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Gluon Polarization and Jet Production in STAR

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One of the primary goals of the RHIC spin program is to determine the gluon polarization distribution within the proton. At leading order, pp collisions involve a mixture of quark-quark, quark-gluon, and gluon-gluon scattering. In RHIC kinematics, the quark-gluon and gluon-gluon contributions dominate, which makes RHIC an ideal tool to explore gluon polarization. The STAR experiment has measured the longitudinal double-spin asymmetry, A_{LL} , for inclusive and di-jet production at $\sqrt{s} = 200$ GeV. The inclusive jet results provide the first experimental indication of non-zero gluon polarization in the x range sampled at RHIC. At leading order, the di-jet studies provide access to the incident parton kinematics, allowing a direct determination of the momentum dependence of the gluon polarization, $\Delta g(x, Q^2)$. During the 2012 and 2013 RHIC runs, STAR is investigating these same observables in pp collisions at $\sqrt{s} = 510$ GeV, which will expand the kinematic reach to lower- x gluons. The STAR measurements at 200 GeV will be discussed, including recent analysis improvements that provide reduced systematic uncertainties. In addition, the anticipated sensitivity of the 510 GeV measurements will be discussed, and STAR plans for future gluon polarization studies will be described.

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