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Plan for the Spin Correlation Coefficients Measurement in Polarized Deuteron-Polarized Proton Scattering Experiment

Necessity of the three-nucleon forces (3NFs) have come to light in various nuclear phenomena, for example, binding energies of nuclei, and equation of state in nuclear matters. As numerically exact solutions of the Faddeev equations using 2N- and 3N-forces are now attainable for observables in nucleon-deuteron (Nd) scattering, intricate information of the 3NFs can be extracted by directly comparing high precision data obtained in Nd experiments and theoretical calculations. Various performances of deuteron-proton (d-p) elastic scattering experiments at 70-300 MeV/nucleon (MeV/N) have confirmed clear signatures of 3NF effects in results of the cross sections below 135 MeV/N, whereas data of spin observables and cross sections at 250 MeV/N or above have suggested deficiencies in the spin dependent parts and high momentum transfer regions of current 3NF models.

In view of determining the 3NFs, we now plan to measure the spin correlation coefficients for polarized deuteron-polarized proton (d-p) scattering at 100 MeV/nucleon. d-p scattering experiment will be performed at RIKEN RIBF facility, using the polarized deuteron beam provided via the polarized ion source and the polarized proton target system based on triplet dynamic nuclear polarization method. Polarized cross sections of particles scattered in left, right, up, and down directions will be measured with a detector system (KuJyaku) incorporating multi-wired drift chambers and plastic scintillators. Data taken will be utilized to fix the low energy constants in chiral effective field theory.

The polarized proton target and the KuJyaku detector system, both of which have been newly developed for the d-p scattering experiment, underwent a beam test at RIKEN using unpolarized deuteron beam in January 2024.

In this conference, detailed explanations and plans on the new d-p elastic scattering experiments and results on the experiment in January will be given.

Consent

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