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Nuclear structure and astrophysics studies with TITAN's Multiple-Reflection Time-Of-Flight Mass Spectrometer

TRIUMF's Ion Trap for Atomic and Nuclear science (TITAN) specializes in high-precision measurements and isobaric separation of exotic nuclei using advanced electromagnetic traps. These precise mass measurements are crucial for investigating nuclear structure and studying astrophysical processes involving isotopes far from the valley of stability.

TITAN's Multiple-Reflection Time-of-Flight Mass Spectrometer (MR-TOF-MS) enables the study of short-lived and rare nuclei through its fast measurement cycles (on the order of milliseconds) and exceptional sensitivity. This presentation highlights recent developments and experimental results achieved with the MR-TOF-MS at TITAN. The recent results include first-time mass measurement of neutron-rich ^{83}Zn and ^{86}Ga nuclei near neutron shell closure of $N = 50$ and $^{136-138}\text{Sn}$ isotopes near $N = 82$ and their implications for studying the 1^{st} and 2^{nd} abundance peaks in the rapid neutron capture process (r -process) [1,2].

[1] A. Jacobs et al., Physical Review Letters 134 (2025)

[2] A. Mollaebrahimi et al., Physical Review Letters (under review)

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