

Simulation Breakout Sessions (A. Villano, AARM Meeting, March 22, FNAL)

Thursday 3:30 – 5:00 pm (Committium)

- **Specialized detector physics**

NEST and other specialized detector physics was discussed in terms of making these things available in a more general way to people who want to simulate the scintillator codes. Currently Nest is intertwined with Geant4 and is available as a package supplied with a website and the “community” informed by an email list from the main author.

It was generally felt that (at least for NEST) it would be difficult to supply the physics in a simulation-package independent way, in fact the Geant4 developers are pushing for NEST to be embedded more deeply into the code.

The session leader was interested in if these kinds of packages can be maintained independently from Geant4 or other simulation packages – this introduces some modularity but it is at the expense of adding external dependency. It was generally felt that these things were too difficult to remove from the “guts” of the code.

- **Specific benchmarking for specialized geometry (e.g. Geant4/FLUKA comp)**

This was discussed in the context of Geant4 and FLUKA comparison about simulation benchmarking and how to make the findings available and able to be used by others, as well as how the simulation is hosted and run for every Geant4 version going forward.

Action: Angie suggested that this job of hosting has been talked about for a long time and we should just talk to someone in one of the collaborations (like Dennis Wright) directly in order to see if hosting at an institution is a possibility. Anthony will email Dennis about this.

What is the best format for these things? Also need specified geometry, or include instructions to make simple geometry. Geometry might depend on physics of interest (split for applications: cosmogenics, neutron radiogenics, electron recoil radiogenics, nuclear recoil radiogenics, neutron transport).

Perhaps do something as rigorous as including checks/tests by the community on the by-process level (Geant4 collab does this to some extent).

In terms of how to do these comparisons for different versions Geant4 is harder than FLUKA. In FLUKA one is forced to update, the old version stops working

(at least legally). Maintainable, and everyone is using the same physics. A series of tests with simple geometries which would be able to compare FLUKA to Geant4 whenever a new version is released.

- **Microscopic data for vetting specialized physics**

This was an interesting discussion that ended up centering around what data has been used already to create things like NEST and/or to compare to other results.

Collection of data from specific papers and theses. Resource online now with data collected for NEST. First NEST publication has large collection of resources. A series of links might be possible. References still needed for Ge.

Calibration meas for other materials: C4F10, CF3, Iodine

Action: Create a wiki space to keep these references at least at first, will turn out to be good cross referencing aside from papers:

<https://zzz.physics.umn.edu/lowrad/meeting7/measurements>

We didn't get to discuss making new measurements, but might be something that is interesting....What measurements do we need? This was talked about a little bit in the benchmarking section, but not as much for the microscopic detector physics.

Friday 4:00 – 5:00 pm (Committium)

- **Simulation Process Physics Documentation**

Basically, we started discussion about the lack of very specific knowledge of the models and **exactly how** the processes are calculated in various simulations. For Geant4 we all know the lists "QGSP_BIC" or "Shielding" but basically these names get passed around so much that the starting point is almost partially based on hearsay. What would be better if people knew what pieces of these things they trusted and **why** they are superior, if indeed they are.

Angie pointed out some documentation for the processes in Geant4 that seems to be partially new, other than that people in the session had done this by searching through the source code and looking for the specific function calls – this is cumbersome:

http://geant4.web.cern.ch/geant4/support/proc_mod_catalog/

The documentation above is “kind of” what we want but it isn’t complete or organized perfectly.

- **Areas related to radiogenics (preparation for cross-over session)**

A simple and short discussion before joining the radiogenic group.

Questions/comments were:

1. Is it better for Geant4 to track alphas and simulate (alpha,n) internally or use Sources to spread neutrons over the volumes – note this spreading can’t be perfect because of “edge effects” that are hard to get without alpha tracking
2. What is the neutron angular correlations of Cf sources? Angie suggests that the totally isotropic approximation is known to not be correct, because of some sims she did that showed a difference in the singles/multiples ratio’s compared to data, when the sim used the fully isotropic approximation. Nobody knew if such detailed data existed.