detectorSimulations_v10 Angular Correlations Extension Documentation

Rishita Gudapati

December 2017

All additions were made to the September 12 2017 commit to `detectorSimulations_v10` on the GRIFFIN-Collaboration GitHub page.

EventAction

Header File

Additions:

- declared variables for deposited energy of particle pairs in cascade
  - the first will be paired with the second, then the second and third will be paired together, etc. Similar to the way `G4VGammaDeexcitation` works.
- declared variables for binning 2D angular correlations histograms (one for $\gamma\gamma$ correlations, and one for γe^- and $e^-\gamma$ correlations)
- declared variables for deciding whether or not to produce histograms for a specific particle pair (`gg`, `ge`, `ee`).
  - there are a matching set of booleans in `HistoManager.hh`. Both sets need to have matching values for each variable. There is definitely an easier way to do this.
  - the `G4bool` *ee* variable will have no effect until a `Paces-Paces` array is added.
- array of angles for germanium-germanium hits (`thisGriffinCryMap`): organized by crystal number from 0 to 63.
- array of angles for paces-germanium/germanium-paces hits (`thisPacesGriffinCryMap`): first index is the PACES detector that was hit, and the second is the germanium crystal that was hit.

Source File

Additions:

- track incoming hits in groups of two (along with their energies) and fill the appropriate 2D histograms based on particle types
- access the corresponding crystal maps to retrieve the angle between hits

HistoManager

Header File

Additions:

- `G4int EDEPNBINSGRIFFIN` : binning for GRIFFIN and PACES histograms
- `G4int EDEPXMAXGRIFFIN` and `G4int EDEPXMINGRIFFIN` : range for GRIFFIN and PACES histograms
- `const G4int MAXNUMANG_GG` and `const G4int MAXNUMANG_GE` : the number of angles used in the $\gamma\gamma$ and mixed particle graphs, respectively.
- `G4int MAXANGCORRHISTO` : number of different *types* of angular correlation graphs (one for $\gamma\gamma$, one for both γe^- and $e^-\gamma$, and one for e^-e^-).
- `short AngCorrNumbers[MAXNUMANG_GE*MAXANGCORRHISTO`MAXANGCORRHISTO];+ stores the 2D histograms. `MAXNUMANG_GE` should be replaced by `MAXNUMANG_GG` if the latter is greater. Again, there is definitely an easier way to do this.
- `short fAngCorrAngles[1];` stores the 1D histograms of all angles produced in the simulation.
- a set of booleans matching the ones in `EventAction`. Both sets need to have matching values.

Source File

Additions:

- create 2D histograms for all correlation types
- fix PACES spectra titles
- replace range and binning for GRIFFIN and PACES graphs
- create 1D histogram for displaying distribution of all angles produced in the simulation.

DetectionSystemPaces

Header File

Unchanged.

Source File

modified measured ϕ angles to match the *NIM* paper.