Contribution ID: **8** Type: **not specified**

CMS ECAL upgrade for precision timing and energy measurements at the High-Luminosity LHC

Tuesday, 26 November 2019 09:30 (20 minutes)

The High Luminosity upgrade of the LHC (HL-LHC) at CERN will provide unprecedented instantaneous and integrated luminosities of around $5 \times 10^{34}\ \mathrm{cm}^{-2}\ \mathrm{s}^{-1}$ and 3000 fb^{-1}, respectively, from 2025 to 2035. During this operational period, an average of 140 to 200 collisions per bunch-crossing (pile up) is expected, posing a challenge to the event reconstruction. In order to cope with these extreme pile up conditions, harsh environment, and increased data rates, the Compact Muon Solenoid (CMS) detector is undergoing a radical Phase II upgrade program. In the barrel region of the CMS electromagnetic calorimeter (ECAL), the lead tungstate crystals and avalanche photodiodes (APDs) will keep performing well and will therefore be maintained, while the entire readout and trigger electronics will be replaced. A dual gain trans-impedance amplifier and an ASIC providing two 160 MHz ADC channels, gain selection, and data compression will be installed. The noise increase in the APDs, due to radiation-induced dark current, will be contained by reducing the temperature at which ECAL is operated. The trigger decision will be moved off-detector and performed by powerful and flexible FPGA processors, allowing for more sophisticated trigger algorithms to be applied.

The upgraded ECAL will be capable of high-precision energy measurements and will greatly improve the time resolution for photons and electrons above 10 GeV. Together with the introduction of a new timing detector designed to perform timing measurements with the resolution of a few tens of picoseconds for minimum ionizing particles, the CMS detector will be able to precisely reconstruct the primary interaction vertex under the described pile up conditions.

In this talk the status of the ongoing R&D activities for the ECAL barrel upgrade will be presented.

Primary authors: SALVATICO, Riccardo (Universita e INFN Torino (IT)); ON BEHALF OF THE CMS COLLABORATION

Presenter: SALVATICO, Riccardo (Universita e INFN Torino (IT))

Session Classification: Calibration, R&D, test beams