**Progress on the light ion guide facility**

G. Tabacaru, J. Arje, and H. L. Clark

The Light Ion Guide (LIG) is part of the future development of the Cyclotron Institute. The LIG is a device that produces radioactive ions using the IGISOL technique: Ion Guide with a Separator On-Line. The principle of functioning is the following:

The beam (a proton beam around 30 MeV) interacts with a production target (e.g. $^{27}$Al) that's playing also the role of a separation foil for the gas cell. In the gas cell helium gas is flowing continuously at constant pressure of 500 mbar maximum. The recoil ions (e.g. $^{27}$Si from $^{27}$Al(p,n)$^{27}$Si) ) are trapped in the buffer gas and ejected at a 90° direction (with respect to the beam direction) through a small exit hole. The 1+ ions are collected and transported by a Sextupole Ion Guide: a non-resonant structure similar to the RFQ's from residual gas analyzers. A differential pumping system evacuates all the residual Helium gas.

In the last year, extensive tests were performed in order to find optimum conditions of functioning of the differential pumping system. We have acquired two Pfeiffer pumping stations with oil free roots blowers and competitive mechanical pumps. The first pumping station has capability to pump Helium gas at speed of 1900 m$^3$/h and the second one at speed of 900 m$^3$/h.

A spark chamber was built for the off-line tests and various experiments were performed. First series of experiments were done in order to tests the pumping speed for the entire system and the conclusions are that an ultimate pressure of 1.6 mbar is obtained in the first roots chamber when a maximum pressure of 500 mbar is kept in the spark chamber, 2 mm exit hole being used. These results confirm the vendor pumping speed curves for Helium.

After testing the pumping speed we have tested the production of 1+ ions using DC voltage in the spark chamber. Current up to 100 µA was observed in a Faraday Cup placed in front of the spark chamber.

The tests performed last year showed a very stable and reliable system. The challenge is to transport

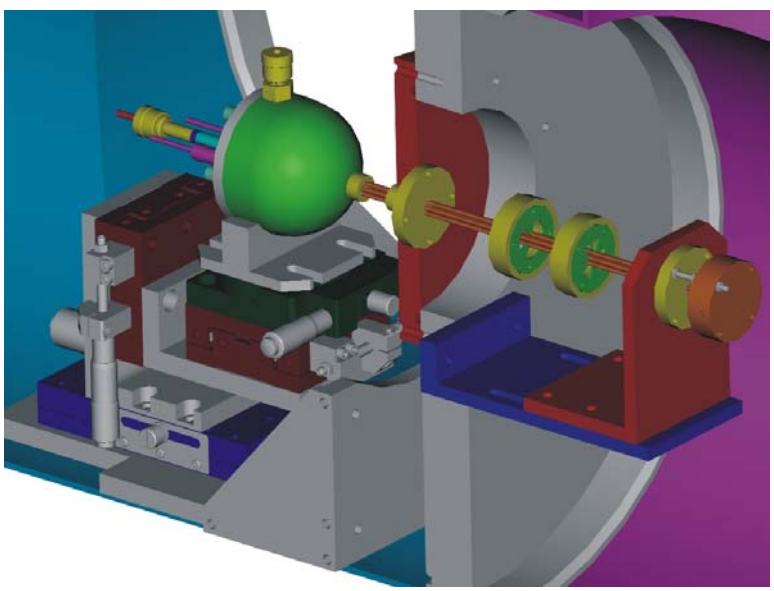

**Figure 1.** View of the spark chamber coupled with the Sextupole Ion-Guide.

with very high efficiency ions through a long Sextupole Ion-Guide, in order to be able to inject them in the future Charge Breeding ECR source.