

# TCAD simulation of silicon detectors: A validation tool for the development of LGAD

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It is widely accepted that implantation profiles in the multiplication layer of Low-Gain Avalanche Detectors (LGAD) constitute a critical feature in view of keeping the gain as low as required by high-energy particle timing measurements. One of the most powerful tools we can use to predict the amount of multiplied charges and then the behavior of LGAD, both before and after irradiation, is the numerical simulation. The aim of this contribution is to present extensive results from TCAD simulations of different LGAD devices fabricated by Fondazione Bruno Kessler (FBK), Centro Nacional de Microelectrónica (CNM) and Hamamatsu Photonics K.K. (HPK) and their comparison with a wide spectrum of experimental measurements. I will also propose a robust numerical setup able to accurately reproduce current, gain and most probable charge as a function of the applied bias, temperature and fluence. This result has been achieved thanks to a fine calibration of some crucial physical parameters of the most common avalanche models, either on pin diodes and on LGAD, and also through the implementation of an empirical model accounting for the acceptor removal mechanism.

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