

Predictions on charge collection efficiency in heavily irradiated Si detectors basing on the approach of active base region

Wednesday 3 June 2009 16:40 (20 minutes)

The approach of an active base with a non-zero electric field in heavily irradiated Si detectors is further developed for estimations of the collected charge up to the fluences of super-LHC range (10^{16} cm^{-2}). The steady-state electric field in heavily irradiated detector has double peak shape with two maxima and the base region in between, in which the electric field is about few kV/cm. Using this approach, the collected charge vs. fluence dependence is calculated and compared to that in the detector with a standard linear electric field. The study is carried out for pad detectors and strip detectors typical for ATLAS topology. Fitting of the calculated charge collection efficiency vs. fluence dependence to the experimental curves allowed definition of the main base parameters. It is shown that the electric field in the active base depends on the irradiation fluence and stimulates an essential increase of the collected charge.

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Session Classification: Pad Detector Characterization and Defect Engineering