Contribution ID: **20** Type: **not specified**

Status of the MIP Timing Detector project for the CMS Phase-2 upgrade

The Large Hadron Collider (LHC) and its associated experiments, including the Compact Muon Solenoid (CMS), are currently undertaking the Run 3 data collection period, set to end in 2025. This period will be followed by the Long Shutdown 3 (LS3) period (2026-2029), during which the High-Luminosity (HL-LHC) upgrade [1] of the LHC will be installed. In order to cope with the planned increase of the instantaneous luminosity delivered by the HL-LHC, CMS is undergoing an extensive upgrade programme, called the Phase-2 upgrade, which will likewise be installed during LS3. As a part of Phase-2 upgrade, a wholly new sub-system, the MIP Timing Detector (MTD) [2], will be installed at CMS. MTD will allow the CMS experiment to retain the current primary vertex (PV) resolution ability in the greatly increased pile-up environment of the HL-LHC. This is made possible by the fact that the primary proton-proton interactions per bunch-crossing are dispersed in time with an RMS value of around 200 ps. This spread in time can be utilised to improve the particle track to PV matching at the experiment.
MTD will offer a track-time resolution of around 30 ps at the start of Run 4, with this parameter degrading to no more than 75 ps by the end-of-life of the detector, currently scheduled for 2041. The final system will consist of two distinct sub-systems, the Barrel Timing Layer (BTL) and the End-cap Timing Layer (ETL), which utilise different particle detection technologies due to vastly differing occupancy and radiation tolerance requirements.

In this contribution we will briefly cover the physics case and the overall design of the detector, with a particular focus on the BTL sub-system, before exploring discussing the current status of the detector development, including the latest milestones reached.

[1] https://cds.cern.ch/record/2749422
[2] https://cds.cern.ch/record/2667167

Type of contribution

Talk

Primary author: DREIMANIS, Karlis (Riga Technical University (LV))

Co-author: COLLABORATION, CMS

Presenter: DREIMANIS, Karlis (Riga Technical University (LV))