

Longitudinal Double-Spin Asymmetry at Small x

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Double-spin asymmetry in particle and jet productions in longitudinally polarized proton-proton collisions is one of the flagship measurements at RHIC, with the aim of determining the spin fraction of gluons within the proton. Although current next-to-leading order perturbative QCD predictions, based on collinear factorization, have been quite successful in explaining experimental data and extracting gluon helicity distribution within the RHIC kinematics, there is a need for predictions that take into account the small x evolution and gluon saturation effect in order to better understand gluons at smaller x . In this talk, I will discuss our efforts to directly calculate the longitudinal double-spin asymmetry in the small x limit, particularly for the gluon production at midrapidity. Our findings show that, in the pure glue case, the double-spin asymmetry depends on a new twist-3 transverse momentum-dependent gluon distribution, in addition to the transverse-momentum dependent gluon helicity distribution. These results suggest that extracting gluon helicity distribution at small x from the double-spin asymmetry using the collinear factorization formalism might overestimate the contribution.

Author: LI, Ming

Co-authors: Prof. KOVCHegov, Yuri; ADAMIak, Daniel (Ohio State University)

Presenter: LI, Ming

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