

# Single spin asymmetry of forward neutron at PHENIX.

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## IP12 experiment

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The Relativistic Heavy Ion Collider (RHIC) at the Brookhaven National Laboratory (BNL) was commissioned for polarized proton-proton collisions at the center of mass energy  $\sqrt{s}=200\text{GeV}$  during the run in 2001-2002. We have measured the single transverse-spin asymmetry  $A_N$  for production of photons, neutral pions, and neutrons at the very forward angle ( $\pm 2.8\text{mrad}$ ). The asymmetries for the photon and neutral pion sample were consistent with zero within the experimental uncertainties. In contrast, the neutron sample exhibited an unexpectedly large asymmetry ( $A_N \sim -10\%$ ).

From RUN3 (2003~), longitudinal spin scattering program has begun. In the RHIC rings, the protons are stored with transverse vertical polarization. The polarization vector gets rotated to longitudinal at the entrance of the interaction region, and back to vertical at the exit using the spin rotator magnets.

At PHENIX experiment, longitudinal of protons can be confirmed by measuring  $A_N \sim 0$  of the forward neutron. We measured longitudinal component,  $p_L/p$ ,  $\sim 99\%$  through the RUN3 and RUN4.

To understand the neutron asymmetry mechanism, we studied the single spin asymmetry of charged particles associated with the forward neutron production. Charged particles are detected by BBCs(Beam Beam Counter) which are covered with  $3.0 < |\eta| < 3.9$  and  $2\phi$  angle. We measured negative and positive  $A_N$  of charged particles for forward and backward correlation respectively. The neutron production asymmetry could be described by diffraction-like process .

In RUN5(2005), a short  $\sqrt{s}=410\text{GeV}$  run is scheduled. We will explore the existence of the analyzing power at this high energy.