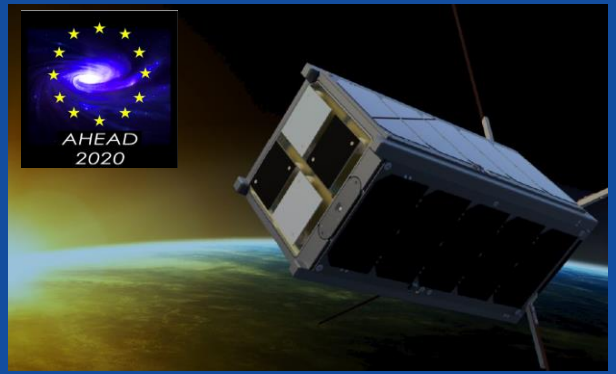
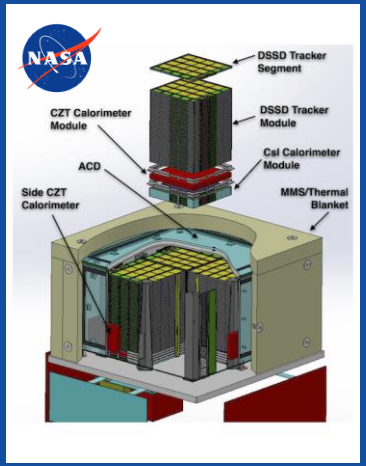
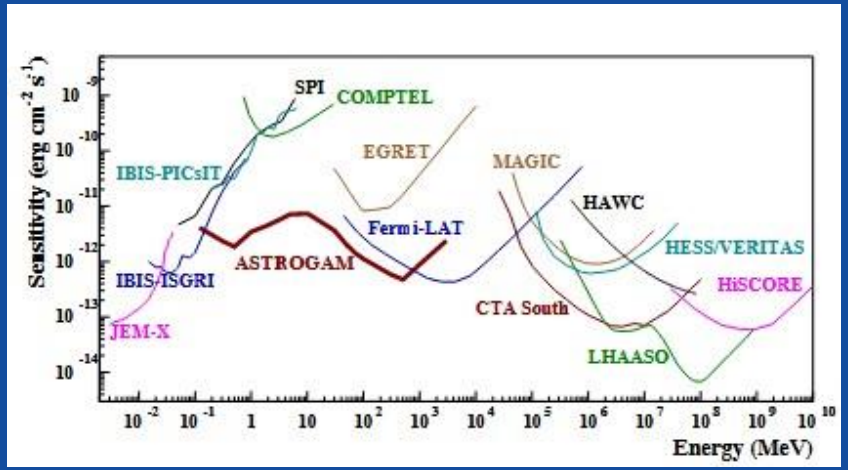
i-Astro Activities

High-energy Astrophysics Missions



COMCube Constellation (EU)





AMEGO – Call 2025, Calorimeter, FPGA, : polarimetry, radiation hardness

Our Partners

LIP
LABORATÓRIO DE INSTRUMENTAÇÃO E FÍSICA EXPERIMENTAL DE PARTÍCULAS
partículas e tecnologia

1 2 90 UNIVERSIDADE D COIMBRA

UNIVERSIDADE BEIRA INTERIOR

INAF OAS BOLOGNA

activespace technologies
making space a global endeavour

Università degli Studi di Ferrara

ADVACAM
Imaging the Unseen

deec.uc

df.uc

esa

imem

pollux

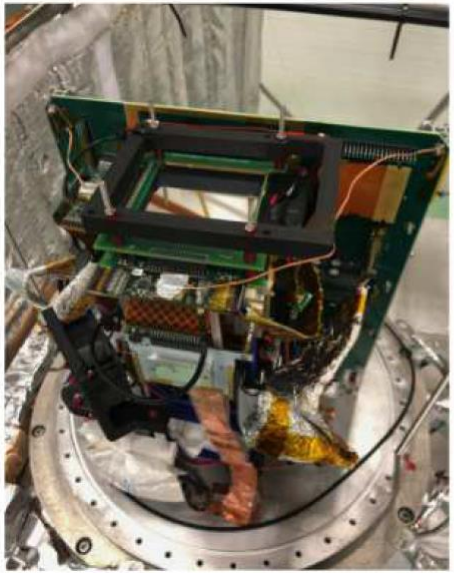
Balloon flight Polarimetry

1st Flight

- August 21st, 2023
- Timmins, Ontario, Canada
- 37 km max. altitude
- 14.5 h
- Not sensitive to polarization

AHEAD WP 11

LIP: 30 k€ -> 2024



LIP Contribution

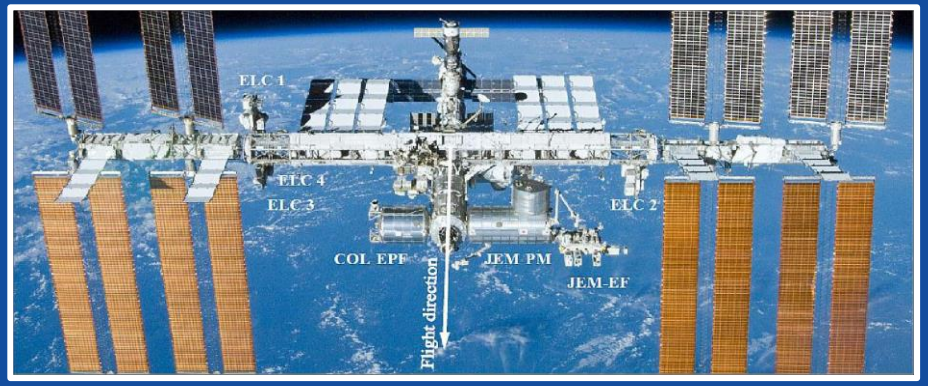
- Instrument Design Simulations
- FPGA Development
- i-Astro Polarization Analysis

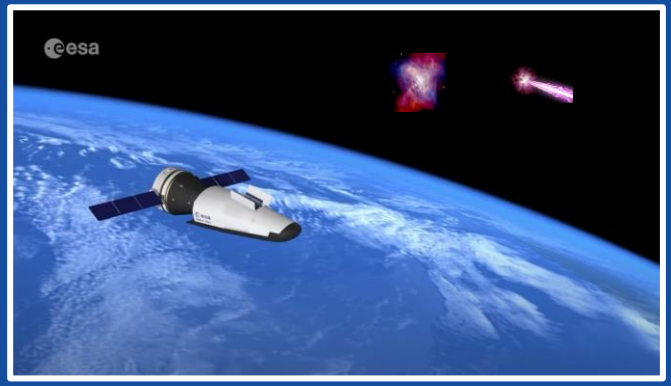
NEXT STEP

HERMES Ballon Flight

- September, 2024
- Kiruna, Sweden
- ~40 km altitude
- Transatlantic flight
- i-Astro will analyse polarization

Space Experiments for High-energy Astrophysics

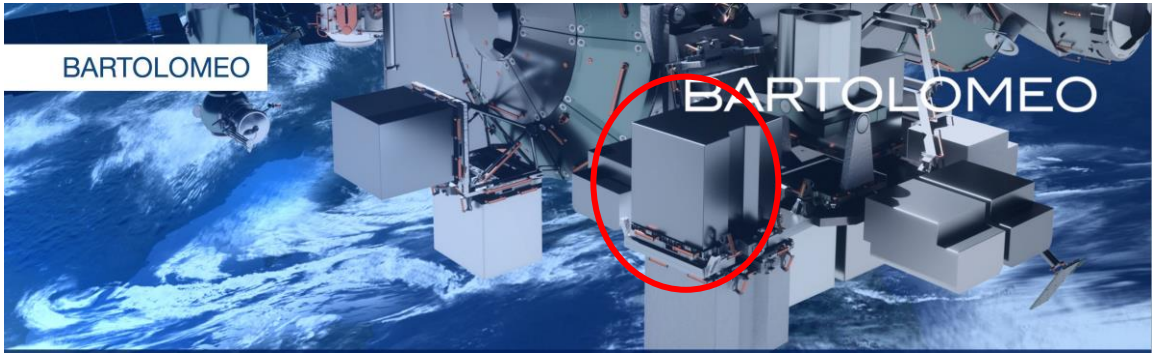




GLOSS: Gamma-ray Laue Optics and Solid State detectors
(ESA/CNES Euro Ageing Materials)

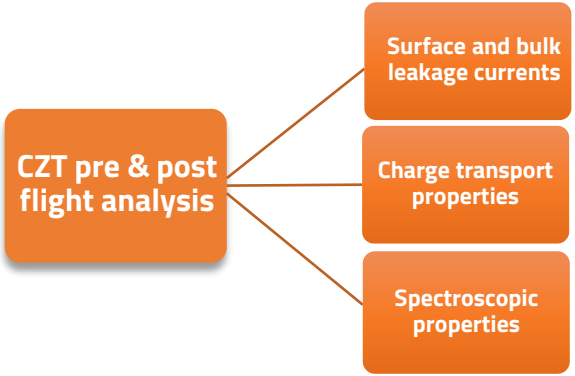
THOR-SR
(ESA Space Rider Maiden Flight Opportunity)

Airbus Bartolomeo Platform
Material Ageing Experiment

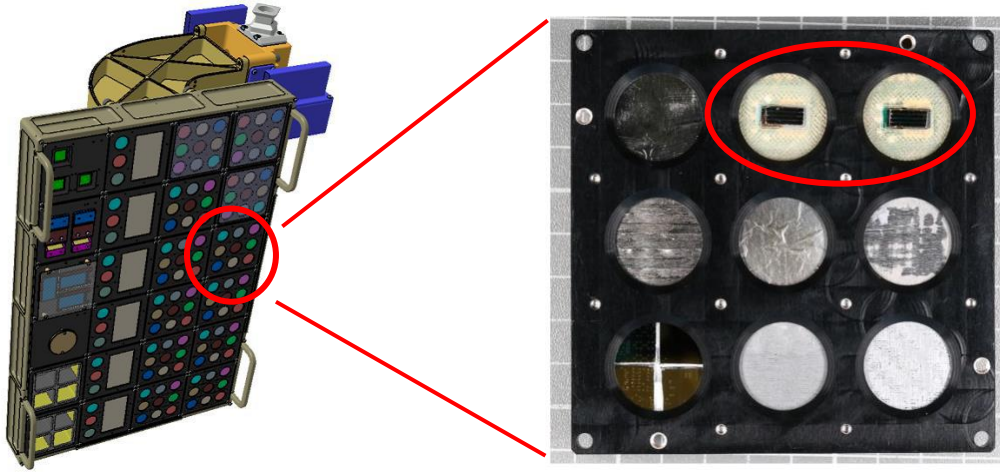


- ❑ ESA Euro Material Ageing Call
- ❑ Orbital Ageing on CZT Detectors
  - Orbital Radiation
  - Solar Activity
  - Temperature: -150° up to +120°C
  - Oxygenation
- ❑ PRODEX (4000136945) : 115 k€ -> 2026

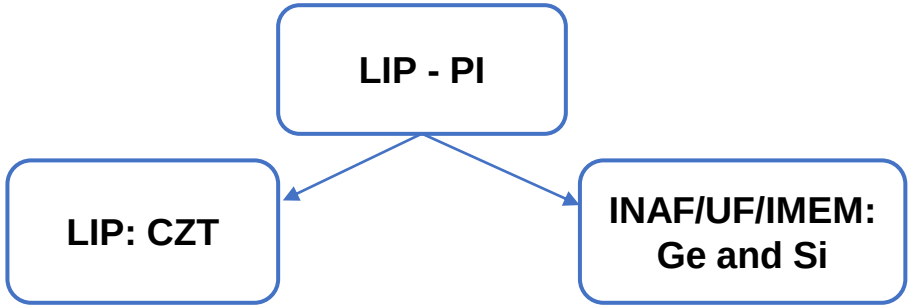
- ❑ Launch to ISS by July/August 2024



CZT samples



GLOSS Timeline



Kick-off
December 2020

Backup Samples
May 2021

Flight Samples Delivery to ESA
End 2021

Launch and Setup at Bartolomeo
Q3 2024

Recover Samples
Q3 2025

End of Project
Q2 2026

Manufacture samples

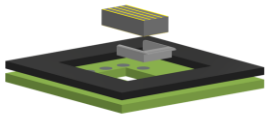
Pre-flight and Characterisation Tests

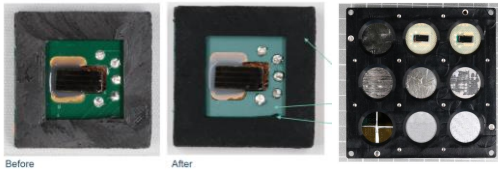
ISS Data Monitoring

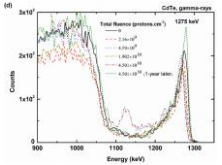
Post-flight Tests

Radiation and Thermal Simulations

Communication and dissemination







THOR
SPACE RIDER

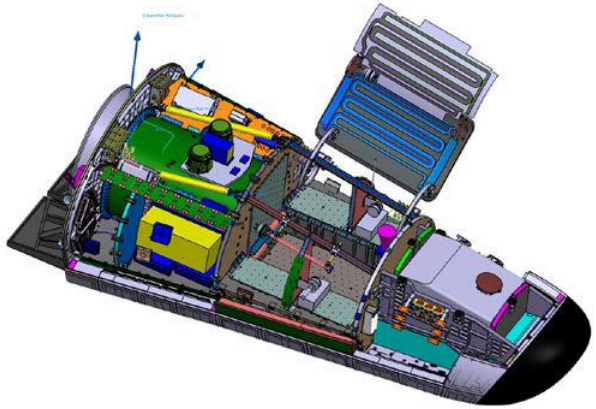
PRODEX

LIP: 470 k€ -> 2026

Industrial Partners

activespace technologies — making space a global endeavour

ADVACAM — Imaging the Unseen

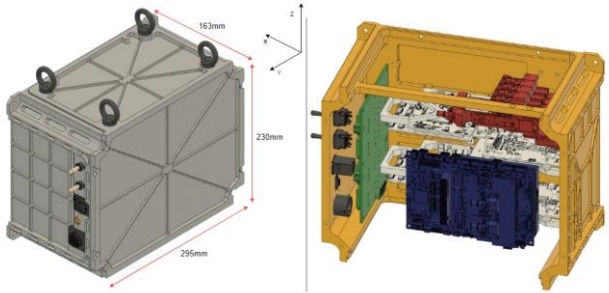


- High-energy Astrophysics Pathfinder Instrument
  1. High-energy Sources: Crab Nebula or GRB. Spectroscopy, Imaging, Time Variability and Polarization in all-sky mode.
  2. Particle environment measurements and Radiation ageing (Space Exposure Locker);

- TGF Science and Aviation Safety:
  3. TGF monitor test;
  4. TGF polarization: outstanding scientific measurement

Enclosure View

Subsystems View



Detector Unit

16 CdTe detectors – Gamma-ray sky and TGFs
2 Si detectors – Orbital environment

PDU

OBC

Nvidia Jetson Xavier GPU

DU Test Models testing plan

2023 Q4	2024 Q1	2024 Q2	2024 Q3

Single Detector Test Model

Quad detector Test Model

✓ Tests @ LIP

LIP Tests

✓ LARIX Setup

✓ Tests @ LARIX

LARIX

Tests @ ICNAS (running)

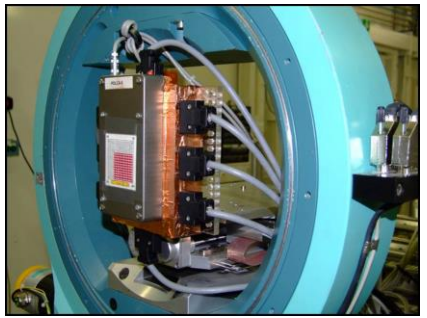
ERSF call

ERSF

Larix (Univ. Ferrara)

ICNAS Univ. Coimbra

ESRF (Grenoble)



SWOT

Strengths

- i-Astro is leading the ESA Eu Material Ageing GLOSS international consortium and also the THOR Space Rider experiment. Members of three major international projects in high-energy astrophysics: AHEAD2020 European project, AMEGO NASA mission and ESA pre-select New Astrogam .

Opportunities

- AHEAD2020 activities provide balloon demonstrator launch opportunity and access to international scientific facilities.
- In case AMEGO or Astrogam selection outstanding NASA or ESA space mission participation.
- The GLOSS project provides an outstanding opportunity to estimate the performance of our instruments under orbital environment at ISS in LEO;
- The Space Rider will provide a unique opportunity to develop space scientific instruments for astrophysics and TGF observation with the industry. TGF Monitor product.

Weaknesses and Threats

- Components world market shortage due to Covid and War in Ukraine;
- Difficult to attract students beyond master thesis research for PhD degree: poor perspectives;
- The LIP Physics Department facilities are not up to date for fine scientific research activities, for instance mass device laboratorial plug sites are not uniformized and radioactive handling equipment is scarce and overused.

2024	2025	2026	2027	2028	2029

New Generation of Space Observatories for High-energy Astrophysics

NASA AMEGO Mission Development

Development of Small Prototype & Test in Balloon Flight

If NASA Probe Call selection: Development of CZT Calorimeter

AMEGO launch and operation

NanoSat Constellation for Multi-messenger Astrophysics

COMCUBE AHEAD 2020

ESA M class call: COMCUBE Constellation

Space Experiments – TRL9

GLOSS Experiment @ Bartolomeo in the ISS

GLOSS launch for ISS

THOR Space Rider Experiment

M class Polarimeter on Space Rider

Space Rider launch

Antaeus ESA Fly Your Satellite [37]