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Production and Characterization of Highly Charged Alkali Ions from the TITAN Electron Beam Ion Trap

Highly Charged Ions (HCIs) enable increased precision when measuring the masses of short-lived radioactive ions. The TRIUMF's Ion Trap for Atomic and Nuclear Science (TITAN) facility receives radioactive, singly charged ions (SCIs) from the ISAC facility before charge-breeding them to HCIs. Specifically, the TITAN Electron Beam Ion Trap (EBIT) generates the higher charge states, while the Measurement Penning Trap (MPET) measures the mass of the ion of interest. Despite previous successful experimental campaigns, the EBIT has presented operational challenges preventing new experiments using HCIs. Several aspects of the EBIT including the electron gun and ion transport optics were recharacterized to assess the status and limitations of the EBIT. Consequently, the EBIT has now been able to charge-breed residual gas, argon, and alkalis. Time-of-flight spectra measurements have shown charges up to 10+ for 85Rb. This paper presents a general description of the TITAN layout, the experimental setup, and the results demonstrating the production of HCIs from alkali SCIs. The promising results will enable the delivery of radioactive HCIs to MPET in late 2023 or early 2024.

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Yes

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