

Gain Suppression Study in LGADs with Different Gain Layers

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It was observed in several research groups that the gain of Low Gain Avalanche Diodes (LGADs) is significantly dependent on the amount of deposited charge and the angle of incidence of the interacting particle. In case of laser illumination, higher deposited charge results in lower gain values. Additionally, the focus of the laser is responsible for a decrease in the measured gain. The physical mechanism behind this gain suppression is a screening effect of the charge carriers on the gain layer space charge, as a result of their high concentration.

A batch of LGADs was produced by Fondazione Bruno Kessler featuring multiple gain layer designs and thicknesses to study the feasibility of having this technology in space-borne observatories for timing applications.

Together with the established study of the gain and timing resolution of the detectors, a measurement campaign employing Single Photon Absorption Transient Current Technique (SPA-TCT) and Two Photons Absorption TCT (TPA-TCT) was conducted on a set of detectors with thickness $100\text{ }\mu\text{m}$ and $150\text{ }\mu\text{m}$.

While the SPA-TCT allows to verify the presence of gain suppression in the samples, TPA-TCT offers the advantage of a three dimensional resolution and much more concentrated charge carriers generation. These make TPA-TCT an excellent tool for investigating gain suppression in a more fundamental and systematic way.

The objective of the campaign was to probe the differences in gain suppression induced by the gain layer depth, the gain layer dose, and by the thickness of the detector, with the ambitious goal of identifying a suitable gain layer solution based on the density of the deposited charge in the specific application.

The first results of the investigation will be presented.

Type of presentation (in-person/online)

in-person presentation

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

I. Presentation on scientific results

Authors: BISHT, Ashish (Fondazione Bruno Kessler (FBK)); Mr FICORELLA, Francesco (Fondazione Bruno Kessler); PATERNOSTER, Giovanni (Fondazione Bruno Kessler); CAVAZZINI, Leo; FERNANDEZ GARCIA, Marcos (Universidad de Cantabria and CSIC (ES)); CENTIS VIGNALI, Matteo (FBK); BOSCARDIN, Maurizio (FBK Trento); MOLL, Michael (CERN); HAMMAD ALI, Omar; KRAUS, Veronika (Vienna University of Technology (AT))

Presenter: CAVAZZINI, Leo

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