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## Measurement for $p$ - $^3\text{He}$ elastic scattering with a 65 MeV polarized proton beam

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One of the most important topics of nuclear physics is to describe various nuclear phenomena based on the nucleon-nucleon interactions combined with three-nucleon forces (3NFs). 3NFs are key elements to understand various nuclear phenomena, e.g. binding energies of light mass nuclei [1] and the equation of state of nuclear matter [2]. In the last decades, the study of 3NFs effects has been extensively performed in deuteron-proton ( $dp$ ) scattering at intermediate energies ( $E/A$  60 MeV). Rigorous numerical Faddeev calculations of the 3N scattering by using  $NN$  potentials as well as 3NFs models have made it possible to compare the data to the theoretical calculations. Consequently, the first evidence of 3NFs effects has been found in the  $dp$  scattering system [3]. As an extension of 3NFs study, it should be interesting to see how 3NFs act in  $p$ - $^3\text{He}$  scattering system. In this system, one could study 3NFs effects in 4N scattering. Also one could approach to 3NFs with the channels of the total iso-spin  $T = 3/2$ .

In order to study 3NFs effects in  $p$ - $^3\text{He}$  elastic scattering, we performed the measurement of the cross section and the proton analyzing power  $A_y$  at 65 MeV with a polarized proton beam at Research Center for Nuclear Physics (RCNP), Osaka University. The gaseous  $^3\text{He}$  target was bombarded by a polarized proton beam, and scattered protons were detected by using the  $E - \Delta E$  detectors which consisted of plastic and NaI(Tl) scintillators. Measured angles were  $20^\circ - 165^\circ$  in the laboratory system ( $26.9^\circ - 170.1^\circ$  in the center of mass system). The typical beam polarizations were 50 % throughout the experiment. We also measured the cross section for  $pp$  elastic scattering with the same experimental setup in order to estimate the overall systematic uncertainties.

In the conference, we will report on the obtained data combined with the theoretical calculations.

[1] S. C. Pieper *et al.*, Phys. Rev. C **64**, 014001 (2001).

[2] A. Akmal, V. R. Pandharipande, and D. G. Ravenhall, Phys. Rev. C **58**, 1804 (1998).

[3] K. Sekiguchi *et al.*, Phys. Rev. C **65**, 034003 (2002).

**Author:** Mr NAKAI, Shinnosuke (Tohoku Univ.)

**Co-authors:** SEKIGUCHI, Kimiko (Tohoku University); Dr MIKI, Kenjiro (Tohoku University); Mr WATANABE, Atomu (Tohoku University); Mr SHIBUYA, Shun (Tohoku University); Mr WATANABE, Morihiro (Tohoku University); Mr KAWAHARA, Kenta (Tohoku University); Mr SAKAI, Daisuke (Tohoku University); Dr WADA, Yasunori (Tohoku University); Prof. ITOH, Masatoshi (Tohoku University, CYRIC); Prof. HATANAKA, Kichiji (Osaka University, RCNP); Prof. TAMII, Atsushi (Osaka University, RCNP); Dr KOBAYASHI, Nobuyuki (Osaka University, RCNP); Ms INOUE, Azusa (Osaka University, RCNP); Mr NAKAMURA, Shoken (Osaka University, RCNP); Prof. WAKASA, Tomotsugu (Kyushu University); Mr MITSUMOTO, Shinji (Kyushu University); Mr OHSHIRO, Hisanori (Kyushu University); Mr GOTO, Shuhei (Kyushu University); Prof. MAEDA, Yukie (Miyazaki University); Prof. SAKAI, Hideyuki (RIKEN, RIBF)

**Presenter:** Mr NAKAI, Shinnosuke (Tohoku Univ.)

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