

# Development of high performance units for EO: Earthcare and MTG

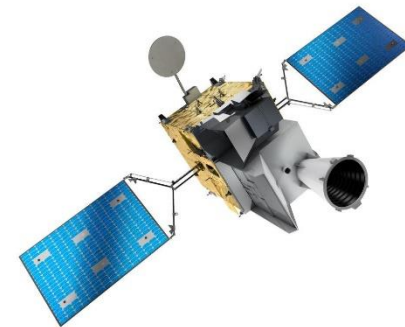
Tecnologías ópticas y fotónicas para aplicaciones espaciales  
Jesús Aivar –BDM UdN Space  
7th May 2019

# LIDAX's contribution to Earthcare & Meteosat Third Generation

Workshop Tecnologías ópticas y fotónicas para aplicaciones espaciales



- **Corporate Presentation**
- Development of High Performance Units for EO: Earthcare & MTG
- Conclusions
- Contact



# LIDAX Leading - Edge Optical Units Development





## EUROPEAN SME LEADER on High performance opto-mechanics & fine positioning subsystems For Space & Science Instrumentation

### High Customers satisfaction

- 1-**Technical Capability**
- 2-**Transparency** to the Customer
- 3-**Commitment** with Quality
- 4-**Optimized Cost**




Well established   
**partnerships** with  
**PRIMES**, Subsidiaries  
& R+D Laboratories

**40 Engineers & Technicians** with 1st class facilities oriented to **>80%** on **D+i** Activities 

2000 

Founded by two Aerospace Engineers with **more than 20 year of Experience**

European Reference on Opto-Thermo-Mechanics "Always below the  $\mu\text{m}$ " 

  
located in Madrid, with **80% export sales in EU Market**

# Main Customers



CENTRO DE ASTROBIOLOGÍA  
ASOCIADO AL NASA ASTROBIOLOGY INSTITUTE

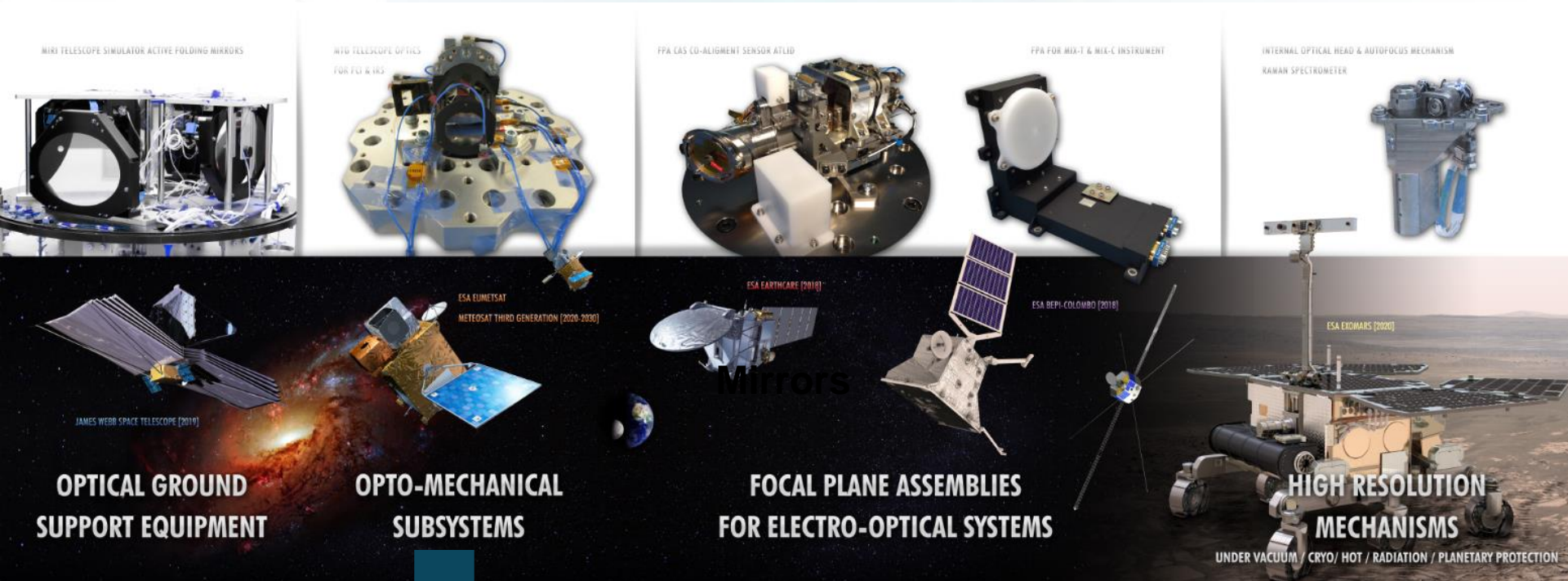


CSIC





# Product Families & Heritage



- ✓ Telescopes
  - ✓ Folding
  - ✓ Cryogenic
  - ✓ Optical Heads
  - ✓ Lens Barrels
  - ✓ Beam Splitters
- Optical Mounts  
Mirrors

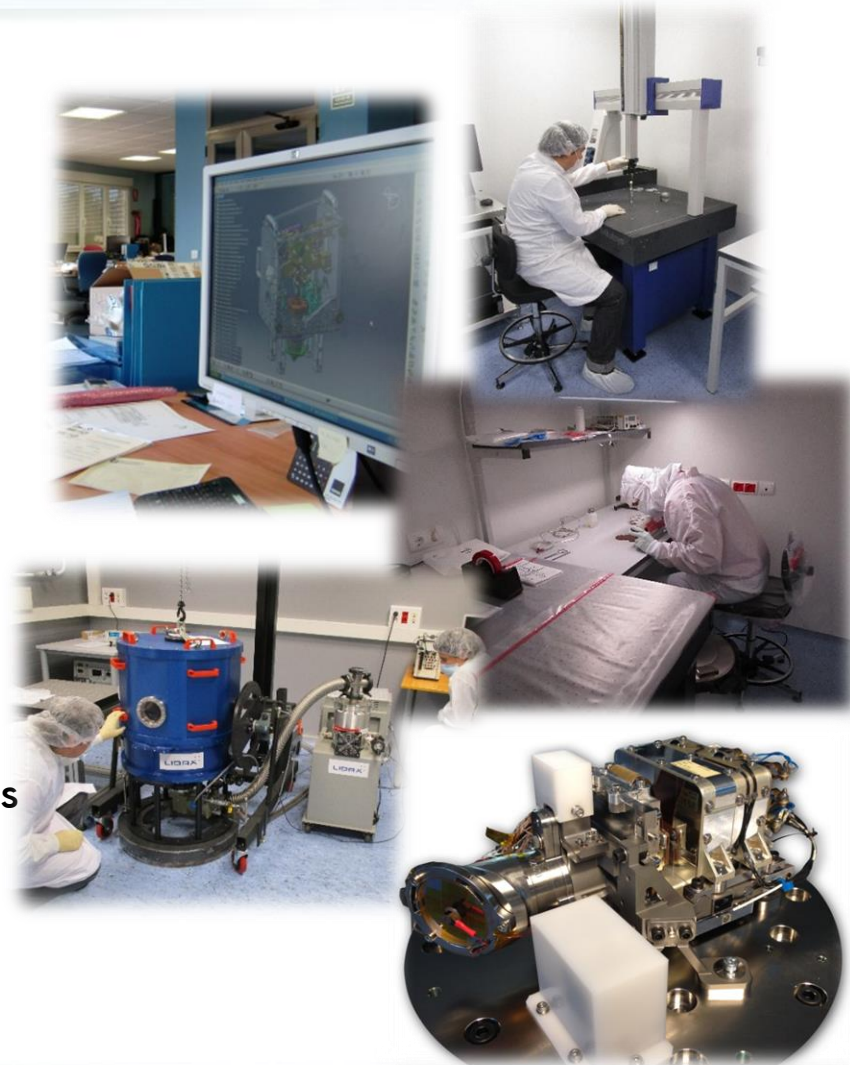


**Full Responsibility on Complete  
OPTICAL FUNCTIONAL Units**

# TEAM & Facilities



- ∴ **Project & PA/QA Management**
- ∴ **System Engineering at Equipment**
- ∴ **Product Engineering**
  - ▶ Opto-Mechanical Design
  - ▶ Thermal & Structural Analysis
  - ▶ AIT Engineering
- ∴ **Purchasing & Procurement Team**
- ∴ **Assembly & Integration (ISO 5/7)**
- ∴ **Testing Facilities in house**
  - ▶ Cryostat & Radiative Oven
  - ▶ Vacuum Oven for Bake-outs
  - ▶ Optical Metrology Tools for Functional Tests
  - ▶ Inspections Systems for Product Assurance
- ∴ **TVC & Vibration Machines nearby**

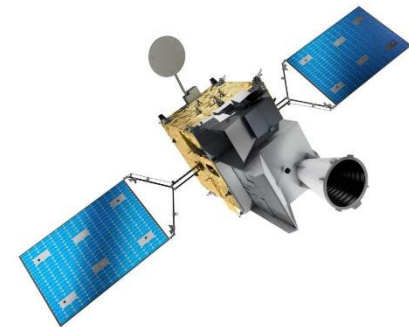


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# EARTHCARE Satellite

## ATLID – Co-Alignment Sensor (CAS)



- ∴ **6th Earth Explorer Mission (ESA & JAXA)**
- ∴ The **ATLID Instrument** is equipped with a high spectral resolution receiver and a depolarizing channel
- ∴ The **co-alignment sensor (CAS)** is an **optoelectronic unit** located in the Optical Bench that will continuously check the ATLID laser beam direction (Receiver Chain)
- ∴ This optoelectronic unit was developed through a strong industry partnership by Airbus D&S (CRISA) and LIDAX.
- ∴ Date for its launch: 2021



*“ATLID aims to study the clouds and aerosols to understand their influence on radiation driving the climate system and its regulation”*



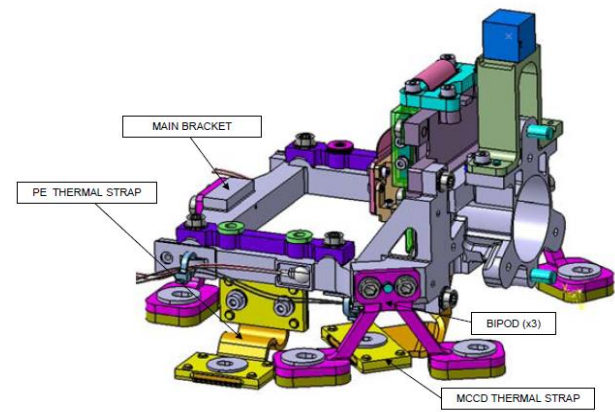
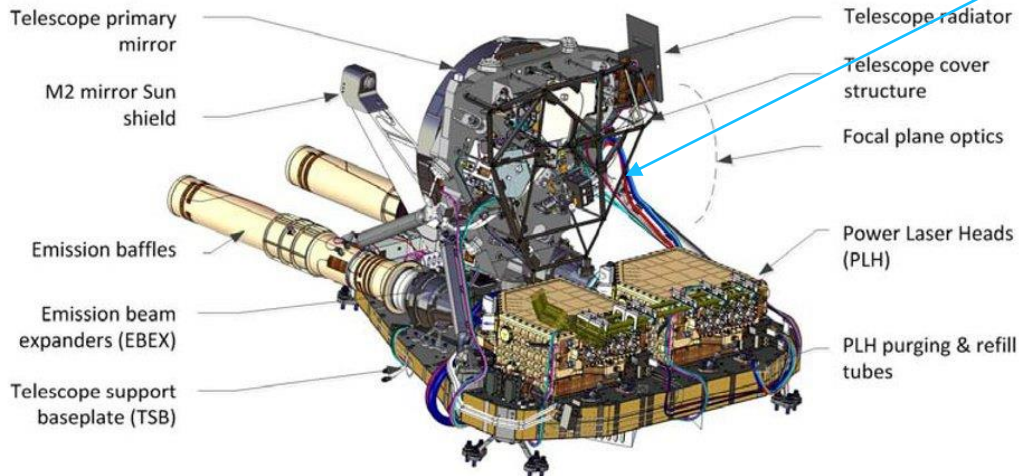
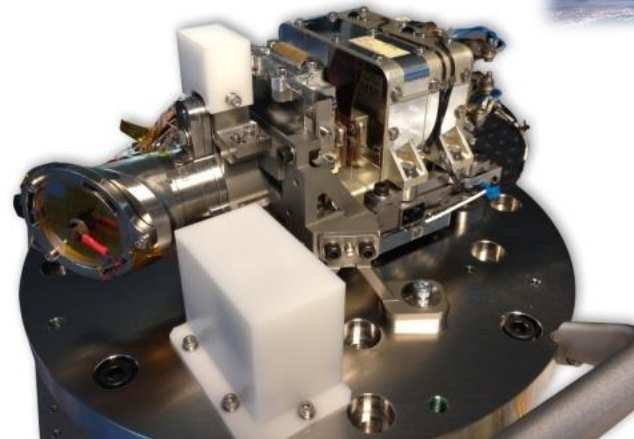
# EARTHCARE Satellite

## FPA Co-Alignment Sensor (CAS)



### PRODUCT DESCRIPTION

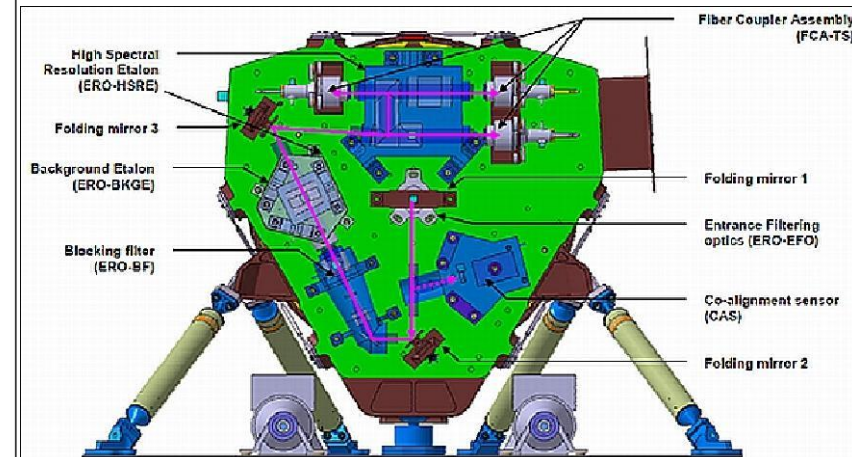
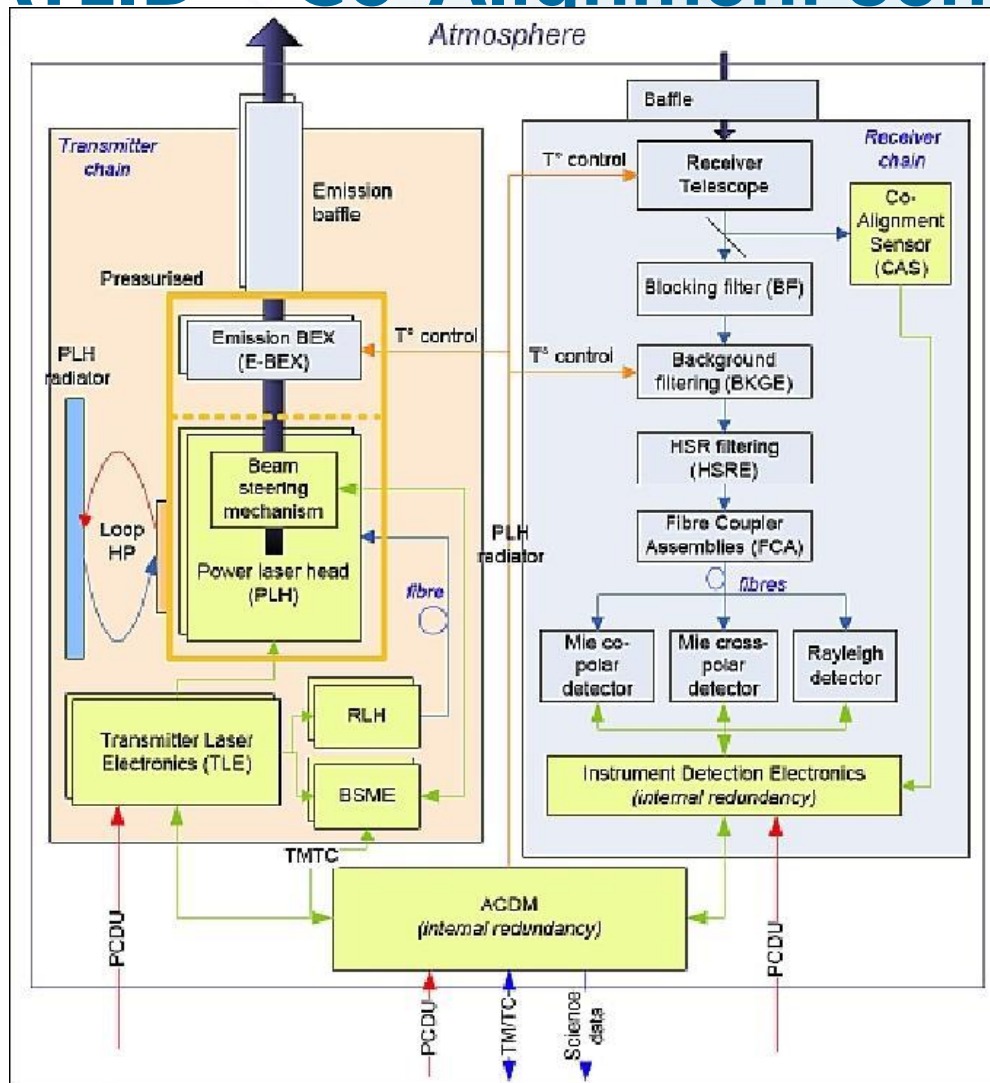
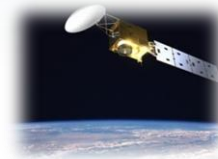
- LIDAX Activities & responsibilities were Focal Plane Assembly Development & Qualification, integrating Optics / Detector and Electronics for STM & PFM Models
- The challenging requirements were:
  - **Stability**  $< 1\mu\text{m}$  (optics/CCD),  $< 30\mu\text{m}$  (overall); Rotational axis  $< 100\mu\text{rad}$  (overall)
  - High Control **Cleanliness**: 50ppm,  $1.0 \cdot 10^{-8} \text{g/cm}^2$
  - **Microvibration Sensitive Equipment**



Instrumentation (Earth Observation)

# EARTHCARE Satellite

## ATLID – Co-Alignment Sensor (CAS)



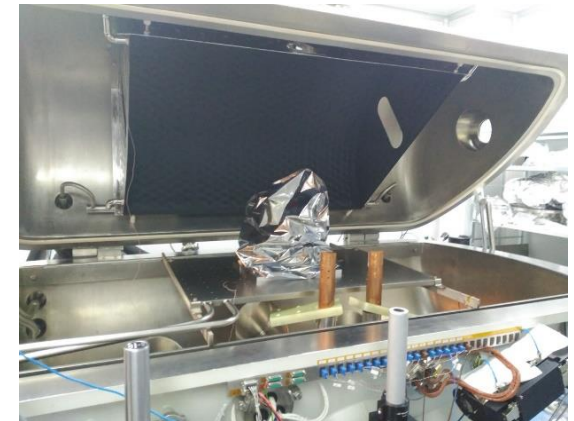
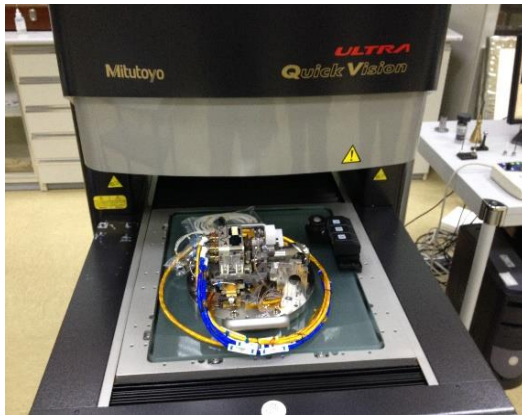
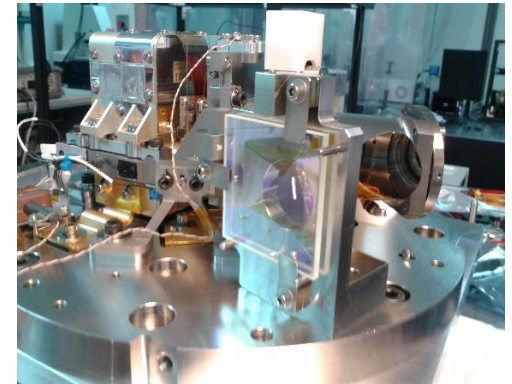
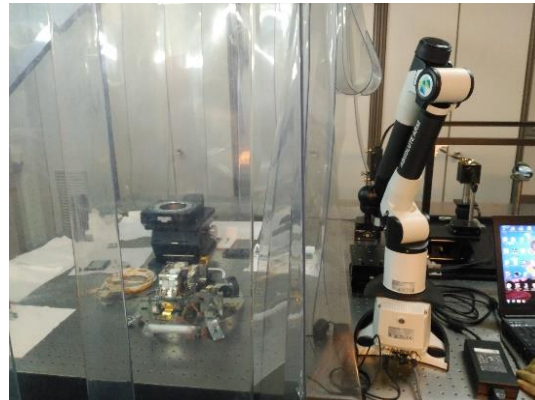
Instrumentation (Earth Observation)



# EARTHCARE Satellite FPA Co-Alignment Sensor (CAS)



## QUALIFICATION CAMPAIGN



*Acknowledgements for their collaboration and support to: Airbus D&S SAS & CRISA, INTA – LINES*

# MTG Telescope Optics for IRS and FCI Telescope Mounts

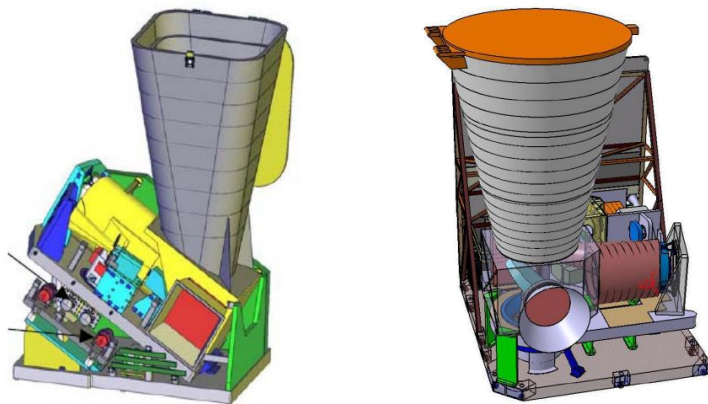


• **Meteosat Third Generation (MTG) Cooperation programme between EUMETSAT and ESA**

• **MTG will enhance global and regional numerical weather prediction (3w in advance), climate and atmospheric chemistry monitoring data from GEO.**

• **In total Six Satellite Series will cover the European meteorology observation until 2039**

- 4x MTG-I Flexible Combined Imager
- 2x MTG-S Infra Red Sounder



Instrumentation (Earth Observation)

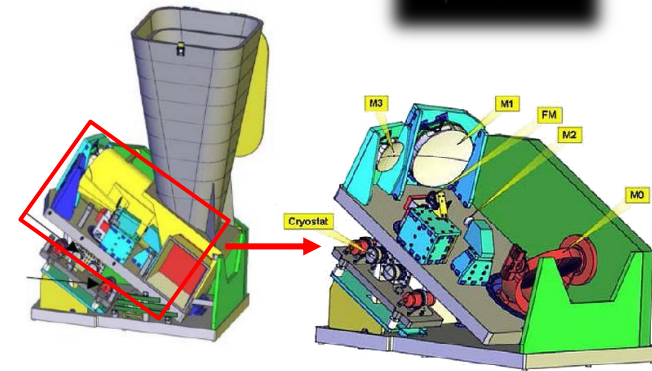


# MTG Telescope Optics for IRS and FCI Telescope Mounts

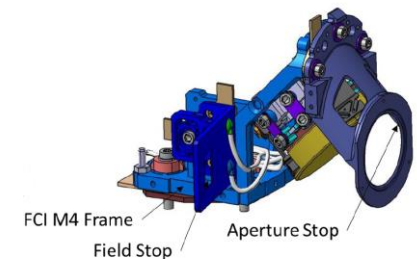


## PROJECT DESCRIPTION

- LIDAX in close collaboration with an Optical Space Manufacturer has the following responsibilities:
  - Optical Mounts **Development & Manufacturing** for M1, M2, M3, and M4 for both instruments FCI and IRS, including Thermal Hardware
  - **Integration and Environmental Testing** of Optical Assemblies
  - Development and MAI of **MGSE**, and **OGSE** required for testing
- The challenging requirements are:
  - High **Stability Mirror Supports** From  $\pm 1 \mu\text{m}$  to  $\pm 20 \mu\text{m}$
  - **Thermal Control Design and Thermal Hardware** Procurement with accuracies below 0,1K
  - **Cleanliness Requirements:** 30-100 ppm & Molecular  $0.3\text{-}2.0 \cdot 10^{-8} \text{ g/cm}^2$
  - **Program & Contractual Management**
- Date for its first launch: from 2021 onwards
- Total: 24 Equipped Mirrors (STM, EQM & FMs)



Preliminary FCI-TO design mounted on the OBA



FCI M4 Opto-Mechanical Assembly Design

Instrumentation (Earth Observation)

# MTG Telescope Optics IRS and FCI Thales SESO, OHB (2013-..)



## PRODUCTION

There will be up to 6 satellites series to cover beyond 20 years of European meteorology.

Four MTG-I and two MTG-S satellites

## Units Delivery Schedule (M1, M2, M3, M4 for IRS & FCI)

		2017	2018	2019
FCI	iSTM	4		
	EQM	2	2	
	FM			8
IRS	STM	4		
	EQM	1	3	
	FM			4

STM FCI M1 Optical Mirror Model

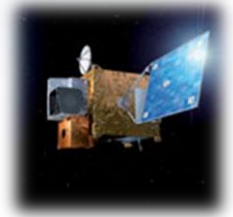
STM FCI M2 Optical Mirror Model

STM FCI M3 Mirror after STM FCI M4 Optical Mirror Qualification

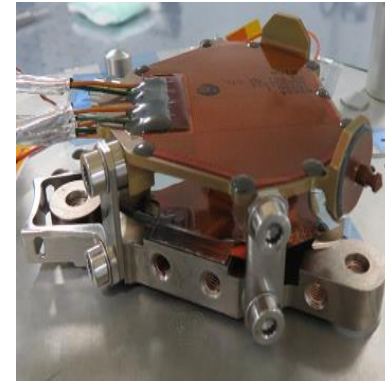
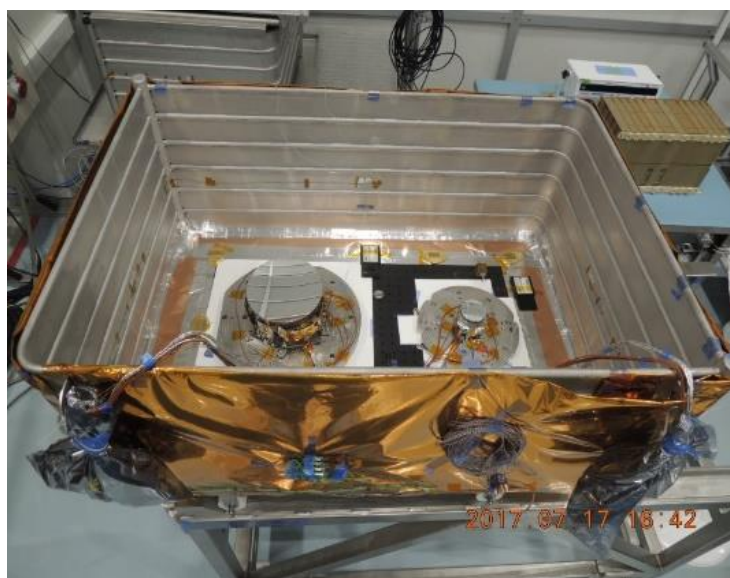
Instrumentation (Earth Observation)

**CONFIDENTIAL**

# MTG Telescope Optics IRS and FCI Telescope Mounts



## ACCEPTANCE TEST CAMPAIGN

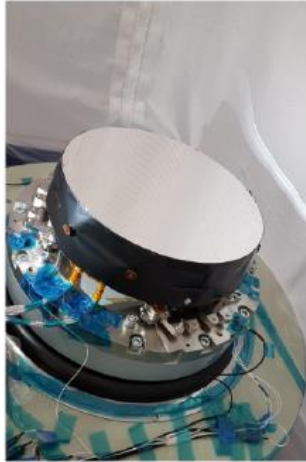
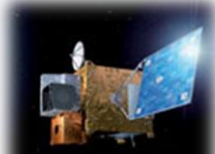


LIDAX is currently delivering last Telescope Optics FM models after a successful Environmental Test Campaign (TVC and Shaker Testing).

*Acknowledgements for their collaboration and support to: **OHB System AG, Thales, TAS France & TAS España***



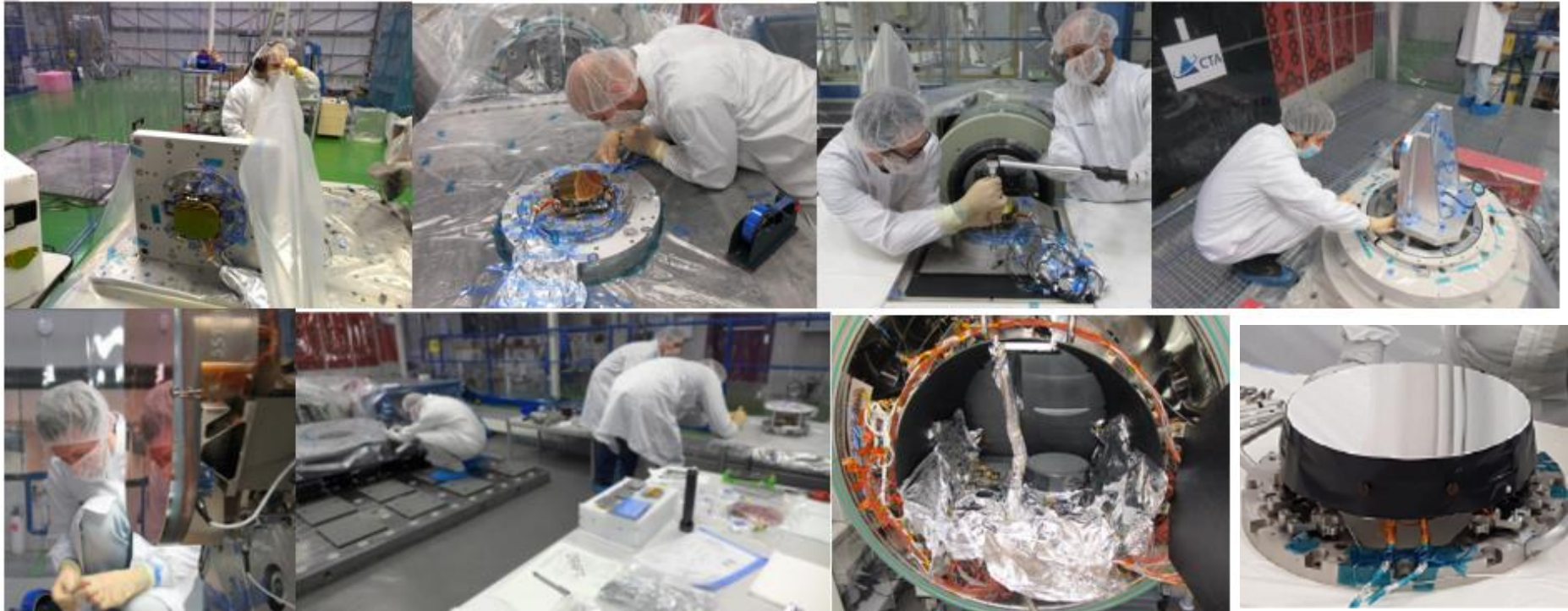
# MTG Telescope Optics IRS and FCI Telescope Mounts



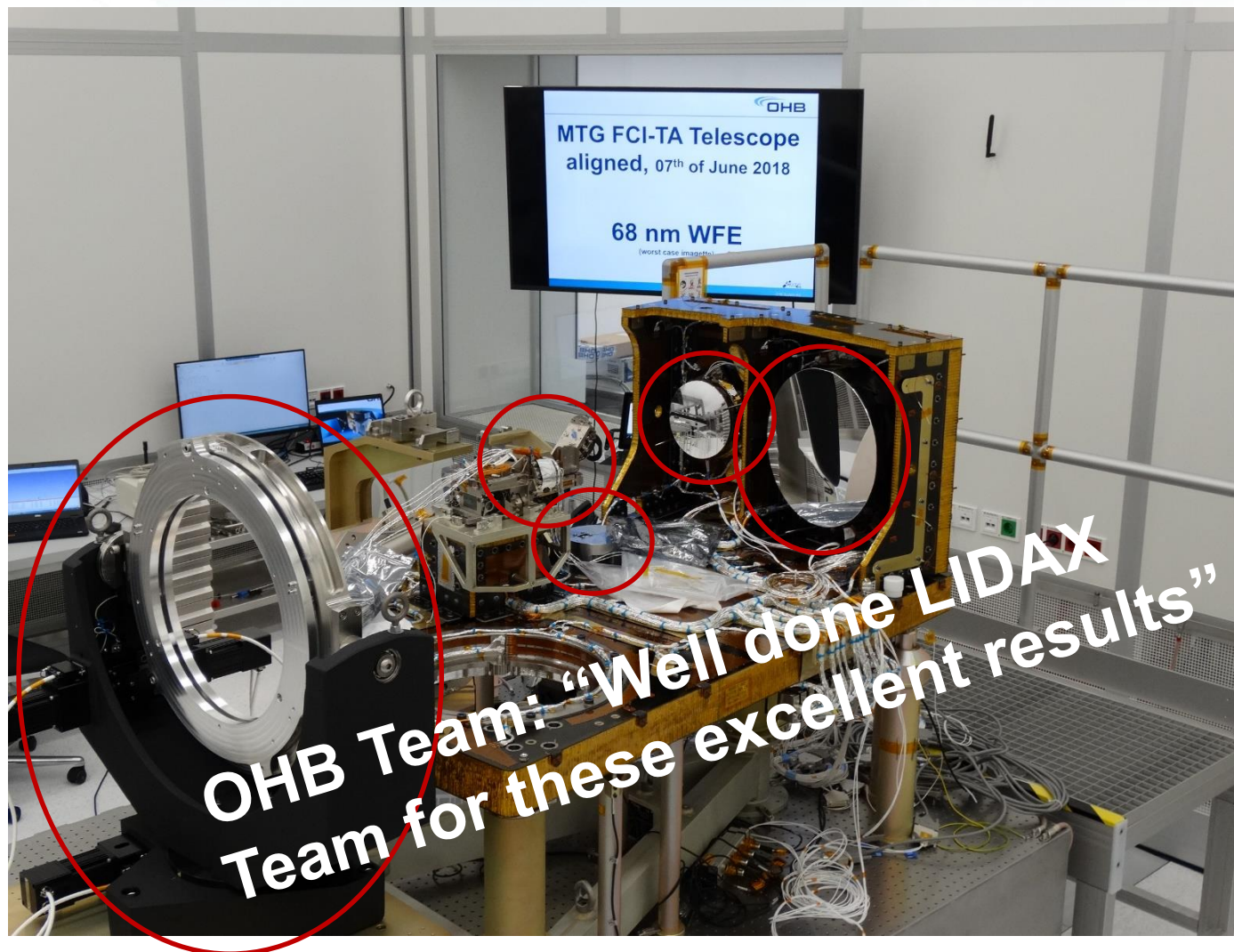
**EQM IRS M1 M4 Set up for Vibration Test Campaign**



# MTG Telescope Optics IRS and FCI Telescope Mounts



# MTG Telescope Optics IRS and FCI Telescope Mounts

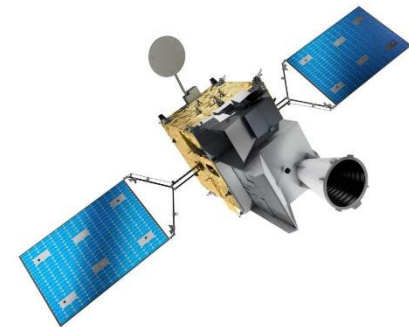


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# Buscando oportunidades JUNTOS

• Se han presentado 2 proyectos de referencia (**Earthcare** y **Meteosat Tercera Generación**) donde se muestra el nivel de capacitación tecnológica alcanzado y la experiencia en Equipos de Vuelo en colaboración con la Industria / Centros de Investigación y Universidades.

• Es preciso incentivar las colaboraciones industriales entre Sistemistas y Equipistas para el desarrollo de productos competitivos en el Mercado de Exportación (Space 4.0): **Constelaciones, Microsatélites,...**

• LIDAX desea colaborar con socios tecnológicos (dentro de la óptica y la fotónica) para desarrollar conjuntamente **productos innovadores** de interés no solo espacio sino en otros mercados (preferiblemente Industrial: Semiconductores?)



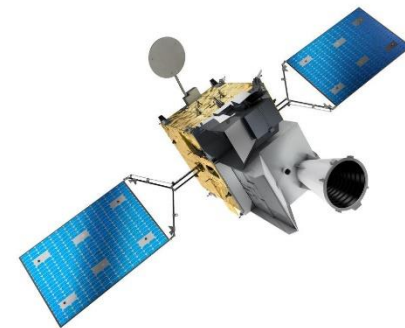


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## :: **Contacts**

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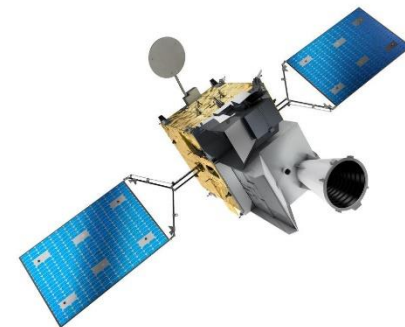
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# THANKS

# FOR YOUR ATTENTION

