PHYSICS AND ASTRONOMY
COLLOQUIUM

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"EXO – Searching for a Neutrinoless Double-Beta Decay"

Abstract

Despite tremendous progress in understanding the fundamental properties of neutrinos over the past decades, several key questions remain unanswered. In particular, we do not yet know if neutrinos are Majorana particles (i.e., are neutrinos and antineutrinos identical?). The most sensitive experimental probe of the Majorana nature of the neutrino is to search for the lepton-number violating neutrinoless double-beta decay ($0\nu\beta\beta$). A positive observation of this decay mode would confirm that neutrinos are Majorona particles and could allow the determination of the absolute neutrino mass scale from the half-life of the decay. The Enriched Xenon Experiment is currently searching for $0\nu\beta\beta$ decays in 136Xe with the EXO-200 detector, and has provided one of the most sensitive limits on the half-life of this decay ($T1/2>1.1 \times 1025$ yr at 90% C.L.).

In order to increase the sensitivity to $0\nu\beta\beta$ decays, the Enriched Xenon Experiment is developing a new detector, called nEXO, which will deploy 5 tonne of liquid xenon, enriched in the isotope 136Xe. In order to push nEXO's limit of sensitivity, new technologies, such as Silicon PhotoMultiplier (SiPM), are being developed. In addition, innovative methods are being investigated to extract and identify the 136Xe $\beta\beta$-decay daughter 136Ba, which would allow an almost background free measurement of $0\nu\beta\beta$. The nEXO detector is designed to improve current measurements by at least one order of magnitude, and it is planned to be located at SNOLAB.

The latest results from EXO-200 will be presented in this talk along with the future prospects and developments of nEXO.

Wednesday, November 23, 2016
3:00 p.m.
Elliott Building
Room 167