



Contribution ID: 10

Type: **not specified**

The Endcap Timing Layer of the CMS MIP Timing Detector for HL-LHC

Wednesday 21 May 2025 10:00 (30 minutes)

The High-Luminosity Large Hadron Collider (HL-LHC) will enable a more detailed exploration of new physics phenomena by significantly increasing collision rates, leading to pileup levels of approximately 200 simultaneous interactions. Several CMS systems will undergo substantial upgrades, including the MIP Timing Detector (MTD) project to prepare for this new era. The MTD is designed to mitigate pileup effects by providing a precise timestamp, accurate to 30–40 picoseconds for each event, thereby ensuring sustained detector performance under HL-LHC conditions. The MTD is divided into two sections: the Barrel Timing Layer (BTL) and the Endcap Timing Layer (ETL), each utilizing different sensor and ASIC technologies to address the varying active surfaces, irradiation conditions, and installation requirements. The ETL, comprising two double-sided disks, utilizes Low-Gain Avalanche Diode (LGAD) sensors and the Endcap Timing Readout Chip (ETROC) to meet the unique demands of its environment. Pre-production of ETL modules is underway, with extensive validation tests including the ETROC system test and module assembly. This presentation will provide an overview of the ETL, focusing on its electronics, current achievements, and status.

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