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Measurement of spin correlation coefficient $C_{y,y}$ for proton- ^3He elastic scattering

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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- ^3He (p - ^3He) scattering is one of the simplest probe 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 - ^3He elastic scattering with the polarized ^3He target at intermediate energies ($E/A \geq 65$ MeV).

In the conference we present the measured spin correlation coefficient $C_{y,y}$ for p - ^3He elastic scattering at 100 MeV at the angles $\theta_{\text{c.m.}} = 46.9^\circ - 149.2^\circ$ in the center of mass system [4]. The experiment was performed using a 100 MeV polarized proton beam in conjunction with the polarized ^3He 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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