Contribution ID: **7** Type: **Soft X-ray Detector Workshop**

Advancing Radiation-Hard Semiconductor Detectors for Soft X-Ray and Particle Tracking Applications

Future work on the radiation-hardened semiconductor detector is core to future high-luminosity observatories and X-ray imaging systems. This study is concerned with simulation and optimization of silicon based detectors that involve TCAD tools which examines the structural and electrical performance of such detectors that under different irradiating conditions. We test charge collection efficiency, electric field map and leakage current changes, under reverse bias to evaluate tester performance in extreme conditions. We also explore sensitivity to low energy (soft) X-rays by varying the device parameters, including the doping profiles, and reverse bias sweep increments, and reveal important correlations between the device parameters and detection abilities. We hope to find a meeting point between TCAD based defect physics and detector applications-specific needs, which allows radiation damage effects to be more soundly analyzed. Its results help to optimise the design of both CMS tracking systems and soft X-ray imaging arrays, and indicates potential normalisation methods that would bring them into agreement with empirical measurements of radiation-hardness. It is also in this work where the researcher finds and presents possible shortcomings to the performance of current detectors as well as suggesting the simulation based approaches to enhance the material and structural selection of any future soft X-ray detection platform.

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