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Characterization of irradiated passive CMOS sensors for tracking in HEP experiments

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Both the current upgrades to accelerator-based HEP detectors (e.g. ATLAS, CMS) and also future projects (e.g. CEPC, FCC) feature large-area silicon-based tracking detectors. Using production lines of industrial CMOS foundries to fabricate silicon radiation detectors, both for pixels and for large-area strip sensors would be most beneficial in terms of availability, throughput and cost. In addition, the availability of multi-layer routing of signals will provide the freedom to optimize the sensor geometry and the performance, with biasing structures implemented in poly-silicon layers and MIM-capacitors allowing for AC coupling. First samples of pixel sensors coming from the LFoundry production line have already been tested and showed good performance up to irradiation levels of 10^{16} neq.cm⁻² for their potential operations as sensors for the CMS inner tracker. This presentation will focus on the systematic characterization of pixel modules at high irradiation levels, up to 1.64×10^{16} neq.cm⁻², studying the performance in terms of charge collection, position resolution and hit efficiency with measurements performed in the laboratory and with beam tests.

Collaboration

CMS

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