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The double longitudinal-spin asymmetry in the neutral pion production

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We studied the production of an inclusive π^0 meson within the kinematic range, relevant to the RHIC and the LHC colliders. We calculated the double longitudinal-spin asymmetry (DLSA) $A_{LL} = \frac{d\sigma^{++} - d\sigma^{+-}}{d\sigma^{++} + d\sigma^{+-}}$ for the production of neutral pions in pp -collisions. This observable provides reliable information on the spin-dependent gluon distribution functions of the polarized proton. For this study we used well-known helicity matrix elements obtained in the collinear parton model at leading order in the strong coupling constant [Babcock, Monsay, Sivers, 1979]. The formation of pions was described by two different sets of fragmentation functions: Kniehl-Kramer-Potter [Kniehl, Kramer, Pötter, 2001] and NNFF1.0 [Bertone, Carrazza, Hartland, Nocera, Rojo, 2017]. The results were compared with data from the PHENIX and STAR collaboration at RHIC. Finally, we provided predictions of the DLSA for the planned SPD experiment at NICA to estimate the expected magnitude of this quantity. The predictions for the A_{LL} have been done recently for charmonium [Karpishkov, Saleev, 2026] and direct photon [Saleev, Shipilova, 2023]

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