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Position Resolution for the Segmented Inverted-Coaxial Germanium detector, SIGMA

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The position resolution of the novel p-type Segmented Inverted-Coaxial Germanium (SIGMA) detector was investigated using the Pulse Shape Analysis (PSA) technique. The design of this large volume HPGe detector is based on a coaxial geometry and combines the small point contact technology along with the segmentation of the outer contact. The location of the γ-ray interaction points is determined by extracting the digitized signals of the 18 outer segments and of the small point contact electrode, which are characteristic for each point of interaction in the detector.
In order to evaluate the position resolution of the SIGMA detector, PSA methods using a figure of merit minimization grid search algorithm are applied, which require a pulse shape database of all possible positions of γ-ray interactions with the detector volume as input. Thus, to determine the γ-ray interaction points, the experimentally measured pulse shapes are compared to the reference signal database. For this reason, the detector response has been simulated using Signal Generation simulation (SigGen) to generate a database of calculated pulse shapes for the SIGMA detector. The simulated pulses were validated against their corresponding average experimental pulses produced on known positions using the University of Liverpool scanning system.
The preliminary result of the position resolution shows that the FWHM obtained is between 2.5 mm and 4.6 mm for the radial positions and is around 7 degrees for the azimuthal positions.

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