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Recent Highlights from the Spin Program at PHENIX

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The Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory has demonstrated the unique ability to collide beams of longitudinally and transversely polarized protons at center of mass energies up to $\sqrt{s}= 500$ GeV. EMC experiment and later DIS experiments showed that the quark spin only contribute about a third to the total spin of the nucleon. Since then several experiments are trying to determine its other contributions. In particular the contribution by the gluon spin was expected to be large. With the applicability of the factorized perturbative QCD (pQCD) and gluons in a leading order process, RHIC provides a unique opportunity to access to the gluon spin in the proton. The PHENIX experiment has studied the polarized gluon distribution via several channels such as π^0 , η , direct photons and heavy flavor which are already partially included in most recent global analysis. With RHIC full energy ($\sqrt{s}= 500$ GeV), W boson provides a unique way to separate the flavor spin components with the high scale of Q^2 and no fragmentation involved. Large single transverse spin asymmetries of hadrons were observed by the E704 experiment in the light hadron production in the forward rapidity. PHENIX has been studying these single spin asymmetries with a variety of final state particles in different rapidity ranges to try to understand the underlying physics, including effects from the Sivers function, the Collins effect, higher contributions, or combinations of all of the above. In this talk, we report highlight from PHENIX spin program.

¹for PHENIX collaboration