

# XXVIII International Workshop on Deep-Inelastic Scattering and Related Subjects



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## Longitudinal double helicity asymmetry $A_{LL}$ from direct photon, jet and charged pion production in polarized $\vec{p} + \vec{p}$ collisions

*Wednesday, 14 April 2021 12:51 (18 minutes)*

Understanding the proton spin composition from the quarks and gluons spin polarization and their motion is important to test various kinds of sum rules and nonperturbative properties of hadrons. At the Relativistic Heavy Ion Collider (RHIC), we collide longitudinally polarized proton beams and measure the double helicity asymmetry  $A_{LL}$ , which is an important physical quantity for extracting the polarized parton distribution functions (PDFs) of the proton. Direct photon, jet and charged pion production are good channels to probe the gluon spin polarization inside the proton, with the ability to probe also the sign of the gluon spin. Direct photon production is the theoretically “cleanest” channel, with little fragmentation contribution, but limited by statistics. On the other hand, jet and charged pion production have more statistics, but include more hard processes and hadronization effects. In this talk, I will present the recent measurements of direct photon, jet and charged pion  $A_{LL}$ s at PHENIX and show their complementary roles in extracting the gluon spin.

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