Measuring ΔG in PHENIX Using Electrons to Tag Heavy Flavor Production

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A new era in spin physics has begun with the successful operation of the Relativistic Heavy Ion Collider at Brookhaven National Laboratory as a polarized proton collider during the 2001-2002 run. At PHENIX 4×10^9 p-p events at center of mass energies of $\sqrt{s}$ = 200 GeV were recorded with transverse beam polarization, first results on single transverse spin asymmetries have been obtained, and studies of systematic errors related to bunch dependent luminosity and polarization measurements have been performed. In light of this analysis we project the sensitivities and limitations of future measurements of the proton gluon polarization using heavy flavor production via electrons to tag jets with the PHENIX detector.

Heavy flavor production, $c\bar{c}$ and $b\bar{b}$, is dominated by gluon-gluon interactions and gives rise to a double spin asymmetry

$$A_{LL} \sim \frac{\Delta G(x_A)}{G(x_A)} \otimes \frac{\Delta G(x_B)}{G(x_B)} \otimes a_{LL}^{gg \to q\bar{q}}, \quad (1)$$

from which ΔG can be extracted. A measurement using heavy flavor production extends PHENIX's accessible x_g-range down to 0.02 or 0.01, depending on center of mass energy. In this talk we focus on channels in which we tag heavy flavor production with single electron and muon/electron coincidences, and J/ψ's identified with electron positron pairs. We will report on our sensitivity to ΔG using a full detector simulation which includes the effects of the trigger and dilutions due to conversions in the inner chambers and π^0 Dalitz decays. The extraction of ΔG through independent channels gives excellent control of systematic and theoretical uncertainty.