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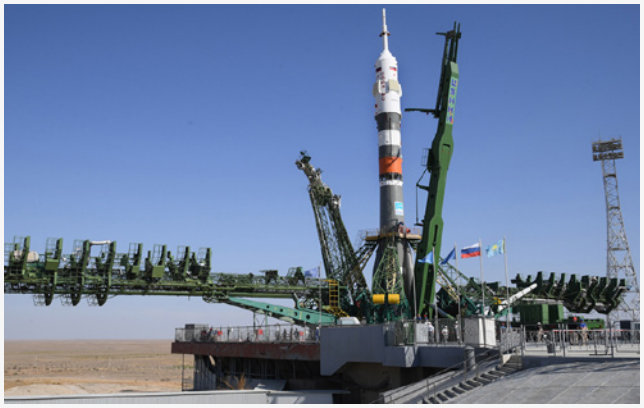

MINI-EUSO, FIRST DATA FROM THE EXPERIMENT ON BOARD THE ISS

Last 7 October, the astronauts on board the International Space Station (ISS), led by Luca Parmitano, switched on the Mini-EUSO (Multiwavelength Imaging New Instrument for Extreme Universe Space Observatory) ultraviolet telescope for the first time. The telescope is the result of an agreement between the Italian Space Agency, the funding body, and the Russian Space Agency Rosocosmos, and it was assembled in the laboratories of the INFN division and Physics Department of the University of Rome Tor Vergata. This first switching-on was followed by a second on 19 October. The two preliminary observation phases demonstrated the correct operation of the experiment and have already produced a considerable amount of data, which will be analysed in depth by the experiment collaboration once on Earth.

The Mini-EUSO experiment arrived on the ISS on 27 August on board the Soyuz MS14 spacecraft, which was launched on 22 August from the Baikonur cosmodrome. Now it is installed inside the Russian Zvezda module, from where it is observing the Earth. Its scientific objectives are many and extend over several fields. For the first time, a map of the Earth's nocturnal emissions in the ultraviolet spectrum and of their variations, both anthropogenic and bioluminescent, i.e. linked to particular plankton and algae behaviour, will be obtained. Phenomena in the upper atmosphere and the possibility of identifying and removing space debris will also be studied.

In addition, meteors will be studied to search for signals from a particular, very dense state of nuclear matter, in their traces as they enter the atmosphere. This nuclear matter, strange matter, has not yet been observed but it is predicted by various theoretical models. Mini-EUSO is also able to observe very high energy cosmic rays.

The new generation optical system and focal surface allow Mini-EUSO to achieve unprecedented sensitivity, being able to detect each photon emitted in a 40-degree field of view at a rate of 400,000 images per

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second. One of the main characteristics of the device is its ability to make observations on different time scales, from a few microseconds upwards, and to be able to correlate data with those from two ancillary cameras, which are sensitive in the visible and near infrared bands. Mini-EUSO also contains a series of new generation detectors, such as the silicon-photomultipliers, with the aim of studying their behaviour and their ability to withstand the space environment. The technology developed within the scope of this experiment - the result of the work of a broad international collaboration of researchers - will be used in future space missions and on stratospheric balloons. One example of the latter is the NASA SPB-2 project, which is scheduled to be launched from New Zealand in 2022. ■