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The High Energy cosmic-Radiation Detection facility: goals, design and performances

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The High Energy cosmic-Radiation Detection (HERD) facility will be installed on board the China's Space Station (CSS) in the years around 2026 and will operate for a period of about 10 years measuring the flux of cosmic rays. Thanks to its innovative design, based on a large, homogeneous and isotropic calorimeter made of LYSO crystals, HERD is capable of detecting particles that enters the detector not only from the top face, but also from the lateral faces. In this way, it is possible to significantly increase the effective geometric factor of the instrument by more than one order of magnitude respect to the experiments currently operating in space. At the same time the high 3D segmentation of the calorimeter is essential to obtain a good electron/hadron separation power, exploiting the reconstruction of the shower profile. HERD will be the first experiment able to directly measure the gamma-ray spectrum from 500 MeV to 100 TeV, electrons+positrons energy flux from 10 GeV to 100 TeV, and protons and nuclei energy flux from 30 GeV up to 1 PeV. Exploiting this potential, it will be possible to pursue two main scientific goals: the search for signatures of the annihilation/decay products of dark matter particles and the understanding of the mechanism responsible for the cosmic rays knee structure. In this talk, we will discuss in detail the goals of the experiment, the requirements needed for these tasks, and the design and the optimization of the instrument to match the required performances.

Collaboration name

HERD

Primary author: BERTI, Eugenio (INFN Firenze)

Presenter: BERTI, Eugenio (INFN Firenze)

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