



Contribution ID: 303

Type: not specified

HERD: A Key for Progressing in Our Understanding of Cosmic Rays

Wednesday, 13 September 2023 18:00 (15 minutes)

The High Energy cosmic-Radiation Detection (HERD) facility is a calorimetric space-borne experiment for the direct detection of cosmic rays. It will be launched and installed onboard the China Space Station in 2027. The ambitious aim of HERD is the direct detection of cosmic rays in the “knee” region (~ 1 PeV), with a detector able to measure electrons, photons and nuclei with an excellent energy resolution, an acceptance 10 times larger than that of current missions, and long lifetime (> 10 years). The primary objectives of HERD are the indirect search for dark matter particles and the precise measurement of energy distribution and composition of cosmic rays from 30 GeV up to few PeV. Furthermore, HERD will monitor the high energy gamma-ray sky from 100 MeV, observing gamma-ray bursts, active galactic nuclei, galactic microquasars, etc. HERD will be composed of a 3D, homogeneous, isotropic, deep ($55 X_0$) and finely segmented calorimeter, surrounded by a scintillating-fiber tracker, a plastic scintillator detector and a silicon charge detector. The HERD design, prospects and expected performance, as well as its contribution to the multimessenger astronomy will be presented in this contribution.

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Session Classification: CCR: Charged Cosmic Ray

Track Classification: Charged Cosmic Rays