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Commissioning a Laser Ablation Ion Source for TITAN Mass Spectroscopy

The use of a Laser Ablation Ion Source (LAS) can bring a lot of flexibility and opportunity to mass-spectrometry experiments through the ability to produce a large diversity of ion species compared to other common ion sources. Of particular interest for trap-based mass-spectrometry applications is the potential to produce isobaric calibrants across a wide range of masses or of a specific species. To this end, a LAS is being developed for TRIUMF's Ion Trap for Atomic and Nuclear Science (TITAN)'s platform. TITAN consists of a suite of four ion traps, an RF Quadrupole cooler-buncher (RFQ) Multiple-Reflection Time-of-Flight Mass Spectrometer (MRTOF-MS), an Electron Beam Ion Trap (EBIT) and a Penning trap used for high-precision mass measurements. Having a LAS will benefit all the traps on the platform by providing mass calibrants for on-line experiments with radioactive beams and as a source for off-line experiments and technical development of the traps. The source will use computer-controlled mirrors to move the laser spot across the target and dynamic ion steering adjustments to allow for ionization of multiple species, studies of multiple samples on a single target, and the flexibility to continue developing novel ion target designs and methods. The LAS design has been optimized using SIMION simulations and will be commissioned at the University of Calgary before eventual installation on TITAN. The status of the commissioning will be discussed including characterization of capabilities such as ion species selectivity, ion current and transport efficiency. The addition of this source to TITAN will not only improve the precision of the mass measurements TITAN is built for but also provide opportunities to leverage the TITAN infrastructure and expertise for off-line experiments in diverse fields of research such as medical and environmental studies.

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