

SMI-2023: 14th International Conference on Stopping and Manipulation of Ions and Related Topics



Contribution ID: 43

Type: **Invited talk**

Isobarically purified beams with TITAN's Multiple-Reflection Time-Of-Flight Mass Spectrometer

Tuesday, 9 May 2023 09:30 (30 minutes)

TRIUMF's Ion Trap for Atomic and Nuclear science (TITAN) is specialized in high-precision measurement on exotic nuclei by using different electromagnetic traps. High-precision mass measurements of these isotopes are demanded for studies of nuclear structure and nuclear astrophysics processes, happening for isotopes far away from the valley of stability. However, one of the challenges when studying these rare isotopes at ISOL facilities is the amount of isobaric backgrounds produced from the target. To overcome this, the TITAN MR-TOF-MS applies mass selective Re-Trapping (RT) to be used as an isobar separator for beam purification with a high separation power. The isobarically-purified beam is then sent to the penning trap or other downstream experiments in TITAN. In addition, MR-TOF-MS can be used as its own isobar separator with RT cycles prior to the mass measurements. This will boost the usual 10^4 dynamic range of MR-TOF-MS to 10^8 and thus increasing the sensitivity of the system for detection of nuclei with a very low production yields (0.01 pps of ^{60}Ga [1]). The TITAN MR-TOF MS enables the studies of short-lived and exotic nuclei far away from the valley of stability due to the fast measurement cycles (a few ms) and high sensitivity. In this work, the performance for isobaric purification, the capabilities and latest technical upgrades of MR-TOF-MS will be presented.

[1] S. Paul et al., *Phys. Rev. C* 104 065803 (2021)

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Session Classification: Plenary Session 3