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Longitudinal double-spin asymmetries of inclusive jet and di-jet production at STAR

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The Solenoidal Tracker at the Relativistic Heavy Ion Collider (STAR) experiment probes the gluon helicity distribution $\Delta g(x, Q^2)$ using collisions of longitudinally polarized protons at $\sqrt{s} = 200$ GeV and $\sqrt{s} = 510$ GeV. $\Delta g(x, Q^2)$ can be accessed through the double spin asymmetries A_{LL} in gluon-dominated hard scattering processes via inclusive jet and di-jet production.

Previously published results on inclusive jet production at $\sqrt{s} = 200$ GeV and mid-pseudorapidity $|\eta_{\text{jet}}| < 1$ are based on data corresponding to an integrated luminosity $L = 20 \text{ pb}^{-1}$ with an average beam polarization $P = 57\%$. When included in perturbative QCD analysis of global data, they provide evidence for positive gluon polarization for the momentum fraction $x > 0.05$ at a hard perturbative scale $Q^2 = 10 \text{ GeV}^2$. This talk will cover the inclusive jet and di-jet A_{LL} measurements based on the most recent data with an approximately twice larger figure of merit, LP^4 , and with improved systematic uncertainties, compared to the published results. The status of the jet A_{LL} measurements at $\sqrt{s} = 510$ GeV, which will constrain $\Delta g(x, Q^2)$ at lower x , will be also discussed.

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