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First Alignment of the CMS Tracker and Implications for the First Collision Data

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We present the first results of the full CMS Silicon Tracker alignment based on several million reconstructed tracks from the cosmic data taken during the commissioning runs with the detector in its final position. Implication for CMS physics performance is discussed. The all-silicon design of the tracking system of the CMS experiment is expected to provide 1-2% resolution for 100 GeV tracks and an efficient tagging of b-jets. To achieve optimal performance the position and orientation of each of the 15148 silicon strip and 1440 silicon pixel modules need to be determined with a precision of several micrometers. 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. The achieved resolution in all five track parameters is controlled with data-driven validation of the track parameter measurements near the interaction region, and tested against prediction with detailed detector simulation. Outlook for expected tracking and physics performance with the first collisions is given.

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