DECAY SPECTROSCOPY OF HIGHLY CHARGED RADIOACTIVE IONS WITH TITAN AT TRIUMF

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For modes of electroweak decay such as electron capture (EC) and internal conversion (IC), the spatial distribution of the electron cloud of the atom plays a major role in the decay probability. By successively removing electrons from these systems the decay probability is altered dramatically, thus changing the transition rates. In some cases, this can increase or decrease the decay rates by several orders of magnitude. These effects are particularily important for nucleosynthesis in hot, ionizing environments, as well as investigations into the fundamental nature of the electroweak interaction. Due to significant technical challenges of generating and storing highly charged ions (HCIs), studies on these decay modes for HCIs are rare, and in the few cases that have been measured using heavy-ion storage rings, some interesting and puzzling results have been observed.

With the commissioning of the TITAN decay spectroscopy setup at TRIUMF, nuclear decay properties of HCIs can now be studied in ion-traps for the first time. This apparatus consists of a 6 Tesla, open-access electron-beam ion-trap (EBIT), surrounded radially by up to 7 low-energy photon detectors that are separated from the trap by thin Be windows. To date, the commisioning measurements have focused on the effects of 25+ to 35+ charge states on EC and IC decay of In and Cs ions. Results from these experiments, as well as recent techincal upgrades to the TITAN facility to further this experimental program, will be presented.