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Tracking Performance and alignment of the recently upgraded CMS tracker

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The CMS Tracker consists of two tracking systems utilizing semiconductor technology: the inner pixel and the outer strip detectors. The tracker detectors occupy the volume around the beam interaction region, between 3 cm and 110 cm in radius and up to 280 cm along the beam axis. The pixel detector consists of 124 million pixels in about 2 m2 total area. It plays a vital role in the seeding of track reconstruction algorithms, and in the reconstruction of primary interactions and secondary decay vertices. It is surrounded by the strip tracker with 10 million read-out channels in 200 m2 total area used in track building. The Tracker is operated in a high-occupancy and high-radiation environment represented by particle collisions in the LHC. The performance of the silicon strip detector continues to be of high quality. The pixel detector that has been used in Run 1 and in the first half of Run 2 was replaced with a new one (the so called Phase 1 Upgrade Pixel Detector) well suited to match the instantaneous luminosity the LHC would reach 2x10E34cm−2s−1. The Phase 1 upgrade of the CMS pixel detector was built to operate at such a high rate with a new digital readout chip. The detector's new layout has an additional inner layer with respect to the previous one; it allows for more efficient tracking with smaller fake rate at higher event pile-up. The presentation will focus on the first results obtained during the commissioning of the new detector. Results will include challenges we had to face during the first data taking to reach the optimal tracking efficiency. Details will be given on the performance at high occupancy with respect to local observables, such as the the read-out thresholds, hit reconstruction efficiency and resolution. The alignment strategy for the reconstruction of the first cosmic ray and collision data will be outlined. The performance of track reconstruction algorithms will be shown.

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