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Elastic scattering of weakly bound nuclei ^{8}B and ^{9,10,11}C on ^{nat}Pb target

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Elastic scattering, a simple process on peripheral reactions, is one of the ideal tools to study the weakly bound nuclei in order to investigate their unusual features [1,2]. A lot of the elastic scattering experiments have been performed for the weakly bound nuclei, such as ^{6}He [3], ^{11}Be [4] and ^{11}Li [5]on heavy targets at the energies around the Coulomb barriers. However, the elastic-scattering data for the proton-halo nuclei above the Coulomb barrier are still scarce. A set of experimental method has been established to measure the differential cross-sections of the elastic scattering on the Radioactive Ion Beam Line in Lanzhou(RIBLL) [6] at the Heavy-Ion Research Facility in Lanzhou(HIRFL) [7]}. Special care was taken to overcome the disadvantages of the broad beam profiles and limited intensities of the radioactive ion beams [8]. The method has been successfully applied to carry out the elastic scattering angular distributions of the proton-rich nuclei ^{8}B and ^{9,10,11}C on ^{nat}Pb target at the energies around 3 times of the Coulomb barrier [9,10].

The experimental data are analyzed using the optical model using a single-folding-type potential and the continuum discretized coupled-channels (CDCC) method. The CDCC calculation describes the angular distribution of ^{8}B very well. The calculation without taking into account the breakup channel coupling does not differ from that of the full CDCC calculation. That is, the effect of breakup-channel coupling on the elastic scattering is small for ^{8}B at the energy well above the Coulomb barrier, in contrast to what was observed in the elastic scattering of neutron-rich nuclei on heavy targets at the energies around the Coulomb barrier. The experimental data of ^{9,10,11}C are analyzed using the optical model with a systematic nucleus-nucleus potential[11]. The experimental data are well described by the optical model calculations.

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