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The Plastic Scintillation Detector for the HERD experiment

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Future satellite experiments for cosmic-ray and gamma-ray detection will employ plastic scintillators to discriminate gamma-rays from charged particles and to identify nuclei up to Iron. The High Energy Cosmic Radiation Detector (HERD) facility will be one of those new experiments, and will be installed onboard the Chinese Tiangong Space Station (TSS). The main goal of the HERD experiment is to detect charged cosmic-rays up to PeV and gamma-rays up to hundreds of GeV. The plastic scintillator detector (PSD) surrounds the inner detectors from five sides. For energies above a few GeV a high detector segmentation is required in order to avoid the back-splash effect, due to the interaction between the high energy particles and the innermost calorimeter. Each PSD basic element (bar or tile) is coupled to several Silicon Photomultipliers (SiPMs) for the scintillation light detection. In 2021 we have performed a beam test campaign to test all the subdetectors of HERD experiment at CERN PS and SPS. We tested two different PSD prototypes, one made of bars and one made of tiles of different scintillating materials (BC-404 and BC-408). Both the prototypes were equipped with SiPMs of two different sizes (MPPC S14160-30050 and S14160-1315) and they were read-out with CAEN Ciroc-based board DT5550W. In this talk we will describe the PSD design and show the beam test results.

Collaboration

HERD PSD group

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