

The CMS High Granularity Calorimeter for HL-LHC

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The High Luminosity LHC (HL-LHC) will integrate 10 times more luminosity than the LHC, posing significant challenges for radiation tolerance and event pileup on detectors, especially for forward calorimetry, and hallmarks the issue for future colliders. As part of its HL-LHC upgrade program, the CMS collaboration is designing a High Granularity Calorimeter to replace the existing endcap calorimeters. It features unprecedented transverse and longitudinal segmentation for both electromagnetic (ECAL) and hadronic (HCAL) compartments. This will facilitate particle-flow calorimetry, where the fine structure of showers can be measured and used to enhance pileup rejection and particle identification, whilst still achieving good energy resolution. The ECAL and a large fraction of HCAL will be based on hexagonal silicon sensors of $0.5 - 1 \text{ cm}^2$ cell size, with the remainder of the HCAL based on highlysegmented scintillators with SiPM readout. The intrinsic highprecision timing capabilities of the silicon sensors will add an extra dimension to event reconstruction, especially in terms of pileup rejection. An overview of the HGCAL project is presented, covering motivation, engineering design, readout and trigger concepts, and performance (simulated and from beam tests).

Presenter: MASTROLORENZO, luca

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