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Double spin correlations in the reaction $dd \rightarrow pnpn$ and elastic proton-nucleon scattering at large angles

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Elastic pp scattering at the invariant mass of the pp-system $\sqrt{s_{pp}} = 3 - 5$ GeV and large c.m.s. angles ($\theta_{cm} = 90^\circ$) demonstrates a very large double-spin correlation [1]. These kinematical region corresponds to very high momentum transfer $|t|$ where quark counting rules are valid and color transparency is expected to be observed. On the other hand, these energies correspond to the thresholds for strangeness (~ 3 GeV) and charm (~ 5 GeV) production in pp collisions, respectively. As was shown in [2], the observed strong correlations (cross-section ratio of 4 : 1 for parallel and antiparallel spins of colliding protons) are compatible with the assumption of the formation of $uuds\bar{u}uud$ and $uudc\bar{c}uud$ octoquark resonances in the s channel. Moreover, on the basis of this assumption, the authors of Ref. [2] also explained qualitatively an unusual behavior of the color transparency in reactions of the $A(p, 2p)B$ type and oscillations in the differential cross section $d\sigma/dt$ for elastic pp scattering in the region of manifestation of quark counting rules. However, the last two effects have a different explanation within the nuclear-filtering model [3]. In this connection one should note that hard dynamics in elastic pp and pn-scattering may be markedly different, because the pn-scattering includes the isoscalar channel in addition to the isovector one. In view of this, it is of importance to study the doubly polarized channel of elastic pn scattering in the same energy range of 3-5 GeV. In principle, this may be done at the SPD in the dd collisions [4]. We studied [5] double spin correlation of the reaction $dd \rightarrow pnpn$ within the impulse (double pole) approximation and found that at zero relative momenta of nucleons in both deuterons, when the deuteron S-wave dominates, the transversal and longitudinal- correlation coincides with the similar double-spin correlation in pp or pn- elastic large angle scattering. Effects of rescatterings and the D-wave contribution are under consideration.

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- [1] D. G. Crabb, R. C. Fernow, P. H. Hansen, et al. Phys. Rev. Lett. 41, 1257 (1978).
- [2] S. J. Brodsky and G. de Teramond, Phys. Rev. Lett. 60, 1924 (1988).
- [3] J. P. Ralston and B. Pire, Phys. Rev. Lett. 49, 1605 (1982).
- [4] V. Abramov et al. Phys. Part. Nucl. 52, 1044 (2021).
- [5] Yu. Uzikov, A. Temerbayev, Phys. Part. Nucl. 55, N4, 895 (2024).

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