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TCAD simulations of Low Gain Avalanche Detectors incorporating improved impact ionization modelling

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Low-Gain Avalanche Detector (LGAD) has become an attractive candidate for ultra-fast silicon detectors. TCAD simulations are playing an increasingly important role in optimizing the LGAD design configurations. A few TCAD studies have indicated a disagreement between the simulated and the measured charge collection, even in the non-irradiated LGADs. In simulations, the impact ionization models mainly control the internal charge multiplication of the LGADs and are sensitive to the electric fields developed within the LGADs. This highlights the importance of not only the accurate implementation of p-well doping profiles but also tailoring the parameters of the impact ionization models used in simulations. The present simulation study focuses on refining the impact ionization parameters in existing models for LGADs within the TCAD Silvaco framework for a better agreement with the measurements. The improved impact ionization modelling and the gain layer degradation, is then used alongside the already developed neutron damage model to understand the performance of LGADs.

Type of presentation (in-person/online)

online presentation (zoom)

Type of presentation (I. scientific results or II. project proposal)

I. Presentation on scientific results

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