Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **2535** Type: **Oral (Non-Student) / Orale (non-étudiant(e))**

Mass Measurements of Neutron-Rich Indium Isotopes for Enhanced r-Process Studies

Wednesday 5 June 2019 13:45 (15 minutes)

The astrophysical *r*-process is responsible for the production of approximately half of the observed abundance of atomic nuclei heavier than iron. A complete understanding of the *r*-process requires reliable atomic mass data for neutron-rich isotopes far from stability, where experimental access is often limited by low production rates, high rates of contamination, and short half-lives. As a result, *r*-process simulations rely heavily on phenomenological models which predict atomic masses using extrapolations from known masses. Such predictions come with a relatively high degree of uncertainty, limiting the ability of *r*-process simulations to constrain the astrophysical conditions required to obtain the observed elemental abundances. In particular, recent sensitivity studies have demonstrated that reducing current uncertainties in the masses of neutron-rich indium isotopes would play an important role in constraining astrophysical models at the second *r*-process abundance peak around *A*=130.
TRIUMF's Ion Trap for Atomic and Nuclear science (TITAN) is among the world leaders in achieving precise and accurate mass measurements of exotic isotopes. The recent addition of a Multiple-Reflection Time-of-Flight (MR-TOF) mass spectrometer has further expanded the measurement capabilities at TITAN, combining high resolution with fast measurement times to achieve high-precision mass measurements of rare isotopes previously inaccessible due to high contamination rates and short half-lives. Most recently, the TITAN MR-TOF was used to measure the masses of neutron-rich indium isotopes from *A*=125-134. This is the first time the masses of ^{133,134}In have ever been measured. Additionally, several isomeric state masses with half-lives as short as 5 ms were resolved from the ground state masses in these measurements. The results of these measurements will be presented along with a discussion of their impact for understanding the astrophysical *r*-process.

Author: Dr IZZO, C. (TRIUMF)

Co-authors: BRUNNER, T. (McGill University); DIETRICH, K. (TRIUMF); DILLING, J. (triumf/UBC); DILLMANN, I.; DUNLING, E. (TRIUMF); FUSCO, D. (TRIUMF/University of Waterloo); GWINNER, G. (University of Manitoba); JACOBS, A. (TRIUMF); KOOTTE, B.; KRIPKÓ-KONCZ, G. (Justus-Liebig University Giessen); LAN, Y. (TRIUMF); Prof. LASCAR, D. (Northwestern University); LEACH, K.G. (Colorado School of Mines); LEISTENSCHNEIDER, E. (TRIUMF); LYKIARDOPOULOU, M. (TRIUMF); MUKUL, I. (TRIUMF); PAUL, S.F. (TRIUMF); REITER, M.P. (TITAN); Prof. THOMPSON, R. (University of Calgary, Canada); TRACY, JR., J.L. (TRIUMF); WIESER, M. (University of Calgary); KWIATKOWSKI, A.A. (TRIUMF)

Presenter: Dr IZZO, C. (TRIUMF)

Session Classification: W2-8 Nuclear Astrophysics II (DNP) | Astrophysique nucléaire II (DPN)

Track Classification: Nuclear Physics / Physique nucléaire (DNP-DPN)