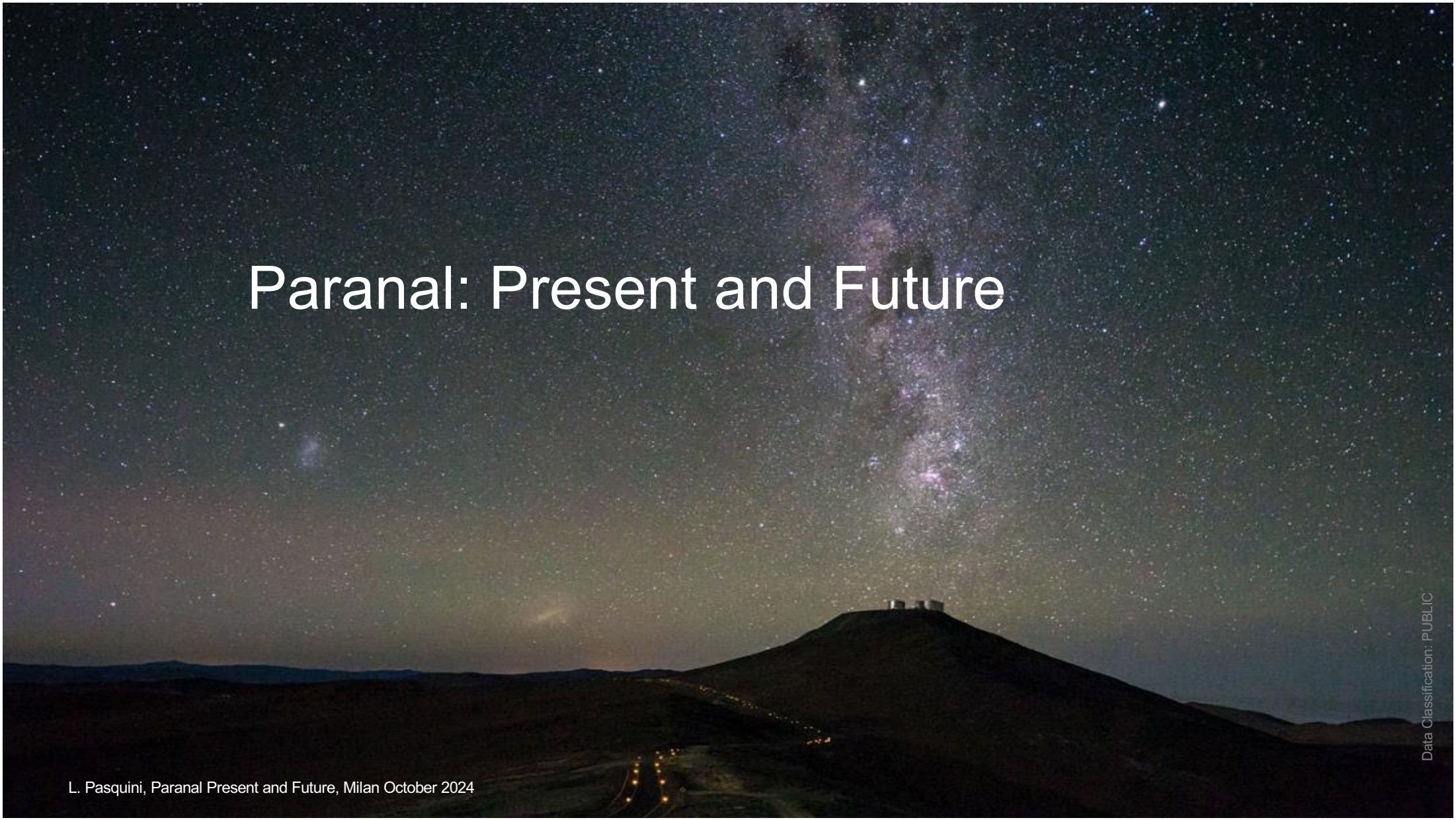
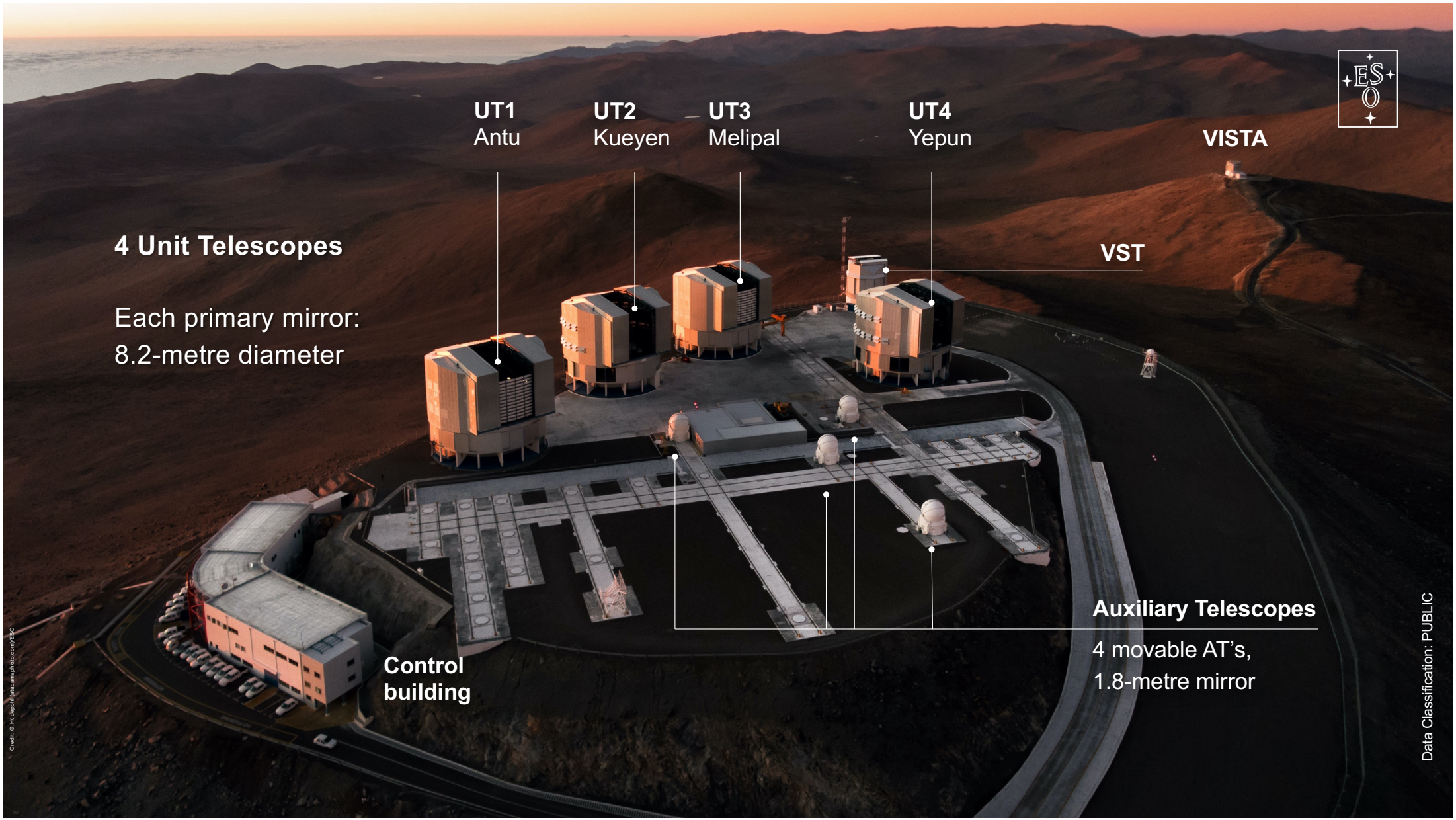
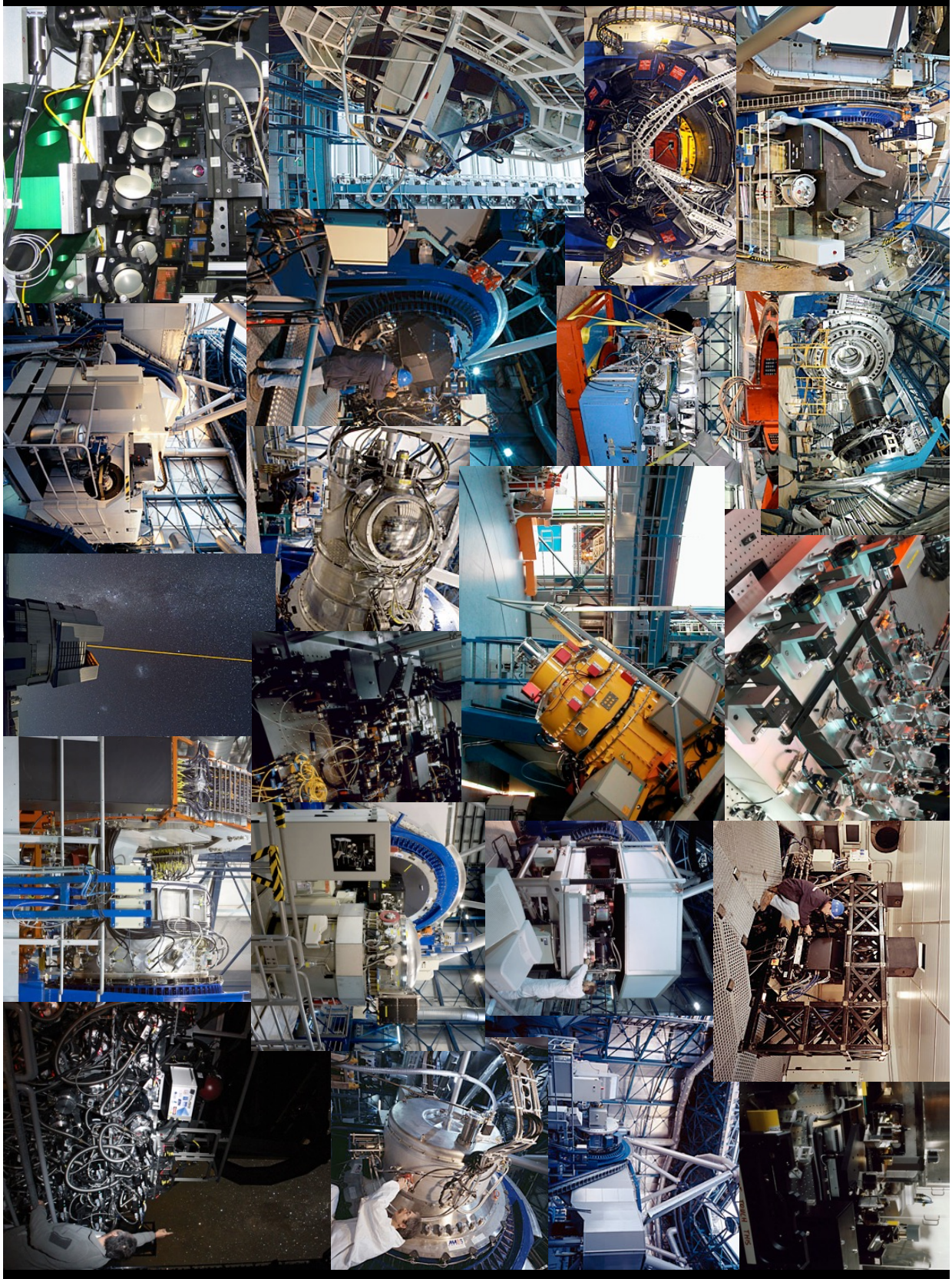



UT1
Antu
UT2
Kueyen
UT3
Melipal
UT4
Yepun
VISTA
VST
4 Unit Telescopes
Each primary mirror:
8.2-metre diameter
Auxiliary Telescopes
4 movable AT's,
1.8-metre mirror
Control
building
Data Classification: PUBLIC



Data Classification: PUBLIC

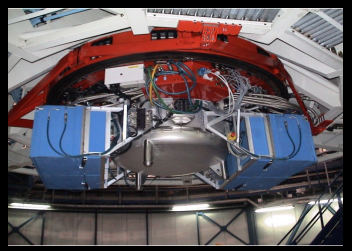
VLT Instruments 2024

UT1 

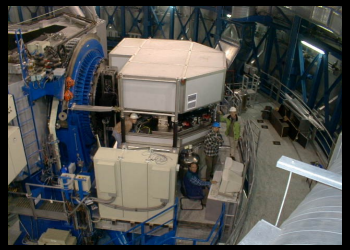
FORS2

UT2 

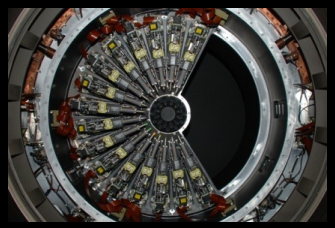
VISIR



UVES



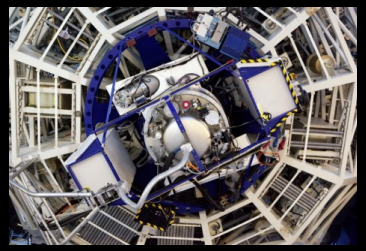
KMOS



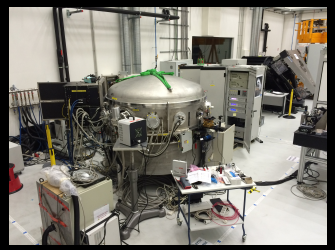
FLAMES

UT3 

X-SHOOTER



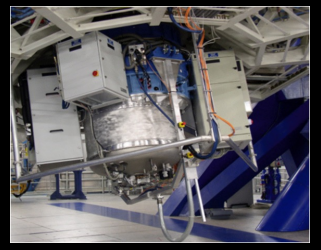
CRIRES



SPHERE

UT4 

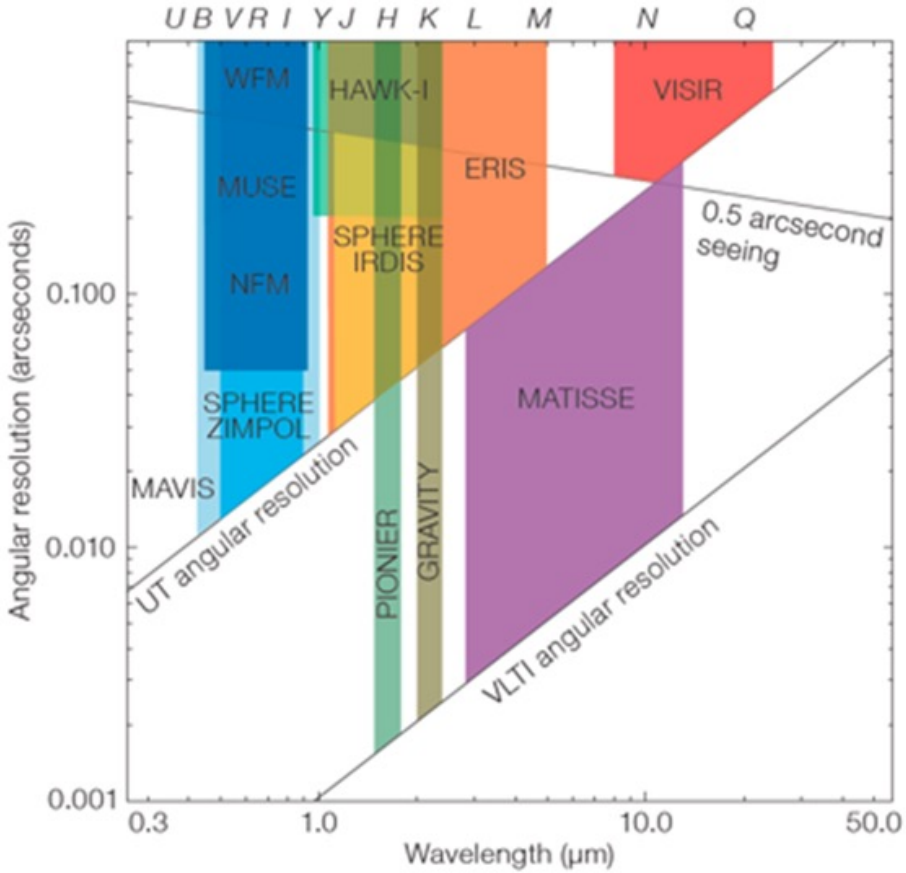
ERIS



MUSE

HAWK-I

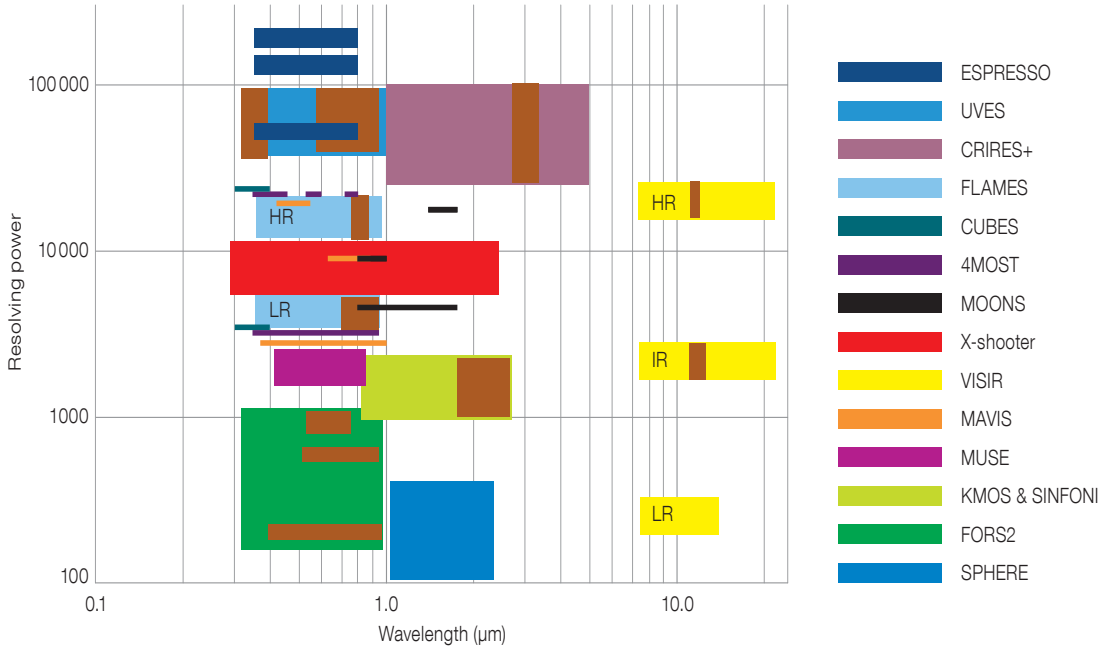
VLT/I angular resolution



VLTI Unique resolution
Astrometry !
AO and VLTI/ Coupled spectroscopy ..

VLT spectral coverage

- Community very active: All VLT spectrographs have been successfully used for chemical analysis



Amazing resolution-wavelength coverage

+ MOS + IFUs + Polarimetry
+ Precise RV

2025: MOONS, Multi-Object-Optical-Near Infrared-Spectrometer for the VLT (Gonzalez et al. 2024)

Long awaited …

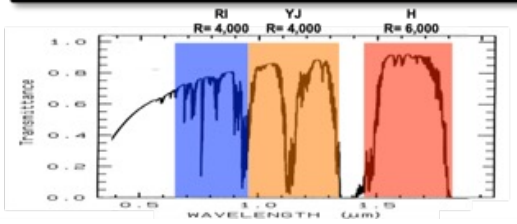
Field of view: 500 sq. arcmin at the 8.2m VLT

Multiplex: 1000 fibers, with the possibility to deploy them in pairs

Fibers: Aperture on sky = 1.1arcsec; Close pair = 10arcsec; Max 7 fibers within 2 arcmin

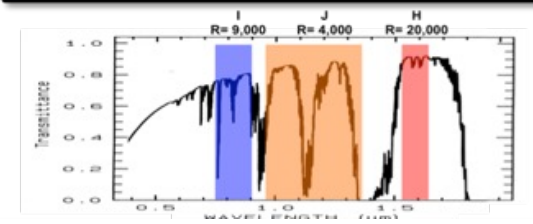
Medium resolution:

Simultaneously 0.64μm-1.8μm
- 0.64-0.95μm at R=4,000
- 0.95-1.35μm at R=4,000
- 1.42-1.81μm at R=6,600



High resolution:

Simultaneously 3 bands:
- 0.76-0.90μm at R = 9,000
- 0.95-1.35μm at R=4,000
- 1.52-1.63μm at R=20,000



MOONS: galaxy evolution from early universe to present day

Low-resolution

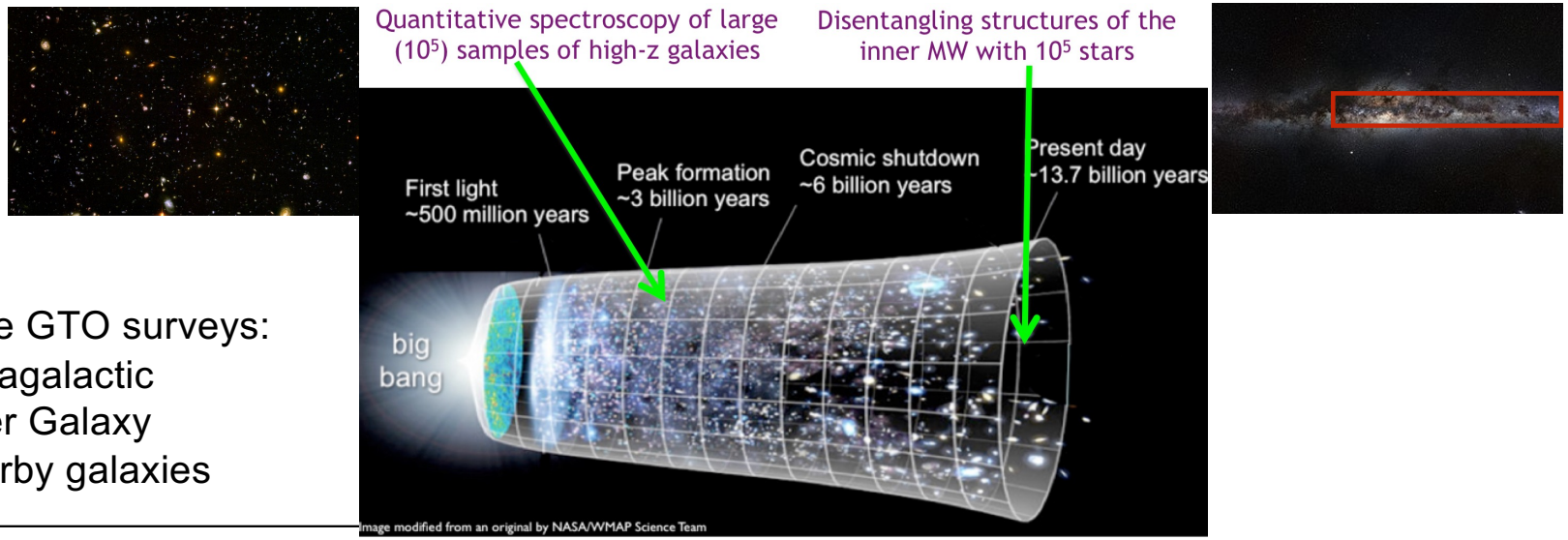
- **SDSS-like survey** across peak of star-formation and black-hole accretion up to first galaxies at high-z

- Diagnostics for passive/star-forming galaxies: Metallicity (R23,N2), SFR (Hα, Hβ, [OII]), extinction (Hα/Hβ), Galaxy mass (σv), BH mass (BLR)

High-resolution

- **Stellar population surveys** of the dense regions of the (reddened) Milky Way and its satellites

- Stellar population diagnostics for millions of stars (stellar parameters, abundances, age indicators, radial velocities)



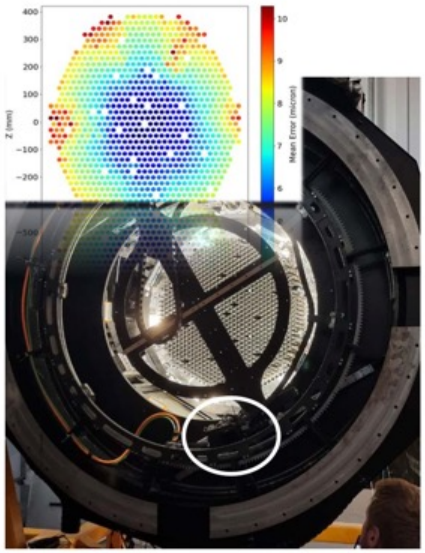
3 large GTO surveys:
1 Extragalactic
1 Inner Galaxy
1 Nearby galaxies

MOONS @ UK-ATC

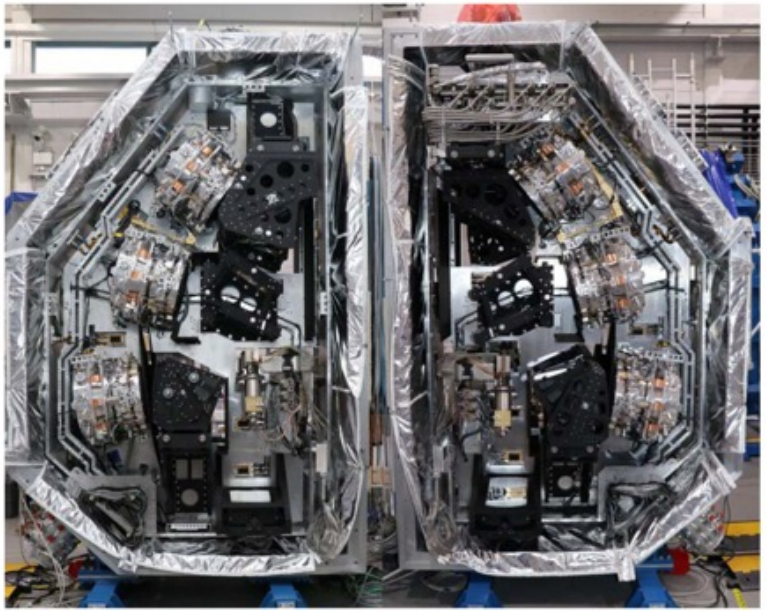
Fully populated Instrument cooldown and tests

Instrument is completed, Corrector mounted and commissioned at VLT UT1
Two motor failures (grating mech) -> investigation from ATC -> coating on gear boxes affect lifetime of motors. Replace gear boxes and new design -> **Preliminary Acceptance Europe in July, shipment to Chile in Q1 2025**

Metrology system

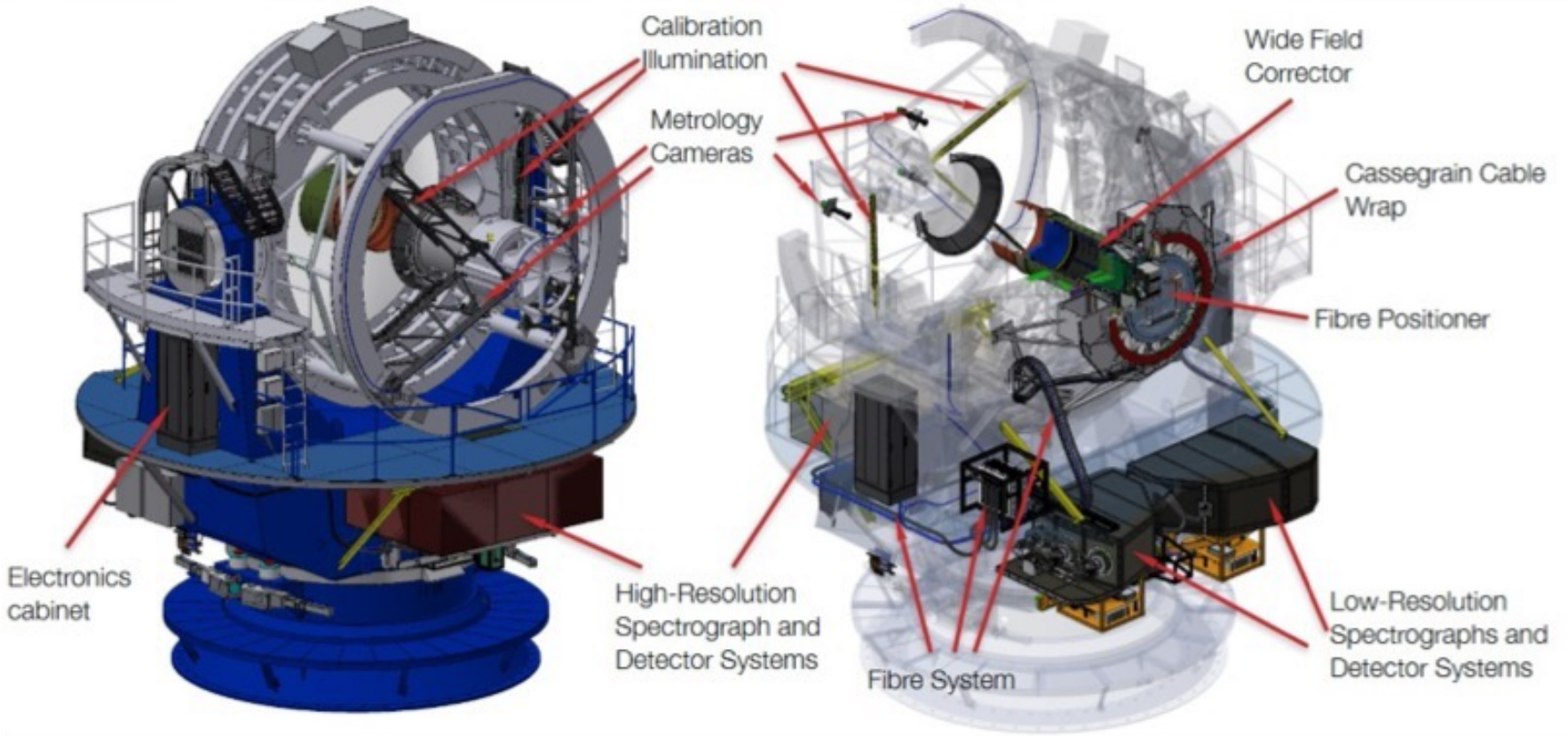


- *944 fully tested and integrated FPUs (requ. was 800, few for spares)*
- *Datum residuals investigation (but <0.1" on sky even for outliers)*
- *Photogrammetry system: FPU mean error of 5 - 10 micron*
- *Single crane rotation proc test and val, post-integration cabling, cooling, etc.*



2025: 4MOST, the optical MOS for the VISTA 4m telescope (de Jong et al. 2024)

4MOST is a complex FACILITY



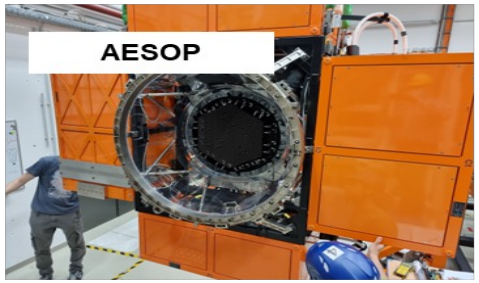
4MOST

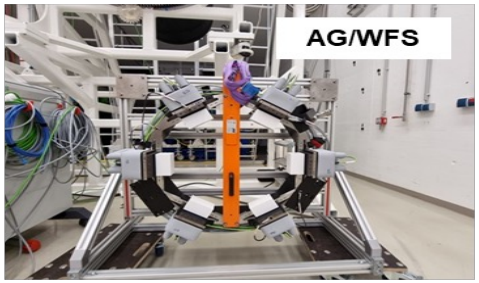
Baseline Specification

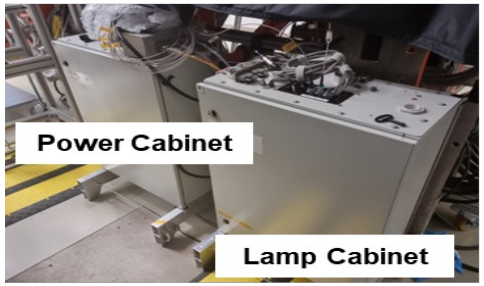
Requirement	Baseline Specification
Field-of-View in hexagon	4.1 degree^2
Fibre multiplex per pointing	2436
Smallest target separation	<17"
Low-Resolution Spectrographs (LRS)	
Fibre multiplex	1624
Spectral resolution	R>4000–7800
Wavelength coverage	370–950 nm
High-Resolution Spectrographs (HRS)	
Fibre multiplex	812
Spectral resolution	R>18,500
Wavelength coverage	392.6–435.5, 516–573 & 610–679 nm

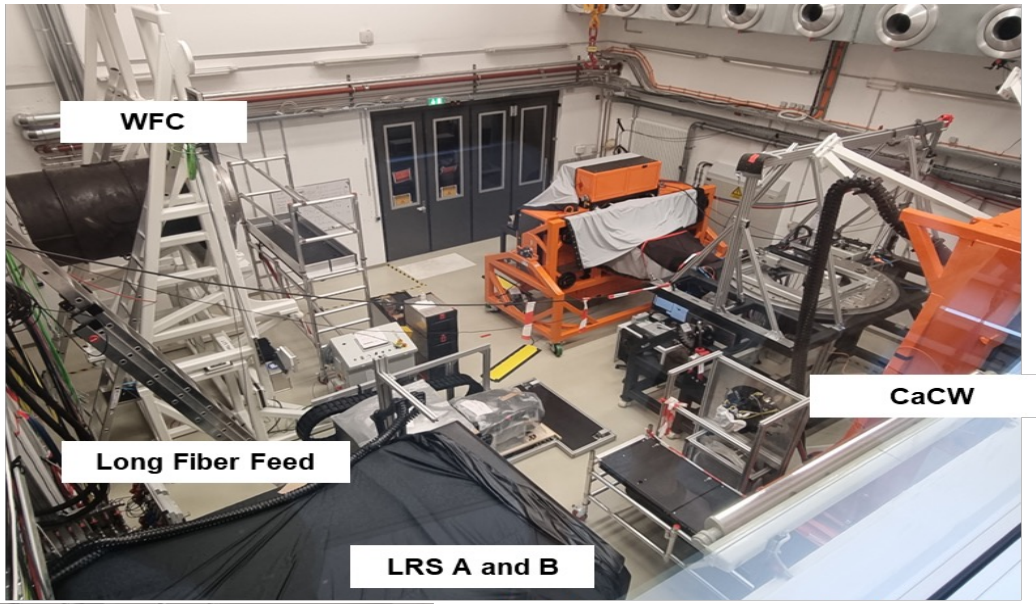
- 4MOST 5 (+5 optional) Years surveys: 70% Consortium, 30% community
- 5 Galactic + 5 Extra-Galactic GTO surveys
  - https://www.4most.eu/cms/science/galconsurv/
  - https://www.4most.eu/cms/science/exgalconsurv/
- 6 Galactic and 9 Extra-Galactic community surveys:
  - https://www.eso.org/sci/observing/PublicSurveys/4most-surveys-projects.html
- **Low and High acquisition spectra simultaneously – different surveys simultaneously**

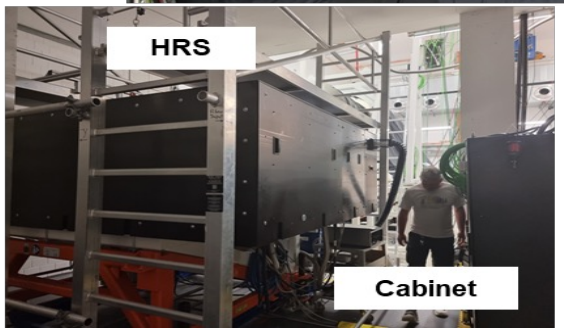
4MOST Status @ AIP: PAE1 Reached on 24/09!!

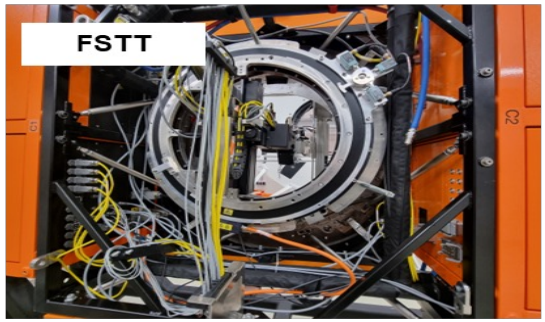




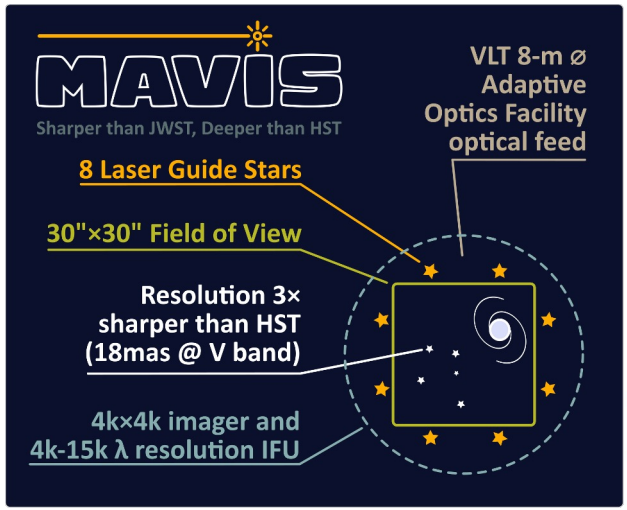




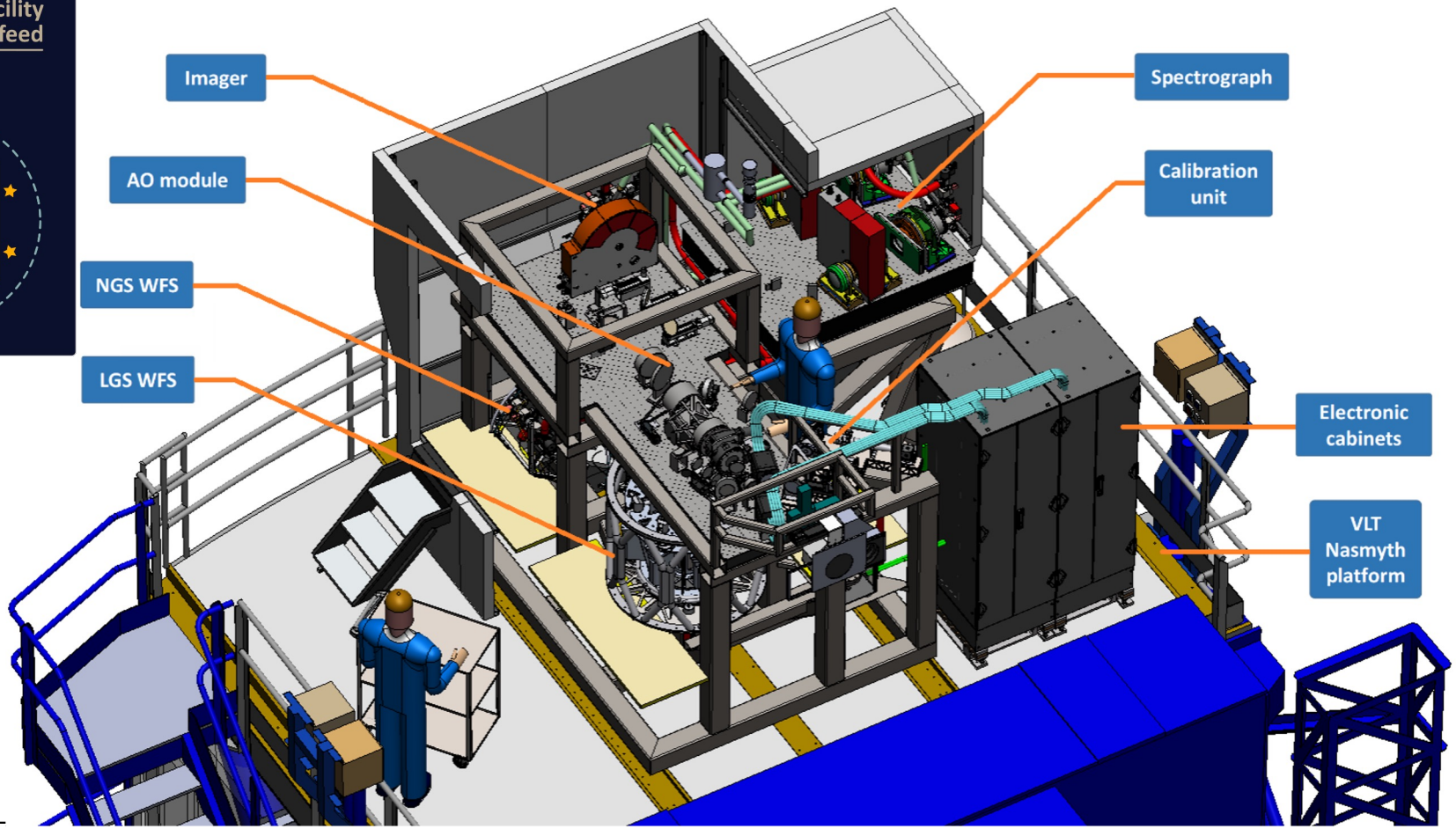




MAVIS: Sharper than JWST, deeper than HST



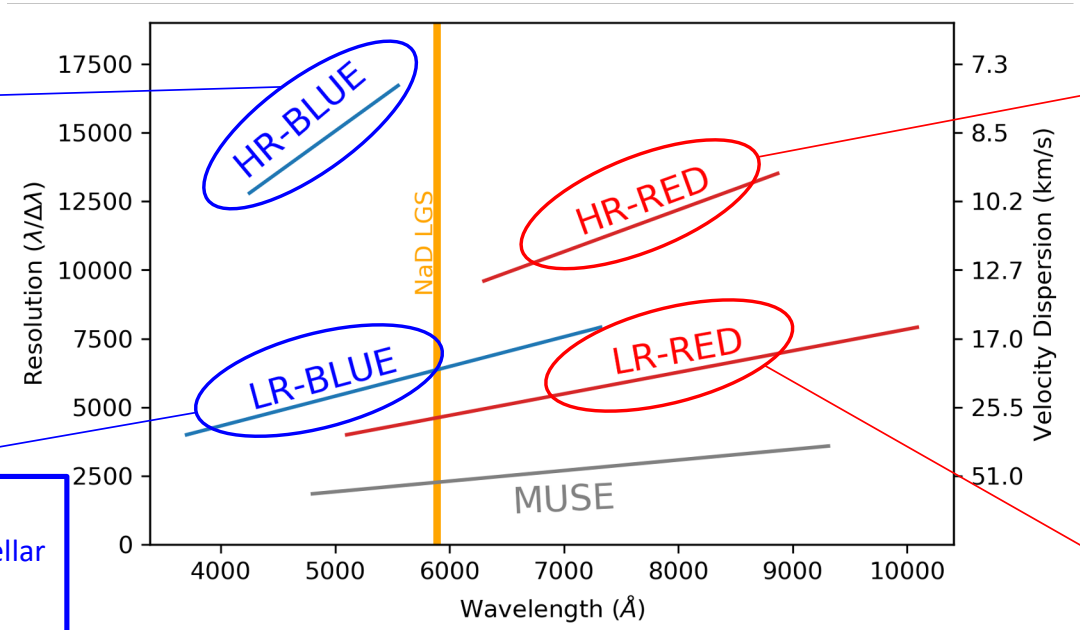
- 8 LGSs WFS
  40×40 sub-aps
  r=17.5”
- 3 NIR NGSs WFS
  1×1/2×2 sub-aps
  patrol FoV r=60”
- 2 post focal DMs
  conj. alt.6 and 13.5km
  pitch 0.25 and 0.32m
- Lasers splitted in 2 to get 8 laser sources



MAVIS

MAVIS IFU Spectrograph

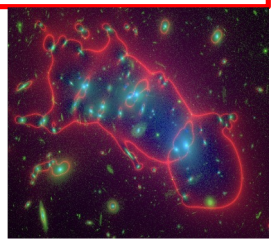
- Stellar abundances in crowded fields
- Radial velocities of stars and gas < 1km/s



- Evolution of ISM turbulence in galaxy disks
- IMBHs

- Ionised gas properties
- Hot/Massive stars, young stellar populations
- Extreme Metal Poor stars

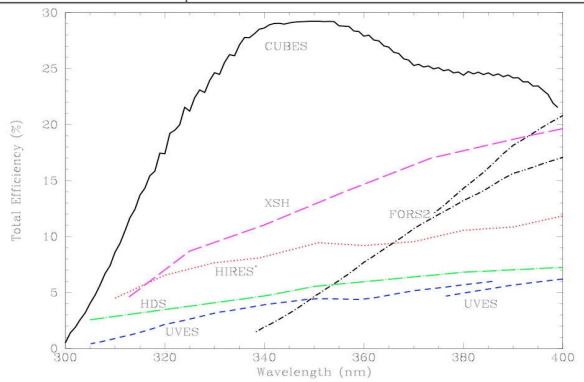
- Evolution of ISM chemistry
- Stellar dynamics z<1
- Lyα sources at z>6.6

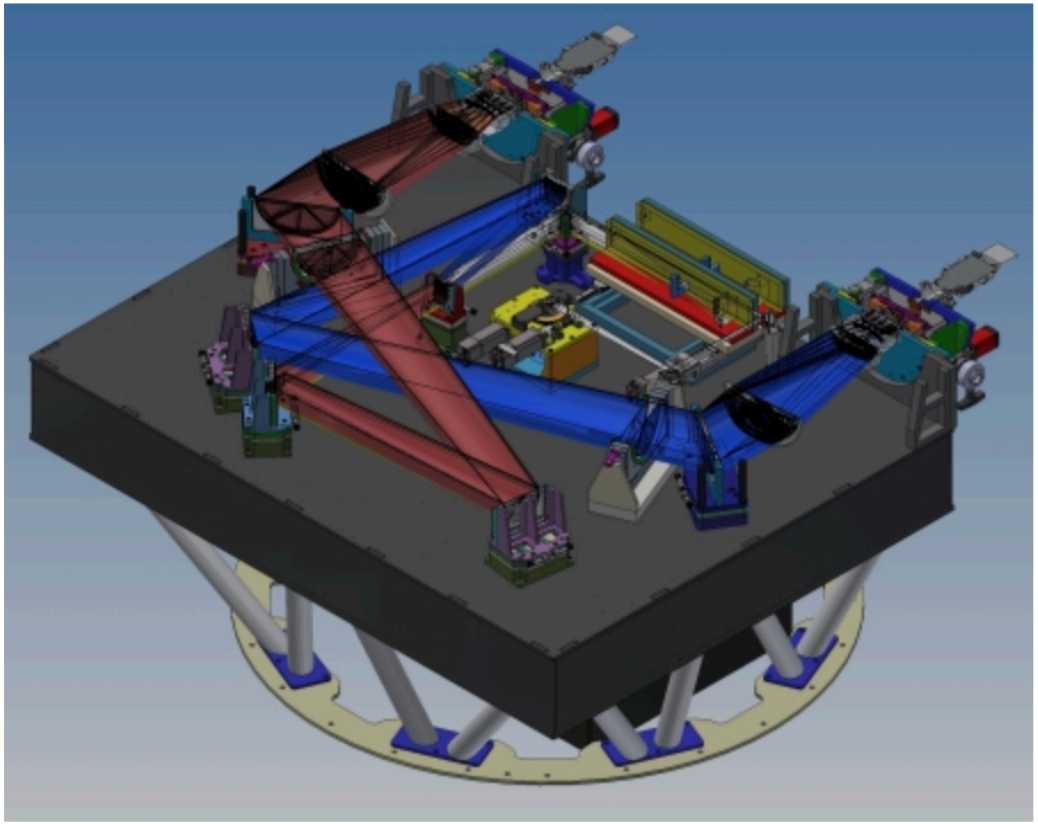


4 different gratings to cover the whole
3700-10000 Å band
optimized for different science requirements

CUBES: Cassegrain U-Band Efficient Spectrograph

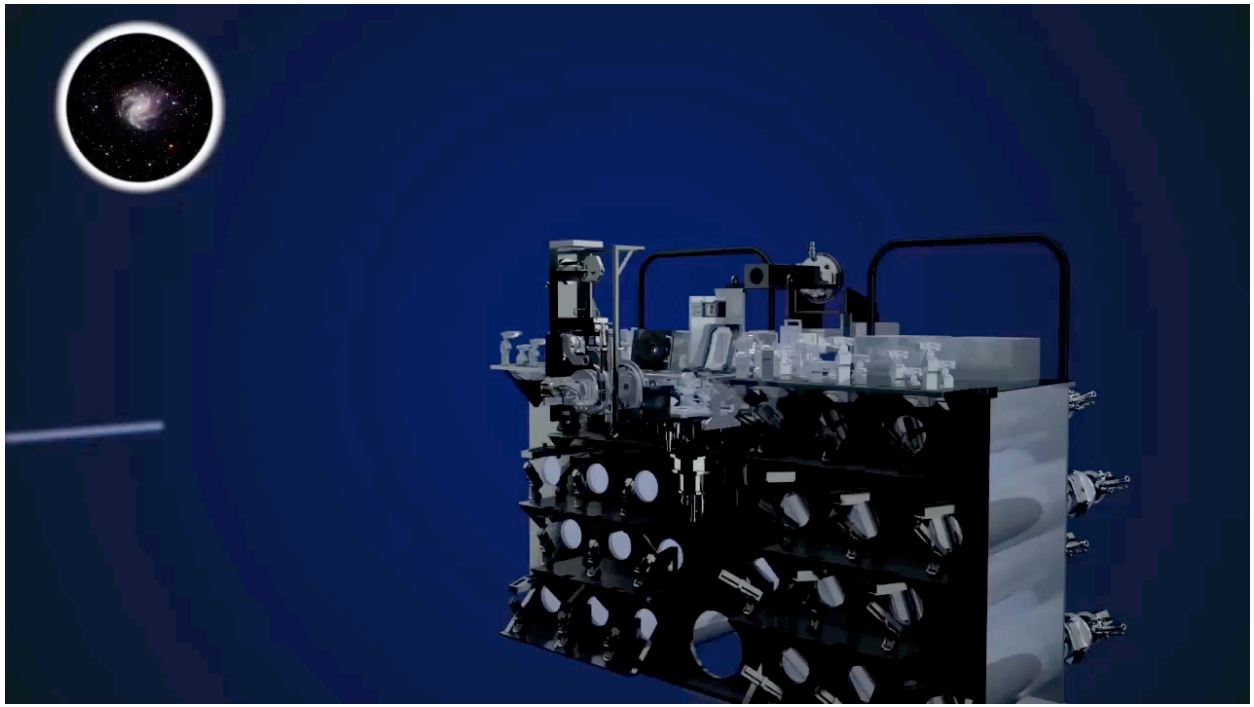
Spectral Resolution	~20000 (~7000 LR mode also provided)
Wavelength Range	305 - 400nm
Slit length/width	HR: 10" x 1.5" (sliced into six 0.25" slitlets) LR: 10" x 6" (sliced into six 1" slitlets)
Efficiency	>40%
Focus	UT1/2/3 Cassegrain
Sensitivity	S/N>20 for U=18 mag at 313 nm (0.007nm wavelength bin)
Acquisition and guiding	V_{ref}~22, photometry error<10%





BlueMUSE (Phase A Study)

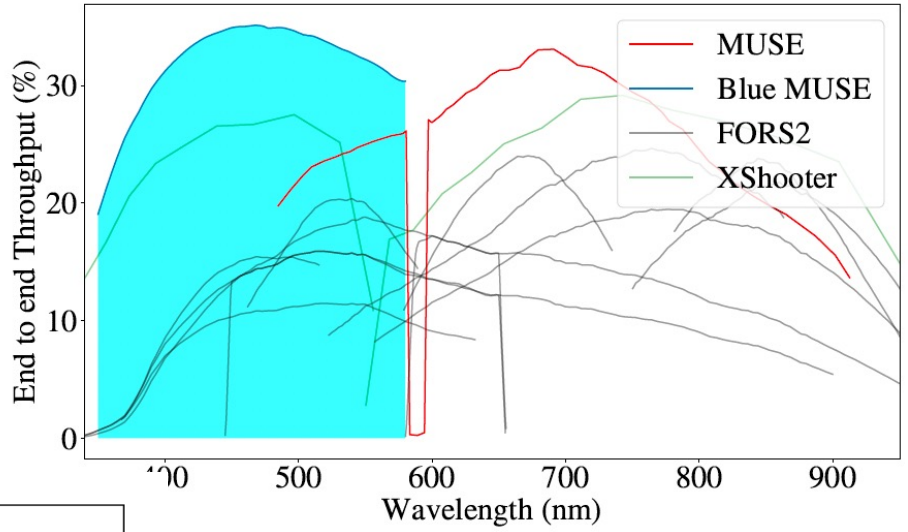
Blue-optimised, medium spectral resolution, panoramic integral field spectrograph

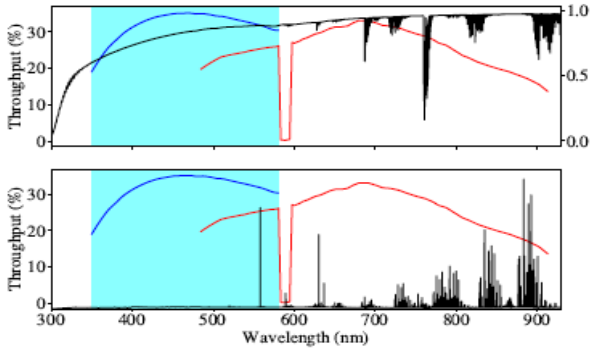


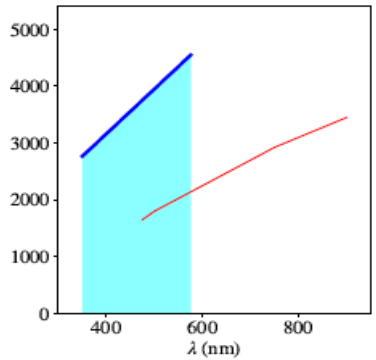
- Lambda > 350 nm
- twice spectral resolution than MUSE
- 1 arcmin² Field of View
- 0.2” x 0.3” spaxel
- 16 IFUs

BlueMUSE in a nutshell

- Builds on MUSE successes
  - Highly complementary
  - Science cases from solar system to high Z galaxies





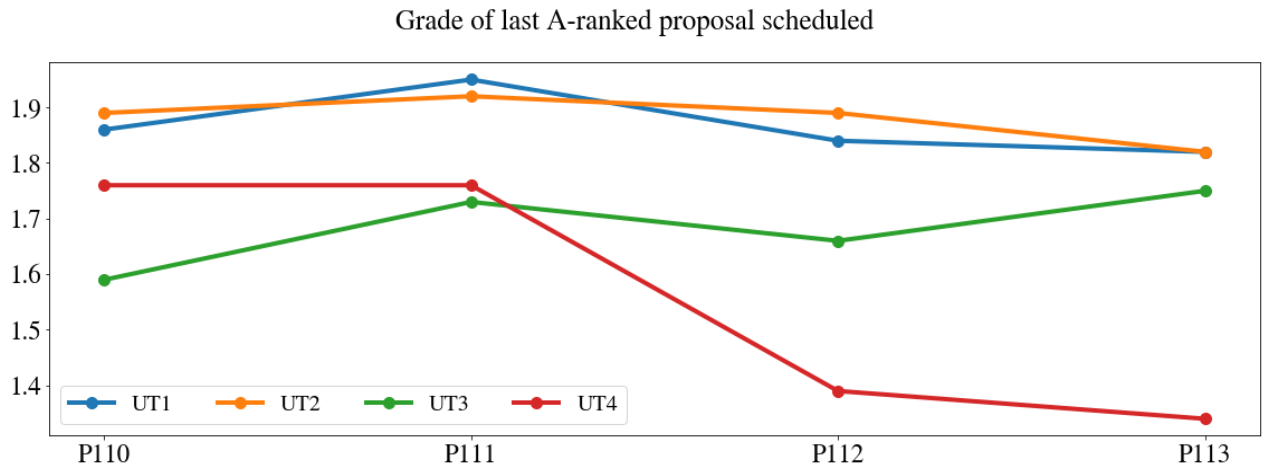


Second Generation Deformable Secondary Mirror at the VLT (2GDSM, Phase A Study)

- AOF is certainly one of the major VLT success
- AOF rests on **three pillars**:
  - Lasers : One laser/UT is now provided by GRAVITY+
  - DSM
  - AO Modules & Instruments
- **Provide the second pillar for a second UT: a new DSM**
  - Will allow to move ERIS, optimizing the UT time distribution (MAVIS is coming!)
  - Will allow the best use of G+ lasers, opening new exciting possibilities
  - Will use the same ELT technology that will retrofit the AOF DSM

Best science needs even UT pressure

- When pressure on one telescope is too high, excellent proposals are turned down
  - Many implications
  - MUSE and ERIS are at the top of most requested instruments, MAVIS promises to be at the same level



Excellent Proposals must be rejected at UT4

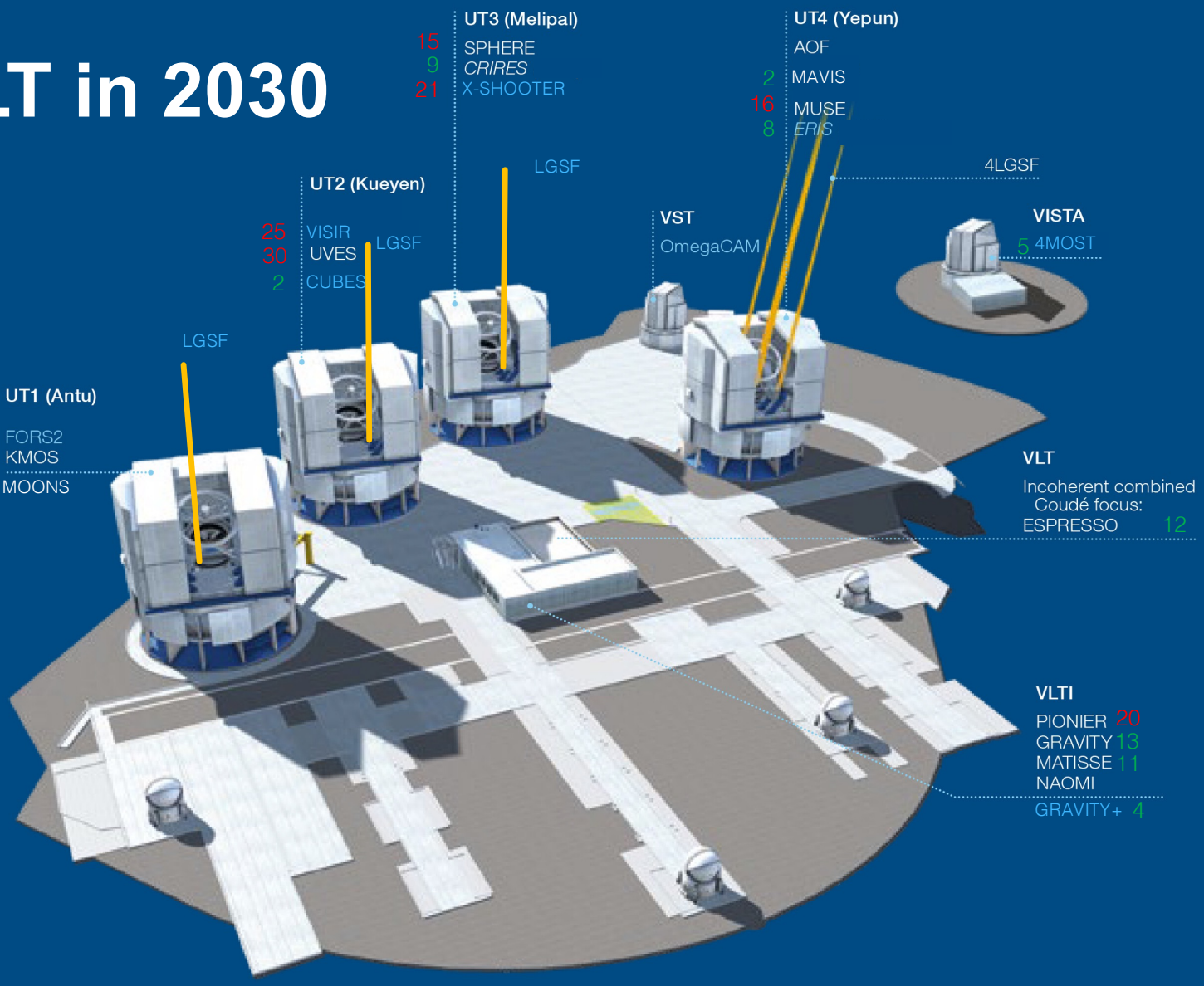
VLT/I: Strategic Choices

- Focus on unique VLT/I strengths and exploit the uniqueness of the VLT/I
  - The VLT/I shall host a mix of workhorse and dedicated instruments
    - Follow the scientific requirements of ESO community

Current Strategic view:

- **VLT/I strengths, uniqueness and leadership area:**
- Flexibility of operations, small/large programmes, reactivity, monitoring
- Diversity and quality: unique workhorses such as X-Shooter and MUSE
- High resolution spectroscopy
- Integral field spectroscopy
- High contrast imaging with AO
- Interferometry & Long Term Plan for VLTI
- Access to blue in the era of JWST and ELTs.

The VLT in 2030



Data Classification: PUBLIC

VLT/I & Paranal

A glorious past, a great present and a superb future

ELT! (One observatory..)

VLT/I continue to have a relevant role: **call late 2025** for **VLT/I new projects**

ESO will also start the process to define the **future of VLT/I** and **next ESO large facility**

Be active in these processes!

Thank you!

Luca Pasquini

@ESOAstronomy
@esoastronomy
@ESO
european-southern-observatory
@ESOobservatory