Contribution ID: **235** Type: **Poster**

The CMS electromagnetic calorimeter barrel upgrade for High-Luminosity LHC

The High Luminosity LHC (HL-LHC) will provide unprecedented instantaneous and integrated luminosity. The lead tungstate crystals forming the barrel part of the CMS Electromagnetic Calorimeter (ECAL) will still perform well, even after the expected 3000 fb-1 at the end of HL-LHC. The avalanche photodiodes (APDs) used to detect the scintillation light have recently been exposed to the levels of radiation expected at the end of HL-LHC. Although they will continue to be operational, there will be some increase in noise due to radiation-induced dark-currents. Triggering on electromagnetic objects with ˜140 pileup events necessitates a change of the front-end electronics. New developments in high-speed optical links will allow single-crystal readout at 40 MHz to upgraded off-detector processors, allowing maximum flexibility and enhanced triggering capabilities. The very-front-end system will also be upgraded, to provide improved rejection of anomalous signals in the APDs as well as to mitigate the increase in APD noise. We are also considering lowering the ECAL barrel operating temperature from 18 degrees C to about 8-10 degrees C, in order to increase the scintillation light output and reduce the APD dark current.

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Track Classification: Sensors: 1a) Calorimetry