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Studies of precision time-tagging of charged tracks with scintillating crystals for the phase-II upgrade of CMS

Monday 18 September 2017 11:00 (30 minutes)

The projected proton beam intensity of the High Luminosity Large Hadron Collider (HL-LHC), planned to begin operation in 2026, will result in about 200 concurrent proton-proton interactions per 25 ns bunch crossing. The scientific program of the HL-LHC, which includes precision characterization of the Higgs boson, measurements of vector boson scattering, and searches for new heavy or exotic particles, will benefit greatly from the enormous HL-LHC dataset. However, particle reconstruction and correct assignment to primary interaction vertices present a formidable challenge to the LHC detectors that must be overcome in order to harvest that benefit. Time tagging of minimum ionizing particles (MIPs) produced in LHC collisions with a resolution of 30 ps provides further discrimination of interaction vertices in the same 25 ns bunch crossing beyond spatial tracking algorithms. The Compact Muon Solenoid (CMS) Collaboration is pursuing two technologies to provide MIP time tagging for the HL-LHC detector upgrade: scintillating crystals read out by silicon photomultipliers (SiPMs) for low radiation areas and silicon low gain avalanche detectors for high radiation areas. This talk will motivate the need for a dedicated timing layer in the CMS upgrade, and focus on the first technology. Test beam results and a reference design using small LYSO tiles will be presented. The requirements on the crystal and SiPMs properties and the R&D needed to optimize the performance within the constraints posed by the integration into the CMS experiment will be discussed.

Has accepted

YES

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