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Multi-element beam delivery with the TRIUMF resonant ionization laser ion source

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The resonant ionization laser ion source (RILIS) has developed into a reliable ion source that allows to ionize a majority of the elements. At TRIUMF's radioactive ion beam facility ISAC - which is short for Isotope Separator and Accelerator facility, a thick isol target is subjected to a primary proton beam from TRIUMF's 500MeV cyclotron for isotope production through fragmentation, fission and spallation. The isotope production target station can receive up to 100uA of protons onto target materials up to 238U. The radioactive isotopes produced need to be ionized in order to be extracted and delivered to experiments. The ion sources available at ISAC are a surface ion source, a gas discharge ion source and a resonant ionization laser ion source. One of the key characteristics of resonance ionization is its element selectivity, its versatility, and high efficiency. By now isotopes from 41 different elements have been ionized with the TRIUMF RILIS, and ionization schemes for another 22 elements have been developed off-line on stable isotopes. Current developments for RILIS aim for higher reliability, shorter setup and switch over time between elements, higher efficiency and improved suppression of non-laser ionized isobars. One way of achieving improved RIB delivery to experiments has been to set up laser ionization of two elements, so that experiments can switch between, laser on/off operation and laser ionization of two different elements. Another operation mode is concurrent laser ionization of two different elements - which is an operation mode that is particularly useful for 225Ac and 225Ra isotope collections.

I will present and discuss several examples of multiple element beam delivery at ISAC for experiments that were conducted in recent years and the instrumental and operational boundary conditions.

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