

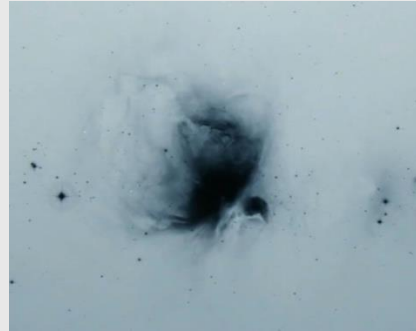
CAHA Over the last 50 years



History



- **1967: MPIA was Born**
- **1968: Looking for the best place**
- **1970: Calar Alto IS the best place**
- **1973: Agreement between Spain and Germany (10% to 90% funding)**
- **1975: 1,23 mT first light and official inauguration**
- **1979: 2,2mT first light**
- **1980: First light Schmidt Telescope**
- **1984: 3,5 mT first light**
- **2005: MPIA 50% CSIC 50%**
- **2019: MPIA 0% CSIC 50% Andaluca 50%**

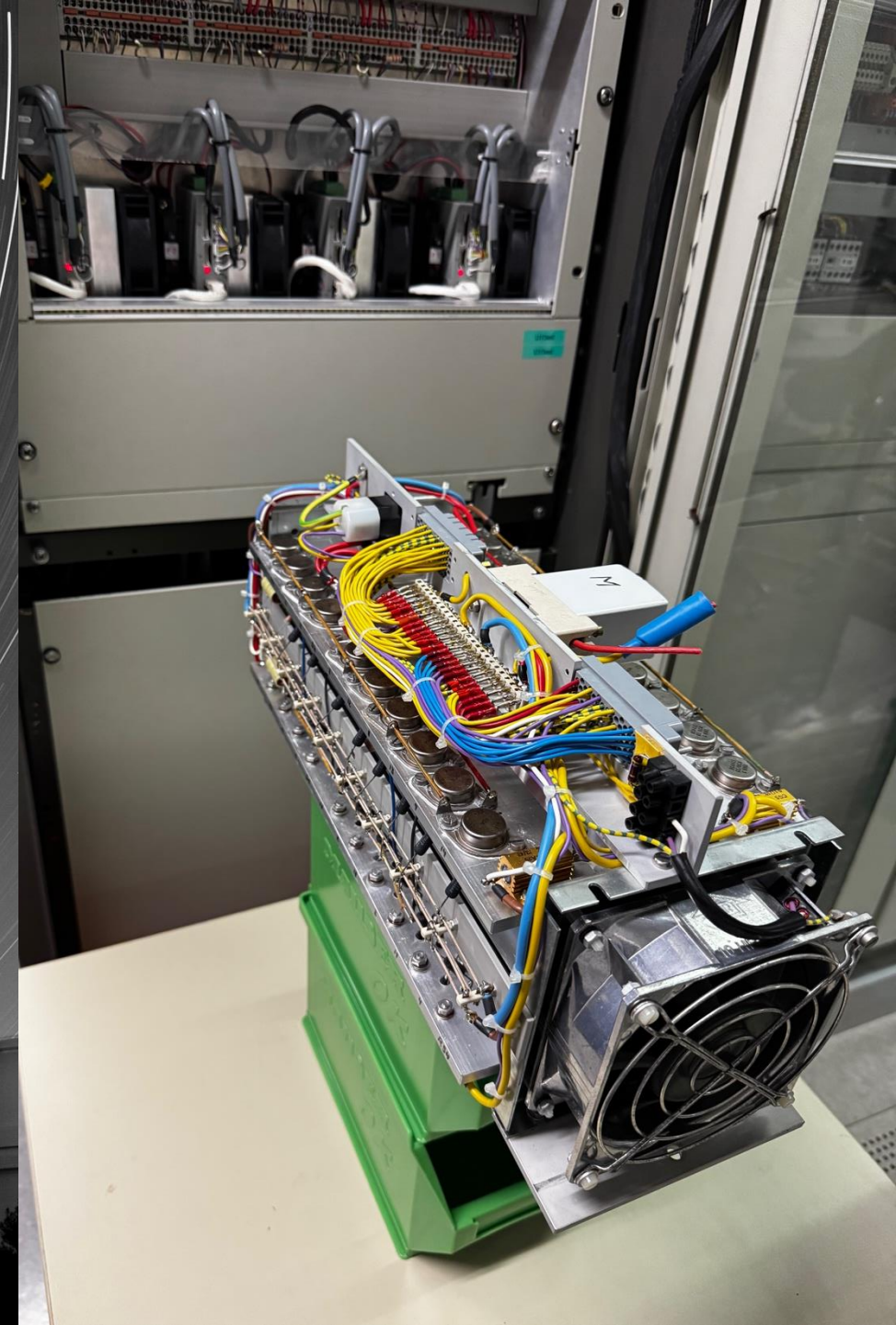


Technical evolution Schmidt Telescope:

- 1980 -1998 with Photo plates, many technical problems due old electronics and mechanics
- 2014 -> Complete renewal of electronics and integration of the first CCD camera (SBIG ST-10 2184x1472 pixel) by CAHA
- Full robotic mode driven by scripts
- 2015 -> Main observer are ESA for NEO's
- 2020 -> INDIGO Observing Gui, which allows to integrate hardware drivers for easier integration
- CAHA develops its own drivers for non commercial HW, which will spare time
- Newer cameras:
 - Finger lakes proline PL230 2016 -> 2025
 - Moravian C5S150M (CMOs 14208x10656 pixel) 2025 ->

Technical evolution 3,5 m Telescope:

- Originally linear amplifiers (transistor cascades)
- The telescope was like a computer with an 1 km long data bus!!
- Many electrostatic problems in dry days
- No spare parts available
- In 2004 Zimi/Wolf (Mpia) and CAHA staff worked together to renew the 3,5 mT electronics
- New drivers from Delta Tau
- 5 New VME computers
- Coude mode decomissioned



Technical evolution 2,2 m Telescope:

- New touch panel for Engineering
- Refurbishment for electronics, motors and encoders
- New controller based on PLC's and industrial drivers
- GUI based on INDIGO
- Automatic dome safety system for all domes



Calar Alto Observatory Schmidt Telescope

File

ST	02:06:14.0	UT	09:43:47.0	JD	2000.0	REMOTE
RA	02:06:13.9	DEC	37:13:26.7	HA	00:00:00.0	
Az	0.0	El	90.0	AirM	1.00	Start Up
DomeAz	359.7	D-Slit	Closed	Focus	N.A.	Shutdown
						M1 Cover
						Abort

Messages

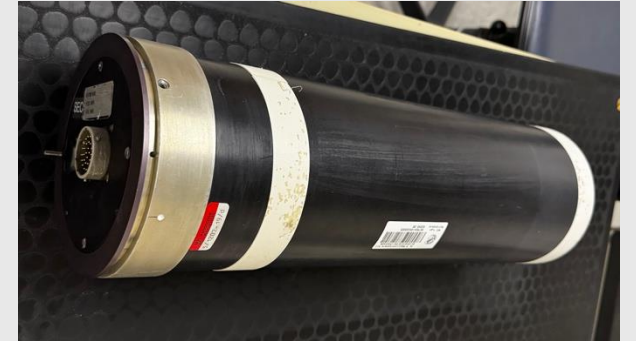
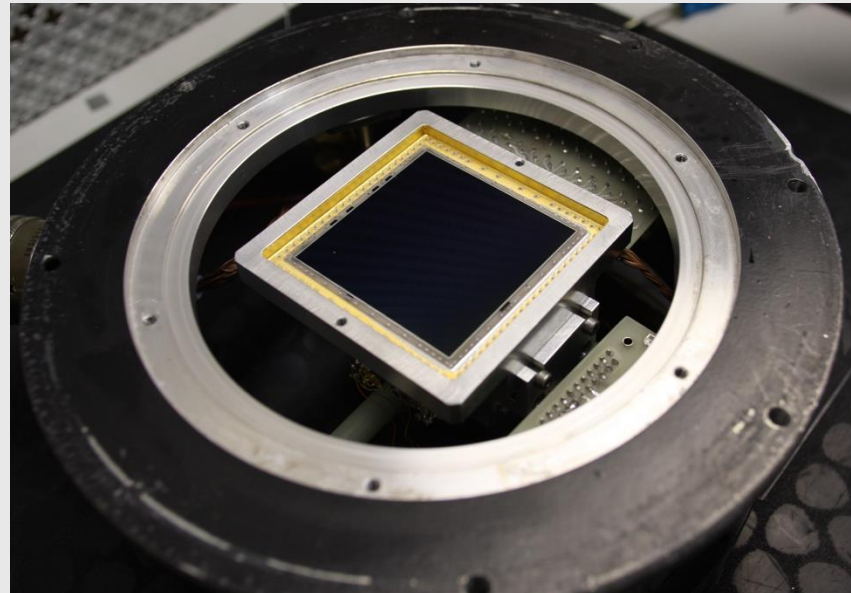
2025-05-30 11:43:28.915 - INFO - Connected to server schmidt.caha.es:7624.
2025-05-30 11:43:29.912 - INFO - Server schmidt.caha.es:7624 for Calar Alto Schmidt MOUNT is online and available.
2025-05-30 11:43:29.913 - INFO - Calar Alto Schmidt MOUNT is CONNECTED to server schmidt.caha.es:7624.
2025-05-30 11:43:30.420 - INFO - Server schmidt.caha.es:7624 for Calar Alto Schmidt DOME is online and available.
2025-05-30 11:43:30.420 - INFO - Calar Alto Schmidt DOME is CONNECTED to server schmidt.caha.es:7624.
2025-05-30 11:43:30.922 - INFO - Server schmidt.caha.es:7624 for Calar Alto Schmidt FOCUSER is online and available.
2025-05-30 11:43:30.923 - ERROR - Calar Alto Schmidt FOCUSER is DISCONNECTED from server schmidt.caha.es:7624.
2025-05-30 11:43:34.907 - INFO - [Calar Alto Schmidt MOUNT.HYDRAULICS] Switching Telescope Hydraulics ON...
2025-05-30 11:43:36.908 - INFO - [Calar Alto Schmidt MOUNT.HYDRAULICS] Telescope Hydraulics ON.
2025-05-30 11:43:38.907 - INFO - [Calar Alto Schmidt MOUNT.DRIVES] Telescope drives ON.
2025-05-30 11:43:39.914 - INFO - [Calar Alto Schmidt MOUNT.MOUNT_PARK] Telescope mount unparked.
2025-05-30 11:43:39.915 - INFO - [Calar Alto Schmidt MOUNT.MOUNT_PARK] Telescope mount unparked.

Desk Control Hydraulics Drives Tracking Dome Abs. Pos. Dif. Pos. Settings

Technical evolution Instruments:

A bit of history:

- 1976 – 2000: Photographic cameras! Chemical developing on site
- 1976 - 1980:” Bildvertarker”, first non photographic images
- Autoguidier 3,5 mT with cathodic tubes and light amplifiers
- 19?? - 1988: Reticon (LCD array)
- 1990 - Today: CCD
- 1998 - 2007 Magic first IR detector



Actual Instruments 3,5 mT:

- Carmenes

Improvements in Radial Velocity (2016 (~100m/s) -> 2024(~<10m/s))

Interlocks, data acquisition Scada and Grafana

New Proportional Valves in state of On/Off/Valves

Several new PI controllers and flow meters

- New AG Guider for all 3 telescopes (Developed around 2013)

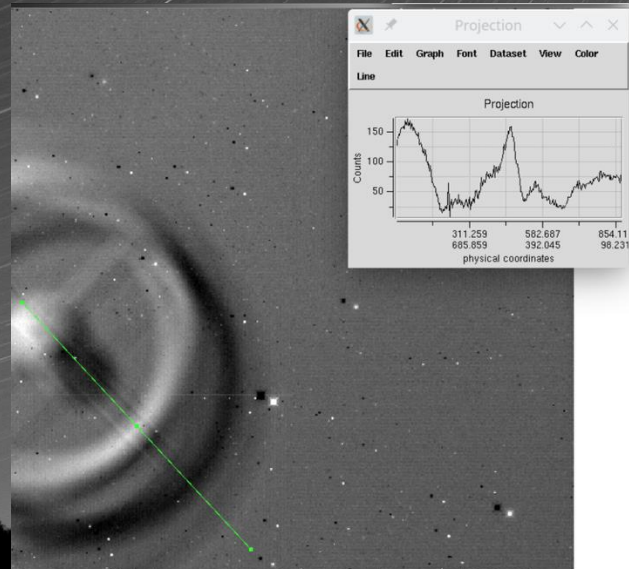
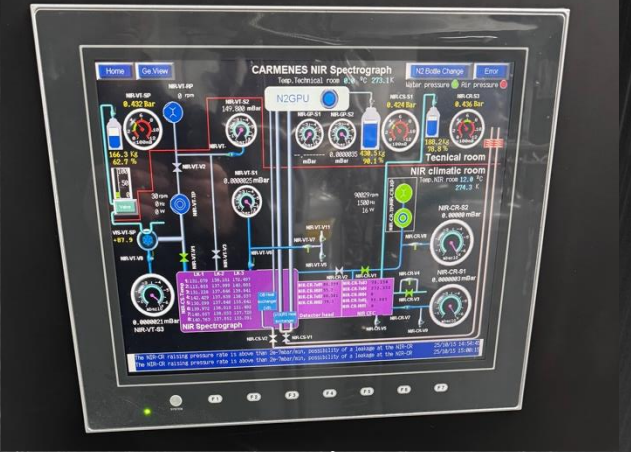
Motor Drivers from EPOS

Cameras with USB connection

Computer near camera in Cass

- O2K (2003 ->) 22 Years old and still grate scientific results

Right now we are investigating some reflections, (filters Coating?)



Actual Instruments 2,2 mT:

Cafos (1997 ->): until now 28 Years fully operational

New ROE (2008)

New shutter (2008)

New GUI

But still original MCU and Lamp unit

Astralux:

Andor Camera

(IA 197x, old CPU for Filters still operational!!)

old spare Pc from EBAY!!!

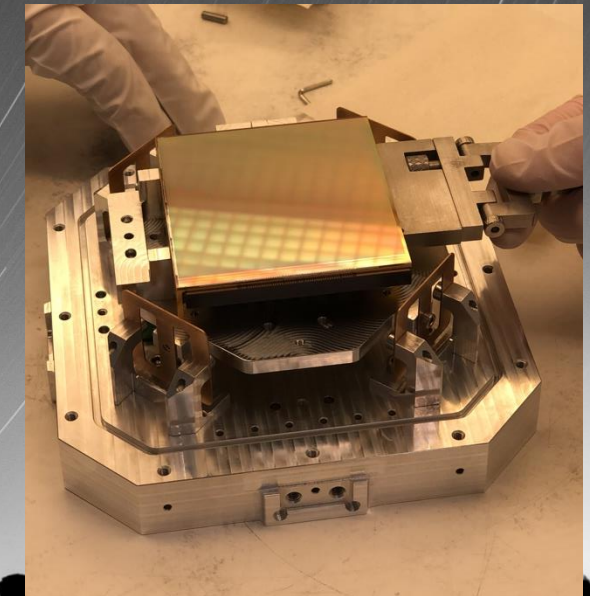
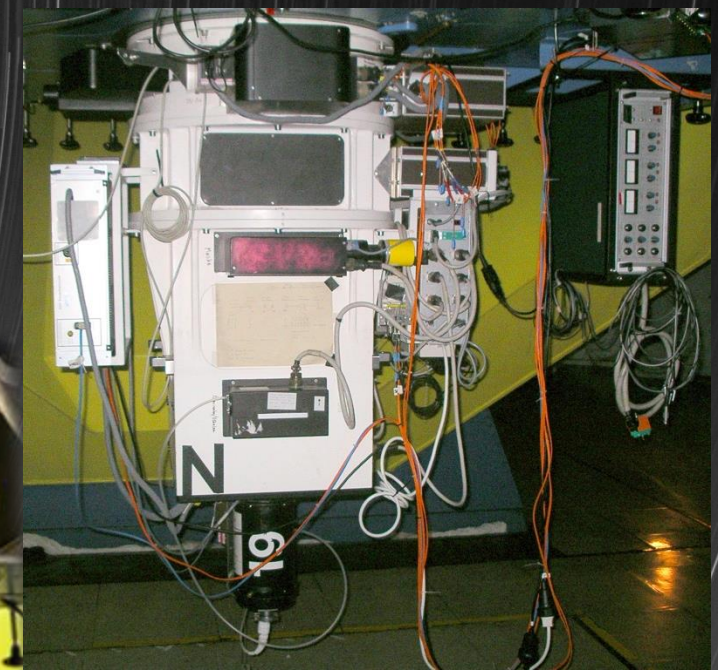
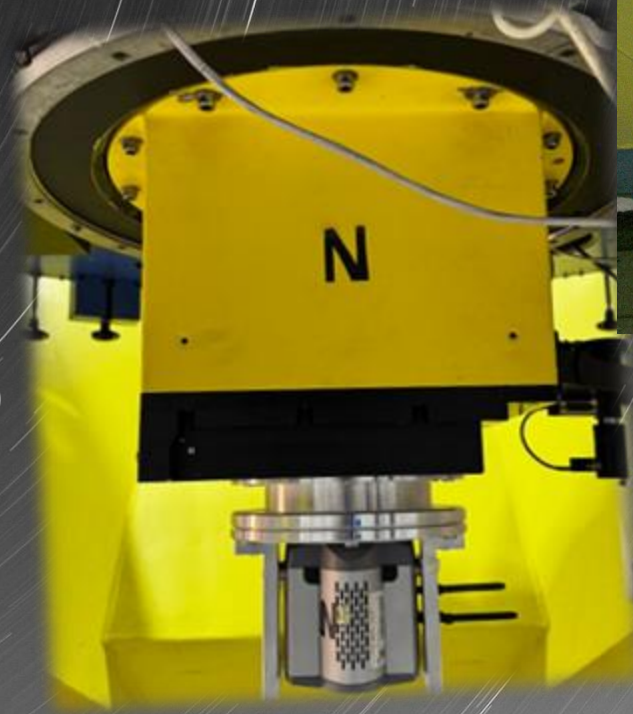
Improvements by Felix Hormut 2025

Panic:

New detector (2019, first light 2024)

New interlock for safety (2025)

New AG Guider (2013)



Actual Instruments 1,23 mT:

IA 197x Old CPU for filter wheels still operative

AG Guider (2013)

DLR CCD

Clear tendency to industrial CMOS cameras:

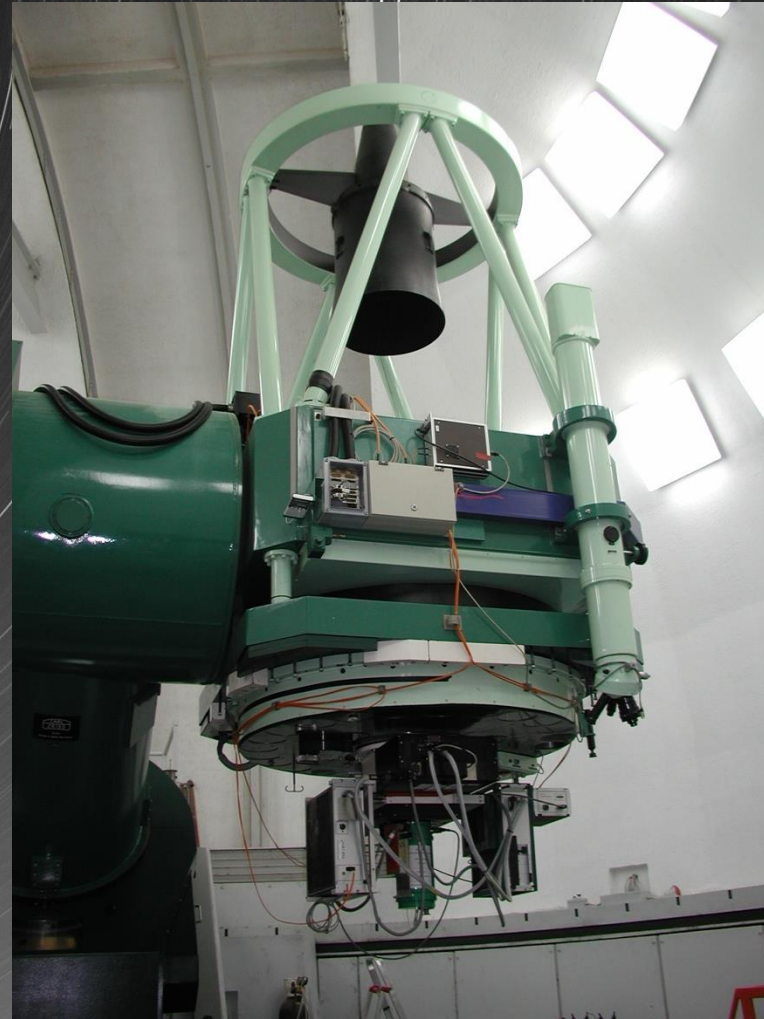
ASI 461

ASI 478 (finder 1,23 for planetary)

Ikon XL (Andor)

ASI 6200

SWIR camera



The near future:

Marcot:

Collects light from 7 cheap commercial telescopes in one single mounting

Direct Imagin:

Each telescope has his own camera (Commercial Cmos)

The 7 images are combined to add light

Spectroscopy:

There will be an Photonic lantern (under developing)

The light form 7 telescopes will be added and mixed to only one fibre

This single fibre will be projected to an spectrograph (MUSE from ESO VLT)

Minor upgrades:

Rotator for Cassegrain 1,23 mT

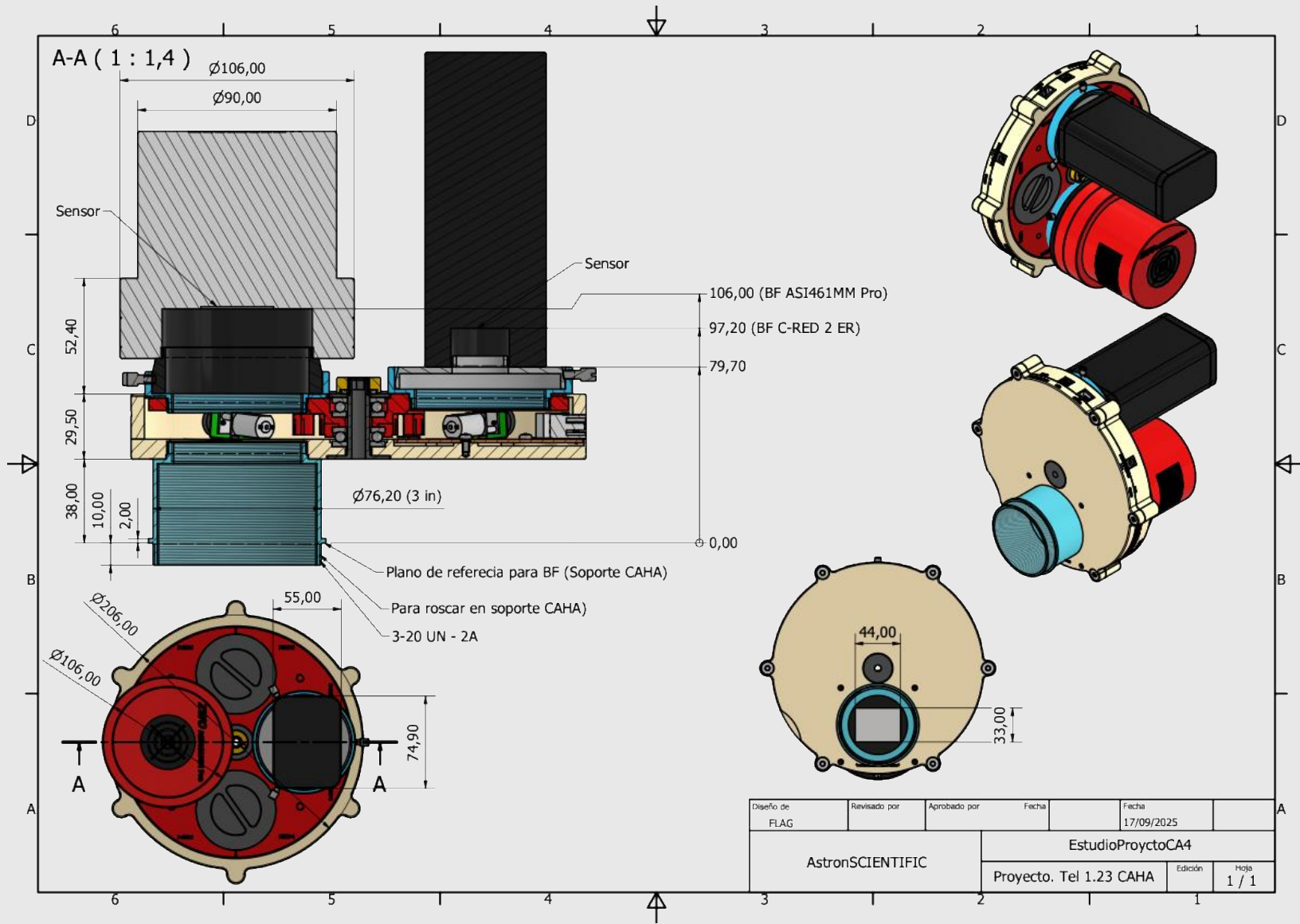
Cassel camera tests (Curved detector)

Old instrments but only < 3% faliures

This means a VERY GOOD TEAM WORK, MPIA developes, Caha Maintenance, Astronomers good projects and results, Instruments older than 25 years still full operational!

A long-exposure photograph of a night sky filled with star trails. The trails are curved, indicating the Earth's rotation. In the foreground, the silhouettes of two observatory domes and a line of trees are visible against the dark sky. The text "Thanks' for your attention!" is centered in the middle of the image.

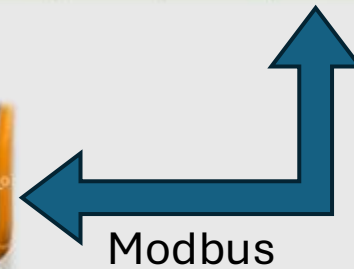
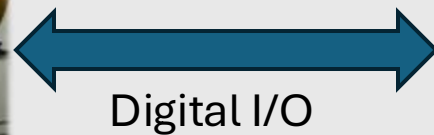
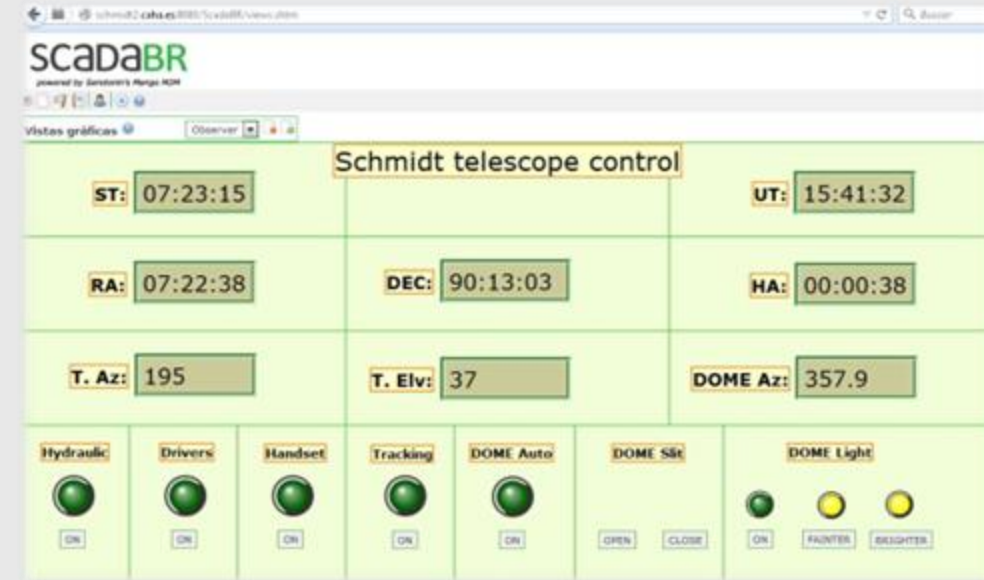
Thanks' for your attention!



Rotator for 1,23 cameras at Cass focus

1º Fase

- Objectives: Should be fast to implement and cheap (the main aim was to demonstrate we can!)
- Camera: CCD SBIG ST-10 (2184x1472)
- Interface console: PLC + SCADA
- Dome Guiding
- Manual and remote modes



2º Fase

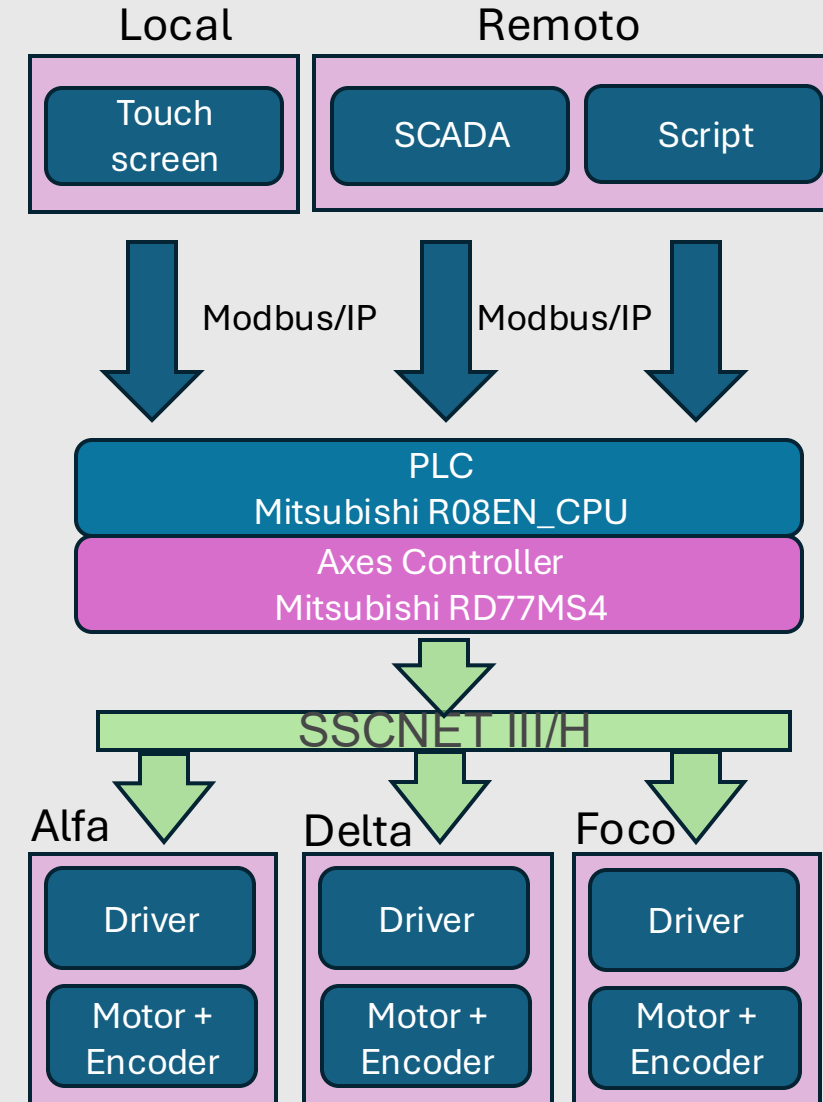
- PLC + Axes and Drivers controllers
- Motors Substitution (Alfa y Delta)
- Focus Motor substitution
- New Observing Script
- Integration of the main meteorological system
- New detector Proline PL230 (2048x2048) (40'x40')

PLC tasks

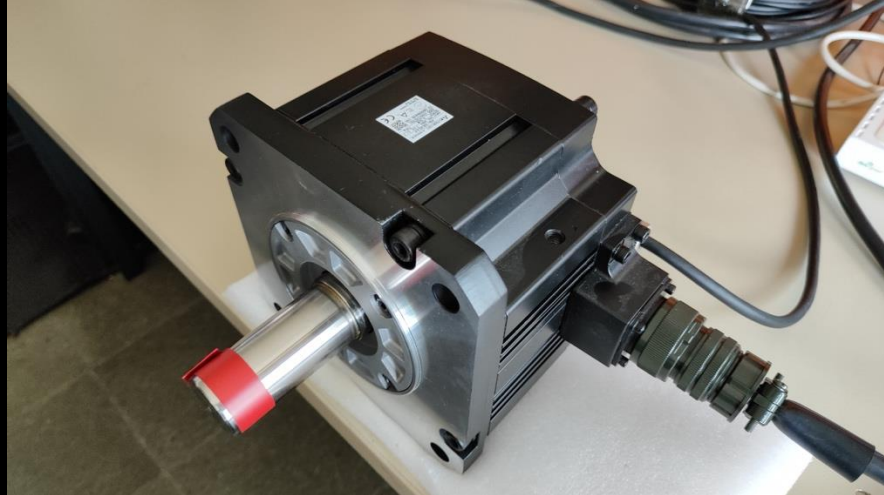
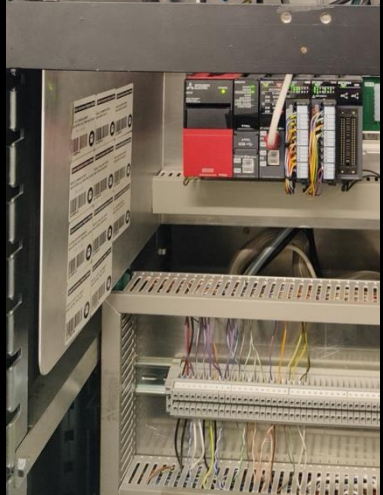
- Sidereal time calculation
- Time Synchronization (SNTP)
- Celestial coordinates calculation
- Motors Position
- Tracking velocity
- Pointing Modell
- Atmospheric correction
- Remote ON/OFF

Script tasks

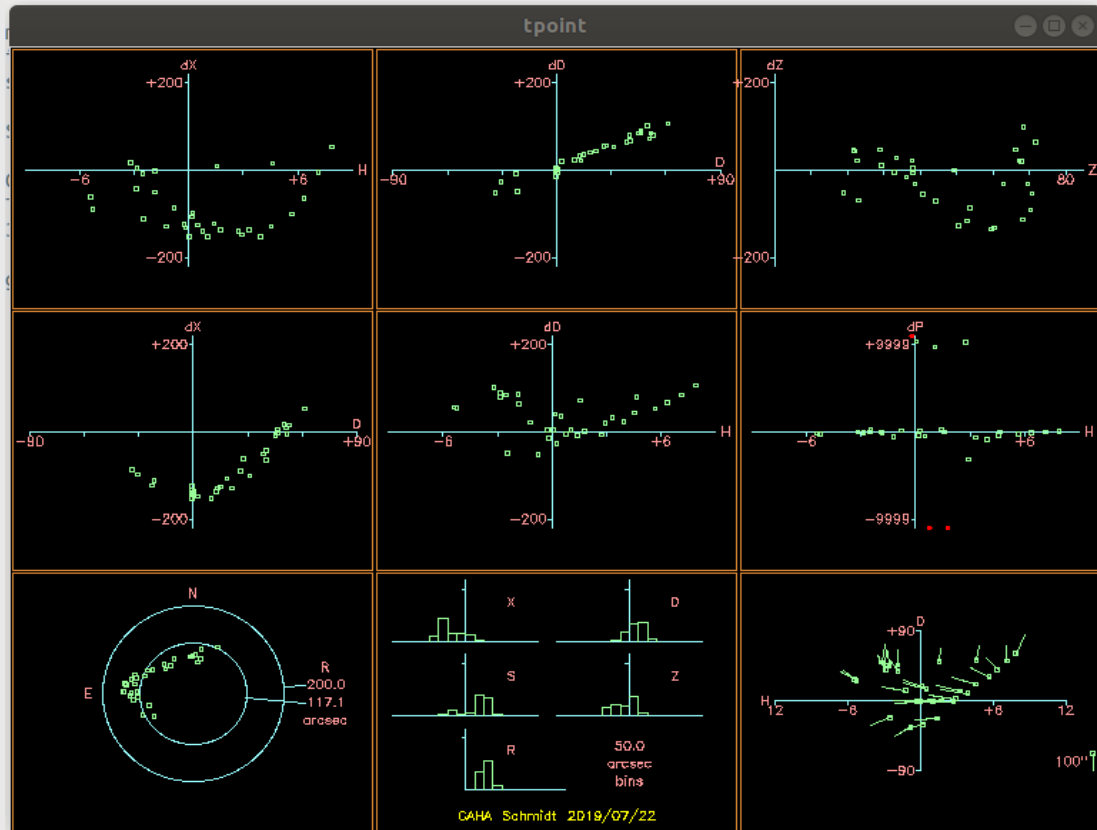
- Developed in Python
- Converts observing files (XML)
- Observing verification
- Convert Coordinates J2000 to actual date
- Image acquisition



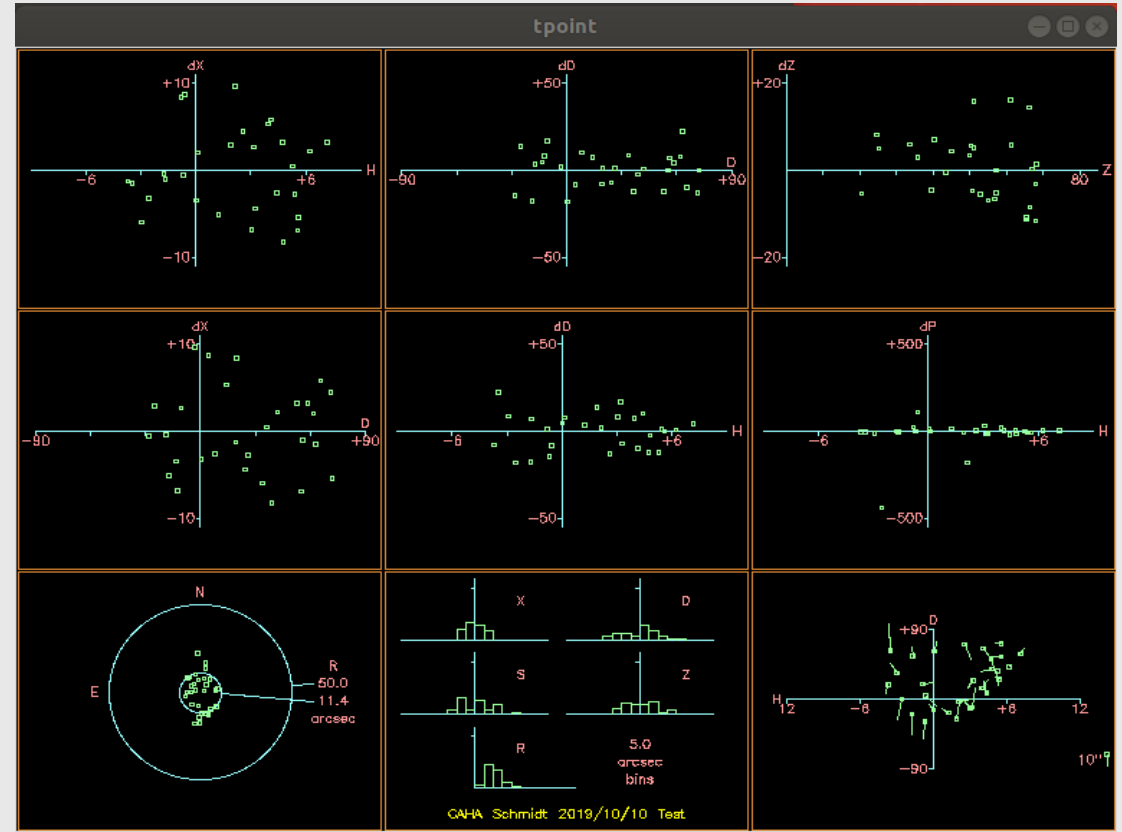
Some [pictures](#)



Pointing modell



	dX	dD	dS	dZ	dR
RMS	102.58	56.55	96.55	66.32	117.13



	dX	dD	dS	dZ	dR
RMS	4.86	10.26	8.37	7.68	11.35

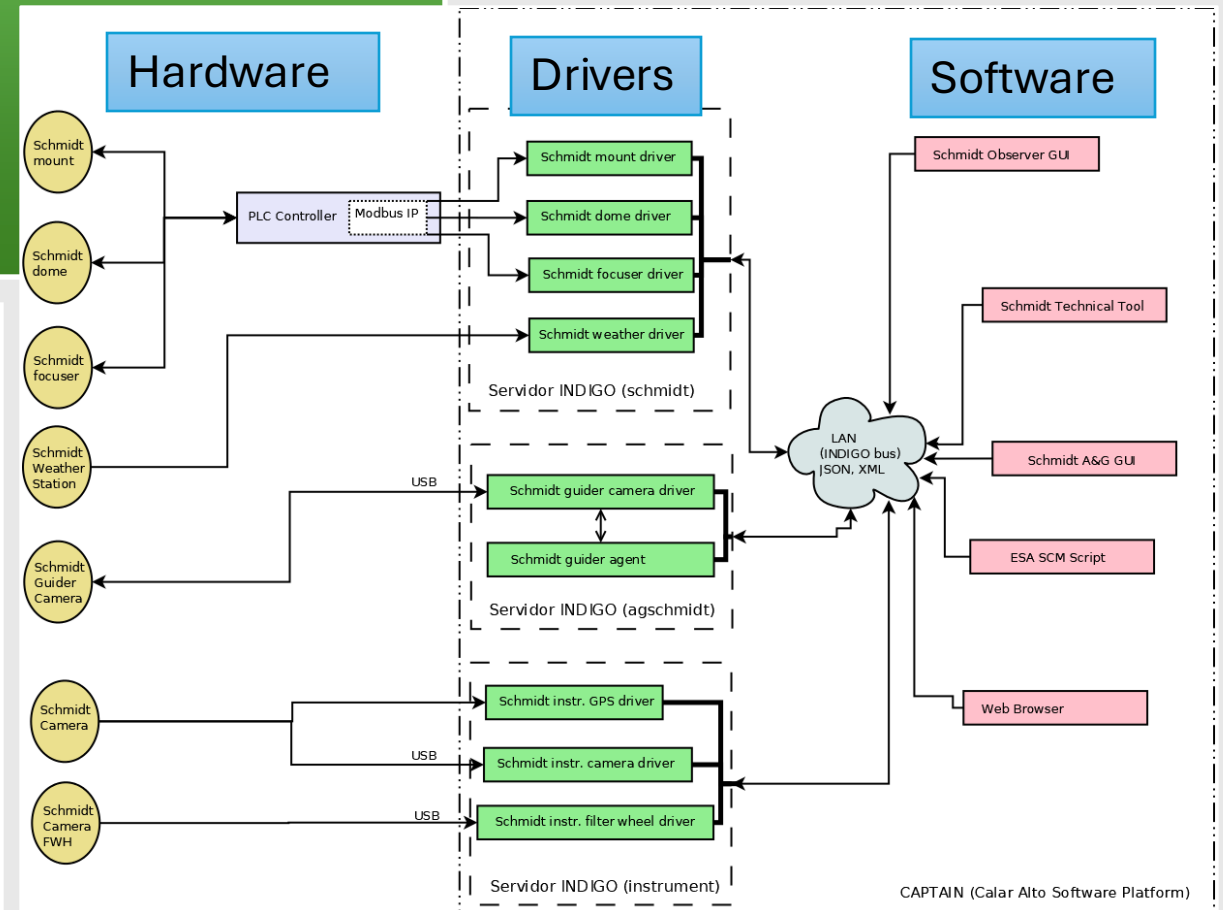
3º Fase

- New detector Moravian (14208x10656)
- Camera + Autoguiding software
- New control GUI de (INDIGO)
- Script integrated in INDIGO



INDIGO Framework

- Multiplatform Standard
- Unified Interphase for all devices
- Message interchange JSON or XML
- Offers an Hardware abstraction layer



MUSE ESO VLT



Figure 1: IFU composed of ISS, SPS and DV

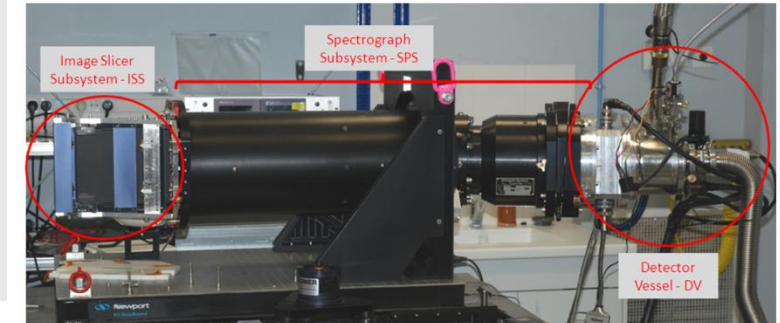


Figure 2: IFU composed of ISS, SPS and DV

