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The CMS Electromagnetic Calorimeter

The CMS electromagnetic calorimeter (ECAL) at the CERN Large Hadron Collider (LHC) is a high granularity, homogeneous detector composed of scintillating lead-tungstate crystals. Designed to provide exceptional energy resolution for electrons and photons, the ECAL was pivotal in the discovery of the Higgs boson, particularly in the two-photon and two Z boson decay channels. With the upcoming transition to the High Luminosity LHC (HL-LHC), the CMS detector is undergoing a significant Phase-2 upgrade to handle the increased instantaneous and integrated luminosity in a more challenging environment. This talk will review the original design considerations of the CMS ECAL, emphasizing its high energy resolution capabilities and its critical role in various physics analyses. We will briefly introduce the precise calibration methods and energy reconstruction algorithms developed and refined during LHC Run III to ensure the stability of the energy scale and resolution. Additionally, we will describe the operation details involving the trigger, handling of spikes, and data quality monitoring (DQM) with machine learning.

Field of contribution

Experiment

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