

Mass measurements of rare isotopes for improved rp-process modeling at the LEBIT facility

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Type I X-ray bursts are frequently observed thermonuclear explosions on the surface of neutron stars that accrete matter from a nearby companion star. The bursts are powered by nuclear reaction sequences that transform accreted hydrogen and helium into heavier elements via the 3α -reaction, the α p-process, and the rapid proton capture process (rp-process). Nuclear data on neutron deficient rare isotopes are needed to predict burst light curves that can then be compared with observations to constrain system parameters and neutron star properties. A recent sensitivity study on type-I x-ray bursts [1] has shown that the light curves and calculated final ash abundances are significantly affected by the current mass uncertainties in many proton rich nuclei. To this end, a recent experimental campaign at the Low Energy Beam and Ion Trap (LEBIT) facility at the National Superconducting Cyclotron Laboratory (NSCL) [2] has set out to measure the masses of several of these nuclei. In this talk, I will discuss recent mass measurements of importance for rp-process modeling including ^{56}Cu [3], ^{51}Fe [4], and ^{61}Zn [in progress] as well as several more planned measurements of ^{27}P , ^{24}Si , and $^{80-82}\text{Zr}$.

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