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## Study of Plastic Scintillator Detector for the High Energy cosmic-Radiation Detection (HERD) experiment

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The High Energy Cosmic Radiation Detection (HERD) facility proposed onboard the future Chinese Space Station (CSS) in 2026 will provide high-quality data on charged cosmic rays and gamma rays from GeV to PeV energies. Because of this capability, the HERD experiment could give valuable contributions to several scientific topics, including dark matter searches, the study of the cosmic-ray chemical composition and high-energy gamma-ray observations. The instrument will be surrounded by a highly segmented plastic scintillator detector (PSD), that will be used to discriminate charged from neutral particles and to identify the cosmic-ray nuclei from their energy deposits. A configuration proposed and studied for the HERD PSD consists of scintillators tiles coupled to Silicon Photomultipliers (SiPMs). SiPMs provide similar or even better performances than standard photomultiplier tubes (PMTs) with lower power consumption and cost benefits. Several tile prototypes equipped with SiPMs of different sizes were tested during beam test campaigns, and some tests with a  $^{90}\text{Sr}$  radioactive source were also performed. We have also implemented a fully customizable simulation framework based on GEANT4 to investigate the performance of a segmented PSD with arbitrary materials and geometries coupled to SiPMs. The results of both simulations and experimental measurements will be shown and compared.

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