

Silicon Detectors for the sLHC - an Overview of Recent RD50 Results

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It is foreseen to significantly increase the luminosity of the Large Hadron Collider(LHC) at CERN around 2018 by upgrading the LHC towards the sLHC (Super-LHC). Due to the radiation damage to the silicon detectors used, the physics experiment will require new tracking detectors for sLHC operation. All-silicon central trackers are being studied in ATLAS, CMS and LHCb, with extremely radiation hard silicon sensors on the innermost layers. The radiation hardness of these new sensors must surpass the one of LHC detectors by roughly an order of magnitude. Within the CERN RD50 collaboration, a massive R&D programme is underway to develop silicon sensors with sufficient radiation tolerance. Among the R&D topics are the development of new sensor types like 3D silicon detectors designed for the extreme radiation levels of the sLHC. Figure 1 shows a sketch of a double-sided 3D silicon sensor, with Figure 2 displaying a cross-section of a 3D detector of the type shown in Figure 1.

We will report on the recent results obtained by RD50 from tests of several detector technologies and silicon materials at radiation levels corresponding to SLHC fluences. Based on these results, we will give recommendations for the silicon detectors to be used at the different radii of SLHC tracking systems.

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