

Prospects on Constraining the Gluon Polarization from a Measurement of A_{LL} for Inclusive Jet Production During the RHIC Run in 2003

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The first run of colliding transverse polarized protons at $\sqrt{s} = 200$ GeV at RHIC opened a new era exploring the spin structure of the proton.

It has been found in polarized lepton-nucleon experiments that only about 1/3 of the proton spin is carried by quarks and anti-quarks, contrary to the expectation of the constituent quark model. A significant fraction of the proton spin must therefore be carried by gluons and orbital angular momentum. The role of the gluons to make up for the missing proton spin is currently only very poorly constrained from scaling violations measured in DIS experiments.

The measurement of the double longitudinal spin asymmetry, A_{LL} , in collisions of longitudinal polarized protons allows to access the gluon polarization, $\Delta G/G$, of the proton.

The anticipated increase in luminosity and polarization for the RHIC run in 2003 together with the installation of spin rotators at the STAR interaction region will allow the first measurement of A_{LL} in inclusive jet production at $\sqrt{s} = 200$ GeV. This data should provide hints on the gluon polarization of the proton. In the long-term, the determination of the gluon polarization of the proton will be made through prompt-photon production and photon-jet coincidences. Other possibilities for measuring $\Delta G/G$ include di-jet production and heavy flavor production.

The STAR detector will undergo major upgrades for the 2003 RHIC run with the installation of endcap and barrel calorimeter modules and the completion of the beam-beam counter. An upgrade proposal for a new forward pion detector system is currently being considered. Besides exploring transverse spin asymmetries at large η , the forward pion detector is expected to play a crucial role as a local polarimeter in the commissioning of the spin rotators at the STAR experiment.

The 2003 STAR spin physics program to constrain the gluon polarization from a measurement of A_{LL} in inclusive jet production, together with a brief overview of the various relevant upgrade programs will be discussed. The measurement of A_{LL} , the expected event rates and simulation results for the anticipated RHIC performance in 2003 will be described together with a discussion of various systematic error sources such as the absolute beam polarization uncertainty.