Precision atomic and nuclear physics experiments with ion traps at TITAN

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The atomic mass provides a snapshot of the total interaction among every constituent particle. This manifestation of the nuclear force reveals the evolution of nuclear shells (analogous to electron shells) and exotic structures in radioactive nuclides. Moreover, mass dictates the pathways accessible in stellar burning, influencing how the elements were formed. The highest-precision mass measurements are critical inputs into rigorous tests of the Standard Model. This precision is achieved through ion-trapping techniques.

Adapted from atomic physics, ion traps offer precision and versatility to achieve increasingly sophisticated manipulation and storage at accelerator-based facilities. TRIUMF's Ion Trap for Atomic and Nuclear science (TITAN) combines five ion traps for a range of studies of radioactive ions, from precision mass spectrometry to studies of"spectator" electrons in fundamental decays. A selection of recent results will be presented.

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