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Direct Detection of TeV—PeV Cosmic Rays in Space

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We present the first results of the ERC PeVSPACE project, aimed at fundamentally improving the precision of direct cosmic ray measurements at the highest energies—in the TeV–PeV range, on Dark Matter Particle Explorer (DAMPE) and High Energy Radiation Detector (HERD) experiments.

DAMPE and HERD provide a unique opportunity of directly probing cosmic ray spectra close to the “knee”. However, such measurements stumble against a critical limitation—dominating systematics uncertainties related to particle reconstruction & identification and hadronic simulations at the highest energies. The goal of our research is to overcome these challenges through the development of novel tracking and particle identification techniques, as well as improved hadronic simulations, using for the first time the state-of-the-art Artificial Intelligence approach.

First, we give a brief overview of the DAMPE and HERD missions, focusing on the main challenges of direct Cosmic Ray detection at TeV—PeV. Then we present the developed techniques and demonstrate their first application on the analysis of DAMPE data at the highest energies.

Collaboration name

DAMPE

Author: TYKHONOV, Andrii (Universite de Geneve (CH))**Presenter:** TYKHONOV, Andrii (Universite de Geneve (CH))**Session Classification:** Cosmic Rays**Track Classification:** Cosmic Rays