



INTA Contribution to MXGS Instrument for the ASIM Payload



Instituto Nacional de Técnica Aeroespacial

V. Eiriz, F. Pérez, J. A. Martín, M. Reina, L. Sabau-Graziati
Instituto Nacional de Técnica Aeroespacial, Torrejón de Ardoz, Madrid, E28850, Spain.

ABSTRACT

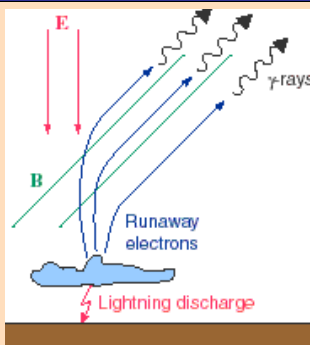
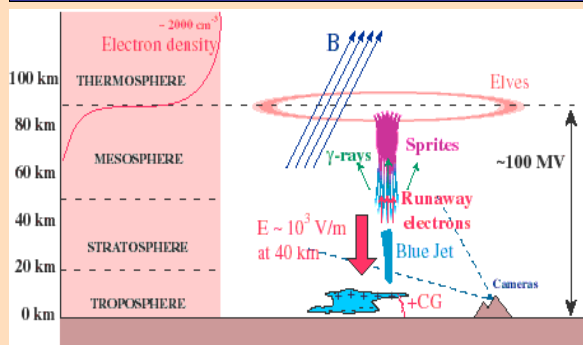
INTA is a partner of the Spanish Consortium on the MXGS (Modular X- and Gamma-Ray Sensor) Instrument, part of the ASIM (Atmosphere-Space Interactions Monitor) ESA Mission to be assembled on the Columbus Module of the ISS (International Space Station).

MXGS is designed to detect Terrestrial Gamma Flashes (TGF) due to high energy phenomena in the upper atmosphere layers, which sources and physics are the mission objectives. Low and Medium Energy Detectors with space heritage (two detectors assemblies, one with CZT and another of BGO detectors), and a Coded Mask at front of the Instrument, provide imaging capabilities for TGF location. All instrument subsystems are mounted in the mechanical housing. A variable environment due to the ISS orbit and attitudes, with tight temperature requirements, is the challenge for the instrument thermal control. Both mass and envelope budget are the main constrains for the Instrument structural design; and also for the assembly, integration, verification and tests activities.

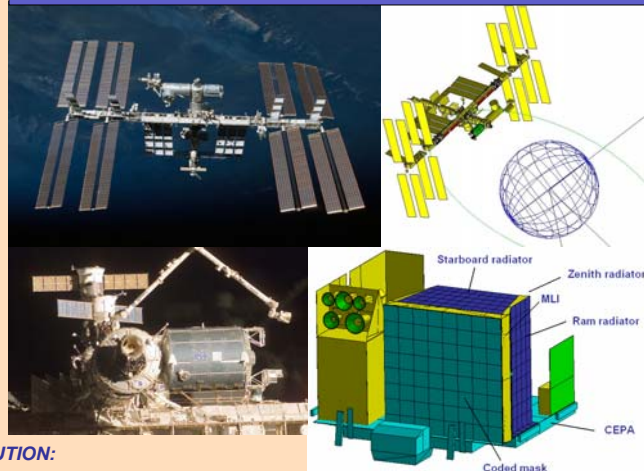
During Phases C/D, INTA is responsible for the Product Assurance (PA) on the Spanish contribution; Assembly, Integration, Verification and Test (AIVT) activities; the Thermal Control Subsystem development; and also participates in the Scientific Program definition.

Electrical charges interactions with the atmosphere magnetic fields could be the source of Terrestrial Gamma-Ray Flashes (TGFs):

- ✓ RHESSI satellite in operation from 2005 is detecting 1 TGF per day
- ✓ MXGS/ASIM TGFs detection rate (estimations): 50 per day

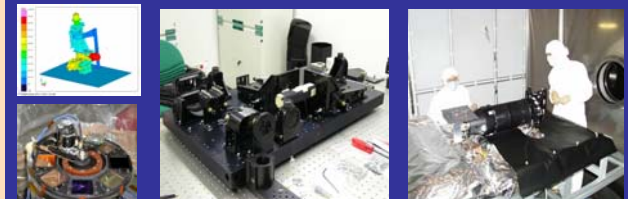


ASIM, located on the ISS Columbus Module External Facility, with the MXGS Instrument facing NADIR, will continuously observe the High Atmosphere accumulating a great number of events.



INTA Payloads and Space Instrumentation Area

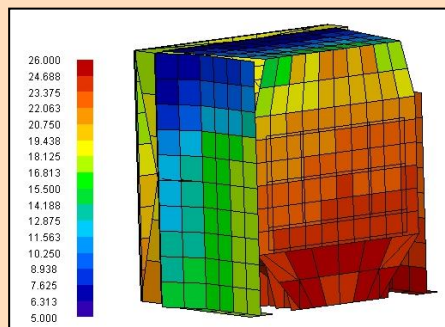
Focus on Payloads Design (both Optical and Electro-Optical Instruments); Supporting the Structural and Thermal Design; and the Assembly, Integration, Verification and Test.



MXGS-ASIM INTA CONTRIBUTION:

- Thermal Control Subsystem Definition & Implementation:
 - ✓ Loop Heat Pipes (LHP)
 - ✓ Axial Grooved Heat Pipes (AGHP)
 - ✓ Survival/Start-Up Heaters and Radiators
 - ✓ Multi-Layer Insulation (MLI)
- Product Assurance (PA) & Safety for the Spanish Contribution
- Assembly, Integration, Verification and Test (AIVT):
 - ✓ Structural and Thermal Model (STM)
 - ✓ Flight Model (FM) for Acceptance
- Scientific Program Definition

MXGS Thermal Mathematical Model provides both cold/hot cases and operational/survival compliance in the ISS orbital configuration, with their orbit simulation and Temperature solver.

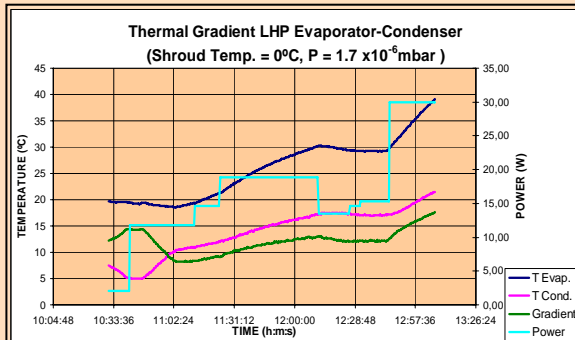
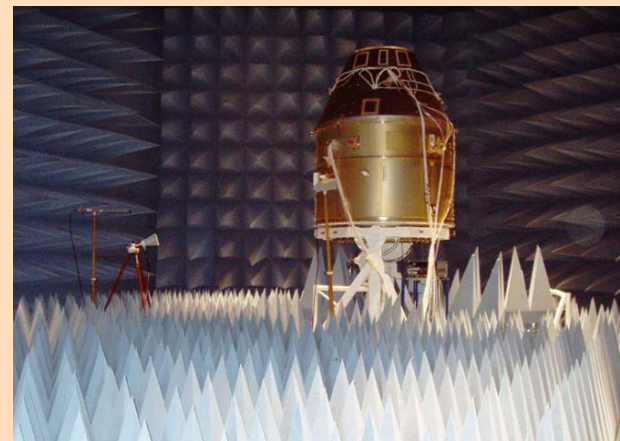
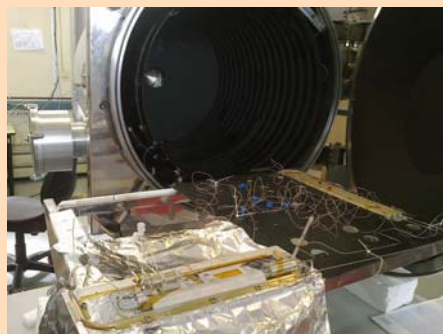


ISS orbit is a Low Earth Orbit, which attitude respect to the Sun changes from +76° to -76°, defining the Hot and Cold cases, respectively. To maintain the Temperature range with mass savings, LHP is the selected technology element.

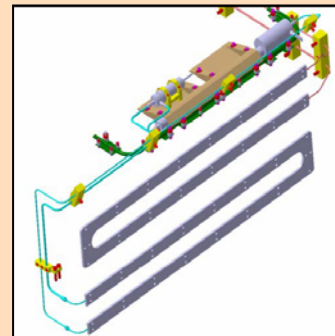


INTA FACILITIES FOR ASIM/MXGS PROJECT

- B13 CLEAN ROOM:
 - Class ISO 8
 - Electronics Laboratory
- ENVIRONMENTAL TESTS:
 - Vibration System LDS984
 - COG Shenck WM4
 - MOI Shenck M4
 - Thermal Vacuum Chamber
 - EMC Laboratory



Loop Heat Pipe (LHP) Technological Model complies with the 10°C gradient during the Thermal Vacuum Test performed in May 2012 at INTA



Loop Heat Pipes (LHP) Flight Configuration on MXGS