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EXPERIMENT FOR DETERMINING np-SCATTERING LENGTH IN THE n + d ⟶ (np) + n REACTION

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In the INR RAS experimental studies of nucleon-nucleon and three-nucleon interactions and effects of charge symmetry breaking are carried out [1, 2]. A test experiment to determine the *np*-scattering singlet length (a_{np}) on the neutron beam of the RADEX channel of the INR RAS was carried out. The experiment purpose is to determine anp in the reaction $n + d \longrightarrow (np) + n$ and search for the influence of three-nucleon forces (3*NF*). The influence of 3*NF* can be manifested in the difference between the a_{np} value obtained in the reaction with three particles in the final state and the value obtained in the forward *np*-scattering.
The experiment was carried out at low neutron energies of 10±2 MeV using a C_6D_6 scintillator as an active deuterated target. The experiment consists in the registration of a recoil neutron and a neutron from the breakup of the *np*-system as well as the fact of registration of a breakup proton in a deuterated target.
The energy of the neutron beam, the energy and emission angle of the proton are recovered from the kinematics of the reaction $n + d \longrightarrow n + p + n$. The relative energy of the np-system is calculated for each event and then the dependence of the reaction yield on the relative energy is plotted. The experimental dependence is compared with the simulation results which depend on the *np*-scattering length.
The test experiment showed that it's possible to determine the value of a_{np} and to compare this value with the value obtained in the forward *np*-scattering at sufficient statistics.

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2. E.S. Konobeevski, A.A. Afonin, S.V.Zuyev, A.A. Kasparov, V.V. Mitcuk, M. V. Mordovskoy and S.I. Potashev. Phys. At. Nucl. 2020. V.83. №4. P.523.

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