

## TCAD numerical simulation of irradiated Low-Gain Avalanche Diodes

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In this work the results of several device-level simulations, carried out with the state-of-the-art Synopsys Sentaurus Technology CAD (TCAD) tool, of non-irradiated and irradiated Low-Gain Avalanche Diode (LGAD) detectors will be presented. Thanks to the intrinsic multiplication of the charge within these silicon sensors, it is possible to improve the signal to noise ratio thus limiting its drastic reduction with fluence, as it happens instead for the standard silicon detectors. In order to have a predictive insight into the electrical behaviour and the charge collection properties of the LGAD detectors up to the highest particle fluences expected in the future HEP experiments, a radiation damage model (called "New University of Perugia TCAD model") has been fully implemented within the simulation environment. By coupling this numerical model, which allows to consider the comprehensive bulk and surface damage effects induced by radiation on silicon sensors, with an empirical model that describes the mechanism of acceptor removal in the multiplication layer, it has been possible to reproduce experimental data with high accuracy, demonstrating the reliability of the simulation framework.

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