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## Constraining Transversity and Nucleon Transverse-polarization Structure Through Polarized-proton Collisions at STAR

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Current knowledge of nucleon transverse-polarization structure comes from measurements of transverse single-spin asymmetries (SSAs) from semi-inclusive deep inelastic scattering (SIDIS). These measurements, combined with those of  $e^+e^-$  collisions, have allowed the first extraction of transversity with limited constraints at higher values of Bjorken- $x$ . One avenue to enrich understanding over a different kinematic range is jet+hadron and di-hadron production from polarized-proton collisions. Through these channels, the STAR detector at RHIC has for the first time observed SSAs due to the effects of transversity coupled to the Collins and interference fragmentation functions (IFFs) in polarized-proton collisions at  $\sqrt{s} = 200$  and 500 GeV. In addition to transversity, the distribution of pions within jets may also provide a window into gluon linear polarization. Furthermore, the comparison of all asymmetry moments at 200 GeV and 500 GeV may yield insight into longstanding theoretical questions concerning evolution, universality, and factorization breaking in non-collinear formulations of pQCD. Preliminary results from the jet+hadron and di-hadron analyses at  $\sqrt{s} = 200$  and 500 GeV will be presented, including the first observations of transversity effects in polarized-proton collisions and the first-ever measurements offering constraints on models involving gluon linear polarization.

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