Analysis of proton elastic scattering from ^{132}Sn and ^{48}Ca at 300 MeV/nucleon in inverse kinematics

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In this report, we show progress of analysis of proton elastic scattering from ^{132}Sn at 300 MeV/nucleon in inverse kinematics. Previously, we already reported the experimental conditions. We also showed the analyses of the particle identifications of the RI beams, and the excitation energy spectra, and the angular distribution of the elastic scattering yields of ^{132}Sn.[1,2)] We have discussed particle identification for beam particles, the excitation energy and of the angular distribution of ^{132}Sn.[1–3)] In order to obtain the absolute value of elastic scattering cross-section of ^{132}Sn, it is necessary to determine the target thickness. As calibration data to determine it, it was necessary to analyze ^{48}Ca data obtained in the same environment as the ^{132}Sn measurement. ^{48}Ca is a stable nucleus and, like ^{132}Sn, a double magic number nucleus. The elastic scattering differential cross section of ^{48}Ca has already been measured with high accuracy at RCNP. We assume that the target thickness can be determined by comparing the cross-section obtained in the analysis with the data already obtained at RCNP. Herein, we report on the analysis of ^{48}Ca. We performed measurement of proton elastic scattering from ^{48}Ca in inverse kinematics at 300 MeV/nucleon at F12 area. The total beam rate was up to 300 kcps, and purity of ^{48}Ca was 15%. By using missing mass spectroscopy, the excitation energy distribution of ^{48}Ca was deduced from the measured recoil proton kinetic energy and scattering angle information. We identified elastic events of ^{48}Ca as shown in Fig. 2. Figure 2 shows the excitation energy spectrum of the proton scattering from ^{48}Ca in the recoil angle 77°–80°. The excitation energy resolution (in r.m.s.) of 900 keV was achieved at a scattering angle of 77–80 degrees. Although the resolution is 1.5 times worse than that for ^{132}Sn, we could separate the excited state and the elastic scattering as shown in Fig. 2. The main excited state energy are 3.8 MeV (J^{π}) or 4.5 MeV (J^{π}). We will deduce the elastic scattering differential cross section of ^{48}Ca by selecting elastic scattering from information on the excitation energy distribution. We plan to determine the target thickness by comparing the differential cross section obtained by analysis data and the data already obtained at RCNP. Using the determined target thickness, we plan to determine the differential cross section of ^{132}Sn for the first time in the world.

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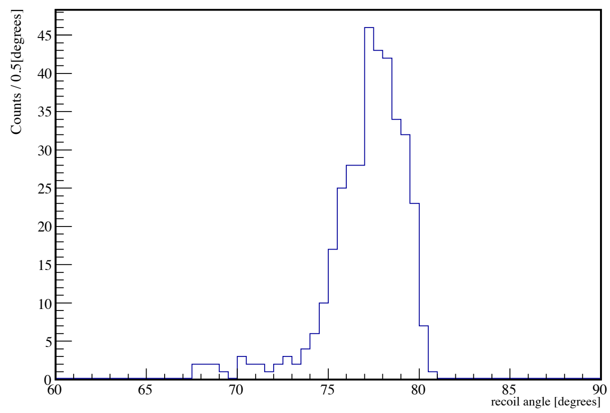

Fig. 1. Angular distribution spectrum for selected elastic scattering events using NaI(TI) calorimeters.

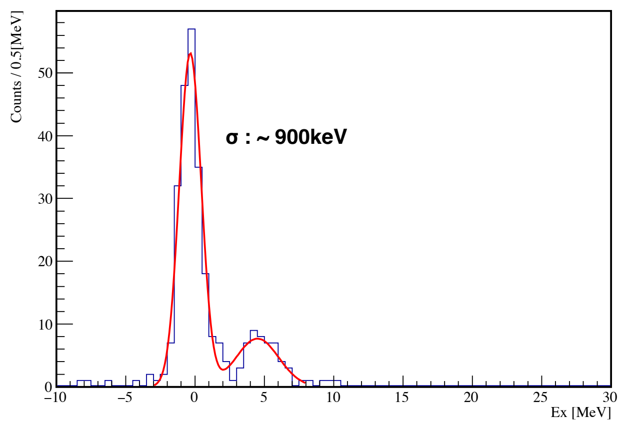

Fig. 2. Excitation energy spectrum of ^{48}Ca at recoil angles in the range of 77°–80°.

References
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