Backgrounds and Simulation

- Goal: compute background and signal rates from "reconstructed pmt data" given flux, detector, and DAQ models.
- We are likely behind the competition:
  - CHOOZ→2×CHOOZ
  - KAMLAND→Daya Bay
- Today: try to consider four issues:
  - Basic simulation scheme (Fsim+G4)
  - Some rules to help us proceed (C++,cvs,…)
  - Specifics of the fast detector sumulation (Fsim)
  - Needs for veto simulation

Item 1: How should we develop our parametric simulation (Fsim) and a full simulation (G4) (9:00-10:00)

- Status of ReactorFsim -- Matt W. 15'
- Geant4 neutrino detector shell at KSU- Tim B. 5'
- A "Generic" simulation derived from KAMLAND -- Glenn H-S. 15'

Some Discussion Items

1. ReactorFsim augmented by parametric flux packages and a parametric veto system simulation package should be the primary tool for the experiment at least through the R&D proposal decision stage.

2. The Spokes should identify a group to lead the development of the veto simulation.

3. The Spokes should identify a group to lead the development of a full simulation based on Geant4. The full simulation should integrate the veto and the detector.

4. Individuals from any institution can contribute to any simulations via cvs.

5. The experiment should on the long term maintain both simulations.

Item 2: A brief discussion of tools and rules (10:00-10:30)

- CVS tools -- Matt W. 15'
- Discussion items:
  - New coding should be done in C++? No new Fortran?
  - cvs should be used for any software that produces a Braidwood result that is to be shown to the outside world.
  - Matt's documentation tools must be used.
  - One institution (UC?) should serve as the central cvs repository for ALL software that produces a Braidwood result that is to be shown to the outside world.

Item 3: What does Fsim need? (10:30-11:30)

- Thoughts from UT– Josh 15'
- Thoughts from KSU- TB 15'
- Other thoughts….

Discussion items- Fsim Needs

- A. Geometry

--keep spherical approx. as much as possible. "Post-process" non-spherical effects.

-- add finite thickness acryllic

PMT geometry

B. Physic

--flux. These should be functions that could "feed" either the nu det. or veto. Some (PMT rad) may need to be customized for one or the other.

a. nubar (done)
b. muons (done)
c. Neutrons
d. gammas (done? but possibly needs explanation/discussion)
e. Other?

Processes, cont'd

- Physics
  - cross sections
    - a. nubar (done)
    - b. mu+N
    - c. n+N (done for E<20 MeV or so)
    - d. e+ annihilation (done, but no positronium)
    - e. gamma (Compton, done; P.E. ?
    - f. charged particle soft --> treat via MCS (below)
    - g. inelastic hadron (use Geant libraries?
    - h. Li9, etc should be "forced", not done mu by mu.
  - Decay
    - a. muon (done?)
    - b. Li9,He8 (done)
    - c. K40, Tl , other PMT (done)
    - d. U,Th chains

More processes

- Track propagation
  - a. neutrons (done for E<~20 MeV)
  - b. gammas (done, only Compton)
  - c. e+/e- dE/dX (done at one point)
  - d. muon, proton dE/dX (Landau only should be OK)
  - e. MCS
  - f. Boundary checking (no finite thickness acryllic yet).
  - g. inelastic

More Processes

- Response
  - a. light propagation (no need to track single photons?)
  - b. Birk effects (easy to implement, but correct?)
  - c. PMT response (now includes only solid angle, QE, Poisson effects on npe)
  - d. PMT digitization

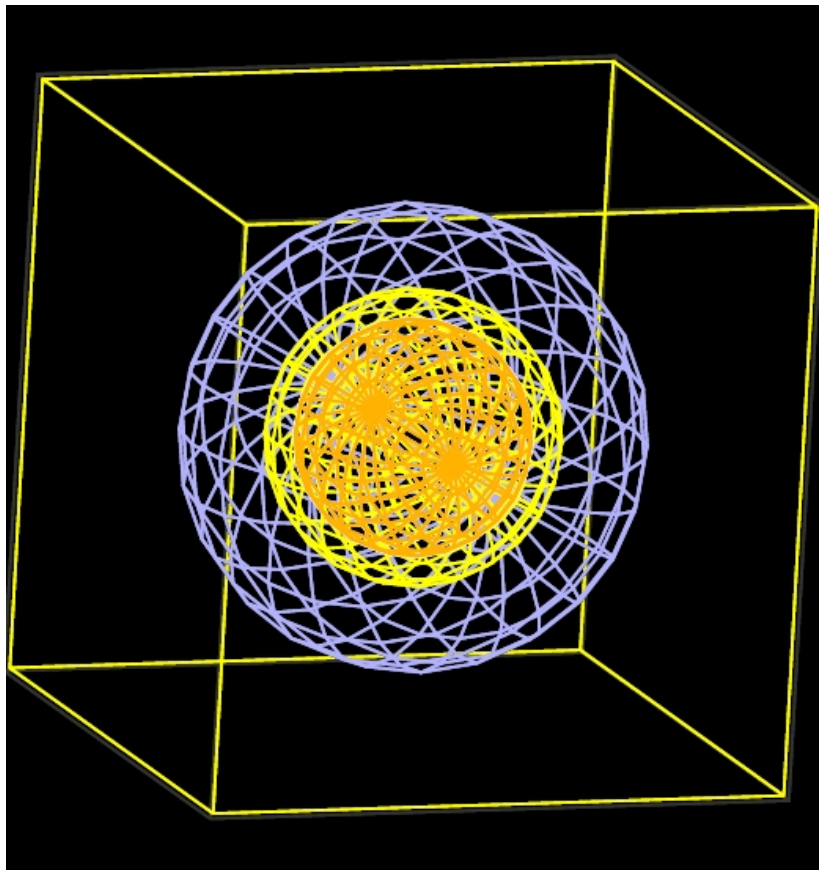
More processes

- Reconstruction
  - a. single vertex RECO (done in two simple implementations)
  - b. double vertex RECO (fun project to try)
  - c. e+ vs e- RECO (fun project to try)
  - d. line segment (mu) RECO (fun project to try)
- Analysis
  - PAW (now, clunky, easy)
  - Root (better)

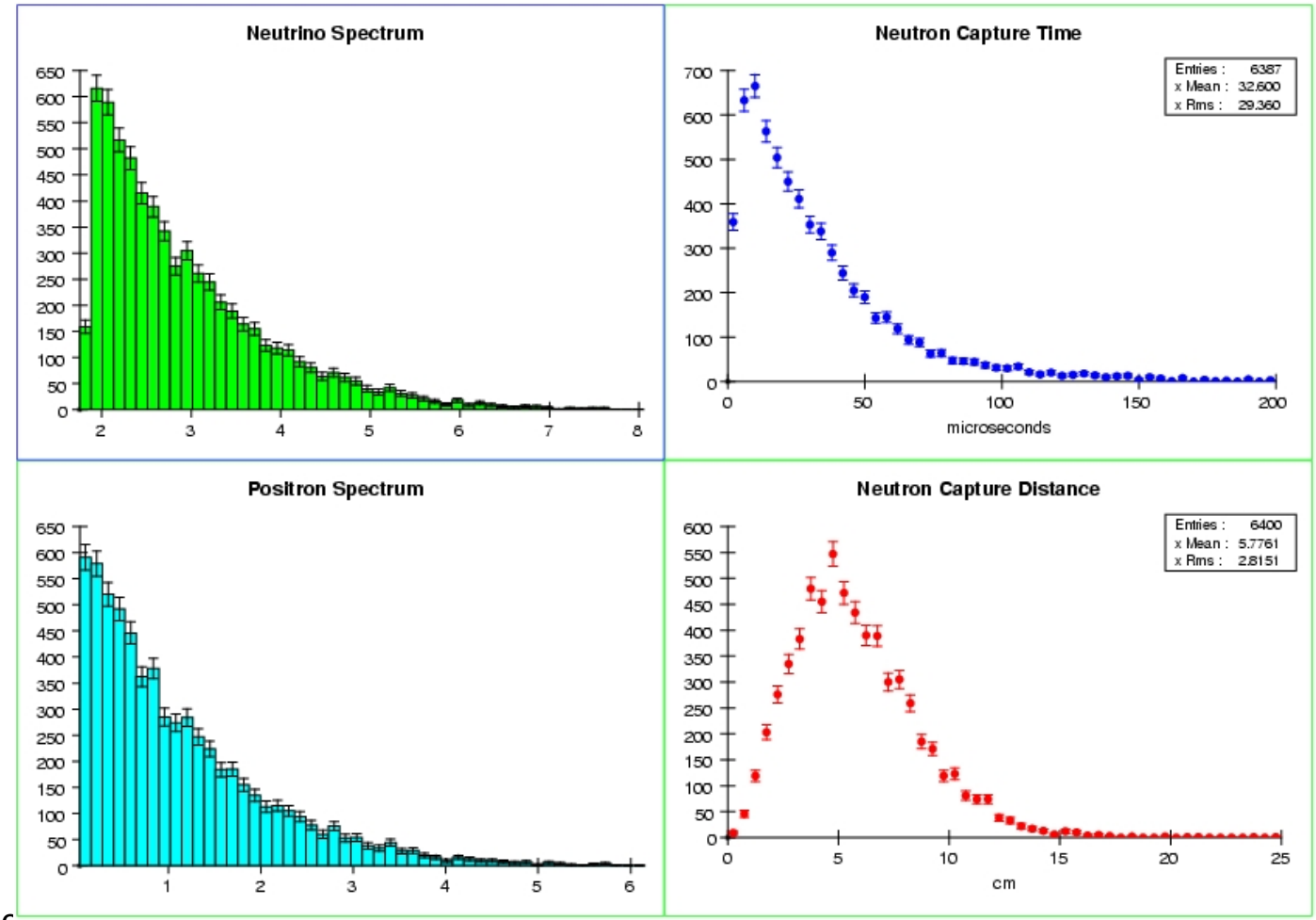
Item 4: Integrating the Veto, Input for the Veto Group (11:30-12:00)

- Discussion items
  - The veto simulation should be used stand-alone to produce flux functions for mu and n that can be called from ReactorFsim.
  - Flux functions need to be strongly associated with a particular veto configuartion.
  - A given veto configuration should generate a function that gives muon tracking resolution functions for use in the RECO part of Fsim.
  - At the G4 level, the veto and detector should function as an integrated package.

KSU Geant4 Shell (D. Onoprienko)



Full simulation results (Not parameterizations)



KSU Geant4 Status

- Inactive. Dima finished (fairly complete) first order model and put in on the shelf.
- Could be used to build up full G4 model.