Contribution ID: **193** Type: **Oral**

The CMS High Granularity Calorimeter for HL-LHC

Tuesday, 18 September 2018 10:45 (45 minutes)

Calorimetry in high-energy physics is rapidly evolving, with new challenges and a wide variety of technologies being employed, both for signal creation and detection. Advances in large-area highly-segmented detectors are providing possibilities for high-granularity calorimetry. The CMS HGCAL, being designed to replace the existing CMS endcap calorimeters for the HL-LHC era, is one example. It is a sampling calorimeter, featuring unprecedented transverse and longitudinal readout segmentation for both electromagnetic (CE-E) and hadronic (CE-H) 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 CE-E and a large fraction of CE-H will use hexagonal silicon sensors as active detector material. The lower-radiation environment will be instrumented with scintillator tiles with on-tile SiPM readout. These concepts borrow heavily from designs produced by the CALICE collaboration but the design of such a detector at a hadron collider is considerably more challenging than at the linear colliders. This is particularly true for the electronics systems, both on- and off-detector, with low noise and power, coupled with high dynamic range, bandwidth and resistance to radiation, being just some of the specifications. We present an overview of HGCAL with some focus on the electronics systems.

Summary

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Session Classification: Invited