Measurement of proton elastic scattering from ^{132}Sn at 300 MeV/nucleon in inverse kinematics

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We report on the progress of data analysis of the RIBF79 experiment performed at the RI Beam Factory of RIKEN Nishina Center in 2019. In this experiment, inverse kinematics proton elastic scattering measurements were performed using a high-intensity beam of ^{132}Sn at approximately 600 kcps. The double magic nucleus ^{132}Sn has a larger isospin asymmetry than ^{208}Pb. Therefore,^{132}Sn is expected to have a larger neutron skin thickness, which is defined as the difference between the neutron and proton root-mean-square radii. Furthermore, ^{132}Sn is a flagship nucleus of the equation of state of nuclear matter study. The goal of this experiment is to extract the neutron density distribution of ^{132}Sn from the inverse kinematics proton elastic scattering of ^{132}Sn.

In the previous reports,[1,2] we discussed particle identification for beam particles and the experimental setup. Herein, we report on the analysis of the recoil proton spectrometer (RPS). RPS consists of a 1-mm-thick solid hydrogen target,[3] two multi-wire drift chambers, two plastic scintillators, and fourteen NaI(Tl) calorimeters. The recoil angle and kinetic energy of recoil protons were measured using RPS. By using missing mass spectroscopy, the excitation energy spectrum of ^{132}Sn was obtained. Figure 1 shows the scattering angle distribution spectrum when elastic scattering is selected from the excitation energy obtained. The pattern of increase and decrease corresponding to the interference is clearly visible. Above 80°, the kinetic energy of the recoil protons was low and could not be detected by NaI calorimeters. Figure 2 shows the excitation energy spectrum of the proton scattering from ^{132}Sn in the recoil angle 78°–79°. Data analysis for determining the angular distribution of the cross sections and the density distribution of ^{132}Sn is now in progress.

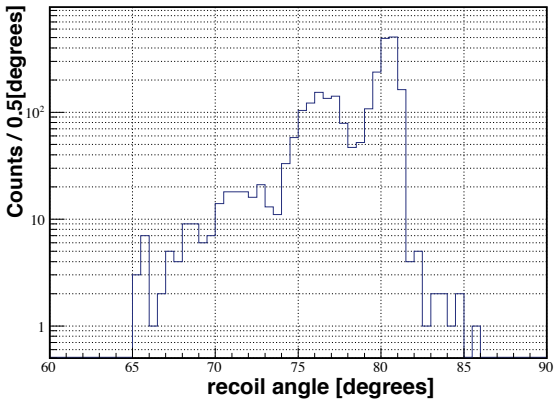

Fig. 1. Angular distribution spectrum for selected elastic scattering events using NaI(TI) calorimeters.

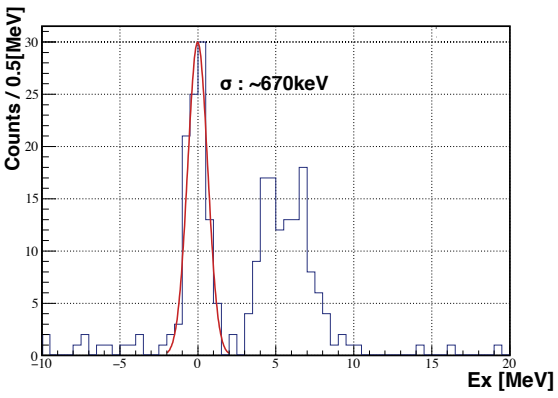

Fig. 2. Excitation energy spectrum of ^{132}Sn at recoil angles in the range of 78°–79°.

References
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