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Upgrade of the CMS instrumentation for luminosity and machine induced background measurements

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To cope with the higher luminosity, higher energy and shorter bunch spacing of 25 ns at the LHC after 2014, an upgrade program is performed for the detectors to measure the luminosity and machine induced background. A new detector is the pixel luminosity telescope consisting of 8 telescopes, equipped with silicon pixel sensors, on both ends of the interactions point (IP). The Beam Conditions Monitoring system, using diamond sensors, is upgraded to 24 sensors, 12 on each end of the IP. In addition, dedicated fast ASICs in 130 nm technology and dead-time free backend electronics using FPGAs for fast signal processing are being developed and built. Also, the part of the forward HCAL used for the luminosity measurement is instrumented with new readout electronics, in uTCA standards. The machine induced background measurement will be supported by a new system of direction sensitive quartz Cherenkov counters, with excellent timing resolution. A data acquisition architecture is developed that is common for all subsystems and allows for synchronization across different hardware. The design of the new system will be presented, and a report will be given on the performance of each system measured in several test-beam campaigns and prototype operation in the last LHC run.

Summary

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