Guidelines for requests of post-accelerated high mass beams

The High Mass Task Force (HMTF) has made substantial progress in developing the techniques to reliably deliver clean beams of charge-bred RIBs to the ISAC accelerator chain.

The improvements include

- reduced stable beam background from the CSB,
- automatic scaling routines for the accelerator chain allowing for precise incremental stepping of the entire accelerator chain through different A/Q,
- improved diagnostics along the accelerator chain
- techniques to separate beam components by A/q and/or time-of-flight in-flight using the ISAC accelerator chain.

The currently established cleaning technique involves the following steps:

- selecting a charge state of the ion of interest for which the stable beam background from the CSB is minimal
- initial cleaning of the beam cocktail using the CSB separator and the RFQ acceleration phase
- after acceleration through the RFQ and DTL section the ions can be stripped to a charge state for which the fewest contaminations are to be expected after stripping (In a few select cases the secondary stripping may not be needed.) with further cleaning using the DSB beamline dispersion bends and TOF.
- acceleration through the SC LINAC

Please note that these techniques are most effective for contaminations with similar A/Q but substantially different mass. Isobaric contaminations coming from the ISAC targets are typically not separated from the beam of interest.

Due to these improvements we invite proposals for experiments using high-mass accelerated RIBs.

In the following we list several guidelines for the current call for proposals:

- start with an average number for the established yield of the isotope of interest.
- assess contaminations from the RIB target from the yield tables.
- assume a 1% efficiency combined for charge breeding to the charge state of interest and low energy beam transport up to the RFQ
- assume a 15% stripping efficiency into the secondary charge state
- assume a 65% transport efficiency through the accelerator chain

Thus, in total one should assume that ~0.1% of the established average yield at the yield station can be delivered to a secondary target in ISAC-2.

The web-tool at (http://www.triumf.ca/research-program/planning-experiments/resources-while-planning) will allow the selection of the first and second charge state and provide information on the likely stable beam contaminants from the CSB in the respective A/Q range.

Please note that each case is special and better transmission numbers may be achievable in some cases. However, if further cleaning of the beam is needed via closing of slits, the total transmission may be further reduced. Thus the numbers above represent conservative estimates for what we feel confident can be delivered to the experiment at this time.

The HMTF will continue to work on further improvements and investigate other cleaning techniques. Existing and forthcoming LOI's will help to guide this process.

TRIUMF through its member universities is also applying for funds to build an EBIS charge breeder, with the goal to improve breeding efficiencies and reduced background which should eliminate the need for secondary stripping in the beam cleaning process. As a result much higher on-target RIB intensities can be expected.