

Commissioning of SCRIT electron scattering facility with stable nuclear targets

K. Tsukada,[*1,*2] K. Adachi,[*1,*3] A. Enokizono,[*1,*3] T. Fujita,[*1,*3] M. Hori,[*1,*3] K. Kurita,[*1,*3] T. Ohnishi,[*1] T. Suda,[*1,*2] T. Tamae,[*1,*2] K. Yamada,[*1,*3] M. Wakasugi,[*1] and M. Watanabe[*1]

The SCRIT electron scattering facility has been developed at RIBF for realizing electron scattering off unstable nuclei. Construction of a magnetic spectrometer, WiSES (Window-frame Spectrometer for Electron Scattering), and a luminosity monitor almost finished in November 2014, and the detector commissioning started[1,2]. ERIS (electron-beam-driven RI separator for SCRIT) and an ion transportation system have been continuously developed up until now to increase the target ion trapped in the SCRIT.

This year, commissioning experiments with several kinds of stable nuclear targets have been performed in order to evaluate the performance of SCRIT facility.

Metal wires of diameter 50 μm made of tungsten and titanium were horizontally mounted at the center of the SCRIT device as stable nuclear targets. By changing the position of these wires remotely, the luminosity can be controlled. Figure 1 shows the angular distribution of elastic scattering events corrected by the acceptance for the tungsten target. These data were taken in July 2015. Although a DWBA calculation[3] is consistent with our results in the forward region, there are small discrepancies of around 50°.

The xenon ion beams have been stably provided by ERIS[4]. For the commissioning, ^{132}Xe was used as a stable target because the natural abundance of ^{132}Xe is 26.9%, which is the largest in the series of xenon isotopes. Figure 2 shows the vertex point distribution along the beam line. These data were taken in December 2015. As shown in the inner figure of Fig. 2, the conditions of ^{132}Xe and the empty target interchanged every 50 ms with an interval of 10 ms.

The difference between Ion IN and Ion OUT is clearly seen. Figure 3 shows the angular distribution of elastic events corrected by the acceptance after background subtraction. In the present analysis, it is assumed that the xenon ions are distributed uniformly in the SCRIT. In the forward region, the calculation and our results are almost consistent. The statistics, however, is not enough in the backward region to discuss the consistencies. Even now, the data taking are being continuously taken by using the ^{132}Xe target with an electron energy of 150 MeV.

In summary, the angular distributions of a stable nuclear target have been measured and compared with a DWBA calculation. Before proceeding to experiments with unstable nuclei, we need more studies with stable targets to understand the acceptance.

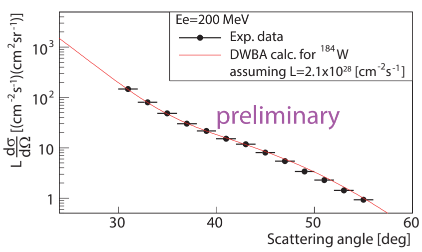

Fig. 1. Obtained differential cross section for tungsten target at the electron beam energy of 200 MeV. The solid line is a calculation by DWBA code assuming averaged luminosity of 2.1×10^{28} [cm^{-2}s^{-1}].

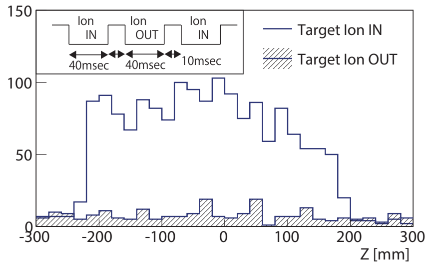

Fig. 2. Vertex point distribution along the beam line. Inner figure shows the time structure of the target conditions.

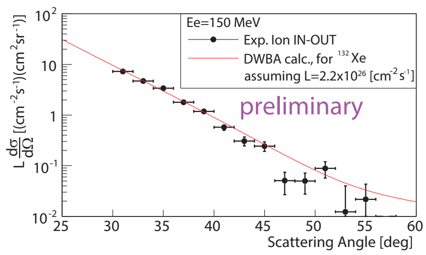

Fig. 3. Obtained differential cross section for ^{132}Xe target at the electron beam energy of 150 MeV. The solid line is a calculation by DWBA code assuming averaged luminosity of 2.2×10^{26} [cm^{-2}s^{-1}].

References
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4) T. Ohnishi *et al.*, in this progress report.

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