Contribution ID: **108** Type: **Contributed Talk**

Measurement of spin correlation coefficient Cy,y for proton-3He elastic scattering

Tuesday, 1 August 2023 17:10 (15 minutes)

The three-nucleon force (3NF) is essentially important to clarify various nuclear phenomena, such as the binding energy of light mass nuclei [1], the equation of state of nuclear matter [2] and few-nucleon scattering systems [3]. The isospin $T = 3/2$ components of the 3NF also play an important role in many-nucleon systems especially for neutron-rich nuclei as well as neutron matter properties. Proton-^{3}He (p-^{3}He) scattering is one of the simplest prove for studying the $T = 3/2$ components of the 3NF. With the aim of exploring the properties of the 3NF we are planning the measurement of p-^{3}He elastic scattering with the polarized ^{3}He target at intermediate energies ($E/A \geq 65$ MeV).

In the conference we present the measured spin correlation coefficient $C_{y,y}$ for p-^{3}He elastic scattering at 100 MeV at the angles $\theta_{\mathrm{c.m.}} = 46.9°$–$149.2°$ in the center of mass system [4]. The experiment was performed using a 100 MeV polarized proton beam in conjunction with the polarized ^{3}He target at RCNP, Osaka University in Japan. Proton beams were injected to the target, and scattered protons were detected by using E-ΔE detectors which consisted of plastic and NaI(Tl) scintillators. The data are compared with rigorous numerical calculations based on realistic NN potentials as well as with the Δ-isobar excitation. The obtained results indicate that the $C_{y,y}$ expands the knowledge of the nuclear interactions with Δ-isobar or those including 3NFs that are masked in nucleon-deuteron elastic scattering.

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Session Classification: Tuesday Parallel Session: Reactions (AudiMax)