Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **3326** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) Commissioning of a linear Paul ion trap for Ba-tagging

Wednesday 8 June 2022 11:45 (15 minutes)

nEXO is a proposed 5-tonne experiment that will search for neutrinoless double-beta decay ($0\nu\beta\beta$) in liquid xenon enriched in the isotope Xe-136. Detection of such an event would significantly improve our understanding of neutrinos and potentially explain the matter-antimatter asymmetry. An observation of $0\nu\beta\beta$ would indicate the violation of the lepton number, a conserved quantity in the Standard Model, as well as demonstrate the Majorana nature of neutrinos.
The 3D event localization in a nEXO-type detector offers the potential to differentiate a double-beta decay event from environmental backgrounds by extracting some liquid xenon from the detector volume and identifying the Xe-136 double-beta decay daughter Ba-136. This is referred to as Ba-tagging, a technique being developed as a potential future upgrade to nEXO. As a part of the Canadian Ba-tagging effort, a linear Paul trap is being developed to filter, cool, and trap ions extracted from the detector volume. Ions first pass through a quadrupole mass filter, calibrated to selectively allow only ions with the correct mass-to-charge ratio. Filtered ions will be collisionally cooled using helium buffer gas and trapped in a buncher. At a later stage, barium ions will be identified using laser fluorescence spectroscopy. The quadrupole mass filter, as well as the linear Paul trap, are currently being commissioned at McGill University. Its design and results of initial testing will be presented.

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Session Classification: W1-6 Nuclei and Neutrinos (DNP) | Noyaux et neutrinos (DPN)

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