MeO Laser Ranging Station

ETIENNE SAMAIN[1], ABDEL ABCHICHE[2], DOMINIQUE ALBANESE[1], NICOLAS GEYSKENS[2], GILLES BUCHHOLTZ[2], AURÉLIEN DREAN[1], JULIEN DUFOUR[1], JÉRÔME EYSSERIC[3], PIERRE EXERTIER[1], FRANCIS PIERRON[1], MONIQUE PIERRON[1], GRÉGOIRE MARTINOT-LAGARDE[1], JOCELYN PARIS[1], JEAN- MARIE TORRE[1], HERVÉ VIOT[1],

[1]OCA, 2130 route de l'observatoire, 06460 Caussols, France
[2] OHP , *France*
[3] INSU DT , *France*

Observatoire de la CÔTE d'AZUR

OCA Laser ranging
New Organization

Until 2003 the French laser ranging activity was represented by 3 tracking laser stations

CERGA

Lunar Laser Ranging (LLR)
for the Moon and high altitude satellites

Satellite Laser Ranging (SLR)
for low altitude satellites

Transportable Laser Ranging System (FTLRS)
for mobile campaigns

OCA Laser ranging New Organization

Since 2004 and 2008 a new organisation has been setup to initiate, in addition to the last program, an instrumental Research and Development activity

GEOAZUR

ransportable Laser Ranging System (FTLRS)
for mobile campaigns

MeO Station
(Ex LLR)
for the Moon and both high a low altitude satellites
Research and Development

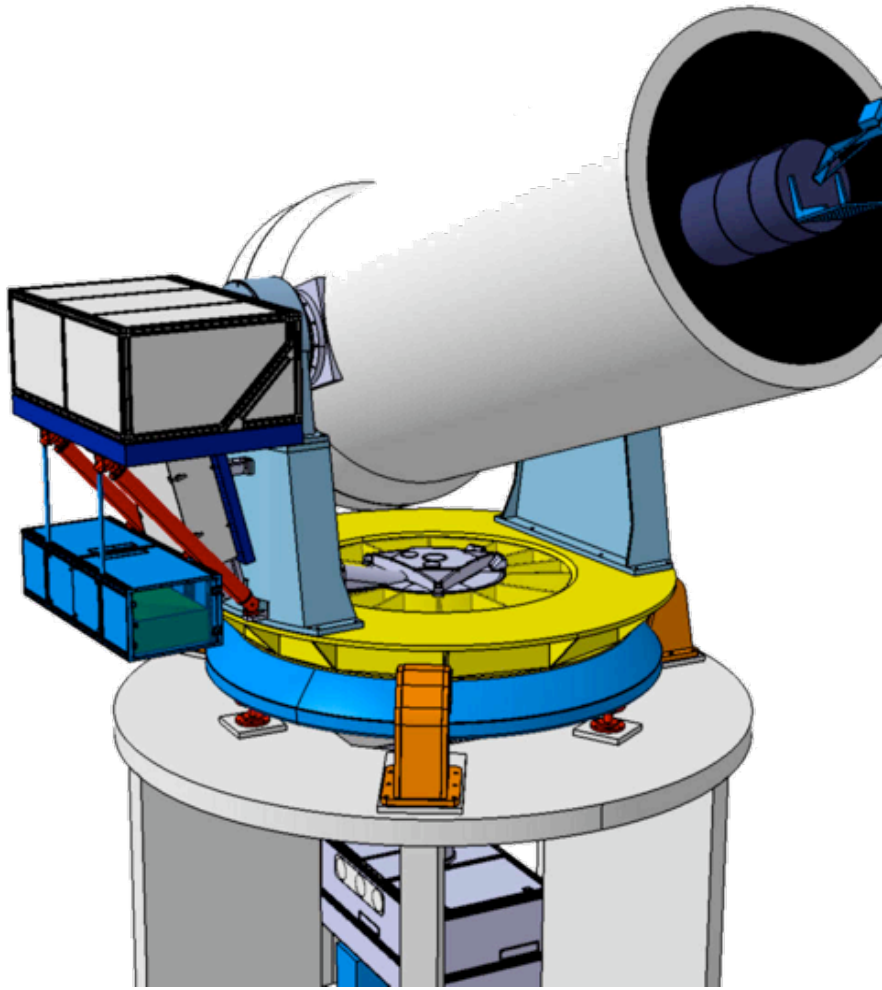
MeO Station

- Objectives
  - Increase the capability of the station
    - From 400 km to the Moon (speed)
    - One way interplanetary mission (accuracy)
  - Give the possibility to do Instrumental research (laboratories facilities)
  - Improve the automation

- Instrumental Developments
  - Transformation of the space to build laboratories
  - Replacement of the motorization of the telescope for speed and accuracy
  - Renovation of the dome for speed
  - Laser and coudé
  - Control Software
  -

MeO Station from 400 km to the moon

- Ritchey Chretien configuration
  - Primary Mirror: Parabolic 1540 mm
  - Nasmyth table
- AltAz mount
- Common Telescope
  - Laser emission
  - Detection
  - Video

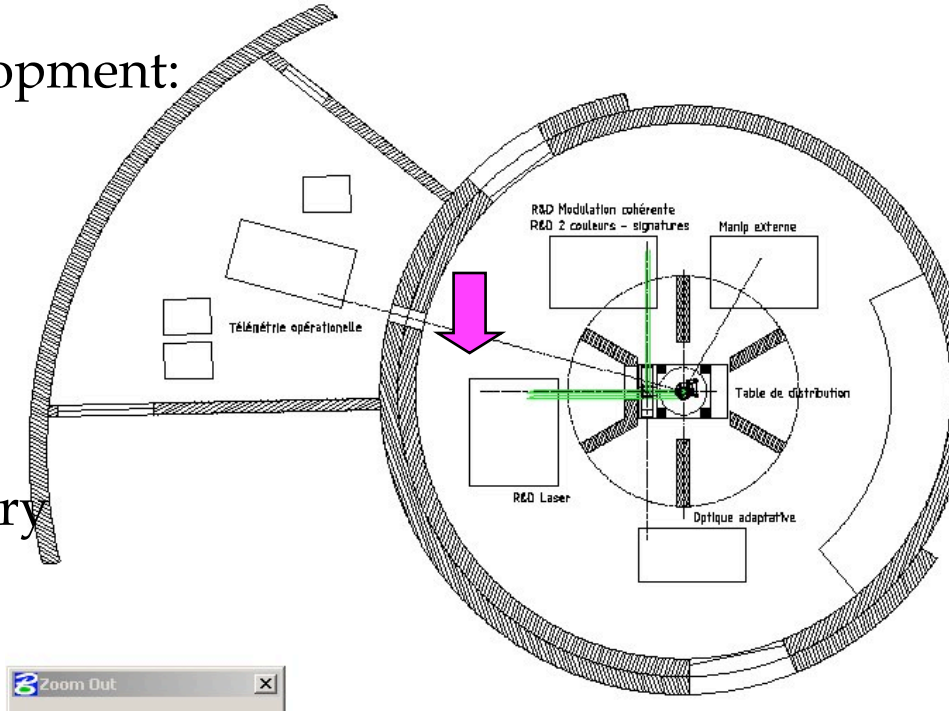


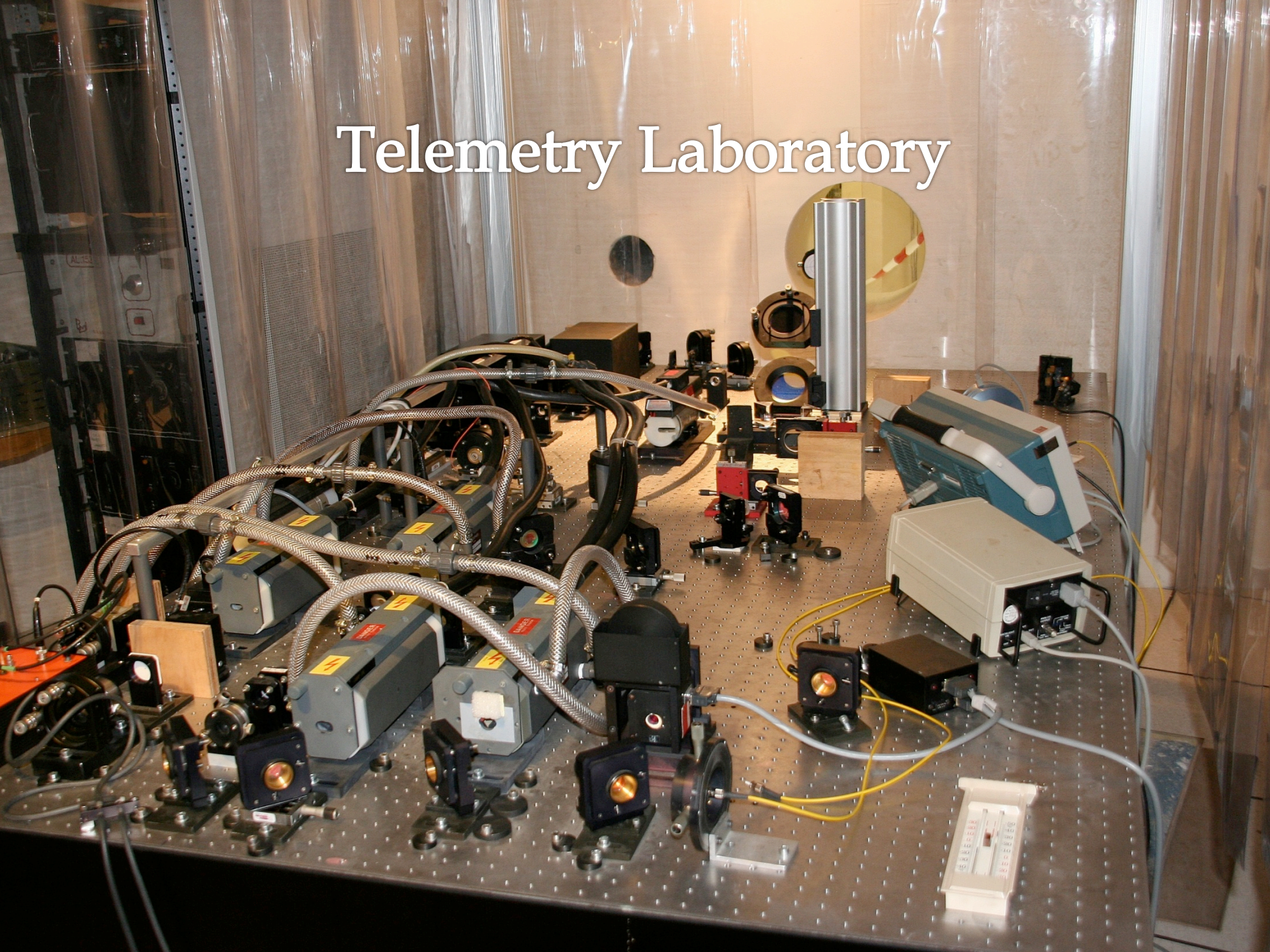
Focus laboratories

- Built 2 new laboratories in direct connection with the telescope flux

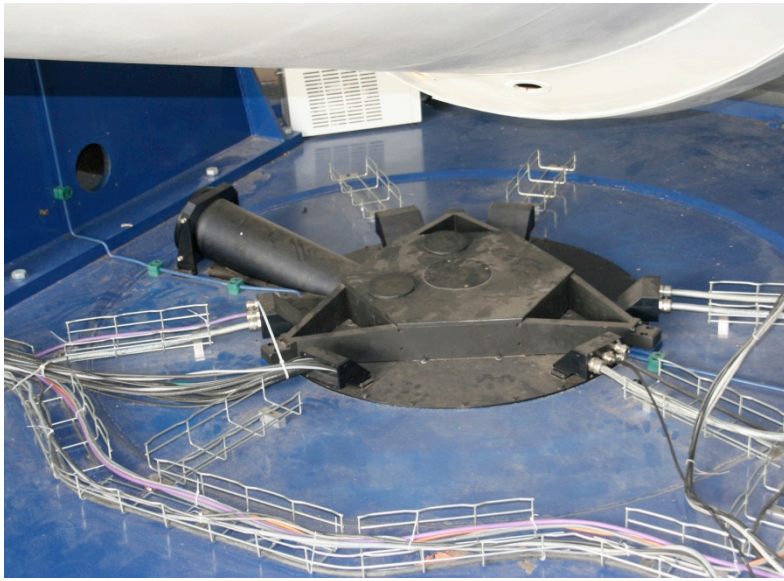
- laboratory for research and development:
  - » Circular room: 60 m²,
  - » 4 optical benches
  - » 1 optical bench for the optical flux distribution

- laboratory for operational telemetry
  - » 6 m apart from the telescope: 45 m²
  - » 1 optical bench for the laser and the detection unit



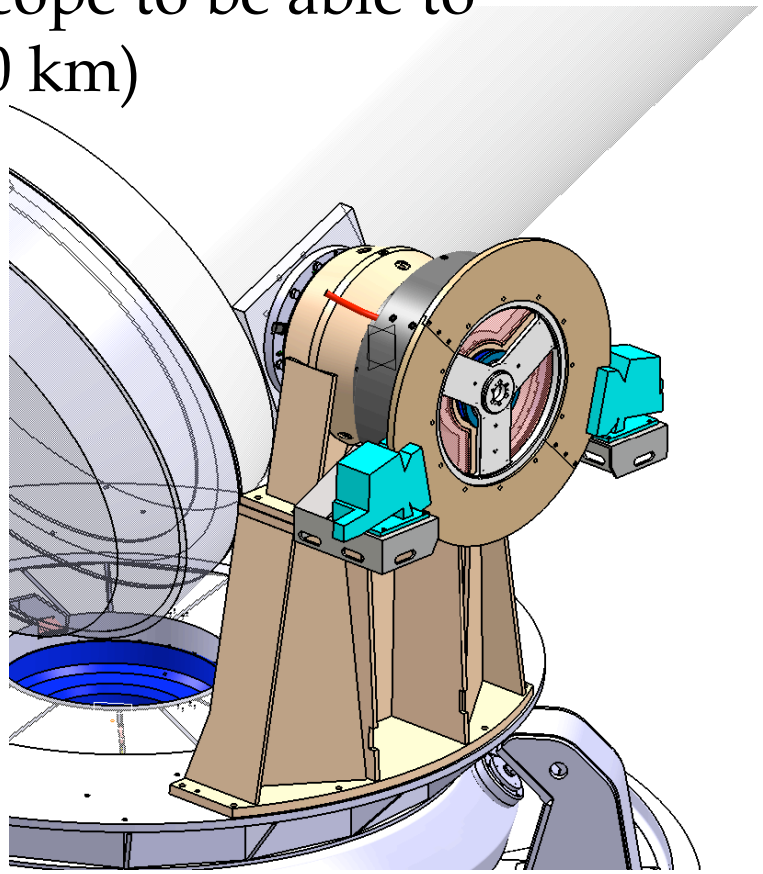

Telemetry Laboratory

Fold mirrors



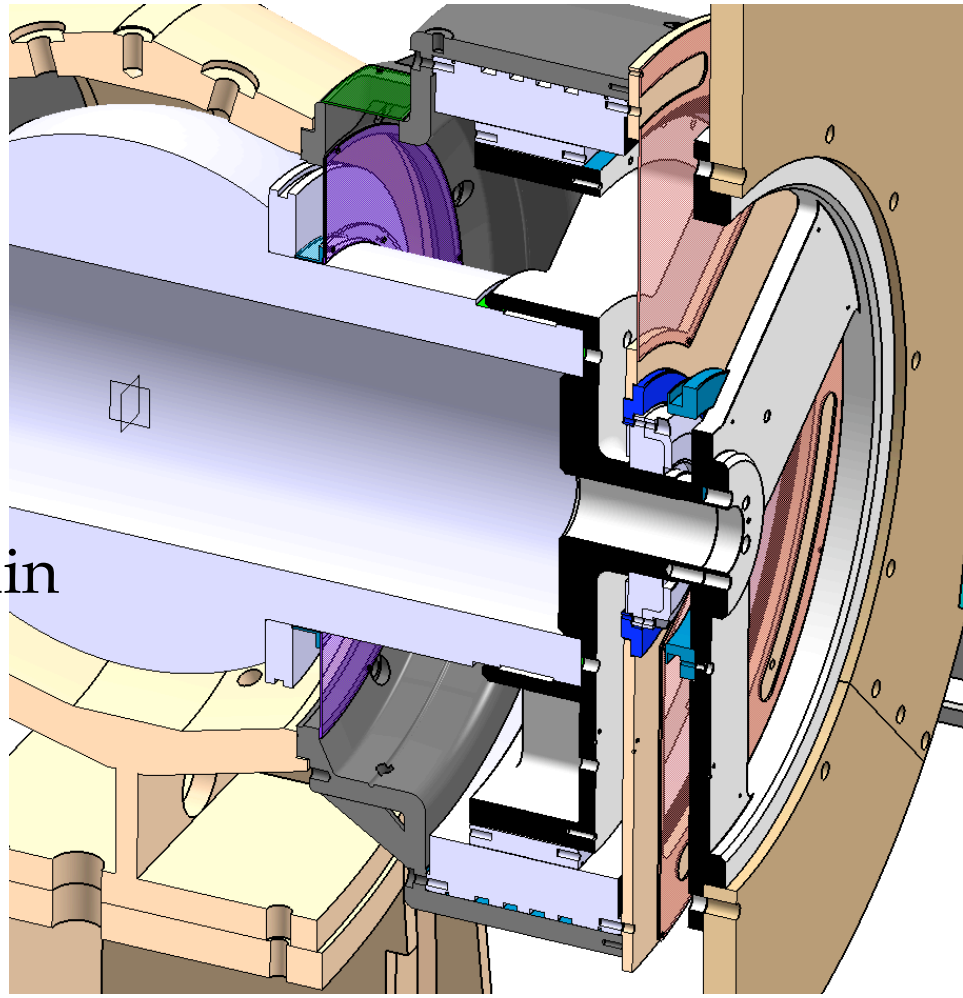
Telescope motorization
Speed and acceleration

- Increase the speed of the telescope to be able to track low altitude satellite (400 km)
  - speed: 5°/s
  - acceleration: $1°/s^{-2}$
  - Dôme speed: v = 5°/s



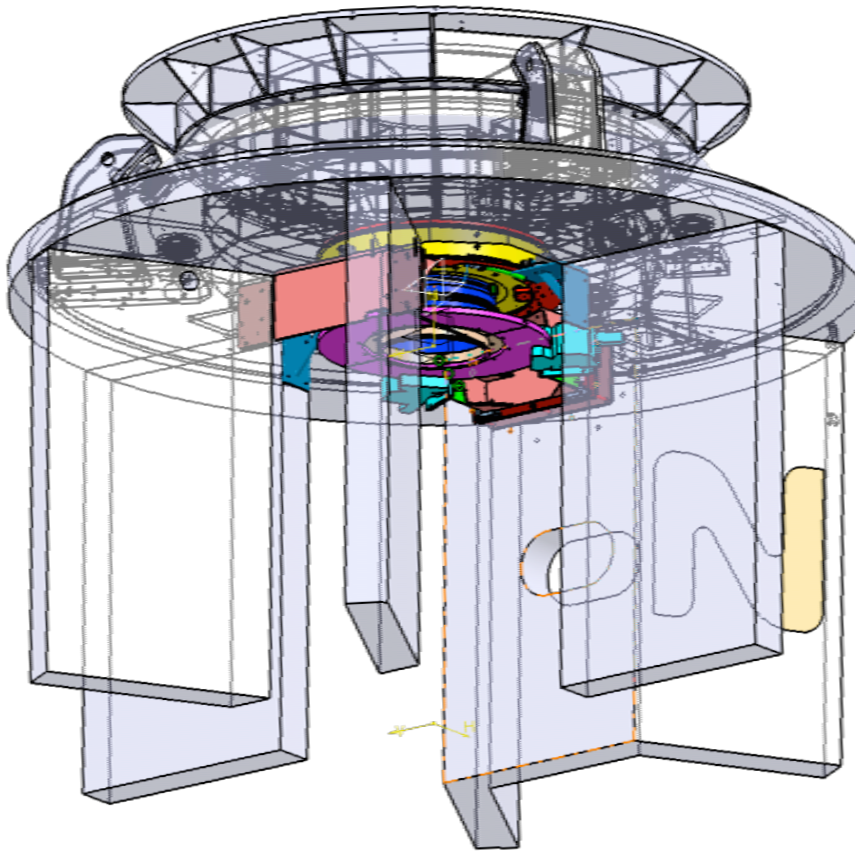
New motorization Elevation axe

- Direct drive Etel motor
  - Torque: 1000 kg.m
  - Diameter 800 mm
- DSPC2 drive (Etel)
  - Encoder integrator
  - Power module
  - Computation system
- Absolute encoder Heidenhain
  - Linearity : 1 arcsec
  - Precision : 0.01 arcsec
- Brake
  - Parking
  - Security

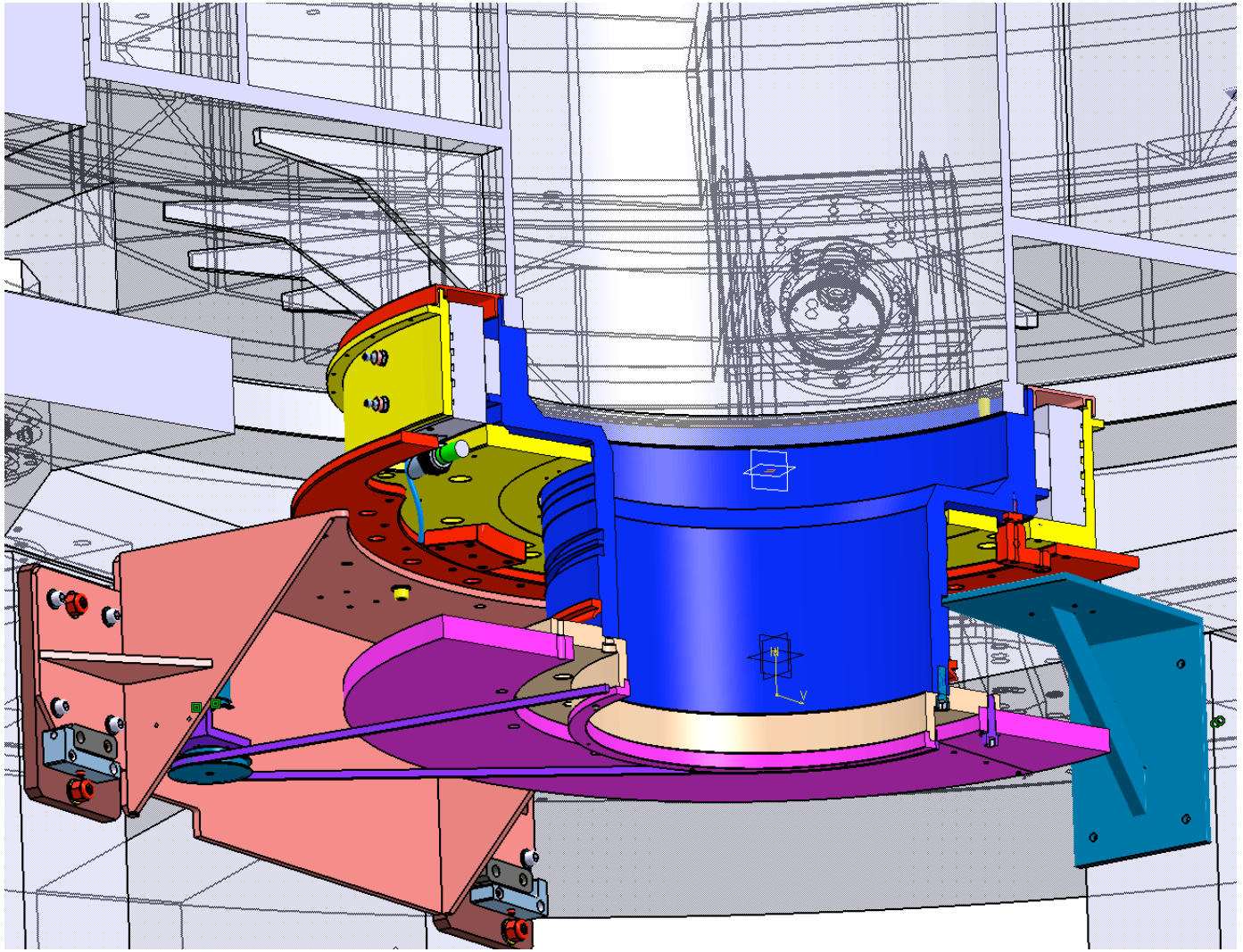


New motorization vertical axe

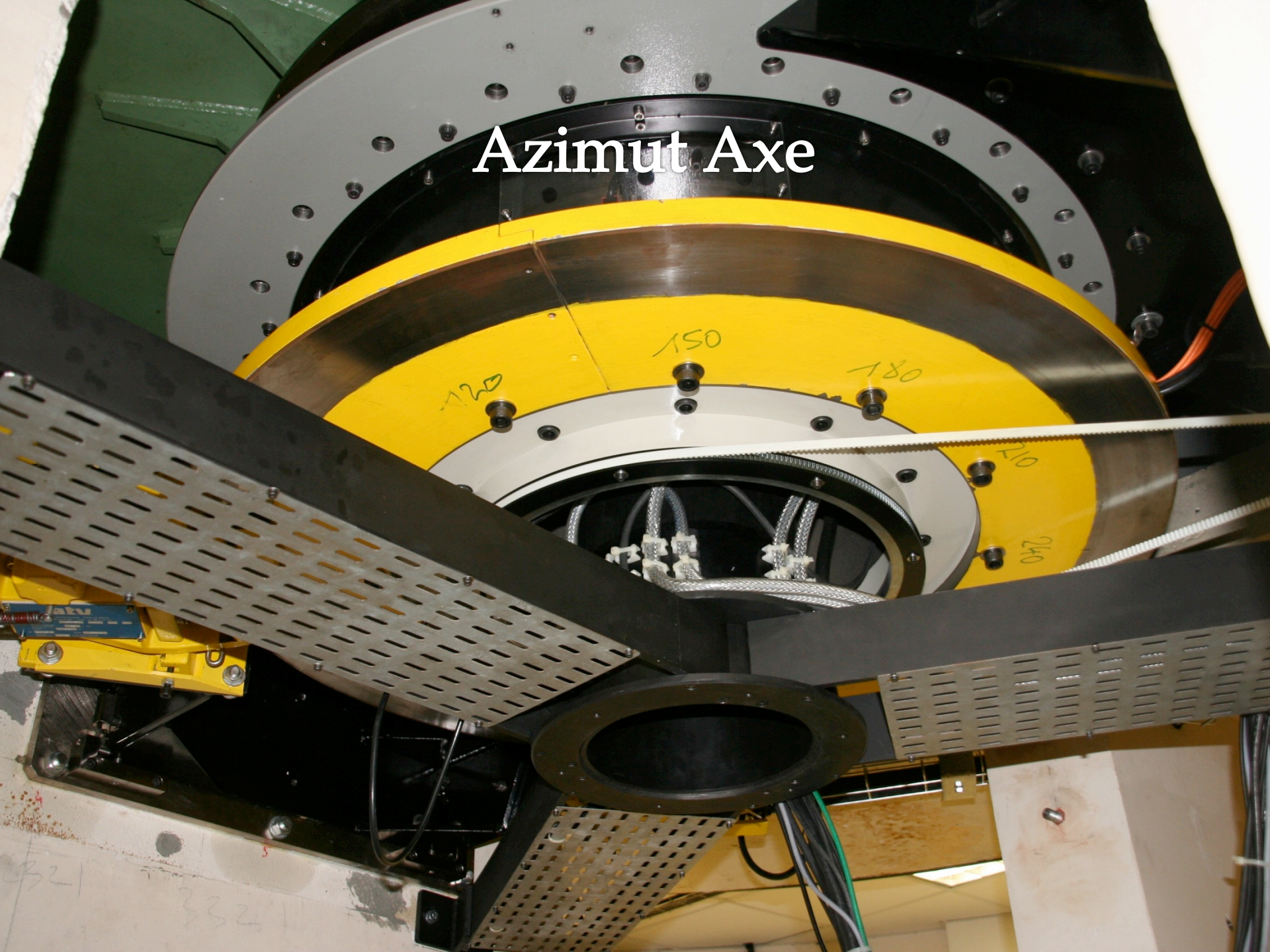
- Direct drive Etel
  - Torque: 1000 kg/m
  - Diameter: 1000 mm – 600 mm
- DSPC2 drive (Etel)
  - Encoder integrator
  - Power module
  - Computation
- Incremental tape encoder Heidenhain
  - Linearity : 20 arcsec
  - Precision : 0.01 arcsec
- Brake
  - Parking
  - Security



New motorization
Direct drive and direct encoder



Azimut Axe


Azimut Axe
120
150
180
210
240

Dome

Status

- First light of the telescope in the new configuration: May 2008
- First echoes obtained in July 2008
- Continuous observation will start by the end of October
- Ranging the moon in November

Conclusions

- The capability of the station is now extended from low altitude satellite to the moon or spacecraft in the solar system
- The Moon will continue to be a major objective for the station together with Time transfer and high altitude satellite
- The new configuration of the station will permit to perform both laser ranging and experimental research