

Mass Measurements at TRIUMF's Ion Trap for Atomic and Nuclear science (TITAN)

TRIUMF's Ion Trap for Atomic and Nuclear science (TITAN) is located at the Isotope Separator and Accelerator (ISAC) facility, Vancouver. Titan is a multiple ion trap system capable of performing high-precision mass measurements and in-trap decay spectroscopy. In particular TITAN has specialized in fast Penning trap mass spectrometry of short-lived exotic nuclei using its Measurement Penning Trap (MPET). In order to reach the highest possible precision, ions can be charge bred into higher charge states by an Electron Beam Ion Trap (EBIT), reducing the required excitation time for a needed precision. Thus using highly charged ions, TITAN is capable of performing mass measurements of short lived heavy species with high precision using the well-established TOF-ICR technique.

Although ISAC can deliver high yields for some of the most exotic species, many measurements suffer from a strong isobaric background distinct to the ISOL method of radio active beam production. This background often prevents the high precision measurement of the exotic species of interest.

To overcome this limitation an isobar separator based on the Multiple-Reflection Time-Of-Flight Mass Spectrometry (MR-TOF-MS) technique has been installed recently at TITAN, similar to other ion trap on-line facilities. At TITAN the mass selection is achieved using dynamic re-trapping of the species of interest after a time-of-flight analysis in an electrostatic isochronous reflector system. Additionally the MR-TOF-MS enables mass measurements of very short-lived nuclides that are weakly produced, complementing TITAN's existing mass measurement program of short-lived exotic nuclei.

In this way TITAN is able to expand its mass measurements towards even more exotic isotopes produced at very low production yields. Results from recent high-precision mass measurements for nuclear structure and nuclear astrophysics will be shown employing singly and highly charged ions with MPET and the new MR-TOF-MS.