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The Canadian search for neutrinoless double beta decay in xenon

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Neutrinos are the most abundant know particle with mass in our Universe. Despite their abundance, our knowledge about neutrinos remains incomplete. For example, we do not know any of the masses of the three neutrinos –a unique quantity of fundamental particles! Furthermore, whether neutrinos are Dirac or Majorana fermions remains an unresolved question in particle physics with fundamental implications on the origin of matter and the evolution of our Universe. A promising approach to probe for the Majorana nature of the neutrino is to search for lepton-number violating neutrinoless double decay (0νββ). An observation of this decay would necessarily imply that neutrinos are Majorana particles and prove the existence of physics beyond the Standard Model of particle physics. For this reason, the search for 0νββ has been identified as high priority in national and international strategies.

The nEXO collaboration developed an advanced conceptual design of a detector to search for 0νββ in a single-phase time-projection chamber containing 5 tonnes of liquid xenon enriched to 90% in the ββ-decaying isotope Xe-136. Very recently, the US Department of Energy announced its decision, based on budgetary constraints only, to advance only a competing experiment to construction while continuing the R&D program for nEXO. We see this turn in the US approach as an exciting possibility for Canada to take leadership and realize a flagship xenon-based 0νββ experiment at SNOLAB. To seize on this opportunity, we are designing a strategy to recruit new collaborators across Canada and internationally, and exploring pathways to fund the experiment.

In this talk we will present the status of our efforts to build the Canadian-sited project and we welcome new collaborators to join our exciting quest to unravel the mystery of the neutrino using xenon-detector technology.

Keyword-1

Neutrinoless double beta decay

Keyword-2

SNOLAB

Keyword-3

Neutrino

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