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Silicon Detectors for the sLHC

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The luminosity upgrade of the Large Hadron Collider (LHC) at CERN to the sLHC will increase the radiation dose seen by the experiments by roughly an order of magnitude compared to the LHC. The elevated radiation levels will require the LHC experiments to upgrade their tracking systems with extremely radiation hard silicon detectors, capable of withstanding up to a 1-MeV neutron-equivalent fluence of 10^16 per square cm for the innermost tracking layers. Recent results on radiation hardening technologies developed within the RD50 Collaboration for sLHC use will be reported. Silicon detectors have been designed and produced on n- and p-type wafers made by Float-Zone, epitaxial and Czochralski technologies. Their charge collection efficiency after proton, neutron and mixed irradiation to sLHC fluences has been extensively studied. Novel detector concepts, in particular several variants of 3D detectors, have been designed, produced and tested as well. By design, 3D detectors are expected to be more radiation hard than comparable planar designs due to the low depletion voltage and short charge collection distance.
Radiation-induced microscopic defects have been investigated and could be partly linked to the performance degradation of irradiated detectors. The radiation hardness of different silicon detector materials and technologies will be compared, resulting in recommendations for tracking detector systems at sLHC experiments.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

http://james.physik.uni-freiburg.de/~parzefal/VCI/Parzefall_VCI.pdf

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