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Recent STAR Measurements to Constrain the Polarized Gluon Distribution Function of the Proton

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The STAR experiment has been studying the spin structure of the proton, using the unique high-energy polarized proton collider, the Relativistic Heavy Ion Collider (RHIC). The kinematic coverage at STAR allows accessing gluons because quark-gluon and gluon-gluon scatterings dominate particle production at low and medium transverse momentum. The polarized gluon distribution function can be constrained by measuring the longitudinal double-spin asymmetry (A_{LL}) of jet production and neutral pions. Global QCD analyses of polarized parton distribution functions, which include the 2009 A_{LL} STAR results for inclusive jet production at $\sqrt{s} = 200 \text{ GeV}$, provide evidence of a non-zero gluon polarization in the measured range of partonic momentum fraction $x > 0.05$. We present the status of the latest measurements of A_{LL} at STAR, for inclusive jet and dijet production at $\sqrt{s} = 510 \text{ GeV}$ and 200 GeV collected in 2013 and 2015 respectively, both at mid-rapidity ($|\eta| < 0.9$). The large data sample taken during these years will improve the precision of our knowledge about the proton spin structure while the increased center of mass energy allows probing the polarized gluon distribution function at smaller partonic momentum fraction. Furthermore, we present measurements of A_{LL} for neutral pions at forward rapidity ($2.65 < \eta < 3.9$) collected during 2012 and 2013 that also allow reaching lower partonic momentum fraction. We compare these measurements with the latest global analyses.

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