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## Charge Transport Simulations and Signal Generation in Position Sensitive Planar Germanium Detectors

A significant milestone in the field of gamma-ray spectroscopy has been the development of highly-segmented germanium detectors to meet the growing need of excellent spectroscopic capabilities. These detectors combined with advanced techniques such as, Pulse Shape Analysis (PSA) and Gamma-Ray Tracking (GRT) are considered as highly promising options for gamma-ray imaging applications [1]. The segmentation is a key attribute, enabling the determination of interaction locations through PSA due to its position sensitivity.

The present study includes detailed simulations of charge transport within a germanium crystal, experimental validation and characterization along with corrections for electronic effects. These simulations help in creating a theoretical database of signals corresponding to all possible interaction positions within the detector volume. The planar detector used in this work is a double-sided orthogonal strip detector featuring 10 x 10 electrical segments arranged along both the horizontal and vertical directions. Geant4 simulations have been performed to find the location and energy deposited in the active volume. The electric potential and field strength within the detector volume have been determined as functions of position using the SolidStateDetector.jl package [2]. The simulations have incorporated parameters such as operating voltage, detector design and electrode configuration. The drift of charge carriers and generation of signals have been simulated using the weighting potential and the parameters like drift velocity and mobilities, which are provided by the AGATA Detector Library (ADL) [3]. Further, the electronic effects from the pre-amplifier have been introduced by convoluting the simulated signal with the help of a response function [4]. To ensure the validity of simulation framework, the simulated signals have been compared with the scanning data of the Position Sensitive Planar Germanium detector carried out at GSI, Germany [5]. The detailed results will be presented during the conference.

### References:

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