A Helium-Jet Ion Source for commensal operation at NSCL/FRIB.

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Abstract: NSCL is funded by the National Science Foundation to be a national user facility with a mission to provide beams of rare isotopes for researchers from around the world. Hundreds of users come to Michigan State University each year to take advantage of the Laboratory's facilities and explore the nature of nuclear forces that bind nucleons into nuclei and the role of nuclei in the universe.

At present, beams of rare isotopes produced by fast fragmentation can only be used in a single experimental end-station at NSCL. The Helium-Jet Ion Source (HJIS) project is aimed to provide a commensal rare isotope beam by collecting rare isotopes that are not delivered to the main stream user. This will be done by stopping rare isotopes that are deflected off the ion-optical axis during separation process in the NSCL fragment separator.

The stopping of rare isotopes will take place in a compact high-pressure helium cell. The cell provides a stopping thickness of at least 70 atm.cm. The helium gas is mixed with aerosols. The stopped ions are captured by the aerosols and will be transported at a Helium flow of 6000 sccm (in a closed loop system) to a high-temperature plasma-ion source using a long capillary. The ion source has a side-jet, which allows efficient separation of helium without compromising the ionization efficiencies. The ionized rare isotopes are extracted at 60 KeV and purified by using a high-resolution isotope separator system. The separator system consists of a 180-degree dipole magnet with matching optics. The eventual goal is to then cool these beams using a RFQ cooler and transport the rare isotopes to one of the low-energy experimental end stations or the NSCL re-accelerator, as shown in the schematic picture.

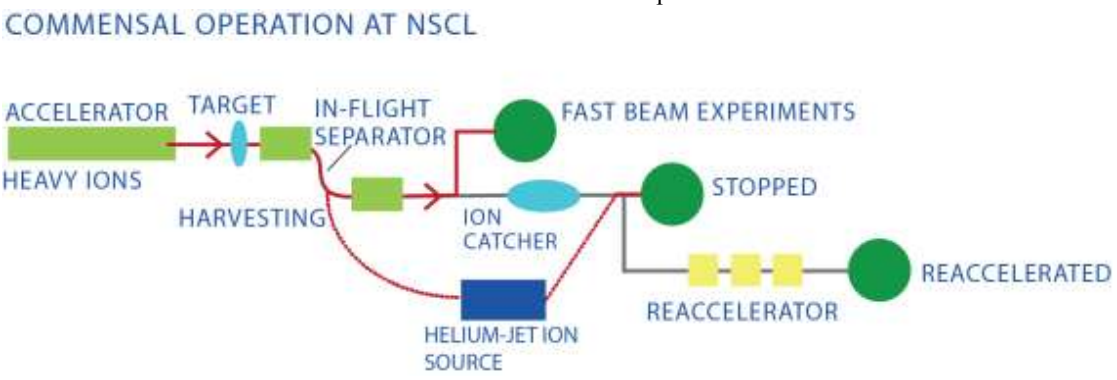

Figure 1: Schematic depiction of the operation of the HJ-IS for simultaneously delivering beams of rare isotopes to two experimental stations at NSCL.

NSCL was awarded a MRI grant from NSF to install and develop the HJIS for operations at the Laboratory. The basic components of the HJIS were shipped from ORNL, where it was developed and tested using Californium fission source by a collaboration of ORNL, the UNIRIB consortium, Rutgers University, and NSCL.

The site selection of HJIS had been finalized at N1 Vault roof. A preliminary design of the layout had been completed. Design of a new lab-space to function as sound and high voltage enclosure for the He-Jet equipment is completed and construction process is underway. Installation of a deck for locating the equipment and utilities has started.

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