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Simulations of Muon-Induced Backgrounds to nEXO

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The nEXO experiment is being designed to search for neutrino-less double beta decay ($0\nu\beta\beta$) in a 5000 kg liquid xenon time projection chamber (TPC) enriched to the isotope xenon-136. nEXO's > 10^{28} year sensitivity reach to the $0\nu\beta\beta$ half-life requires extremely low backgrounds from external sources. Backgrounds are dealt with in part by surrounding the TPC with an outer detector (OD) in the form of a cylindrical water tank. The OD serves both to passively shield from incident particles like gammas and neutrons from local U and Th decays and also to actively veto cosmogenic backgrounds by detecting the Cherenkov light of passing muons using photomultiplier tubes (PMTs). These muons undergo spallation processes on local nuclei sending neutrons into the TPC and activating the xenon.

In this talk, we discuss the simulation of incident cosmic muons and the neutrons they induce. Following the precursory work of simple Monte Carlo muon simulations, FLUKA was deployed to simulate the muonic backgrounds with more comprehensive physics. The simulation techniques will be discussed along with preliminary simulation results.

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