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TCAD numerical simulation of irradiated Low-Gain Avalanche Diodes

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The project 4DInSiDe has the ambitious goal to implement several technological breakthroughs in the fabrication of the Low Gain Avalanche Diode (LGAD). In this work the results of device-level simulations, carried out with the state-of-the-art Synopsys Sentaurus Technology CAD (TCAD) tool, of non-irradiated and irradiated LGAD will be presented. In order to have a predictive insight into the electrical behaviour and the charge collection properties of the LGAD detectors, a radiation damage model has been fully implemented within the simulation environment. By coupling this numerical model 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. Indeed the new developed model can be proficiently applied for predictive insight of the electrical behavior and for the optimization of the design of the detector.

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