

The ERIS instrument for the VLT

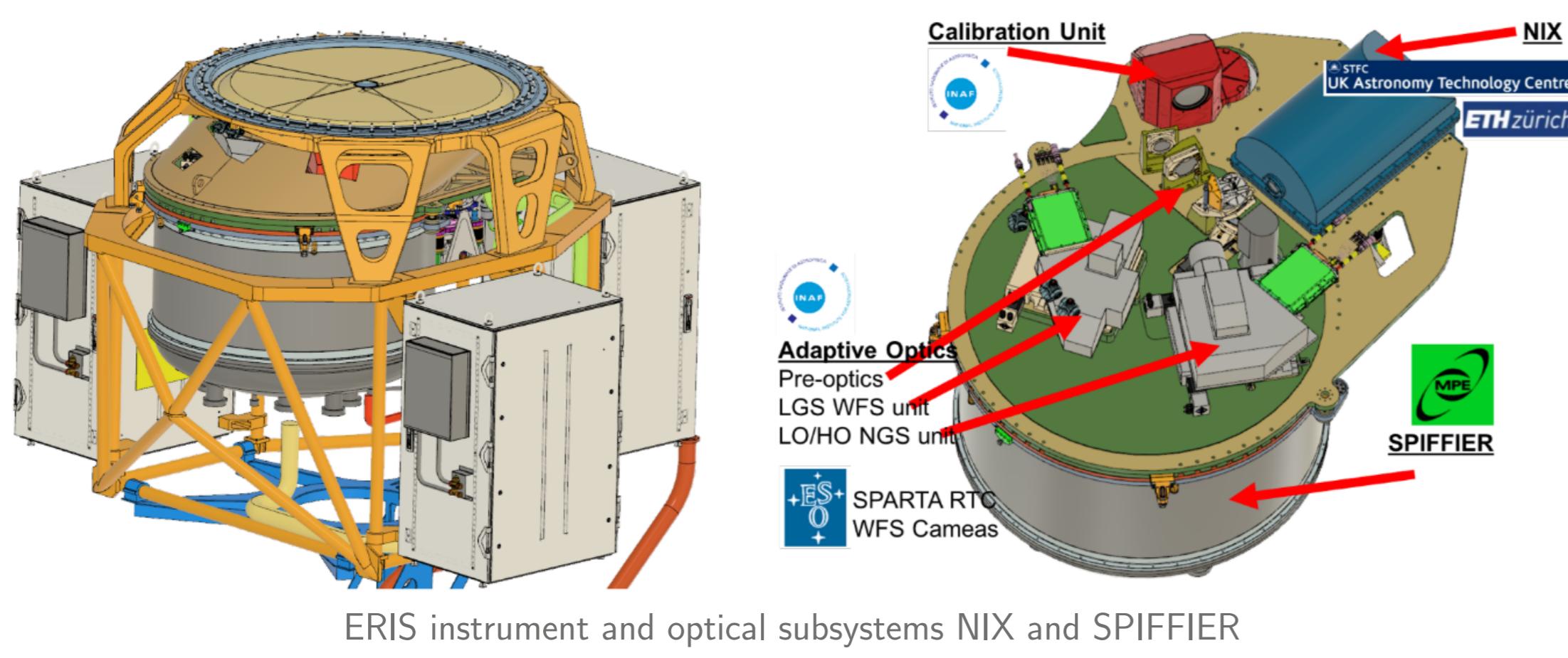
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Introduction

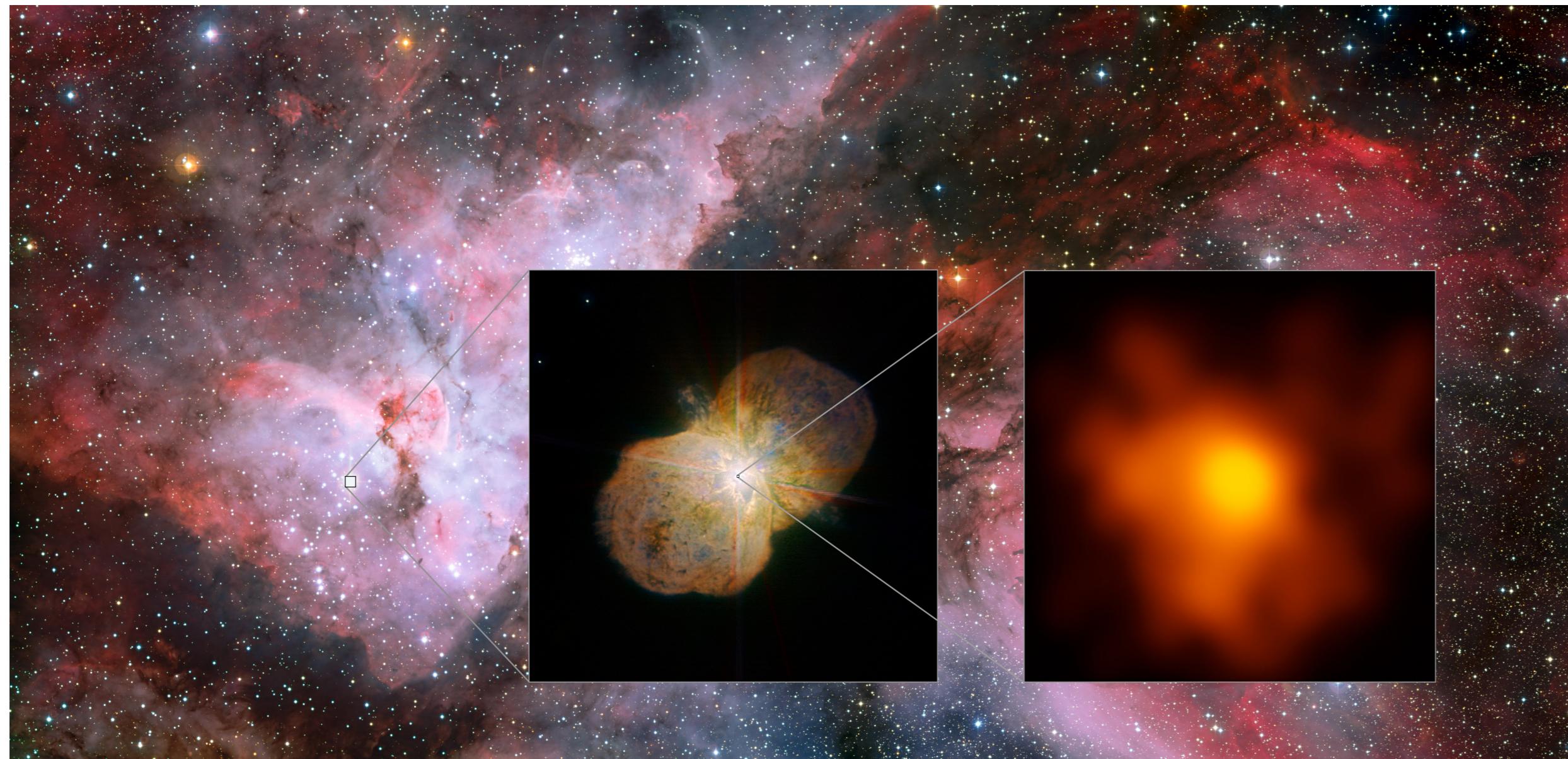
The Enhanced Resolution Imager and Spectrograph (ERIS) is the next-generation IR instrument for the Cassegrain focus of the Very Large Telescope (VLT). As the successor to NACO and SINFONI-SPIFFI, ERIS will use adaptive optics to provide high resolution imaging in the $1\text{-}5\mu\text{m}$ band, and $1\text{-}2.5\mu\text{m}$ spectroscopy. This will provide state-of-the-art detection IR imaging, replacing and exceeding the capabilities of current detectors at the VLT[3].



Science Mission

ERIS has a wide range of scientific objectives, encompassing many near to mid IR observation targets[1].

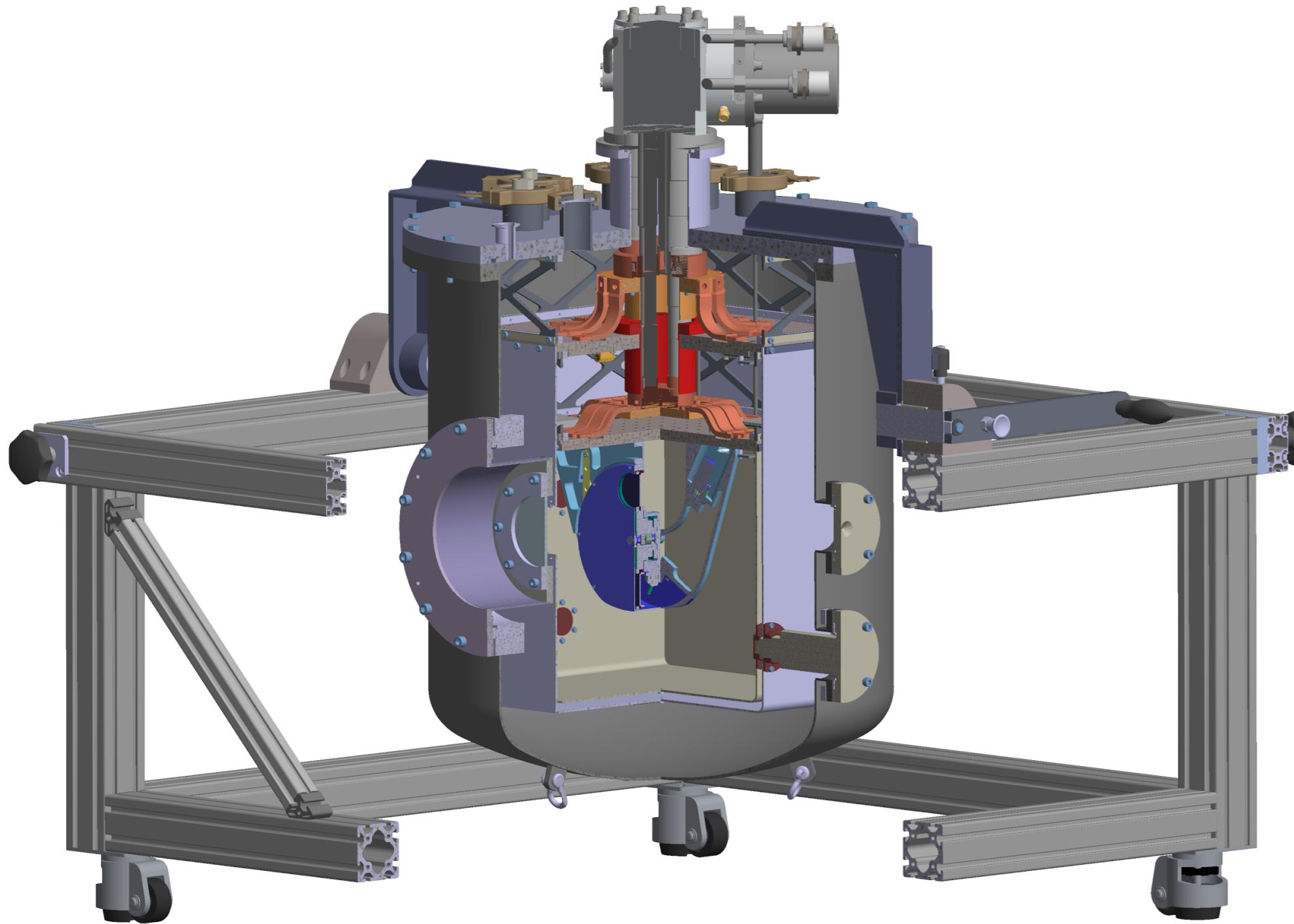
- ▶ **Solar System** - measurements of asteroids and the moons of Jupiter and Saturn.
- ▶ **Stellar Disks** - studies of proto-star and planetary formation.
- ▶ **Exoplanets** - Direct imaging and L-, M-band spectroscopy.
- ▶ **Black Holes** - using stellar orbits to measure the mass of Sagittarius A, along with accretion disk physics.
- ▶ **Galactic Centers** - studies of black holes and their effect on star formation.
- ▶ **Distant Galaxies** - Medium to high redshift galaxy dynamics and evolution.



ERIS will improve on the scientific capabilities of current instruments at the VLT. Credit: ESO/G. Weigelt

Test facilities

ETH Zürich has constructed a cryogenic test facility for precision testing of the optical wheels and astronomy instruments for the NIX imager. The facility was designed by the ETH Zürich engineering department.



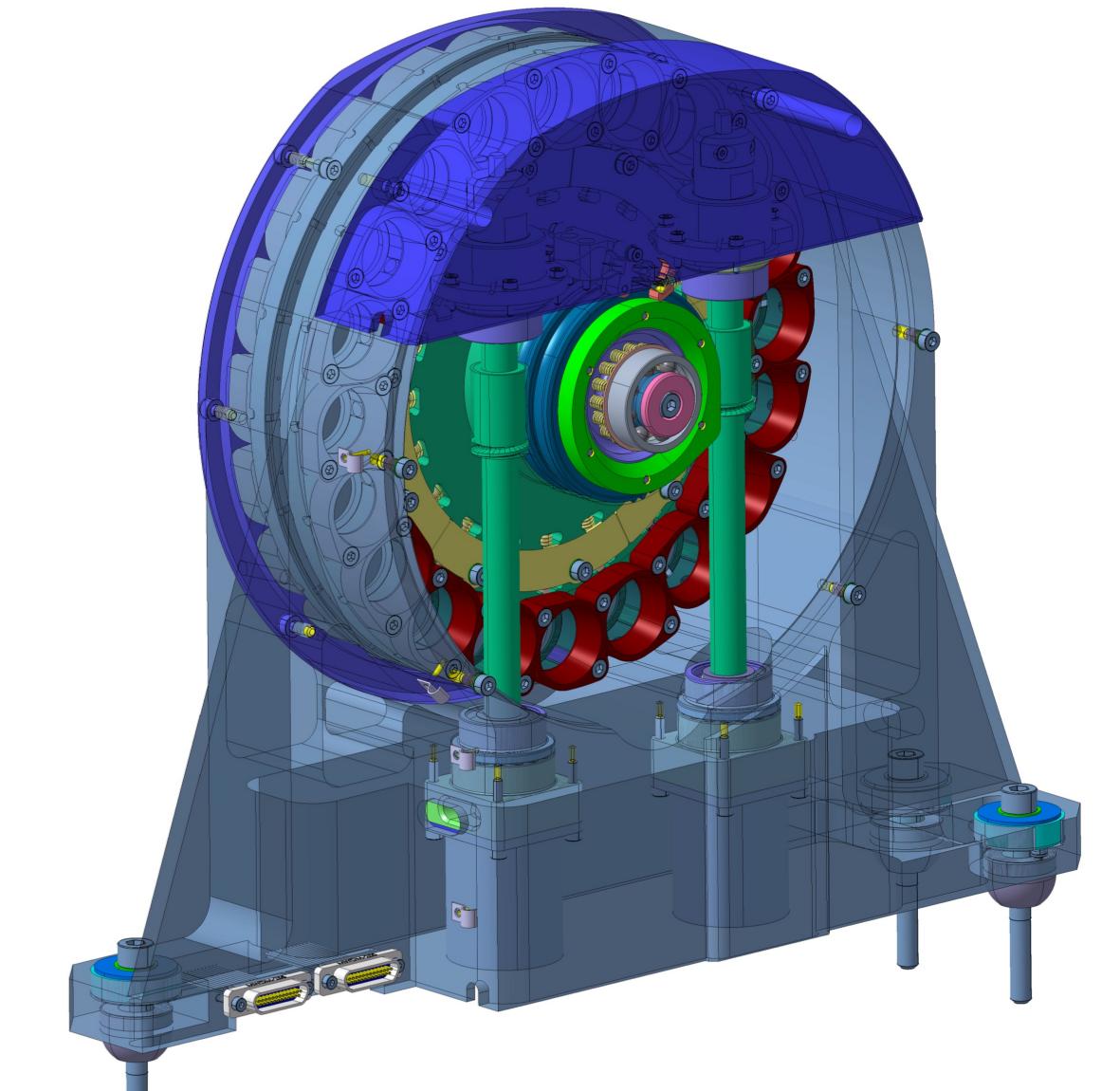
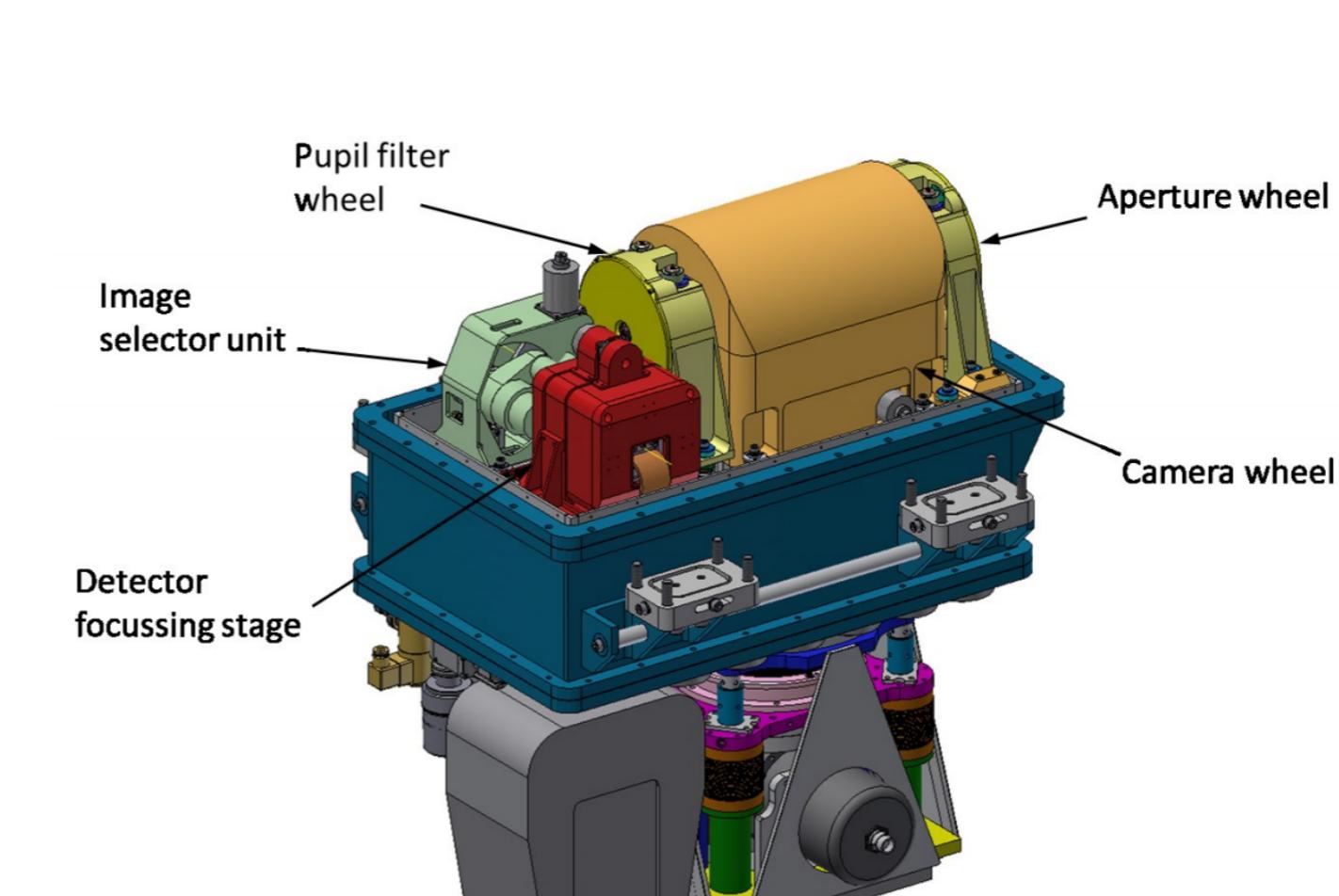
Cryogenic test facility located at ETH Zürich

Design

ERIS relies on several subsystems to improve the performance of the VLT:

- ▶ Adaptive Optics - ERIS is designed for superior Strehl performance.
- ▶ Calibration unit - Minimise instrument signature to reduce background noise.
- ▶ NIX - High resolution IR Imaging.
- ▶ SPIFFIER - IR Spectroscopy.

The NIX subsystem provides $1\text{-}5\mu\text{m}$ imaging, with functionality for coronagraphy, sparse aperture masking and L-M band longslit spectroscopy[2]. SPIFFIER acts as an upgrade to SPIFFI, providing high resolution integral field spectroscopy in the $1\text{-}2.5\mu\text{m}$ band.

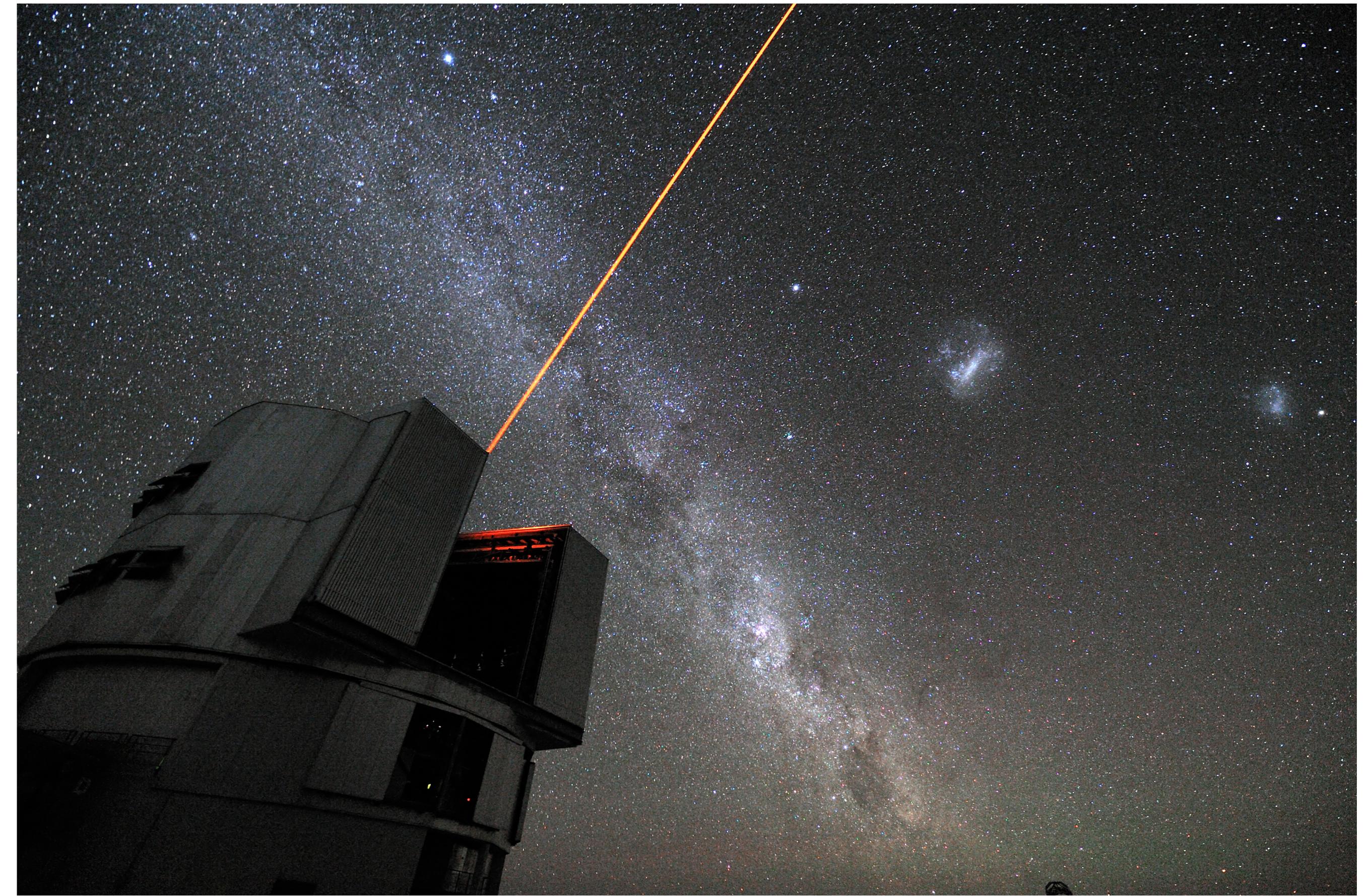


The NIX imager (left) and the pupil and filter wheel (right).

ETH Zürich contributes to the overall design and testing of the NIX subsystem. Present effort is focussed on manufacturing and testing the aperture, pupil and filter wheels at operating temperatures, critical to providing coronographic and spectroscopic capabilities. The pupils and filters can be combined to provide nearly 100 unique functionalities depending on the requirements of the the observation. To minimise optical aberration, the wheels are designed to provide accurate, repeatable positioning of the wheels with precision of $5\mu\text{m}$.

Current Status

In May 2017, ERIS passed its final design review, with hardware manufacturing and testing occurring over the next two years. Commissioning and first light at the VLT is expected in 2020.



ERIS will be installed on the VLT. Credit: ESO/B. Tafreshi

References

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- [3] Riccardi, A. et. al.
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