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The CMS Electromagnetic Calorimeter: lessons learned during LHC run 1, overview and future projections

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The Electromagnetic Calorimeter (ECAL) of the Compact Muon Solenoid (CMS) experiment at the LHC is a hermetic, fine grained, homogeneous calorimeter, comprising 75848 lead tungstate scintillating crystals. We highlight the key role of the ECAL in the discovery and elucidation of the Standard Model Higgs boson during LHC Run I. We discuss, with reference to specific examples from LHC Run I, the challenges of operating a crystal calorimeter at a hadron collider. Particular successes, chiefly in terms of achieving and maintaining the required detector energy resolution in the harsh radiation environment of the LHC, are described. The prospects for LHC Run II (starting in 2015) are discussed, building upon the experience gained from Run I. The high luminosity upgrade of the LHC (HL-LHC) is expected to be operational from about 2025 to 2035 and will provide instantaneous and integrated luminosities of around 5 x 10ˆ34 cm-2 s-1 and 3000 fb-1 respectively. We outline the challenges that ECAL will face and motivate the evolution of the detector that is thought to be necessary to maintain its performance throughout LHC and High-Luminosity LHC operation.

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