3-Nucleon Force in Proton Polarized Helium-3 Scattering Feasibility Studies

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Available models of nucleon-nucleon potential reached perfect agreement with experimental data obtained for systems composed of two nucleons [1, 2], but description of systems containing third nucleon, still pose a great challenge even with implementation additional dynamics -- three-nucleon force (3NF). The idea of examining four-nucleon system gives quite new possibilities for 3NF studies and appearing here 4-nucleon force. Brand new theoretical approaches [3] call for validation.

We propose to enter four-nucleon systems area by performing kinematically complete measurement of proton scattering on polarized helium-3 (elastic and breakup channels). The proposed method, involving tracking of reaction products for subsequent reconstruction of the reaction vertex, should be regarded as a novel experimental approach in this low energy nuclear physics experiment. The details of a proposed experimental setup and results of the first tests of its components will be given.

References

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