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

There have been numerous attempts in the last couple of decades to understand the origin of the unexpectedly large transverse single spin asymmetry (A_N) of inclusive hadron production at forward rapidities observed in $p^{\uparrow}$+p collisions at different center-of-mass energies ($\sqrt{s}$). The current theoretical framework to explain such a puzzle includes the twist-3 contributions in the collinear factorization framework, and 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 the large A_N might come from diffractive processes, according to the previous analyses of A_N for forward π^0 and electromagnetic jets in $p^{\uparrow}$+p collisions at STAR [1]. The STAR Forward Meson Spectrometer (FMS) is an electromagnetic calorimeter, which can detect photons, neutral pions, and eta mesons, with a pseudorapidity coverage of $2.6 < \eta < 4.2$. In 2015 and 2017, STAR collected large $p^{\uparrow}$+p data sets at $\sqrt{s} = 200$ GeV and $\sqrt{s} = 510$ GeV, which provide a great opportunity to measure A_N for inclusive and diffractive electromagnetic jets. In this talk, we will present the preliminary results and analysis updates on A_N for inclusive and diffractive electromagnetic jets in the FMS at $\sqrt{s} = 200$ GeV and 510 GeV. Also, we will present the comparison of A_N between inclusive and diffractive electromagnetic jets.

References

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