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Insight into the behaviour of futuristic low bulk resistivity Si sensors using device simulation.

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There has been a growing interest for the relatively higher bulk doping density (10ˆ13 cmˆ(-3) to 2x10ˆ14 cmˆ(-3)) Si sensors due to their better ability for internal charge multiplication and hence higher charge collection efficiency. The CMOS, APD and LGAD are some of the examples having high bulk doping density (or low resistivity) sensors. However, there has not been a detailed investigation of possible radiation damage effects, which these low resistivity devices may experience in the future collider experiments.
In the present work, we are reporting a systematic TCAD simulation study for the effect of proton fluence (up to 1x10ˆ16 neqcm-2) on charge collection efficiency of low resistivity, p- and n-type Si diodes of thicknesses 100 micron, 200 micron and 300 micron. A two trap proton damage model (Delhi model) is used to implement the radiation damage within TCAD framework. As expected, the results show better radiation hardness behaviour for such devices.

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