

Contribution ID: 31

Type: not specified

The CMS ECAL Upgrade for Precision Crystal Calorimetry at the HL-LHC

Friday 25 May 2018 09:18 (20 minutes)

The electromagnetic calorimeter (ECAL) of the Compact Muon Solenoid Experiment (CMS) has been operating at the Large Hadron Collider (LHC) with proton-proton collisions at 13 TeV center-of-mass energy and a bunch spacing of 25 ns since 2015. Challenging running conditions for CMS are expected after the High-Luminosity upgrade of the LHC (HL-LHC). We review the design and R&D studies for the CMS ECAL barrel crystal calorimeter upgrade and present first test beam studies. Particular challenges at the HL-LHC are the harsh radiation environment, the increasing data rates and the extreme level of pile-up events, with up to 200 simultaneous proton-proton collisions. We present test beam results of hadron irradiated PbWO crystals up to fluences expected at the HL-LHC. The R&D for the new readout and trigger electronics, which must be upgraded due to the increased trigger and latency requirements at the HL-LHC, will also be reported.

Secondary topics

Applications

Design concepts for future calorimeter at the energy frontier

Primary topic

Crystals

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Session Classification: Session 14