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Progress on TITAN's Cooler PEnning Trap

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The masses of radioisotopes is a fundamental property which is critical to a number of fields of study, and Penning traps have proven to be an important tool in measuring these masses to high precision. The TITAN facility at TRIUMF has achieved many successes in this field including a successful measurement of the mass of 11Li, the shortest-lived nuclide to ever be measured in such a trap. There is always a trade-off between half-life and precision, and masses off short-lived isotopes are necessary inputs for fields ranging from tests of the unitarity of the CKM matrix, to studies of r-process nucleosynthesis.

The precision of these measurements can be maximized by charge-breeding the isotopes to highly ionized states by utilizing the high-energy electron beam of an Electron Beam Ion Trap (EBIT). The EBIT has been found to increase the energy spread of the ion bunch sent to the measurement Penning trap for mass measurement. However, the improvement due to charge-breeding will be greatest if we limit this energy spread to $\sim$1eV/q. For this reason, TITAN is developing a Cooler PEnning Trap (CPET), which will trap the charge-bred ions with a large acceptance, and cool them to appropriate energies prior to mass measurement. Since highly charged ions would charge exchange with a buffer gas, cooling will be accomplished by trapping the ions in the same region as a simultaneously trapped plasma of electrons. Recent steps toward implementing this trap in the radioactive beam-line will be discussed.

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