Azimuthal transverse single-spin asymmetries of hadrons within jets from polarized pp collisions at $\sqrt{s} = 510$ GeV

Yixin Zhang

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Abstract

The examination of the origins of transverse single-spin asymmetries has catalyzed the advancement of twist-3 formalism and transverse-momentum-dependent parton distribution functions (TMDs). The azimuthal distribution measurements of identified hadrons within a jet in transversely polarized hadronic interactions offer crucial insights into TMD physics, particularly the Collins effect, which involves quark transversity and the Collins fragmentation functions. The STAR collaboration has reported on the measurements of Collins asymmetries from jet + $\pi^{\pm}$ production in transversely polarized proton-proton (pp) collisions at a center-of-mass energy of $\sqrt{s} =$ 500 GeV. These results are derived from data collected in 2011, with an integrated luminosity of 23 pb^{-1}. Additionally, comprehensive measurements of azimuthal transverse single-spin asymmetries of hadrons within jets from transversely polarized pp collisions at $\sqrt{s} = 200$ GeV were performed using data from 2012 and 2015. In 2017, STAR acquired a substantially larger pp dataset with an integrated luminosity of 320 pb^{-1} at $\sqrt{s} = 510$ GeV. This large dataset is expected to significantly enhance the precision of transverse single-spin asymmetry measurements, particularly in the high jet transverse momentum region. This talk presents preliminary results on azimuthal transverse single-spin asymmetries for charged pions within jets from transversely polarized pp collisions at $\sqrt{s} = 510$ GeV. The comparison of Collins asymmetries in pp collisions at 200 GeV and 510 GeV can provide constraints on the evolution effect of Collins function. Simultaneously, comparing the experimental results from pp collisions with theoretical models obtained by global fits based on semi-inclusive deep inelastic scattering and e^+e^- annihilation data can test the universality of Collins asymmetries.