

The Plastic Scintillator Detector for the future High Energy cosmic-Radiation Detection facility on board the Chinese Space Station

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The High Energy cosmic-Radiation Detection (HERD) facility, located on board the Chinese Space Station, is expected to make significant advancements in cosmic-ray observations, dark matter searches, and gamma-ray astronomy, thanks to its innovative design. The HERD geometry is based on a 3-dimensional imaging calorimeter, which is surrounded on five sides by a fiber tracker, a plastic scintillator detector (PSD), and a silicon charge detector. This unique configuration enables HERD to address key questions in high-energy astrophysics with unprecedented sensitivity and resolution.

The PSD serves as an anti-coincidence system for precise gamma-ray detection (charged particle veto) and charged cosmic-ray nuclei identification. In order to achieve high performance in terms of detection efficiency and charge resolution, the PSD requires a highly segmented geometry, as well as the optimization of the light sensors and electronic read-out. The current design consists of long trapezoidal scintillator tiles coupled to Silicon Photomultipliers (SiPMs).

Different prototypes have been built and tested at CERN, Switzerland, and at the CNAO (Centro Nazionale di Adroterapia Oncologica) facility in Italy to study and improve the performance of the PSD. In this contribution, we present the overall project design and the PSD performance, with a focus on the nuclei identification capability.

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Yes

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