

Energy resolution and timing performance studies of a W-CeF₃ sampling calorimeter with a wavelength-shifting fiber readout

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The performance of a sampling calorimeter consisting of tungsten and CeF₃ crystals read out with wavelength shifting fibers was evaluated in multiple electron beam tests and compared to a GEANT4 simulation. At the Beam Test Facility in Frascati, Italy, electrons with an energy of up to 491 MeV delivered a first proof of principle on the performance of the W-CeF₃ prototype. At the SPS-H4 beam line at CERN, electrons with an energy of up to 150 GeV allowed for an in-depth study of the energy resolution and of the response as a function of the impact point. A further beam test, where cerium-doped quartz fibers were used for wavelength-shifting, showed an energy resolution matching the expectations. First tests of the timing performance showed that a resolution better than 100 ps is achievable with SiPMs.

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