Contribution ID: **25** Type: **WG6 - Wide bandgap materials**

Improving spatial and temporal resolution of 3D diamond detectors using TPA characterisation and neural network

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3D diamond detectors feature conductive column arrays fabricated within Chemical Vapour Deposition (CVD) diamond using femtosecond-laser graphitization. In this work, several 3D geometries are simulated, with electric fields simulated in Sentaurus TCAD and signal responses studied via Monte Carlo simulations using Garfield++. Then a Neural Network (NN)–based algorithm is developed to analyse signal waveforms and enhance spatial and temporal resolutions by predicting the hit position and time of arrival. Detector prototypes with various electrode configurations are fabricated using a femtosecond laser system equipped with a Spatial Light Modulator (SLM). The Two-Photon Absorption (TPA) technique is employed to generate localized charge distributions inside the sensors, enabling high-resolution characterization. The prototypes are further tested with CERN SPS test beam to evaluate detector performance under realistic experimental conditions.

Type of presentation (in-person/online)

in-person presentation

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

I. Presentation on scientific results

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