LUXSim: A GEANT4-based Simulation Framework for the Large Underground Xenon Detector MELINDA SWEANY, UC Davis, LUX COLLABORATION — The Large Underground Xenon (LUX) detector is a 100 kg target mass WIMP detector capable of achieving a cross section sensitivity of $7\mathrm{x}10^{-42}\mathrm{cm}^2$ for a 100 GeV WIMP. LUX will commence operations in early 2010 at the Sanford Underground Lab in Lead, South Dakota. The most important consideration in building LUX is the minimization and characterization of neutron backgrounds that could emulate a WIMP signal. In order to accurately determine the level of background, we require a precise simulation of radioactive sources embedded within the detector components. Traditionally in GEANT4 simulations, particle beams have been distinct from the detectors, as is typical in high energy or medical applications. We are developing a GEANT4 simulation framework, LUXSim, capable of generating primary particles within detector components from independently specified activities of radionuclei. Geometry classes are also recast so that tracking information within individual components, such as energy depositions, is easily stored without specifying each as a sensitive detector. In addition, LUXSim includes built-in commands for changing detector type, activities within components, and the level of information storage for each detector component, so that recompilation is not necessary. The basic class structure of LUXSim will be described, including examples of usage, and preliminary results will be presented.

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