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The CMS MTD Endcap Timing Layer: Precision Timing with Low Gain Avalanche Detectors

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The Compact Muon Solenoid (CMS) detector at the CERN Large Hadron Collider (LHC) is undergoing an extensive 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 ~40-50 ps per hit and coverage up to |η|=3. 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 and will bring new and unique capabilities to the CMS detector. The endcap region of the MTD, called the endcap timing layer (ETL), must endure high fluences, motivating the use of thin, radiation tolerant silicon sensors with fast charge collection. As such, the ETL will be instrumented with silicon low-gain avalanche diodes (LGADs), covering the high-radiation pseudo-rapidity region 1.6 < |η| < 3.0. The LGADs will be read out with the ETROC readout chip, which is being designed for precision timing measurements. We will present the extensive developments and progress made for the ETL detector, from sensors to readout electronics, mechanical design, and plans for system testing. In addition, we will present test beam results, which demonstrate the desired time resolution.

In-person participation

Yes

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