

Using Chroma ray-tracing software to determine the trigger conditions for nEXO's Outer Detector

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The nEXO experiment is designed with the goal of observing neutrinoless double beta decay by placing 5000kg of liquid xenon (enriched to 90% in ^{136}Xe) within a time projection chamber (TPC). To achieve the desired sensitivity to a neutrinoless double beta decay half-life of 1.35×10^{28} years, experimental backgrounds need to be characterized and reduced as much as possible. To limit cosmogenic backgrounds, the TPC is immersed in a large water tank over two kilometres underground. Despite these efforts, cosmogenic muons can still cause backgrounds at this depth. It is therefore important to be able to identify which muons pass close enough to the TPC to cause this background. Some of this can be achieved by tagging cosmic muons passing through the water tank using the ~ 125 photomultiplier tubes (PMTs) in order to detect Cherenkov radiation caused by muons. Chroma, a ray tracing simulation software, is being used to optimize the Outer Detector design. A crucial part of this simulation is understanding and verifying the optical properties used in Chroma. The reflection, refraction, absorption, and detection of photons are all properties which are crucial to the integrity of the simulation. Once these properties are incorporated in the simulation, we will be able to determine our trigger conditions.

This talk summarizes the ways in which we verify the optical parameters used in Chroma for nEXO's Outer Detector and determine trigger conditions, balancing efficiency and PMT backgrounds.

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