Probing gluon polarization with $\pi^0$s in longitudinally polarized proton collisions.

The amazing result from polarized deep-inelastic (polarized-DIS) lepton scattering experiments is that only 20-30% of the nucleon spin is carried by quarks and antiquarks in the nucleon. The most obvious solutions to this "spin puzzle" is that the gluon contribution to the nucleon spin is large. Since gluons do not couple directly to the photon, gluon polarization cannot be directly measured in polarized-DIS experiments. In contrast, in polarized proton-proton collisions, the gluon polarization can be probed using processes where gluons participate directly. One of the promising methods is the measurement of double longitudinal spin asymmetry ($A_{LL}$) in high $p_T$ particle production.

During 2004 run, RHIC succeeded in accelerator commissioning to achieve about 40% beam polarization in the average at a center of mass energy of 200 GeV. PHENIX has accumulated about 0.12 pb$^{-1}$ which corresponds to about twice precision at figure of merit than last year. We’ll present and discuss latest PHENIX results on $\pi^0$ $A_{LL}$ measurements.