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Measurement of transverse single spin asymmetries at forward rapidities by the STAR experiment at $\sqrt{s} = 200$ and 500 GeV

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We present recent results of transverse single spin asymmetries (TSSAs) for neutral pions using the Forward Meson Spectrometer at STAR at center of mass energies of 200 and 500 GeV in proton-proton collisions. Combining the results from the two energies shows that the pion TSSA increases monotonically with Feynman- x . Comparisons with previous measurements show that the pion TSSA is mostly independent of the center of mass energy from 20 GeV to 500 GeV. It is found that pions with no nearby particles tend to have a larger TSSA than isolated pions, which may suggest different mechanisms for the TSSAs for different sub-groups of pions. In order to separate the contributions from initial and final state effects at both energies, we have also measured TSSAs for the electromagnetic jets and the Collins asymmetry through the TSSA of neutral pions inside the electromagnetic jets. The jet TSSA follows the Feynman- x behavior of the pion TSSA, but with a significantly smaller amplitude. The Collins asymmetry is consistently small across all the studied z_{em} and j_T bins, which refers to the neutral pion energy fraction and the neutral pion transverse momentum projection onto the jet axis, respectively. These results provide rich information to understand the neutral pion TSSA.

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