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Achieving the optimal performance of the CMS ECAL in Run II

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Many physics analyses using the Compact Muon Solenoid (CMS) detector at the LHC require accurate, high resolution electron and photon energy measurements. Particularly important are decays of the Higgs boson resulting in electromagnetic particles in the final state. Di-photon events in CMS are also a very important channel in the search for Higgs boson production in association with other particles or in the search for possible new resonances of higher mass. The requirement for high performance electromagnetic calorimetry therefore remains high during LHC Run II.

Following the excellent performance achieved in Run I at a center of mass energy of 7 and 8 TeV, the CMS electromagnetic calorimeter (ECAL) started operating at the LHC in Spring 2015 with proton-proton collisions at 13 TeV center-of-mass energy.

The instantaneous luminosity delivered by the LHC during Run II is expected to exceed the levels achieved in Run I, using 25 ns bunch spacing. The average number of concurrent proton-proton collisions per bunch-crossing (pileup) is expected to reach up to 40 interactions in 2016.

These high pileup levels necessitate a retuning of the ECAL readout and trigger thresholds and reconstruction algorithms, to maintain the best possible performance in these more challenging conditions. The energy response of the detector must be precisely calibrated and monitored to achieve and maintain the excellent performance obtained in Run I in terms of energy scale and resolution. A dedicated calibration of each detector channel is performed with physics events exploiting electrons from W and Z boson decays, photons from pi0/eta decays and from the azimuthally symmetrical energy distribution of minimum bias events.

This talk describes the new reconstruction algorithm and calibration strategies that we have implemented to maintain the excellent performance of the CMS ECAL throughout Run II. We will show performance results from the 2015 and 2016 data taking periods and provide an outlook on the expected Run II performance in the years to come.

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