Transverse Single-Spin Asymmetry for Electromagnetic Jets at Forward Rapidities at STAR in $p^{\uparrow}$+p Collisions at $\sqrt{s} = 200$ GeV

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Abstract

There have been various attempts, both experimentally and theoretically, to understand the origin of the unexpectedly large transverse single-spin asymmetries (A_N) for inclusive hadron production at forward rapidity in $p^{\uparrow}$+p collisions that persist at high center-of-mass energies. Two proposed potential sources are the twist-3 contributions in the collinear factorization and the transverse-momentum-dependent contributions from either the initial-state quark and gluon Sivers functions or the final-state Collins fragmentation function. In 2015 and 2017, RHIC collected the largest data sets so far on transversely polarized $p^{\uparrow}$+p collisions at $\sqrt{s} = 200$ GeV and 510 GeV, which are ideal to further characterize A_N and explore its potential sources. The STAR Forward Meson Spectrometer (FMS) and Endcap Electromagnetic Calorimeter (EEMC), having pseudo-rapidity coverages of 2.6 - 4.2 and 1.1 - 2.0 respectively, can be used to detect photons, neutral pions, and eta mesons. We present an analysis update for A_N of electromagnetic jets in FMS and EEMC using $p^{\uparrow}$+p collisions at $\sqrt{s} = 200$ GeV. In this analysis, we explore the dependences of A_N on photon multiplicity inside the jet, jet transverse momentum, and jet energy.