

Transverse Single Spin Asymmetry for Inclusive and Diffractive Electromagnetic Jets at Forward Rapidity in $p^\uparrow+p$ Collisions at $\sqrt{s} = 200$ GeV and 510 GeV at STAR

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Abstract

In recent decades, there have been numerous efforts to understand the origin of the unexpectedly large transverse single spin asymmetry (A_N) of inclusive hadron productions at forward rapidities observed in $p^\uparrow+p$ collisions at different center-of-mass energies (\sqrt{s}). Several theories have been proposed to explain this phenomenon, including the twist-3 contributions in the collinear factorization framework, the transverse-momentum-dependent contributions from the initial-state quark and gluon (Sivers functions), and/or final-state Collins fragmentation functions. However, there are indications that diffractive processes might also contribute to the large A_N , based on the previous analyses of A_N for forward π^0 and electromagnetic jets (EM-jets) in $p^\uparrow+p$ collisions at STAR [1]. A direct measurement of the A_N of diffractive processes could shed more light on the origin of the large A_N .

The STAR experiment provides an ideal opportunity to measure the A_N for the diffractive processes at the forward rapidities with the data collected from Forward Meson Spectrometer and Roman Pot detectors. This talk will present the analysis updates and preliminary results on A_N for inclusive and diffractive EM-jets at forward rapidity ($2.6 < \eta < 4.2$) using $p^\uparrow+p$ collisions at $\sqrt{s} = 200$ GeV and 510 GeV at STAR. The A_N for photon multiplicity-dependent EM-jets in the inclusive and diffractive processes will be explored, and the contribution of A_N from diffractive processes to the inclusive processes will be discussed.

References

- [1] (STAR) J. Adam *et al.*, Phys. Rev. D 103, 092009 (2021)