Mini-EUSO: Measurement of the Earth's UV background emission from the ISS as a pathfinder for the JEM-EUSO mission

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Scientific Objectives



→ High res. Earth UV bg
→ Moon phase dependence
→ Night time UV mapping

Atmospheric Phenomenon



Meteoroids



Technological Objectives

- The second second
- → 2) Optimisation of characteristics and performance of EUSO
- → 3) Raise the technological readiness level of the hardware and software



Technical Specifications

- → Dimensions
 BxHxL: 35x35x60 cm³
- → Mass
 - 30 kg
- Power
 - 30 W
 - 28 V (ISS Supply)
- → Data
 - SSD storage
 - No Up/Down Link
 - Crew Rotation



Technical Specifications

- → 1 Photo-Detection Module PDM
 - 36 MAPMTs → 2304 pixels
 - 300-400 nm
- → 2.5 µs time resolution
 Shower development
 Fast/Slow events
- → 2 Fresnel lenses 25 cm
 ±19 deg FoV
 - $~60 000 \text{ km}^2$
- IR/VIS Cameras
 Atmospheric monitoring
- Protective Iris
 - Local night time operations





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Expected Results

High resolution UV map







Expected Results

Computer simulated 10²¹ eV air shower as would be observed by Mini-EUSO



Ground based laser operations will simulate these types of events when in the FoV of Mini-EUSO



ISS

~400 km

Space Debris Remediation



Space Debris Remediation

- NORAD provides data of known debris in FoV of Mini-EUSO (a few – termination line between dark and light)
- Look for unknown debris (includes meteors for this purpose)
- →Laser shooting from Ground to Mini-EUSO (CSM - US)
 - Laser shooting debris (difficult)



Demonstration designs for the remediation of space debris from the International Space Station

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Mini-EUSO time table

- → 2013
 Approved by the
 Italian Space Agency VUS/2
- → 2014
 Approved by Roscosmos
 (UV Atmosphere)
- → 2015
 Included in the
 Paolo Nespoli Mission for
 the ISS
- → 2016 Construction and integration
- → 2017 Launch to the ISS



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Summary

- → We will place Mini-EUSO, a Fresnel based telescope, on the ISS during 2017 to observe the Earth in the UV range.
- → It is a small (25x35x60 cm³) light weight (~30 kg) telescope observing through the UV transparent window of the Zvezda module
- → Mini-EUSO will be capable of:
 - producing a high resolution UV map of the Earth
 - observing atmospheric phenomenon (TLEs, Elvs...)
 - recording meteor/meteorite data
 - searching for SQM
 - performing in-situ tests of the debris remediation system
- Raise the technological readiness level of the JEM-EUSO collaboration