SEARCH FOR TIME-INVARIANCE VIOLATION IN DOUBLE POLARIZED pd-, 3He-d and dd-SCATTERING AND TEST OF THE pN SPIN AMPLITUDES AT HIGH ENERGIES

The total cross section of the interaction of transversaly polarized (P_y) proton (^{3}He or deuteron) with the tenzor polarized (P_{xz}) deuteron constitues a null-test signal of time-reversal invariance violation under parity conservation (TVPC) in such processes (see Ref. [1] and references therein). This result follows from the optical theorem providing this signal for such kind of double polarized scattering, as a product of unknown constant of the TVPC interaction and the ordinary T-even spin flip helicity ϕ_5 amplitude of pN-scattering and the deuteron form factor. Knowledge of energy dependence of this signal is necessary for planning experiments and this function was calculated (up to unknown TVPC constant) for pd [1] in the GeV region and recently at energies of SPD NICA for pd [2], ^{3}He-d [3] and dd [4] collisions.

Since some of hadronic spin amplitudes of pN elastic scattering are absolutely necessary for search of time-invariance violation in polarization experiments, it is important to have a test of existing parametrizations of these and others spin pN amplitudes especially at high energies where data are non-complete and, therefore, some model parametrizations for pN amplitudes are used [5,6]. As known, spin observables of the pd-elastic scattering in the GeV region are well described on the basis of the spin-dependent Glauber theory [7] using data on spin amplitudes of elastic pp- and pn-scattering. Therefore, spin observables of pd-elastic scattering being analyzed within the Glauber theory can be used as an effective test of existing spin pN-amplitudes. At the NICA SPD collider the asymmetric pd-collision mode will be not implemented, while the symmetric dd-mode will be realized. We show [8] that vector and tensor analyzing powers A_y^p, A_y^d, A_{yy}, and spin-correlations coefficients $_{y,y}$, $C_{yy,y}$ of the dd$\rightarrow$ npd reaction for the pole mechanism with a subprocess of quasi-free pd-elastic scattering are directly related to the corresponding spin observables of the free pd- elastic scattering. Most of these observables a very sensitive to the spin pN amplitudes. Therefore measurement of these observables in the reaction dd-npd at SPD NICA in kinematics of quasi free pd-pd process and forthcoming analysis within the Glauber theory will be important as an effective test of available spin pN-amplitudes.

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