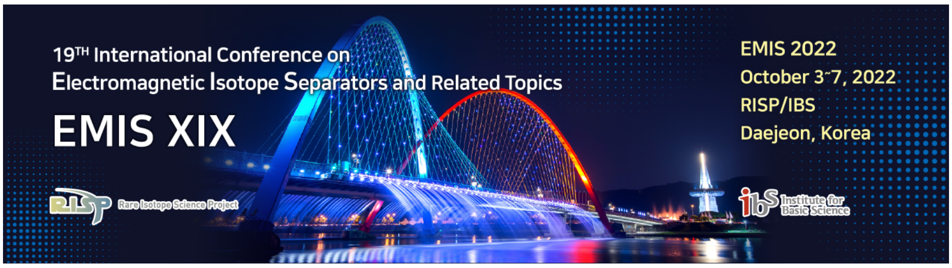

Contribution ID: **102**

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Improved isotope intensity and purity from a new spallation-driven proton-to-neutron converter at ISAC-TRIUMF

Monday, 3 October 2022 12:00 (20 minutes)

A spallation-driven, proton-to-neutron converter target has been developed and irradiated at the ISAC-TRIUMF facility, focusing on the production of radioactive ion beams (RIBs) of neutron-rich fission fragments and limiting by design the production of their neutron-deficient isobaric contaminants. So far, fission fragment RIBs have been produced at ISAC-TRIUMF with the ISOL method by impinging the incoming proton beam onto a 10-cm stack of hundreds of closely packed actinide composite foils in a cylindrical tantalum oven. One important issue that users experience is the presence of neutron-deficient isobaric contamination that frequently dominates the beam of interest and prevents the successful outcome of the experiment. A new proton-to-neutron converter target assembly has been designed with the intent of reducing the in-target production of neutron-deficient isobaric contaminants by generating an intense spallation neutron field from a tungsten converter, positioned just downstream of an annular uranium carbide target. The fast neutrons subsequently induce fission reactions in the actinide material, producing predominantly neutron-rich radioisotopes while limiting the production of the neutron-deficient, spallation-induced reaction products. In addition to the different distribution of produced isotopes, a thermal decoupling between the target and converter components, as well as the reduction of long-lived and highly radiotoxic alpha emitting isotopes offer additional benefits that allow high-power irradiations and more efficient isotope release.
This contribution presents the combined numerical and experimental optimization process that led to the final target design and focuses on the successful online results obtained at the ISAC-TRIUMF facility from several independent irradiation campaigns. The extensive online beam time dedicated to this target has allowed for precise characterization of its performance by exploring a wide parameter space and has already allowed the delivery of more exotic neutron-rich isotope beams of Rb, Cs, Zn and Ga, enabling successful completion of previously unfeasible experiments. Further investigations of Sn isotopes are planned for the summer of 2022.

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