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Next-generation neutrino-less double beta decay search with LXe

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Following the success of SNO, recognized internationally with the award of the 2015 Noble Prize in Physics, the underground laboratory has been expanded to the new SNOLab facility which is designed to house a variety of experiments that will investigate the properties of neutrinos and dark matter. The EXO collaboration is developing detection techniques that will enable a precision search for the neutrino-less double beta decay. A definitive discovery of this process would provide new information on the properties of neutrinos, helping to determine the absolute mass scale. The double beta decay of Xe-136 produces a Ba-136 ion that is the only element for which there is experimentally demonstrated single-ion detection and identification capability aka tagging. However, applying efficiently the Ba ion tagging technique to a massive cryogenic TPC remains a challenge. EXO-Carleton focuses on a R&D program aimed at developing, optimizing and characterizing a probe for ion collection from a LXe TPC. The talk will present the challenges that the next generation neutrino-less double beta decay experiments are facing as well as the discovery potential of nEXO. It will also review the progress toward an efficient Ba ion tagging technique, with emphasis on future Canadian contributions.

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