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(POS-3) Watching the Watchers: Monitoring the nEXO's Muon Veto System

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Large-volume, low-background noble-liquid-based detectors have emerged as a leading technology in neutrino science and dark matter physics. A requirement for these experiments is minimizing environmental radiation, including those caused by neutrons from cosmic radiation. This can be achieved by tagging passing muons, which allows vetoing the data stream and subsequent background events.

nEXO is a neutrinoless double beta ($0\nu\beta\beta$) decay search using a 5-tonne liquid xenon time projection chamber enriched in the isotope xenon-136. With a projected half-life sensitivity of 10^{28} years, nEXO requires extremely low background levels. The experiment incorporates a 12.3-meter diameter, 12.8-meter high water tank containing 1.5 kilotonnes of ultra-pure water, equipped with 125 photomultiplier tubes (PMTs).

To maintain the efficiency of muon veto systems, regular monitoring of water quality and the performance of the PMTs is essential. Monitoring of the veto system relies on optical methods, where a controlled light source emits photons, and the response of the PMTs is analyzed to evaluate both their functionality and the quality of the water.

A monitoring system is being developed for the muon veto system of the nEXO experiment. It uses optical fibers to deliver laser light to diffuser balls placed within the tank. I will discuss the conceptual design of the system, its requirements, the simulation results, and the current development status of the prototype.

Keyword-1

nEXO

Keyword-2

Muon Veto

Keyword-3

Monitoring System

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