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A Laser Ablation Source for LEBIT

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The use of Penning traps in nuclear physics has brought unprecedented precision to nuclear mass measurements. As the only Penning trap system installed at a projectile-fragmentation facility, the LEBIT facility [1] at NSCL has played a unique role in the mass measurement field, offering access to elements that are difficult to produce at other rare-isotope-beam facilities. The high level of precision achieved with LEBIT is used for measurements vital for nuclear structure, nuclear astrophysics, and the study of fundamental interactions.

LEBIT has recently expanded its capability with the addition of a Laser Ablation Source. This source provides access to a wide range of carbon cluster ions, which cover the whole nuclear chart and have essentially no mass uncertainty by definition of the atomic mass. Carbon cluster ions therefore are ideal for rigorous testing and calibration of the LEBIT system, as well as for use as reference masses during experiments, so that the masses of ions of interest can be measured to the highest possible precision. The laser source also provides simple, efficient access to other stable and long-lived isotopes of interest. This has allowed for several measurements important for neutrino physics [2-5]. Here I will present a description of the design and capabilities of this new ion source.

[1] M. Redshaw, et al., Nucl. Instrum. Meth. B 317, 510 (2013).

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[3] D. L. Lincoln, et al., Phys. Rev. Lett. 110, 012501 (2013).

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[5] S. Bustabad, et al., Phys. Rev. C 88, 035502 (2013).

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