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Large-Area Silicon Detectors for the CMS High Granularity Calorimeter

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During the so-called Phase-II Upgrade the CMS experiment at CERN will undergo significant improvements to cope with a 10-fold increase in luminosity of the High Luminosity LHC (HL-LHC) era. Especially the forward calorimetry will then suffer from very high radiation levels and intensified pile-ups in the detectors. Thus, 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 consist of a sandwich structure with silicon as active detector material. The sensors will be of hexagonal shape, maximizing the available 8-inch wafer area. Each sensor consists between 100 and 300 individual pixels, each of 0.5 - 1 cmˆ2 in size without any common biasing structure. Biasing of the cells will be performed through the readout chip on module level, but poses several complications for the electrical characterization of the bare sensors in the lab. In this talk, the current status of the detector development is presented, including the different vendors which have an 8-inch production available. Moreover, radiation hardness studies and the construction of a dedicated test system to cope with the challenging testing of those sensors will be presented.

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