Compton Electron Tracking: Meeting Notes

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| 14/06/13 10:00-11:00 | Teleconference |
| Attendees: Ian Lazarus, Marc Labiche, Daniel Judson, Amina Patel, Laura Harkness, Matt Wilson. |
| Apologies: Andrew Boston , Helen Boston |

# Meeting Notes

Matt recapped the overall goals of the project and decisions from last meeting. The plan was to simulate the effects of an ASIC and interconnect layer on the Compton Scattered gamma rays – e.g. how many events had a second interaction in the ASIC? The energies to be investigated were 141keV for SPECT; 662keV to simulate decommissioning energies and 1332keV for Nuclear Physics.

Some figures of interest from the simulations are listed in Table 1. The values show the raw number of Compton events and the number of useable Compton events after a veto is applied for incomplete electron capture and secondary interactions in the In or ASIC layers. *For reference, a typical SPECT medical collimator is ~0.05% efficient with spatial resolutions of several mm*.

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| --- | --- | --- | --- | --- |
| Energy (keV) | Compton Edge (Max e- Energy) (keV) | Si Detector Thickness (µm) | # of Compton Events from 1M Incident Photons | % of Incident Event Resulting in Scattering event that could be reconstructed. (Inc. All Vetos) |
| Raw | + Veto ASIC and In Scatter | + Veto Incomplete electron Measure |
| 141 | 50.0 | 100 | 607 | 587 | 505 | 0.05 |
| 300 | 1731 | 1686 | 1604 | 0.16 |
| 750 | 4255 | 4148 | 4096 | 0.41 |
| 1000 | 5549 | 5414 | 5337 | 0.53 |
| 662 | 477.7 | 100 | 328 | 326 | 82 | 0.008 |
| 300 | 965 | 954 | 357 | 0.036 |
| 750 | 2428 | 2411 | 1458 | 0.146 |
| 1000 | 3229 | 3199 | 2257 | 0.226 |
| 1332 | 1117.6 | 100 | 221 | 219 | 35 | 0.004 |
| 300 | 675 | 650 | 123 | 0.012 |
| 750 | 1763 | 1750 | 536 | 0.054 |
| 1000 | 2292 | 2273 | 768 | 0.077 |

Table 1. List of values from Marc’s simulations.

It was noted that the higher energy photons resulted in a lower Compton yield and significant losses due to the Compton electron escaping the scattering detector volume. **It was agreed that the simulations should focus on SPECT energies of 141keV and 364keV**.

Amina had started to use GAMOS to replicate Marc’s simulations. As a first point she was going to attempt to simulate the energies and geometries above and verify that the results roughly the same. Iain suggested that another method of calculating the validity of the simulations would be sensible – EGS4 might be a suitable tool but this will be added as an action to consider in the next meetings too.

Amina will provide Matt with some example output file of energy deposited by the photon and the Compton electron (x,y,z, E and maybe time). Matt will simulate some detector responses (drift, diffusion and pixel response) for this energy deposition. Matt will contact John McGrath in Diamond to see if Comsol is an easy option for this.

# Actions

Amina to simulate the same geometries as Marc to see if GAMOS produces same/similar outputs.

Amina to provide Matt with example output files.

Matt to find a suitable date at the end of July for the next meeting.

# Next Meeting

We will discuss:

* Simulation Results from GAMOS.
* Detector response simulations added to the output of GAMOS/GEANT.
* Alternative codes to verify results from GEANT.
* Any other relevant work.
* Funding, including the PRD call.