Contribution ID: **11** Type: **not specified**

The upgrade of CMS ECAL for precise timing measurements at the High-Luminosity LHC

Wednesday 21 May 2025 09:10 (20 minutes)

The Electromagnetic Calorimeter ECAL of the CMS experiment at the Large Hadron Collider at CERN is a homogeneous calorimeter made of lead tungstate scintillating crystals. An upgrade of ECAL is in preparation to cope with the challenging conditions anticipated for the High Luminosity phase of LHC. The endcap part of the ECAL will be replaced by a new detector. In the ECAL barrel the crystals and the avalanche photodiodes (APDs) will be preserved, while the readout and trigger electronics will undergo a complete replacement. Two ASICs have been designed for the readout of the APDs. The first, CATIA, is a gain trans-impedance amplifier with two outputs with different gains. The second, LiteDTU, includes two 160 MHz ADCs, one for each CATIA output and the logic to select the gain to read out, compress, format, and serialize the data. The noise increase in the photodetectors, due to radiation-induced dark current, will be mitigated by reducing the ECAL operating temperature from 18℃ to 9℃. The trigger primitive formation will be moved off-detector and handled by powerful and flexible FPGA processors. The upgrade of the ECAL electronics will greatly enhance the time resolution of the detector, which will reach around 30 ps for high energy electrons and photons. In this presentation an overview of the ECAL Upgrade project will be given, describing the final design of the full ECAL barrel readout chain together with the status of the individual component R&D. The results from recent test beam campaigns at the CERN SPS will be summarised, focusing in particular on the timing resolution performance of the latest readout electronics prototypes.

Author: GHEZZI, Alessio (Universita & INFN, Milano-Bicocca (IT))

Presenter: GHEZZI, Alessio (Universita & INFN, Milano-Bicocca (IT))