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Neutrino Physics Needs a New Generation of Bubble Chambers with Light Nuclear Targets

Wednesday, 29 March 2023 09:00 (20 minutes)

Long-baseline neutrino oscillation experiments present some of the most compelling paths towards beyond-the-standard-model physics through measurement of PMNS matrix elements and observation of the degree of leptonic CP violation. State-of-the-art long-baseline oscillation experiments, like NOvA and T2K, are currently statistically limited, however uncertainty in neutrino-nucleus scattering represent important sources of systematic uncertainty and will fundamentally affect the precision of future experiments like DUNE and Hyper-K, if not addressed. Neutrino cross section uncertainties can be reduced through high statistics measurement of neutrino interactions on light nuclei, but creating a detector with an appropriate light target has proved elusive since the hydrogen bubble chambers designed of the last century. Modern chamber-based dark matter detectors like the Scintillating Bubble Chamber have demonstrated that advances in sensor technology, computing, and automation would allow a modern bubble chamber to fully utilize the megawatt scale intensity LBNF beam through the use of high resolution and high speed cameras, novel triggering, and machine-learning based event reconstruction. This talk will review the broad physics program for the construction of a bubble chamber for use with neutrinos supplied by Fermilab.

Submitted on behalf of a Collaboration?

No

Participate in poster competition?

No

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