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(G*) Characterization of the Isobar Separator for Anions for Accelerator Mass Spectrometry measurements

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Accelerator Mass Spectrometry (AMS) provides high sensitivity measurements (typically at or below 1 part in 10^{12}) for rare, long-lived radioisotopes when isobars (other elements with the same atomic weight as the isotope of interest) can be eliminated. In AMS laboratories, established techniques are used for the removal of the interfering isobars of some light isotopes. However, for smaller, lower-energy AMS systems separating the abundant isobars of many isotopes, such as the sulfur-36 in measurements of chlorine-36, remains a challenge. For some heavy isotopes, such as strontium-90 and cesium-135,137, even high energy accelerators are unable to separate the interfering isobars.

The Isobar Separator for Anions (ISA), which has been integrated into a second injection line of the 3 MeV tandem accelerator system at the A. E. Lalonde AMS Laboratory, will provide a universal way to measure rare radioisotopes without the interference of abundant isobars. The ISA is a radiofrequency quadrupole (RFQ) reaction cell system, including a DC deceleration region, a combined cooling and reaction cell, and a DC acceleration region. The deceleration region accepts a mass analyzed beam from the ion source (with energy 20-35 keV) and reduces the energy to a level that the reaction cell can accept. RFQ segments along the length of the cell create a potential well which limits the divergence of the traversing ions. DC rod offset voltages on these RFQ segments maintain a controlled ion velocity through the cell. The cell is filled with an inert cooling gas that has been experimentally selected to provide the lowest ion energy and the highest transmission, and with nitrogen dioxide, a reaction gas chosen to preferentially react with the interfering isobar. In the case of chlorine-36, the sulfur-36 isobar has been shown to be reduced by over 10^6. Preliminary characterization of the ISA and its incoming and outgoing ion beams will be presented.

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