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2 Measurement of transverse single-spin asymmetries of π^0 and
3 electromagnetic jets at forward rapidity in 200 and 500 GeV
4 transversely polarized proton-proton collisions at STAR

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6 **Abstract**

7 We present recent results of transverse single-spin asymmetries (TSSAs) for inclusive
8 neutral pions using the Forward Meson Spectrometer at STAR in proton-proton collisions
9 at center of mass energies of 200 and 500 GeV. The results from the two energies show
10 that the pion TSSA increases continuously with Feynman- x . Comparisons with previous
11 measurements show that the pion TSSA is mostly independent of collision energy from 20
12 GeV to 510 GeV. It is also observed that isolated pions with no other particles nearby tend
13 to have larger TSSA than the non-isolated ones, which may suggest novel mechanisms for
14 generating the TSSA. In order to separate the contributions of initial and final state effects,
15 we also measure the TSSA for the electromagnetic jets and the Collins asymmetry through
16 the TSSA of neutral pions inside the electromagnetic jets. The jet TSSA, sensitive to the
17 initial state effect, follows a similar Feynman- x dependence as the neutral pions, but with
18 a significantly smaller amplitude. The Collins asymmetry, related to the final state effect,
19 shows evidence of a j_T dependence, which is the pion transverse momentum with respect to
20 the jet axis, and is consistent with zero when integrated over j_T . These results provide rich
21 information towards understanding the physics mechanism of TSSA in hadron collisions.