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Beam-tests of CMS High Granularity Calorimeter Prototypes at CERN and DESY 2018

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As part of its HL-LHC upgrade program, CMS is developing a High Granularity Calorimeter (HGCAL) to replace the existing endcap calorimeters. The HGCAL will be realised as a sampling calorimeter, including 28 layers of silicon pad and 24 layers of silicon+scintillator detectors interspersed with metal absorber plates. In 2018, beam tests of different sampling configurations made from these modules have been conducted at CERN's SPS using beams of electrons and charged hadrons with momenta from 10 to 300 GeV/c. The setup was complemented with CALICE's AHCAL prototype, a 39-layer scintillator+SiPM sampling calorimeter, mimicking somewhat the proposed design of the HGCAL's back part. Delay wire chambers for particle tracking, MCPs for time reference measurement and threshold Cherenkov counters for hadron identification have been integrated in the data taking.

Furthermore, a few HGCAL modules were tested at DESY with electrons up to 6 GeV earlier this year. The DATURA telescope was operated in parallel and allowed, in addition to measurements of efficiency vs position, tomography scans of HGCAL prototypes to be performed for the first time.

This talk summarises the HGCAL test beam efforts in 2018. The different setups including the beam characterising detectors are discussed. Secondly, preliminary results on the studies with minimum ionising particles, as well as on the energy and position resolution of electron and hadron induced showers are shown. The usefulness of independent beam characterising detectors in these tests will be demonstrated. Finally, first impressions on the timing performance of full modules in beam conditions are presented.

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