

Development of the CMS Phase-1 Pixel Online Monitoring System and the Evolution of Pixel Leakage Current

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A new pixel online monitoring system has been developed to give a fast and intuitive view of the detector performance both offline and online. The source script was written modularly in Python programming language in association with the SQLite and Java languages. It establishes a connection with the CMS detector monitoring database, and extracts and stores detector information into a local database. Among all of the monitored detector parameters, the pixel leakage current is one of the most interesting, as it reflects the accumulated radiation damage of the silicon sensors. The leakage currents obtained from different module positions in the pixel detector are highly correlated with the distance from the beam pipe. Based on the new monitoring system, we have analyzed the pixel detector leakage current evolution since the recent Phase-I upgrade of the pixel detector and its dependence on the environmental temperature influenced by the cooling loop arrangement inside the pixel detector. The results provide a crucial reference on the detector performance for the re-design of the detector in the Phase-2 upgrade.

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Detector performance and upgrade

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