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The NSCL Cyclotron Gas Stopper - entering commissioning

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At the NSCL rare isotopes are produced by projectile fragmentation at energies on the order of 100 MeV/u for a wide range of research. Linear gas stopping cells have been used successfully at NSCL for a decade to slow down these beams to the keV-energy range; first for use with low-energy high precision experiments such as the Penning-trap mass spectrometer LEBIT and the collinear laser spectroscopy setup BECOLA, and more recently, for NSCL's re-accelerator ReA.

A gas-filled reverse cyclotron is currently under construction by the NSCL. Simulations indicate that very efficient stopping and fast extraction will be possible even for light and medium-mass ions, which are difficult to efficiently thermalize in linear gas cells. The device is based on a 2.6T maximum-field three-sectored cyclotron-type magnet to confine the injected beam while it is slowed down in ~100 mbar of high-purity LN2-temperature helium gas. Once thermalized, the beam will be transported to the center of the device by a traveling-wave RF-carpet system, extracted along the symmetry axis with an ion conveyor and accelerated to a few tens of keV of energy for delivery to the users.

The magnet with its pair of superconducting coils has been constructed on a 60kV-HV platform and is currently being commissioned. The magnet's two cryostats use 3 cryo-refrigerators each and liquid-nitrogen cooled thermal shields to cool the coils to superconductivity. This concept, chosen not to have to rely on external liquid helium, has been working well. First measurements of axial and radial field profiles confirm field calculations.

The individual RF-ion guiding components for low-energy ion transport through the device have been tested successfully. The beam stopping chamber with its 1m-diameter RF carpet system is currently being prepared for installation inside the magnet and will be coupled to the extraction conveyor for a full low-energy transport test in early 2015.

The design and the predicted performance of the machine will be summarized and an update on its commissioning status given.

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