Direct Photon Production and Gluon Polarization Measurements in Proton-Proton Collisions at PHENIX

NILS FEEGE, Stony Brook University, PHENIX COLLABORATION —

Direct photons probe the hard scattering process in proton-proton collisions. The channel that dominates their production in these collisions is “the inverse QCD Compton effect,” $g + q \rightarrow \gamma + q$. Calculating this process requires no photon fragmentation function, which facilitates comparisons between theories and experiments. In polarized $p+p$ collisions, direct photons help determine the proton spin structure. At leading order, the longitudinal double-spin asymmetry $A_{LL}$ is directly proportional to the product of quark and gluon polarizations. The polarized quark distributions are known from polarized lepton-proton scattering experiments. Using them together with $A_{LL}$ measurements allows to access both the magnitude and sign of the polarized gluon distribution. The PHENIX experiment has collected data from polarized $p+p$ collisions at RHIC at center of mass energies of 200 GeV and 500 GeV. This talk presents the status of direct photon cross section measurements and $A_{LL}$ measurements at midrapidity ($|\eta| < 0.35$) using these data.

Nils Feege
Stony Brook University

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