

Tracking TeV-PeV Cosmic Rays in Space

The astroparticle field is experiencing a new dawn of precision measurements with the rise of spaceborne instruments for direct detection of Cosmic Rays at extreme TeV—PeV energy range. In particular, DArk Matter Particle Explorer (DAMPE) mission, launched in December 2015, has recently reported the measurements of Cosmic Ray electron, proton and helium spectra at multi-TeV energies with unprecedented energy resolution.

Tracker is a key sub-detector of DAMPE and of the successor next-generation instrument, High Energy Radiation Detection (HERD) facility. Track reconstruction poses a fundamental challenge due to the complex nature of TeV—PeV interactions in the detector, which vastly obscure the sought signal. As a result, track reconstruction becomes a key limiting factor affecting measurement accuracy. The development of novel tracking techniques is therefore critical in order to fully uncover the science potential of DAMPE and HERD missions.

In this talk, we present the first findings of the ERC PeVSPACE project with the goal of employing state-of-the-art Artificial Intelligence techniques to qualitatively improve the accuracy of particle tracking at the highest energies. We also give a brief overview of the DAMPE mission, focusing on its Silicon Tracker sub-detector, and demonstrate the first application of the developed techniques to the analysis of the DAMPE data.

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Track Classification: Applications in Astro-particle Physics