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## The CMS ECAL upgrade for the High-Luminosity LHC era

*Wednesday, 23 August 2023 09:10 (20 minutes)*

The upgraded CERN LHC for high luminosity (HL-LHC) will deliver unprecedented instantaneous luminosities to the detectors which, together with an average of up to 200 simultaneous interactions per bunch crossing, requires major upgrades of the CMS electromagnetic calorimeter (ECAL). While a new detector will be installed in the endcap regions, the ECAL barrel's lead tungstate crystals and photo detectors are expected to sustain the new conditions. However, a completely new and upgraded readout and trigger electronic system will need to be installed to cope with the challenging HL-LHC conditions. Each of the 61,200 ECAL barrel crystals will be read out by two custom ASICs providing signal amplification with two gains, ADC with 160 MHz sampling rate, and lossless data compression for the transmission of all channel data to the off detector electronics. Trigger primitives generation by updated reconstruction algorithms as well as data acquisition will be implemented on powerful FPGA processors boards. The upgrade of the ECAL electronics will allow to maintain the excellent energy resolution of the detector and, in addition, greatly improves the time resolution of electrons and photons above 10 GeV, down to a few tens of picoseconds. This talk presents the design and status of the individual components of the upgraded ECAL barrel detector, and results of energy and time resolution measurements with a full readout chain prototype system in recent test beam campaigns at the CERN SPS.

### Collaboration / Activity

CMS

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