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The overall electronics chain (powering and readout) of the CMS HGCAL

The endcap calorimeters of CMS will be upgraded to a single High Granularity Calorimeter (HGCAL) for the HL-LHC, including both silicon sensors and scintillator tiles with on-tile SiPMs as active elements. The readout of the active elements is performed by the HGCROC ASIC (using 130nm CMOS technology) that measures the amplitude and arrival time of the signals. The amplitude is measured over a large dynamic range to allow calibration with single particles and the measurement of TeV showers. The time of arrival of high-energy showers will be measured with a precision of around 30 ps. A second pair of “concentrator” ASICs –ECON-D and ECON-T –takes the data from the HGCROC channels and packages them for transmission via optical links to the off-detector electronics. The ECON-D transmits concentrated data packets at up to 1 MHz, upon reception of a level-1 trigger signal. The ECON-T transmits trigger data at 40 MHz, to form part of the CMS Level-1 trigger. In addition to these ASICs, HGCAL will use modified versions of common HL-LHC electronics developments for the power chain and the optical control/readout. The dense nature of the HGCAL provides additional challenges for the electronic boards and cabling. The back-end readout system is also based on a common development: ATCA boards called “Serenity”, featuring optical inputs and FPGA-based processing. We present the overall HGCAL electronics scheme, including the latest performance of the HGCROC.

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