Simple Geometry C_9H_{12} Geant4.9.3 Simulations

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Abstract

Work continues on cosmogenic shower simulations on simple geometries suggested some months ago at the AARM meeting Minneapolis and again at the Berkeley cosmogenics workshop. Here Geant4.9.3 is used exclusively, and to enable some initial preliminary comparison with Borexino and/or Kamland data the hydrocarbon scintillator is approximated by C_9H_{12} at density $\rho = 0.887$ g/cm^3.

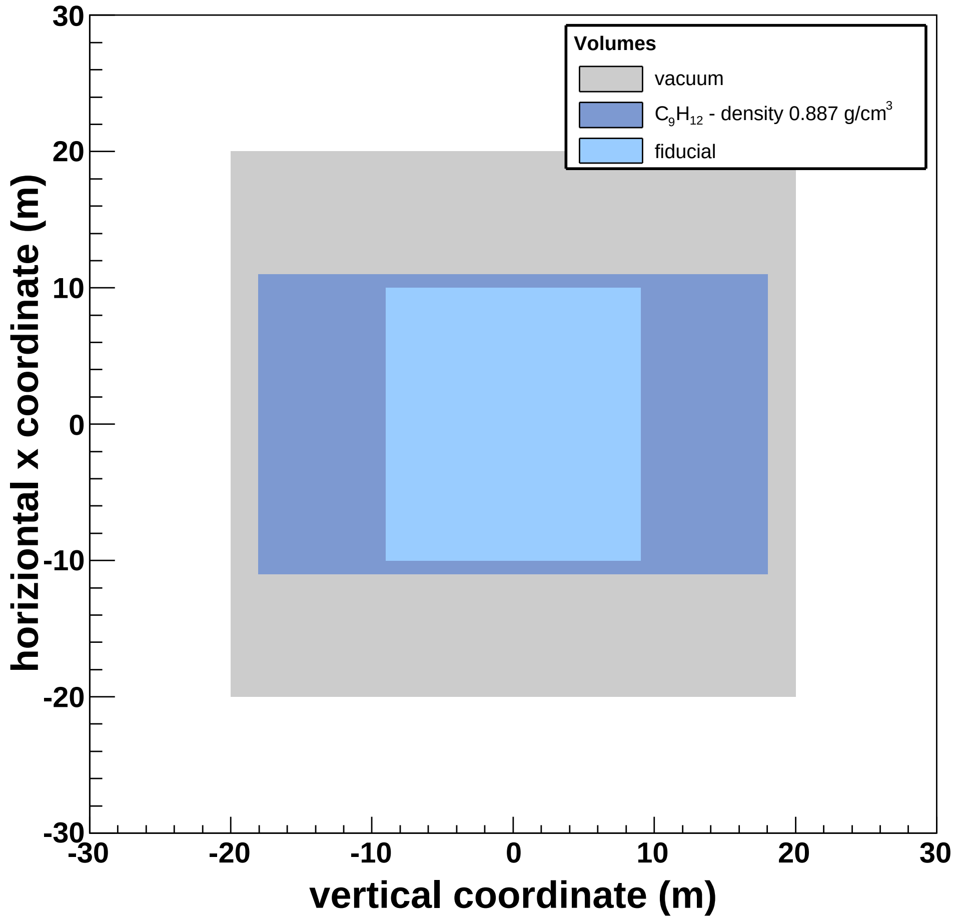

Figure 1: Basic cylinder and fiducial volumes as viewed from the side.

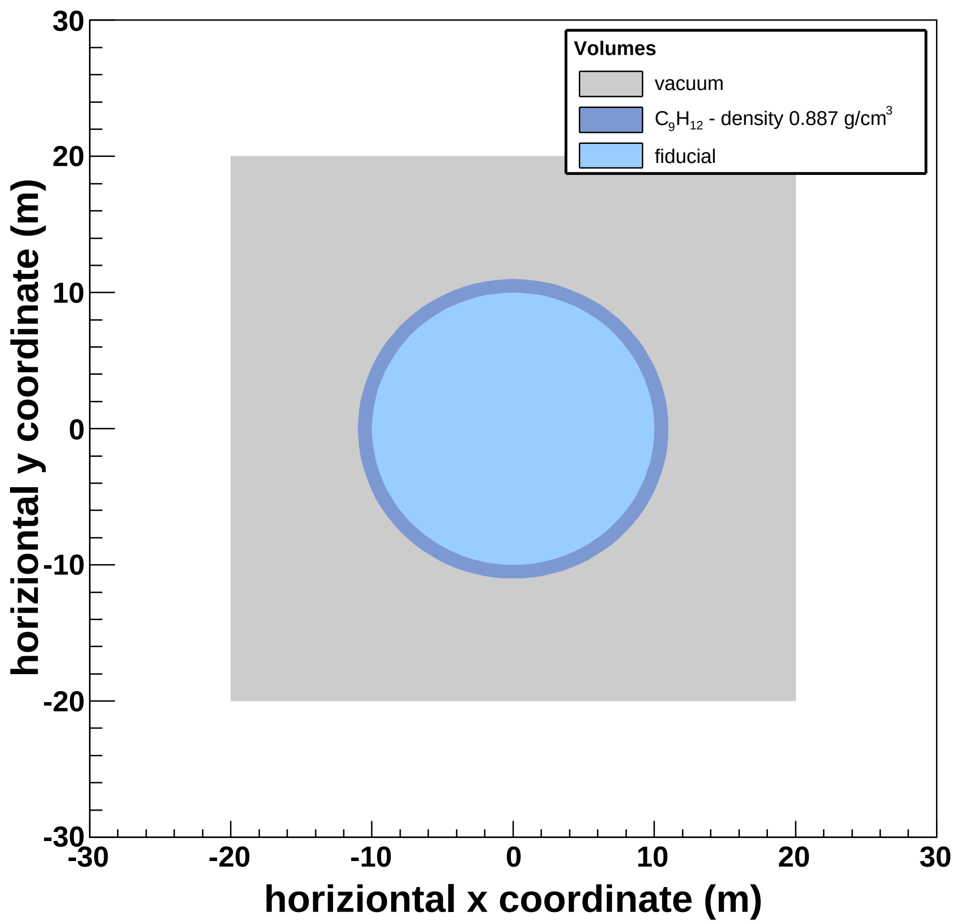

Figure 2: Basic cylinder and fiducial volumes as viewed from the top.

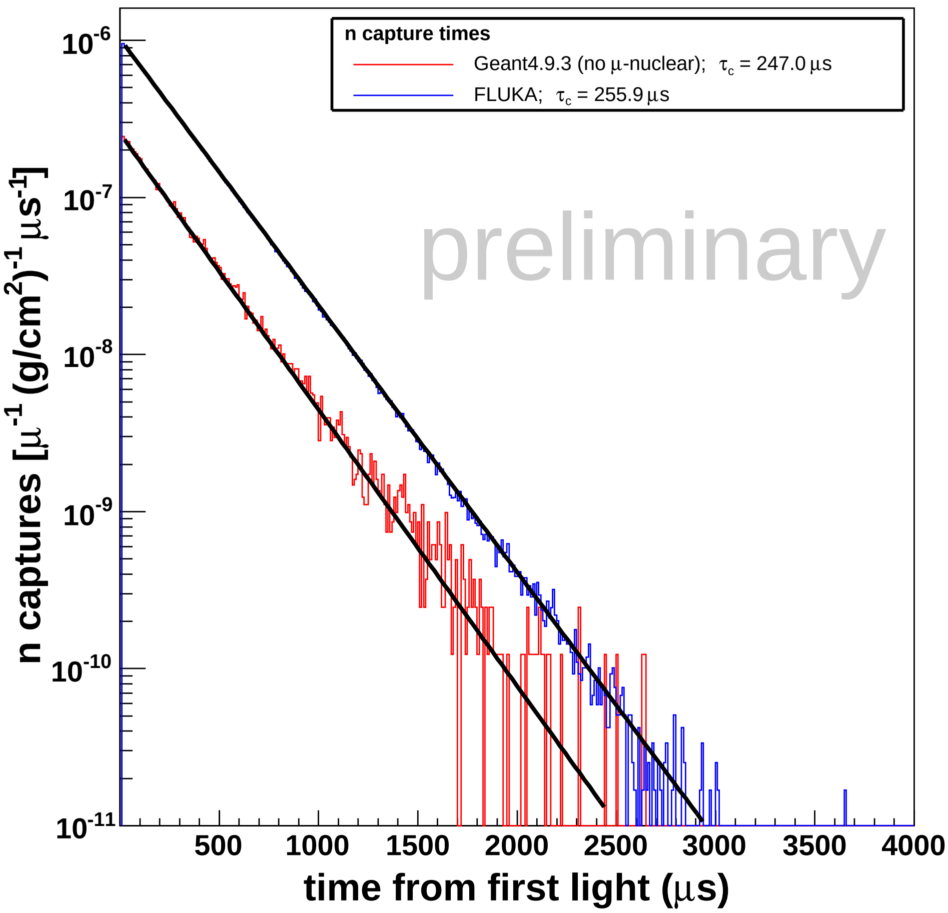

Figure 3: Time from first μ interaction to neutron capture. This distribution is fit by an exponential with average capture time constant displayed in the legend. Borexino unofficially takes data only after around 200 μs and Kamland only after about 1300 μs. It is often attempted to correct the data to obtain fluxes in these venues.

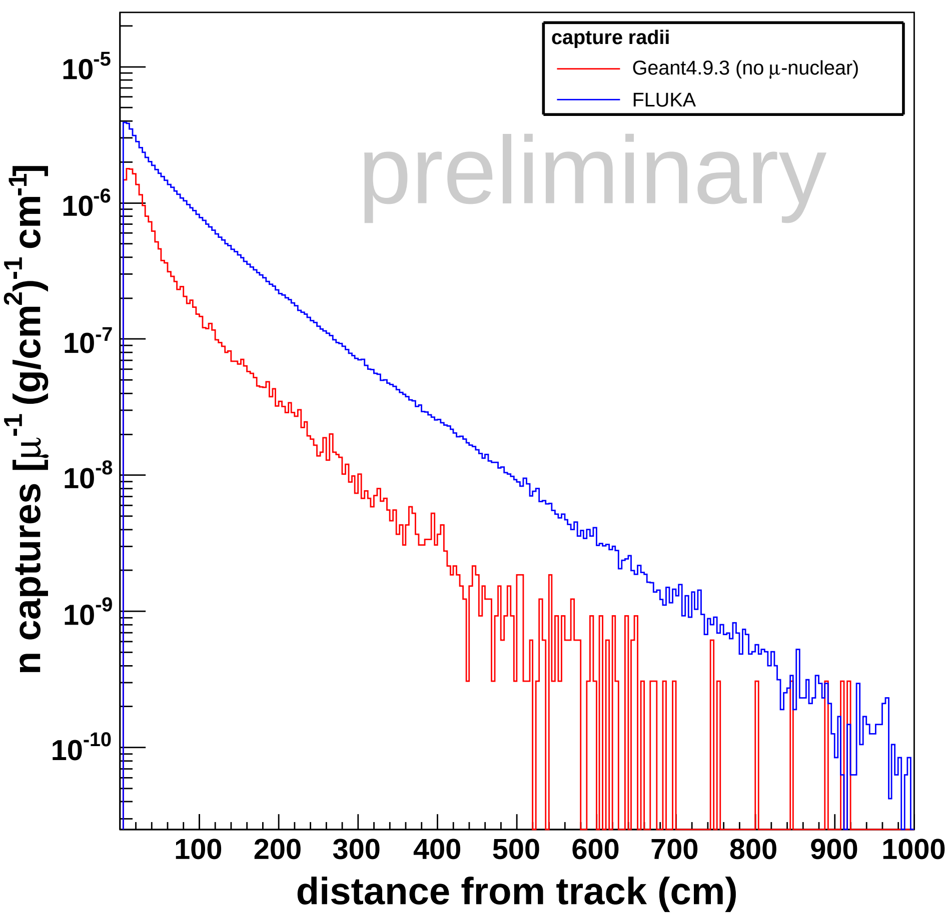

Figure 4: Position from primary μ track to neutron capture. This is a possible observable accessible at Borexino and Kamland, albeit for only very delayed captures.

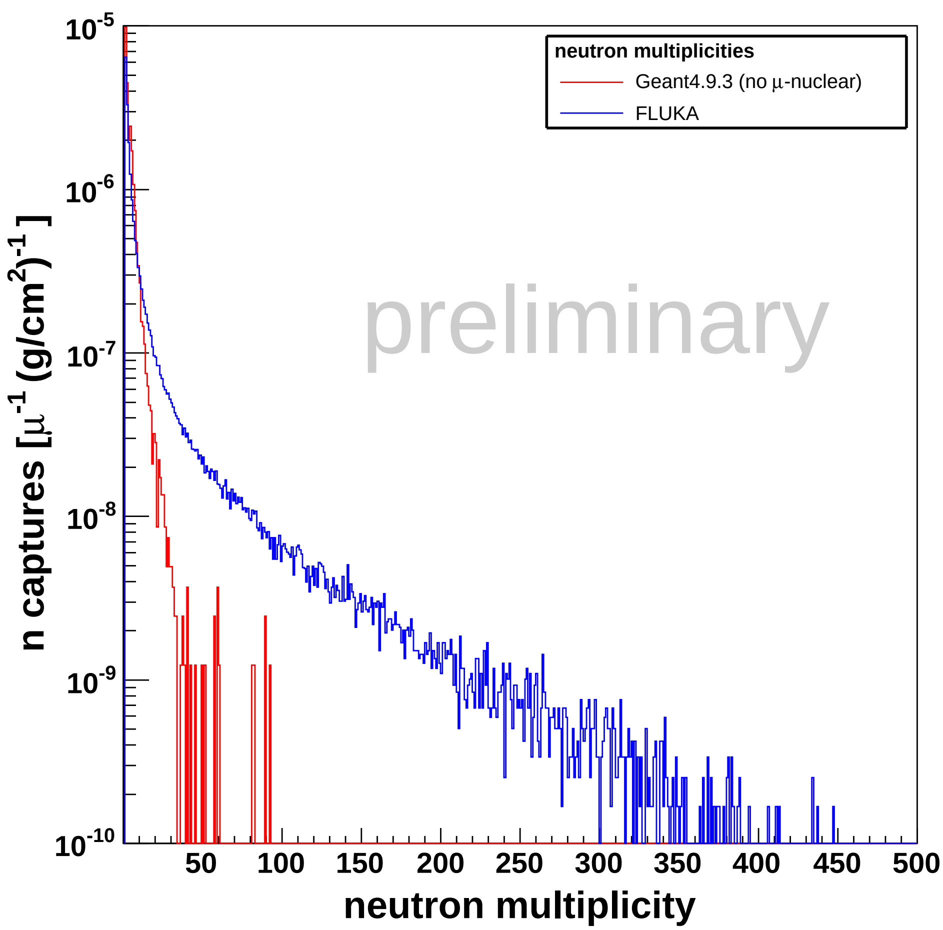

Figure 5: Neutron capture multiplicity. The number of neutrons in a given event which eventually capture.