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Dose rate dependence of TID Damage in front-end electronics for SLS 2.0

The Swiss Light Source (SLS) is currently in the final stages of upgrading to a diffraction-limited storage ring configuration, SLS 2.0. This upgrade will significantly enhance the brilliance by up to two orders of magnitude. However, it introduces new challenges for silicon detectors due to increased radiation damage. A primary concern is the higher accumulated dose received by the front-end electronics, which may lead to performance degradation over time due to total ionizing dose (TID) effects [1].
To investigate these effects, we studied test structures developed in 110 nm technology. These structures were irradiated at different dose rates at room temperature using an in-house X-ray source. We evaluated the analog and digital functionalities of these structures to assess the impact of TID under different irradiation conditions, with particular focus on dose rate dependence. We also examined the annealing dynamics to understand the potential for recovery or further degradation following irradiation.
References
[1] J. S. George. An overview of radiation effects in electronics. In 25th International Conference on the Application of Accelerators in Research and Industry, volume 2160, page 060002, 2019.

Workshop topics

Detector systems

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