KEK WNSC seminar

Speaker: **Dr. Ryan Ringle**
(National Superconducting Cyclotron Laboratory, Michigan State University)

Title: **Advancing Penning trap mass spectrometry of rare isotopes at the LEBIT facility**

∗ The seminar will be given in *English.*

Date: From 13:30 on July 2, 2018

Place: RIBF bldg. R203

Abstract

The Low-Energy Beam and Ion Trap (LEBIT) facility [1] at the National Superconducting Cyclotron Laboratory (NSCL) remains the only facility that employs Penning trap mass spectrometry for high-precision mass measurements of rare isotopes produced via projectile fragmentation. This powerful combination of a fast, chemically insensitive rare isotope production method with a high-precision Penning trap mass spectrometer has yielded mass measurements of short-lived rare isotopes with precisions below 10 ppb across the chart of nuclides. The most recent LEBIT measurement campaigns have focused on fundamental interactions such as $T = 1/2$ mirror decay Q-values (^{11}C [2] and ^{21}Na [3]), and superallowed β-decay Q-values (^{14}O [4]), the nuclear mass surface near $N = 40$ ($^{68,\ 69}$Co [5]), and the rp-process (^{56}Cu [6]). LEBIT has also recently been used to measure the Q-values of several neutrinoless $\beta\beta$-decay candidates and highly forbidden decays, using ions produced offline with local ion sources.

In order to expand the experimental reach of Penning trap mass spectrometry to nuclides delivered at very low rates, the new Single Ion Penning Trap (SIPT) has been built. SIPT uses narrowband FT-ICR detection under cryogenic conditions to perform mass measurements of high-impact candidates, delivered at rates as low as one ion per day, with only a single detected ion. Used in concert with the existing LEBIT 9.4-T time-of-flight mass spectrometer, the 7-T SIPT system will ensure that the LEBIT mass measurement program at NSCL will make optimal use of the wide range of rare isotope beams provided by the future FRIB facility.

* This material is based upon work supported by the National Science Foundation under Contract No. PHY-1102511 and PHY-1126282.

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[3] M. Eibach *et al.*, Phys. Rev. C **92**, 045502 (2015).
[4] A.A. Valverde *et al.*, Phys. Rev. Lett. **114**, 232502 (2015).
[5] C. Izzo *et al.*, Phys. Rev. C **97**, 014309 (2018).
[6] A.A. Valverde *et al.*, Phys. Rev. Lett. **120**, 032701 (2018).

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