

## Test of T-invariance in Double Polarized Scattering of $^3\text{He}$ Nuclei on Deuterons

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The total cross section of scattering of vector polarized protons on tensor polarized deuterons provides a null-test signal of violation of invariance with respect to time reversal (T) while conserving spatial (P) parity [1]. Very similar is the double polarized  $^3\text{He}$ -d scattering considered here. The null-test signal cannot be simulated by the interaction in the initial and final states. We have calculated this observable for the  $^3\text{He}$ -d scattering process up to an unknown constant of the T-odd P-even NN interaction at the energies of the  $^3\text{He}$  nuclear beam in the range of 100-1000 MeV/nucleon based on the Glauber theory. The necessary spin amplitudes of  $p^3\text{He}$  and  $n^3\text{He}$  elastic scattering are calculated in the S-wave approximation for the wave function of the  $^3\text{He}$  nucleus taking into account the spin dependence of the pN elastic scattering amplitudes [2] with the contribution of T-invariance violating, but P-parity conserving interactions between nucleons. All types of mechanisms –single, double and triple scatterings, are included for both T-even and T-odd amplitudes. When calculating the amplitude of elastic  $^3\text{He}$ -d scattering, the previously developed formalism for elastic pd scattering [1,2] is used, taking into account the S and D waves of the deuteron wave function, while the spin-dependent pN scattering amplitudes are replaced by the corresponding spin-dependent amplitudes of the  $^3\text{He}$ -N scattering. The results of the calculation of the differential cross section, vector analyzing power  $A_y$  and spin correlations of the  $p^3\text{He}$  scattering process are in good agreement with the available experimental data [3,4] in the forward hemisphere at energies of 150-1000 MeV. The dependence of the null-test signal on the  $^3\text{He}$ -d collision energy for different types of T-odd P-even NN interaction [5] is presented. The research was carried out at the expense of the grant of the Russian Science Foundation No. 23-22-00123, <https://rscf.ru/project/23-22-00123/>.

### List of references

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