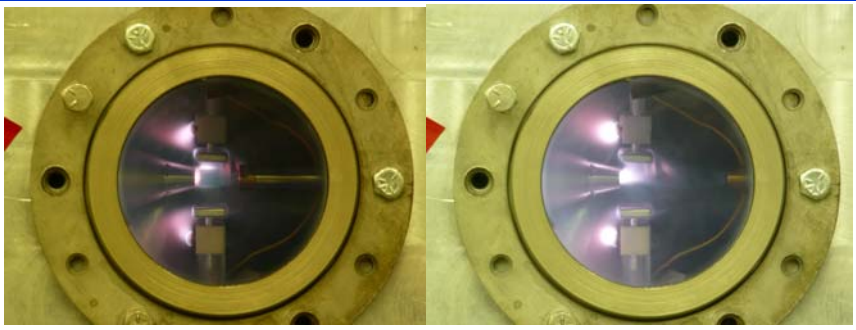
A Jet-Gastarget for the St. George recoil mass separator

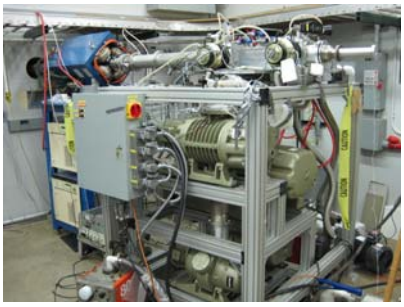


The recoil mass separator St. George at Notre Dame is primarily designed to study alpha capture reactions in inverse kinematics. Therefore a heavy ion beam is in combination with a ^{4}He gas target. We designed a differentially pumped windowless jet-gas target to reduce beam straggling and back ground scattering and provide a point-like source for the recoil separator.

^{4}He at a pressure of several bar enters the vacuum chamber through a convergent-divergent Laval nozzle, thus forming a supersonic jet. The largest fraction of the gas is then captured by a catcher and pumped by a combination of Roots Blowers and Rotary Vane pumps. To reach the required high vaccuum conditions in the beamline a total of 4 pumping stages, consisting of roots blowers and turbomolecular pumps, reduces the pressure down to the 10^{-6} torr range.

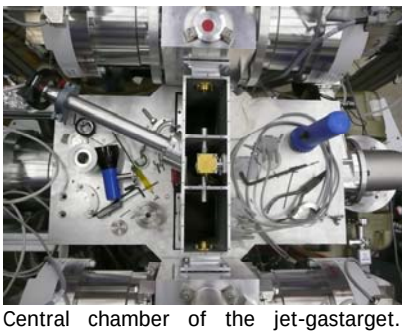
The central chamber of the gastarget was designed to be especially small allowing easy placement of γ-ray detectors covering large solid angles. The overall length of the gastarget is strongly constrained by the optics of the recoil separator. All relevant vacuum components, including the convergent-divergent Laval nozzles, have been manufactured locally.

Researchers:
M. Couder [1], J. Görres [1], A. Kontos [1],
D. Schürmann [2], E. Stech [1], M. Wiescher [1]



Jet-gastarget assembled on the beamline.

The Roots Blowers pumps have a total weight of 2000 lbs. Mounted on their own stand they can be moved easily.



Central chamber of the jet-gastarget. Apertures separate the different pumping stages. At 60° a silicon detector is mounted to monitor elastically scattered particles.