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Transverse Single Spin Asymmetry of Electromagnetic Jets at Forward Rapidity in p↑+p Collisions at STAR

Transverse single spin asymmetries (TSSAs, denoted AN) in transversely polarized p↑ + p collisions provide critical insights into the proton ' s spin structure, yet their unexpectedly large magnitudes at forward rapidities remain a puzzle. Observed across experiments, including those at RHIC, these asymmetries have yet to be fully explained by theoretical models, such as those based on twist-3 contributions in collinear factorization or transverse momentum dependent (TMD) parton distributions. Recent STAR measurements suggested that diffractive processes may contribute significantly to the observed AN , prompting a deeper investigation into their role.

This talk presents precise measurements of AN for electromagnetic jets in inclusive and diffractive processes from p↑ +p collisions at $\sqrt{s}$ = 200 and 510 GeV, collected using the Forward Meson Spectrometer at STAR ($2.5 < \eta < 4.2$). By isolating diffractive contributions, these results quantify their impact on inclusive AN , providing new constraints on the underlying mechanisms, advancing our understanding of the origins of large TSSAs at forward rapidities.

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