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Barium Tagging from Xe Gas as an Upgrade to the nEXO Experiment

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The proposed nEXO experiment will search for neutrinoless double beta decay (0νββ) of Xe-136 in a 5-tonne enriched liquid xenon TPC. If observed, 0νββ will reveal the Majorana nature of neutrinos and show that lepton number conservation is violated in weak decays. nEXO's sensitivity is projected to reach beyond 10^28 years (at 90% confidence level) probing for effective Majorana neutrino masses as low as 4.7 meV –20.3 meV. Searches for such extremely rare events require excellent background suppression and rejection methods to achieve high sensitivities. The identification or "tagging"of the Xe-136 ββ decay daughter Ba-136 offers a very powerful discrimination technique in 0νββ searches and is being investigated as a potential upgrade for nEXO. Furthermore, a positive confirmation of a ββ event is provided by tagging the Ba daughter. By leveraging the 3D reconstruction of the time-projection chamber (TPC), a sample of xenon surrounding a candidate 0νββ event can be extracted to tag the Ba daughter, if present. To this end, an apparatus is being developed to take a gaseous sample from a liquid Xe environment and transport a Ba ion to high vacuum using an RF ion funnel. The ion is then trapped and identified via laser-fluorescence and mass spectroscopy. The status of the Ba-tagging effort in Canada is presented in this talk.

Primary author: Dr CHAMBERS, Christopher

Co-authors: BRUNNER, Thomas (McGill University); COLLISTER, Rob (Carleton University); GONZALEZ ESCUDERO, Laura (McGill University); LAN, Yang (TRIUMF); MURRAY, Kevin; RASIWALA, Hussain (McGill University)

Presenter: Dr CHAMBERS, Christopher

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