Neutron Propagation in Geant4
Discussion Slides
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12/4/14

Initial Ideas

- What do experiments care about?
  - How far neutrons travel before dropping below a threshold energy
  - How far neutrons travel before thermalization or capture
  - How does the initial spectrum affect this
  - Can neutron captures be identified
- So how does this fit with simulations and our paper?

Geant4 Described

- Will discuss models vs datafiles from databases, etc.- Will need to see what improvements have happened since geant4.9.5 (now on 4.10.0.p03)
  - Cover elastic and inelastic scatters
  - Captures: most complicated (for the correct decay channels) and also the most changed in 4.10
    - and highly variable based on capturing nuclei
  - Should any old bugs be discussed?

Plots to Include

- Any cross section comparisons? Requires choosing what targets, and then showing elastic, inelastic (multiple) and capture…
- Distance traveled to under threshold/ thermalized/capture vs neutron energy (derived from simulations)
  - Should the simulations start from the edge of a material (with neutron momentum in direction into material)? or at center of ~infinite material?
  - choice of materials? water, lead, stainless steel?
  - statistics: 1 million? 10 million?
  - energy cutoff to look at? > 20 MeV because of Geant model switch over?
- Neutron elastic scatter spectra?
  - materials (detectors targets?)
  - highlight impact, or lack of impact of different initial spectra, or cross section resonances -> links back to importance of what measurements might be needed

Plots Cont'd

- Anything more directly related to capture?

- Anything illuminating more fundamental neutron physics, or is this too far afield from the paper topic?

  - number of scatters before thermalization, average energy lost, distance between scatters, etc.

  - discuss impact of elastic and inelastic scatters?

Materials

- More alpha-n to consider: PTFE, which should be dominated by flourine, anything for neutrino less double-beta decay experiments like Kamleand Zen, CUORE and SNO+?(I'm not sure what dominates their production)

- Shielding materials: water, lead, stainless steel, fewer? more (concrete, oils or plastics)?

- Detector materials: Ge, Si, Ar, Xe, anything else? (for neutrino less double beta experiments like SNO+ and CUORE?)

- Capture materials: B, Gd, other basic materials?