Analyzing power for ^{208}Pb($\vec{p}$, 2p)^{207}Tl reaction at 392 MeV

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A qasifree scattering at intermediate energies has been used as a suitable means to investigate in-medium nuclear interactions as well as nuclear single-particle properties. One of the interesting theme related to this reaction is to examine the reliability of the Dirac approach through spin observables of the $(p, 2p)$ reactions, which reflect possible apparent modification of the interaction as a result of the relativistic effect. Neveling *et al.* measured analyzing power for ^{208}Pb($\vec{p}$, 2p)^{207}Tl at an incident beam energy of 202 MeV and reported that a relativistic distorted wave impulse approximation (DWIA) calculation gives better predictions to the data compared with a non-relativistic DWIA calculation [1]. However, their incident energy may be not high enough to guarantee one-step dominance of the reaction mechanism and, in addition, the energy resolution of their experiment is not high enough to resolve the final states unambiguously.

In order to examine the relativistic effect more precisely we performed an experimental measurement of the differential cross section and the analyzing power for the same reaction at an incident beam energy of 392 MeV by using a two-arm spectrometer consisting of GR and LAS. In the last RCNP annual repot, we showed that our recently achieved energy resolution was high enough to separate the ground 1/2+ state and the first excited state (351 keV, 3/2+) as well as the second excited state (1348 keV, 11/2−) and the third excited state (1683keV, 5/2+) of the residual ^{207}Tl [2].

The cross section and the analyzing power were measured under two different kinematical conditions where a relativistic and a non-relativistic calculation give different predictions. In Fig. 1, our analyzing power data for the 3s$_{1/2}$ knockout and the 2d$_{3/2}$ knockout are plotted against the energy of the forward emitted proton and compared with DWIA calculations in the relativistic(solid line) [3] and the non-relativistic(dashed line) frameworks. The detecting angles of two outgoing protons are fixed, 32.5° for GR and 50.0° for LAS. Within the comparison given in the figure, the relativistic calculation is some what better predictions than the non-relativistic one, but the result is not conclusive. Data analysis for other kinematical conditions and further theoretical examinations are in progress.

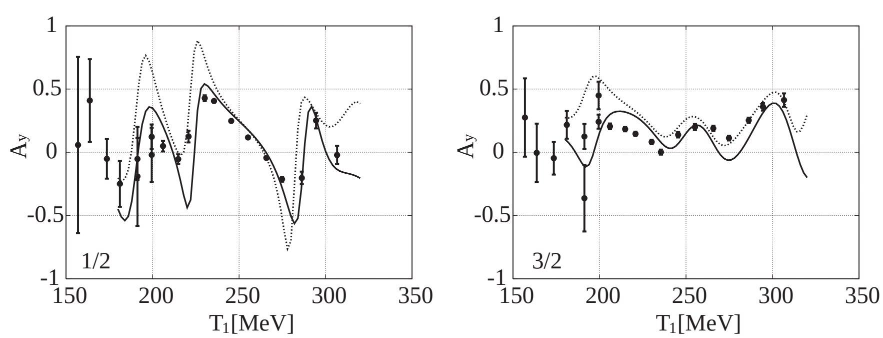

Figure 1: The analyzing power of ^{208}Pb($\vec{p}$, 2p)^{207}Tl reaction leading to the 1/2 state and the 3/2 state as functions of the energies of forward emitted protons. The angle of GR was 32.5° and that of LAS was 50.0°. The solid and dashed lines represent the results of relativistic and non-relativistic DWIA calculations respectively.

References

[1] R. Neveling *et al.*, Phys. Rev. **C66** (2002) 034602.

[2] RCNP Annual Report 2003, p.15.

[3] G. C. Hillhouse, private communications.