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## **Measurement of transverse single-spin asymmetries of $\pi^0$ and electromagnetic jets at forward rapidity in 200 and 500 GeV transversely polarized proton-proton collisions at STAR**

*Tuesday 30 November 2021 15:10 (20 minutes)*

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

**Primary author:** ZHU, Zhanwen (University of Chinese Academy of Sciences)

**Presenter:** ZHU, Zhanwen (University of Chinese Academy of Sciences)

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