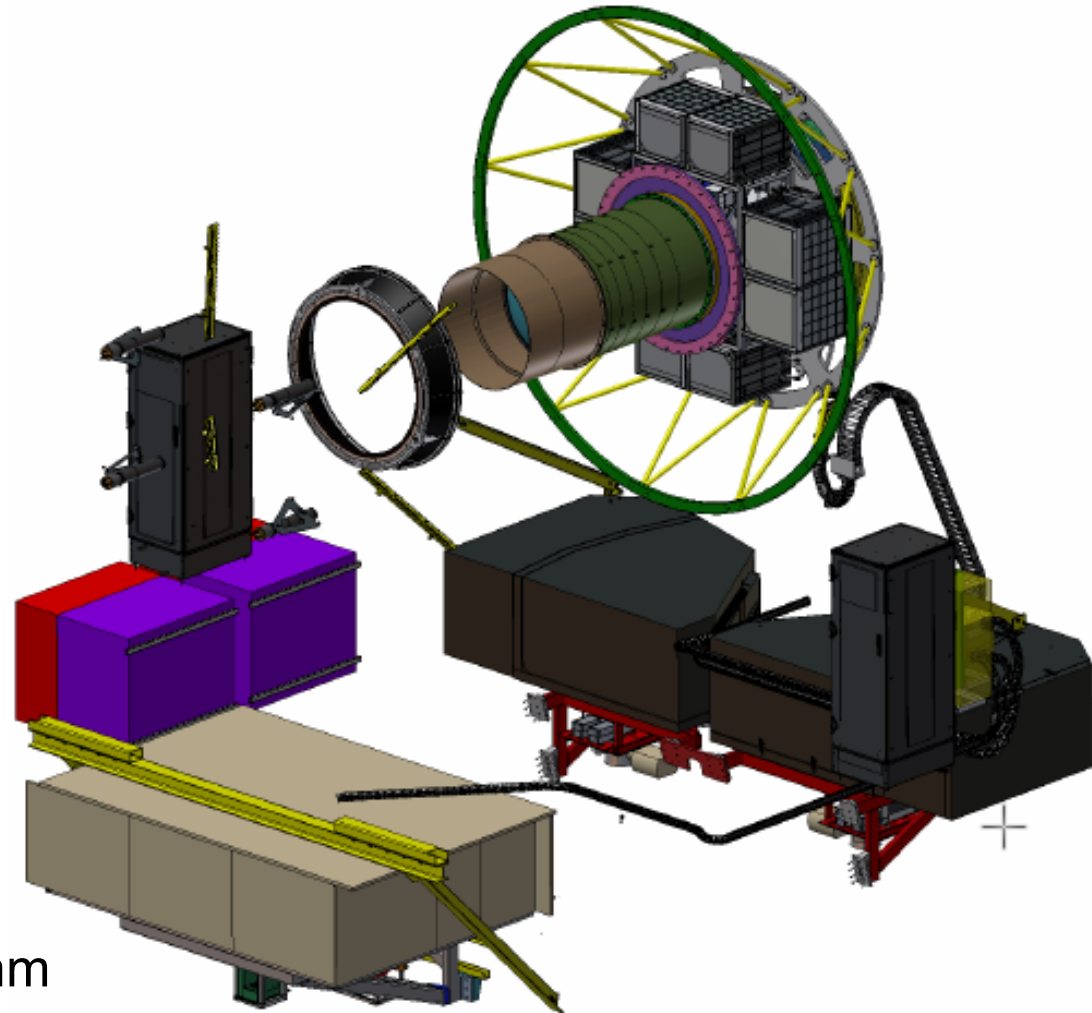
www.4MOST.eu



4MOST in a nutshell



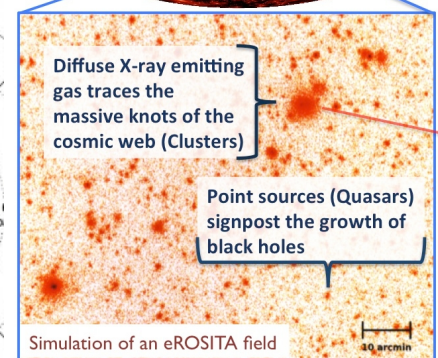
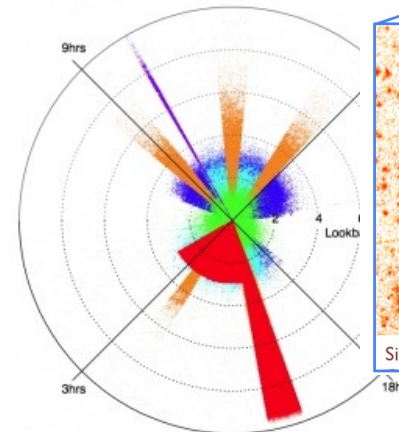
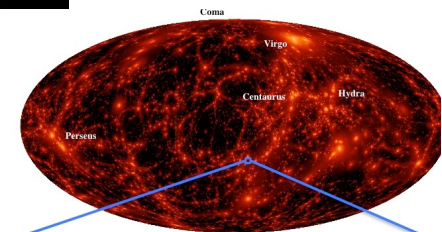
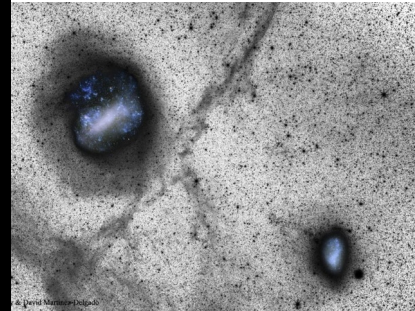
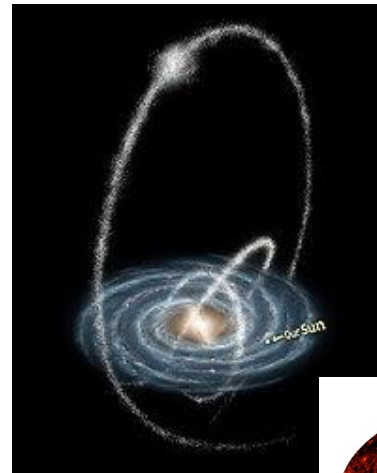
- 3.7 meter aperture
- 2.5° field diameter
- 4 square degrees
- 2400 fibers
- 1.45" aperture each
- 3 spectrographs
- 800 fibers each
- 2x Low Resolution
 - $\sim 5000 \lambda/\Delta\lambda$
 - 395-895 nm
- 1x High Resolution
 - $\sim 18000 \lambda/\Delta\lambda$
 - 395-440, 500-555, 605-675 nm



4MOST Core Science – structure growth, chemical and dynamical evolution of the universe



- **5 Galactic Surveys**
 - **GAIA** complements
 - Chemistry and dynamics of the Milky Way and Magellanic Clouds - *25 million stars*
- **5 Extra Galactic Surveys**
 - **eROSITA** complements, evolution of Active Galaxies - *50000 galaxy clusters, 1 million AGN* showing X-ray signatures
 - Understanding galaxy evolution
 - *2 million galaxies*
 - **EUCLID** complements, constrain dark energy - *Millions LRG and eLG*
 - Time domain follow up of **LSST** - *SN Ia host, AGN variables and unusual transient events*



| 6dFRS | SDSS DR9 | 2dFGRS | GAMA | zCOSMOS | WAVES |

MPIAs role in 4MOST



Scientific

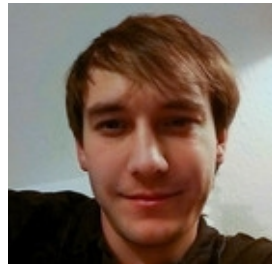
- High-resolution Galactic Disk and Bulge Survey (PI Maria Bergemann)
- Galactic analysis pipelines (Head Karin Lind)
- Object classification (Head Morgan Fouesneau)



Maria Bergemann



Gábor Worseck



Morgan Fouesneau



Jan Rybizki



Karin Lind



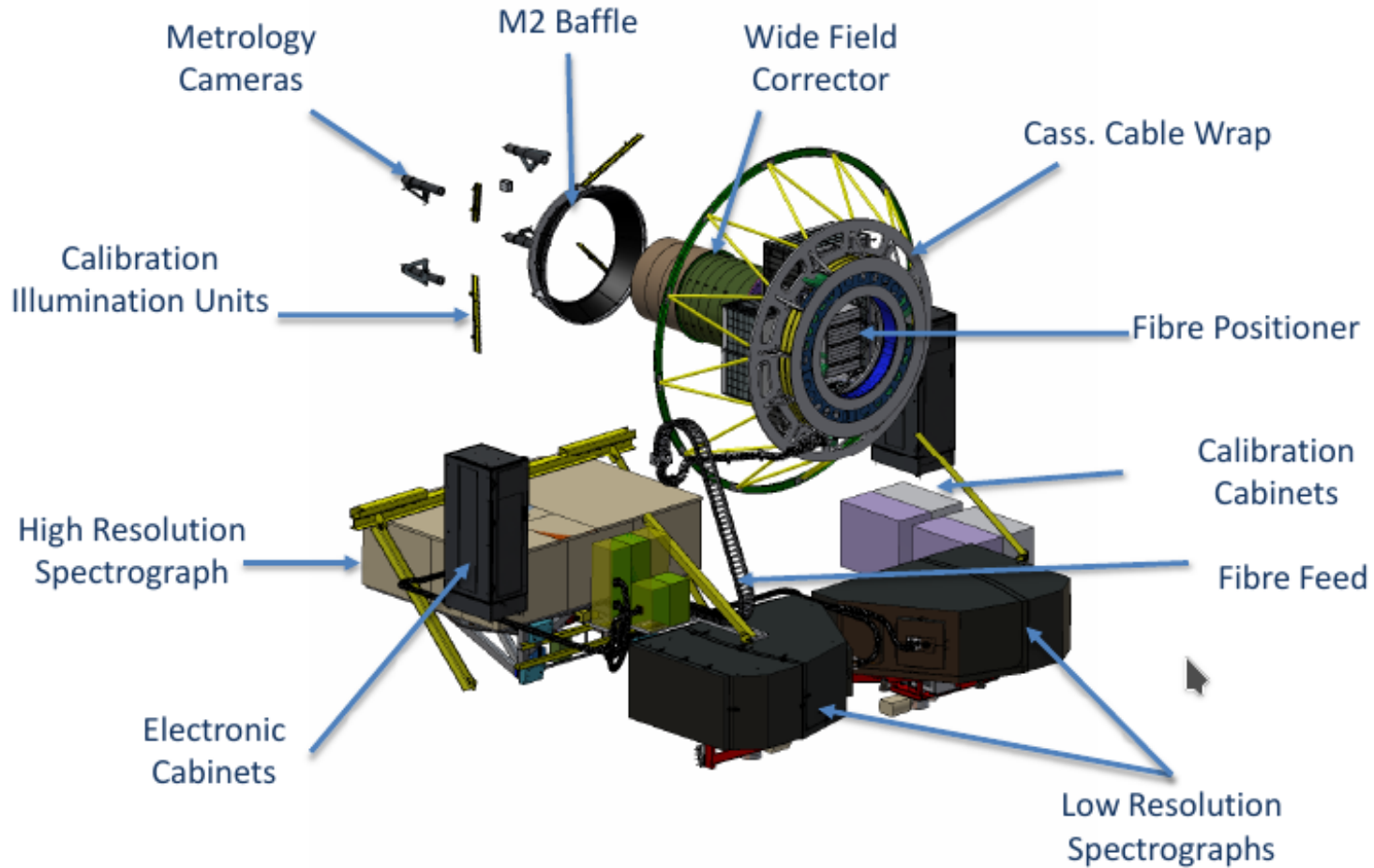
Hans-Walter Rix

Technical

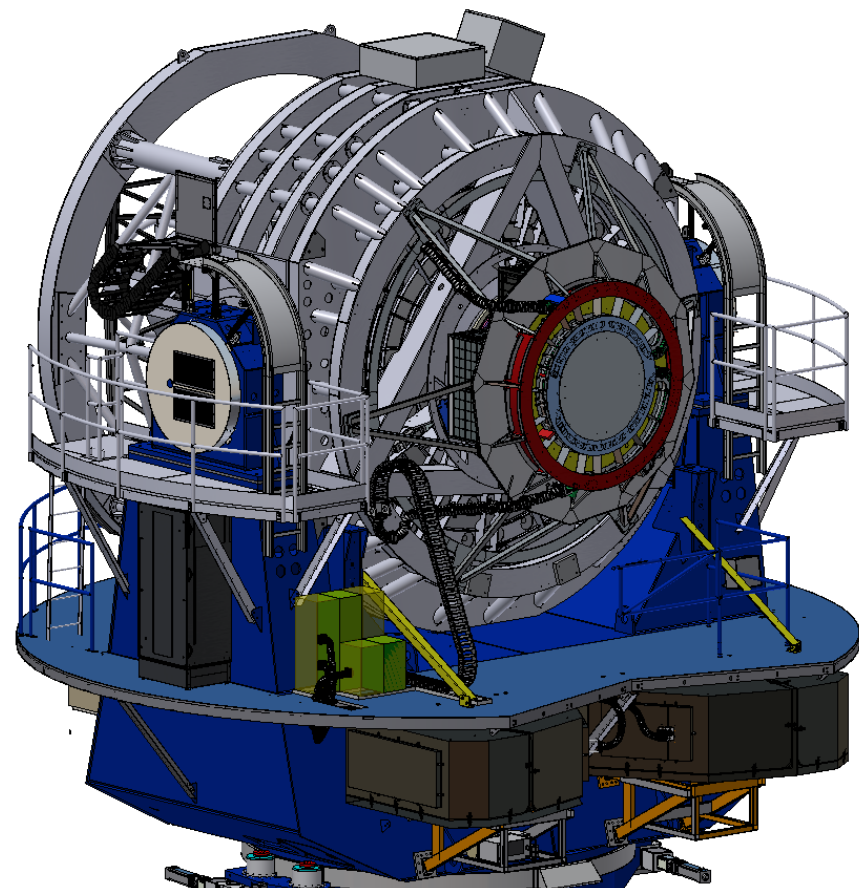
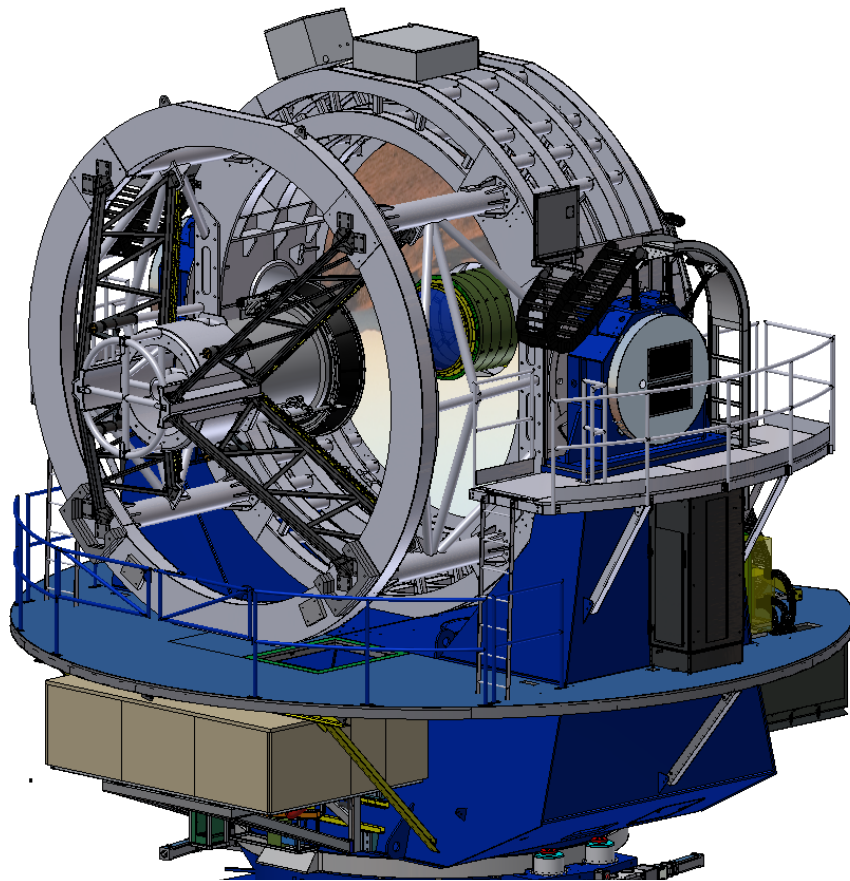
- Facility control hardware (Local Project Manager Wolfgang Gaessler)
- Carbon fiber housing for metrology camera optics

Michael Lehmitz and nearly the full electronic department, Ralf-Rainer Rohloff, Armin Huber and die Feinwerktechnik

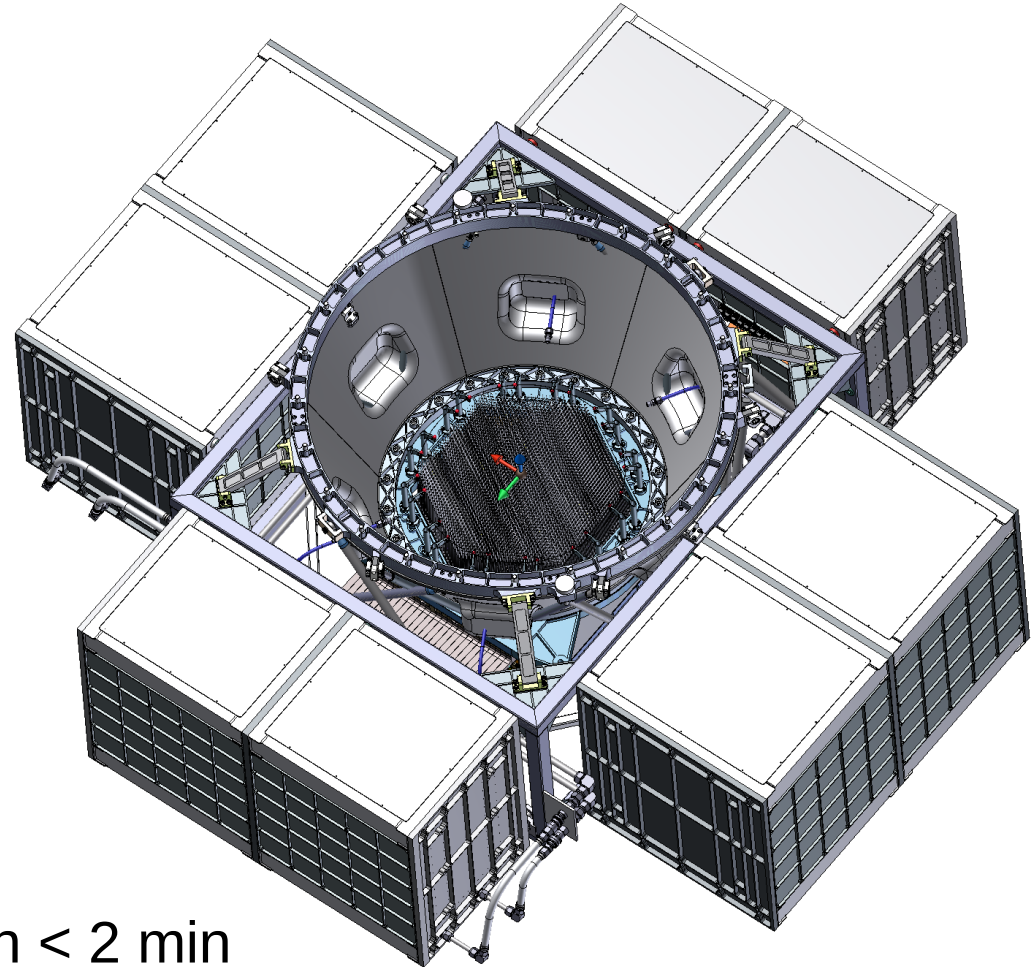
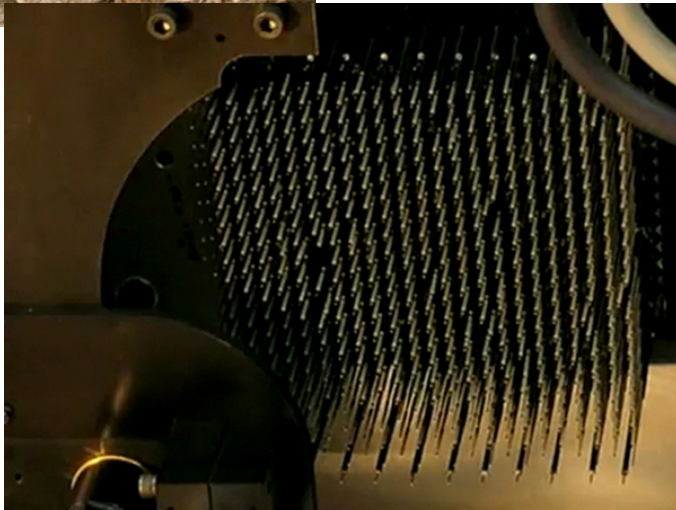
4MOST in detail



4MOST and telescope

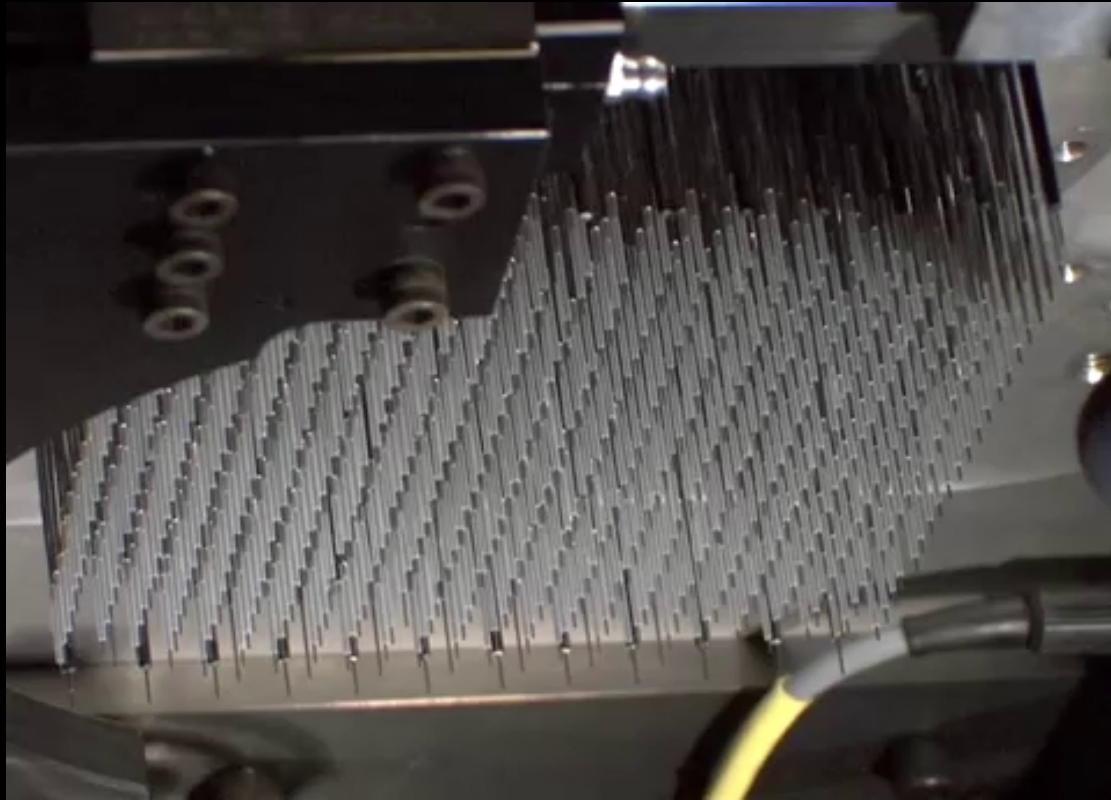


4MOST Positioner - Echidna



- Tilted spines
- Simultaneously reconfigure in < 2 min

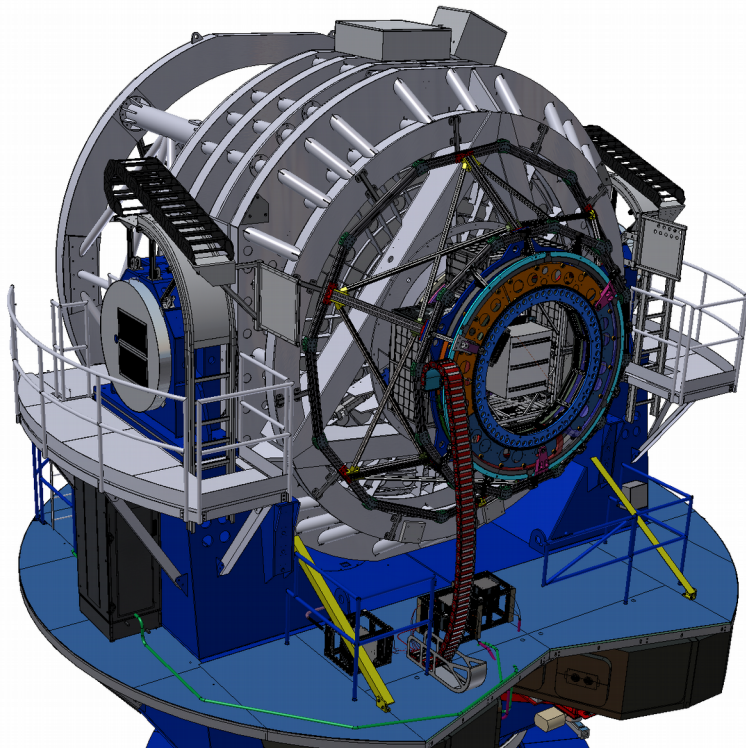
AESOP fiber positioner



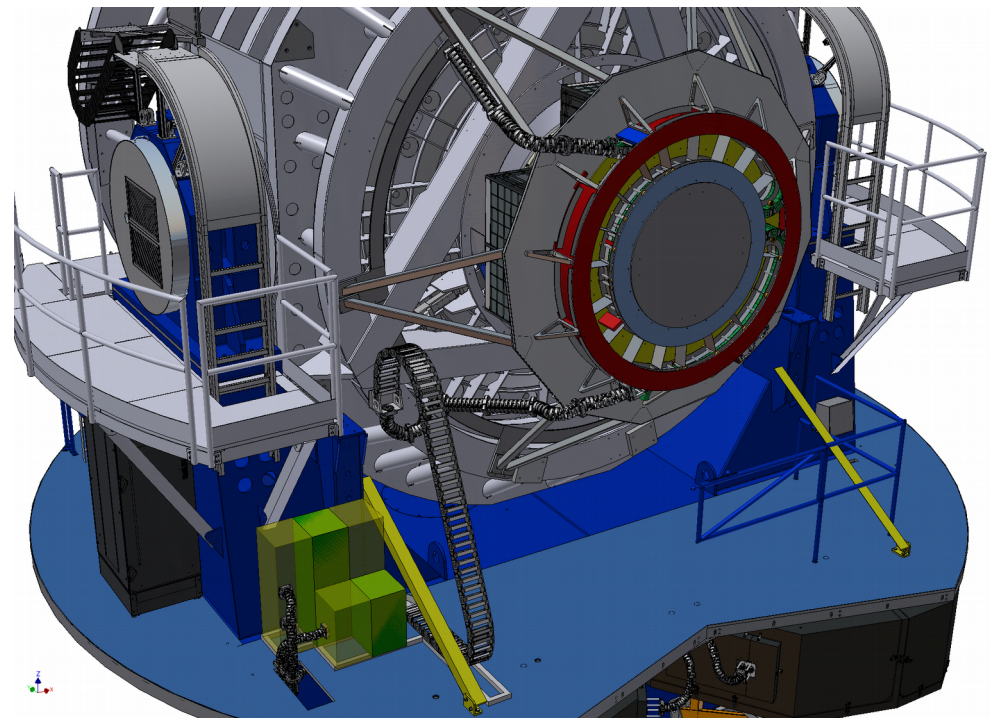
4MOST Long Fiber Feed



Old



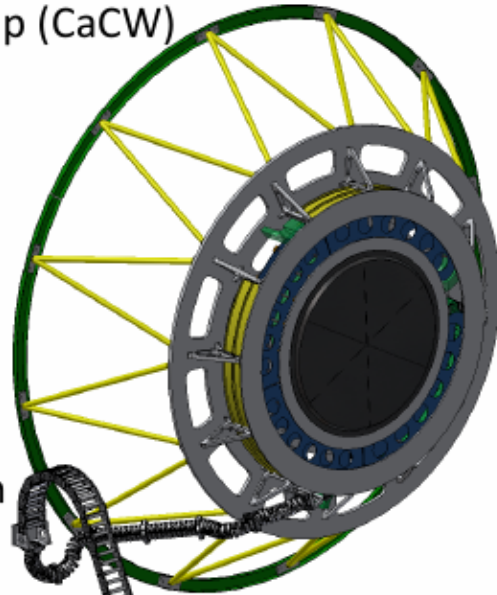
New



4MOST Long Fiber feed – Load tests



Cassegrain Cable Wrap (CaCW)



Fibre elevation chain

Strain relief boxes

LRS fibres

HRS fibres



4MOST Wide field corrector + atmospheric dispersion compensator



- 4 Lenses with 2 counter-rotating prisms
- 2.6° Field of view diameter
- Dispersion compensation to ZD=55°

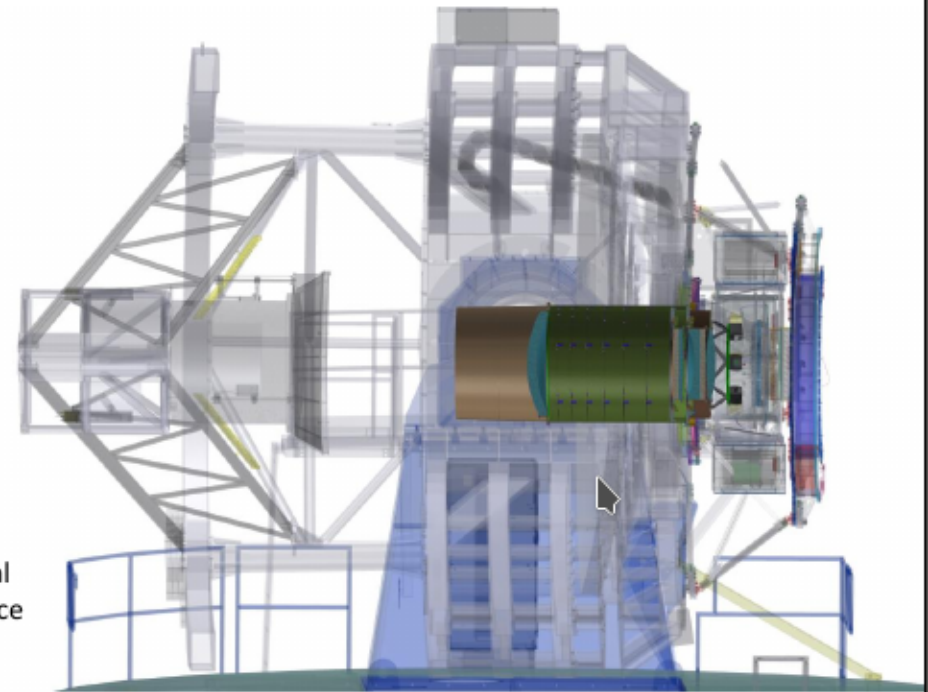
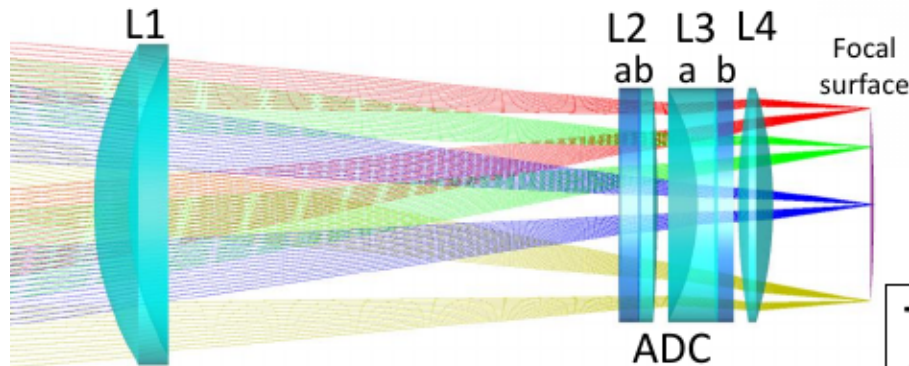
L1 – Fused Silica

L2 – L2A – LLF1; L2B – NBK7

L3 – L3A – NBK7; L3B – LLF1

L4 – NBK7

∅ = 900 mm

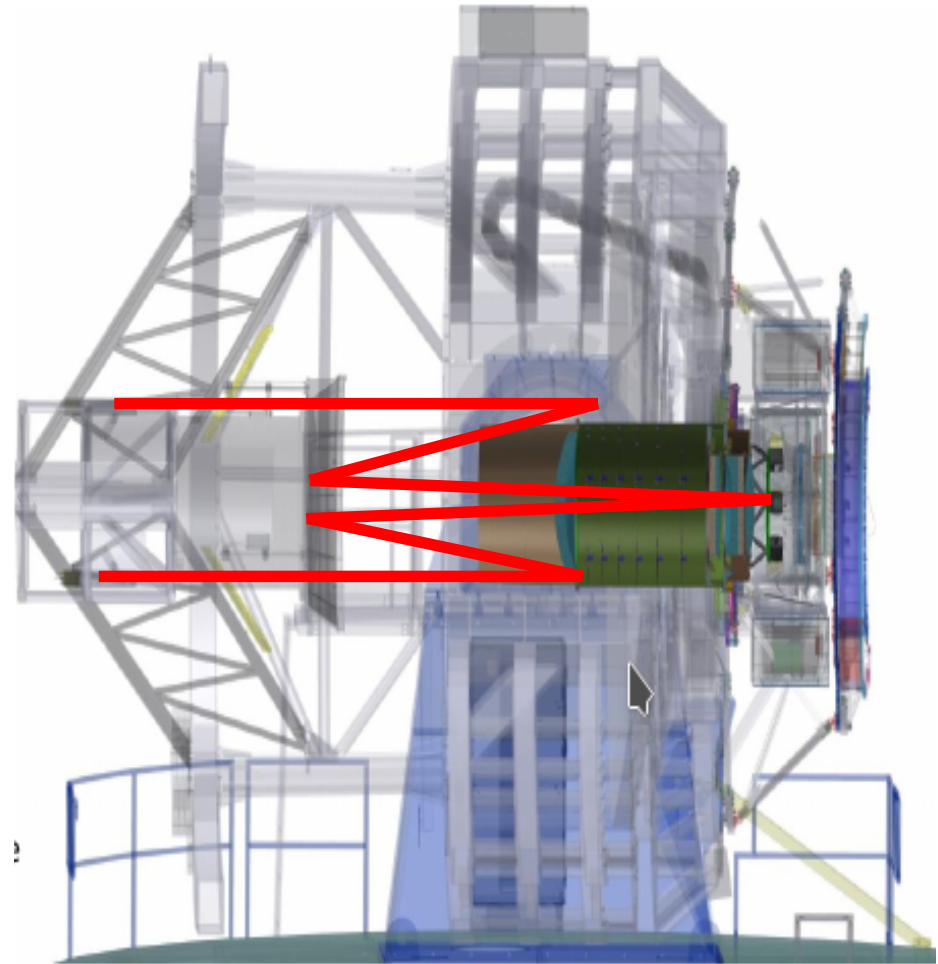
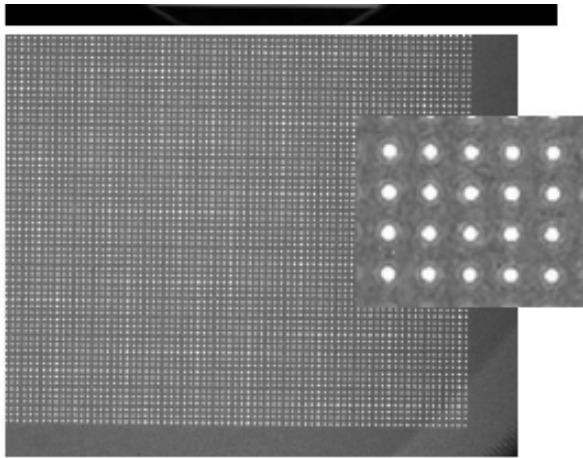


The design successfully passed LLI-FDR
Optics procurement – in progress

4MOST metrology system



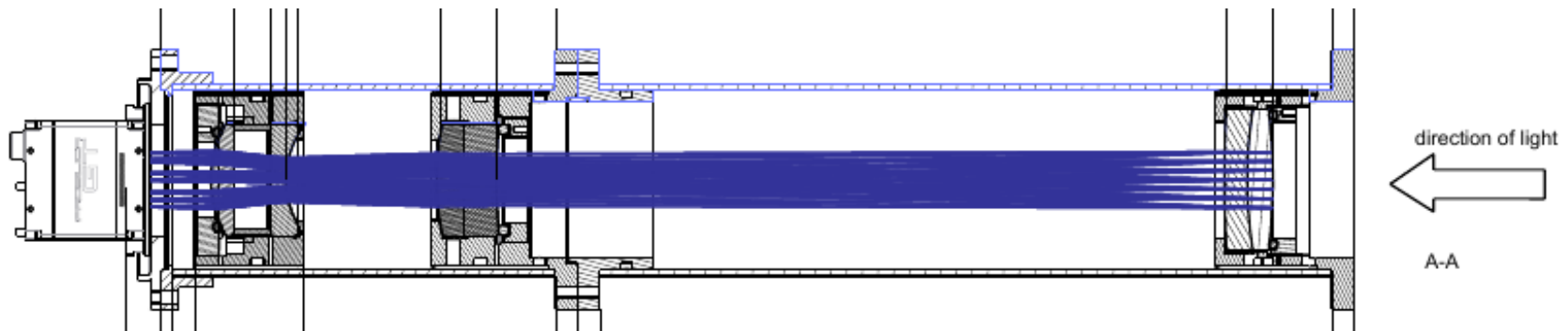
- System to look on the spines
- Spines are illuminated from the back (out of the spectrographs)
- Need to measure fiber positions to $\sim 5 \mu\text{m}$ precision out of $\sim 540 \text{ mm}$ (< 1 part in 100000).



4MOST metrology system



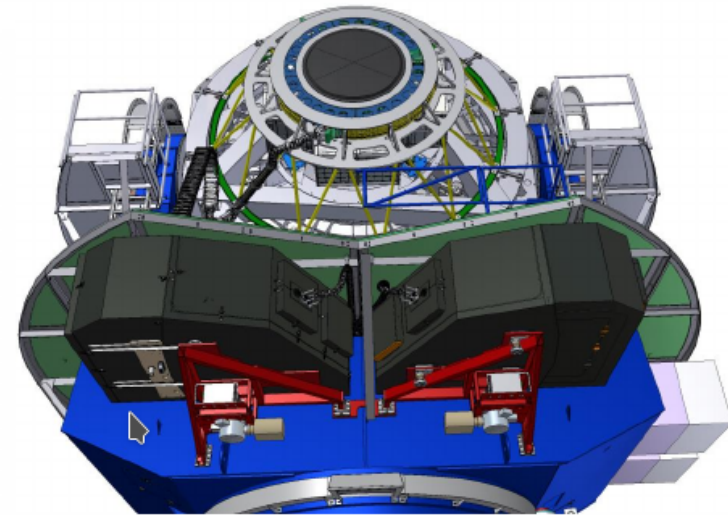
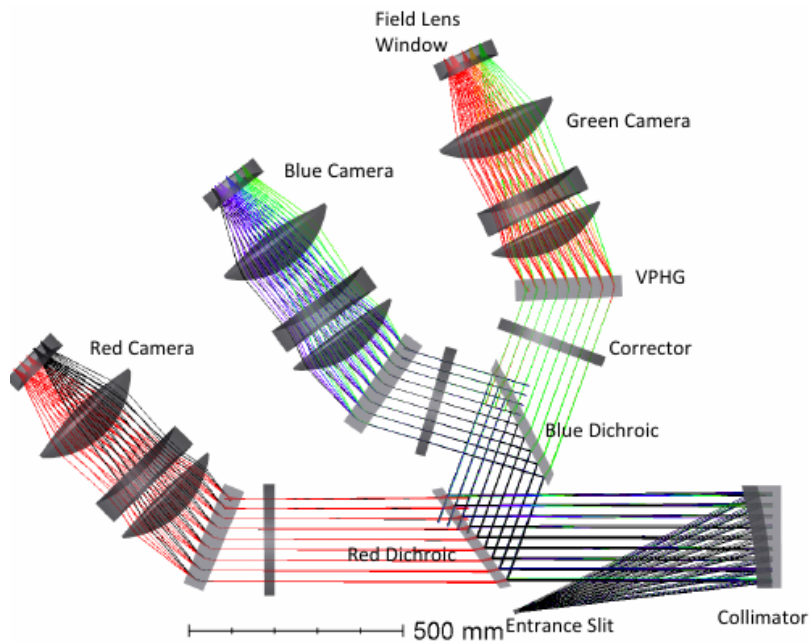
- Commercial camera
- Optical distortion should not change with temperature
- Carbon fiber tube proposal from MPIA



4MOST LRS spectrographs



- Must be temperature stabilized



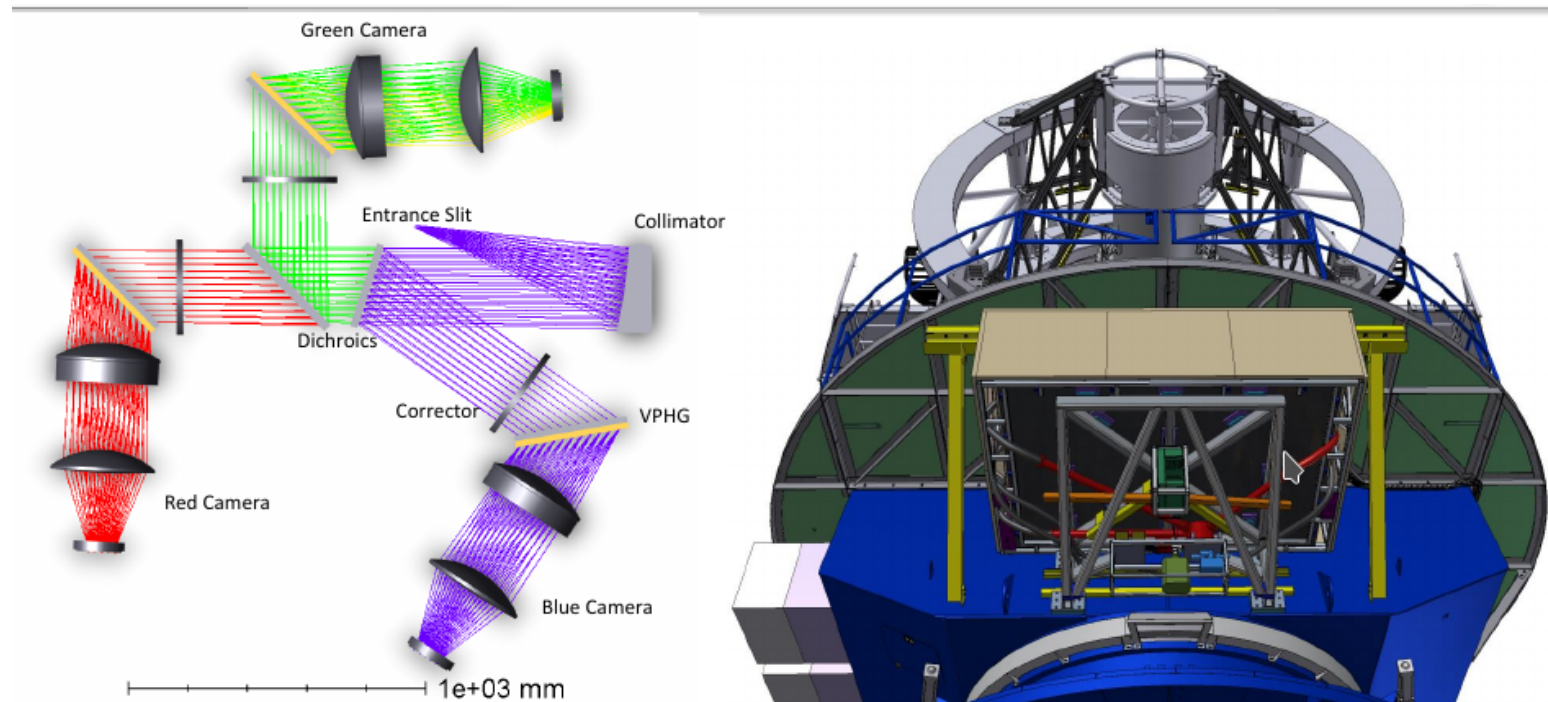
The manufacturing of two low resolution spectrographs has been approved by the Executive board!!!

The optical design successfully passed LLI-FDR
Optics procurement – in progress

4MOST HRS spectrographs



- Athermal design

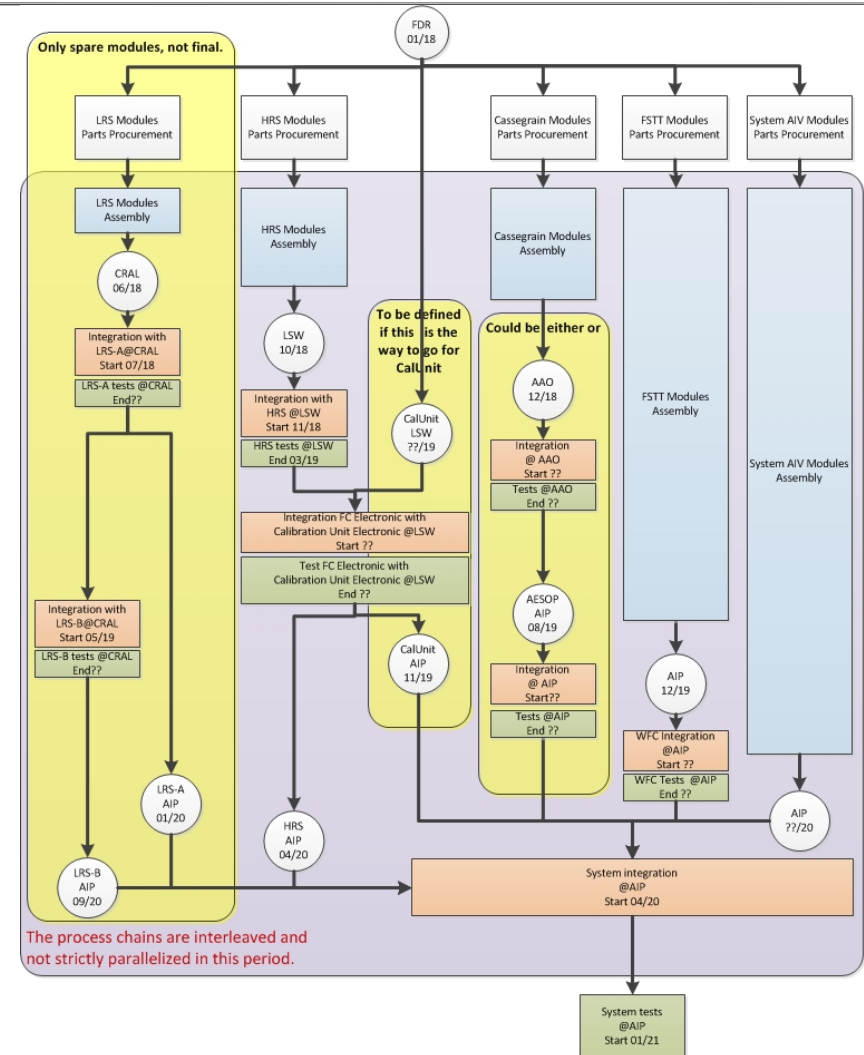


The optical design successfully passed LLI-FDR
Optics procurement – in progress

4MOST schedule and resources



- One electronic for all three spectrographs
- Electronic delivery to three different places partially in parallel
 - Lyon, Heidelberg, Potsdam
- Duplication of electronics because of parallel integration needed
- Pre-FDR manufacturing
- Nevertheless very tight schedule
- Therefore 2018 and 2019 main customer of electronic department



4MOST – money



- All 4MOST ~ 14 million Euro
- MPIA contributes
 - 350 kEuro Electronics
 - 400 kEuro HRS camera optics
 - 250 kEuro Guiding and Acquisition cameras
- All funded through a Grossprojekteantrag.

4MOST in a nutshell



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