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Comparison of Radiation Hardness Properties of p+n- & n+p- Si Strip Sensors Using Simulation Approach

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To address the problems caused by intense radiation environment in planned SLHC tracker, extensive measurements and simulations studies aimed for CMS tracker requirements have been initiated which are investigating different designs, materials and polarity for Si microstrip sensors. One of the most important task is to compare the sustainability of p+n- and n+p- type of Si strip sensors after different level of radiation damages. In the present work, extensive simulations have been carried out for the n-type and p-type of Si microstrip sensors incorporating surface damage and bulk damage together. The simulations have been performed using Silvaco TCAD tools. The surface damage is incorporated using different amount of surface oxide charge density between interface of Si and SiO2 while bulk damage is included by a new trap model. Various properties of n-type and p-type sensors have been compared for different levels of radiation damage. Further, observed higher microdischarge rate in measured irradiated n-type Si strip sensors is explained using a qualitative model and electric field simulations.

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