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Measurement of Direct Photon Cross Section and Double Spin Asymmetry in p+p Collisions at $\sqrt{s} = 510$ GeV

Longitudinal double spin asymmetry A_{LL} of hadron, jet and direct photon in p+p collisions at the Relativistic Heavy Ion Collider (RHIC) is sensitive to the gluon spin at leading order. Unlike hadrons and jet, direct photon production provides clean access to the polarized gluon distribution since there is involved in this process. However, small direct photon cross section compared to π^0 and jet production has limited its utility in extracting the polarized gluon distribution. With recent increases in RHIC luminosity, we expect this limitation will be partially overcome and we try to revisit this “golden” measurement of polarized gluons based on RHIC run from 2013. This analysis measures the direct photon cross section and A_{LL} from the data collected by the PHENIX experiment at mid-rapidity ($|\eta| < 0.35$). This will be the first direct photon cross section and A_{LL} measurement in p+p at $\sqrt{s} = 510$ GeV with this experiment.

In this talk, I will present two methods to measure the direct photon cross section. One is π^0 tag method and the other is isolation method. I will compare the measurement from different detector parts as a check for consistency. The measurement will be compared with the next-to-leading order perturbative QCD to see whether the theoretical framework describe the data well or not. Next, I will show the status of A_{LL} measurement. This measurement can be used to constrain the gluon polarization when added to global fits such as DSSV

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