Contribution ID: **655** Type: **Parallel**

Precision Timing with the CMS MIP Timing Detector

Thursday, July 5, 2018 9:36 AM (12 minutes)

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). In particular, a new timing layer will measure minimum ionizing particles (MIPs) with a time resolution of ~30ps and hermetic coverage up to a pseudo-rapidity of $|\eta|=3$. This MIP Timing Detector (MTD) will consist of a central barrel region based on LYSO:Ce crystals read out with SiPMs and two end-caps instrumented with radiation-tolerant Low Gain Avalanche Diodes. The precision time information from the MTD will reduce the effects of the high levels of pile-up expected at the HL-LHC and will bring new and unique capabilities to the CMS detector. The time information assigned to each track will enable the use of 4D reconstruction algorithms and will further discriminate interaction vertices within the same bunch crossing to recover the track purity of vertices in current LHC conditions. For instance, in the analysis of di-Higgs boson production decaying to heavy flavor and two photons, 30 ps timing resolution is expected to improve the effective luminosity by 22% through gains in b-tagging and photon isolation efficiency. We present motivations for precision timing at the HL-LHC and the ongoing MTD R&D targeting enhanced timing performance and radiation tolerance, including test beam results.

Primary author: BENAGLIA, Andrea Davide (Universita & INFN, Milano-Bicocca (IT))

Presenter: BENAGLIA, Andrea Davide (Universita & INFN, Milano-Bicocca (IT))

Session Classification: Detector: R&D for Present and Future Facilities

Track Classification: Detector: R&D for Present and Future Facilities