

FRACTAL S.L.N.E

A technological company for astronomical Instrumentation and Software

https://www.fractalslne.es/

Marisa García Vargas, marisa.garcia@fractal-es.com

Introducing FRACTAL

- FRACTAL S.L.N.E. is a private technological company founded in August 2005. (> 17 years)
- The motivation was **to keep the know-how** accumulated by our team during about 25 years working at ESA, public Research Centers and universities, and the GTC Project Office.
- We focus our services mainly on the Research Centers and Universities with Physics, Engineering and Astronomy Departments, although due to our skills and previous experience we have worked mainly **for professional Astrophysics (90%)**.
- Our best referees are **our customers**:

http://www.fractal-es.com Contact: Marisa García Vargas marisa.garcia@fractal-es.com

Who are us?: FRACTAL Team

A group of people covering:

- Astronomy
- Management
- System Engineering
- Optics & Adaptive Optics
- Opto-mechanics and Mechanics
- Cryogenics, CCDs and Data Acquisition Systems
- Control Software
- Data Bases
- Telescope Control Systems
- Data Reduction. Pipelines



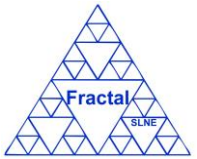
Full-time, part-time consultants

Most of us worked many years (> 9) at the GTC Project Office in the Instrumentation, Control and System Engineering groups

Also at ESA, ESO and EUMETSAT

Contact: Marisa García Vargas marisa.garcia@fractal-es.com

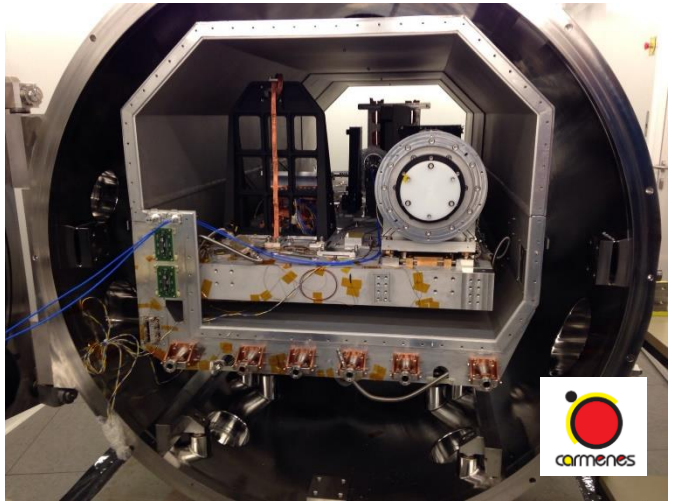
FRACTAL Services



- Management and System Engineering services and products
- Instrumentation: Consultancy, Design and Development
  - Design from scientific requirements definition to conceptual, preliminary and detailed design.
  - Optics (including wide experience on Fibers and Gratings) and Opto-mechanics
  - Cryogenics
  - Integration and tests at laboratory, and commissioning at observatories
- Software development for Scientific Applications
- Scientific operations (Astronomy) and Technical attendance at customer's site
- Specialized Training (general or in-house courses, participation in masters)
- Web services: public pages and customized-Intranet development and hosting
- Partnership with Wasatch Photonics (VPH) and distributor for Europe

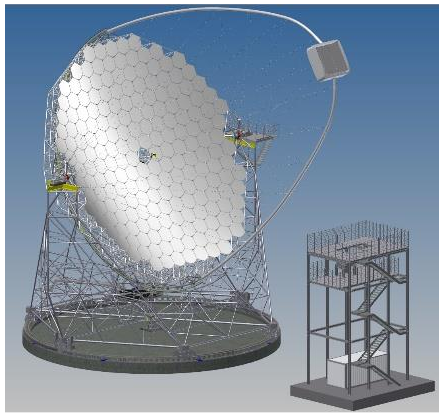
- http://www.fractalslne.es/ http://www.fractalslne.es/files/FRACTAL-Services-Instrumentation-and-software-general.pdf
- Video with FRACTAL activities: https://youtu.be/161gsgbnRNU

Management and System Engineering services - RAMS plans



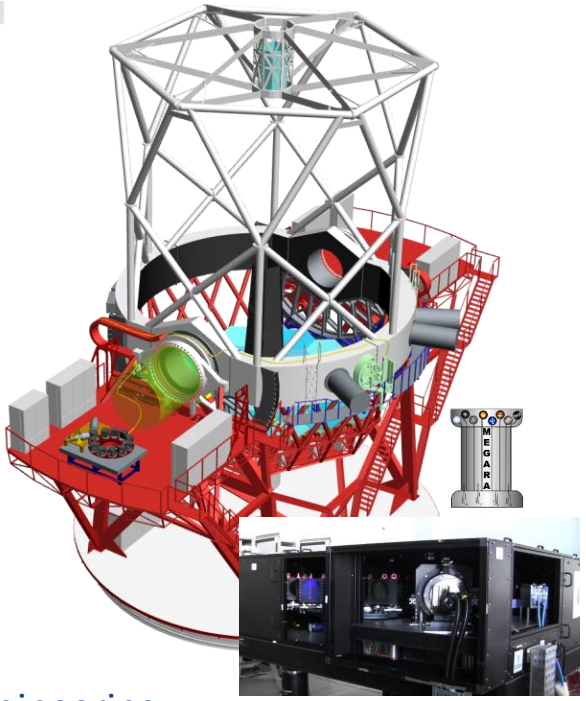
Management and System Engineering
CARMENES (2013 – 2015)

Safety Study for LST-CTA





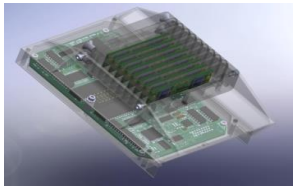
Management and System Engineering
MEGARA (2010 – 2017)



Management and System Engineering
TSPM (IA-UNAM, SO/UA, SAO, INAOE), 2016 - 2020

Management support in the
TTT project (SEOSAT, INTA)





LDT Precursor developed for NANOSAT 1B



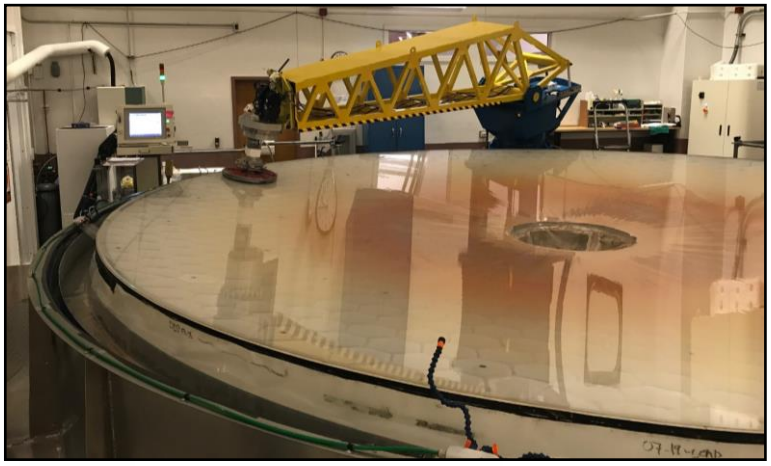
Just do Science
Fractal
SLNE
www.fractal-es.com

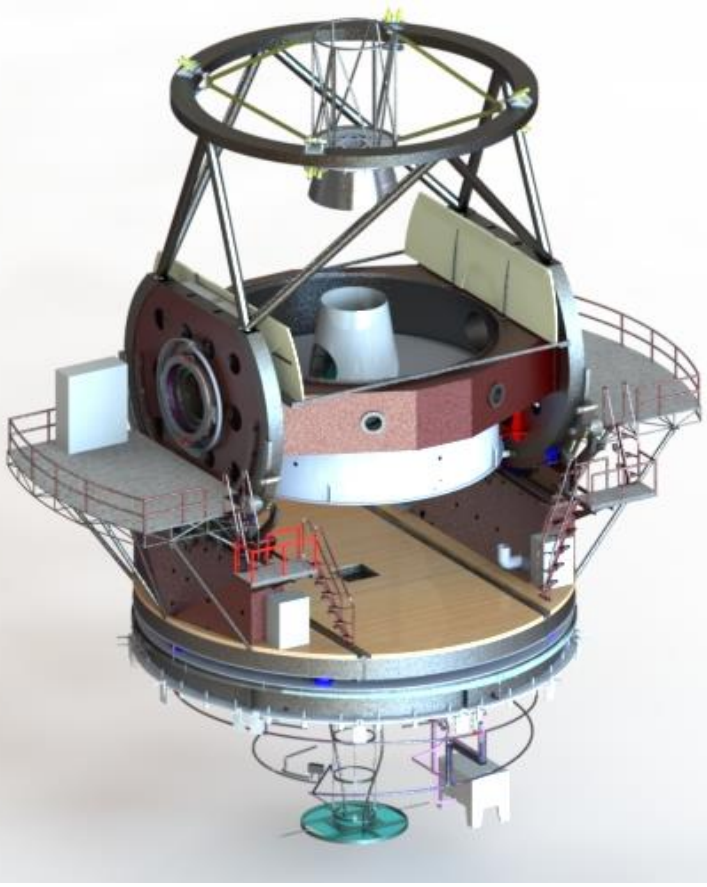
Participation in Large Projects

6.5m Telescopio San Pedro Mártir (Baja California)

Detailed design phase. Finished)

- Management
- System Engineering (also SE tools)
- Consultancy in Optics, Mechanics and Civil Work





Partners:

IA-UNAM (México)
INAOE (México)
Steward Observatory/University of Arizona
Smithsonian Astronomical Observatory (Harvard, Cambridge Mass)

Calar Alto high-Resolution search for M dwarfs with Exoearths with Near-infrared and optical Echelle Spectrographs

Two fibre-fed stabilised échelle spectrographs (R=82,000) at the coudé thermal rooms of the 3.5 m telescop

(Detailed Design to Commissioning)

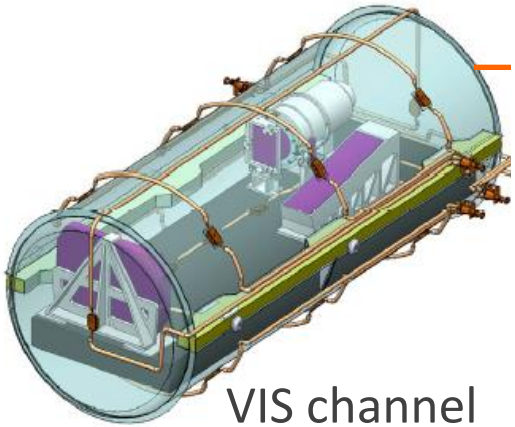
Commissioning: May - December 2015
Regular operations since: January 1st 2016

https://carmenes.caha.es/

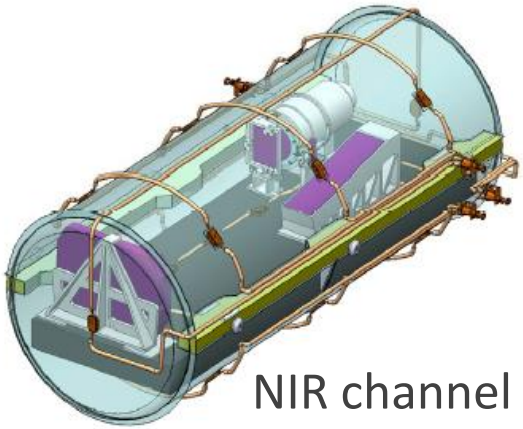
- Project Manager and System Engineer
- SE tools and web services
- Detector characterization and Data Acquisition system







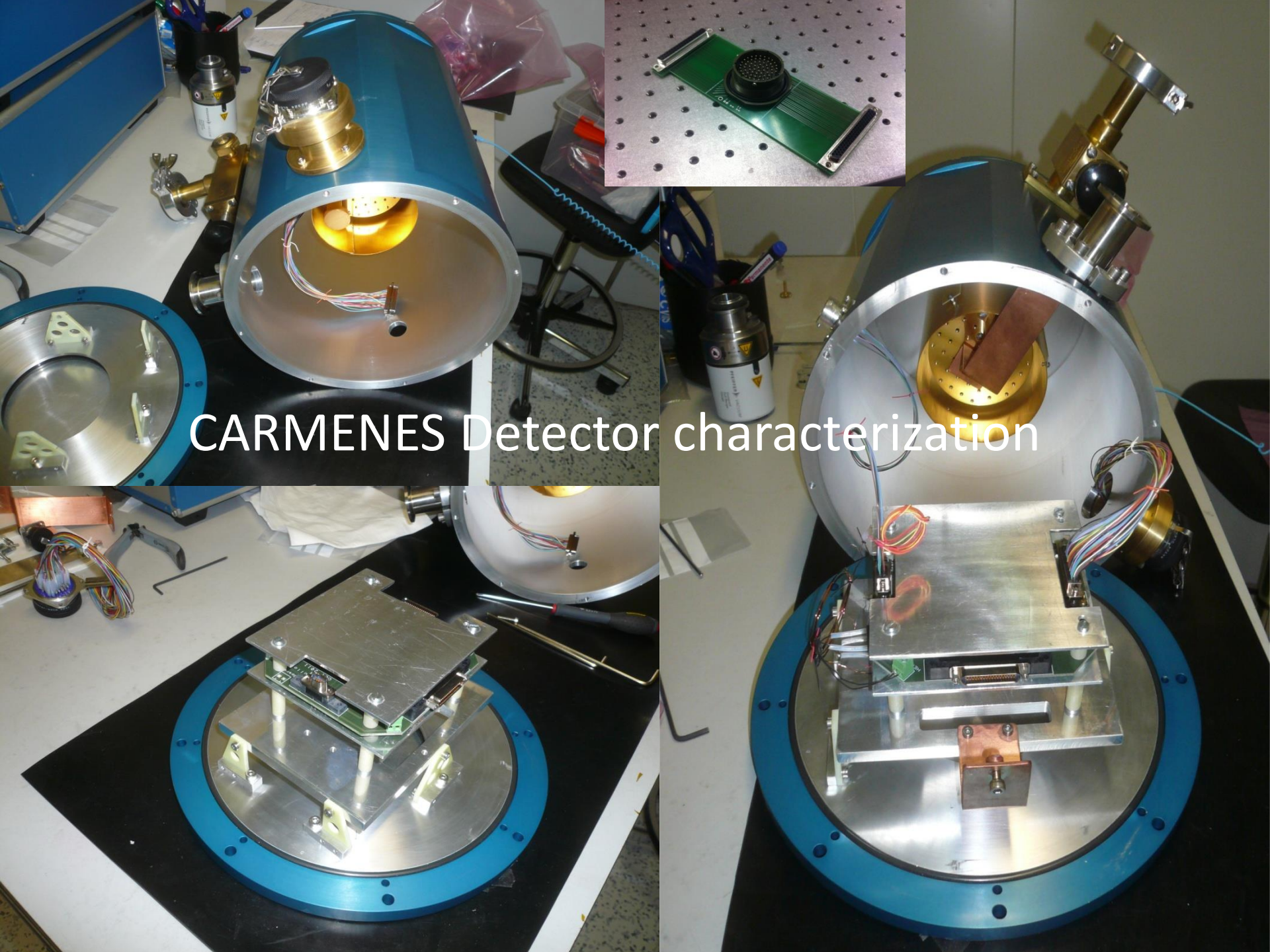
VIS channel



NIR channel



Front-end

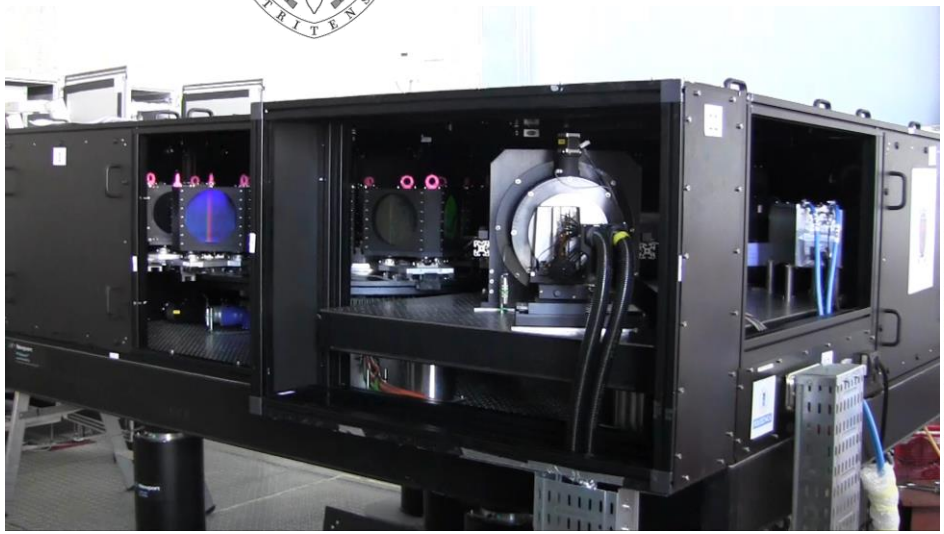

CARMENES Detector characterization

MEGARA @ GTC

Multi
Espectrógrafo en
GTC de
Alta
Resolución para
Astronomía

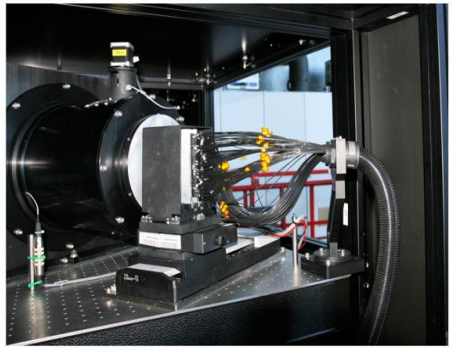
https://guaix.fis.ucm.es/megara/index.html

Design contract GRANTECAN – UCM signed June 2014
Integration: April – May 2017
Commissioning: May – August 2017
Regular operations since July 1st 2018 (2018-B)

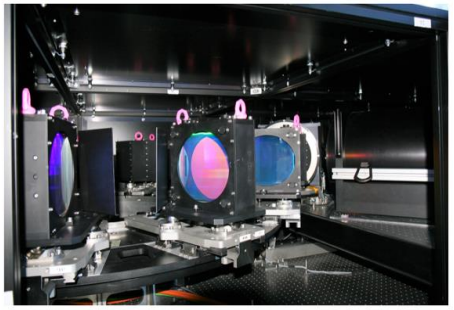










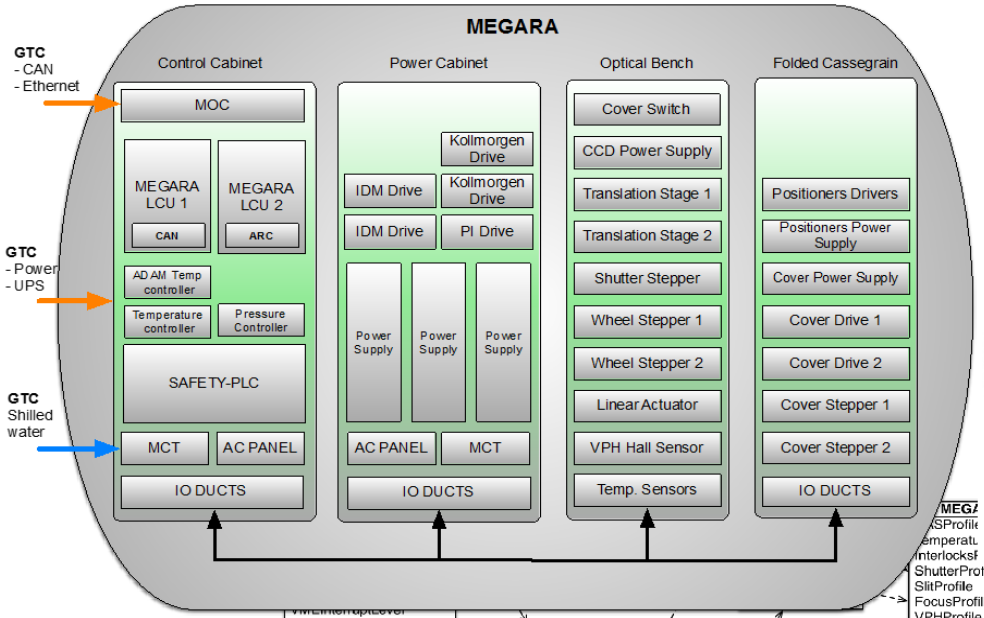


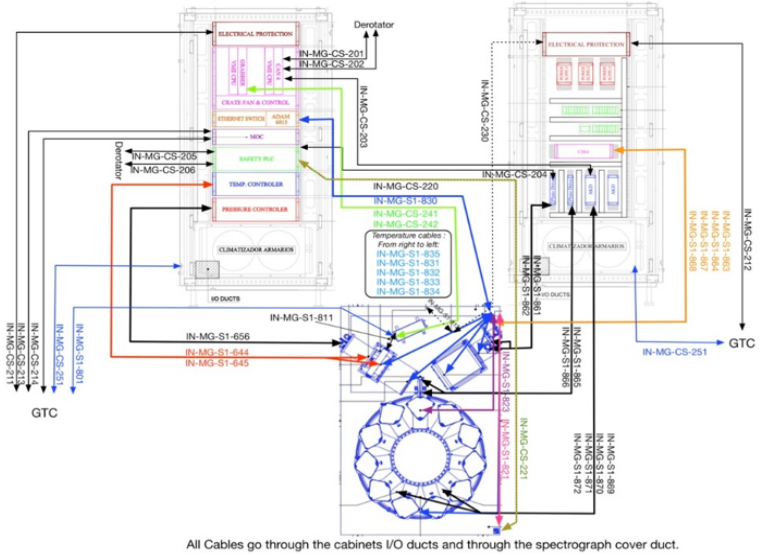
- Project Manager
- System Engineer (also SE tools and web services)
- Optics, Mechanics, Detector Design and AIV
- Many packages of the Control System
- Detector and Data Acquisition system AIV, tests
- AIV (complete) and commissioning at the Observatory

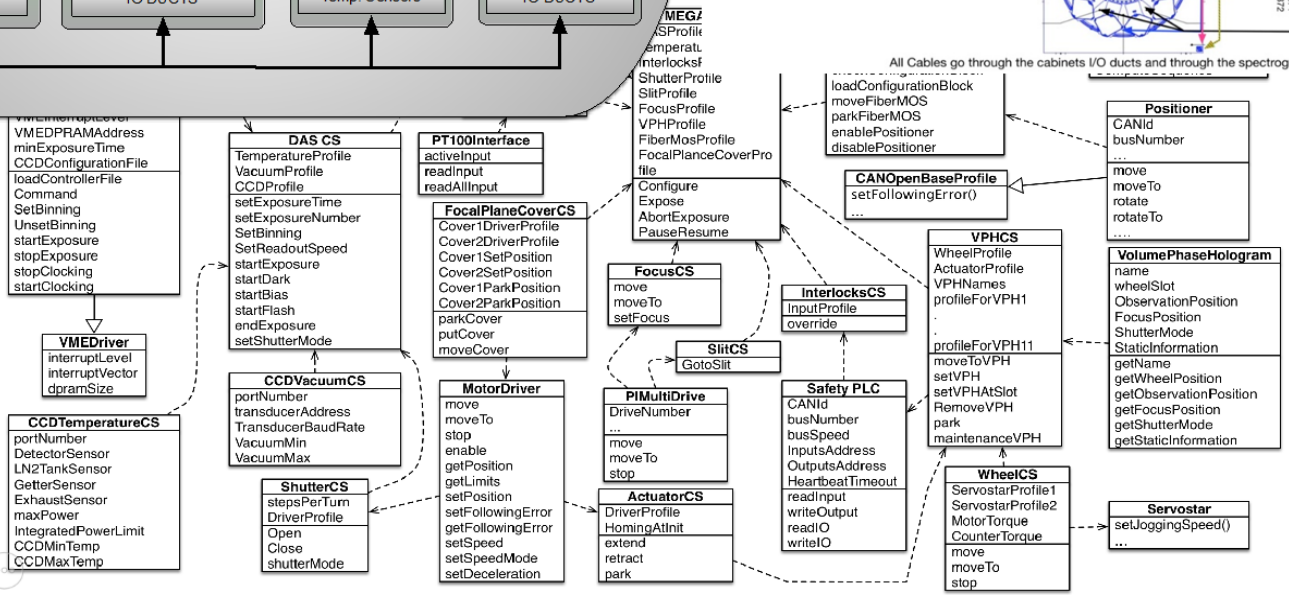
Video on Integration https://www.youtube.com/watch?v=xyBV0b5okwI

MEGARA Mechanisms control system

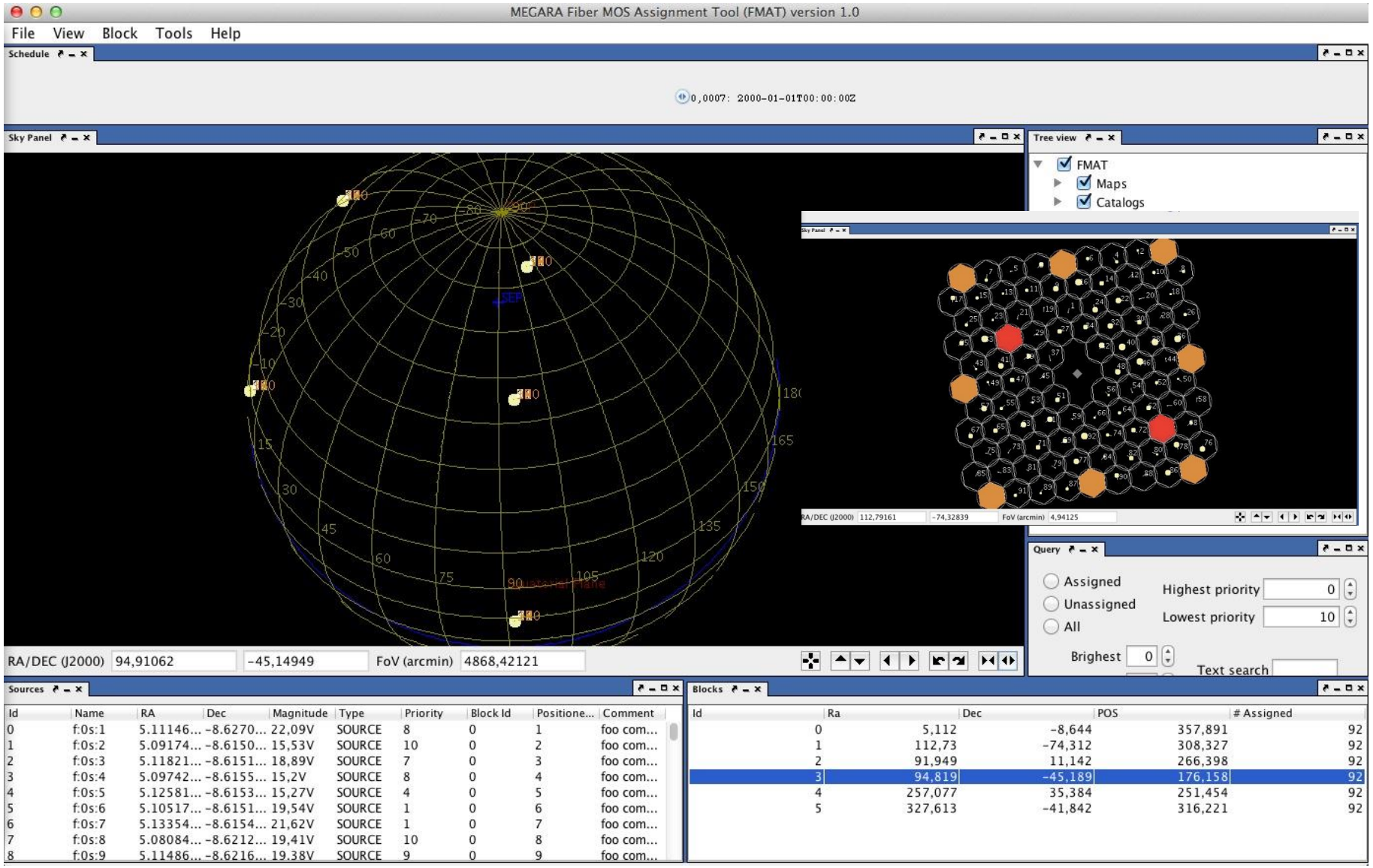
Customer: UCM



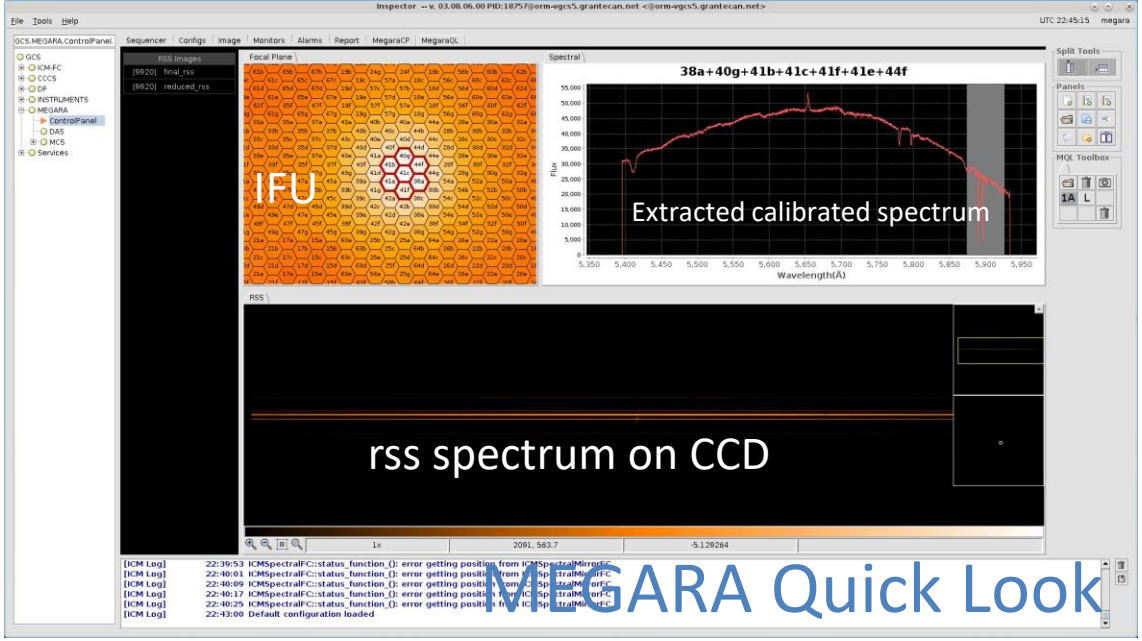


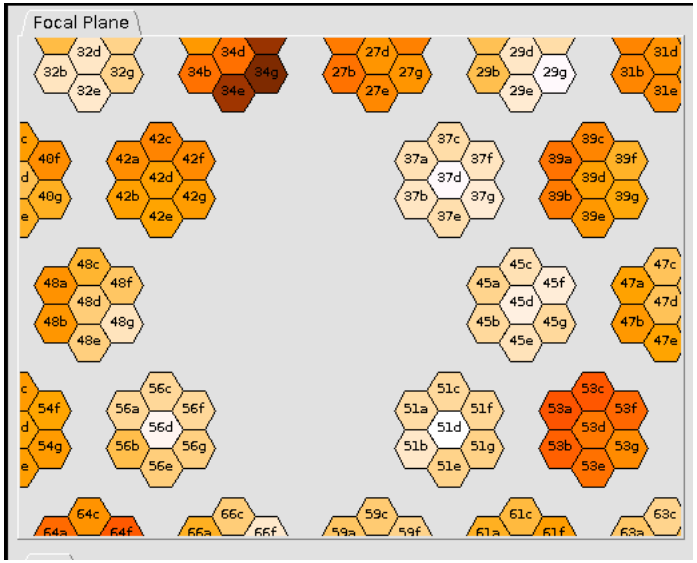


MEGARA Fiber MOS Assignment Tool (FMAT)
Customer: IAA / UCM



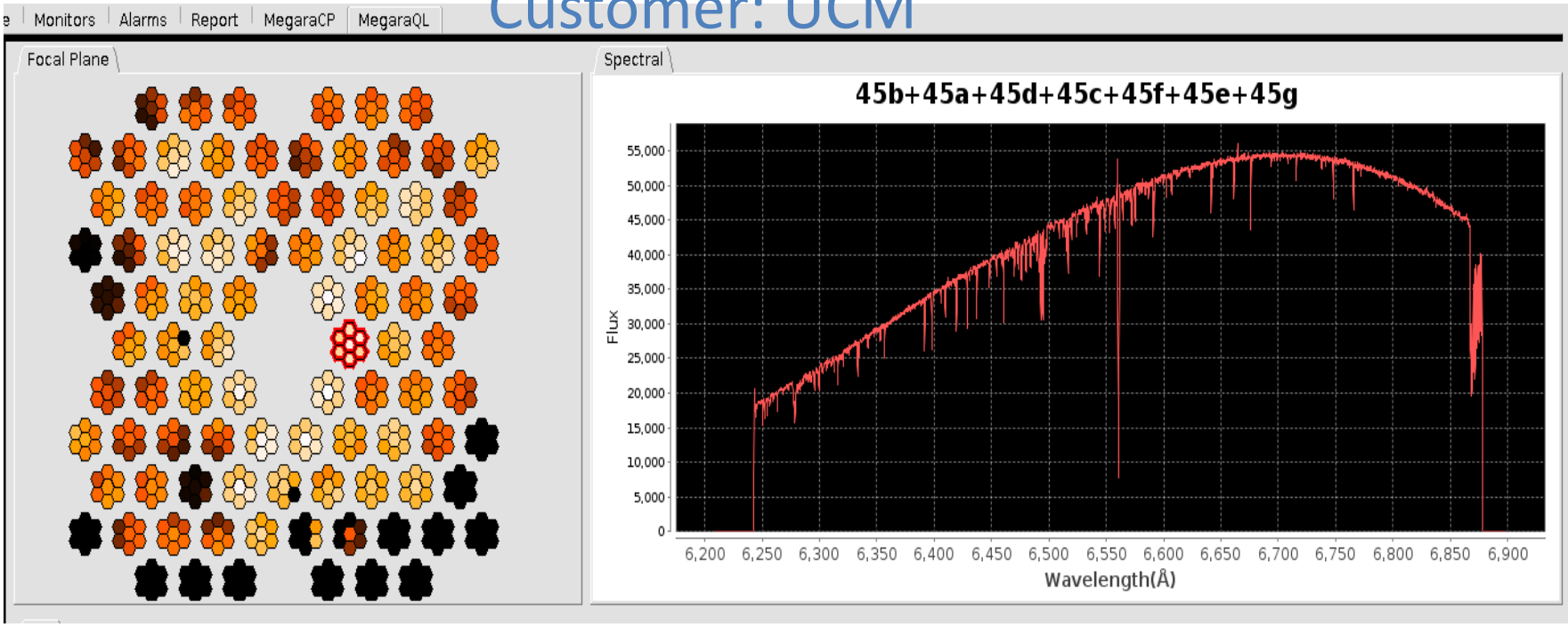
http://www.fractal-es.com





MEGARA Quick Look

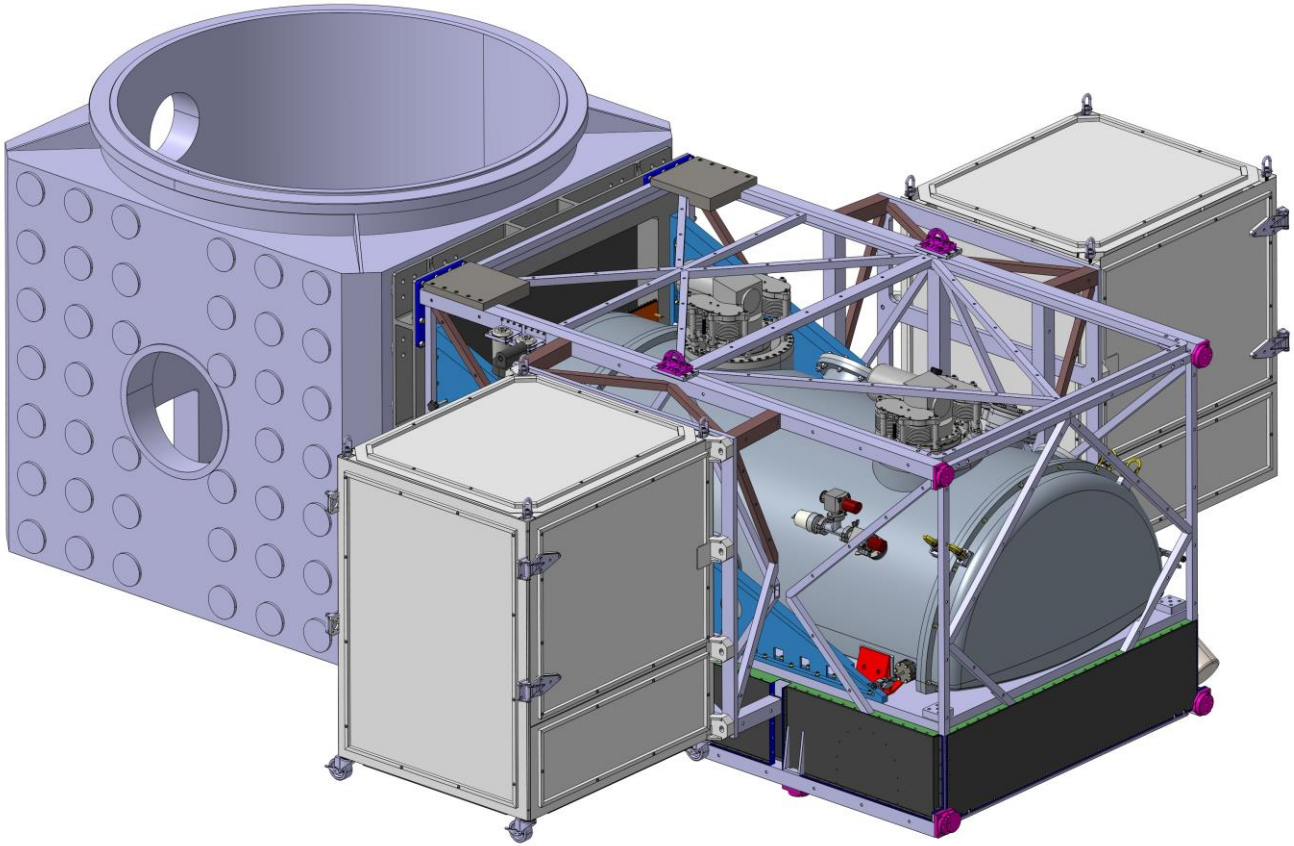
Customer: UCM

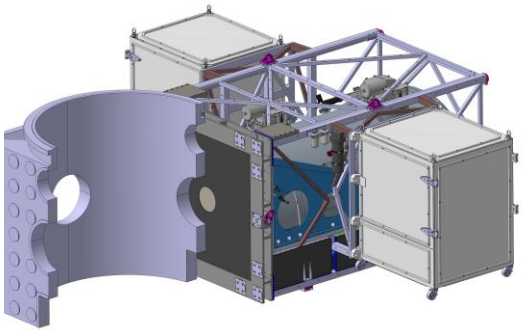


SCORPIO for Gemini Optics/Mechanics/Thermal WPs

Customer: SwRI (San Antonio, TX, USA), currently at subsystems AIV stage

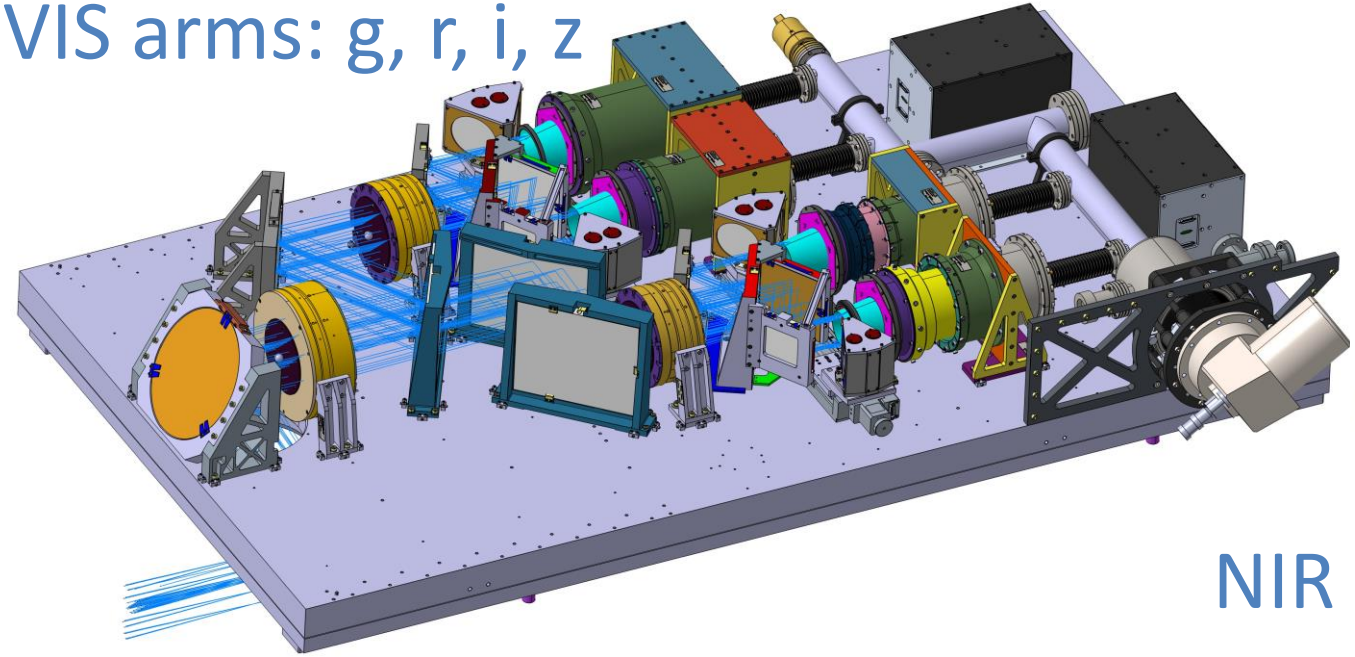
- Management and System engineering of the Optics/Mechanics/Thermal WPs
- Optics design, manufacturing supervision and integration
- Mechanics & Thermal subsystems design, manufacturing supervision and integration
- Manufacturing subcontracts
- Instrument assembly, integration and verification.

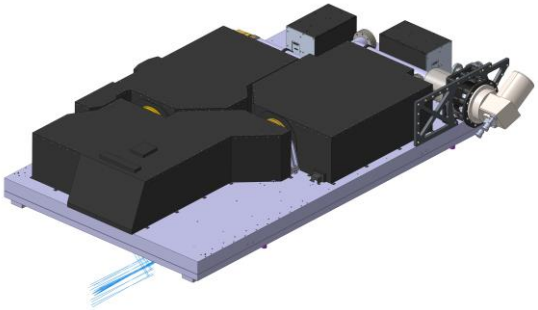




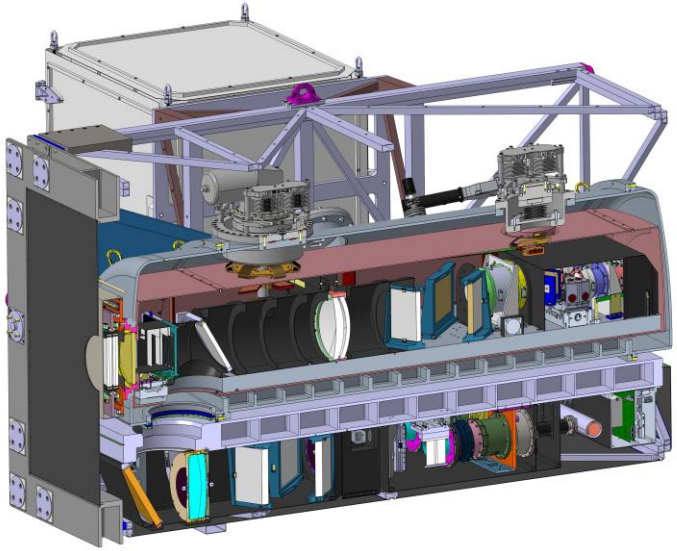
FRACTAL Contract: 2017 - 2023

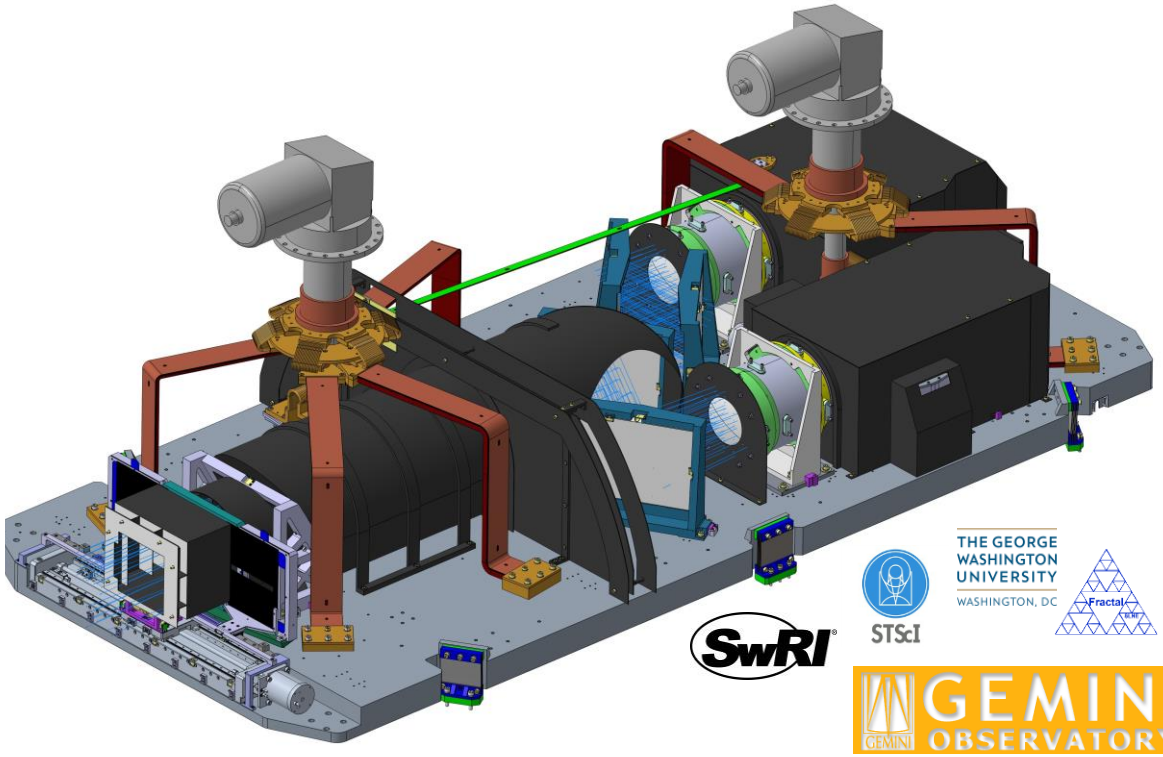
VIS arms: g, r, i, z





NIR arms: Y, J, H, K

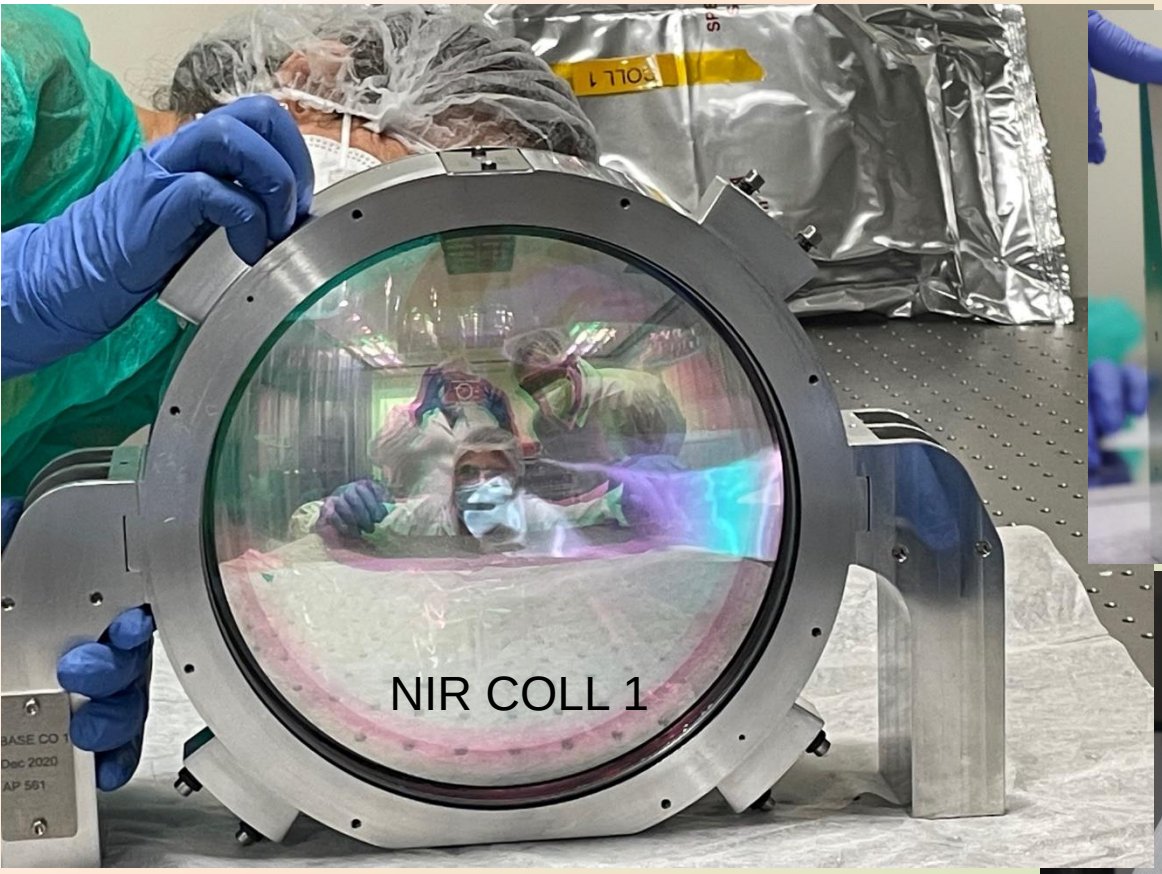


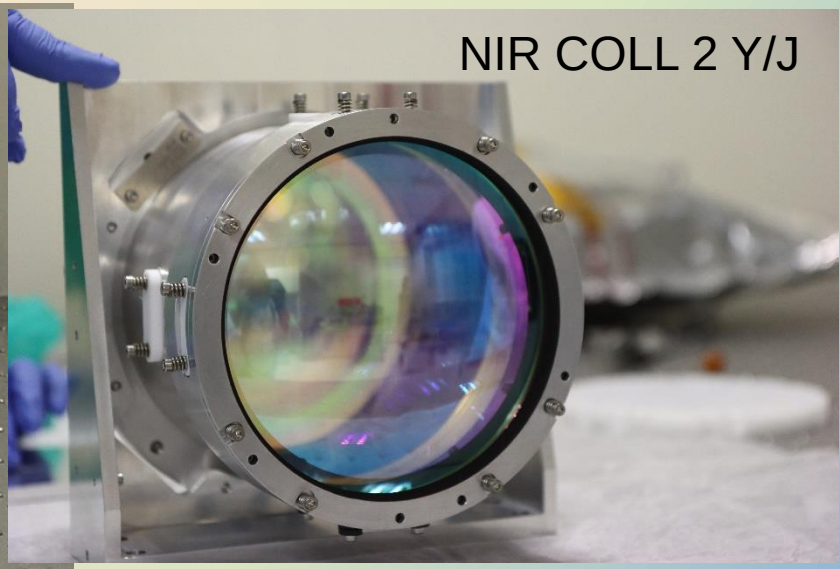


SCORPIO
SPECTROGRAPH AND CAMERA FOR OBSERVING RAPID PHENOMENA
IN THE INFRARED AND OPTICAL

SwRI
STScI
THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC
Fractal
GEMINI OBSERVATORY

NIR Collimator and camera



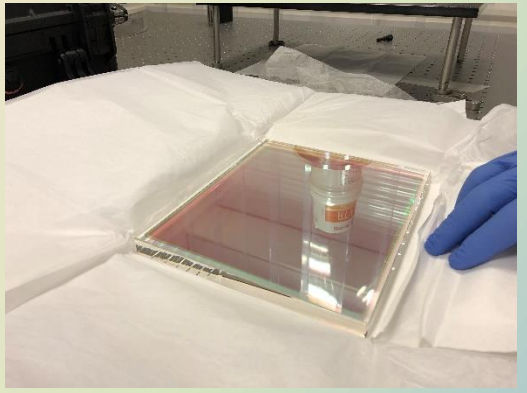


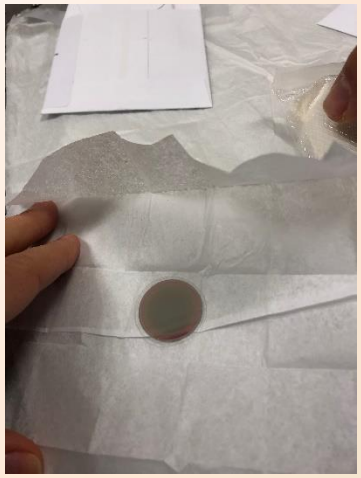


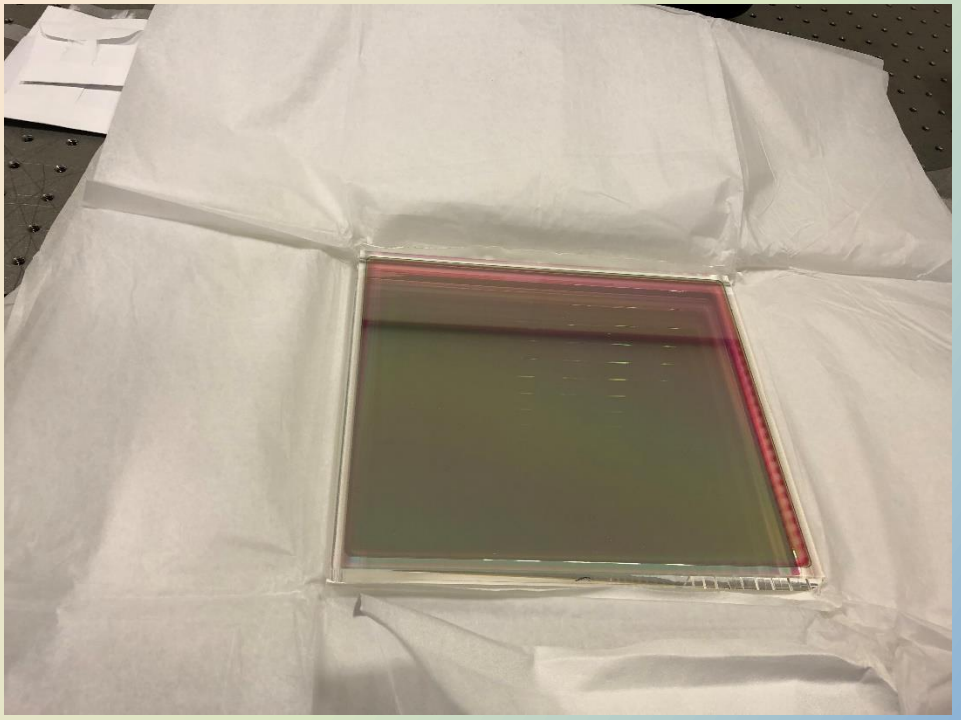
NIR beamsplitter YJ/HK @LICA











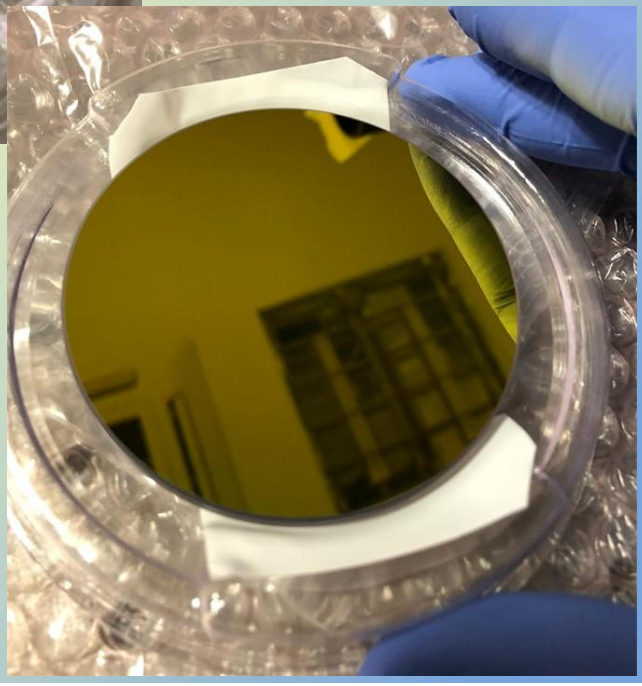


NIR filters: inspection at LICA

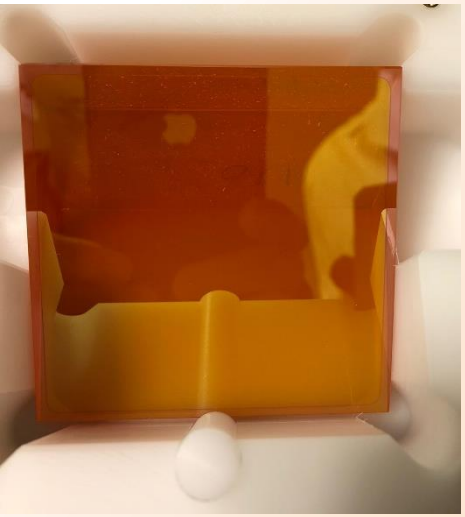


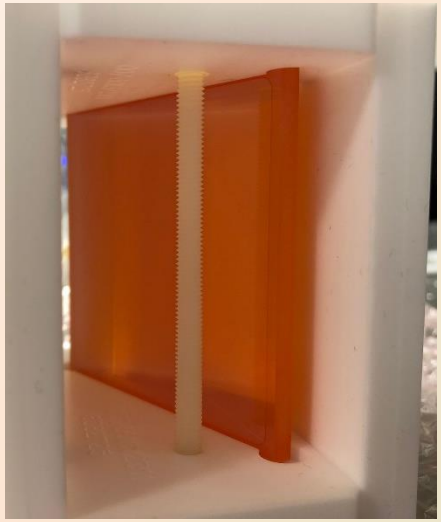




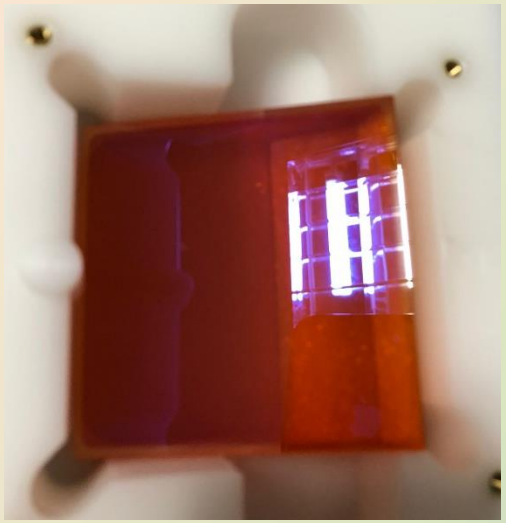


NIR prisms: inspection at LICA



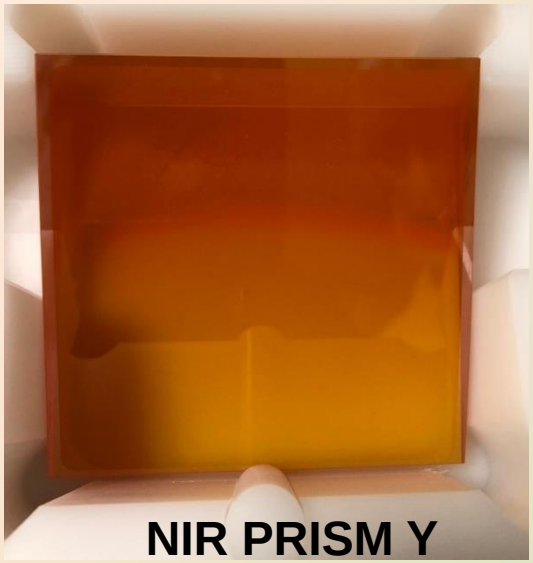


NIR PRISM H

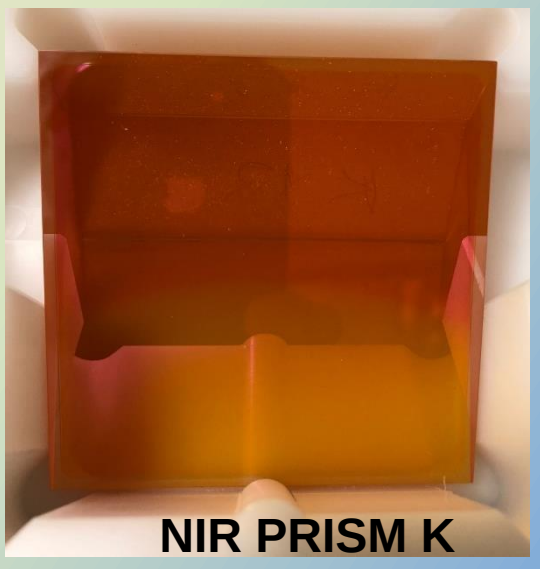




NIR PRISM J



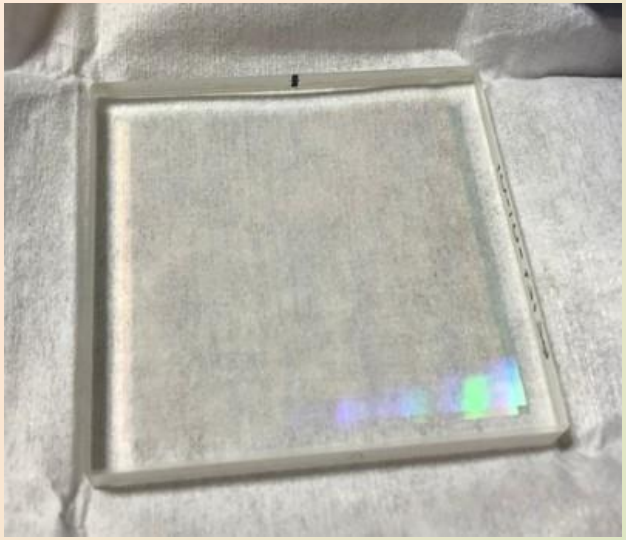
NIR PRISM Y

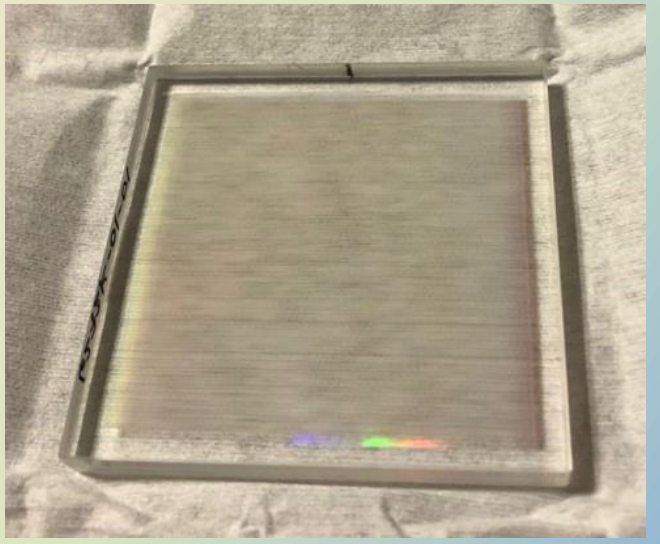


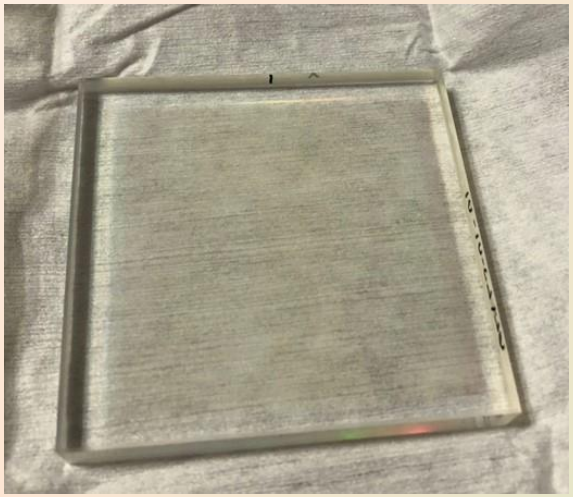
NIR PRISM K

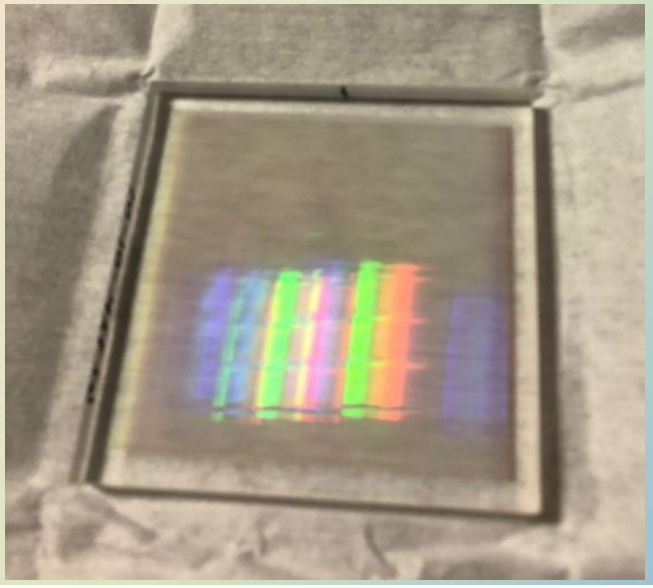
NIR VPHs: inspection at LICA



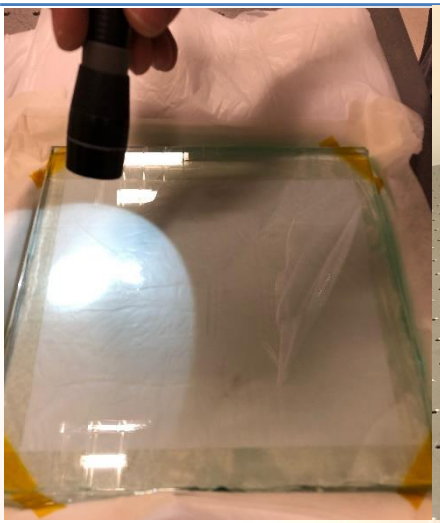
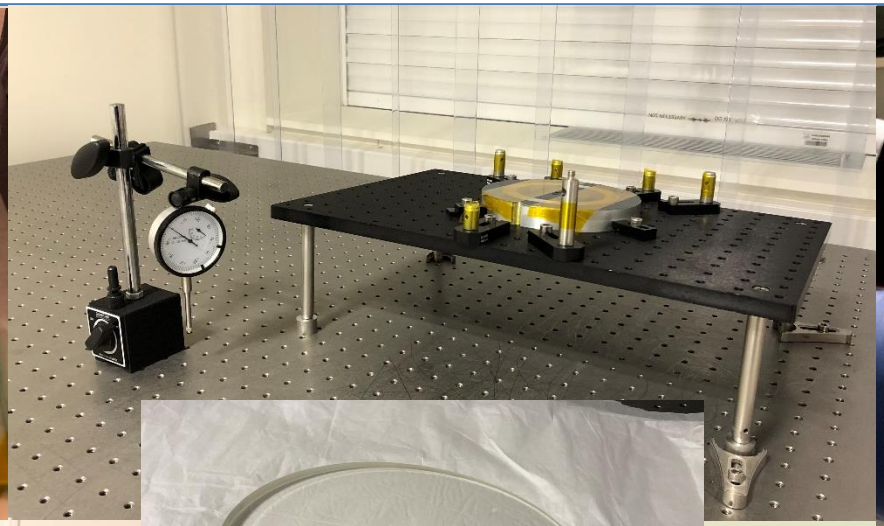
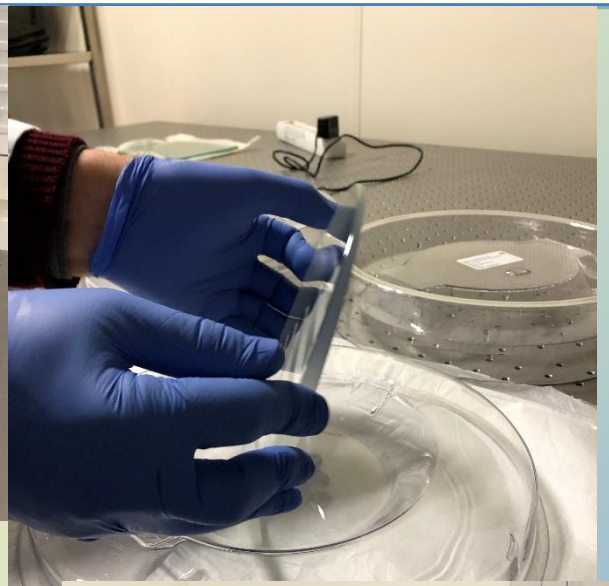


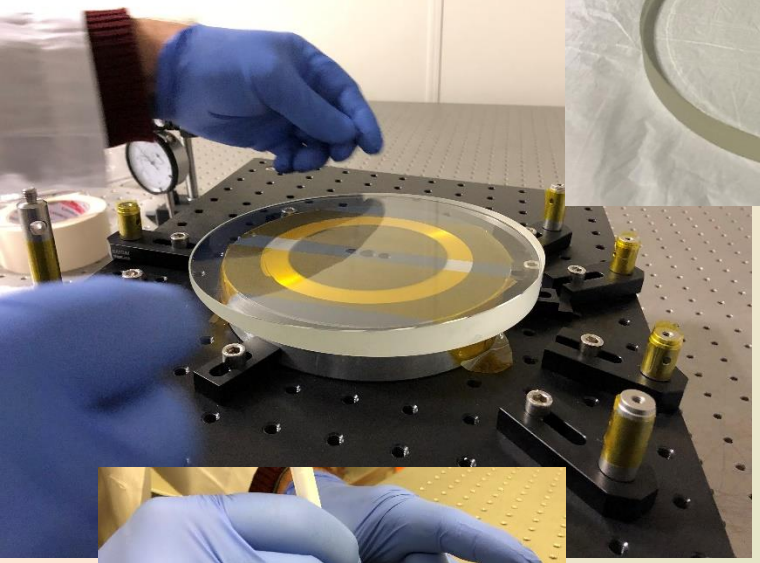
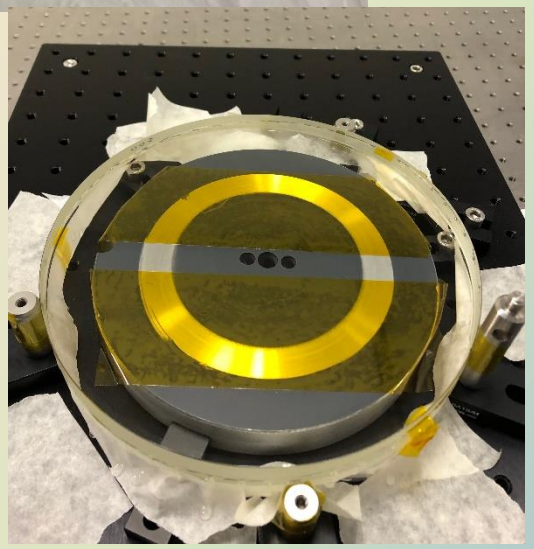
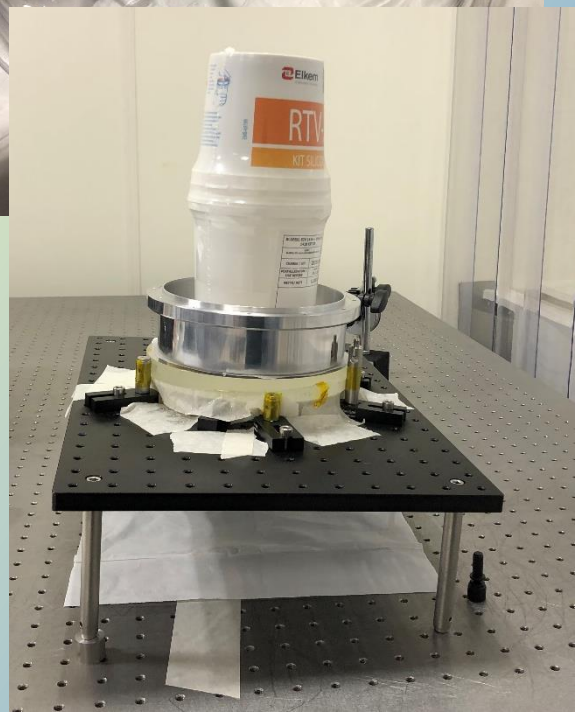


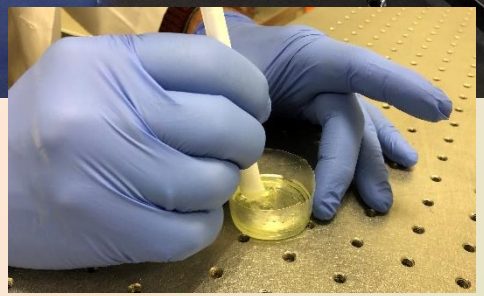




ADC prims gluing

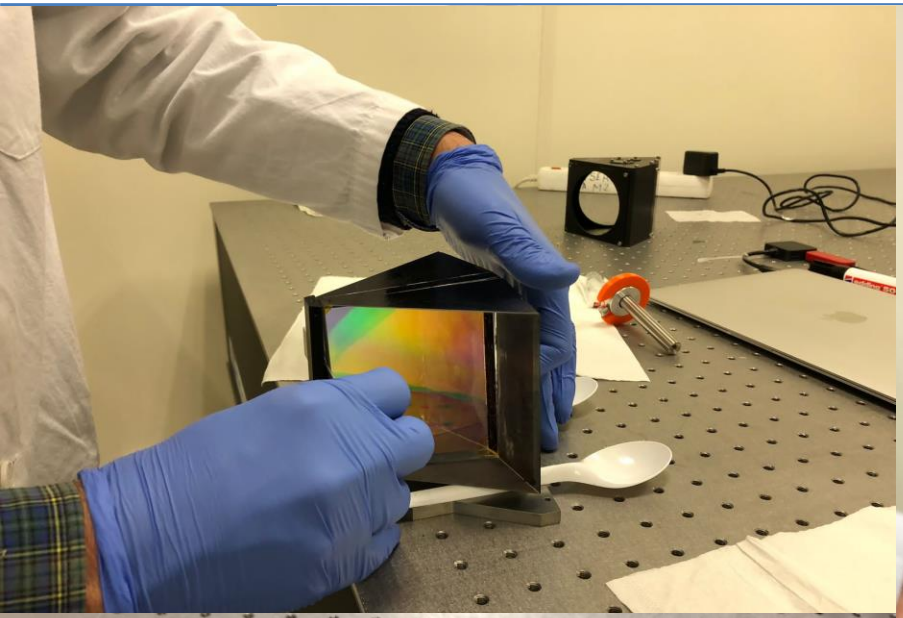






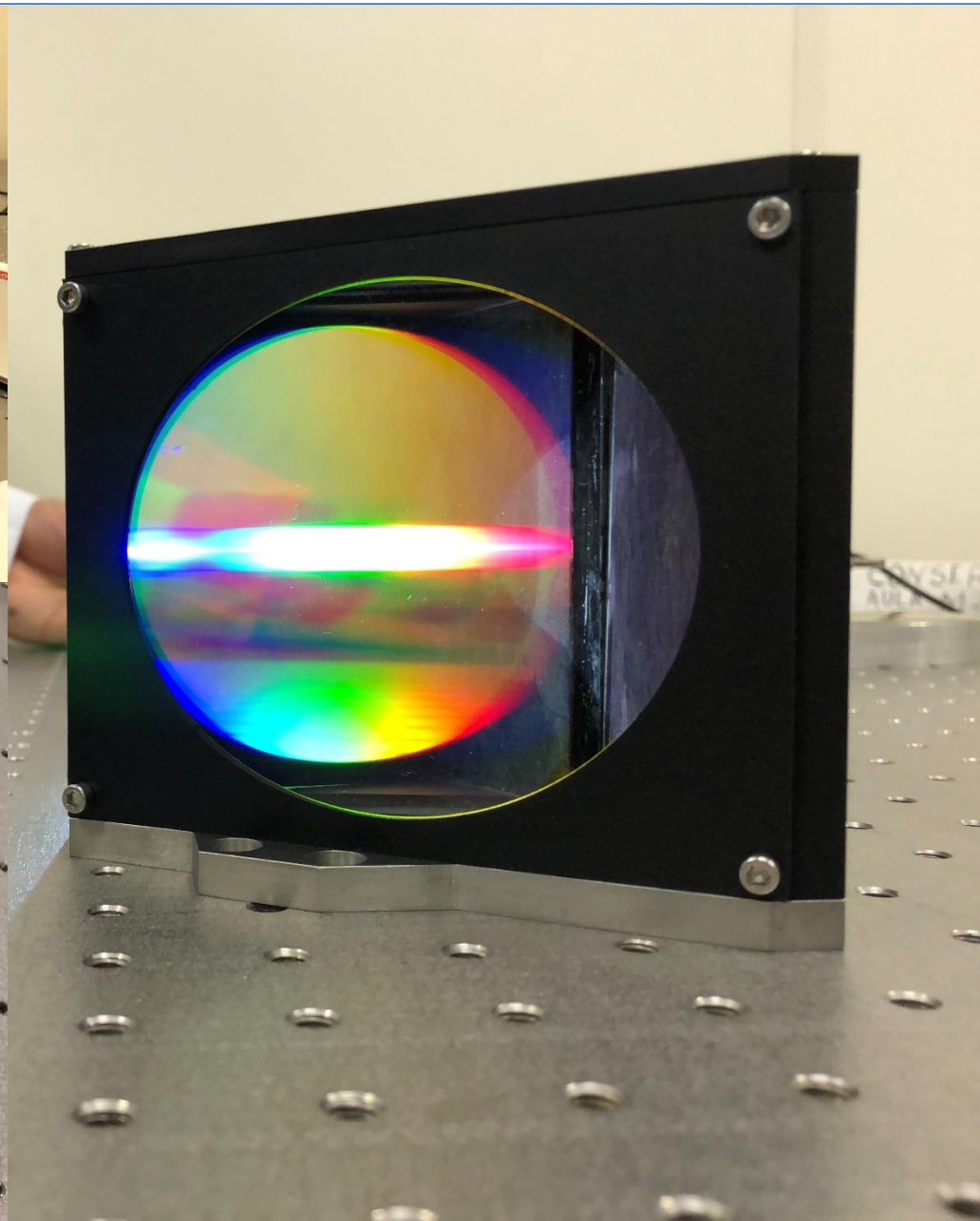
VPH-g bonding



VPH-g Optics/Opto-mechanics assembly

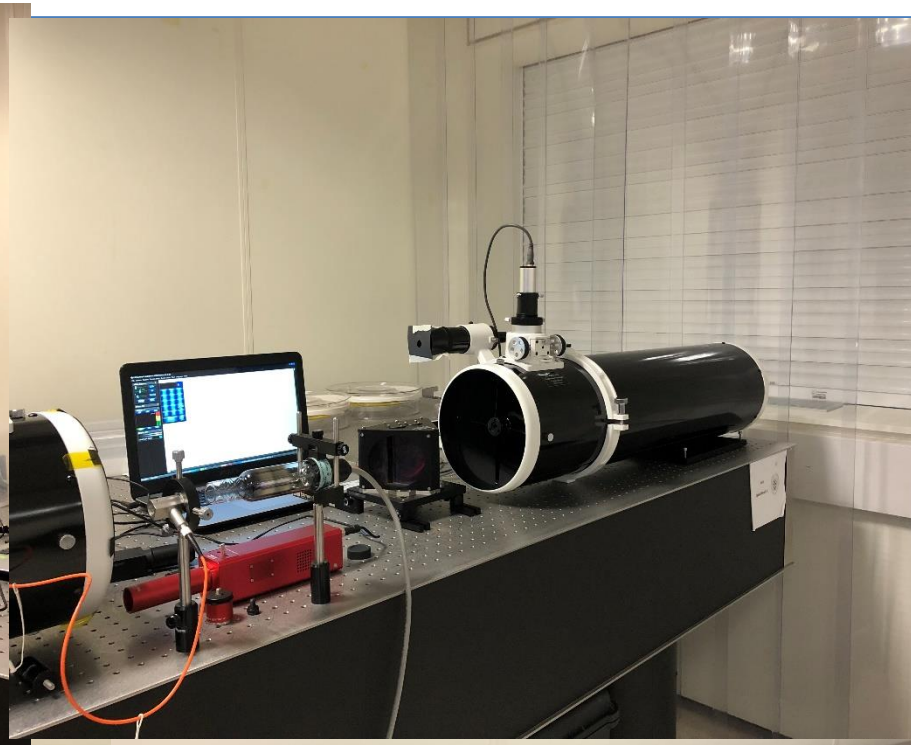


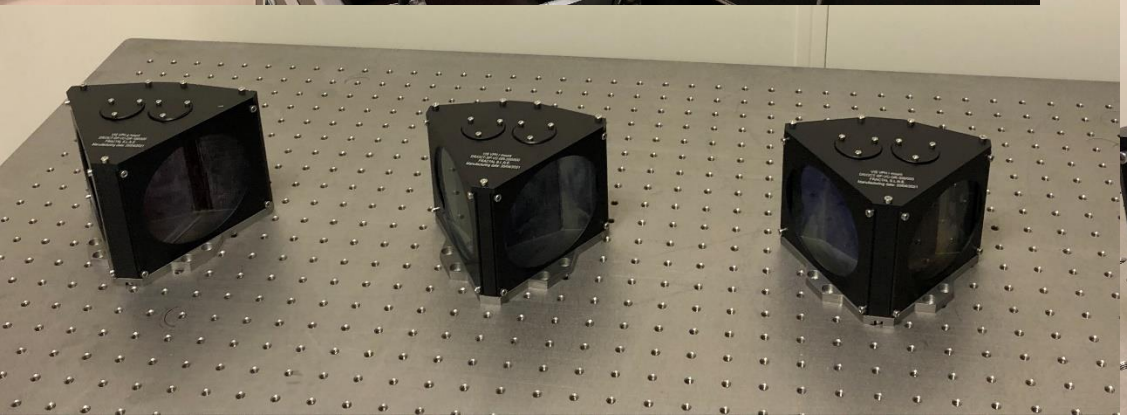


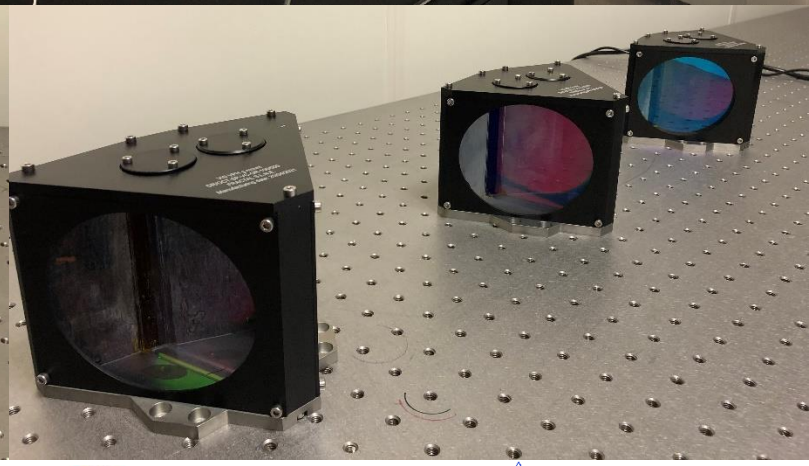


VPH-g, r, i tests

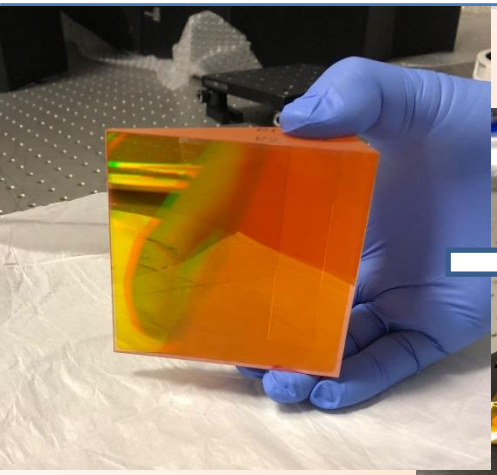


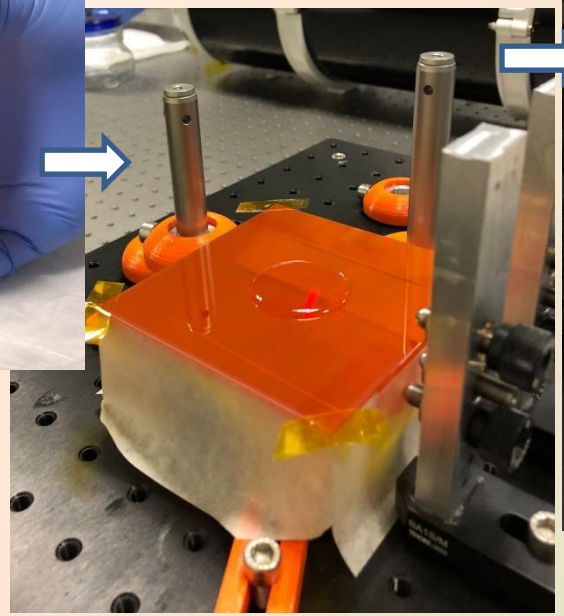


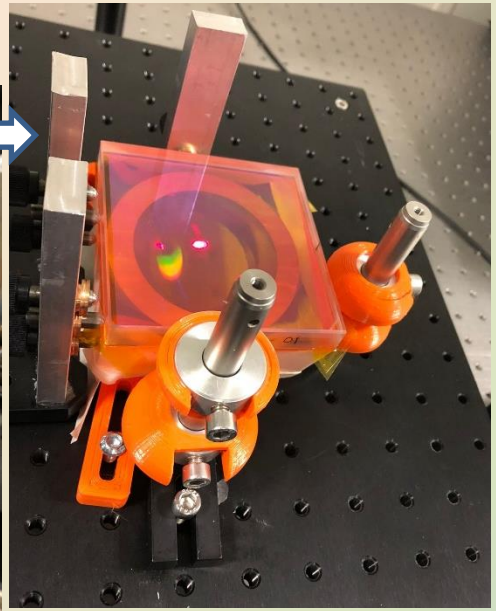


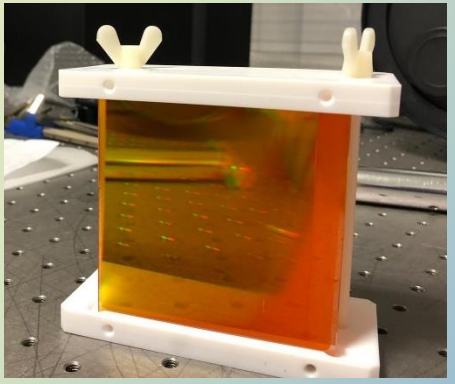


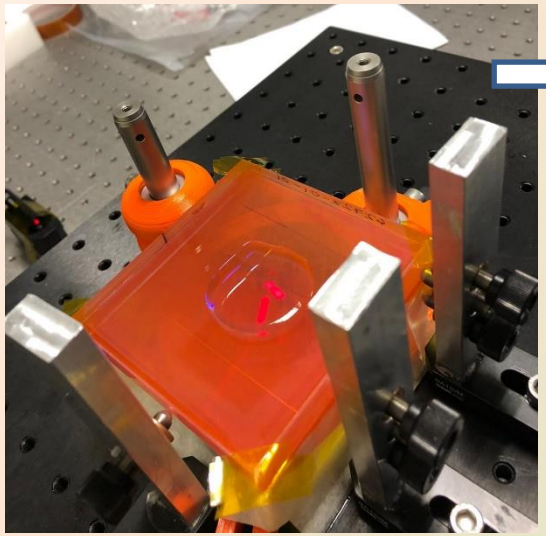
VPH-z bonding

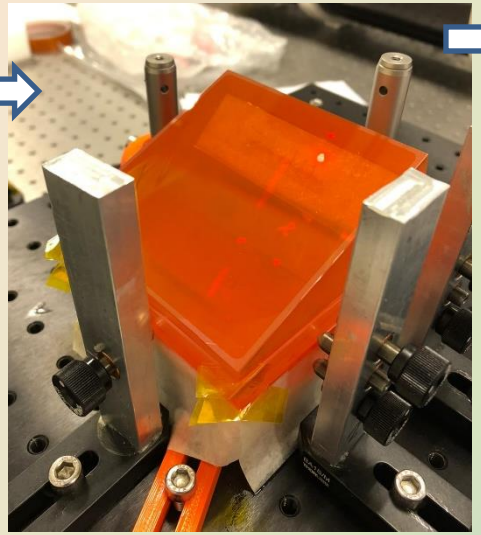


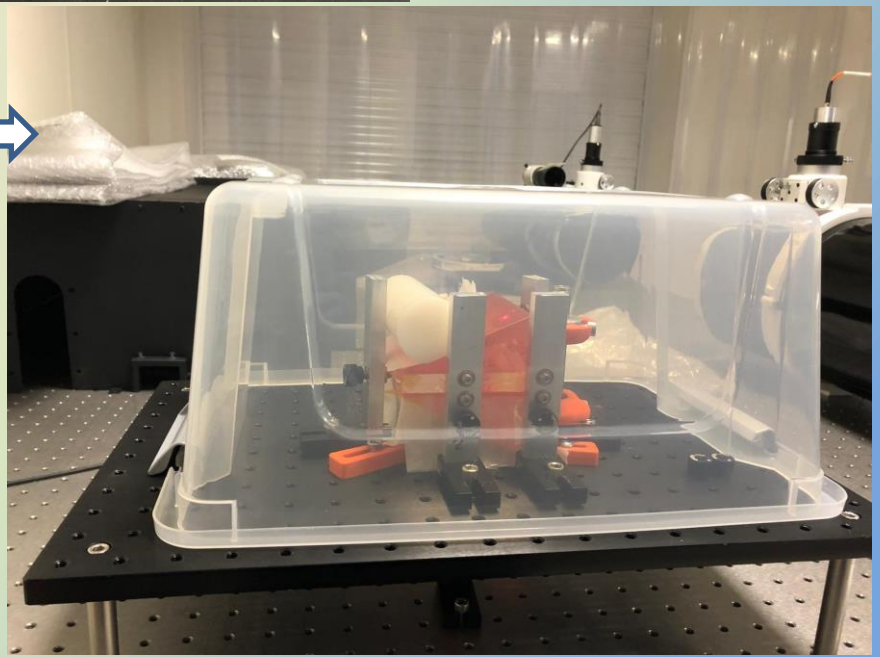




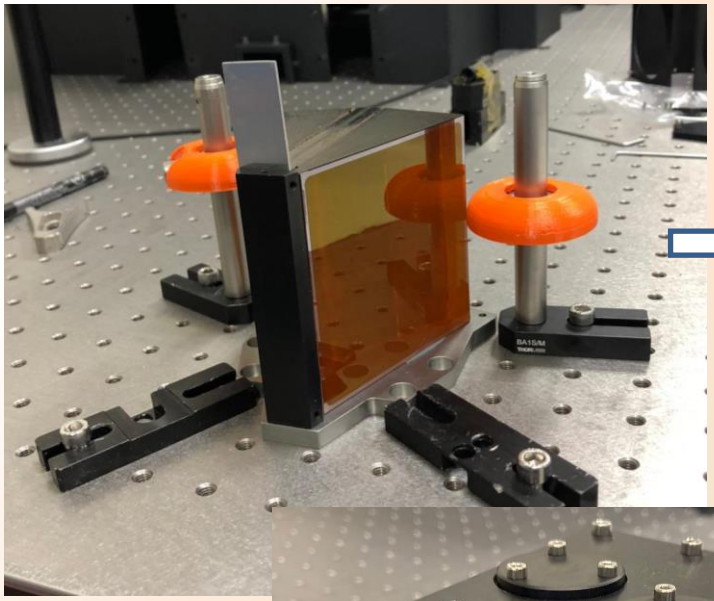


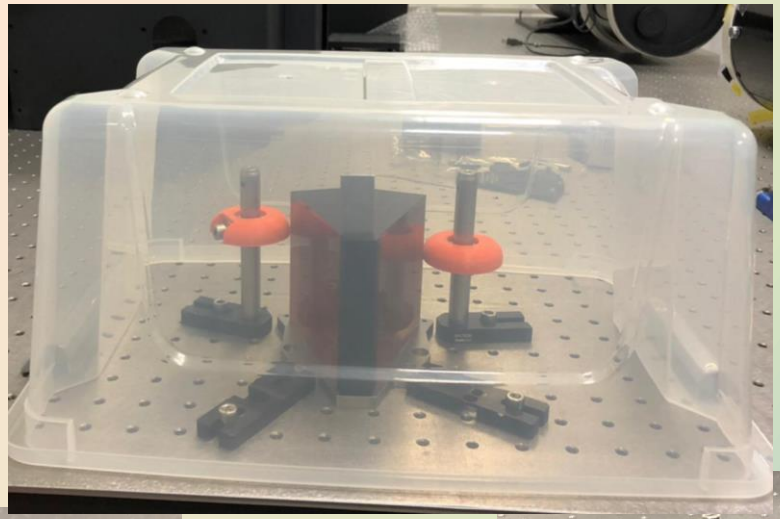


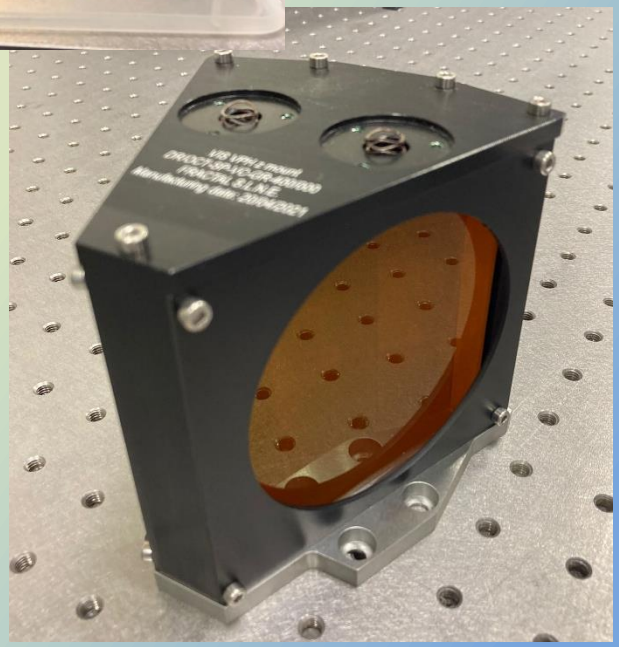


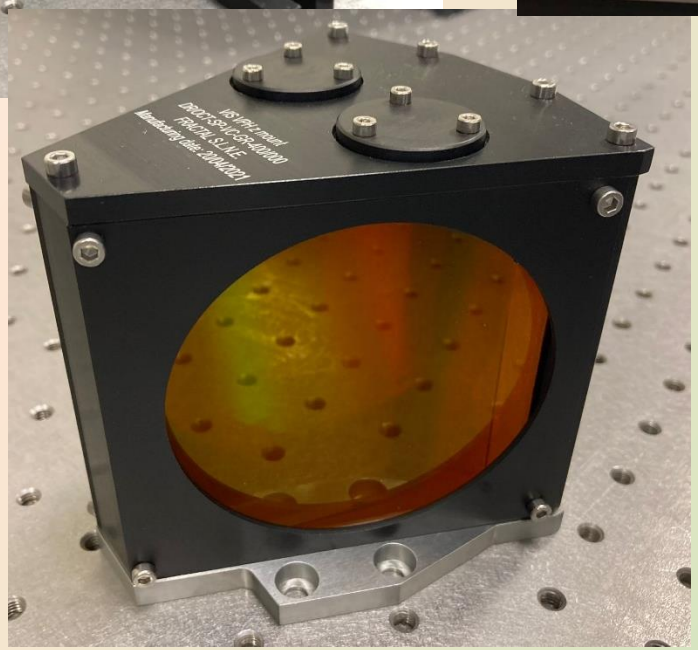


VPH-z Optics/Opto-mechanics assembly



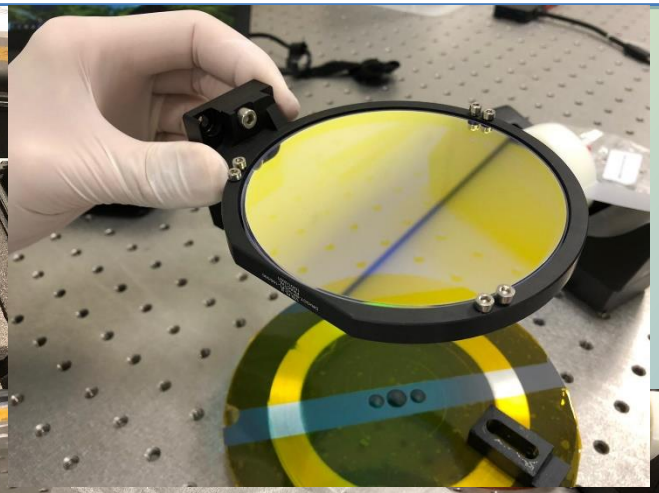
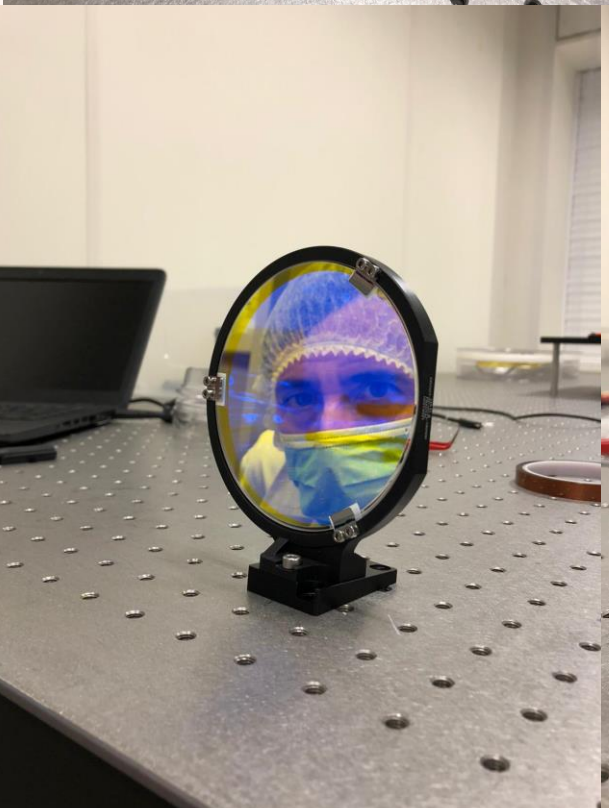
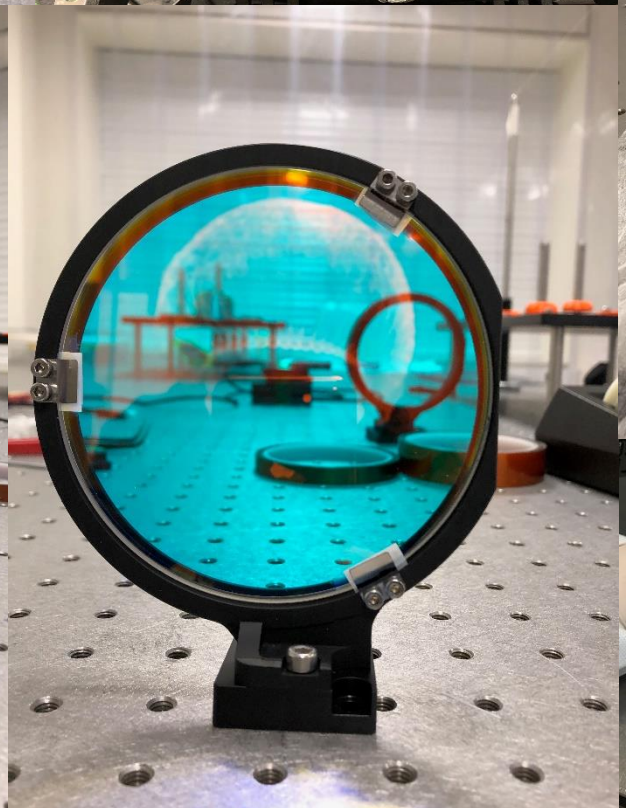


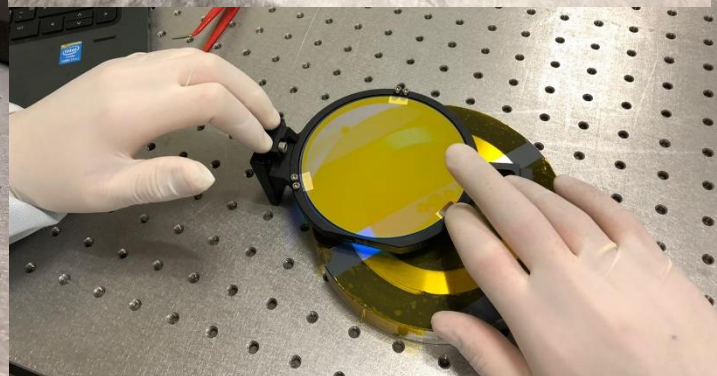




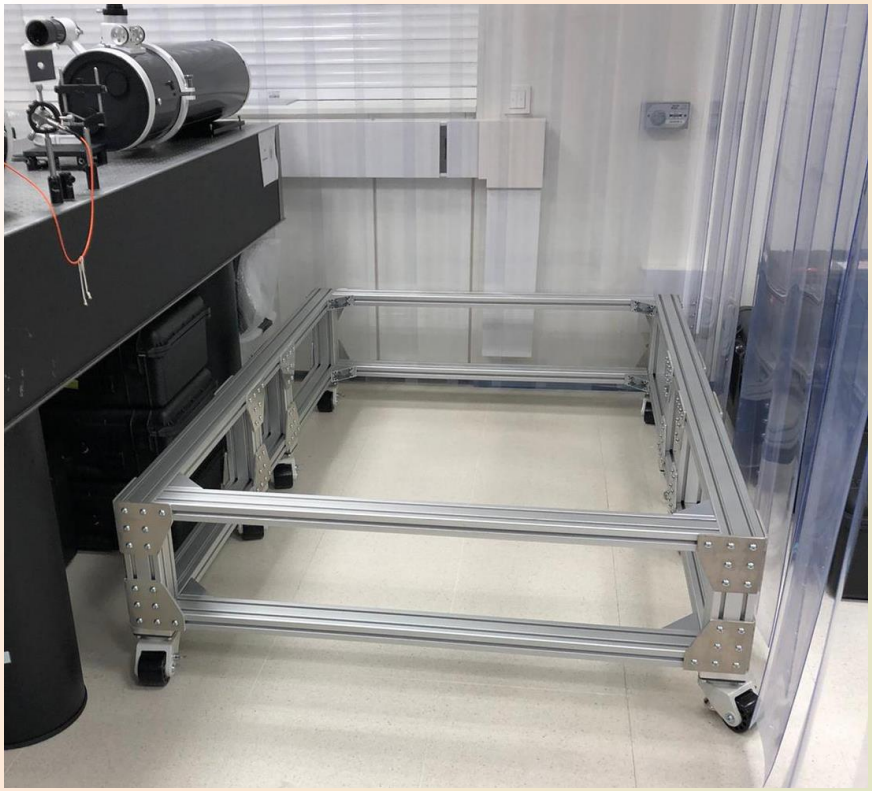
Filter g assembly



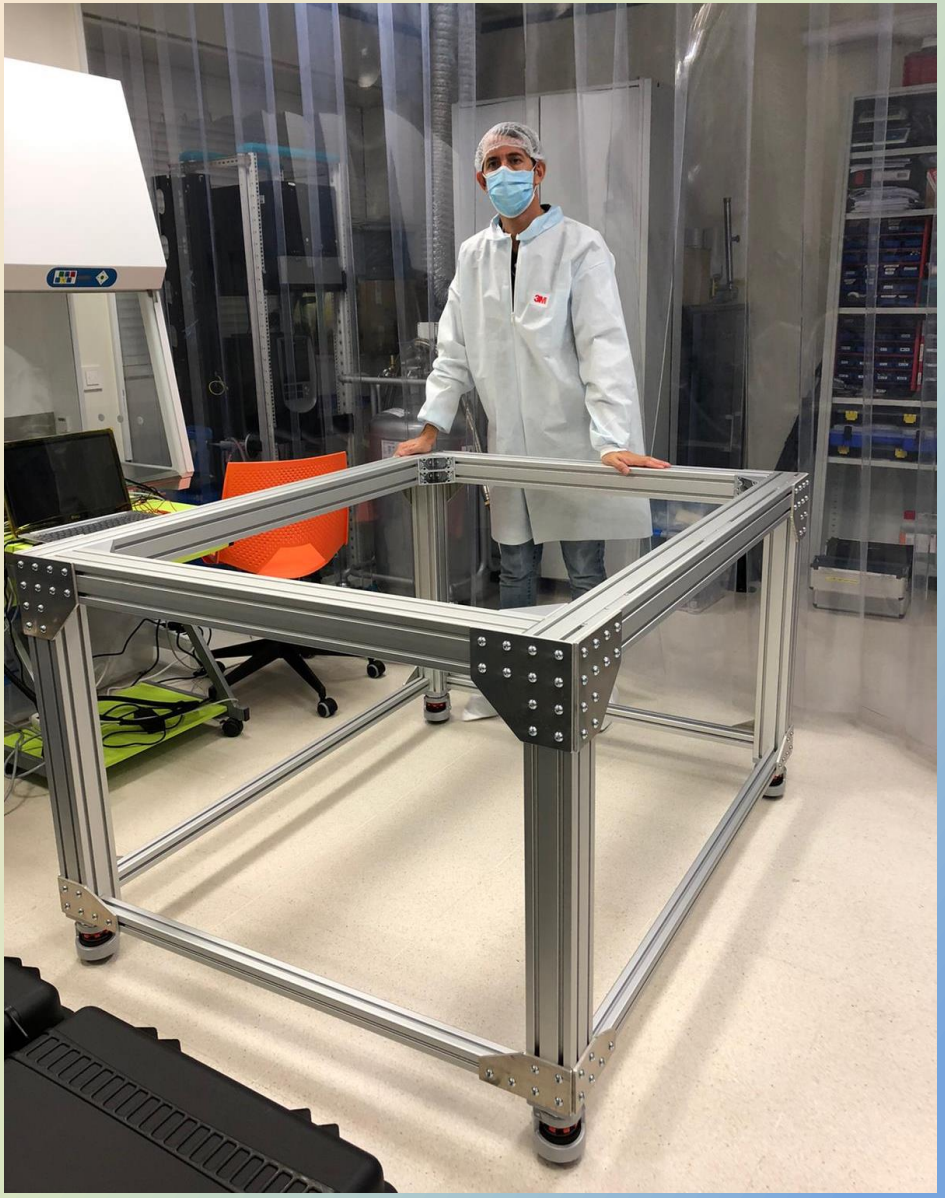






AIV tools. Carts. Finished at LICA



External Frame auxiliary support

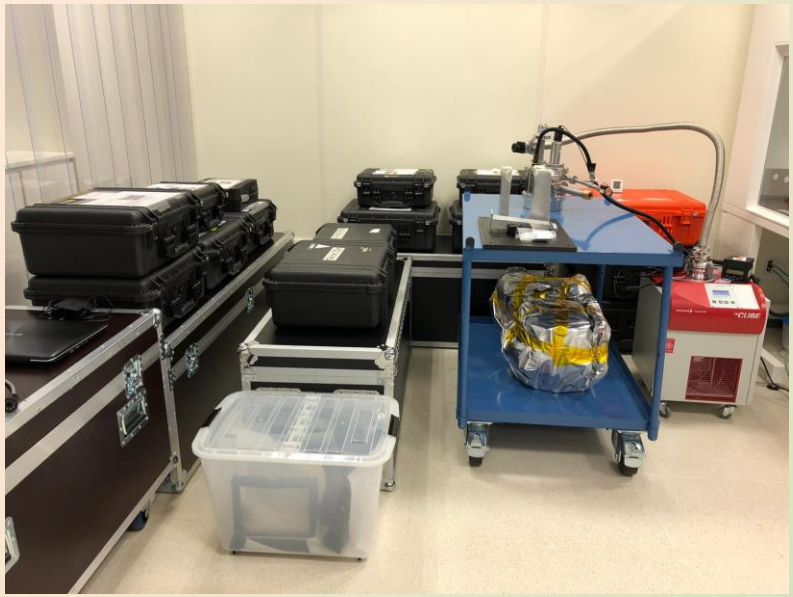


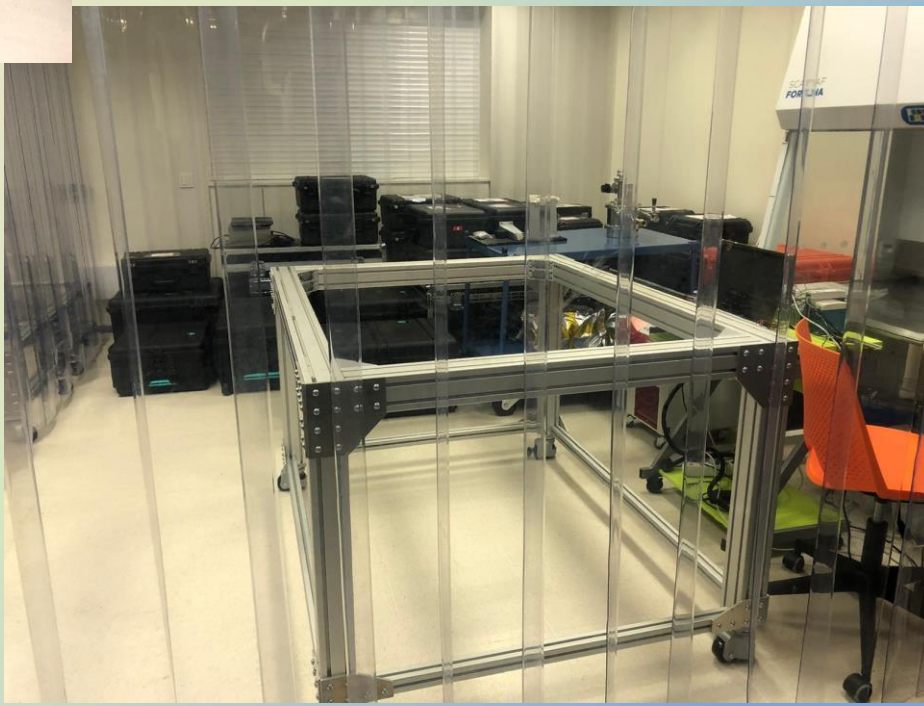
NIR cryostat handling cart





LICA





Anti-Vibration Mounts













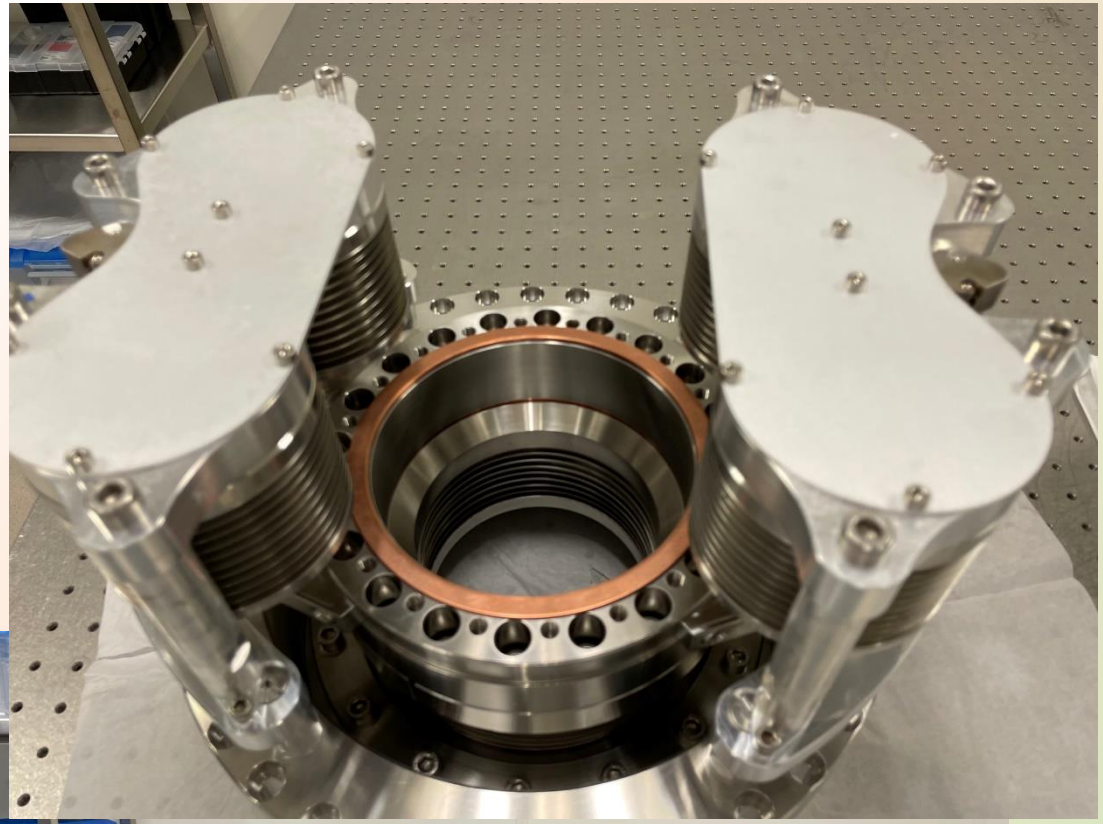


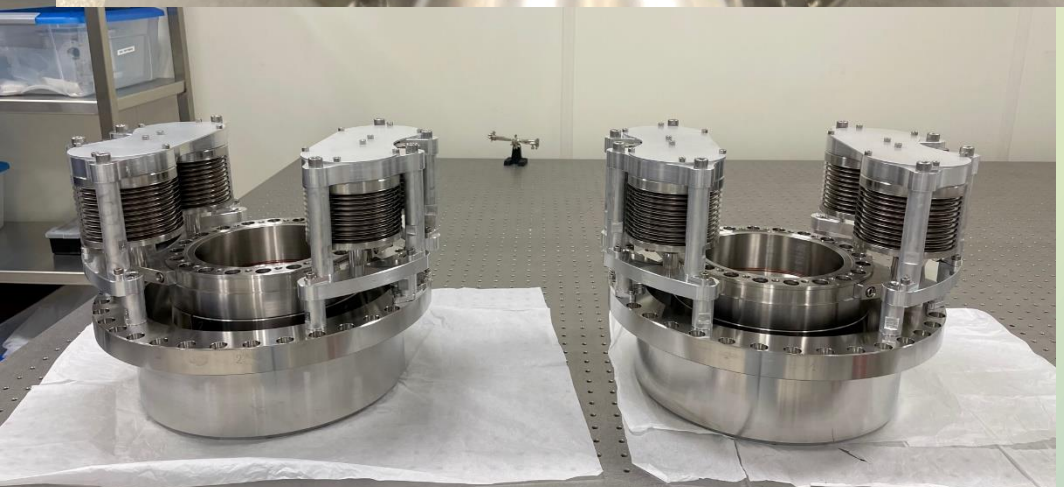




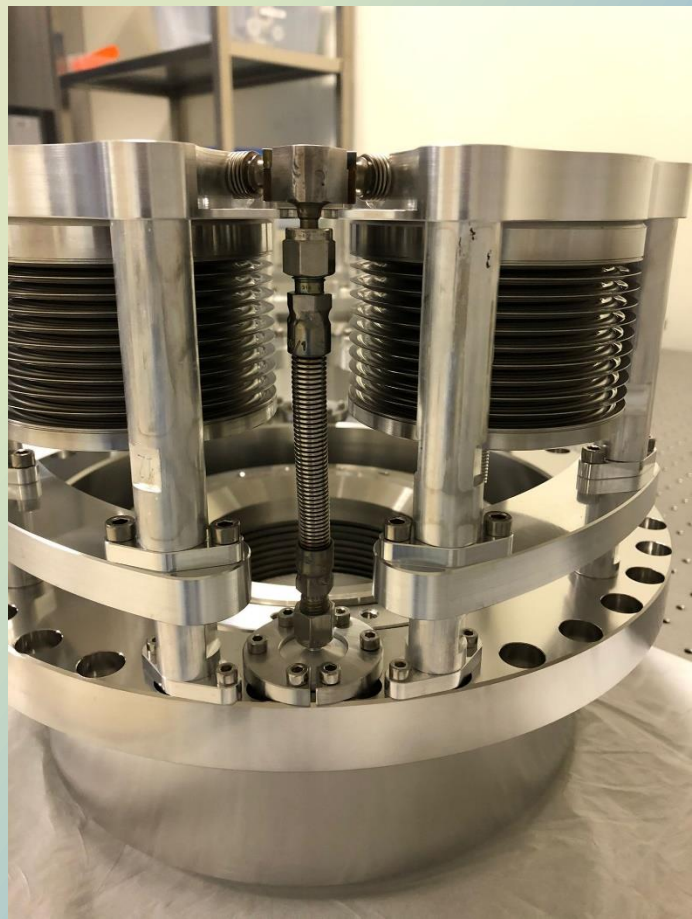
Assembled by FRACTAL

Anti-Vibration Mounts



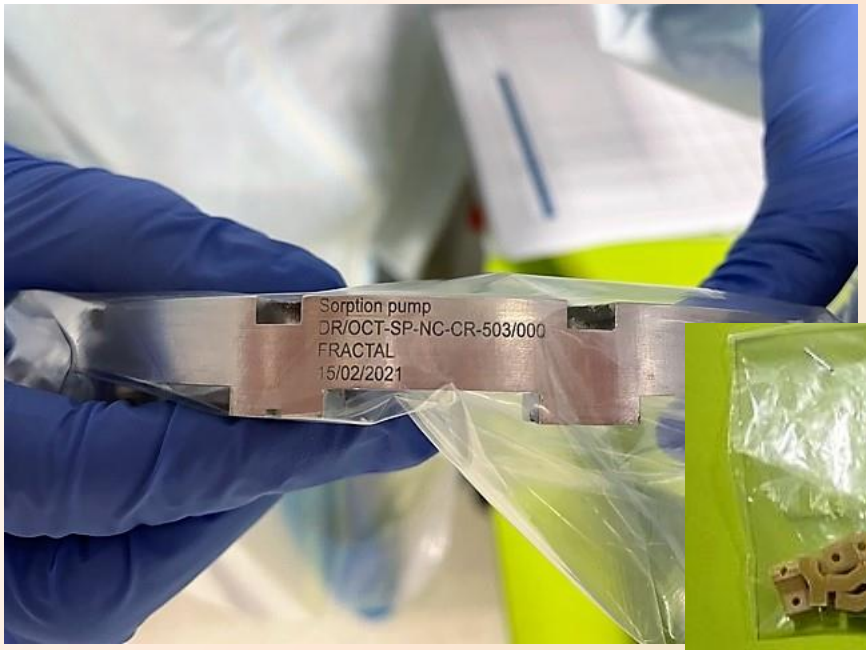






Getter

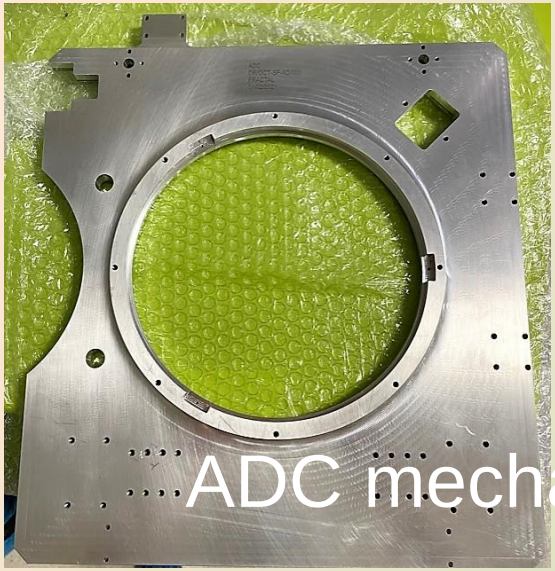
Design and assembled by FRACTAL













ADC mechanical custom parts







Air blower and Cover Door custom parts



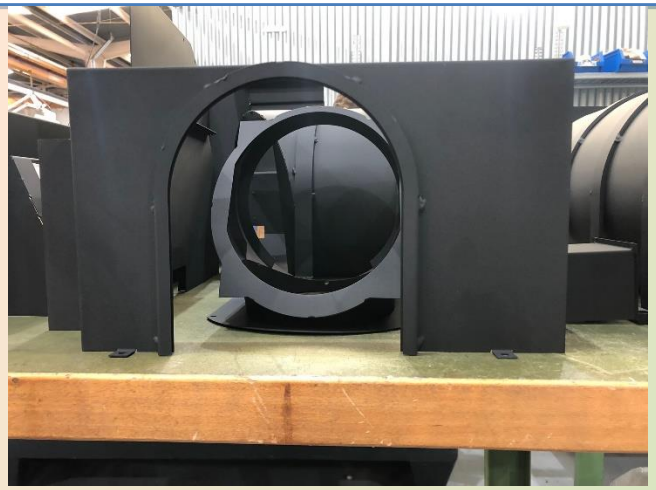




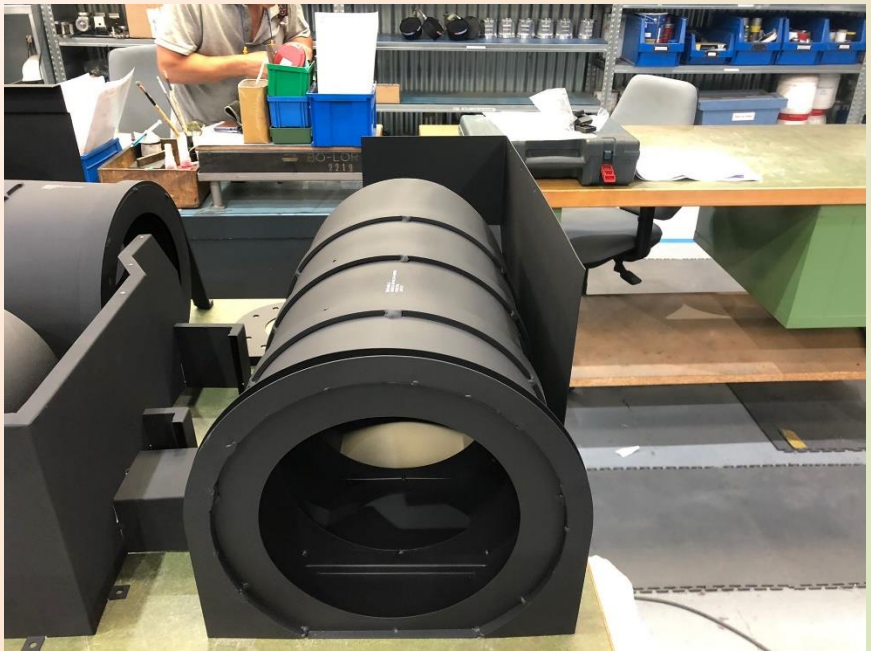


Baffles (at factory, final inspection)





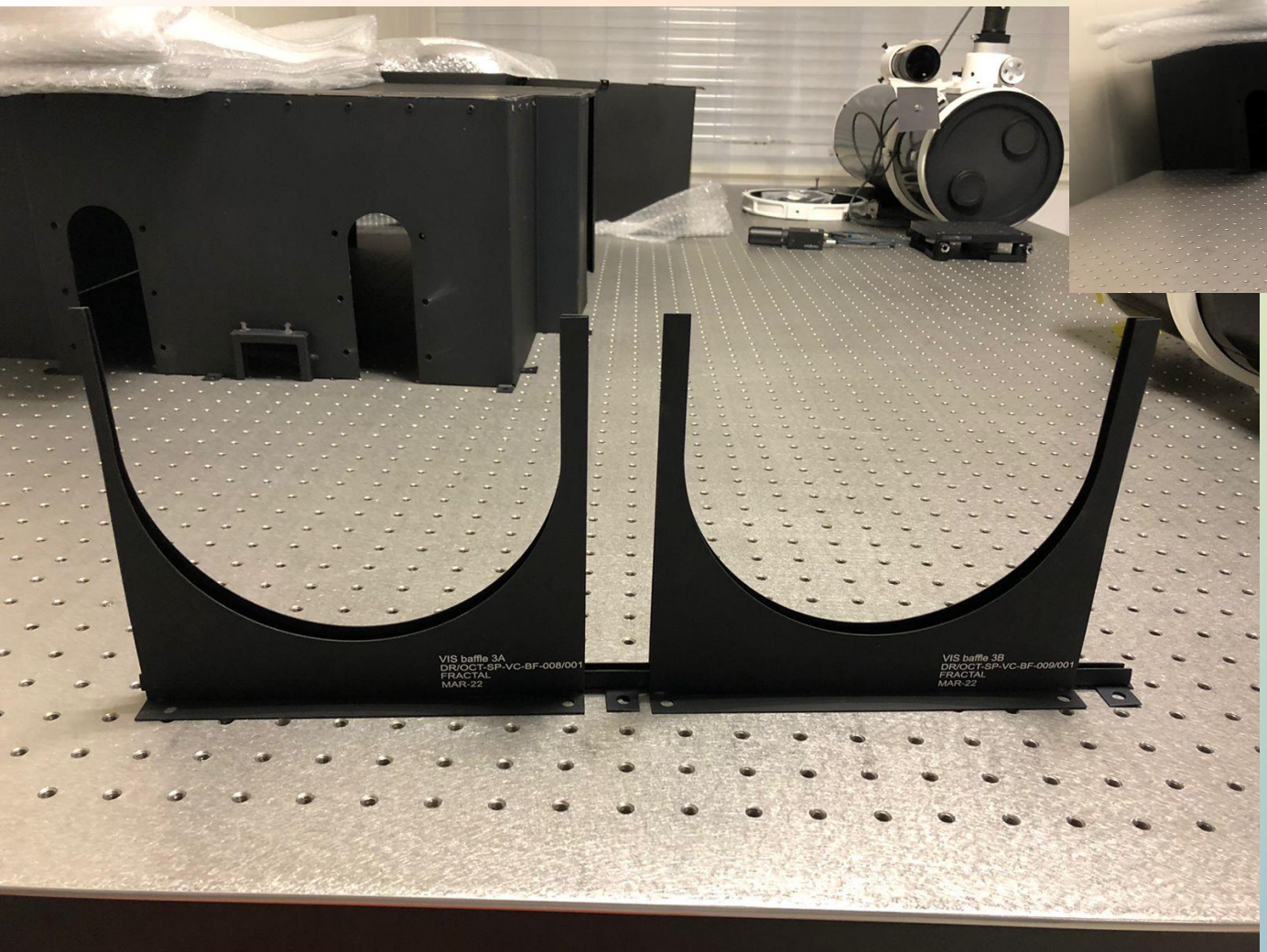






Baffles (at LICA)

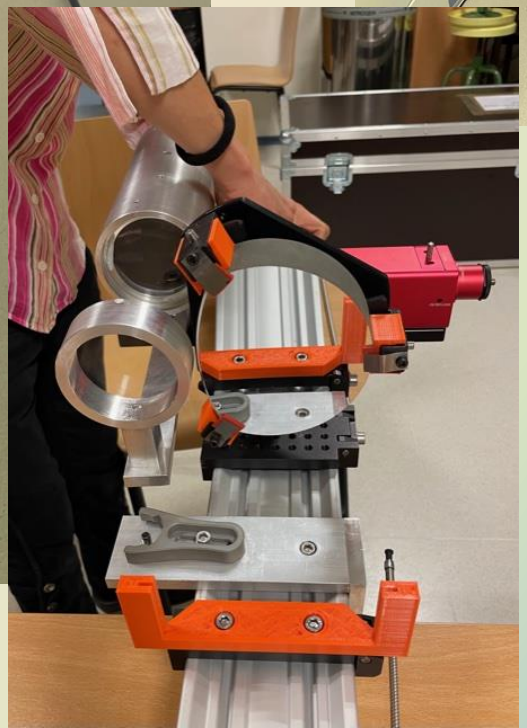




Gemini Telescope Simulator



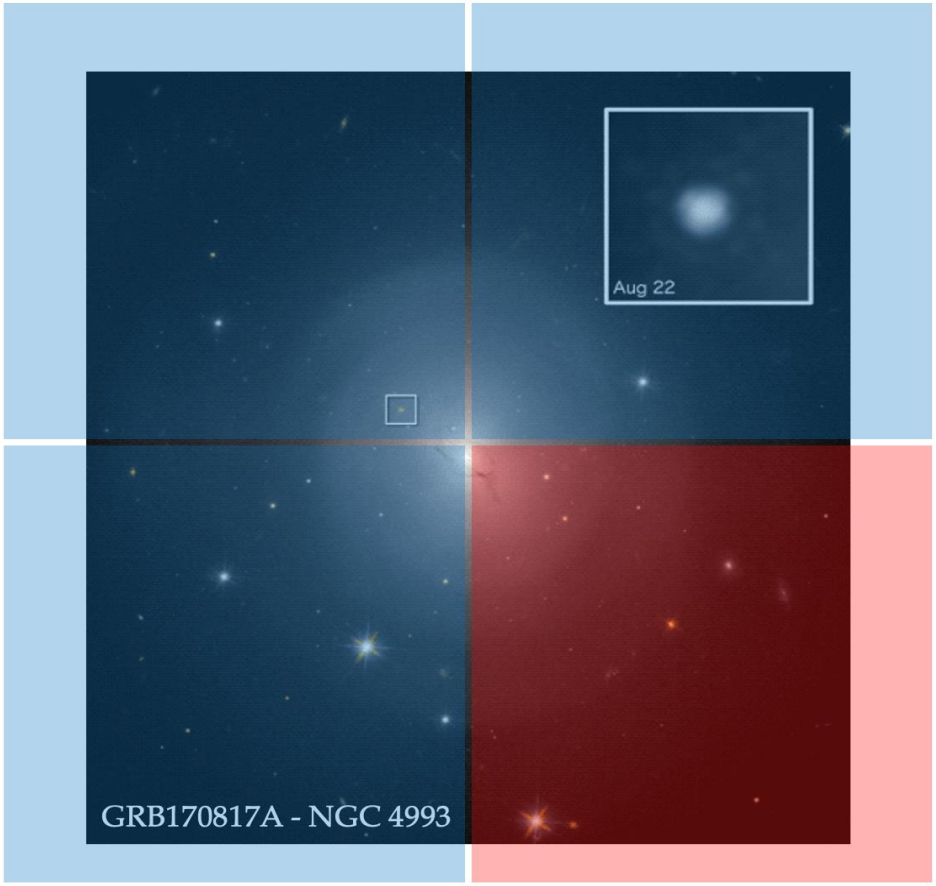






"Tetra-ARmed Super-Ifu Spectrograph"

designed for long trips with unknown destinies...



IFU. **Connected** FoV

Large FoV, 9 arcmin^2 4 x (1.40 x 1.40)

Spaxel size: 2.1 arcsec

Bluest spectral range

Wide λ coverage

320 to 520 nm

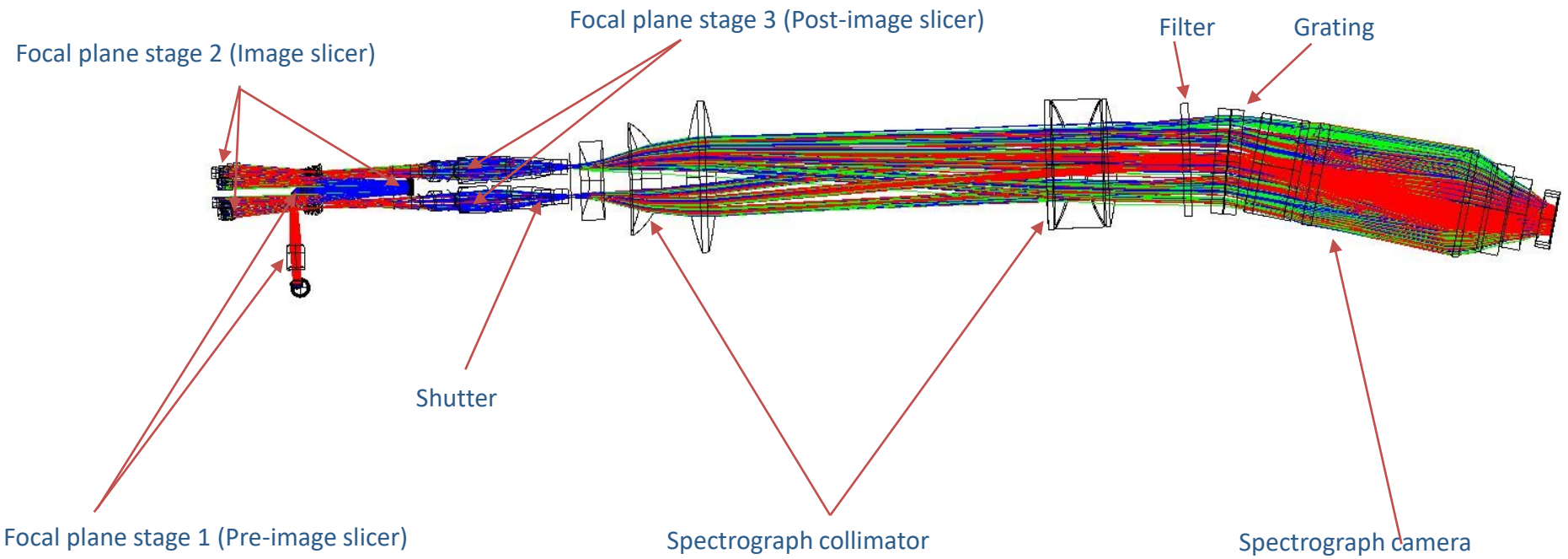
510 to 810 nm

Spectral resolution R ~1000

December 2026 + 6 months contingency

7.2 M€ + 0.70 M€ contingency

"Tetra-ARmed Super-Ifu Spectrograph"



one arm view

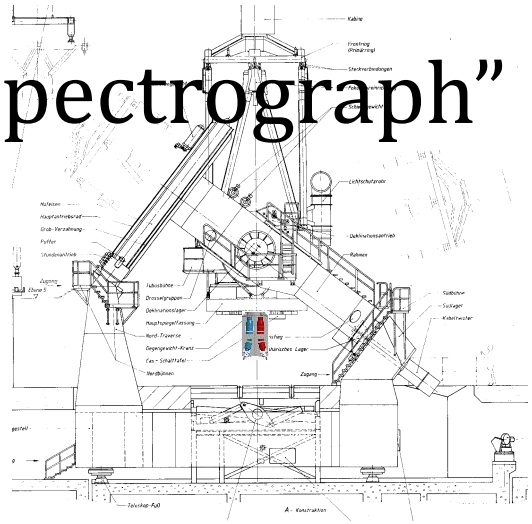
1e+03 mm

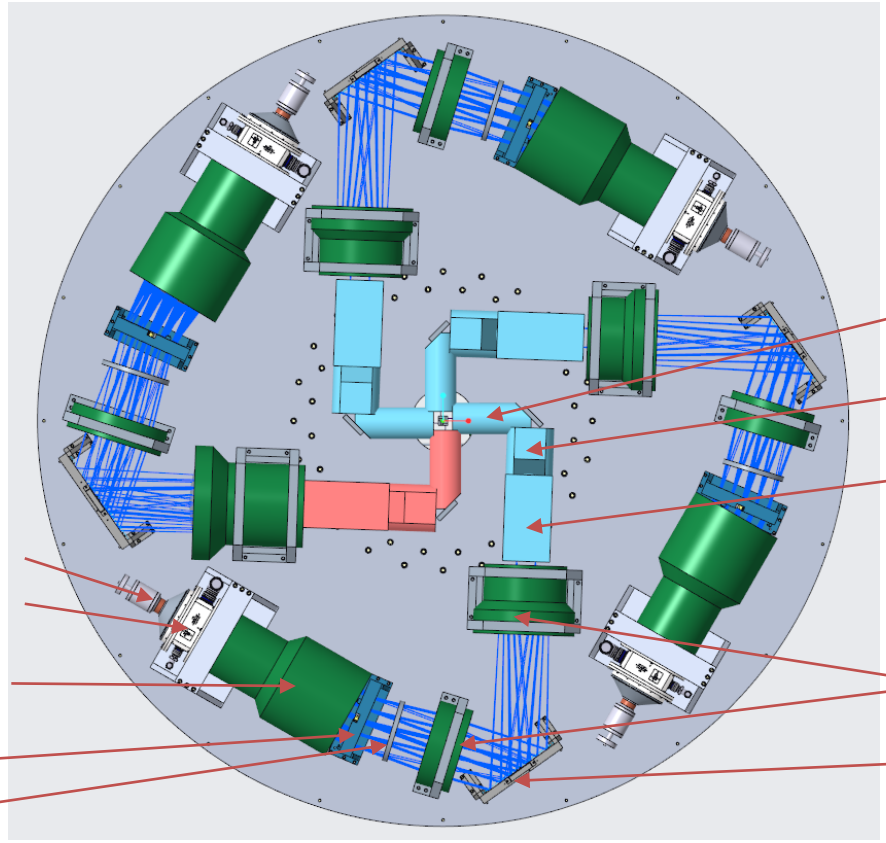
3D Layout

9/29/2022

Zemax
Zemax OpticsViewer 20.1

"TARSIS: Tetra-ARmed Super-Ifu Spectrograph"





Focal plane stage 1 (Pre- image slicer)

Focal plane stage 2 (Image slicer)

Focal plane stage 1 (Post-image slicer)

Detector cooling system

Detector & cold head

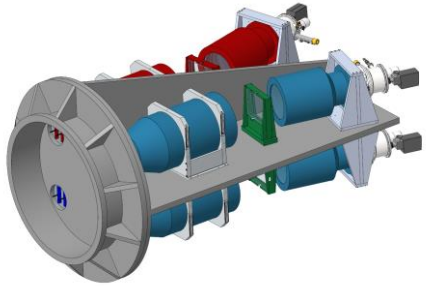
Spectrograph camera

Spectrograph grating

Spectrograph filter

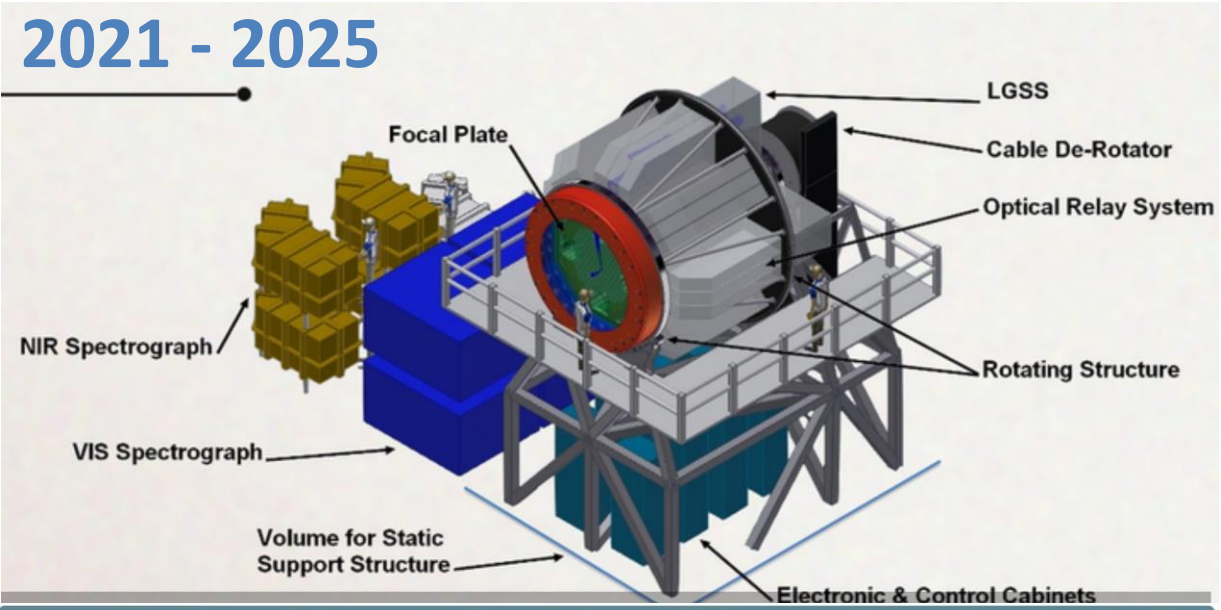
Spectrograph collimator

Spectrograph fold mirror



MOSAIC ELT
Customer: UCM

2021 - 2025

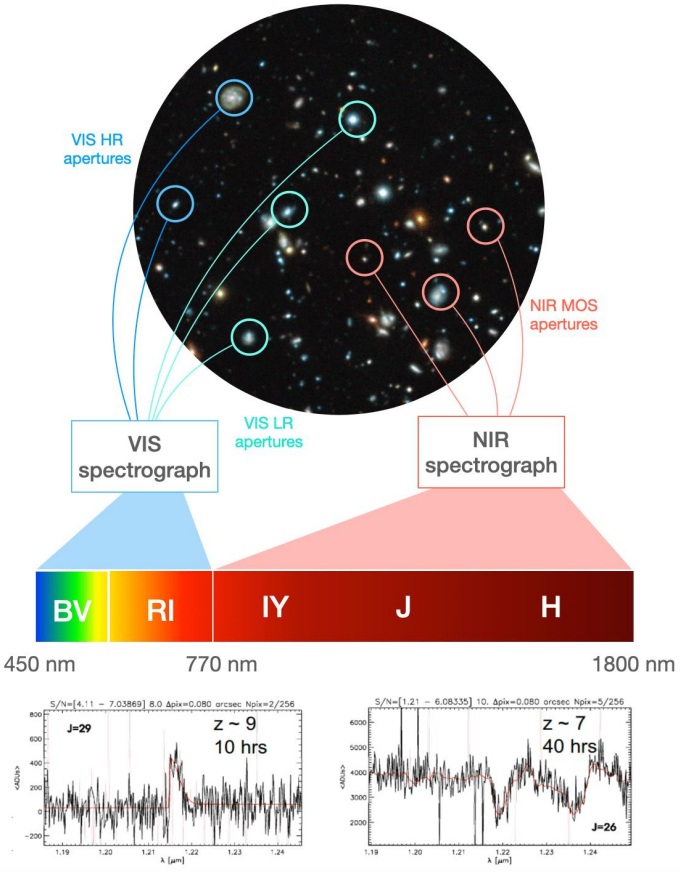


Instrument configuration name	Mode	Operating wavelength (µm)	Multiplex	Aperture on sky (arcsec)	Spectral resolution (λ/Δλ)
MOS-VIS-LR	MOS	0.45 – 0.7	200	0.7	R ~ 4,000
MOS-VIS-HR	MOS	0.45 – 0.877	100	0.7	R ~ 18,000
MOS-NIR-LR	MOS	0.77 – 1.80	200	0.6	R ~ 4,000
MOS-NIR-HR	MOS	0.77 – 1.80	200	0.6	R ~ 18,000
mIFU-LR	mIFU	0.77 – 1.80	8	2.5	R ~ 4,000
mIFU-HR	mIFU	0.77 – 1.80	8	2.5	R ~ 18,000

Band	Resolution (λ/Δλ)	Bandwidth (µm)
VIS LR1	4000 (5000 goal)	0.45 - 0.59
VIS LR2	4 000 (5 000 goal)	0.59 -0.77
VIS LR3 (*Goal*)	4 000	0.38-0.45
VIS HR1	18 000	0.51-0.57
VIS HR2	18 000	0.61-0.67

The full near-IR band spanning from 0.77 to 1.8µm is covered simultaneously at low spectral resolution. The two HR bands in the near-IR can also be observed simultaneously.

Band	Resolution (λ/Δλ)	Bandwidth (µm)
NIR LR	4 000 (5 000 goal)	0.77 - 1.8
NIR HR1	9 000	0.77-0.89
NIR HR2	18 000	1.53-1.62



WPs

CALEMOS, Calibration module

NIR spectrographs mechanisms and VPH gratings

CTA Maintenance Plan

Grouped task code	Detailed preventive task code	Grouped task description	Components affected and location/access tools
CAM-P2	**Camera regular visual inspection (that needs hardware disassembly) every 6 months from the camera access tower to check:**		
	CAM-P-003D	Cooling system fans: regular maintenance (cleaning, checking electrical and data connectors, correct air flow, unforeseen vibrations or noises, etc.)	Cooling system fans (inside camera, front door access)/ need scaffolding
	CAM-P-004D	Cooling system fans: check power and data connectors, power distribution board and connection to I/O modules	Cooling system fans (inside camera, front door access)/ need scaffolding
CAM-P3	**External water system: regular maintenance of commercial chiller every 6 months from the azimuth rail platform:**		
	CAM-P-030D	External water system: regular maintenance of commercial chiller as per manufacturer's recommendations. Regular visual inspection to check any leak, pressure and chiller control panel alarms.	Azimuth rail area platform

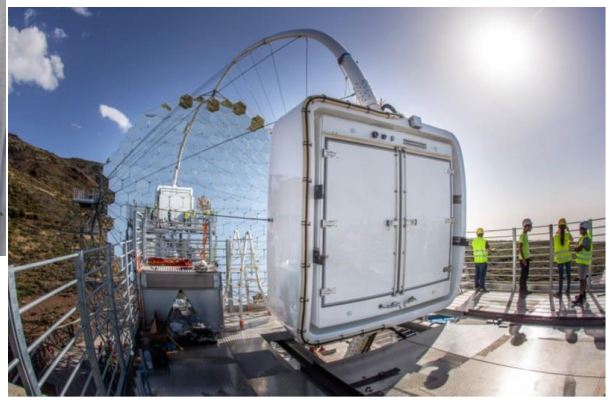
Development of a **Maintenance plan** for the, Camera, Bogies and Azimuth Locking system of the **LST-1** (Large-sized telescope) of the Cherenkov Telescope Array project (**CTA**)

Product Tree → FMECA → Maintenance Plan



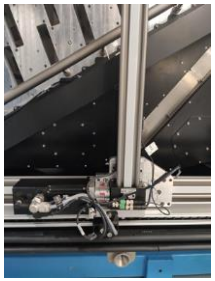


Extract from Camera System preventive tasks summary













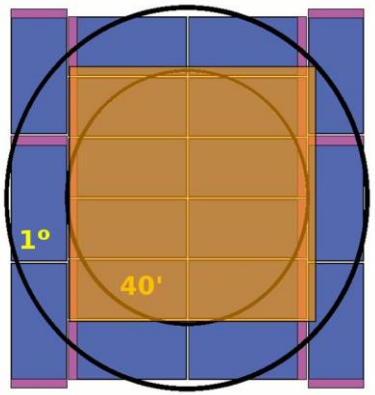
Astronomical instrumentation

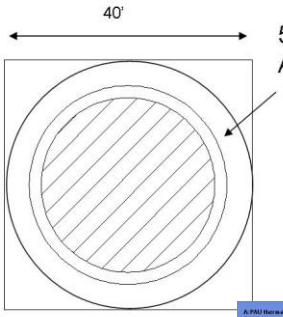
- Design
- Ordering and manufacturing tracking
- Assembly, Integration and Verification

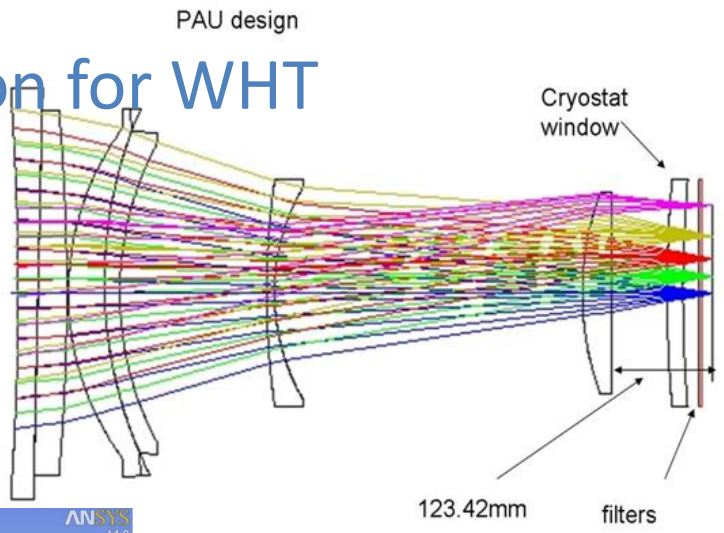
(slides of different projects at the end of the presentation)

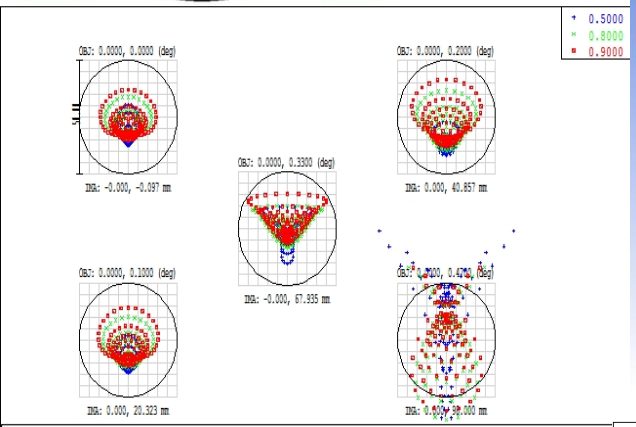
PAU Optics design and specification for WHT

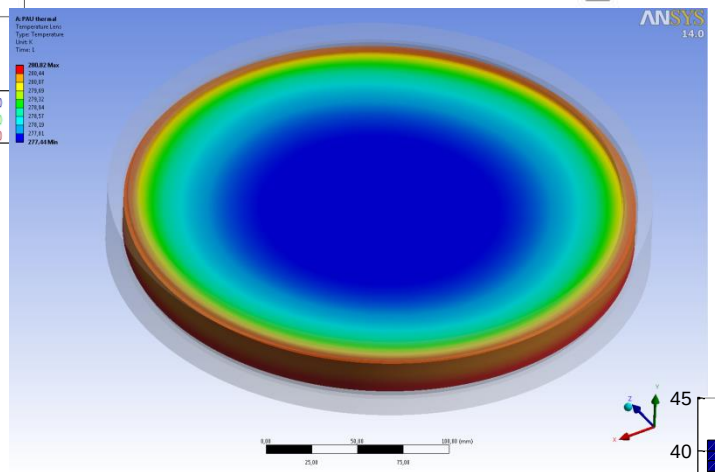
Customer: IEEC, In operation

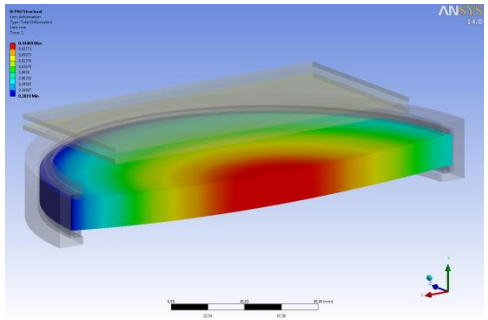




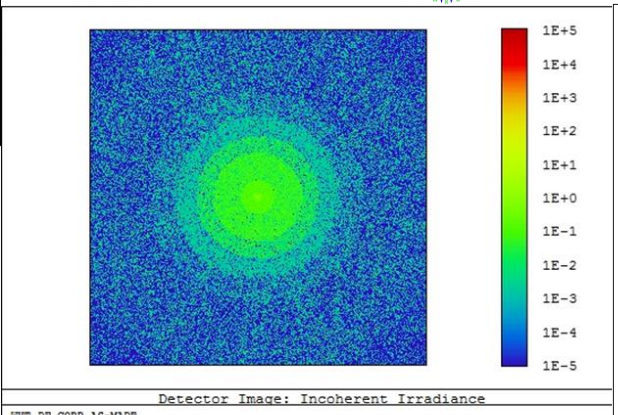


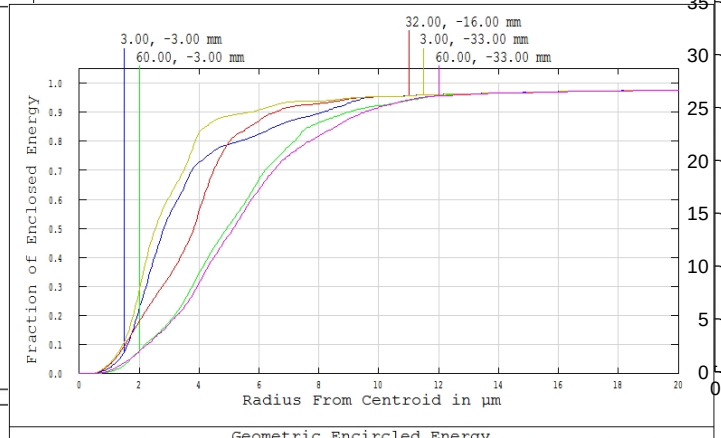


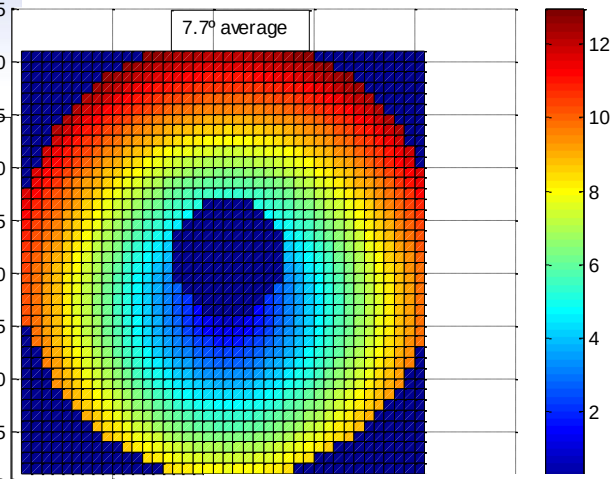




AOI for the pupil rays at Field at 32' indiameter



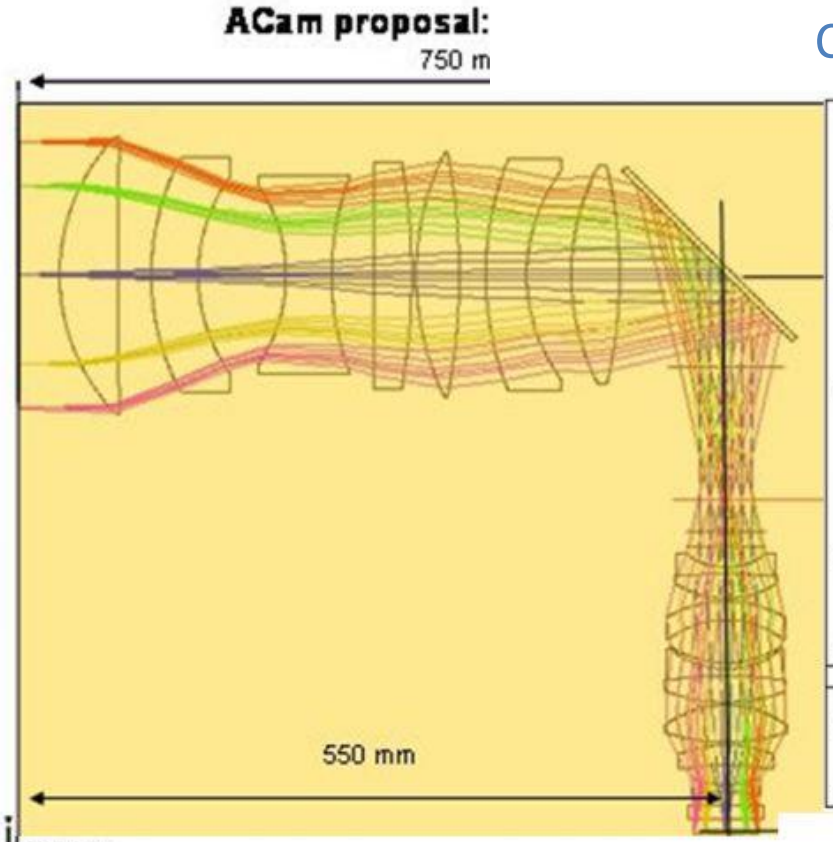


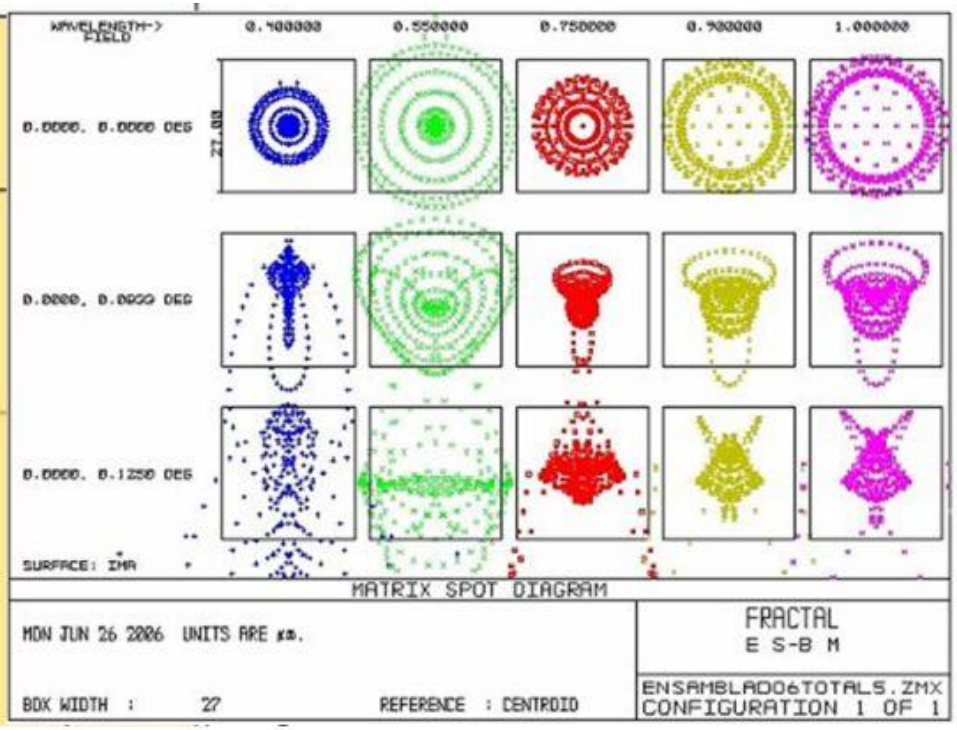


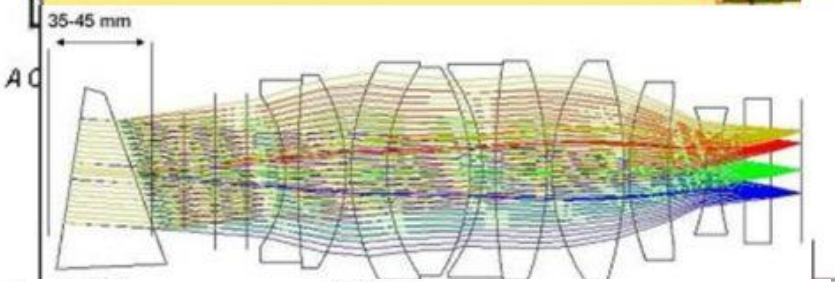
http://www.fractal-es.com

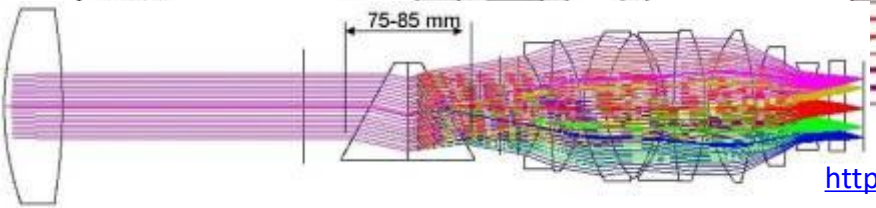
Conceptual Design for ACam (@WHT

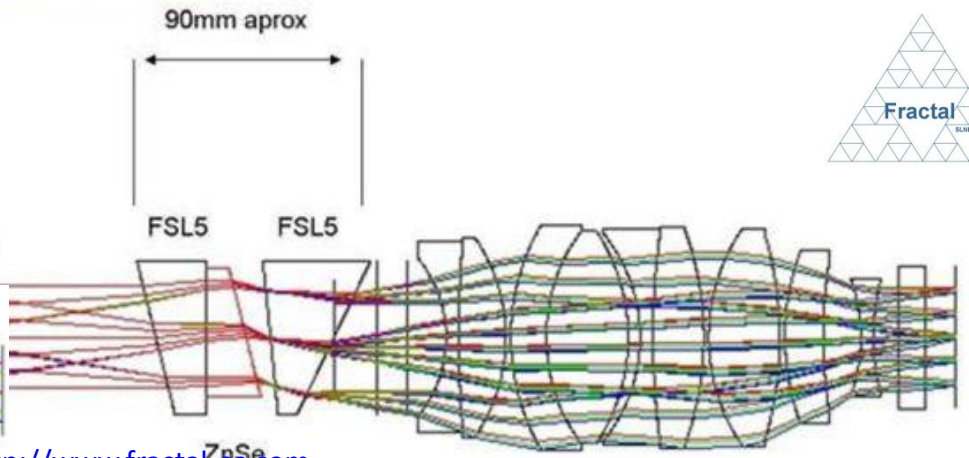
Customer: ING /PPARC, In Operation



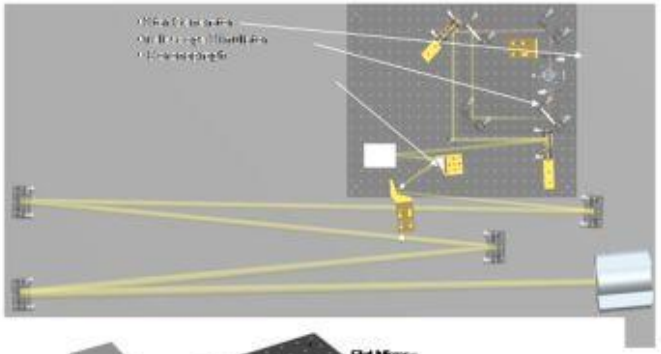


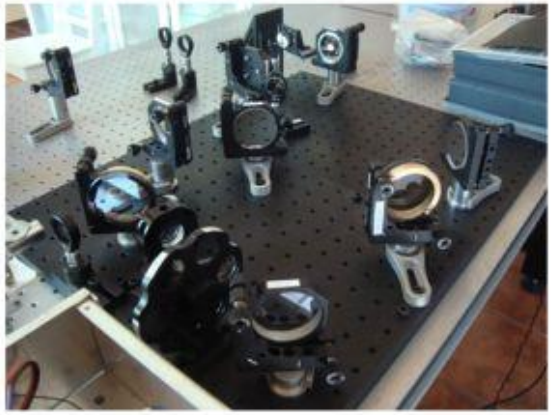


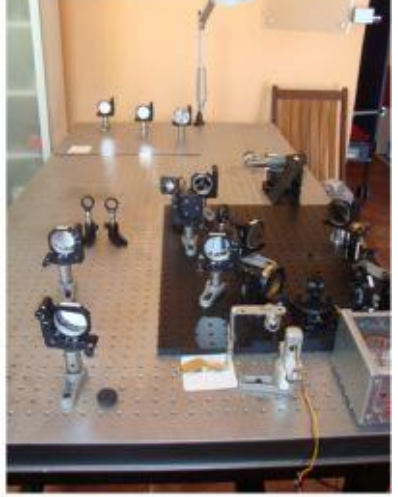


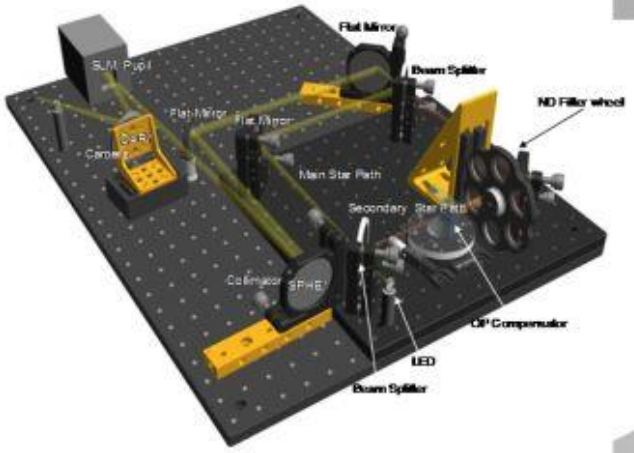


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Star simulator

Coronagraph

3.5 CAHA
Telescope simulator

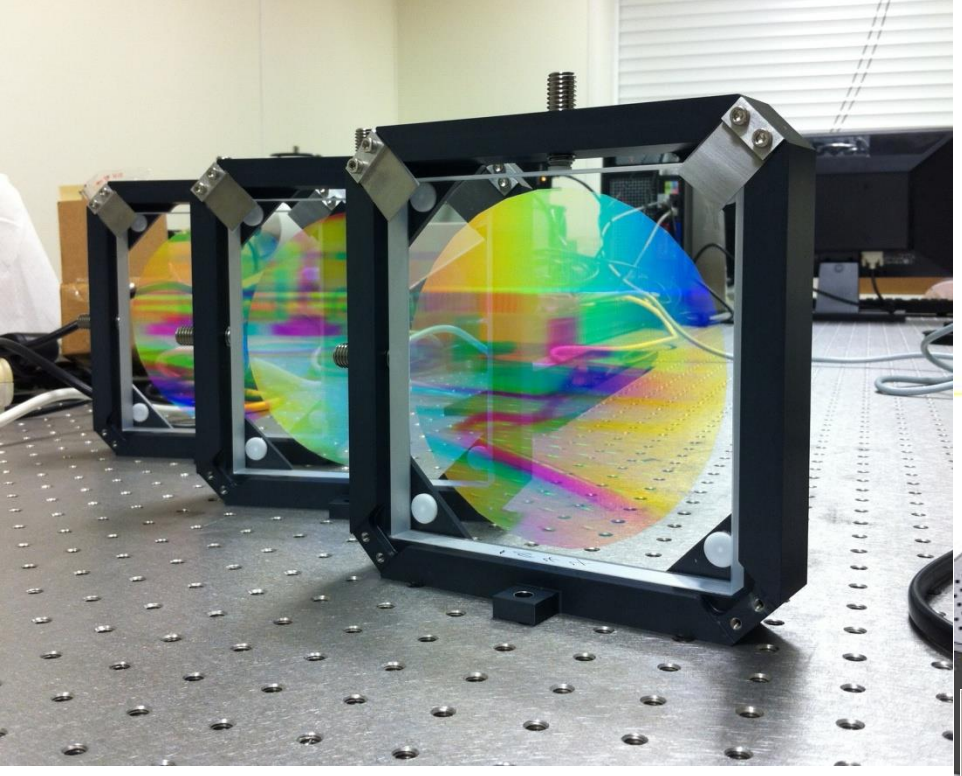


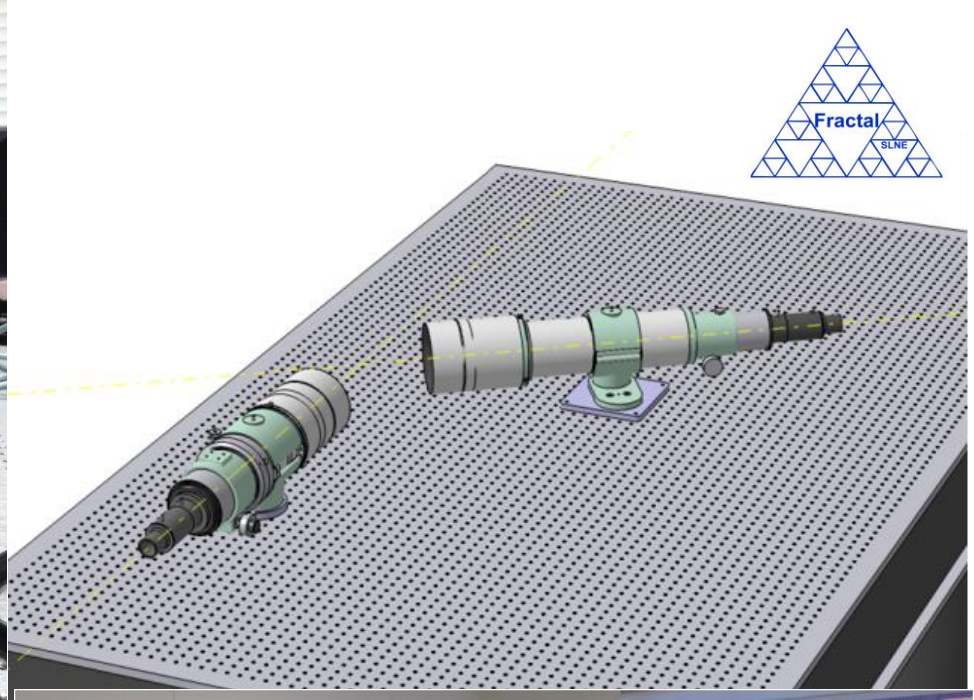


UC-coronagraph and auxiliary systems

Customer: University of Cantabria, In operation

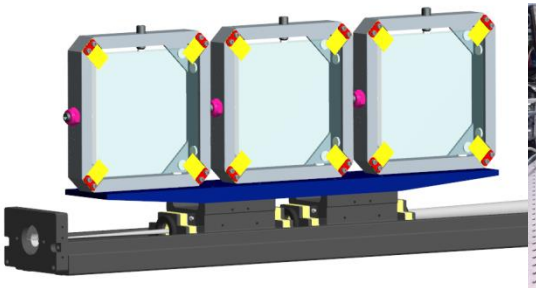
http://www.fractal-es.com

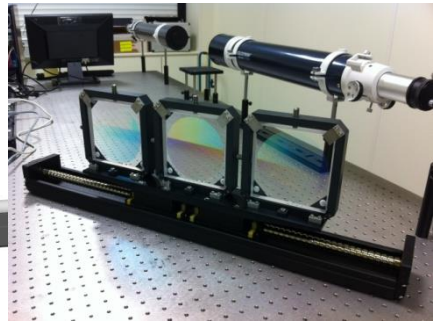




ARES spectrograph

Customer: IEEC, in operation

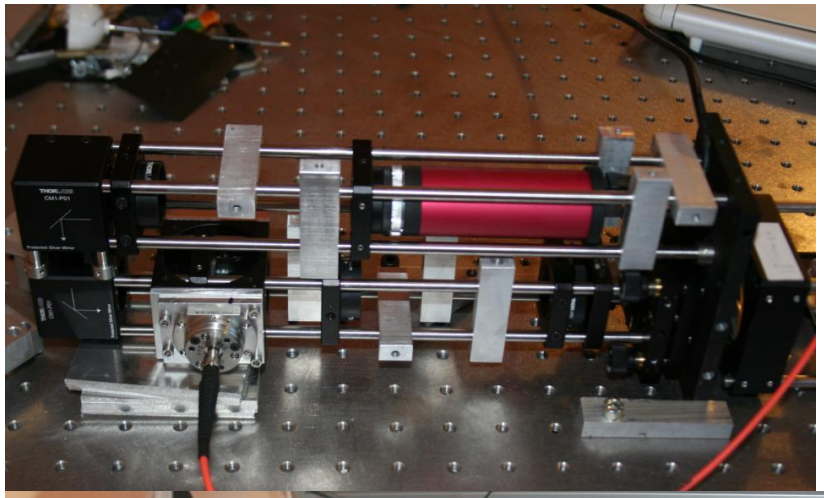






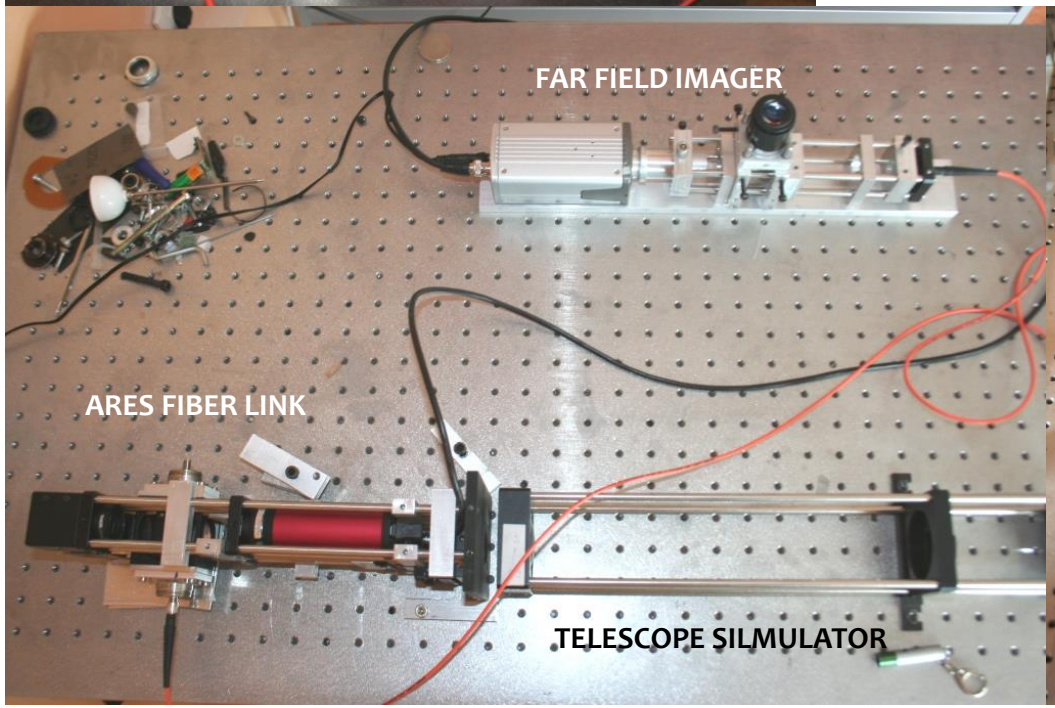
http://www.fractal-es.com

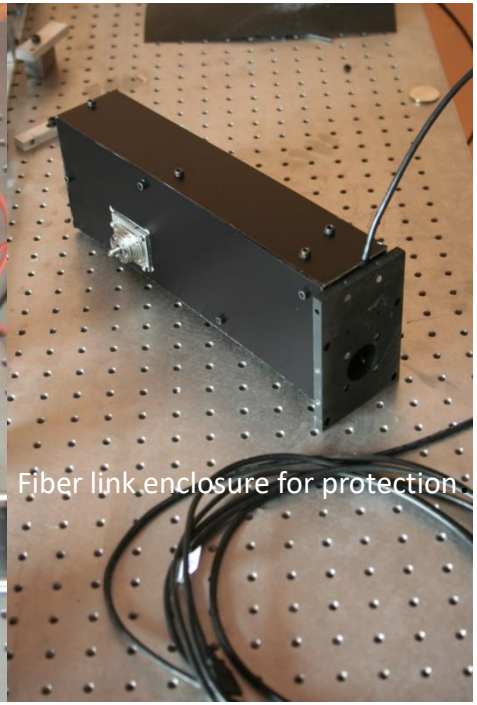
Telescope illuminator + ARES fiber link+ Far field imager.
From this setup we obtain the final image after the fiber link



ARES Fiber link

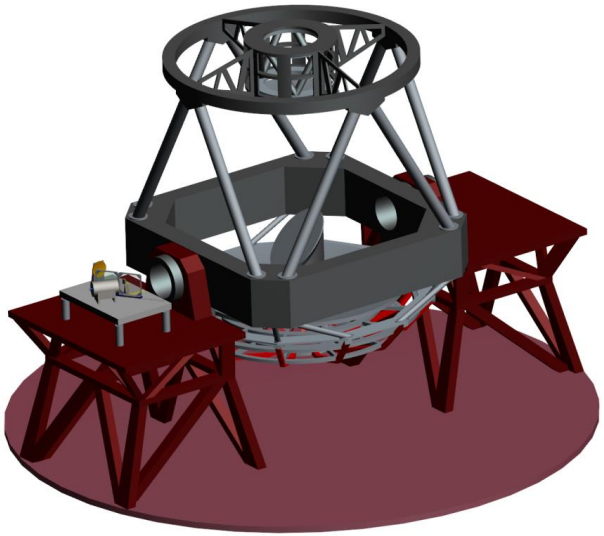
Customer: IEEC, in operation



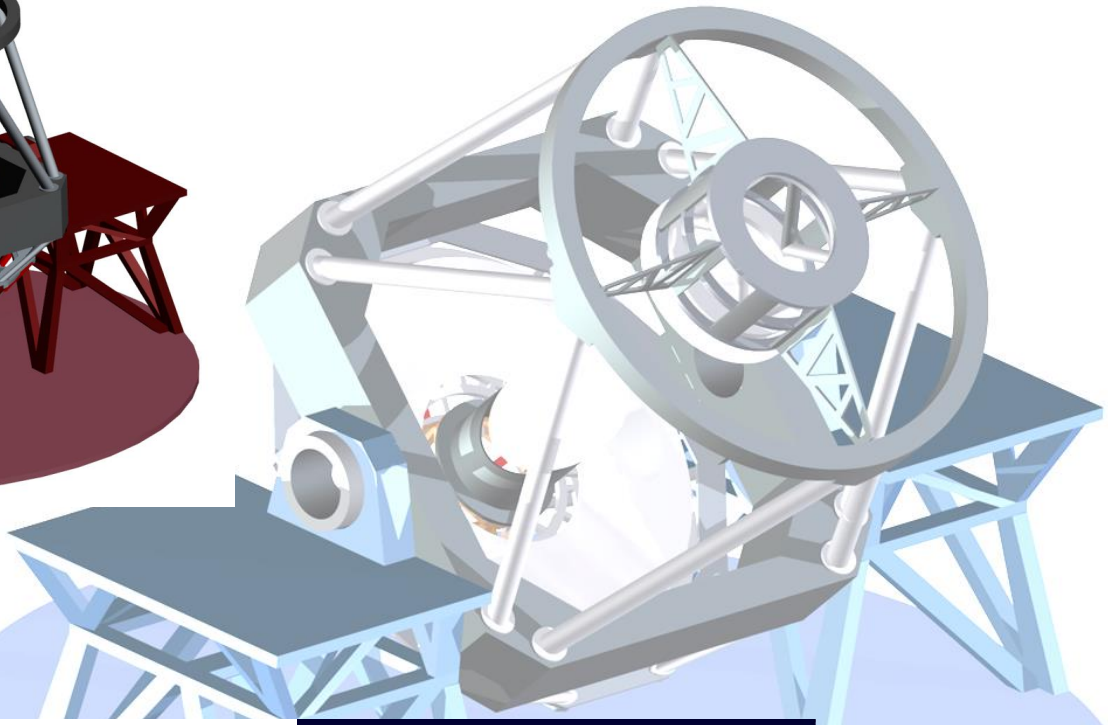


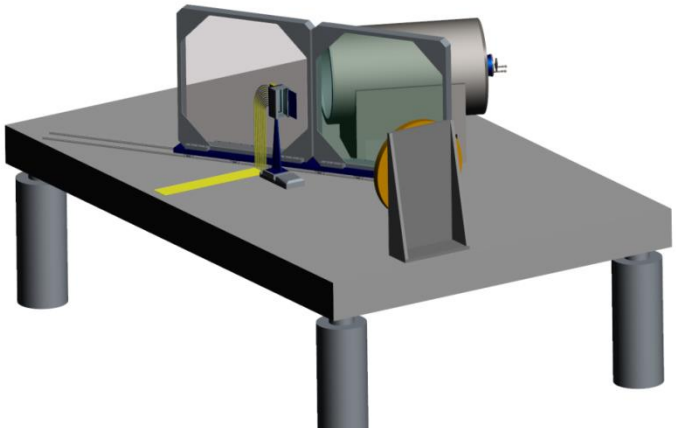
HEXA 6.5m Telescope Conceptual Design

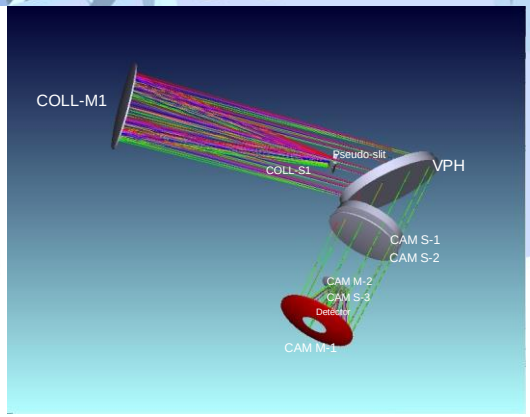
Customer: Calar Alto Observatory



HECATE

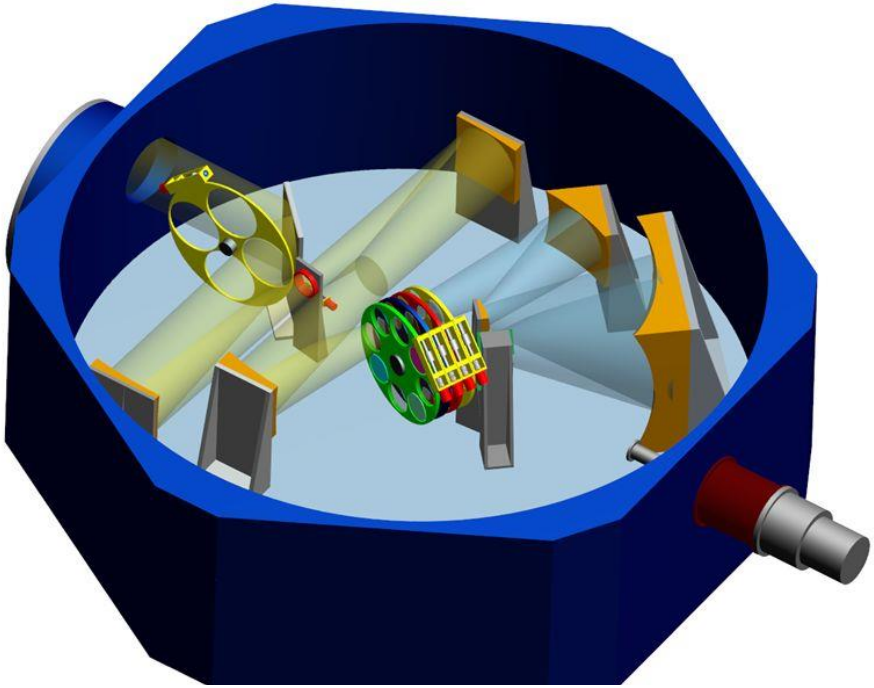


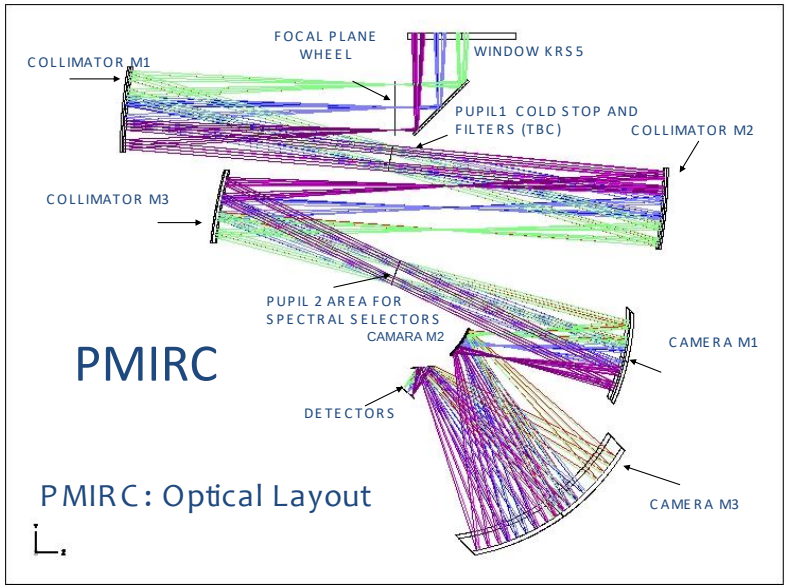


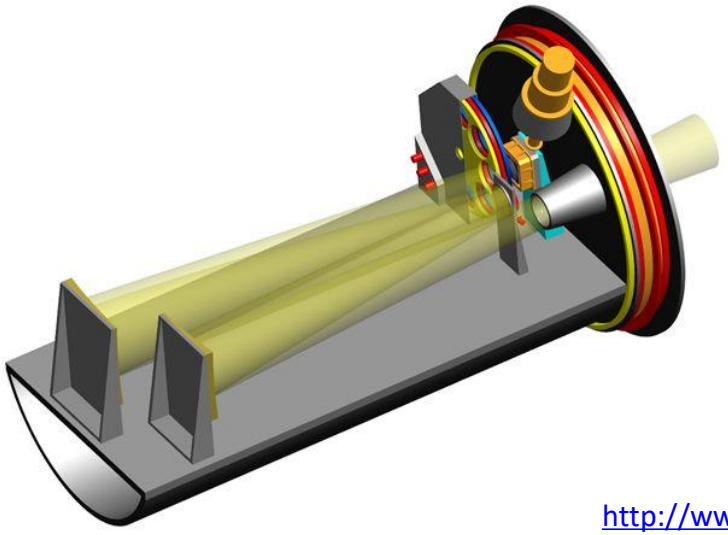


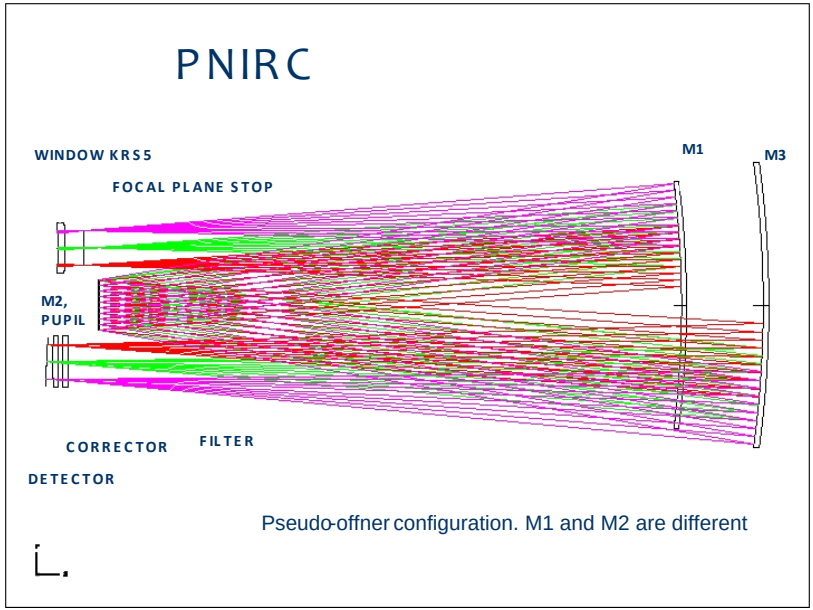
Conceptual Design of IR Instrumentation for Antarctica

Customer: Universidad Autónoma de Madrid









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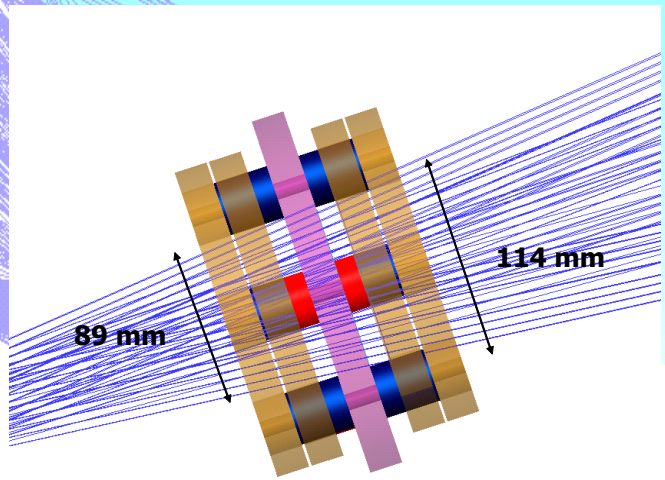
Design of Tunable filter for CIRCE/GTC)

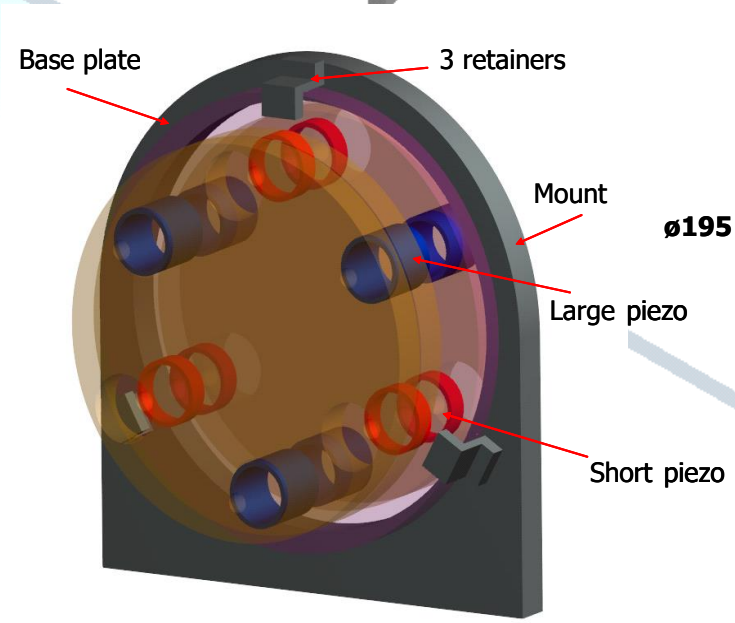
Customer: UCM

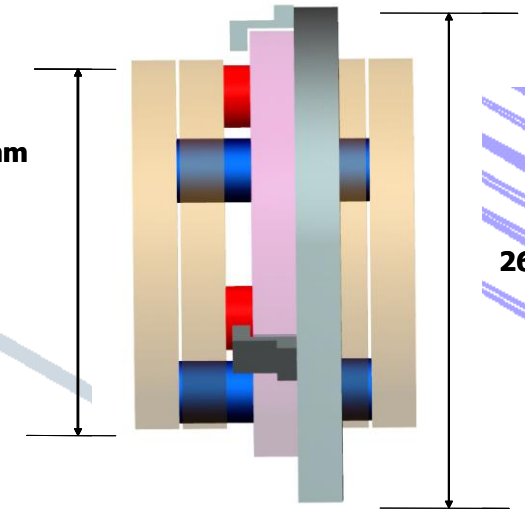
R = 750 - 754 for ALBA project (1 - 1.6 µm), see poster

R = 400 @ J, H and K bands









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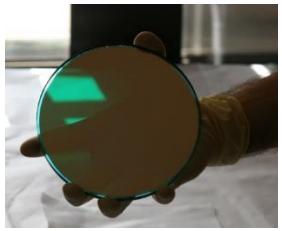
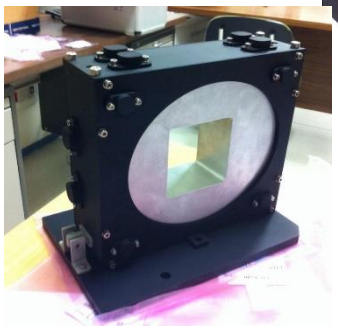
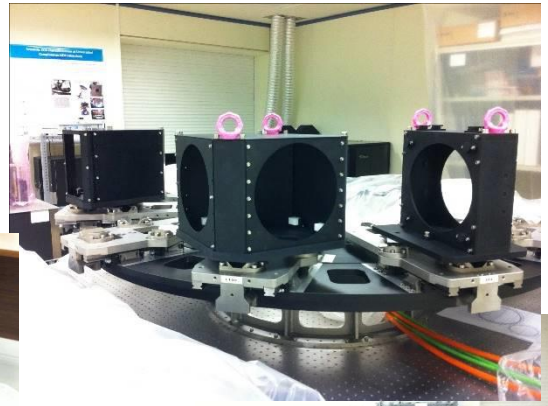
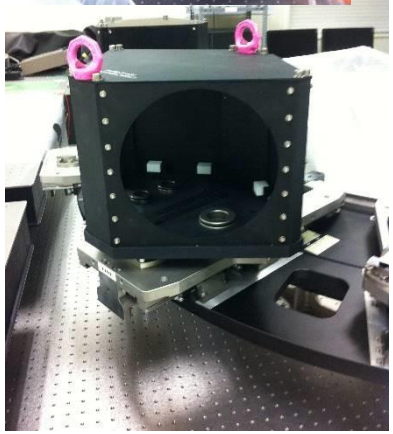
Optics and Opto-mechanics

Optics and Opto-mechanics

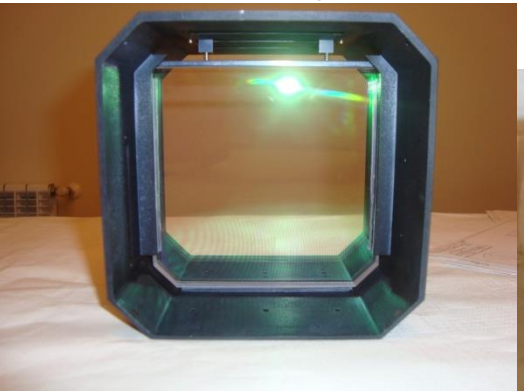
- Design, specification, manufacturing and tests of optical systems

  We can carry out the development of any optical system. Starting from the basic scientific requirements, we can produce feasibility studies, designs (at different levels) or the development of the whole project. We have a network of qualified manufacturers for all elements.

- Specification, design, acquisition, and tests of filters, prisms, VPHs (especially for Astronomy applications).

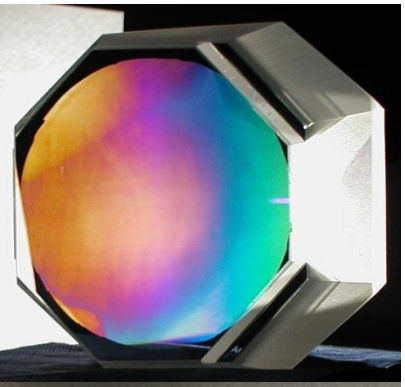






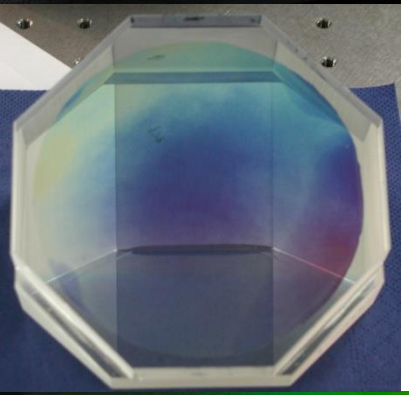
- Partnership with Wasatch Photonics




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Wasatch Photonics
Ultimate Diffraction Gratings

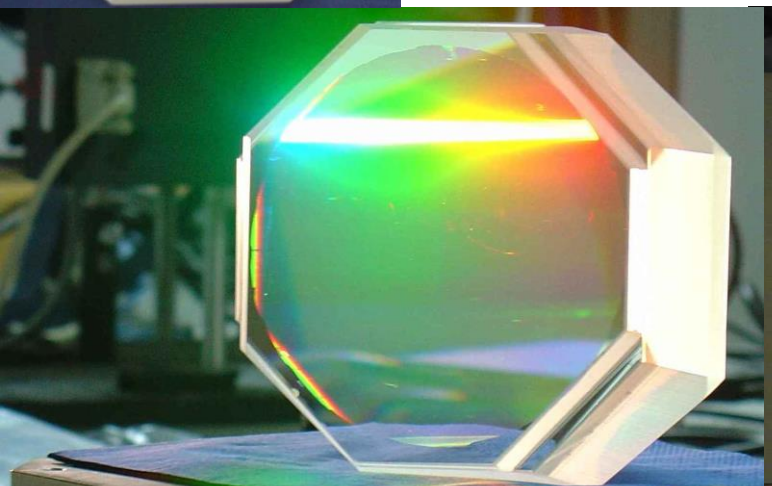




- Wasatch Photonics specializes in high performance Volume Phase Holographic Gratings (VPHGs) and Volume Phase Holographic Optical Elements (VHOEs). Their flagship products are called Dickson® gratings. These are an enhanced form of VPHGs using Wasatch Photonics' patented technologies and proprietary know-how. http://www.wasatchphotonics.com/index.html

- FRACTAL is partner of Wasatch Photonics for Product Distribution and future R+D. We can specify what our customer need and work with our partner to provide the required gratings

- FRACTAL is **distributor for Wasatch Photonics in several countries**





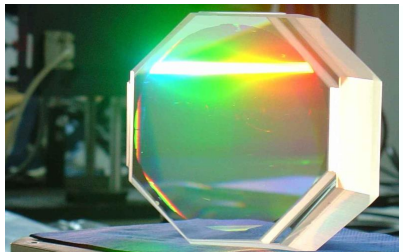
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VPHs for ExoMars

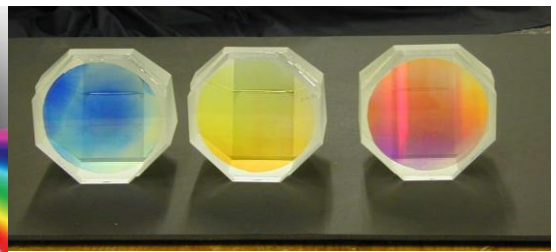
Diffraction Gratings Specification for RLS Raman Spectrometer

Customer: INTA

The spectrometer unit belongs to the RLS system of the ExoMars-Pasteur rover's payload instruments. The RLS system is part of the Analytic Lab instrument placed inside the rover and provides Raman spectroscopy.



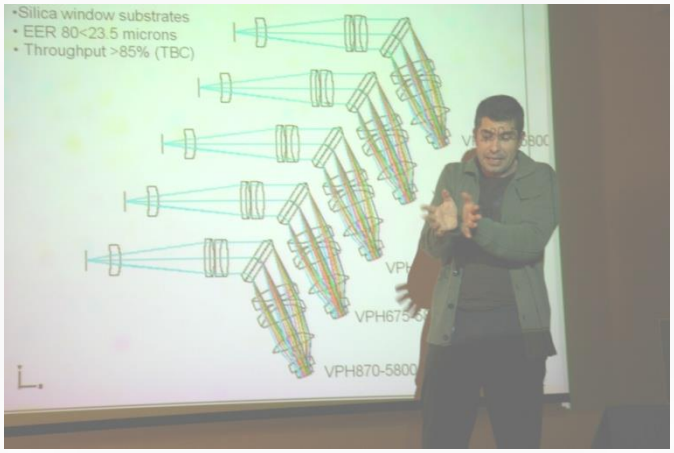




Specialized Training



Training at customer's offices



General 1, 2 ,3 days-courses in Madrid

Three perspectives on Project Management
System Engineering: Application and Development
Optical systems design for Instrumentation
Adaptive Optics
Opto-mechanics systems projects
Introduction to Mechanical Design for IR Instrumentation
Optical Fibres in Astronomy
Scientific Imaging in the visible and near-IR
RAMS analyses
Image Processing Techniques
Object Oriented Software Project engineering
CAN/CANOpen buses integration

http://www.fractalslne.es/calendario.jsp



Technology Transfer and Innovation

- ESO Technology Transfer

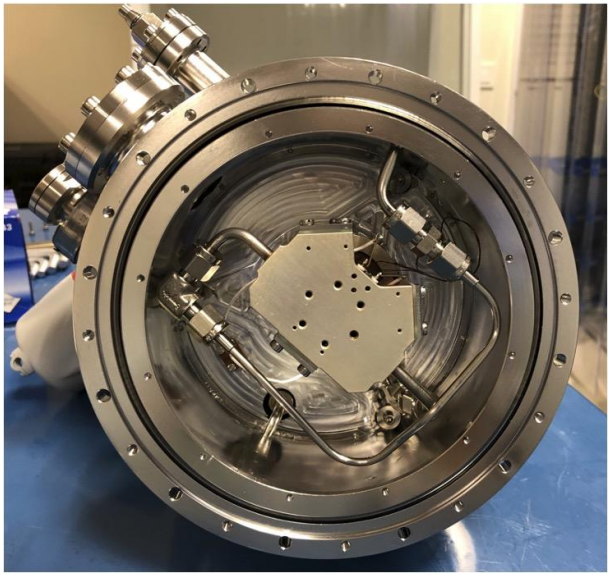
(slides of I+D projects at the end of the presentation)

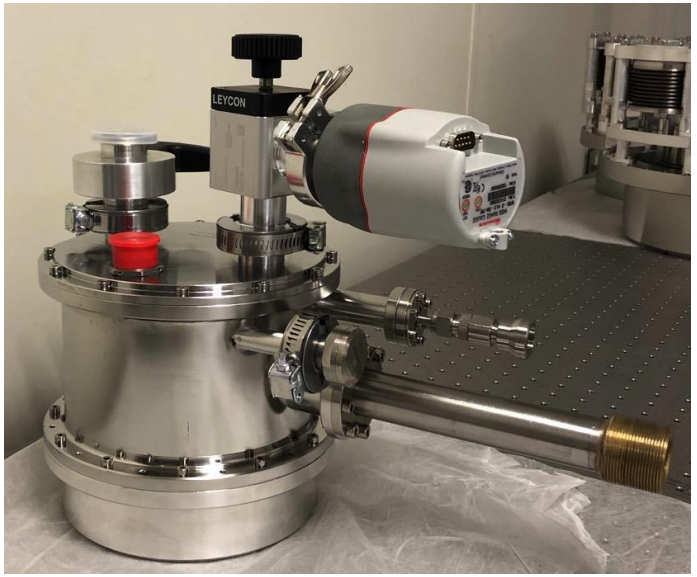
Continuous Flow Cryostats

Technology Transfer Licence Agreement for Cooling System from ESO

Signature: 2015







Agreement to license its cooling system technology to our company FRACTAL SLNE. Continuous flow cooling systems were first developed at ESO for the cooling of instruments and detectors for the Very Large Telescope (VLT).

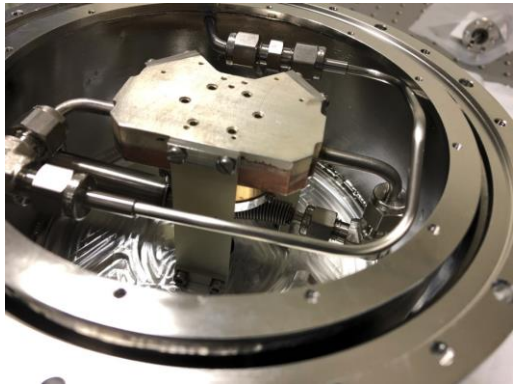
Continuous flow systems are more compact than traditional systems that use a bath of very cold liquid, but share the advantage of being vibration free. The continuous flow system allows the temperature within an instrument to be changed from room temperature to –193 degrees Celsius and is not affected by the loss of electrical power. As a result, the instrument can be kept very close to its operating temperature and the vacuum within the instrument can be retained.

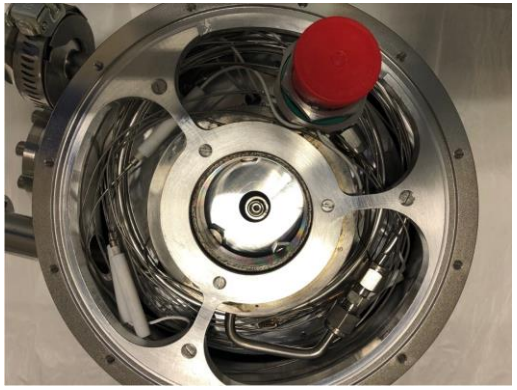
This agreement includes the licensing of the well-proven cryostats (which regulate the low temperatures) that are used to cool individual detectors from room temperature down to –193 degrees Celsius and the more sophisticated version that is used for the cooling of the ultra-stable detectors used in more sensitive measurements.

CFCs for ESO

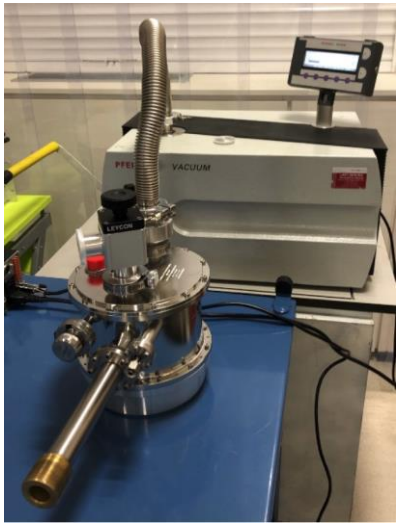


- 4 Continuous Flow Cryostats (CFCs) for ESO have been manufactured, integrated and verified.

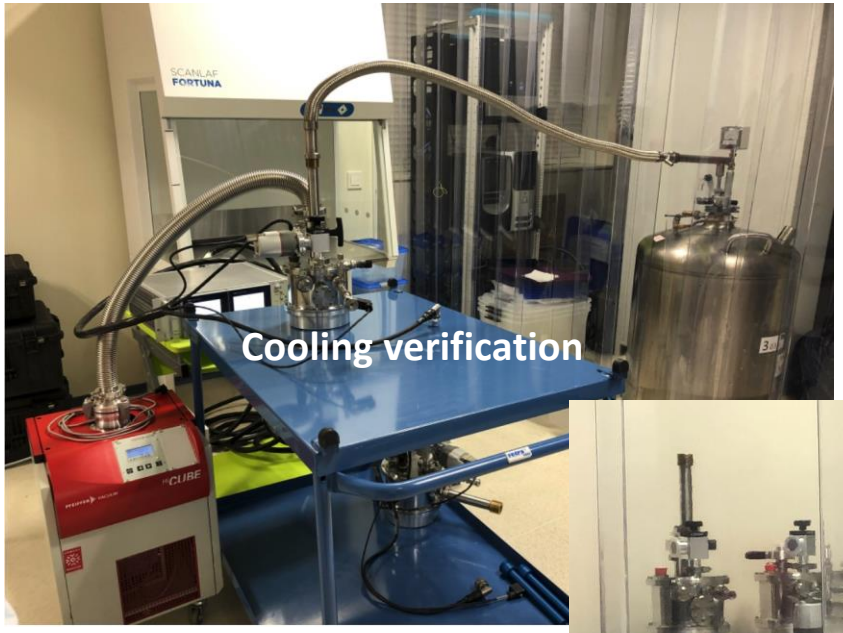


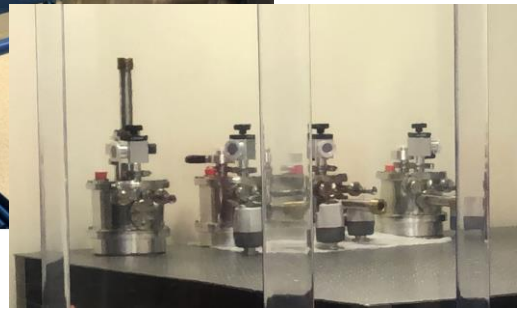


Leak testing



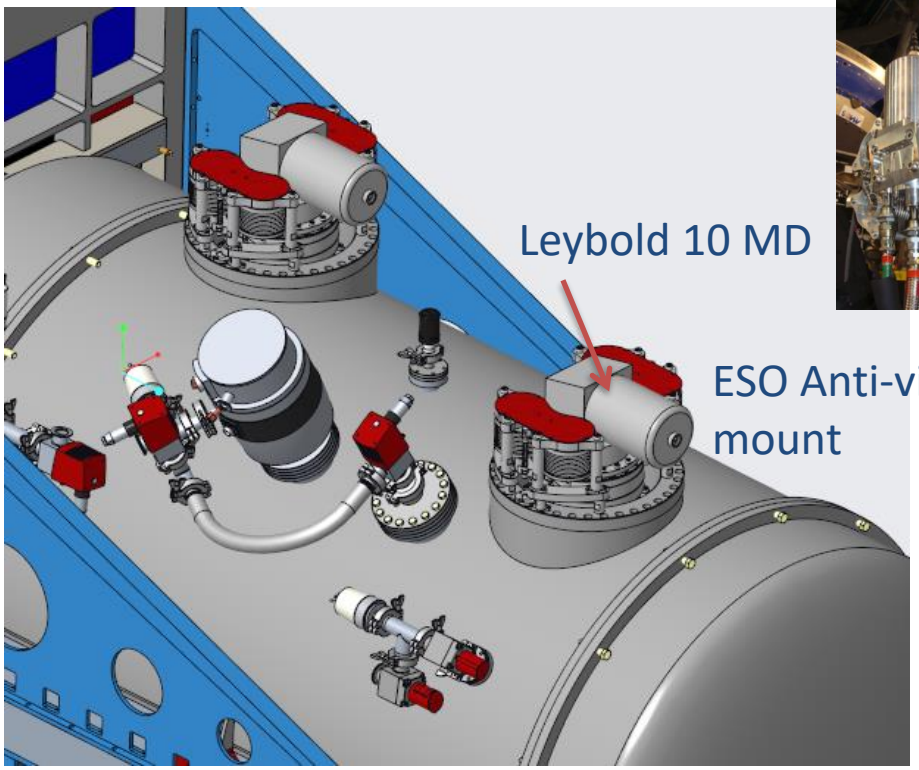






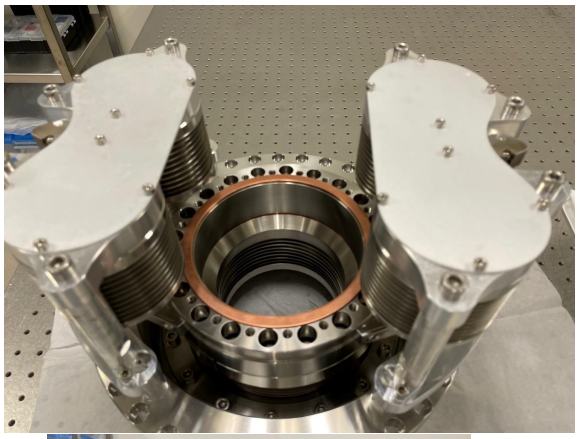
4 CFCs (3 lateral and 1 axial) ready for delivery

ESO Anti-vibration for Closed Cycle Cooler Cold Head technology





Signed: 23-July-2018





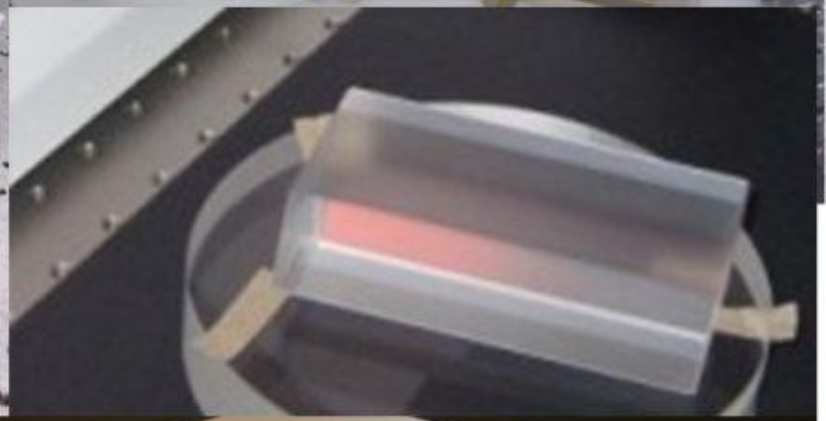
ESO signed an agreement to license anti-vibration mount for Closed Cycle Cooler Cold Head to our company FRACTAL S.L.N.E. The photo on the right (Credit: ESO) shows CRIRES instrument on the VLT. The instrument helium cold heads (Leybold 10 MD) are equipped with anti-vibration mounts to reduce the cold head vibrations to the stability levels demanded for the instrument. The new instrument for Gemini (SCORPIO, shown on the left and currently in detailed design phase) shall include this technology.

ESO initially developed a damping system that was applied to ISAAC and NACO (which were using the cold head RG 5/80 from Leybold) . Successive improvements were performed to cope with the high stability demanded by the VLTI configuration. Anti-vibration mounts were also used for HAWK-I and KMOS. The current damping system is a 3rd generation design adapted to the Leybold 10 MD cold head and currently in use at CRIRES. This system keeps the cold head fully floating between two soft bellows removing vibration coming from the motion of the heavy displacer.

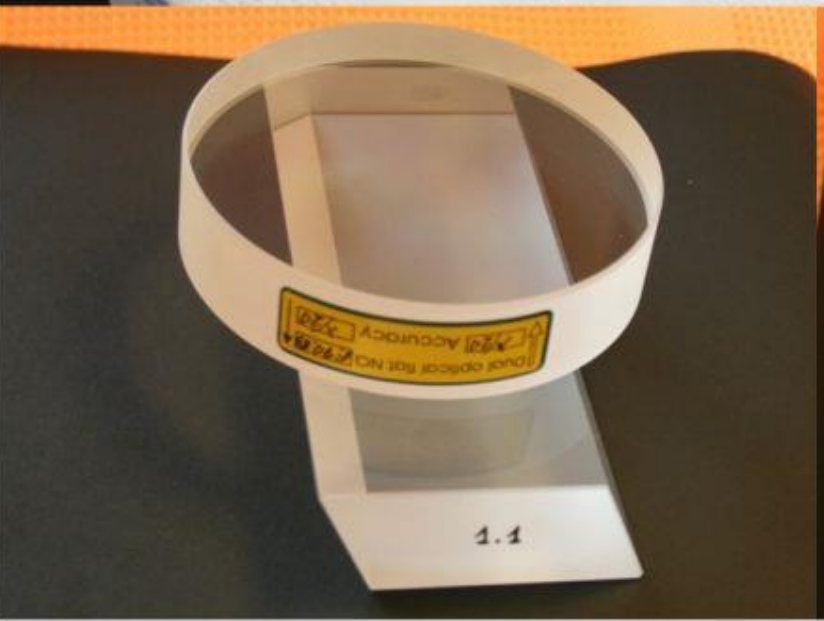
Innovative Prototypes

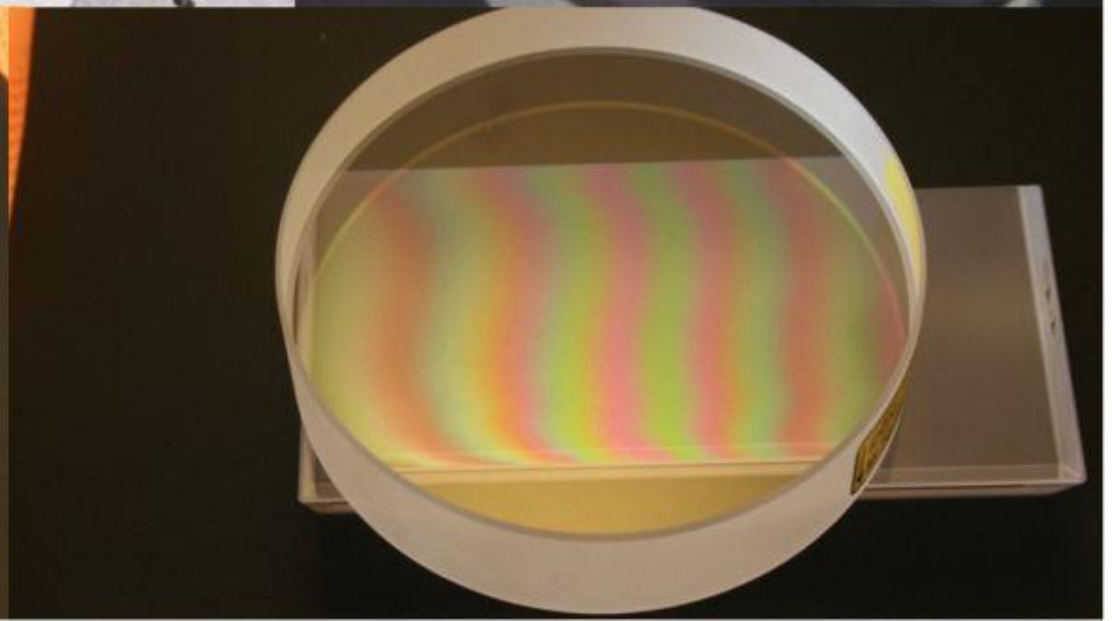




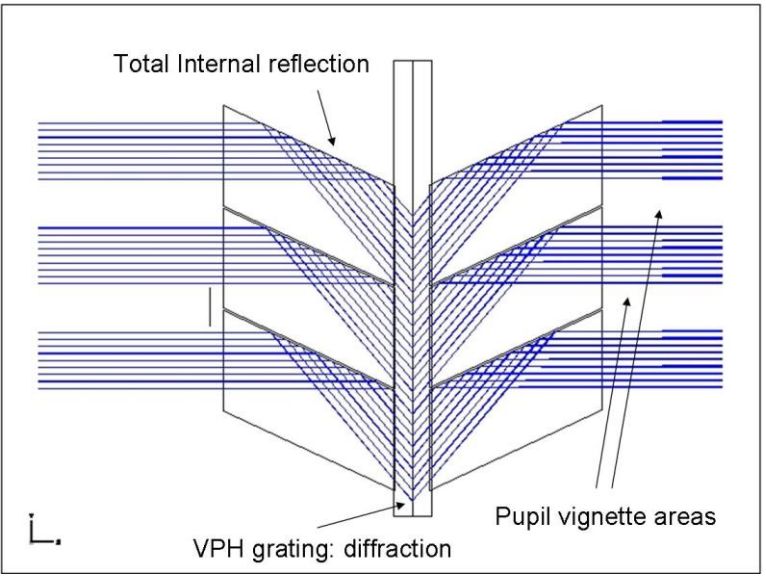


Sliced Pupil Grating Prototype





Sliced Pupil Grating Prototype, FRACTAL-UCM



Universidad Complutense Madrid

Fractal SLNE

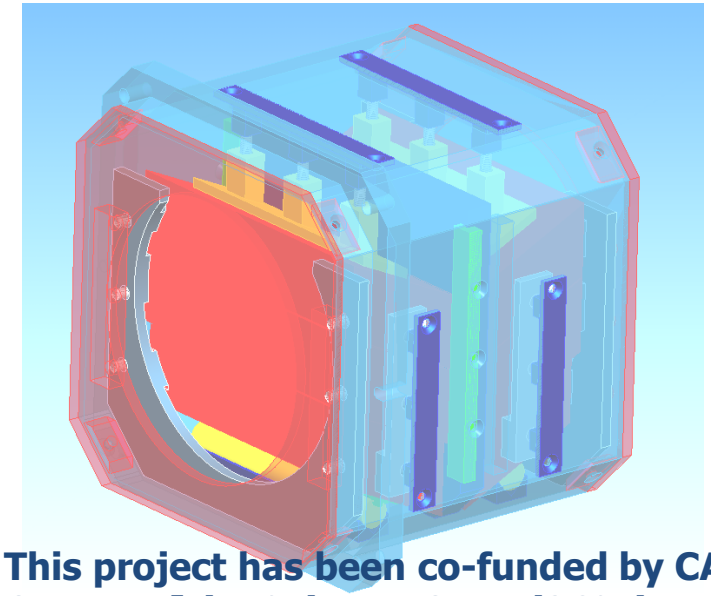
Dirección General de Economía, Estadística e Innovación Tecnológica
CONSEJERÍA DE ECONOMÍA Y HACIENDA
Comunidad de Madrid

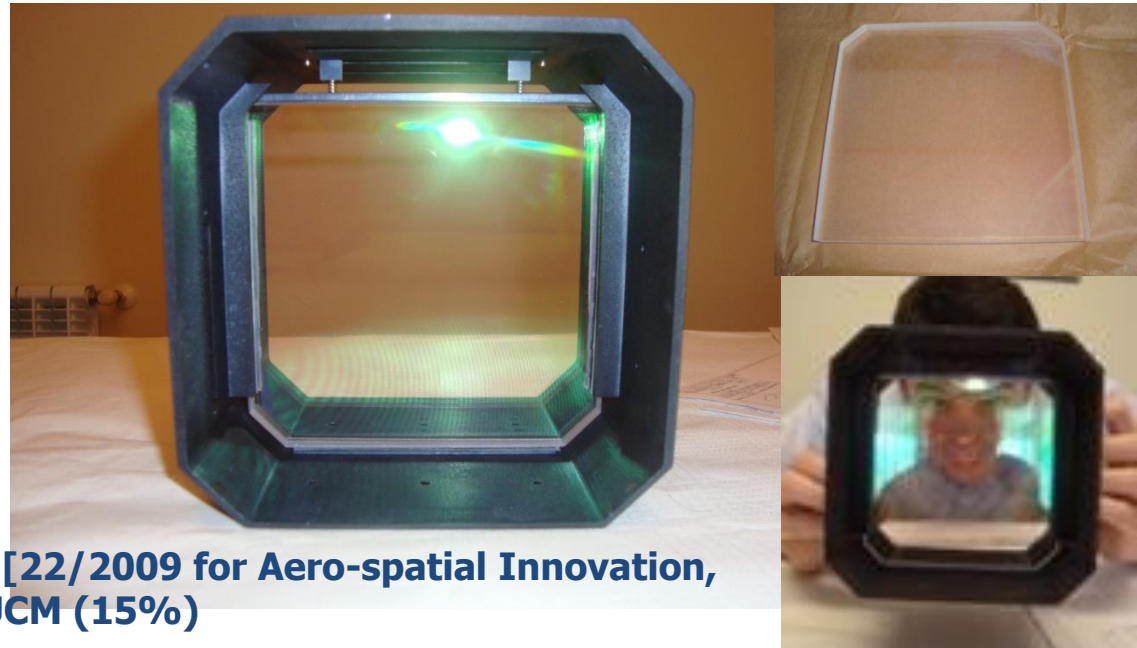
Unión Europea
Fondo Europeo De Desarrollo Regional

Motivation: to look for a **high resolution element** when
Goal: to multiply the spectral resolution of your already-built instrument by a factor **of 2 or 3**

- Your instrument is in Littrow (Ground-based)
- You have problems of weight (Space)
- You have problems of feasibility due to size and mass (Large/Very Large Ground Telescopes)

The solution uses sliced-pupil gratings. There is some vignetting (less than in a non-VPH grating) but can be lowered by increasing the number of slices and the complexity of the integration if needed

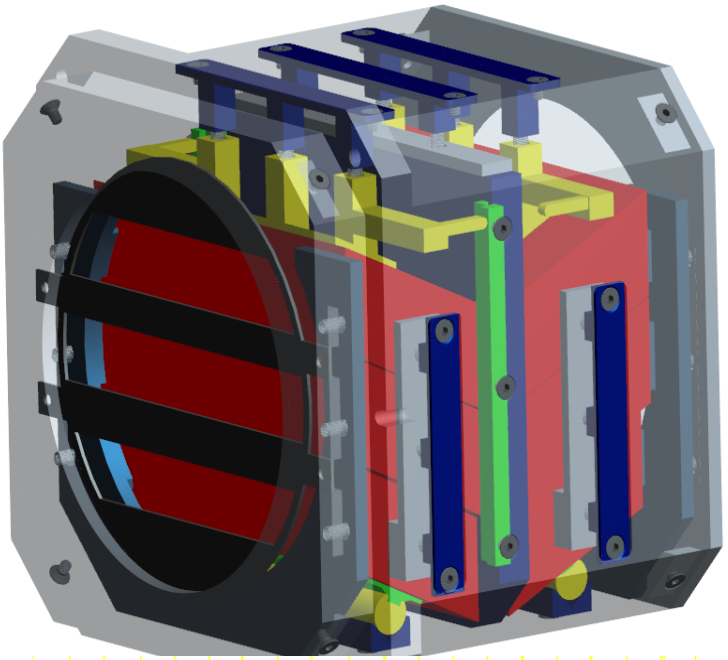




This project has been co-funded by CAM [22/2009 for Aero-spatial Innovation, CAM+UE] (51%), FRACTAL (36%) and UCM (15%)

Opto-Mechanics

Sliced Pupil Grating Prototype
FRACTAL-UCM





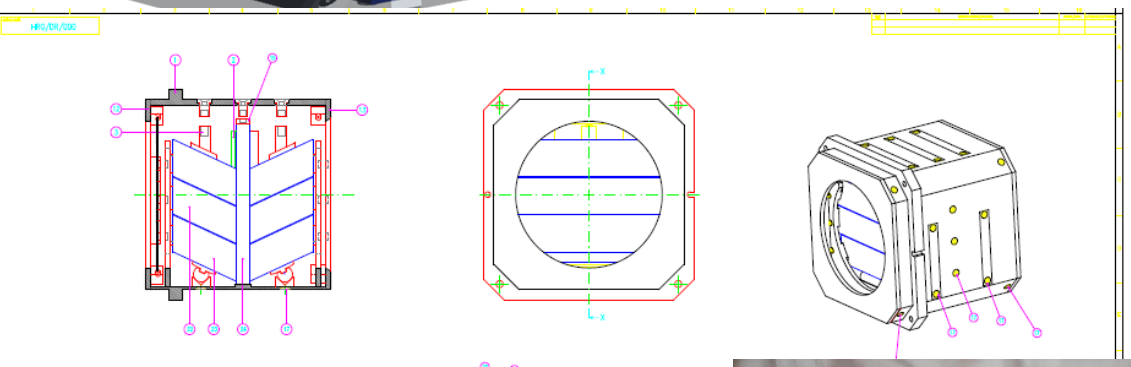
Comunidad de Madrid

Unión Europea

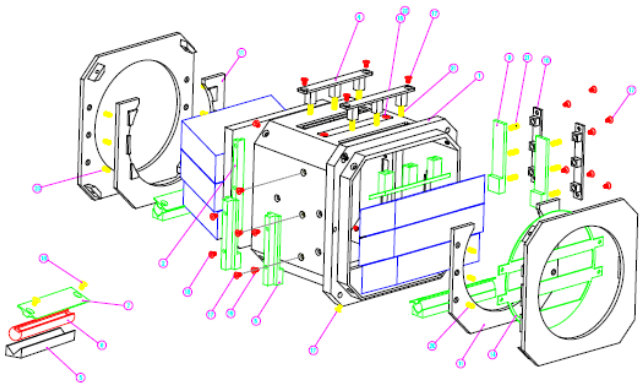
Fondo Europeo De Desarrollo Regional

Universidad Complutense Madrid

Fractal SLNE









VIENTOS Project

- Partially funded by CDTI under *Industry for Science*
- The goal is to study novel solutions for pupil elements to be applied to large telescopes (10-m type and E-ELTs)
- Some of the studies within the program are
  - Application of sliced-pupil gratings
  - Tunable filter in the near-IR
  - Filters based on nanotechnology

CDTI Centro para el Desarrollo Tecnológico Industrial

Universidad Complutense Madrid

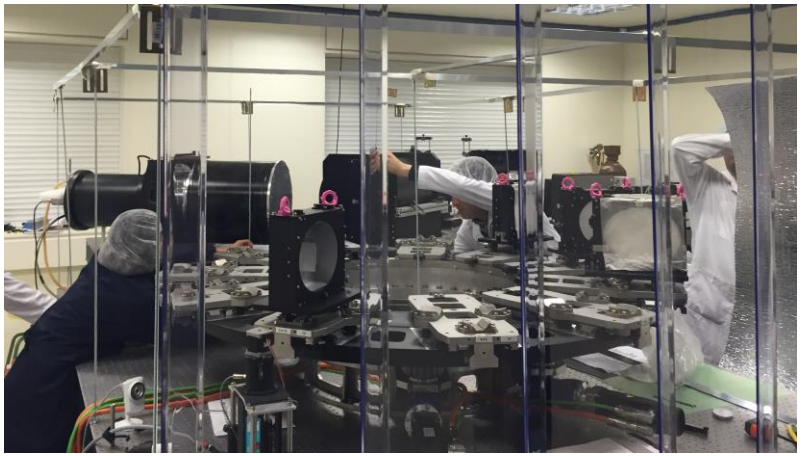


Just do Science
Fractal
SLNE
www.fractal-es.com

Laboratory:
Assembly, Integration and Tests

LICA laboratory at UCM

Collaborative project FRACTAL – UCM since 2010

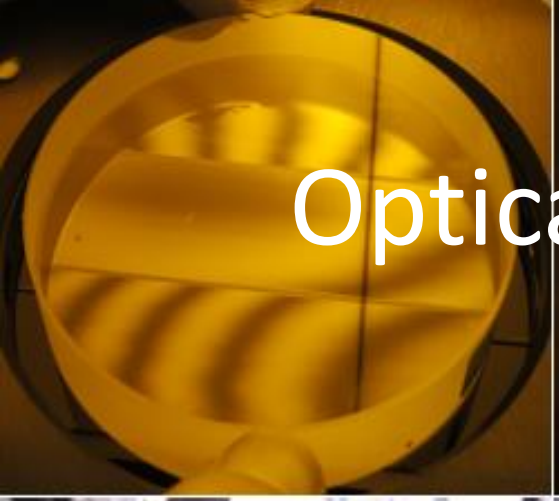
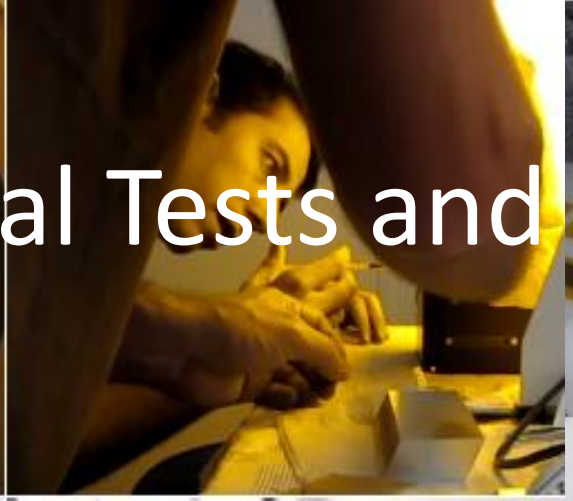


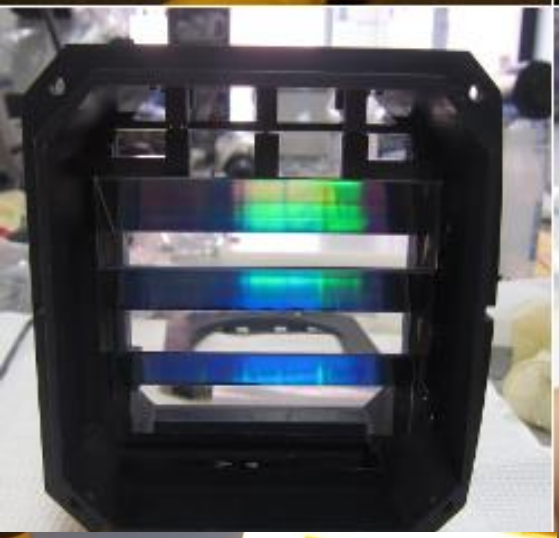
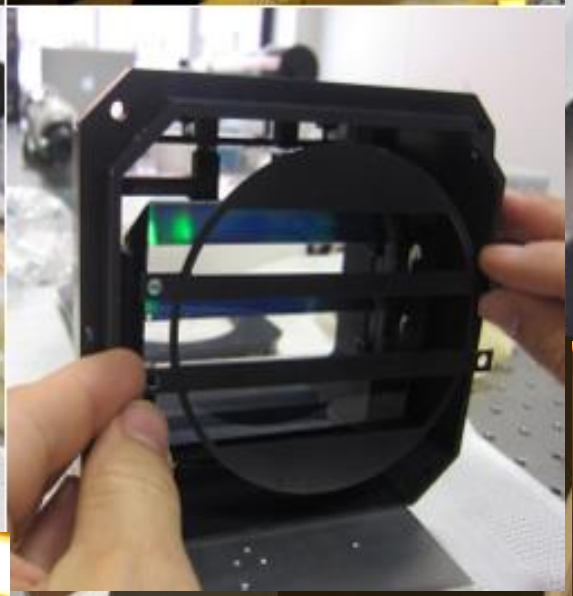
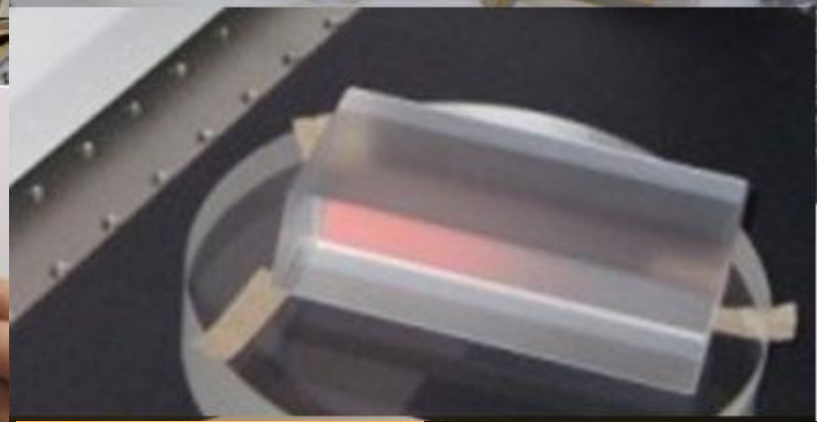


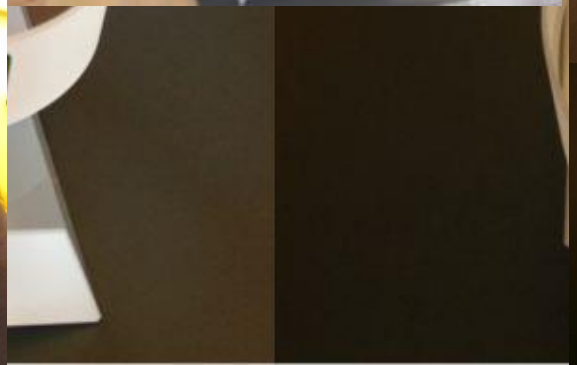


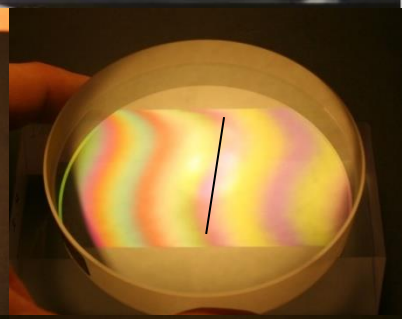
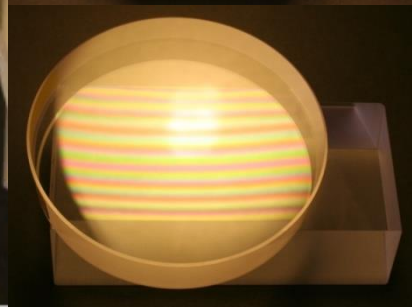
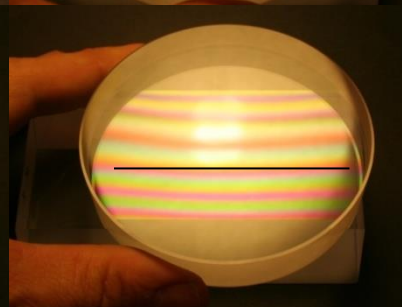
- Instrumentation assembly and tests
- VPH gratings test bench
- Optical bundles test bench
- Detector Test Bench characterization
- Cryogenic system (cryotiger)
- R+D, Innovation and Prototypes
- GTC Control System simulator
- Teaching and practices activities
- Access to UCM facilities

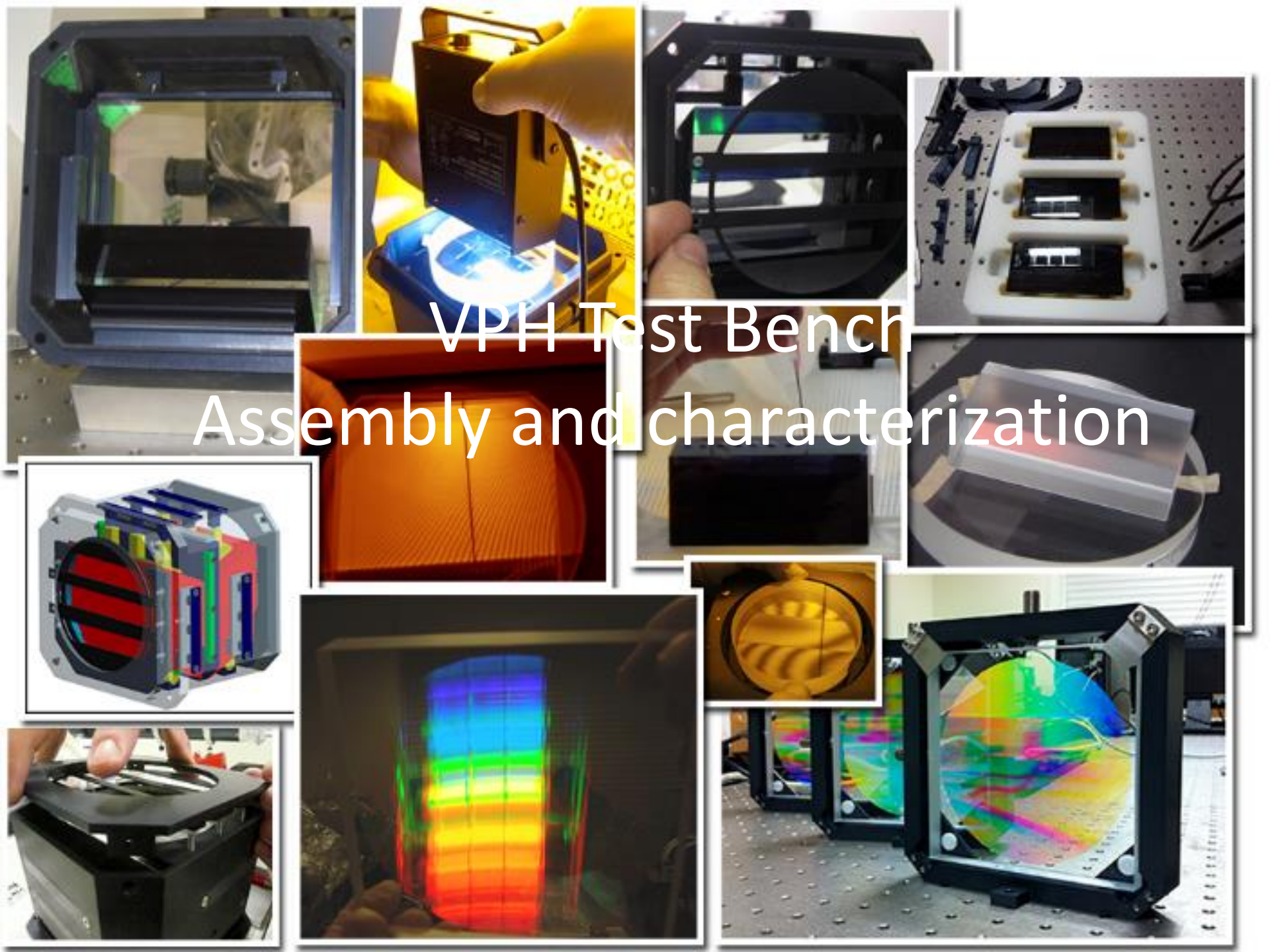
Optical Tests and Assembly

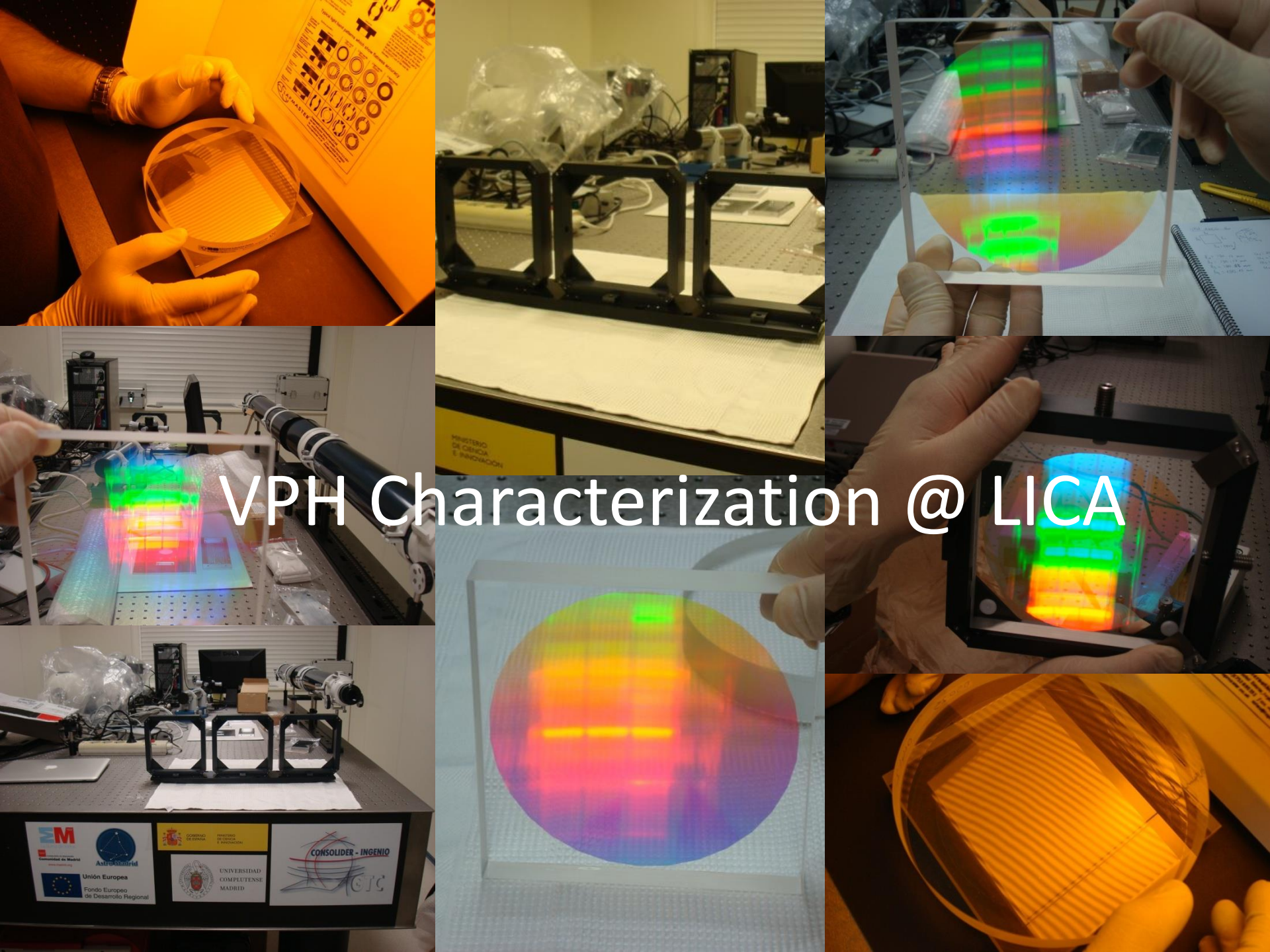



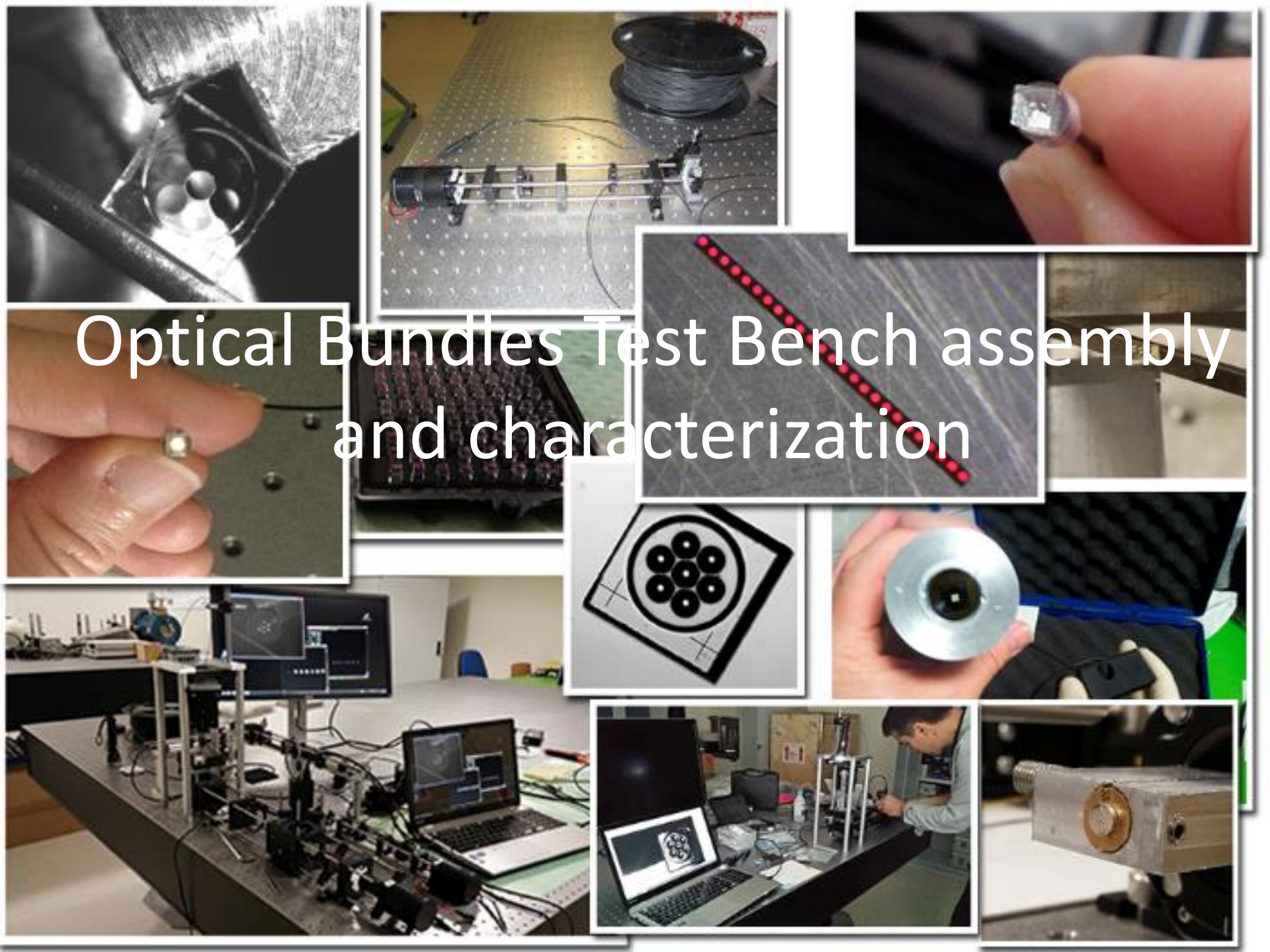






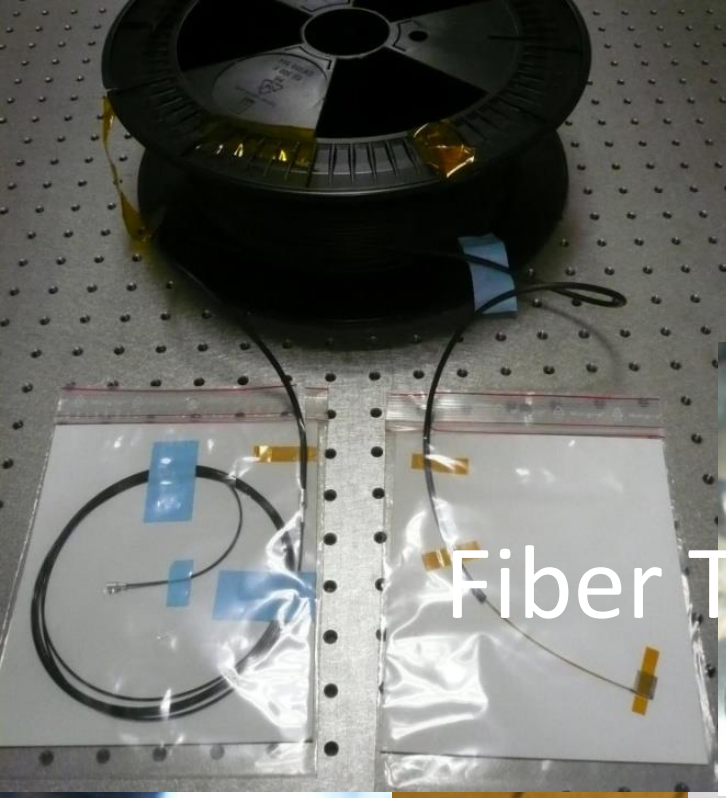

VPH Test Bench
Assembly and characterization

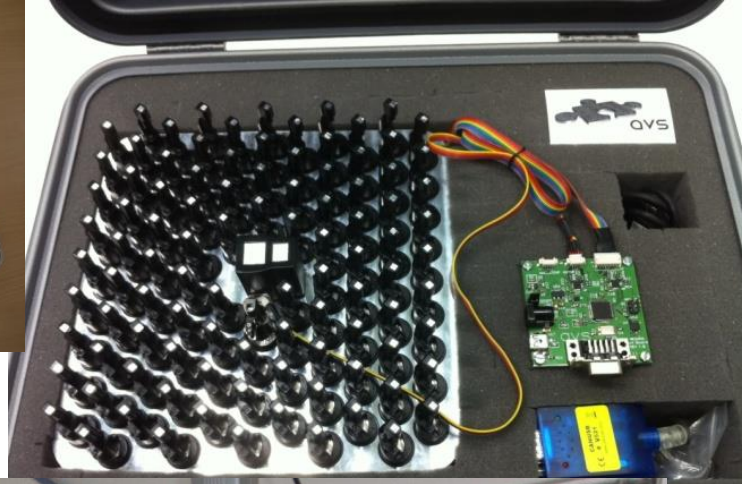

VPH Characterization @ LICA
Unión Europea
Fondo Europeo de Desarrollo Regional
UNIVERSIDAD COMPLUTENSE MADRID
CONSOLIDER - INGENIO



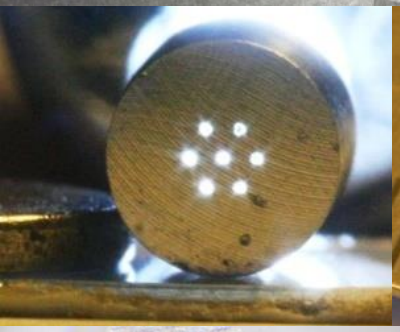
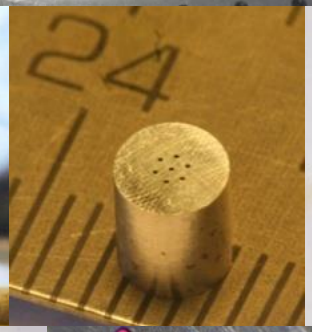
Optical Bundles Test Bench assembly and characterization

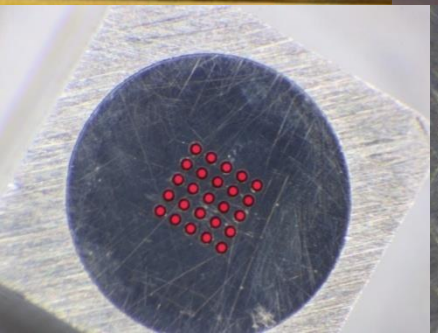
Fiber Tests and bundle assembly

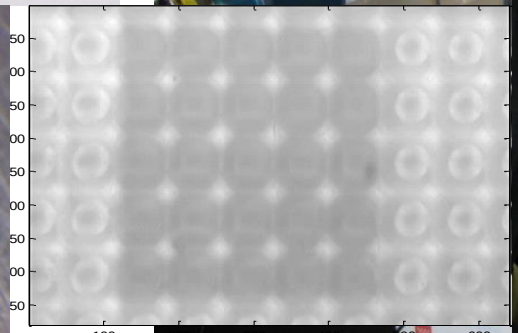






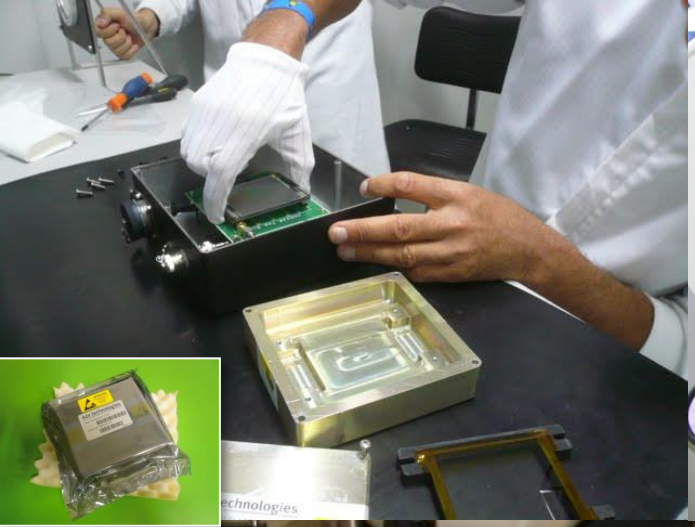



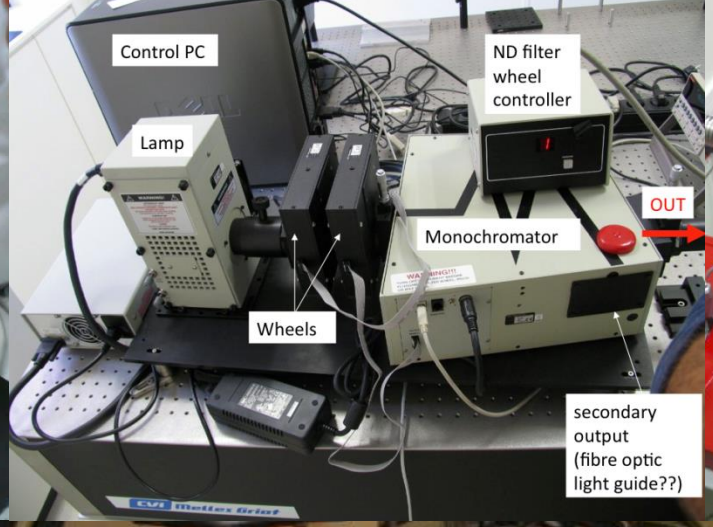








Detector Test Bench
characterization

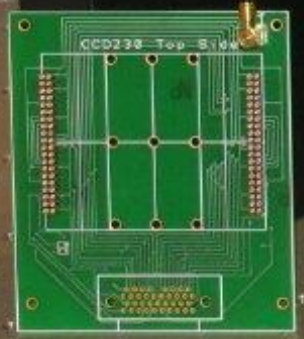






Detector Test Bench at LICA-UCM

Warm test camera



ARC controller

CCD Characterization

Cold test camera


Assembly and tests
MEGARA, now SCORPIO starting, then
TARSIS and MOSAIC subsystems

FRACTAL partners have built a small observatory in Sierra de Guadarrama (Madrid) where instrumentation and software can be tested on sky.







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SLNE
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Software and Control systems

Software services

- Real Time Software: Telescopes & Instruments CS
- Final-user S/W for Instruments (mission planning, exposure time calculators, preparation of observations with multi-object spectrographs, data visualization, etc.)
- Databases
- Customized S/W
- In-situ S/W engineering services
- Proprietary S/W for Project Management & System Engineering
- Proprietary Operation and Maintenance Tool

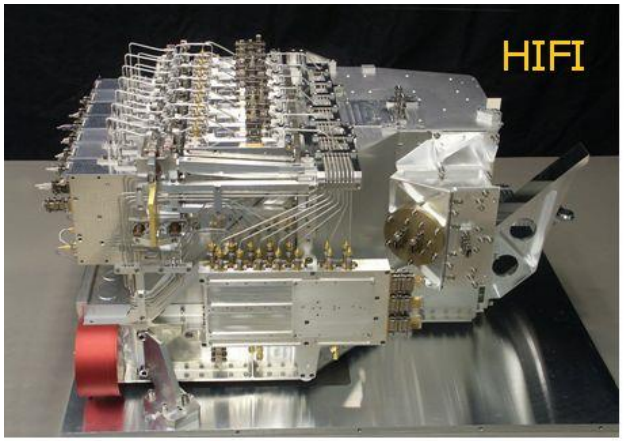
Software development, scientific support and operations on-site services

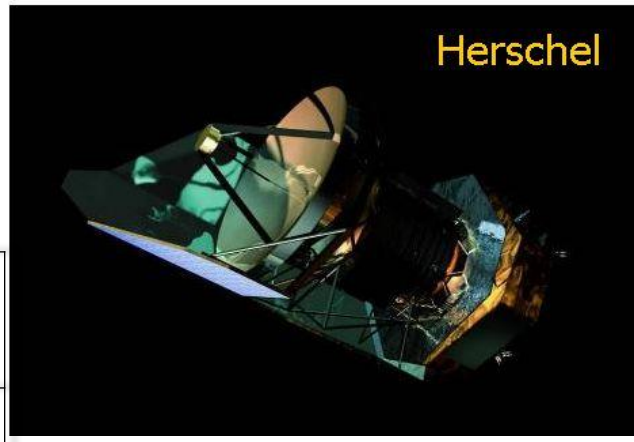
Customers: ESO, OAN, CAB, UCM, IAA

Software Development

- Databases
- Observation planning tools
- Data reduction
- Intranet facilities
- Telescope and instruments control system

Astronomical support for the Spanish National Observatory (Radioastronomy) in the development of a user support platform for the HIFI instrument (Herschel mission, ESA)	CNIG OAN	2006-2010
Pre-launch Operational support for the Spanish National Observatory (Radioastronomy) for the HIFI instrument (Herschel mission, ESA)	CNIG OAN	2006-2010
Software development. Pipelines for VLT instruments (HAWK-I, SINFONI). ESO-Reflex workflows	ESO	2008-2010
Software development. Implementation of data reduction procedures for the ESO VLT pipelines (ANSI-C with the ESO-CPL)	ESO	2010-2012
Proposal for services in ESAC Frame Contract with VEGA-Telespazio	ESA	2017 - 2022



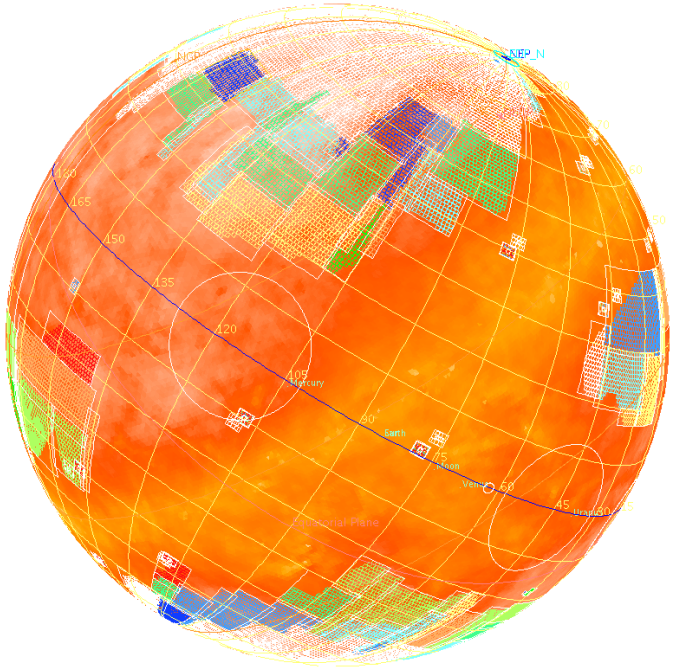


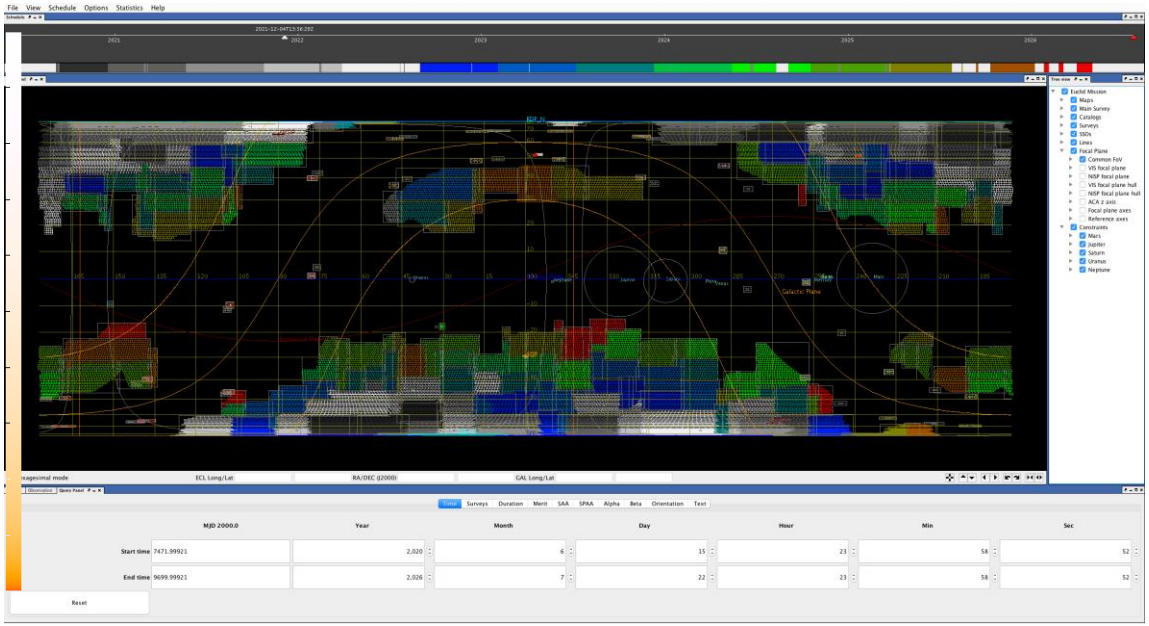


EUCLID Mission Planning Software

Customer: Telespazio for ESA

The ESS is the software package in charge of the planning, visualization, validation and inspection of the past, present and future of the mission. It will take the Reference Survey generated from the Euclid Consortium and after validation it will converted to time-tagged pointing commands to ESA's Mission Operation Centre (MOC). The ESS is implemented 100% in java and using GWT for the web components.
It is fully OO and implemented using highly reusable components where the basic functionality is available: math, ephemerides, region representation, tessellation (HEALPIX& HTM), DB access, astrometry, etc.



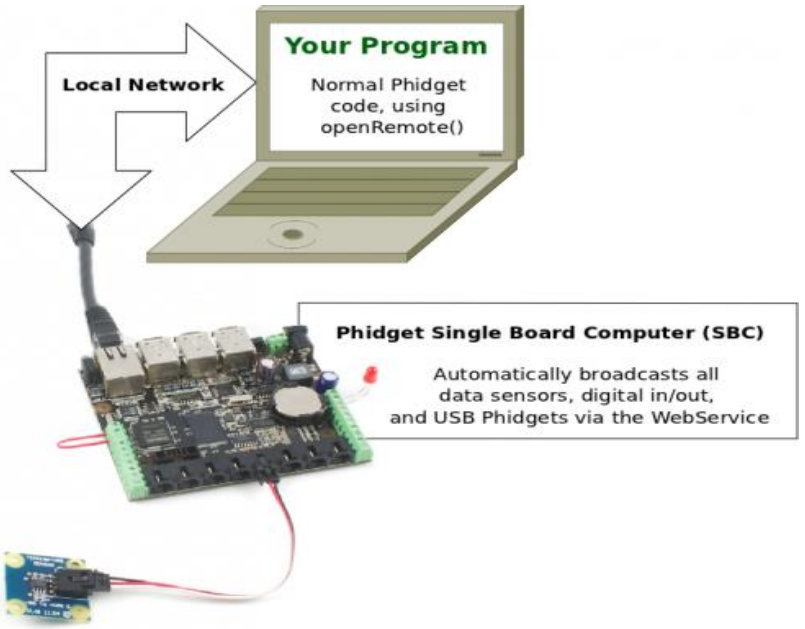


Instrument control system - Technology

- Phidget products (motor controllers, single board computer, interface kit boards) for controlling all instrument components remotely.

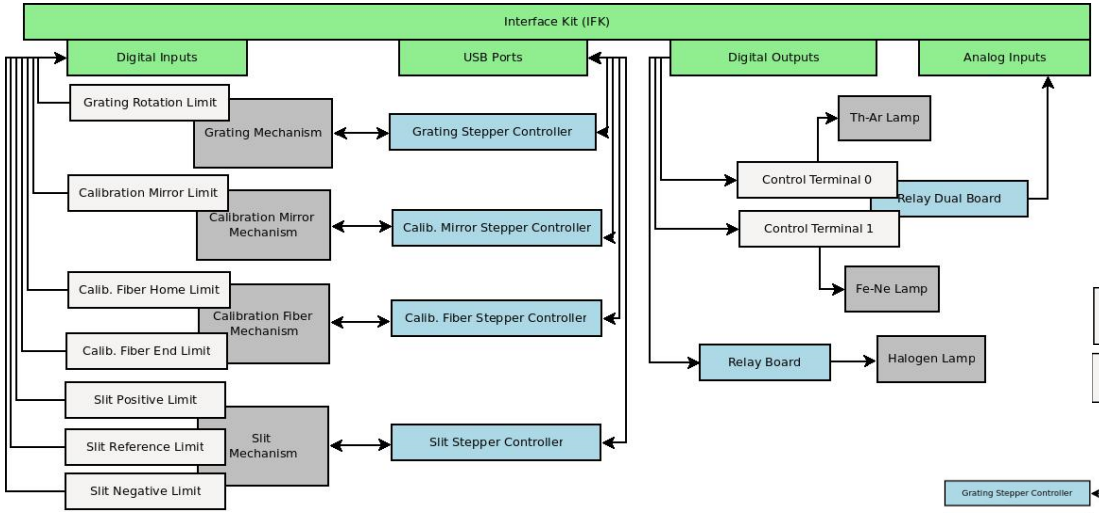
- Can control many motor types:
  - Servo motor
  - Stepper motor
  - DC motor

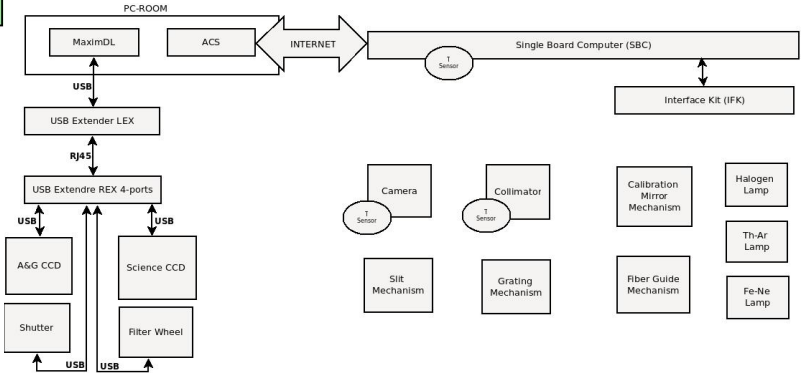
- Can control many others components:
  - Sensors
  - Relays
  - Limit switches
  - LEDs

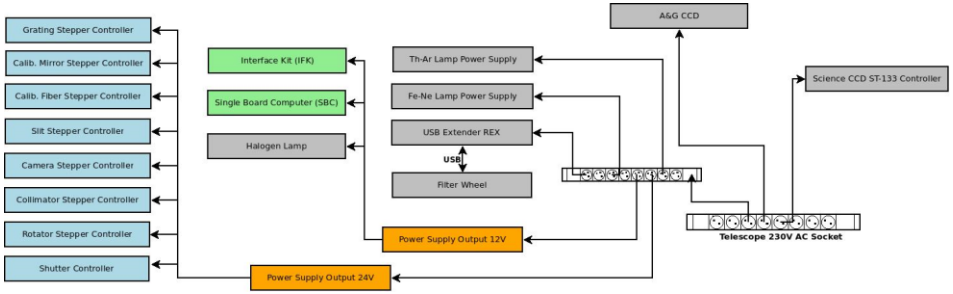


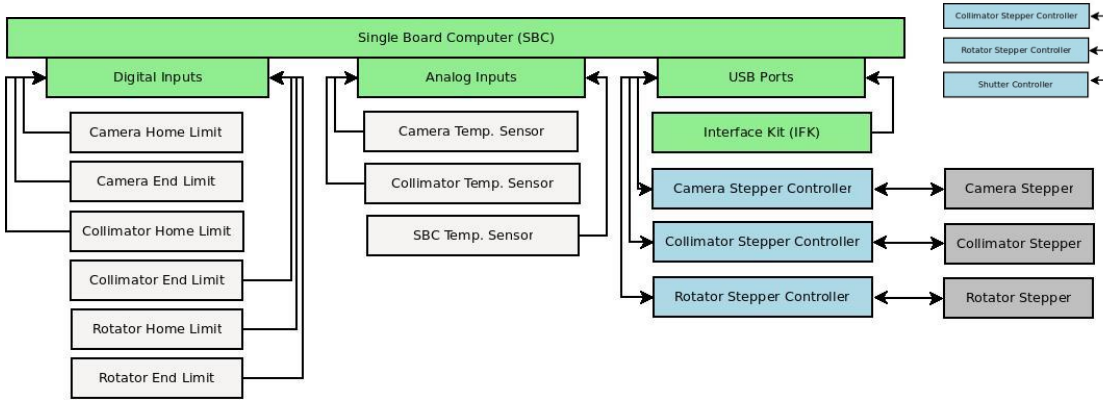
- There is no need for proprietary software, Phidgets products work in many popular programing languages (Java, C#, C/C++, Python, Android Java, etc.) and on practically any operating system (Windows, Linux, OS X, Android, iOS, etc..).

Instrument control system – Architecture

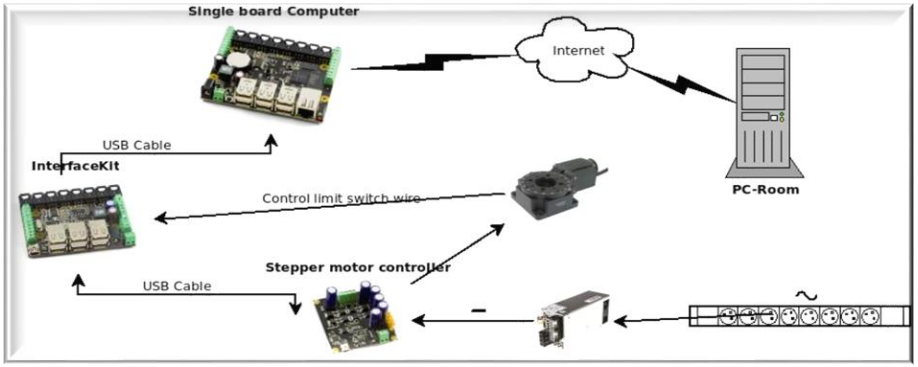


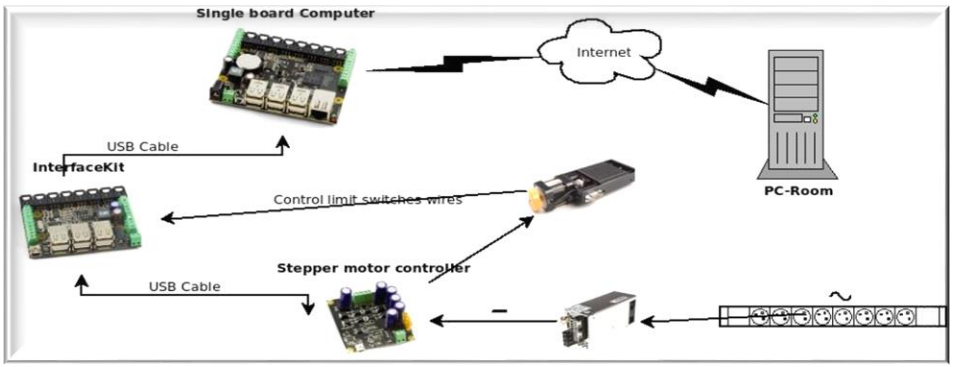


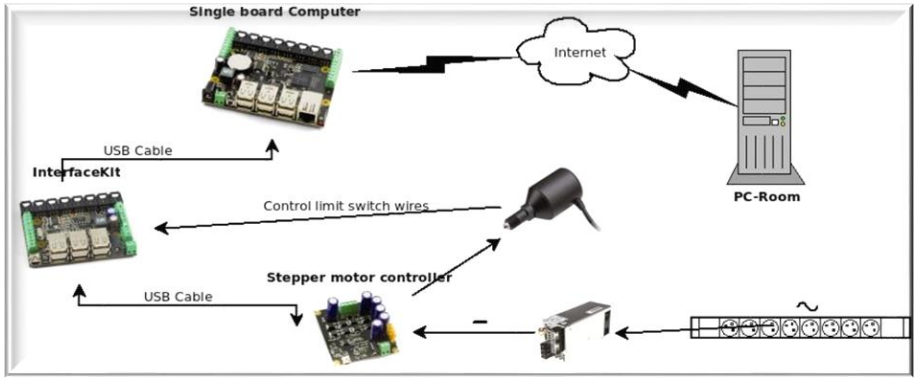


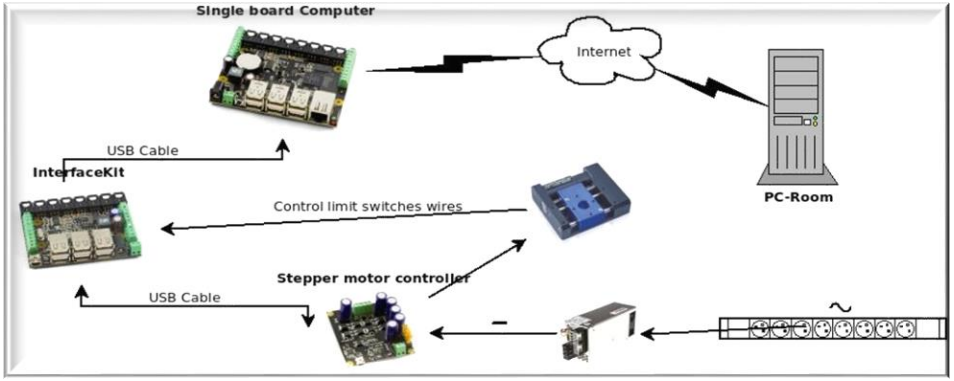


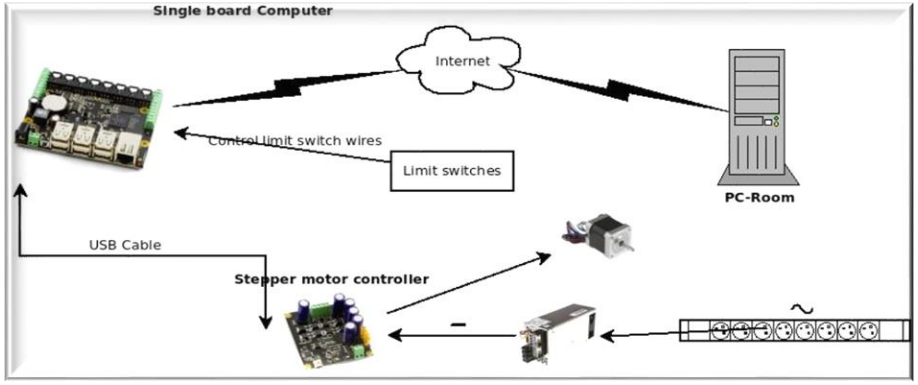
Instrument control system – Hardware

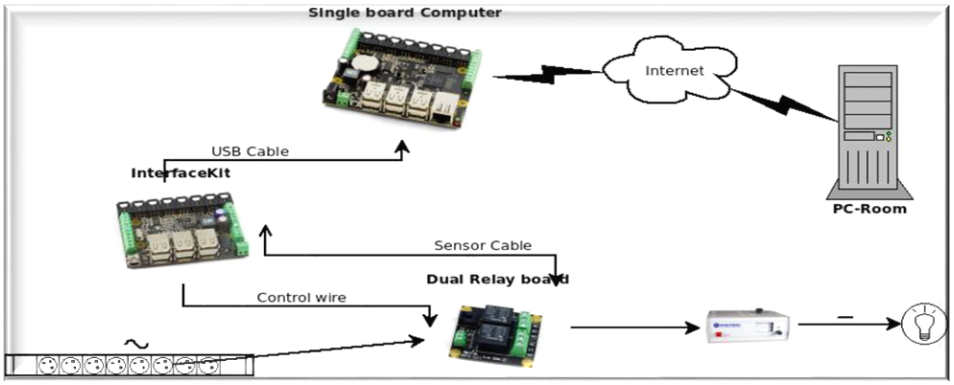




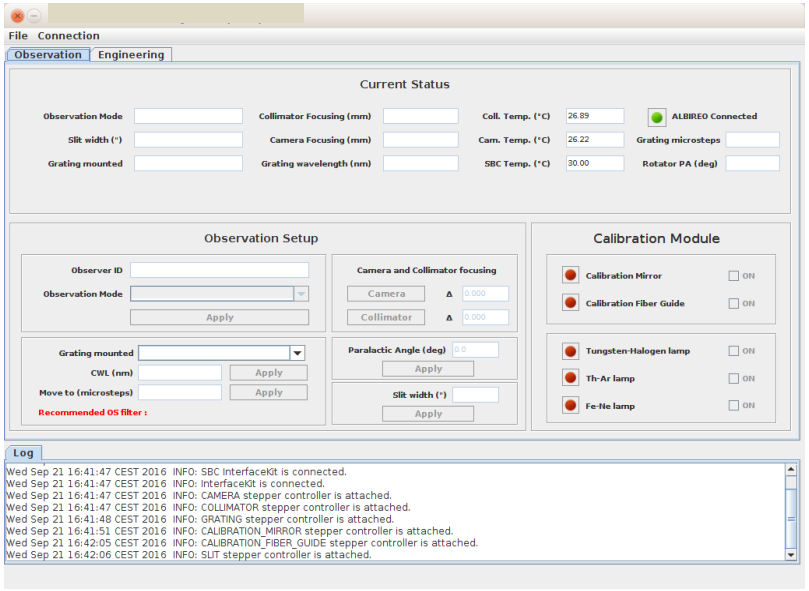


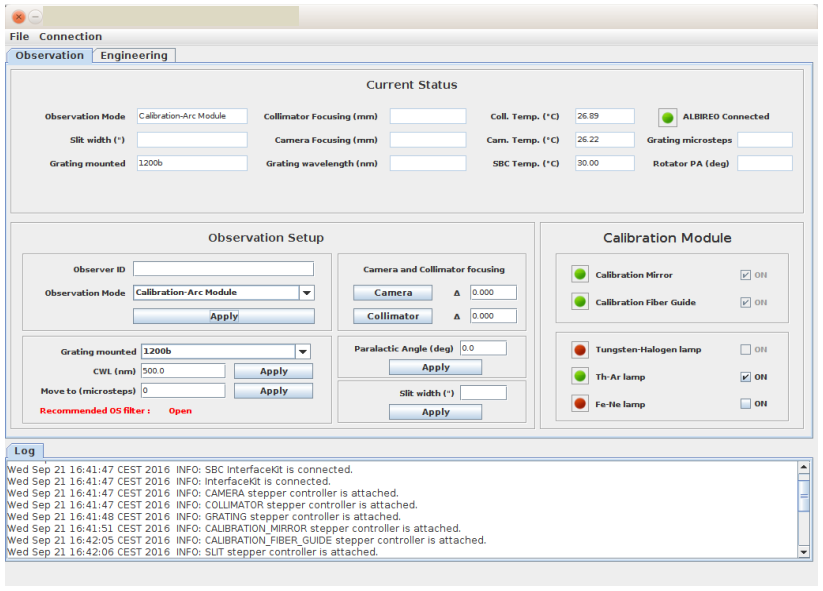


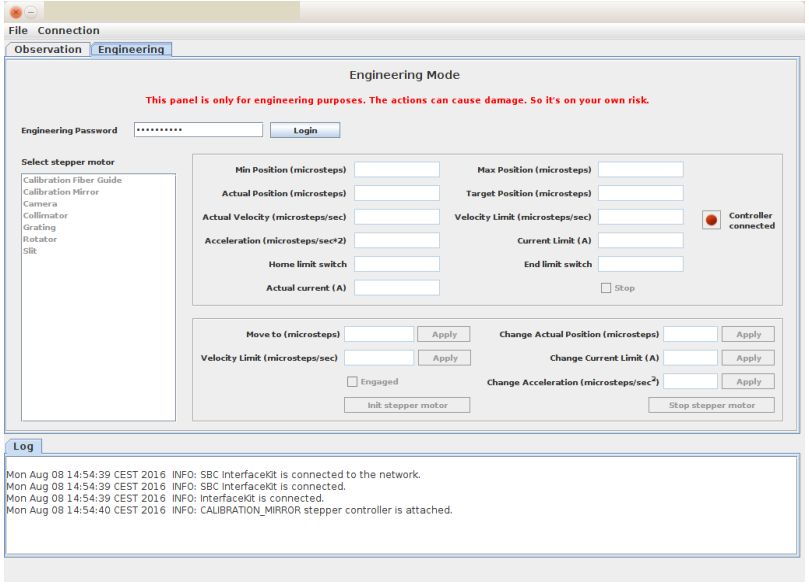


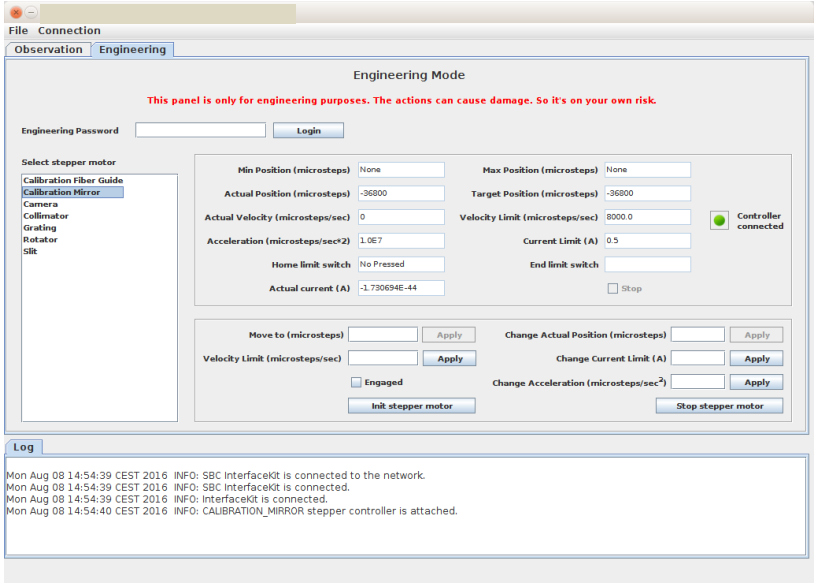


Instrument control system – Software









Software development for Continuous Flow Cryostats (CfCs) technology

In June 2015, ESO and FRACTAL signed a “Non-exclusive know-how license agreement on the use of the ESO Continuous flow cryostat technology”.

The concept of this technology is cooled a CCD detector with a nitrogen cryostat which did not need daily refilling and being smaller as possible.

The operating concept is represented in Figure 1 where DH are Detector Heads, Tn are temperature sensors, Rn are Resistors, V are valves, Sn are pressure sensors and OPn are overpressure sensors.

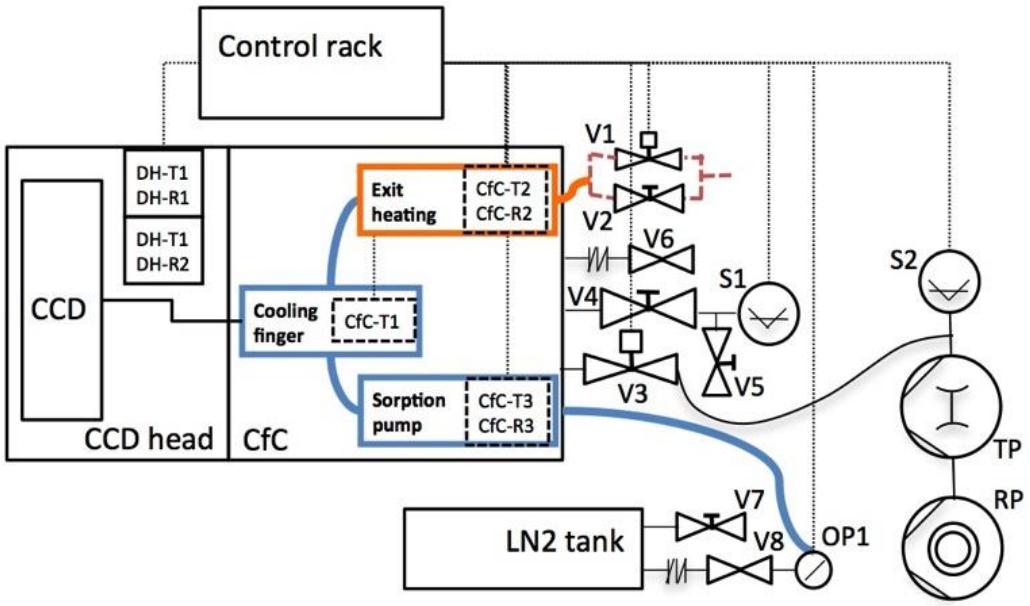
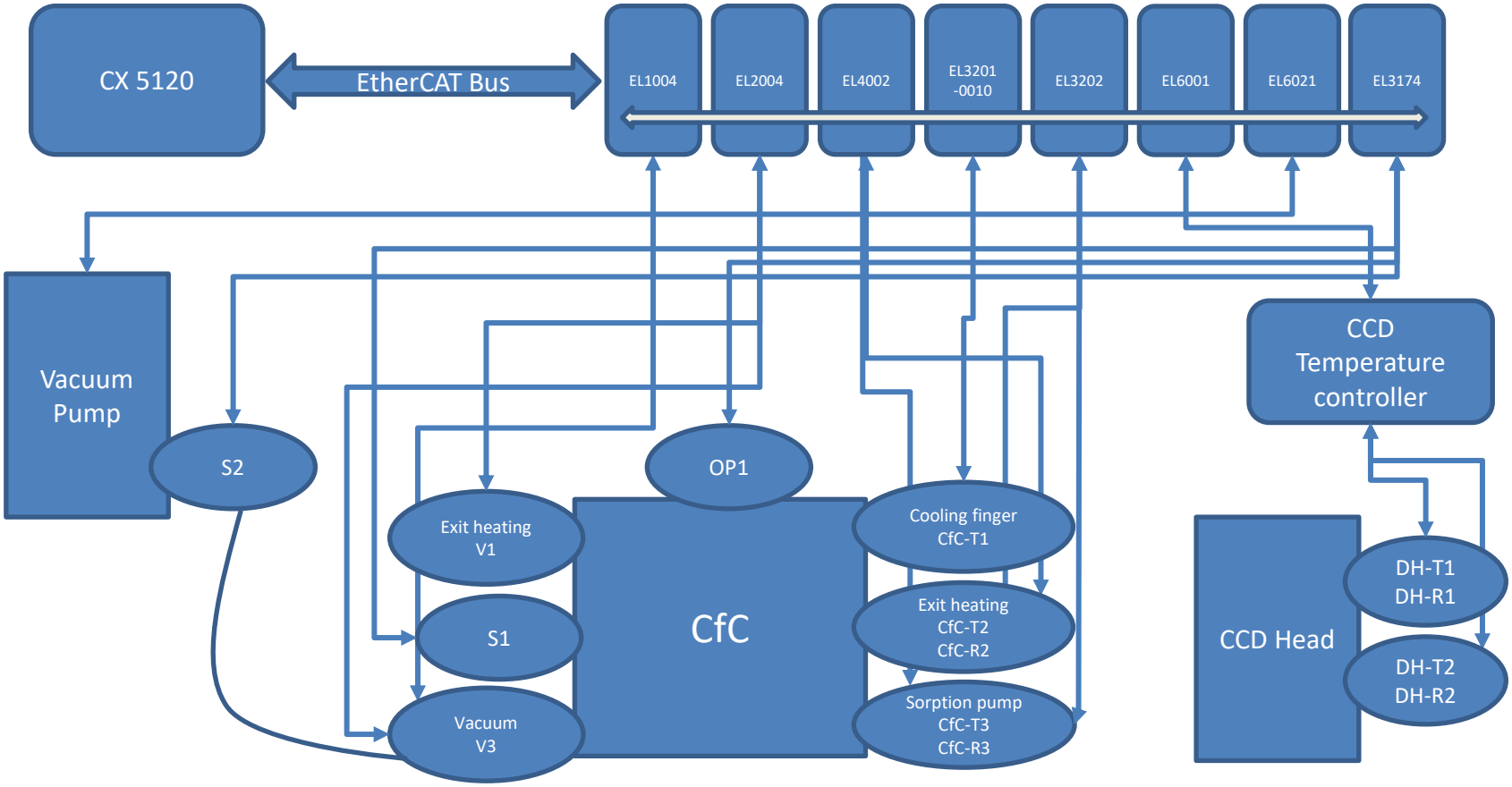


Figure 1: Operation concept of CfCs

CfCs Control System Architecture



	Technology
PLC	Beckhoff CX Embedded PC
Bus	EtherCat
OS	TwinCat 3.1 (Beckhoff)
Programing Language	Structure text (ST), C++
Drivers	N/A (i.e, direct access to HW)



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SSP SED Plot
H-R Diagrams Model
SSP H-R Plot
SSP Properties
SSP properties Plot
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Combination of 2 SSP SED Plot
Photometrical Parameters of a combination of 2 SS
Photometrical Parameters 2 SSP Plot

PopStar Ingredients | SSP SED Plot

certain units, as described below the plot area. This spectrum can also be plotted normalized to a given wavelength and/or with an offset

- The plot can be visualized linear or log-log
- A wavelength range for visualization can be defined
- Once the plot is done, viewing, zooming and printing options will become available by clicking with the right mouse button over the graphic area. Also, it is possible to zoom over a certain plotted area by selecting it with the left mouse button

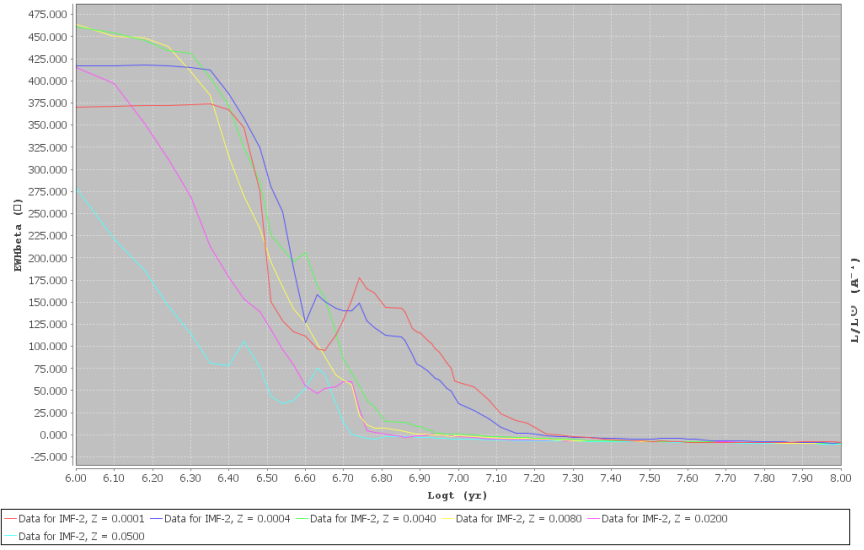
IMF	Z	Log t (yr)	E(B - V)	offset (constant)	Norm (λ, Å)	L type [$L/L_{\odot}$, $Å^{-1}$]
IMF-2 Salpeter (1955)	0.0200	5.00	0.00	0	0.000	Ltot
IMF-2 Salpeter (1955)	0.0200	6.00	0	0	0	Ltot
IMF-2 Salpeter (1955)	0.0200	7.00	0	0	0	Ltot
IMF-2 Salpeter (1955)	0.0200	8.00	0	0	0	Ltot

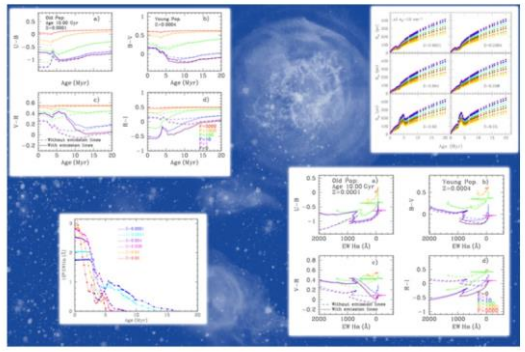
http://www.fractalsIne.es/PopStar

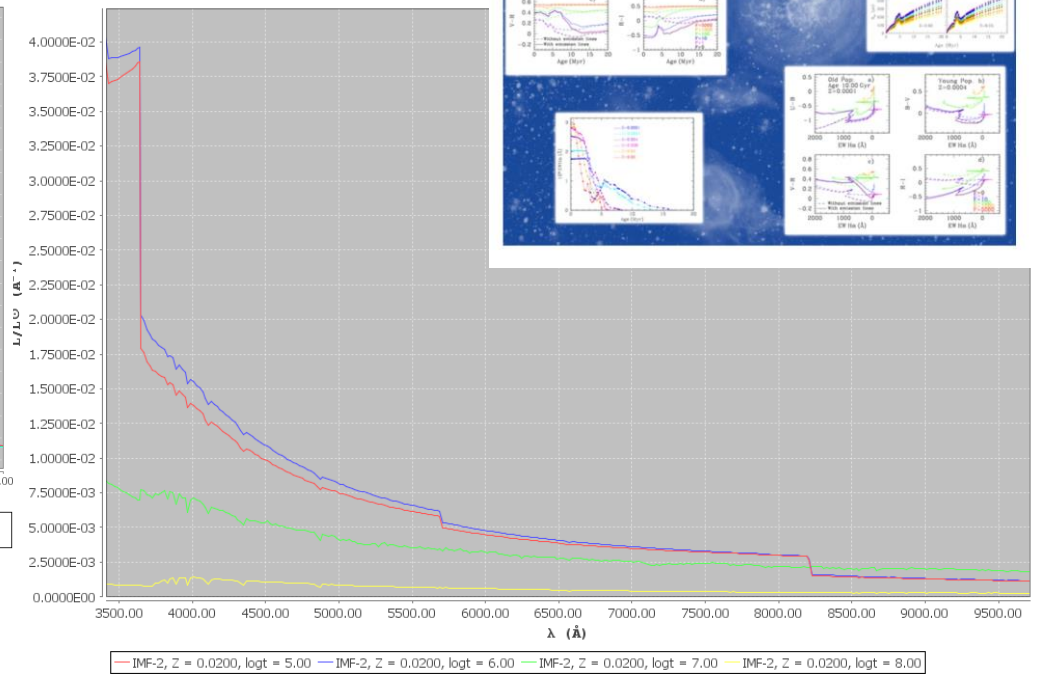
Add new row

User Custom Spectra (*)

Add custom spectra file? Offset (constant) : 0 Norm (λ, Å) : 0.000







Database with the MEGARA-GTC stellar spectral library and a web-based software tool for managing the observations



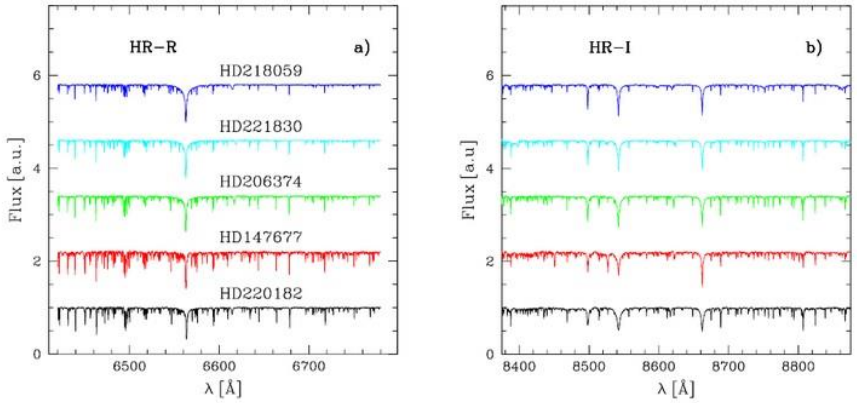
- Home
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- Observations
- Library Completion
- Utilities
- Useful links
- Project description
- Papers

MEGARA-GTC Stellar Spectral Library

MEGARA (Multi Espectrógrafo en GTC de Alta Resolución para Astronomía) is an optical (3650 - 9750Å), fibre-fed, medium-high spectral resolution (R = 6000, 12000, 20000) instrument for the GTC 10.4m telescope, in operation since July 2018. The scientific exploitation of MEGARA demands a stellar-spectra library to interpret galaxy data and to estimate the contribution of the stellar populations. To date, there is no complete library, either empirical or theoretical, able to fulfill the MEGARA parameters. The motivation of this project is to obtain a stellar spectral atlas for MEGARA, focused on the highest resolution setups. The spectra have R ~ 20000 in the HR-R and HR-I setups, centred at 6563 and 8633 Å respectively. The data will become available to the community through different releases that can be download here.

The on-going GTC Open-Time program provides the data through filler-type observations in telescope scratch time. The proposals from which we have received granted GTC filler-type time for this program are: GTC22-18B, GTC37-19A, GTC33-19B and GTC19-20A.

Estimated Date of the release 1.0: June 2020

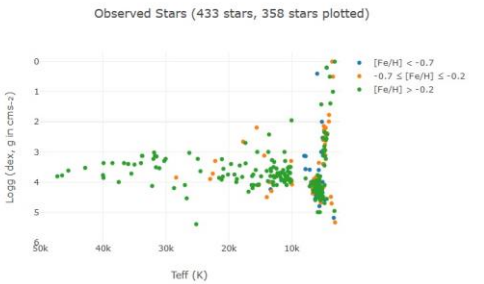


Source search form

Name
Other Name
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DEC (±dd:mm:ss.s) (range between [-19:56:35.2,+89:15:50.8])
Δ RA (mas/yr)
Δ DEC (mas/yr)
SP Type
Phase-2 (HR-R & HR-I)
Object Type
U (range between [-0.5,16.7])
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V (range between [-1.17,18.9])
R (range between [-1.17,18.9])
I (range between [-2.45,16.5])
J (range between [-3,14.1])
Teff (range between [2389,49863])
Teff-L
Logg (range between [-0.25,5.5])
Logg-L
[Fe/H] (range between [-2.99,2.9])
[Fe/H]-L
Reference
Comments
Other Comments

Source list

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2MASS J22244381-0158521	22:24:43.8	-01:58:52.1	modify	delete
BD+002058A	07:43:44.0	+00:04:01.0	modify	delete
BD+003740	17:38:37.8	+00:01:44.1	modify	delete
BD+012916	14:21:45.3	+00:46:59.2	modify	delete
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BD+023375	17:39:45.6	+02:25:00.0	modify	delete
BD+024651	23:19:40.5	+03:22:16.7	modify	delete



Customers: CIEMAT, INAOE

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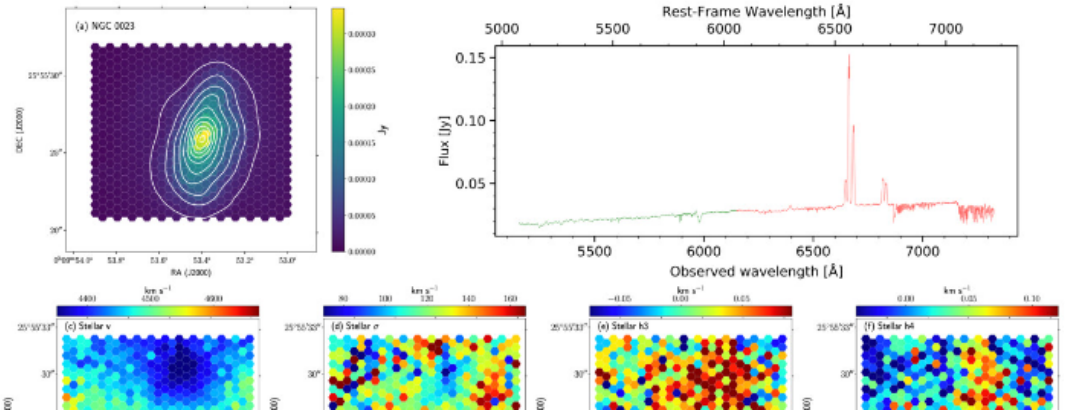
MEGADES: MEGARA Galaxy Discs Evolution Survey

The main interest of the Science Team for the exploitation of the MEGARA (Multi Espectrógrafo en GTC de Alta Resolución para Astronomía) instrument at the 10.4m Gran Telescopio Canarias (GTC) is devoted to the study of nearby galaxies, with focus on the research of the history of star formation, and chemical and kinematical properties of disc systems. We refer to this project as MEGADES: MEGARA Galaxy Discs Evolution Survey.

The initial goal of MEGADES is to provide a detailed study of the inner regions of nearby disc galaxies, both in terms of their spectrophotometric and chemical evolution, and their dynamical characterisation, by disentangling the contribution of in-situ and ex-situ processes to the history of star formation and effective chemical enrichment of these regions. In addition, the dynamical analysis of these inner regions naturally includes the identification and characterization of galactic winds (GWs) potentially present in these regions. At a later stage, we will extend this study further out in galactocentric distance.

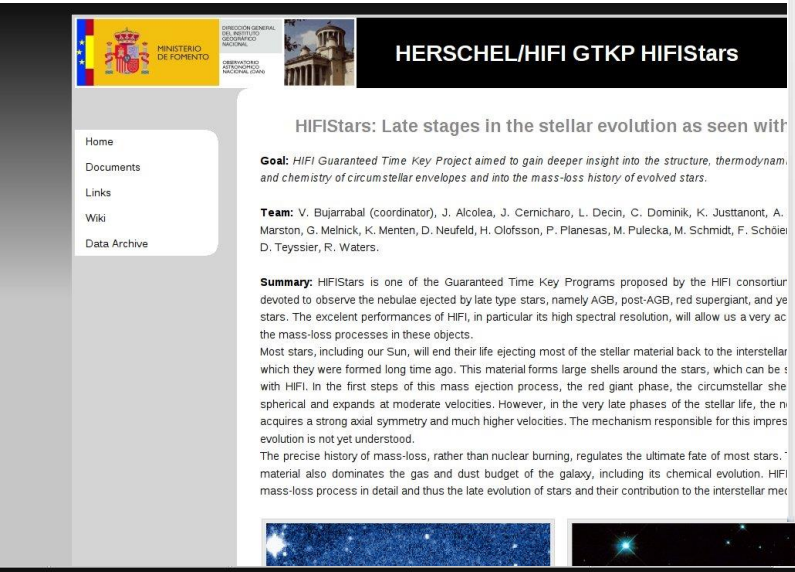
The first stage of this project encompasses the analysis of the central regions of a total of 43 nearby galaxies observed with MEGARA for ~ 114 hours, including both Guaranteed Time and Open Time observations, using three different VPHs (VPH480-LR, VPH570-LR and VPH675-LR) covering a spectral range from 4350 to 7288 Å at R = 6000. In this webpage we provide a set of all the processed data products available to the community and early results from the analysis of these data regarding stellar continuum, ionized and neutral gas features.

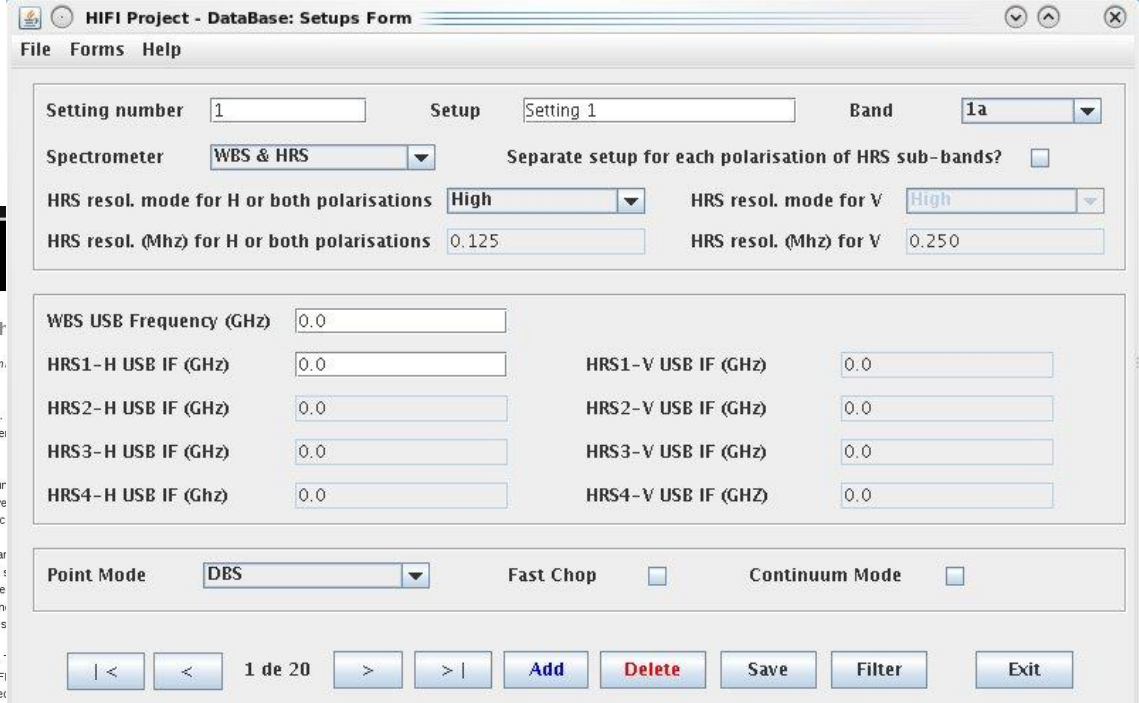
Data Release DR1 already available here.

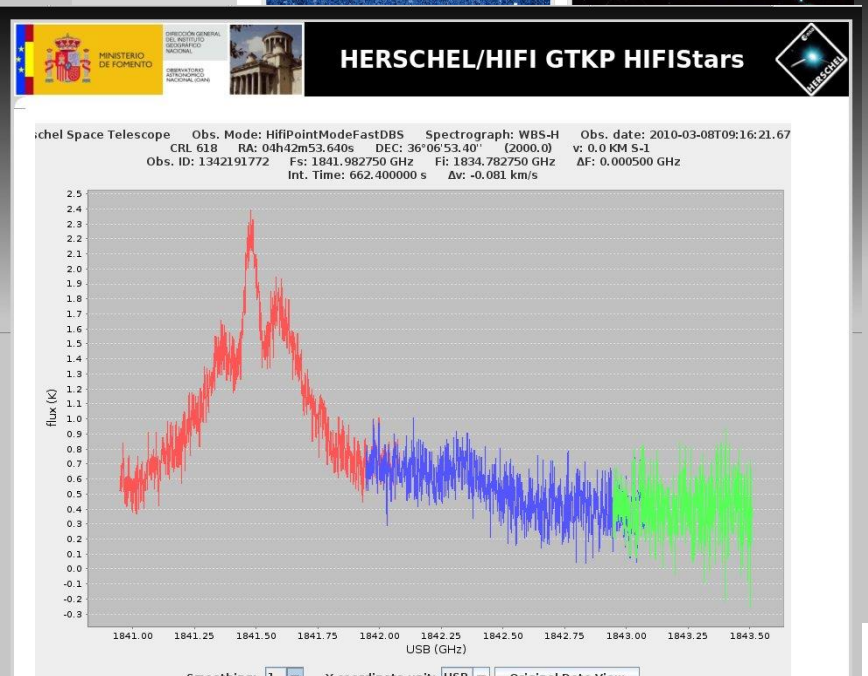


Database and Quick Look

HIFI / Herschel. Customer: OAN





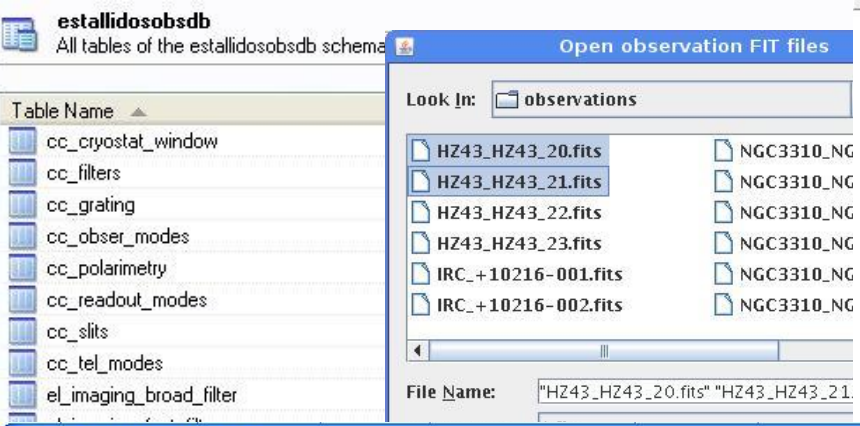


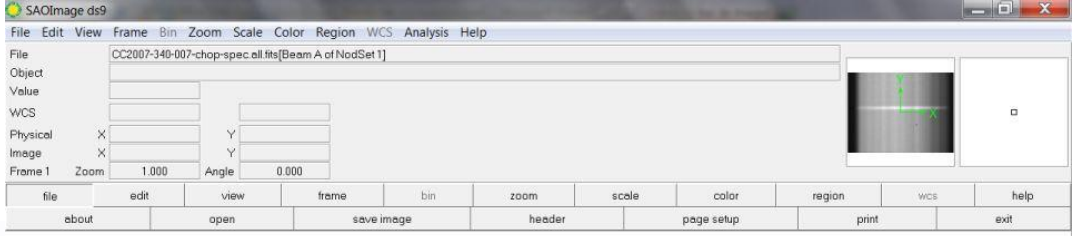


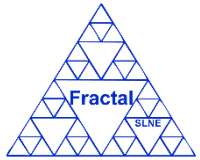
http://www.fractal-es.com

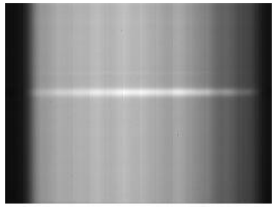
Estallidos-GTC database

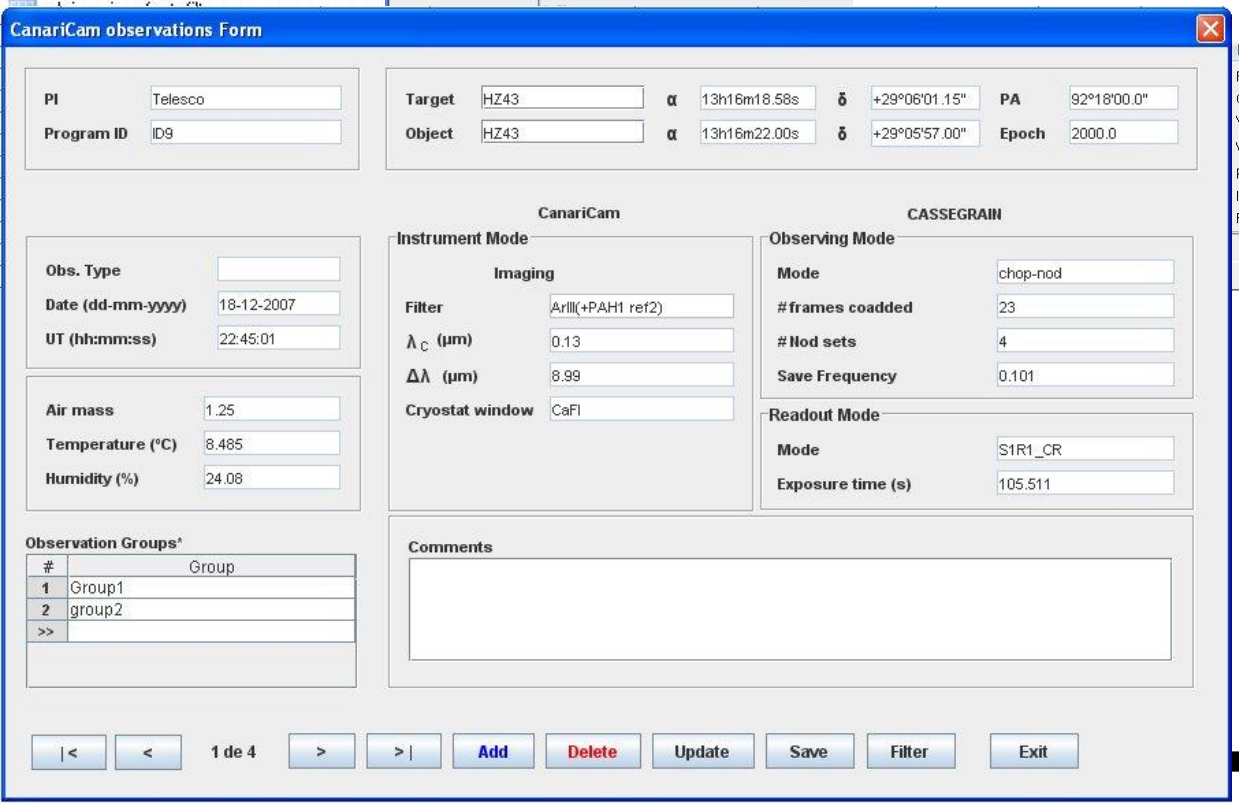
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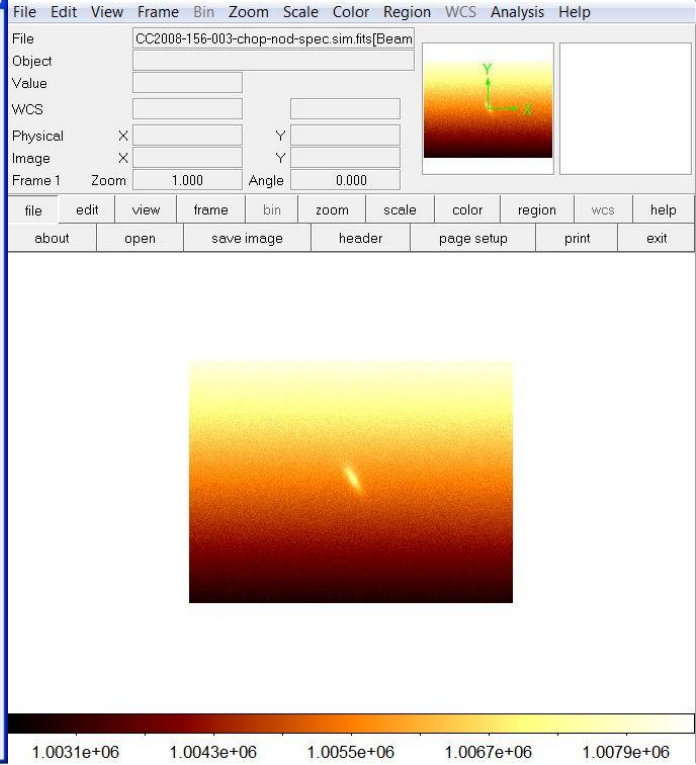






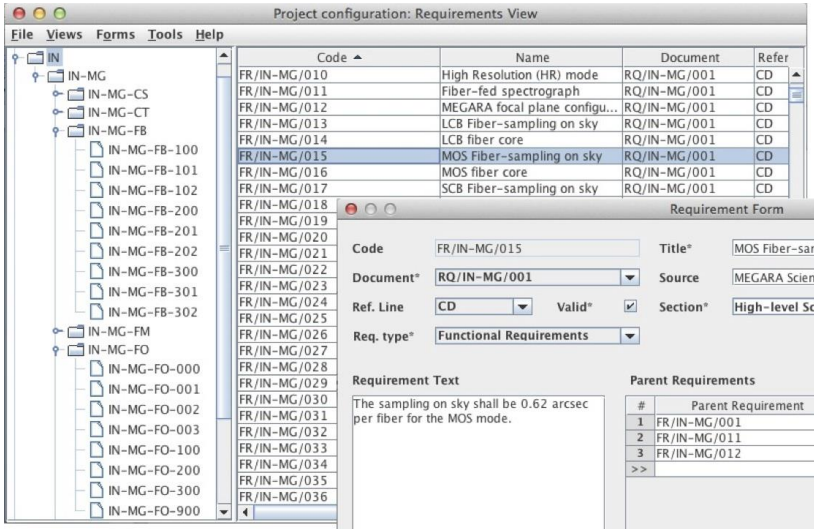




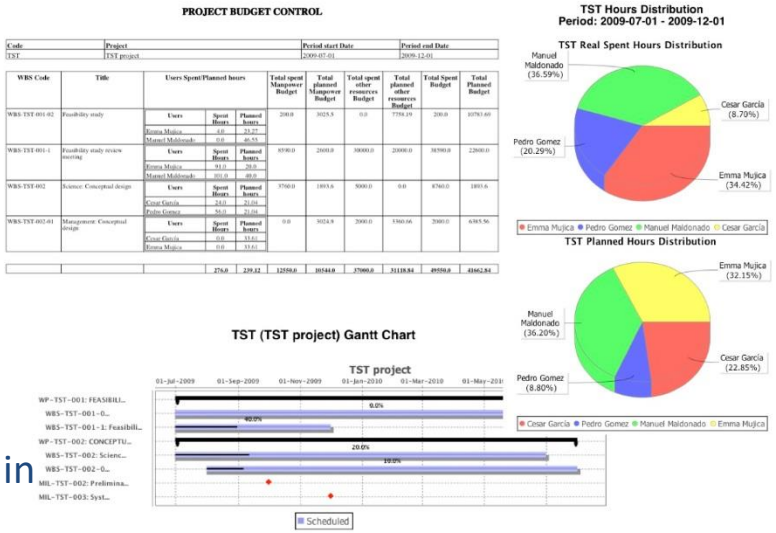


Fractal Suite: a complete set of tools for System Engineering and Management

GECO	Configuration Control
DOCMA	Documentation Management
MANATEE	Project Management
LLAMA	Laboratory management tool

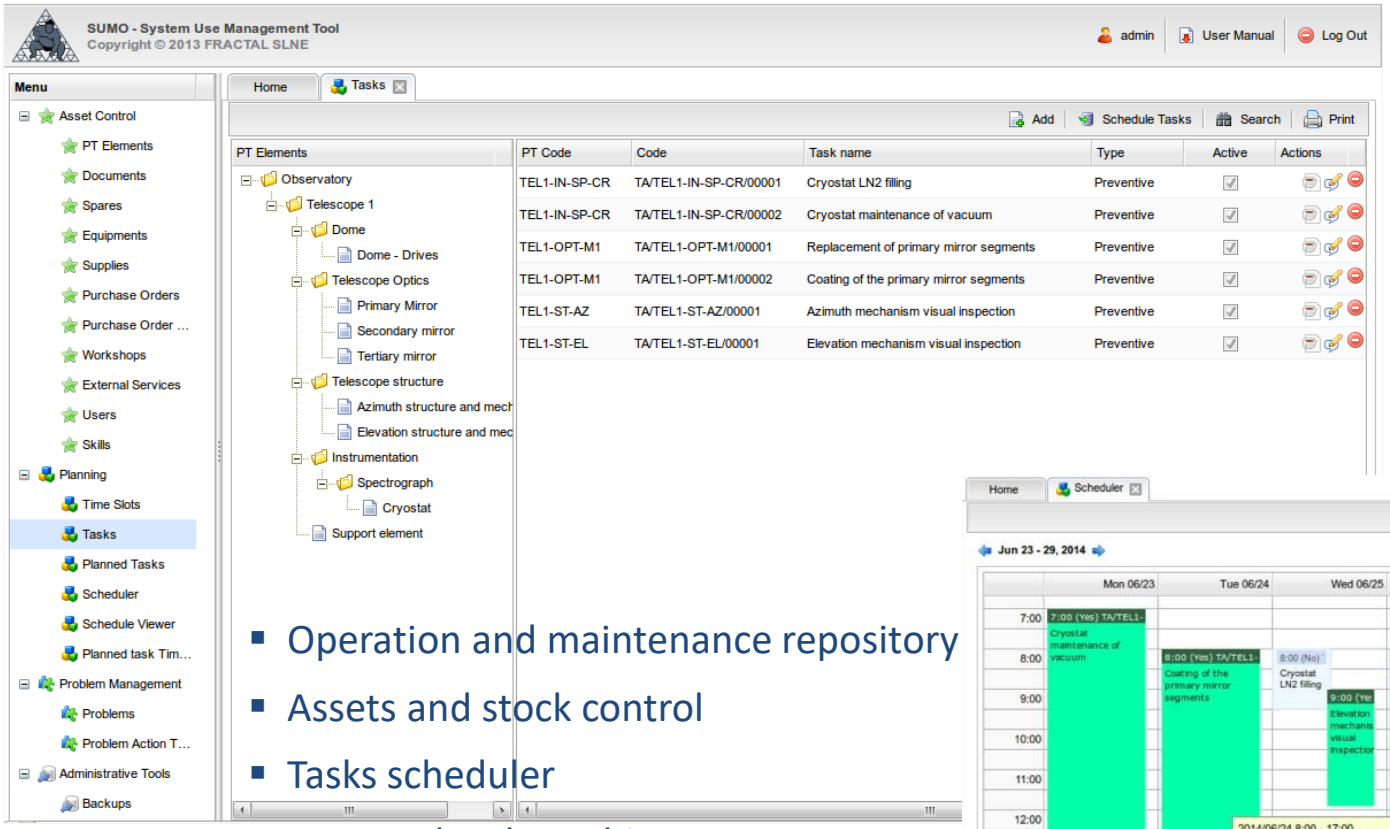


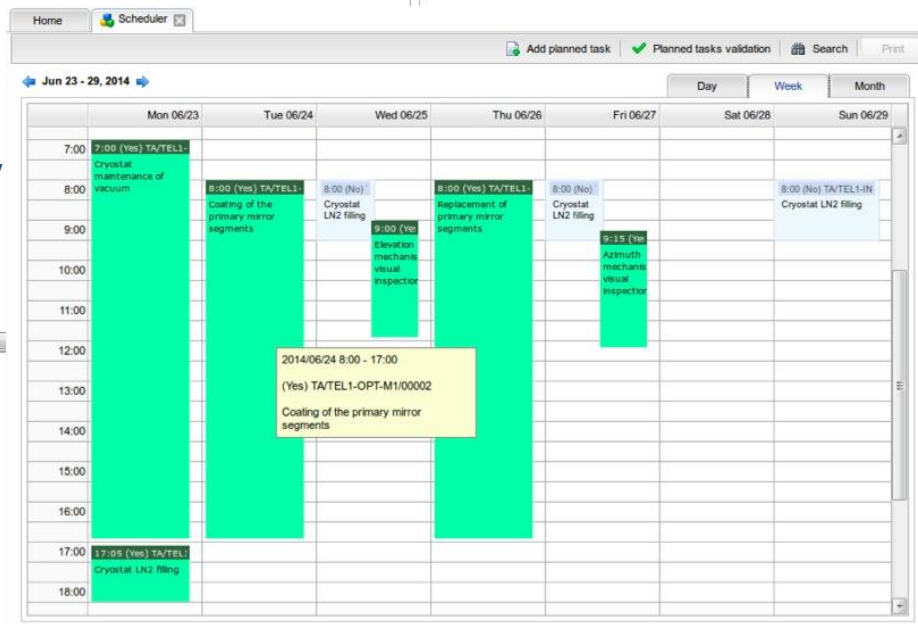




- Oriented to ease the Management and System Engineering in Instrumentation projects
- Especially suited for those Consortia and teams collaborating in a multi-discipline, complex project in a geographically distributed environment

SUMO: Operation and Maintenance Management tool





- Operation and maintenance repository
- Assets and stock control
- Tasks scheduler
- Executed tasks archive
- Anomalies control
- Notification and users management

- Web tool to be useful for distributed organizations.
- Manage the operation and maintenance activities and resources that will be required for the exploitation of a complex system during the Operation phase.



FRACTAL S.L.N.E.

ABOUT FRACTAL ASTROJOBS

FRACTAL AstroJobs is a business line that promotes the job positions offered by our customers.

ASTROJOBS AIM

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FRACTAL AstroJobs service is contracted by our customers, being totally free for all applicants.

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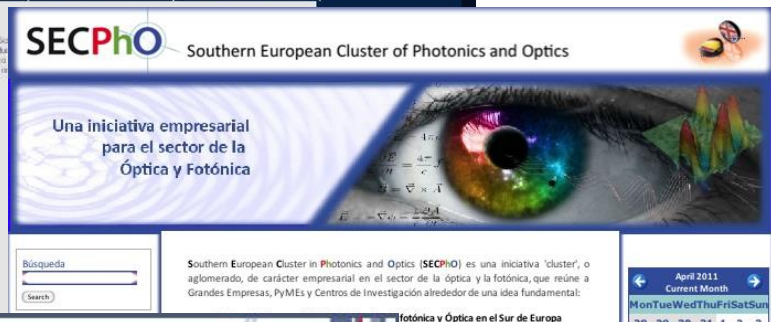
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Web Services














GTC y el estudio de la formación estelar


GTC a la vanguardia de la tecnología instrumental




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