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New Photosensors for the CMS Hadronic Calorimeter Upgrade

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The CMS Barrel (HB) and Endcap (HE) Hadron Calorimeters are scintillator sampling calorimeters with embedded wavelength shifting fibers (WLS) in scintillator tiles. The fibers from the sampling layers are ganged together to form towers whose light is detected by photo-sensors. The photo-sensors that are currently used are hybrid photodiodes (HPDs). The HCAL upgrade is required for the increased luminosity (5×10^{34}) of SLHC. A key aspect of the HCAL upgrade is to add longitudinal segmentation to improve background rejection, energy resolution, and electron isolation at L1 trigger. The increased segmentation can be achieved by replacing the hybrid photodiodes (HPDs) with multi-pixel Geiger-mode avalanche photodiodes (also known as silicon photomultipliers (SiPMs)). The SiPMs for the CMS HCAL upgrade have to operate in a very hostile SLHC radiation environment. They should have good linearity for a wide range of scintillating signals and excellent reliability. Here we report on our studies of the most recent large dynamic range (2500 - 15000 cells/mm²) SiPMs developed by Hamamatsu (Japan), Zecotek (Singapore), KETEK (Germany) and NDL (China) for the CMS HCAL Upgrade project. The results of our measurements of photon detection efficiency, spectral response, cell recovery time, linearity for fast LED and Y11 WLS light, as well as the results on the radiation hardness of SiPMs will be reported in this presentation.

for the collaboration

CMS Hcal Collaboration

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