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Standalone Barrel Electron/Photon Reconstruction Performance in the CMS Level-1 Phase-2 Calorimeter Trigger

To mitigate high pileup conditions in the High-Luminosity Large Hadron Collider (HL-LHC), the Phase-2 upgrade to the Compact Muon Solenoid (CMS) detector will make use of tracking and high-granularity calorimeter information for the first time at the Level-1 Trigger. We focus on the barrel region ($|\eta| < 1.5$) of the electromagnetic calorimeter (ECAL) where the granularity of the ECAL barrel trigger and electronics systems will increase by a factor of 25 compared to the Phase-1 calorimeter trigger. The upgraded calorimeter trigger object reconstruction algorithms for electrons (e) and photons (γ) are emulated using realistic firmware implementation on the VU9P Xilinx FPGA board. We present an overview of the performance of these reconstruction algorithms obtained from firmware emulation using simulated HL-LHC Monte Carlo samples. The Level-1 Trigger reconstruction efficiencies of e/γ objects as a function of generator-level transverse momentum reach 99% while maintaining expected rates in a scenario with 200 average pileup interactions.

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