Canadian Association of Physicists

Association canadienne des physiciens et physiciennes

Contribution ID: **3841** Type: **Oral not-in-competition (Graduate Student) / Orale non-compétitive (Étudiant(e) du 2e ou 3e cycle)**

Ion trapping for a Ba-tagging technique

Thursday 22 June 2023 09:00 (15 minutes)

nEXO is a proposed experiment that aims to detect neutrinoless double beta decay (0vbb), a Standard Model (SM) forbidden, rare nuclear process that, if observed, would have profound implications for fundamental physics. Such decay would be the first experimental evidence of the Majorana nature of neutrinos (i.e., neutrinos would be their own antiparticles), provide insights into the neutrino mass hierarchy, and also potentially explain the matter-antimatter asymmetry observed in the universe. nEXO will search for 0vbb in 5 tonnes of liquid xenon enriched in the double-beta decaying isotope Xe-136.

A technique called Ba-tagging has been proposed as a potential future upgrade path to nEXO, identifying the Xe-136 bb-decay daughter nucleus, Ba-136. Detection of a Ba-136 ion at the site of a possible 0vbb event will effectively exclude all non-double-beta decay background events and facilitate the unambiguous verification of a Xe bb-decay event. This talk will discuss the potential benefits of Ba-tagging for the upgraded nEXO experiment and focus on the latest results for the Ba-tagging subsystems, a linear Paul trap, and a time-of-flight mass spectrometer currently being commissioned at McGill University.

Keyword-1

Barium-tagging

Keyword-2

Neutrinoless double-beta decay

Keyword-3

nEXO Experiment

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Session Classification: (DNP) R1-5 Nuclei and Neutrinos II | Noyaux et neutrinos II (DPN)

Track Classification: Technical Sessions / Sessions techniques: Nuclear Physics / Physique nucléaire (DNP-DPN)