Paper ID: 29903
oral

HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Utilization & Exploitation of Human Spaceflight Systems (3)

Author: Prof. Christer Fuglesang
KTH, Sweden

MINI-EUSO INSIDE ISS TO PREPARE FOR STUDYING ULTRA-HIGH ENERGY PARTICLES FROM THE OUTSIDE

Abstract

The Mini-EUSO (Extreme Universe Space Observatory) project will build a small UV telescope and place it inside the Zvezda module of ISS in 2017, as part of the large JEM-EUSO collaboration work. The Mini-EUSO instrument will be equipped with one full original JEM-EUSO Photo-Detector-Module (PDM), an optical system made of two Fresnel lenses (25 cm of diameter) and a data acquisition system. The objective of the full JEM-EUSO is to place a large instrument on the outside of ISS to study Ultra-High Energy Cosmic Rays (UHECR) with (E ¿ 30 EeV), by measuring the light in the UV-range from the Extensive Air Showers these particles triggers in the atmosphere. By using a target volume far greater than is possible from the ground, unprecedented statistical accuracy of the primary energy, arrival direction and composition of UHECRs will be obtained. Such data will shed light on the origin of the UHECRs, on the sources that are producing them, on the propagation environment from the source to the Earth and, possibly, on the particle physics mechanisms at energies well beyond the ones achievable in man-made accelerators. Moreover, there are exploratory objectives such as constraining the galactic and extragalactic magnetic fields, the detection of extreme energy neutrinos and gamma rays, the verification of special relativity at extremely large Lorentz factors, the examination of possible quantum gravity effects at extreme energies, and the systematic surveillance of atmospheric phenomena. The Mini-EUSO instrument will have 2304 pixels with 36 multi-anode PMTs. Each pixel view an area of 560 m2 on ground. The full field of view is 3.8 and the time resolution 2.5 s. The Mini-EUSO mission has at least four different objectives: to raise the technical readiness level of JEM-EUSO to the highest grade, to perform an absolute calibration of the multi-anode photomultipliers in flight (crucial for JEM-EUSO), to take advantage of being at ISS altitude, like JEM-EUSO and study in a precise way the UV background coming from earth in all the different reflective conditions (water, earth, vegetation, snow, etc.). The limited size of Mini-EUSO precludes the observation of showers, but the absolute background evaluation is very important for the JEM-EUSO shower observation because it sets the shower energy threshold. to study atmospheric phenomena, like lightning, and related light, as well as meteors.