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# Results of the first orbital ultra-high-energy cosmic ray detector TUS in view of future space mission KLYPVE-EUSO

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The observation of ultra-high energy cosmic rays (UHECR) from Earth orbit relies on the detection of the UV fluorescence tracks of the extensive air shower (EAS). This technique is widely used by ground-based detectors. Analogous measurements from space will allow to achieve the largest instantaneous aperture for observation the whole sky with nearly homogeneous exposure. It is important for the efficient search for anisotropy, spectrum and composition of UHECR flux.
The first experience of UHECR measurements from space was obtained in the operation of the TUS (Tracking Ultraviolet Set-up) detector on board the Lomonosov satellite. It was launched on April 28, 2016. The TUS detector is a UV telescope with 2 m2 mirror and ±4.5° field of view. During two years of operation an important information on transient UV atmospheric emission which determine the conditions of measurements was obtained. The TUS trigger was optimized for EAS search but it has to operate in conditions of the atmosphere glow as of natural origin (aurora light, scattered moon light, thunderstorm) so of anthropogenic origin (city light). Search for EAS events in the TUS data and their analysis with an emphasis on a strong UHECR candidate registered on October 3, 2016 has been done. Conditions of the measurements were studied to exclude thunderstorm atmospheric events and anthropogenic sources. An arrival direction and energy of a primary particle have been estimated basing on results of simulations and new reconstruction algorithms.
KLYPVE-EUSO (K-EUSO) is the next step in the program for UHECR studies from space. It is a large fluorescence telescope has to be installed at the Mini-Research Module of the Russian Segment (RS) of the International Space Station (ISS). Recently the design studies were done by SINP MSU together with the JEM-EUSO collaboration based on the TUS experience and the collaboration expertise to enhance the instrument performance with improved detector of larger field of view. The optical design is based on the Schmidt telescope including the 4 m diameter carbon plastic mirror and the 2.5 m corrector lens, made of Poly Methyl Methacrylate (PMMA). This allows to increase the telescope field of view to 40 degrees The focal surface of K-EUSO is nearly identical to that of JEM-EUSO and consists of ~105 pixels with 1 mrad angular resolution. The launch of the experiment is scheduled to 2022 on the RS of the ISS for at least two years of operation.

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