Modifications to GATE to accommodate metamaterial detectors

Nikos Efthimiou

University of Hull

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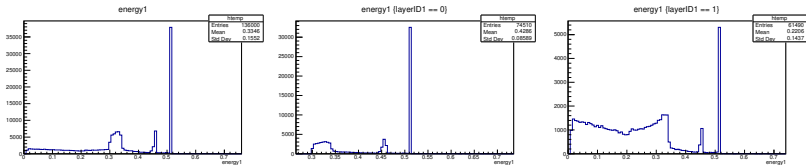
- Separate application of threshold in each layer
- Separate application of temporal resolution in each layer

Separable Threshold

- Different thresholds can be applied in each layer.
- In the example the LYSO has threshold 300 keV and plastic 10 keV

```
/gate/digitizer/Singles/name thresholderLYSO
/gate/digitizer/Singles/insert thresholder
/gate/digitizer/Singles/thresholderLYSO/setThreshold 300. keV
/gate/digitizer/Singles/thresholderLYSO/chooseTHVolume LYSO_cry

/gate/digitizer/Singles/name thresholderPlastic
/gate/digitizer/Singles/insert thresholder
/gate/digitizer/Singles/thresholderPlastic/setThreshold 10. keV
/gate/digitizer/Singles/thresholderPlastic/chooseTHVolume Plastic_cry
```

- Different tim. resolutions can be applied in each layer.
- In the example the LYSO has threshold 130 ps and plastic 50 ps
- The medium speed should naturally occur from the asymmetrical application of the different resolutions.

```
/gate/digitizer/Singles/insert timeResolution
# 130 / sqrt(2)
/gate/digitizer/Singles/timeResolutionLYSO/setTimeResolution 91.92 ps
/gate/digitizer/Singles/timeResolutionLYSO/chooseTRVolume LYSO_cry

/gate/digitizer/Singles/name timeResolutionPlastic
/gate/digitizer/Singles/insert timeResolution
# 50 / sqrt(2)
/gate/digitizer/Singles/timeResolutionPlastic/setTimeResolution 35.35 ps
/gate/digitizer/Singles/timeResolutionPlastic/chooseTRVolume Plastic_cry
```
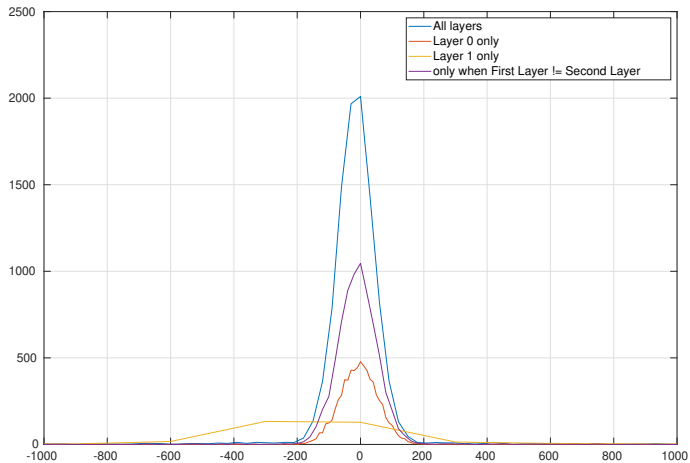
Conclusions

- Functionalities in GATE have been extended.
- Simulation with application of different threshold and time resolution in each layer, has been implemented.
- The initial results of the application of the threshold are reasonable.
- In the case of the timing resolution the results are reasonable in all cases but for layer 1. That is the plastic.
- A possible explanation could be the very low threshold which has been applied, only 10 keV.
- In addition in this simulation the energy cut was set to 10 um.