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Study of proton helicity structure in polarized p+p collisions at PHENIX

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To study the proton spin structure, the Relativistic Heavy Ion Collider (RHIC) at BNL provides a unique opportunity by colliding polarized protons. The hard subprocesses in proton-proton collisions involve gluons in leading order, therefore measurements of cross section asymmetries between aligned and anti aligned proton helicities give us information about the spin dependent gluon distribution, which might hold the longstanding missing proton spin component.
For the longitudinal spin program, the PHENIX experiment accumulated about 10/pb of data at sqrt(s)=200GeV with roughly 60% proton beam polarization and 0.1/pb of data at sqrt(s)=62GeV with 50% polarization. Up until now, we have performed spin asymmetry measurements focusing on pi0 production with the central electromagnetic calorimeters. Despite low integrated luminosity, it was shown that the sqrt(s)=62GeV data have comparable sensitivity to the gluon polarization through the high x_T=2p_T/sqrt(s) region.
In addition, various channels such as partial jets, charged pions, direct photons in the central rapidity region, large rapidity J/psi's through the muon channel and pi0's in a newly installed large rapidity electromagnetic calorimeter will provide complementary results.
We also measure double helicity asymmetries of the average intrinsic k_T by 2-particle correlations,which may be sensitive to the partonic orbital angular momentum, another possible contribution to the proton spin.
In this talk, we report recent results and plans of the PHENIX longitudinal spin program.

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