



Contribution ID: 13

Type: not specified

Towards the start-up of CMS detector: CMS tracker alignment

Friday, 2 October 2009 14:35 (35 minutes)

CMS detector is complete and is ready to record LHC collisions. Precise and prompt alignment and calibration will be crucial to the performance of the CMS detector. The CMS silicon strip tracker is the largest device of this type ever built for detection of charge particles produced in beam-beam collisions. The all-silicon design of the CMS Tracker poses new challenges in aligning a complex system with 15148 silicon strip and 1440 silicon pixel modules. For optimal track-parameter resolution, the position and orientation of its modules need to be determined with a precision of several micrometers. The detector was installed inside CMS in December 2007, and it was commissioned during the summer 2008. During the 2008 Cosmic Run at Four Tesla (CRAFT) the CMS tracker operated for the first time with the rest of the CMS detectors and about 6 millions of cosmic muons were reconstructed. With this amount of data it was possible to test the detector performances, to align the detector and to test the CMS track reconstruction algorithms with real cosmic events. For the modules well illuminated by cosmic ray particles, the ultimate precision has been achieved with data from the silicon modules traversed in-situ by charged muons used in combination with survey measurements. Description of the calibration and alignment work flow for such detector will be mentioned and the achieved precision on the alignment will be described together with an outlook for expected tracking performance with the first collisions.

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