

Tests of the Signal from Minimum Ionising Particles of 50 μm Thick Silicon Micro-Strip Sensors after Extreme Fluences above 3E16 Neq cm²

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The development of silicon detectors tolerant to extreme fluences for future high energy and high luminosity hadron colliders (like the upgrade of the present Large Hadron Collider to high luminosity at CERN) is demanded not only for instrumenting the innermost layers (where pixel sensors will be deployed) but also for particle flow calorimetry. The anticipated fluence levels range from 2E16 neq/cm² in the inner pixel layers to possibly 1E17 neq/cm² in the forward calorimeter region. The challenge is daunting, because of the large increase of the reverse current and the severe decrease of the signal recorder by the irradiated devices. The use of thin silicon detectors in charge multiplication regime could take the tolerance of silicon detectors further towards satisfying this requirement. We show here the experimental result obtained with silicon micro-strip sensors with a thickness of 50 μm irradiated with neutrons to various fluences up to 3E16 neq/cm². After irradiation the signal is studied with fast electrons from a radioactive source, to mimic the signal of minimum ionising particles. The sensors are readout with LHC speed electronics (the ALIBAVA system, 40MHz clock speed).

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