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The satellite-based detector HERD: precise high-energy cosmic rays' physics and multimessenger astronomy.

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A few years from now, the HERD (High Energy Cosmic Radiation Detection) detector will be installed on the China's Space Station.

The main science objectives of HERD are searching dark matter particle, study of cosmic ray chemical composition up to the knee and high energy gamma-ray observations.

The main constraints imposed on HERD are: total weight less than around 2 tons and total power consumption less than around 2 kW.

HERD consists at the core of a very thick (3 lambda, 55 X0) cubic calorimeter made of small LYSO cubic crystals allowing 3D reconstruction; before the calorimeter there is a tracker consisting of silicon micro-strip detectors and thin converter foils for gamma conversion; the detector is surrounded by plastic

scintillator plates for veto, trigger track charge measurements.

HERS will extend high precision and high statistics measurement of cosmic ray spectra to higher energy up to 1 PeV.

Furthermore it will provide high statistics and high resolution measurements of gamma-rays up to 1 TeV with large FOV

contributing to multimessenger astronomy together with ground based

high energy gamma-ray telescope (CTA,HAWC) and neutrino and gravitation wave detectors.

Summary

The satellite-based detector HERD will provide high quality data on charged cosmic rays extending the measured range.

It will also collect large statistics of gamma-rays up to very high energy contributing to multimessenger astronomy.

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