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Gluon Sivers function and linearly polarized gluons in J/ψ production in ep collision

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Among the leading twist gluon TMDs, gluon Sivers function (GSF) and Boer-Mulders function (BMF) have been receiving paramount of interest in spin physics, as they provide the spin nature of the hadron. The GSF and BMF describe the density of unpolarized and linearly polarized gluons inside the transversely and unpolarized proton respectively. The non-perturbative GSF and BMF can be extracted by studying the Sivers and $\cos 2\phi$ asymmetries in ep and pp collision. We estimate the Sivers and $\cos 2\phi$ asymmetries in J/ψ production in SIDIS process within TMD factorization framework. The leading order photon-gluon fusion subprocess color octet states 3S_1 , 1S_0 and 3P_J ($J = 0, 1, 2$) contribution to J/ψ production is considered by employing the NRQCD based color octet model. The estimated negative Sivers asymmetry is in good agreement with COMPASS data at $z = 1$. Sizable $\cos 2\phi$ asymmetry is estimated as a function of Bjorken variable (x_B) and p_T . We also calculate the Sivers asymmetry in photoproduction of J/ψ at Next-Leading-Order in α_s using color octet model.

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