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Outer Tracker Upgrade for the High Luminosity LHC: Beam Test Results and Recent Advances

The CMS experiment is preparing for the High Luminosity phase of the Large Hadron Collider (HL-LHC), set to begin in the late 2020s. To cope with the significantly harsher operational conditions expected during this phase, including an unprecedented increase in instantaneous luminosity and particle fluence, the CMS collaboration has planned a comprehensive upgrade of its tracking system. The current silicon tracker will be replaced during the upcoming LHC shutdown prior to HL-LHC to maintain excellent tracking and vertexing performance.

The upgrade introduces a new tracker architecture, specifically designed to endure the extreme radiation environment and increased occupancy. The Outer Tracker (OT) will play a key role in the upgrade, featuring an innovative design with two types of pT modules: 2S and PS modules. The 2S modules consist of two closely spaced silicon strip sensors, while the PS modules combine pixel and strip sensors. These pT modules enable the first-level trigger to identify high transverse momentum (pT) tracks, optimizing data reduction and improving trigger efficiency.

This talk will focus on the development and performance of the 2S and PS modules, highlighting key results from recent beam tests at CERN that validated their functionality under realistic conditions, including radiation exposure and high particle densities.

Field of contribution

Experiment

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