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Results of Irradiation Quality Assurance of CMS Silicon Microstrip Sensors

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The Compact Muon Solenoid is one of the experiments at the Large Hadron Collider under construction at CERN. Its inner tracking system consists of the world largest Silicon Strip Tracker. Its sensors are single sided n-doped sensors with p-strip implants, poly crystalline bias resistors and AC coupling. In total 24244 sensors covering an area of 206 m² will be implemented in the tracker. In order to construct a large system of this size and ensure its functionality for the full lifetime of 10 years under LHC condition, the CMS collaboration developed an elaborate design and a detailed quality assurance program. After arriving at CERN the sensors are delivered to the Quality Test Centers, the Process Quality Control Centers and to the Bonding Test Centers to determine the initial quality of the sensors. A fraction (around 1%) of the sensors is sent to the Irradiation Qualification Centers in Karlsruhe (Germany) and Louvain-la-Neuve (Belgium), where they are irradiated with 26MeV-protons (Karlsruhe) or with fast neutrons (Louvain-la-Neuve). After the irradiation with a fluence corresponding to 10 years operation at LHC the sensors are tested again to test the radiation hardness. If problems occur special irradiation campaigns have to be done to find out the origins and the solutions for the problems. The talk describes the radiation environment of the CMS tracker and after explaining the radiation hardness concept of the sensors, the main results of the irradiation qualification with 26MeV-protons and the special irradiation campaigns will be discussed.

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