**Investigation of Proton Irradiation Effects in n-in-p-MCz Thin Silicon Microstrip Detector up to the fleunce of 1 x 1017 neq./cm2 at FCC Experiment:TCAD Simulation and Experiments**

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**Abstract.** Physicists around the world are looking for the high performance of position sensitive and advanced design detectors, which can be used in harsh radiation environment at Future Circular collider (FCC). According to RD50 collaboration, one of the leading candidates for the detector material is p-MCz silicon for the bulk. In this work, we have proposed an advanced four deep trap level proton irradiation model for p-MCz Silicon detector for the FCC fluence. A very good agreement is observed in the experimental data of full depletion voltage, TCAD simulation and SRH modeling. The effective introduction rate of deep level donor trap E(30K) is played in the model using SRH statistics for effective doping concentration which helps to mitigate the increase of full depletion voltage at very high fluence. The extrapolated values of full depletion voltage, leakage current and charge collection efficiency are shown up-to the fluence of 1 x 1017 neq/cm2 in thin detector using TCAD simulation, and the results are explained using the electric field distribution, and space charges distribution inside the heavily irradiated detectors.

**Keywords:** Si detector, FCC, Full depletion voltage, Leakage current, Charge collection efficiency.

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