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Characterization of the iThemba LABS segmented clover detector for gamma-ray tracking

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The iThemba LABS segmented clover detector is a new generation gamma spectroscopy detector and is made of four Ge crystals. Each crystal has one central electrode where a high voltage with positive polarity is applied, while the outside electrode is grounded and segmented 8-fold. When a gamma-ray interacts inside the detector it creates charges. These charges move towards the electrodes creating electric currents. The signals observed on the electrodes represent such currents and have shapes that are indicative where (i.e. how far from each electrode) the charge was created.

The determination of the interaction position in the detector requires both experimental and simulated data. A data base containing sets of simulated pulses that characterize every possible interaction position in the volume of the detector should be built first. The measured signals for gamma-ray interaction are then compared with the pulses in this data base. The interaction position is determined based on the best match of experimental pulses and pulses from the simulations.

Simulation of the pulses corresponding to different interactions has been done using Agata Data Library software (ADL). For each simulated gamma ray interaction ADL out-puts nine pulses per interaction, however it needs several parameters that have to be measured experimentally. In this work, response functions, crystal orientations and charge mobilities have been measured.
These parameters were then incorporated into the ADL code and the output traces corresponding to charge collection were compared to the experimental data. The results show good agreement. They will be presented and discussed.

Summary

he iThemba LABS segmented clover detector is a new generation gamma spectroscopy detector and is made of four Ge crystals. Each crystal has one central electrode where a high voltage with positive polarity is applied, while the outside electrode is grounded and segmented 8-fold. When a gamma-ray interacts inside the detector it creates charges. These charges move towards the electrodes creating electric currents. The signals observed on the electrodes represent such currents and have shapes that are indicative where (i.e. how far from each electrode) the charge was created.

Apply to be
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   award (Yes / No)?

yes

Level for award
 (Hons, MSc,
   PhD, N/A)?

PHD

Main supervisor (name and email)
and his / her institution

DR E.A Lawrie

iThemba LABS

Would you like to
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Yes

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