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Test beam study of SiPM-on-tile configurations for the CMS HGCAL

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The scintillator section of the CMS high granularity calorimeter (HGCAL) will be composed of the SiPM-on-tile technology, where the SiPM is located in a dimple machined into the scintillator tile surface. This design directly couples the light produced from a scintillator tile to an individual SiPM, which is crucial for calibrating the detector throughout its lifetime. We report the light collection and spatial uniformity for a large variety of configurations of scintillator tiles. The varied parameters include tile transverse size, tile thickness, tile wrapping material, scintillator composition, and SiPM model. These studies were performed using 120 GeV protons at the Fermilab Test Beam Facility. External tracking allowed the position of each proton penetrating a tile to be measured. The results were compared to a GEANT4 simulation of each configuration of scintillator, wrapping, and SiPM.

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