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Development and Performance of a highly granular scintillator-tungsten ECAL prototype for the CEPC

The Circular Electron Positron Collider (CEPC) is a future Higgs factory. The baseline CEPC magnetic spectrometer is designed based on particle flow algorithm (PFA), which requires the jet energy resolution to reach $30\%/\sqrt{E}$ (GeV). The highly granular electromagnetic calorimeter (ECAL) is one of the important sub detectors of the PFA spectrometer. In order to study the performance of the ECAL, an ECAL scheme based on small unit plastic scintillator strip and tungsten plate is proposed. In the laboratory, an ECAL prototype has been developed. It has 32 sampling layers, and each layer has 210 channels. The whole prototype measures around 600600400 mm^3 in dimensions and roughly 250 kg in weight. A long time cosmic ray test has been carried out and studied to quantitatively evaluate the key performance, including the position resolution and cell-to-cell response calibration, etc. The results show that the position resolution of each layer is better than 2 mm, and the detector efficiency is better than 90%. In addition, time measurement will also be introduced.

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