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Precision Timing with the CMS MIP Timing Detector for HL-LHC

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The Compact Muon Solenoid (CMS) detector at the CERN Large Hadron Collider (LHC) is undergoing an extensive Phase II upgrade program to prepare for the challenging conditions of the High-Luminosity LHC (HL-LHC). A new timing detector in CMS will measure minimum ionizing particles (MIPs) with a time resolution of 30-40 ps for MIP signals at a rate of 2.5 Mhit/s per channel at the beginning of HL-LHC operation. The precision time information from this MIP Timing Detector (MTD) will reduce the effects of the high levels of pileup expected at the HL-LHC, bringing new capabilities to the CMS detector. The MTD will be composed of an Endcap Timing Layer (ETL), instrumented with Low-Gain Avalanche Detectors, as well as a Barrel Timing Layer (BTL) based on LYSO:Ce crystals coupled to SiPMs. In this talk we will present overview of the MTD, focusing on recent prototyping results and R&D studies targeting enhanced timing performance and radiation tolerance.

Authors: GOERLACH, Ulrich (Centre National de la Recherche Scientifique (FR)); CMS

Presenter: CARDWELL, Bryan (University of Virginia (US))

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