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Spin asymmetries and cross sections of eta mesons at PHENIX

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Recent measurements by the PHENIX collaboration of η meson spin observables will be presented. The η meson is a practical final-state for study: as a light neutral meson, it is abundantly produced in hadronic collisions, while its heavier mass compared to the π^0 helps mitigate detector effects that limit the reach and precision of its lighter counterpart. At forward rapidity, the cross section at $\sqrt{s} = 500$ GeV and transverse single spin asymmetry (TSSA) at $\sqrt{s} = 200$ GeV were measured. For p_T *gtrsim* 2 GeV, the cross section is well-described by perturbative QCD calculations, confirming collinear factorization in this regime. This measurement is set to be included in an updated η meson fragmentation function global analysis. The forward TSSA provides sensitivity to the twist-3 quark-gluon correlation functions, related by k_T moments to the quark transverse-momentum-dependent distributions. At high Feynman- x values, large asymmetries exceeding 30% are observed. Comparisons to the π^0 TSSA indicate no major impact from final-state differences like mass or strange quark content. On the other hand, predictions of the twist-3 initial-state contribution to the TSSA underestimate the asymmetry, suggesting a key role played by twist-3 fragmentation terms. The status of the midrapidity cross section and longitudinal double spin asymmetry at $\sqrt{s} = 510$ GeV will also be presented. These measurements have the broadest reach in p_T of any PHENIX inclusive measurement. The cross section will serve as an additional input to the global fragmentation function fit while the longitudinal spin asymmetry probes the gluon helicity distribution.

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