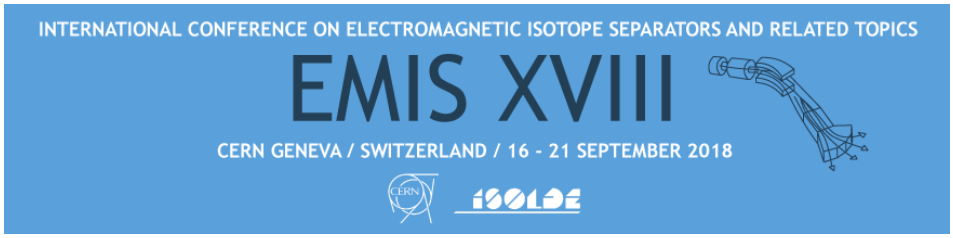

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TITAN's Next Generation of Experimental Setup for Mass Spectrometry of Highly Charged Ions

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Atomic masses are key tools to understand the nature of nuclear forces and structure, fundamental symmetries and astrophysical processes if known with sufficient precision. With the availability of beams of increasingly exotic species, mass spectroscopy techniques have become more challenging. They need to be faster for shorter lifetimes, more sensitive for lower intensities, and sufficiently precise for scientific interest.

The TITAN facility at TRIUMF has been successfully performing precision mass measurements of radioactive nuclei for over a decade. Its mass Measurement Penning Trap (MPET) is designed to probe atomic masses of ions living as short as 10 ms, with low production yields, in the 10^{-7} - 10^{-9} precision range. A powerful way to boost this precision is to charge breed the inspected ion, which is done at TITAN through electron impact ionization in an Electron Beam Ion Trap (EBIT).

The implementation of TITAN's next generation capabilities of performing mass spectrometry on highly charged ions (HCIs) is currently on its final stages. The EBIT has been upgraded to deliver electron beam energies up to 60 keV, which can provide access to bare ions up to Z=65. On the other hand, MPET is being redesigned to perform mass measurements of ions at charge states well beyond +20. It will be integrated into a new cryogenic vacuum system to prevent electron recombination due to ion's interaction with background gas.

We will present our most recent mass spectrometry results employing highly charged ions, as well as details of TITAN's new CryoMPET and EBIT high voltage upgrades, their design concepts, status and future plans.

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