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Mass Measurements with TITAN: Capabilities and Progress

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Nuclear and atomic masses factor into almost every branch of physics. In nuclear physics and nuclear astrophysics, masses contribute to our understanding of fundamental symmetries and explosive nucleosynthesis, just to name a few applications.
TRIUMF's Ion Trap for Atomic and Nuclear science (TITAN) has been built to study exotic, short-lived nuclei. The TITAN facility consists of three main ion traps: a gas-filled RadioFrequency Quadrupole (RFQ) trap that cools and bunches continuous beam from TRIUMF's ISAC facility, an Electron Beam Ion Trap (EBIT) which charge breeds ions in advance of their mass measurement, and a Measurement PEnning Trap (MPET) which makes precision mass measurements via the Time-of-Flight ion cyclotron resonance method.
In addition to the ion traps currently in operation, TITAN is commissioning two additional ion traps to assist in the goal of precision mass measurements. The energy spread of the charge bred ion bunch coming from the EBIT adversely affects the precision of mass measurements in MPET. A new Cooler PEnning Trap (CPET) seeks to cool highly charged ion bunches via the Coulomb interaction with a simultaneously trapped electron plasma. The cooled iopn bunch can then be sent to MPET for precision mass measurement. TITAN's other trap is a Multi-Reflection Time-of-Flight mass spectrometer (MR-ToF) which is designed to provide a mass resolving power of greater than 1 part in 10^5 (an improvement of more than an order of magnitude over ISAC's mass separator). Both CPET and the TITAN MR-ToF are currently being tested offline before being integrated into the TITAN beamline.
Recent upgrades to TITANs capabilities, such as the ability of the EBIT to be used for isobaric separation, status of the MR-ToF and CPET, as well as updates on the state of mass measurements with TITAN will be discussed.

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