

Measurement of Transverse Single-Spin Asymmetries for  $J/\psi$   
Production in Polarized  $p + p$  Collisions at  $\sqrt{s} = 200$  GeV

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**Abstract**

Transverse single spin asymmetries (SSAs) quantify the asymmetry of particle production relative to the transverse spin axis of a polarized hadron. SSAs have come to be recognized as a means of accessing QCD dynamics, both within initial-state hadrons and in the process of hadronization from partons. At  $\sqrt{s} = 200$  GeV, heavy flavor single-spin asymmetries in proton-proton collisions provide access to gluon dynamics within the nucleon. Any large transverse single spin asymmetry observed in heavy flavor production can not originate from Collins effect because the gluon's transversity is zero. Therefore, the production of heavy flavor particles in the transversely polarized pp collisions at PHENIX experiment offers a good opportunity to gain information on the Sivers effect. Transverse single-spin asymmetries of  $J/\psi$  production may shed light on the long-standing question in QCD of the  $J/\psi$  production mechanism.

In this paper the first measurement of transverse SSAs in  $J/\psi$  production is presented. The data were taken by the PHENIX experiment at the Relativistic Heavy Ion Collider (RHIC) during the 2006 and 2008 polarized proton run at  $\sqrt{s} = 200$  GeV. The  $p_T$  and  $x_F$  dependencies are studied, for rapidity regions of  $-2.2 < y < -1.2$ ,  $|y| < 0.35$ , and  $1.2 < y < 2.2$ , and  $p_T$  up to 6 GeV/ $c$ .

Results were obtained as a function of  $J/\psi$  transverse momentum and Feynman- $x$ .