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Beam Tests of the first CMS HGCAL Tilemodule prototypes

— •Malinda de Silva, Mathias Reinecke, Ole Bach, Katja Krüger, and Felix Sefkow — Deutsches Elektronen-Synchrotron (DESY)

For the HL-LHC phase, the calorimeter endcap of the CMS detector will be upgraded with a High Granularity Calorimeter (HGCAL), a sampling calorimeter which will use silicon sensors as well as scintillator tiles read out by silicon photomultiplier (SiPMs) as active material (SiPM-on-tile). The complete HGCAL will be operated at -30 °C. The SiPMs will be used in areas where the expected radiation dose during the lifetime of the detector is up to 5x10^13 neq/cm^2. The design of the SiPM-on-tile part is inspired by the CALICE AHCAL.

The basic detector unit in the SiPM-on-tile part is the tile module, consisting of a PCB with one or two HGCROC ASICs, reading out up to 96 tiles with SiPMs. The first functional tile module prototypes have been constructed with HGCROC2 ASICs and SiPMs which are candidates for the HGCAL production. They have undergone beam tests at DESY and Fermilab, investigating the interplay of the components and evaluating the performance with several scintillator tile types. The first test with irradiated SiPMs was also performed. We will report on these tests, which were all performed in 2020, and the work still to come using beams.

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Email:	**malinda.de.silva@desy.de**