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

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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.

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