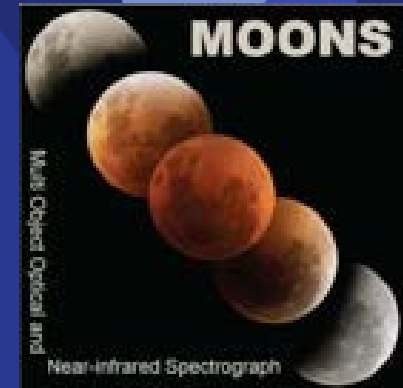


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MOONS Metrology System

Holger Drass

Metrology team



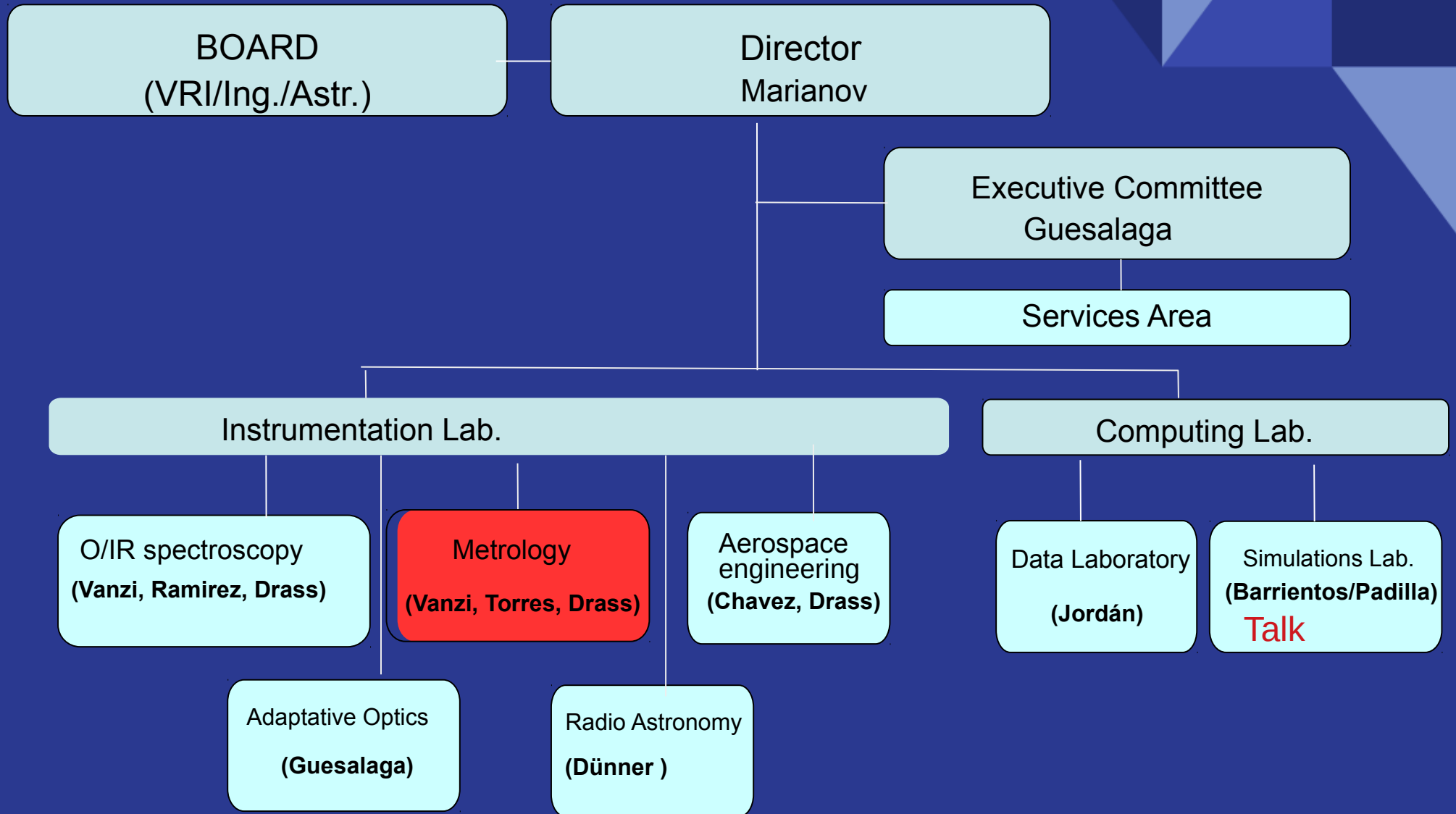
Agenda

- Presentation AIUC
- MOONS metrology
- Application of MOONS

Astro-Engineering at the Pontificia Universidad Católica



Organization



Purpose

Technological development
and transfer to astronomy



High-impact
science



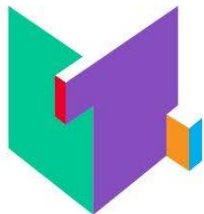
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Form advanced
human capital



Fascinating
of the public



CENTRO DE INNOVACION UC
ANACLETO ANGELINI



Spectroscopy/Metrology at the Centre for Astro-Engineering UC

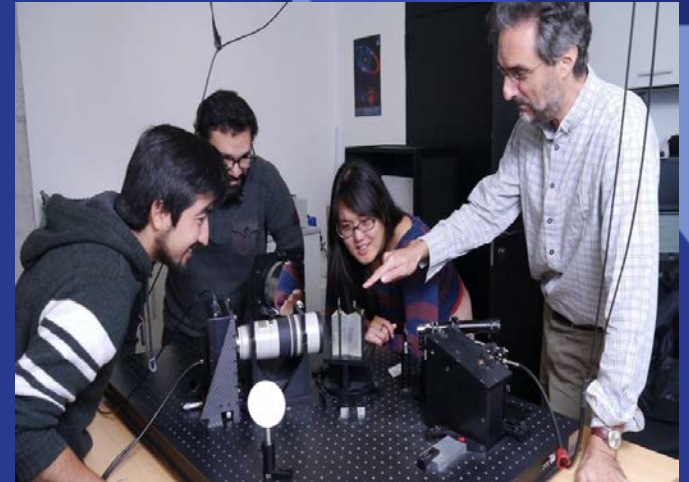
2009 AIUC was inaugurated, start to built the first spectrographs made in Chile; PUCHEROS, FIDEOS, and TARdYS.

**NIR detector Quimal 2017 (300K\$)
Drass, Vanzi et al.**

-> Talk Ramirez

2010/2016 AIUC integrates to the consortia for the MOONS and HIRES instruments that will be mounted at the VLT and E-ELT, respectively.

2016 AIUC inaugurates new dependency located in the Innovation building.



The MOONS metrology team:



Organization

Scientific background



Photogrammetrie



Low thermal expansion
Camera housing

Application in the instrument



MOONS Electronics
Rotating Front End
Cabinet



Metrology
camera enclosure



MOONS
Overall instrument
software



Software pipeline



Light control

MOONS in a nutshell

Multi-Object Optical and Near-infrared Spectrograph for the VLT

Field of view: 500 sq. arcmin at the 8.2m VLT

Multiplex: 1024 fibers, with the possibility to deploy them in pairs

Medium resolution:

Simultaneously $0.64\mu\text{m}$ - $1.8\mu\text{m}$

at

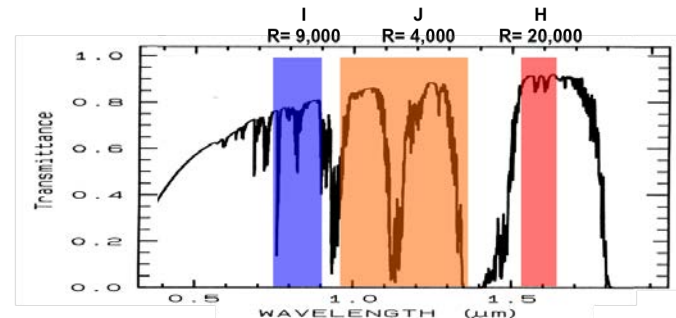
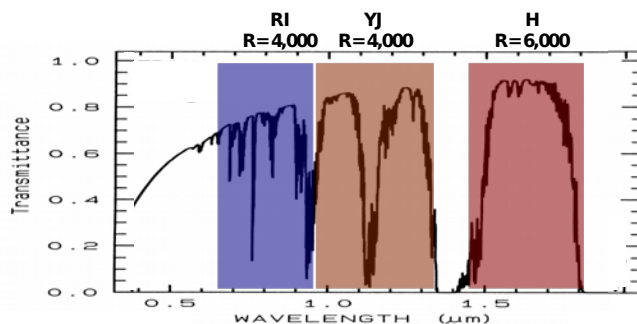
$R=4,000 - 6,000$



High resolution:

Simultaneously 3 bands:

- 0.76 - $0.90\mu\text{m}$ at $R = 9,000$
- 0.95 - $1.35\mu\text{m}$ at $R=4,000$
- 1.52 - $1.63\mu\text{m}$ at $R=20,000$

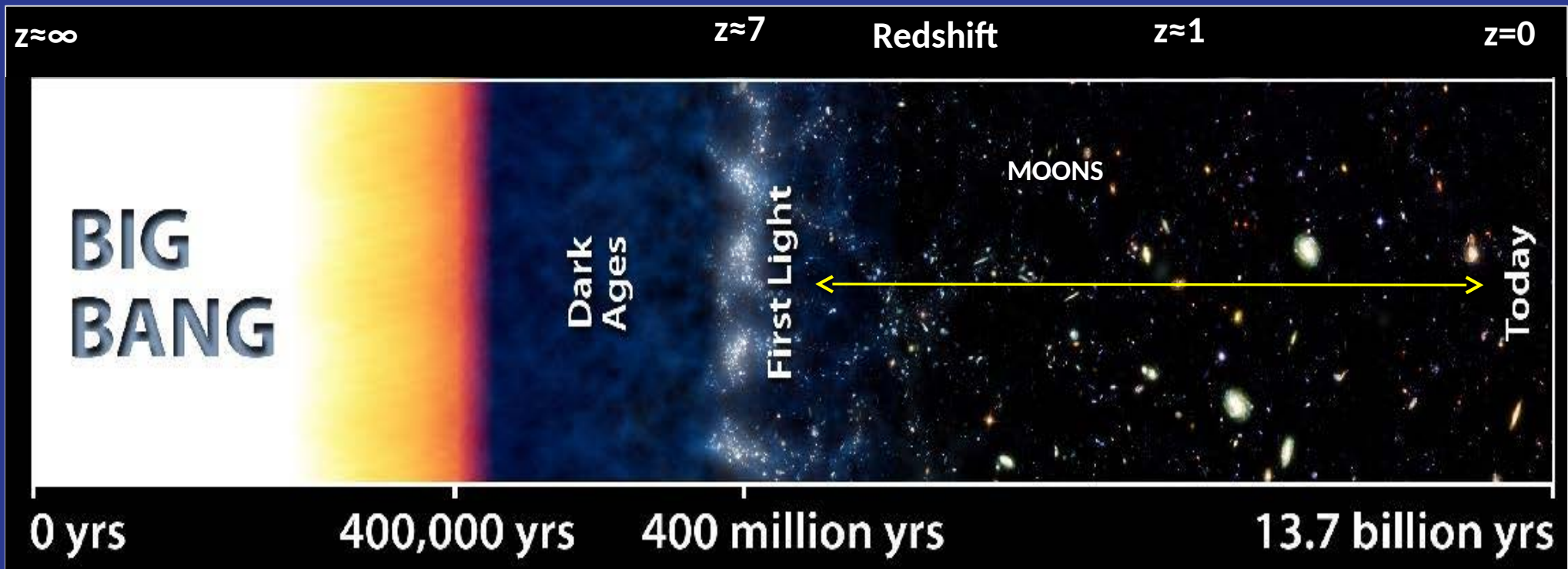


Throughput: ~ 30 %

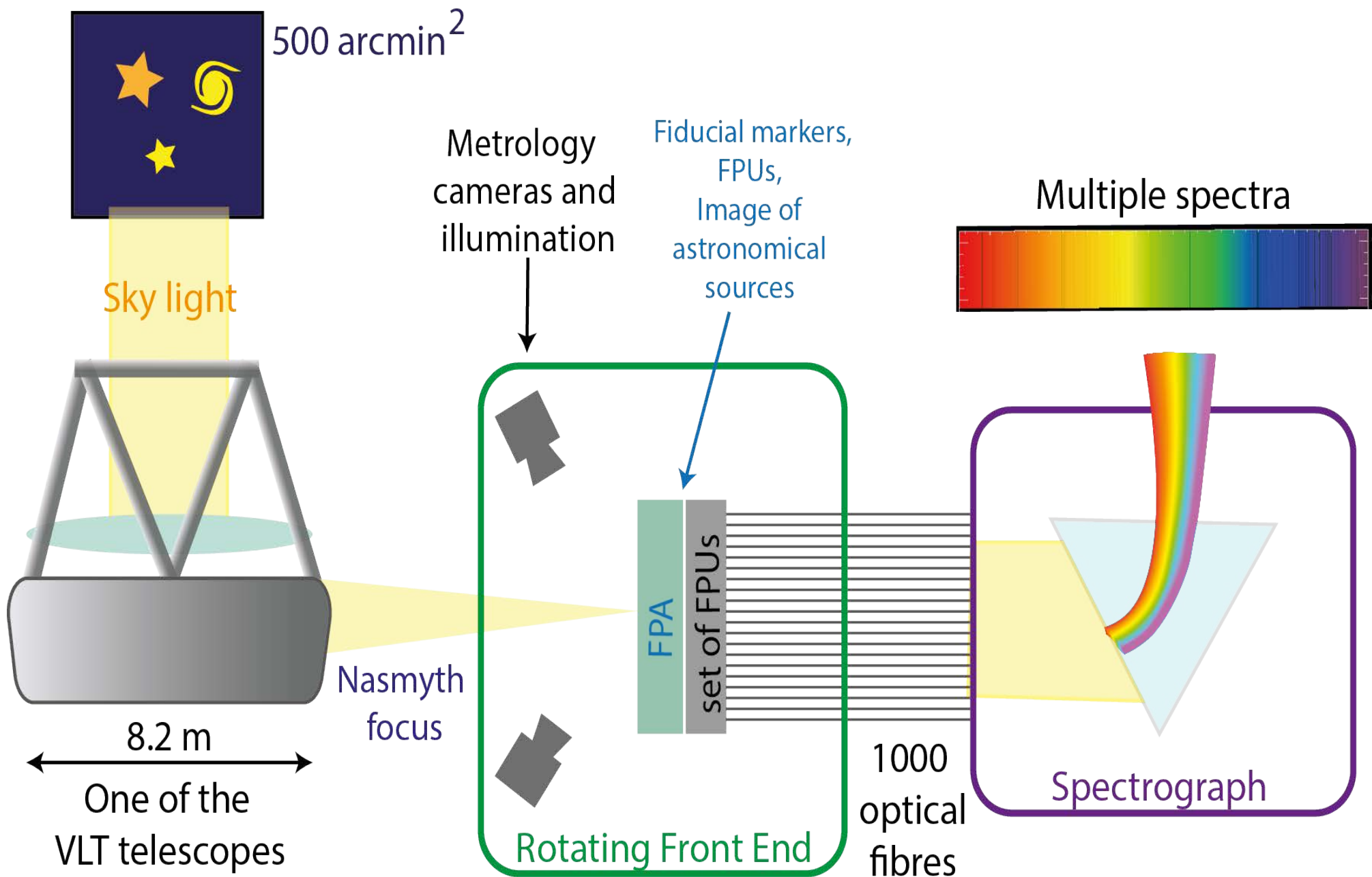
Learning from the history

Why MOONS is needed

- History of the Milky Way -- radial velocities, metallicities and chemical abundances
- History of the Universe -- SDSS-like survey at $z \approx 1-1.5$

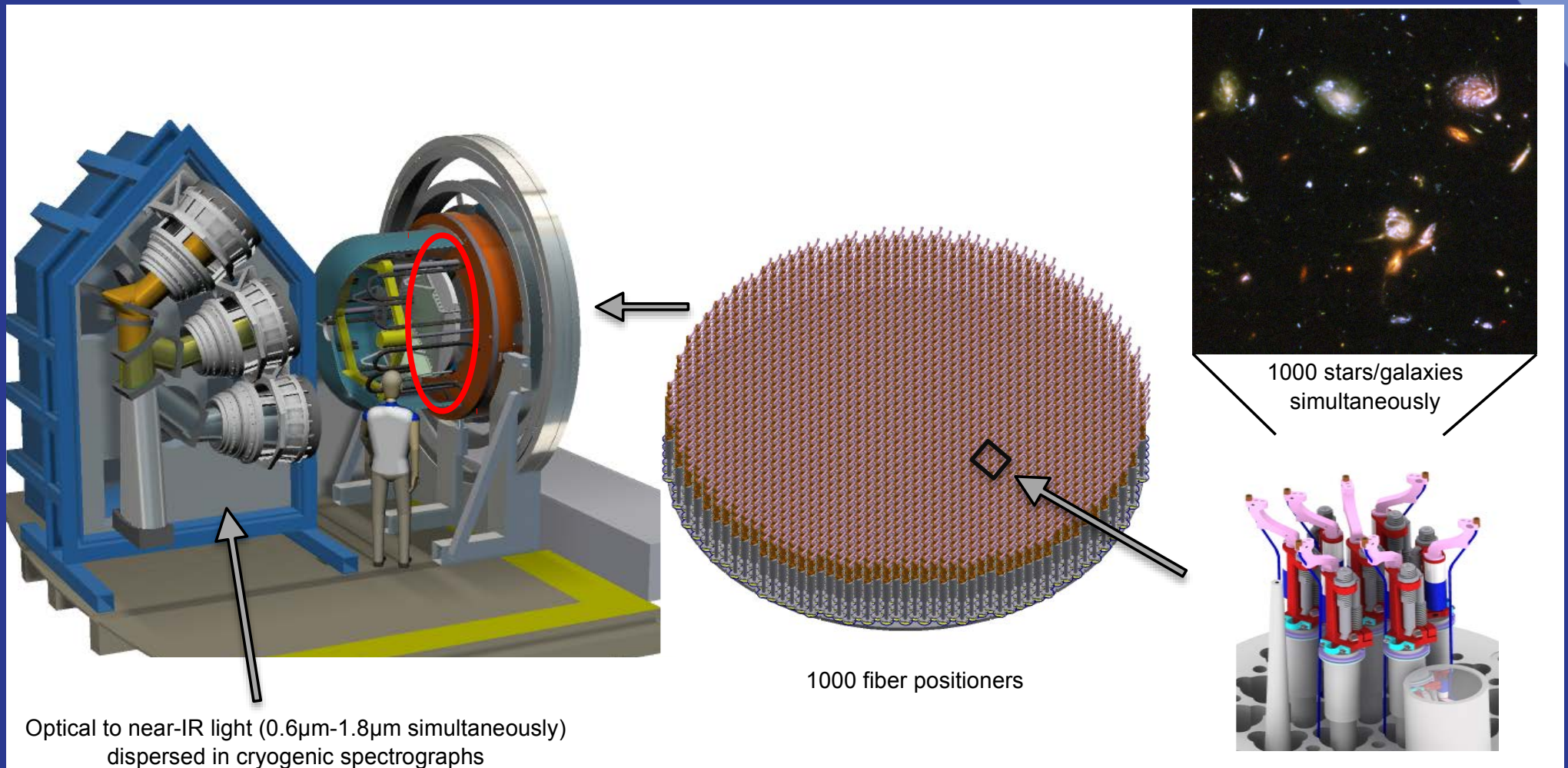


MOONS - Concept

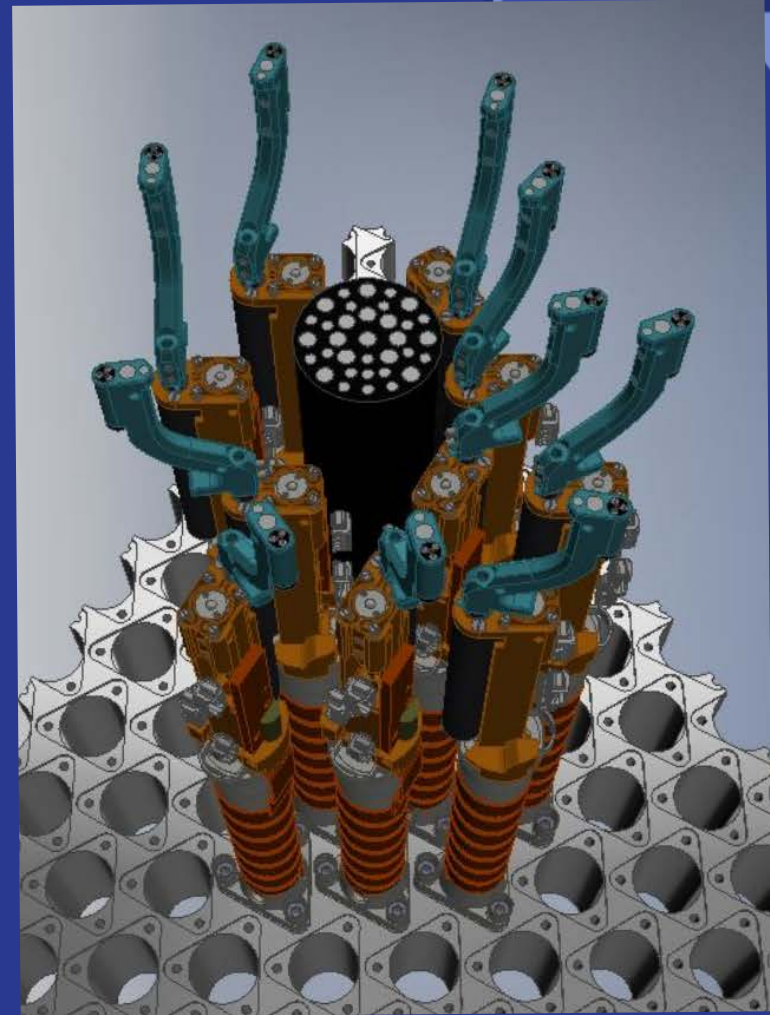
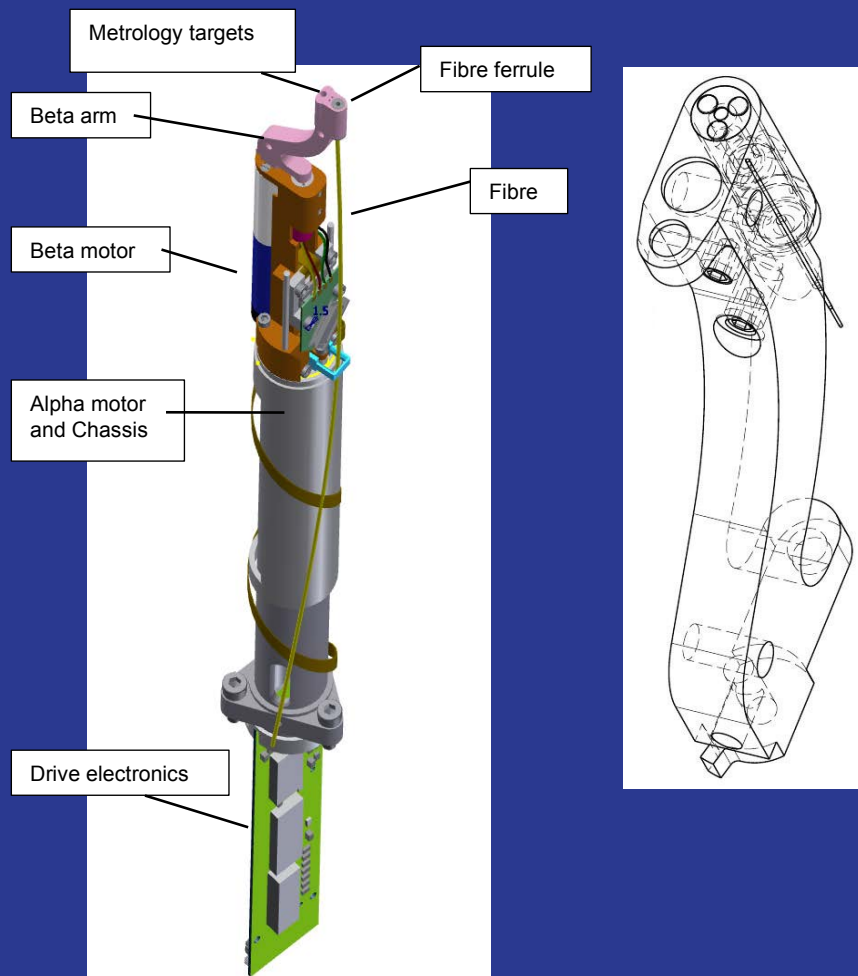


MOONS

Multi-Object Optical and Near-infrared Spectrograph for the VLT



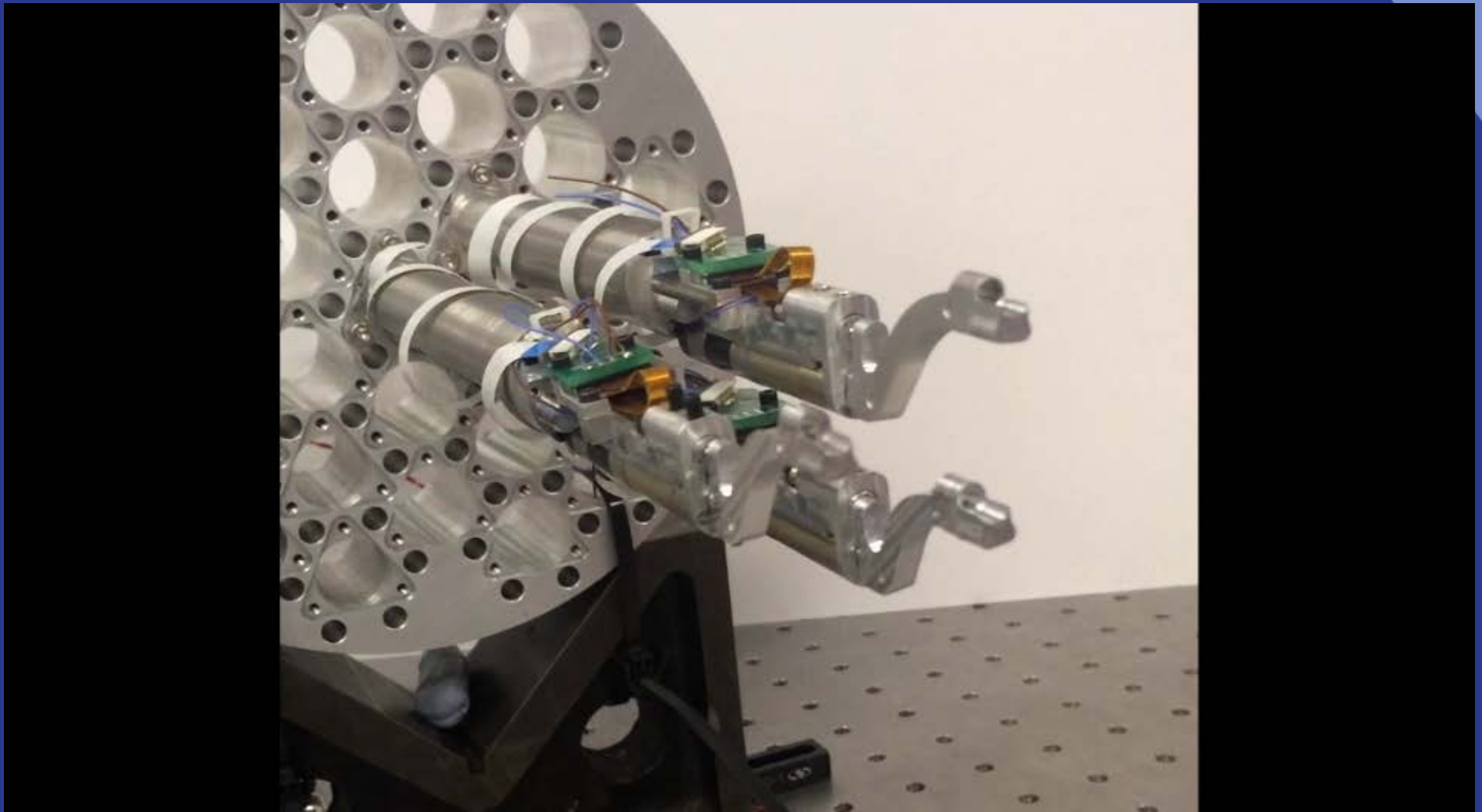
Fiber positioner micro-mechanical pick-off system



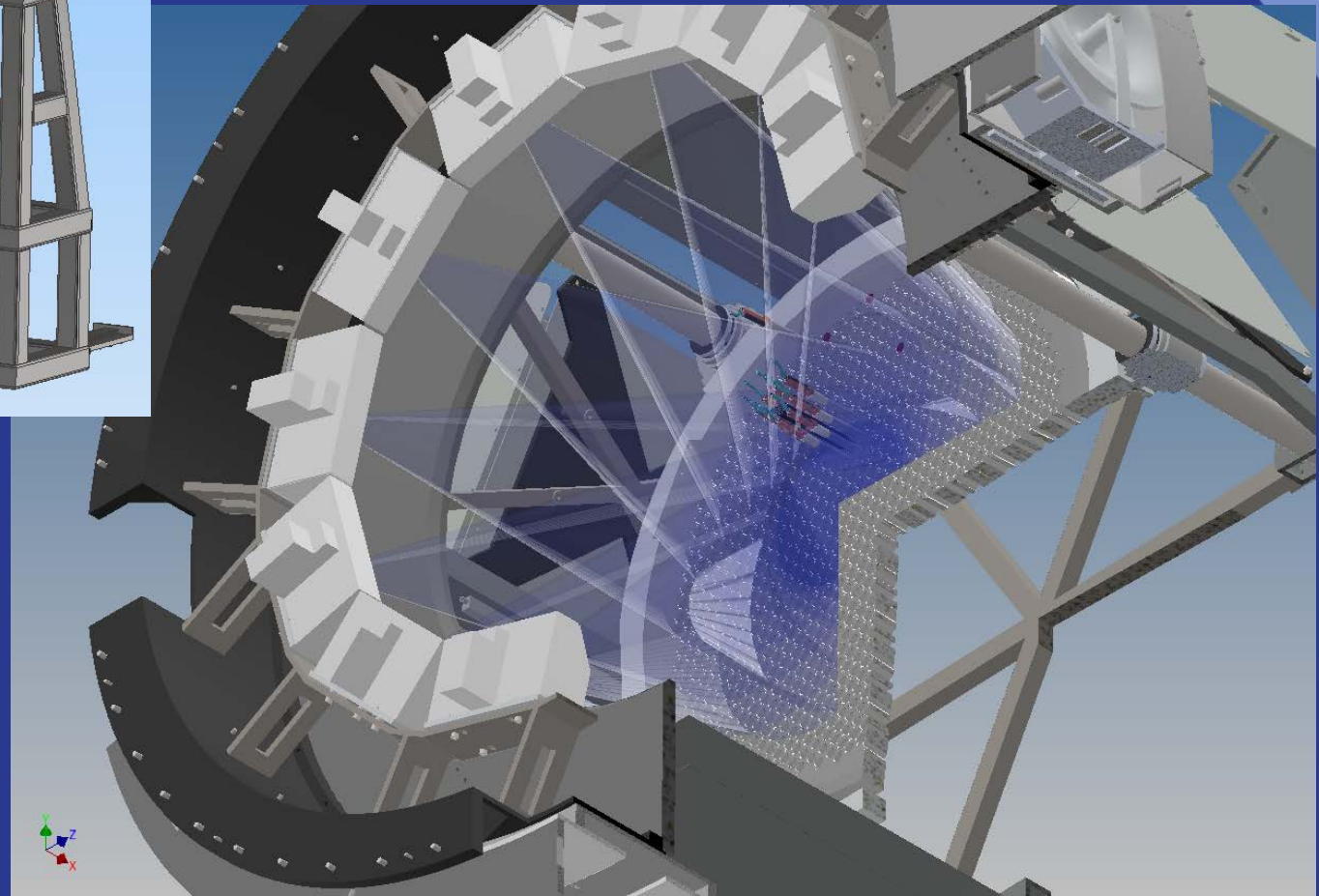
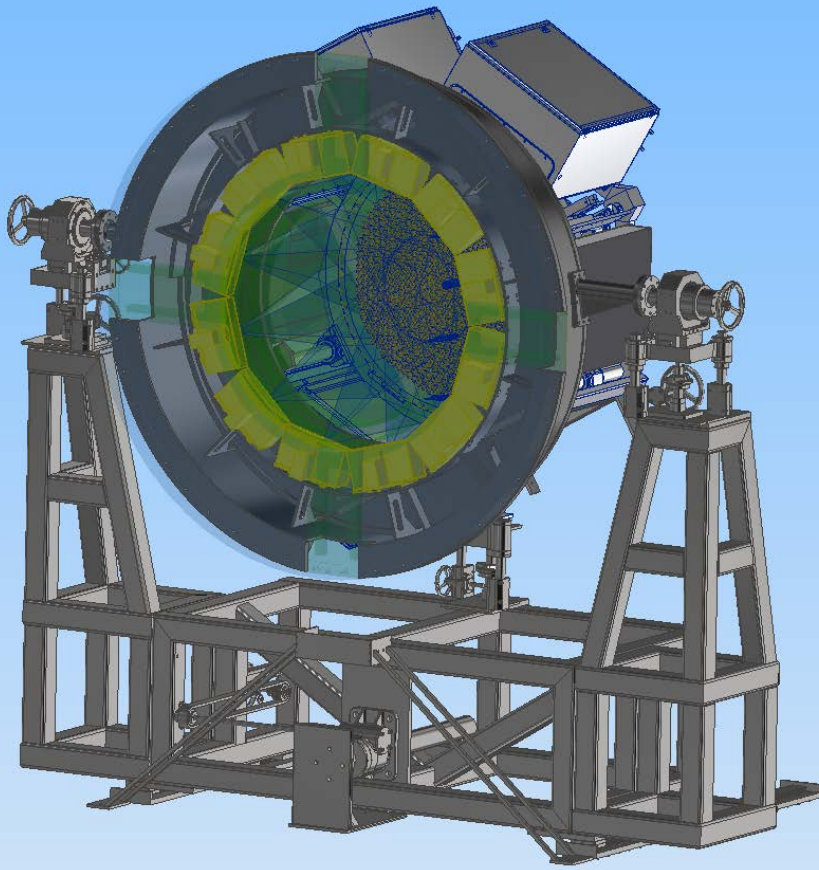
- ✓ Large overlap between positioners
- ✓ Possibility to pair all fibers for optimal sky subtraction
- ✓ Both motors with encoders and a minimum backlash
- ✓ Fast reconfiguration time (< 1min)

Fiber positioner system

micro-mechanical pick-off movement



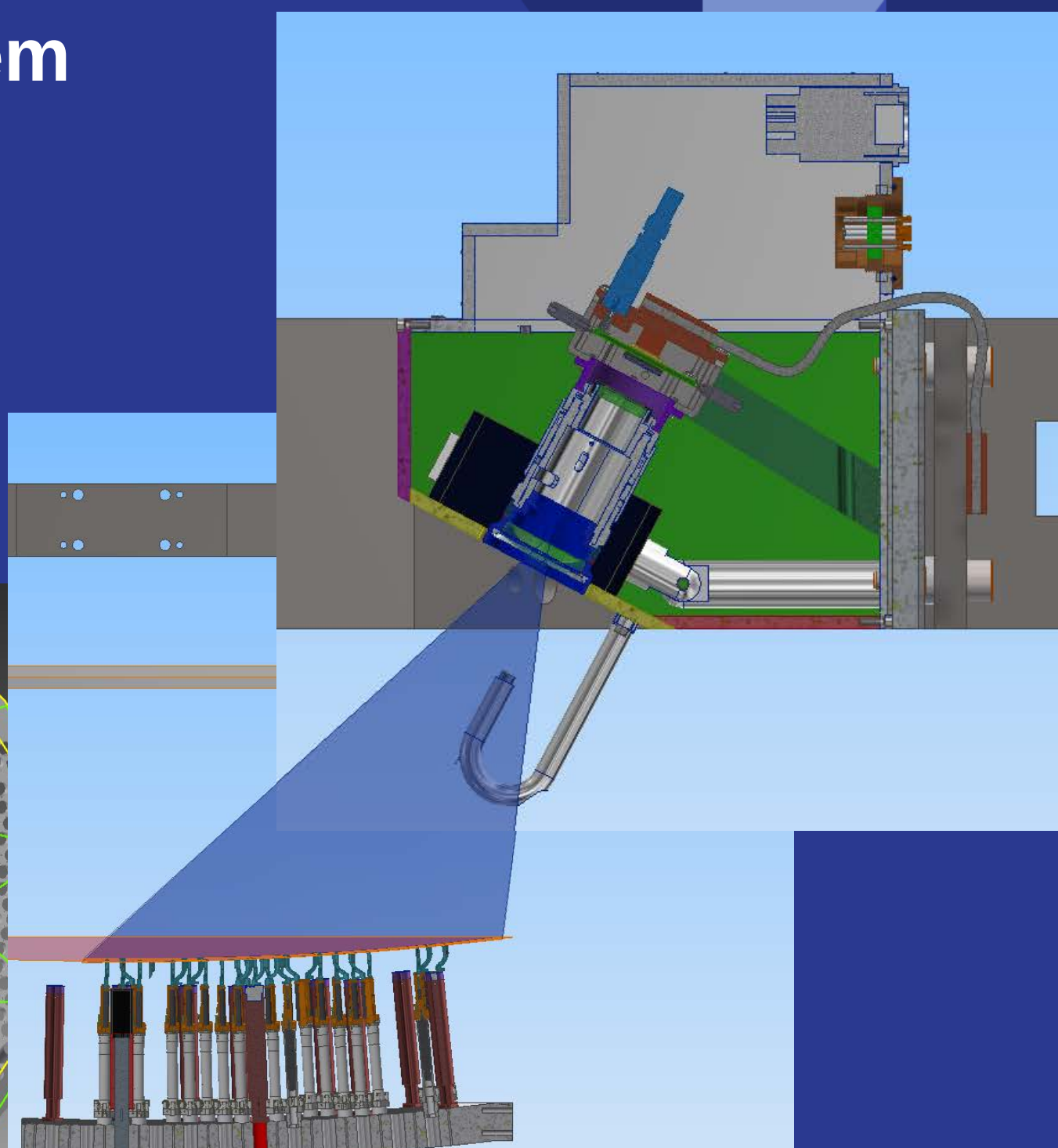
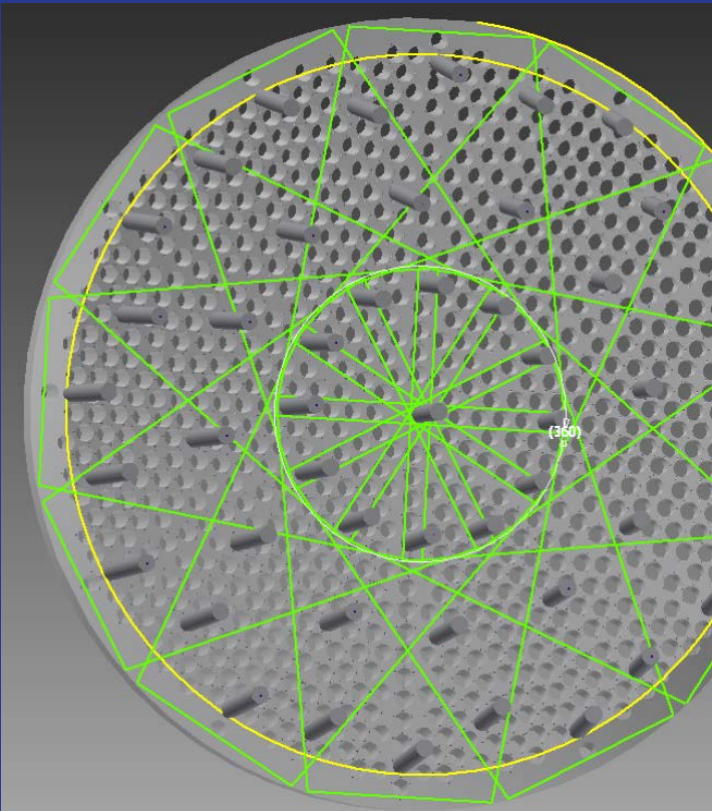
Metrology camera arrangement



Metrology system arrangement

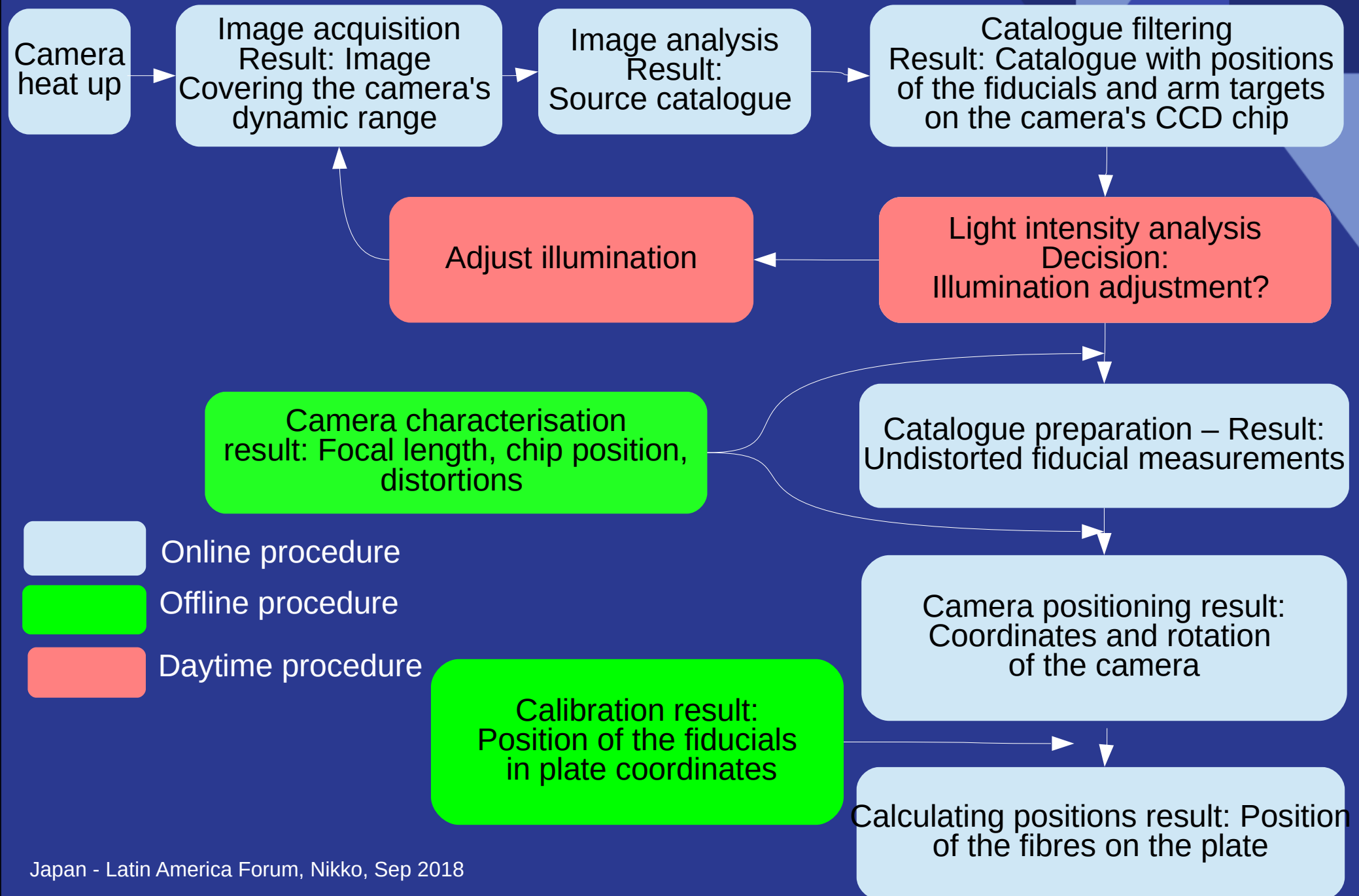
Main result:
15 μm precision
over the full field of view

Fiducial configuration
on the FPU support plate



Camera position and orientation

Software – Metrology pipeline



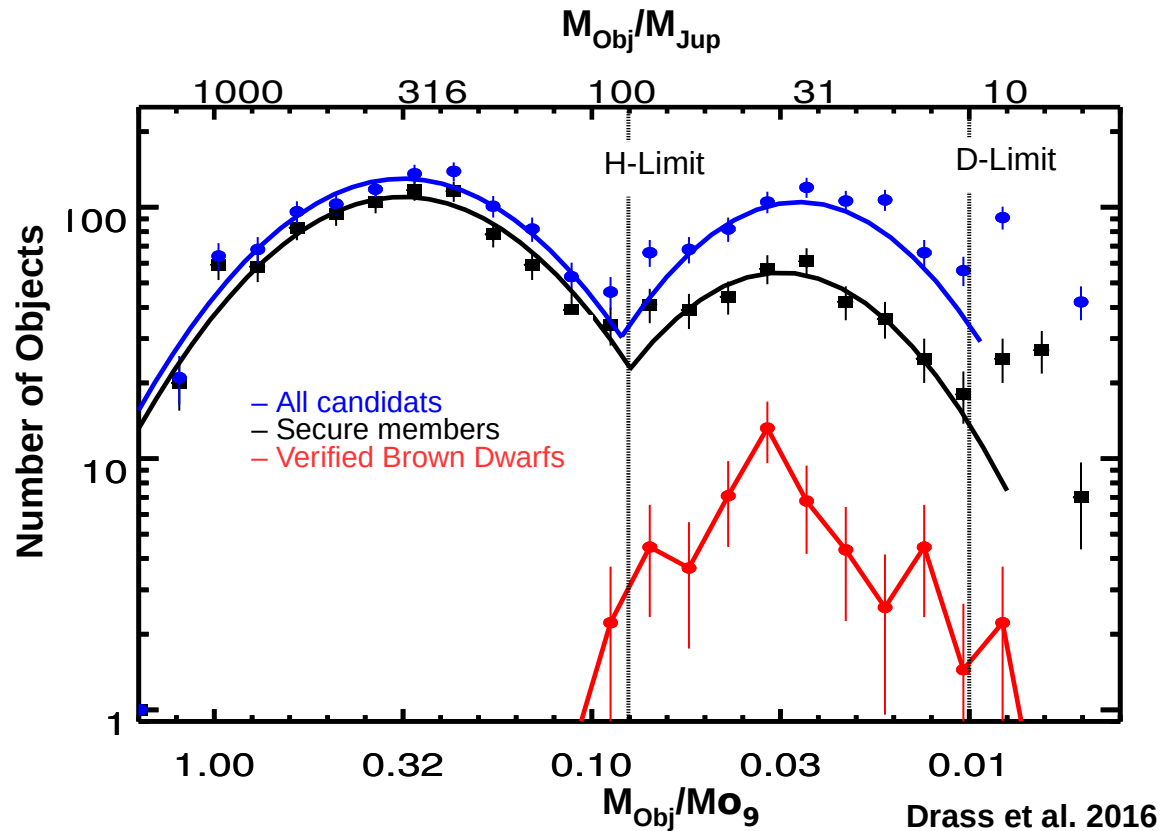


Orion Nebula Cluster:

Benchmark for star formation:

- Young (~ 3 Myr)
- Nearby (~ 400 pc)
- Known large mass range

Mass distribution of candidates

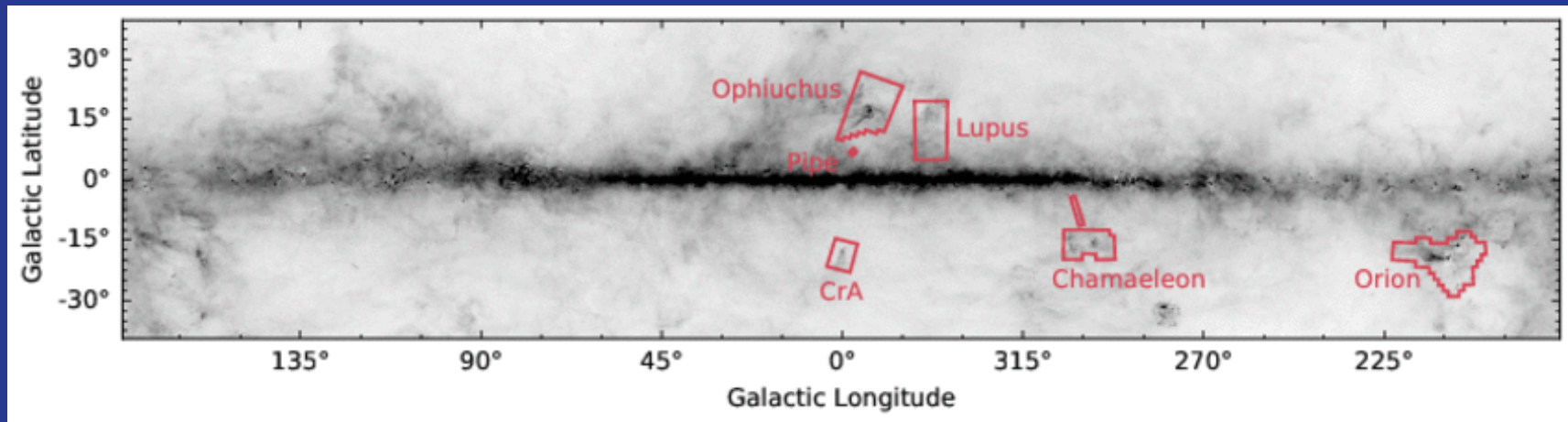


160 Planet cand.
(~ old x 50)
760 Brown Dwarf cand.
(~ old x 10)
920 Stars

- In discussion since 60 years. (Initial mass function, IMF, *Salpeter 1955*)
- Bimodal mass distribution, with dips at the hydrogen and deuterium burning limit.
- Confirmation of the substellar IMF-maximum through known Brown Dwarfs
(*Slesnick et al. 2004, Riddick et al. 2007, Weights et al. 2009*)

M-VISIONS

Spectroscopic highlight survey of the nearby star-forming regions



Suggested regions based on VISIONS the
VISTA star-formation Atlas:
Ophiuchus, Lupus, Pipe, CrA, Chamaeleon, Orion

Conclusions and Outlook

- Design completed.
- System under construction.
- First Software version for the FPU verification delivered to the consortium.
- Hardware and Software of the Metrology system delivery planned for the end of the year.
- Science preparation is on the way.

