Design of Recoil-Arm for the SCRIT Experiment

Y. Shimakura,[*1,*2] A. Enokizono,[*1,*2] T. Ohnishi,[*2] K. Kurita,[*1] M. Togasaki,[*1,*2] and M. Wakasugi[*2]

The self-confining RI Ion target (SCRIT) electron scattering facility[1] is now under construction. Electrons scattered from target ions trapped in the SCRIT device are detected, and their angular distribution is obtained. A recoil ion detector referred to as the "recoil-arm" is being designed. It will be used for the determination of the luminosity distribution in the ion trapping region along the beam axis. We also plan to use the recoil-arm for estimating the contribution of residual gas ions, which are trapped simultaneously with target ions in scattering events[2].

Figure 1 shows a schematic of the recoil-arm. It consists of returning meshes, multi-stage slits, two quadrupole benders[3], and a channeltron array consisting of 15 channeltrons. Ions that are recoiled from the trapping region in the SCRIT are accelerated by the electrostatic potential applied to the SCRIT electrodes. Returning meshes are used to reduce the background ions that leak in the trapping region in the SCRIT. Multi-stage slits confine the angular acceptance of recoil ions. Fig.2 shows the first quadrupole bender designed by us. Two quadrupole benders are used to deflect the transported recoiled ions and reduce the background produced by the synchrotron radiation. The channeltrons are arranged in a line so as to minimize dead space. The aperture of every channeltron is rectangular (15mm×30 mm).

Perpendicularly recoiled ions as a result of forward electron scattering are extracted and transported in parallel to the channeltron array. The counting rates of the 15 channneltrons indicate the trapped ion distribution, i.e., luminosity, along the beam axis. We can identify the mass number of the recoil ions in scattering events by measuring the time delay from the instant when forward scattered electrons are detected by the plastic scintillator; accordingly, we can estimate the attributable fraction of residual gas ions in scattering events.

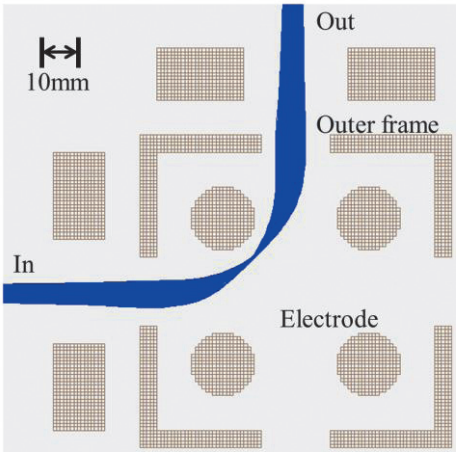

Fig.2. Quadrupole bender

The off-line test bench of the recoil-arm is now under construction. We will be studying the performance of the recoil-arm before its installation in the SCRIT device.

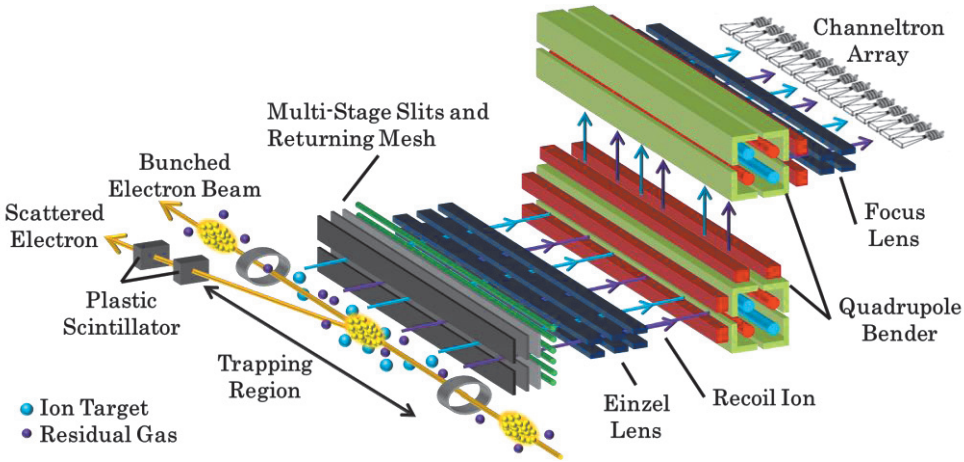

Fig.1. Schematic diagram of the recoil-arm

References
1) M. Wakasugi et al.: Nucl. Instr. and Meth. A [**532**], 216 (2004)
2) R. Ogawara et al.: RIKEN Acc. Prog.Repo. [**45**], 142 (2012)
3) H. D. Zemsn et al.: Rev. Sci. Instrum. [**48**], 8 (1977)

*1 Department of Physics, Rikkyo University
*2 RIKEN Nishina Center