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Beam test characterization of an irradiated pixel-strip module for the HL-LHC CMS tracker upgrade.

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A new tracker, for the CMS detector at The Large Hadron Collider, will be built to address the demands of the High Luminosity upgrade which aims to achieve peak instantaneous luminosities from 5 up to $7.5 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ and an integrated luminosity of 3000–4000 fb^{-1} at a center of mass energy of 14 TeV. To meet the resulting challenges, the CMS experiment is changing its outer tracker silicon modules to include tracking capabilities at the Level-1 trigger. As part of this upgrade effort, a prototype module, combining both pixel and strip sensors (PS-module), was irradiated and subsequently tested at the Fermilab Test Beam and Irradiation facilities. These tests evaluated the module's ability to maintain precise tracking, effective particle momentum discrimination, and consistent performance when exposed to the radiation levels expected in the High Luminosity LHC environment. Results from these studies are presented with a focus on comparing the module's performance before and after irradiation.

Primary experiment

CMS collaboration

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