Measuring ΔG with Jets STAR

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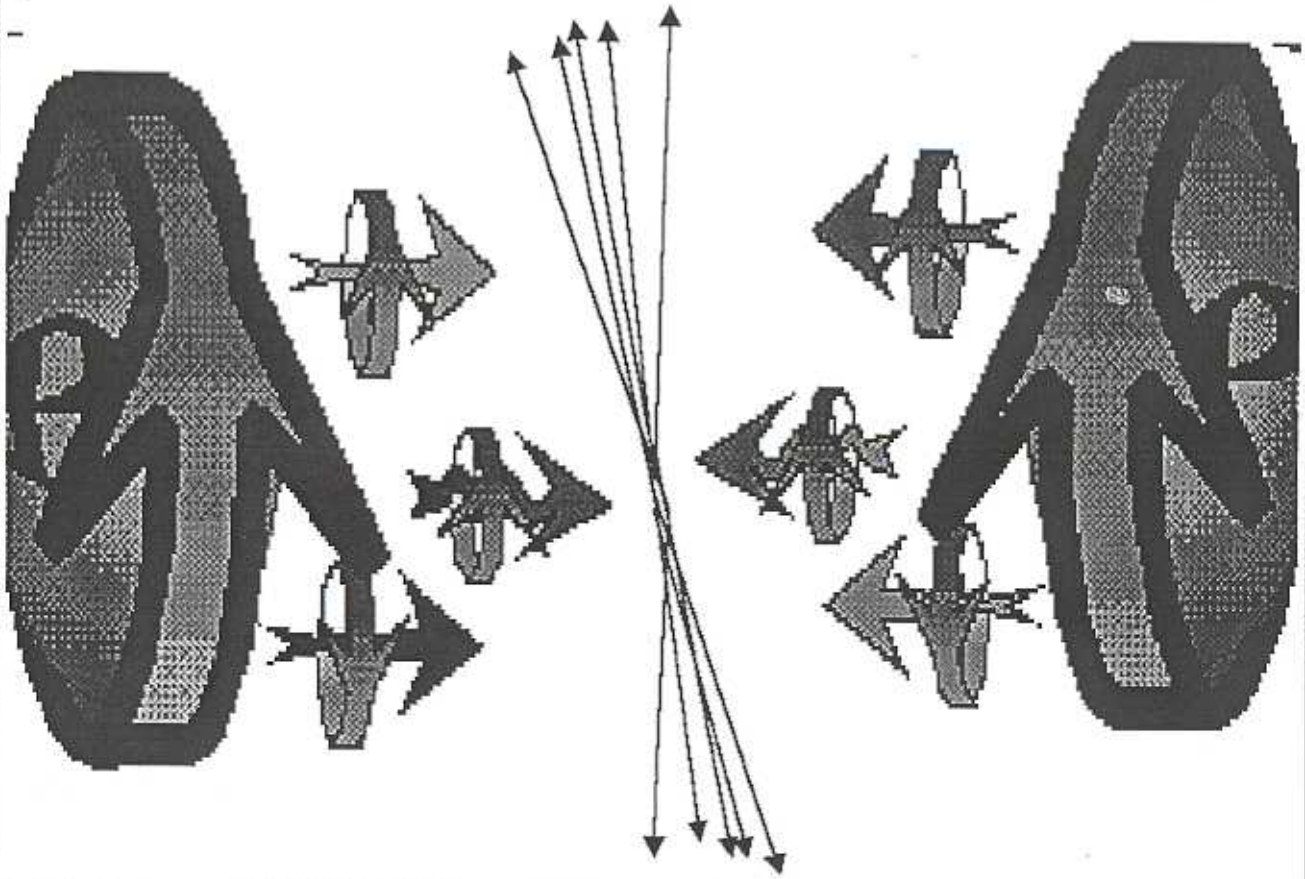


Summary

The clean and easily interpreted method for measuring ΔG involves the measurement of longitudinal double spin asymmetry of direct photon + jet events. However detection of jet pairs may make up in statistics part of what is lacking in clarity of interpretation. Focusing specifically here on dijets in the central rapidity region

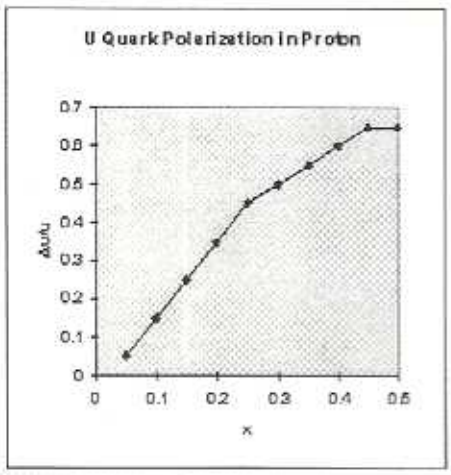
- Luminosity = 800 pbarns^{-1}
- $|Y_1|<.2$
- $|Y_2|<.2$
- $p_t>5$ GeV/c
- $E_{cm}=500$ GeV

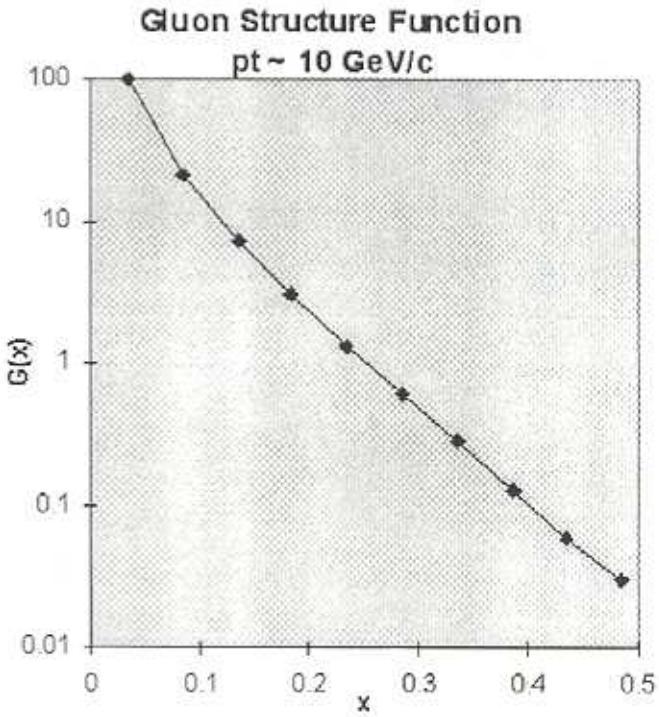
it is possible to make a determination of $\Delta G(x)$ around x=.02. This measurement may be the best handle on the low x part of the integral $\int_{x\,min}^{1} \Delta G(x)dx$. The error in this region is likely to dominate the error of the integral of the gluon spin. Measurements of $\Delta G(x=.02)$ at the 1% level would be very important to limit the low x contribution to the uncertainty of the integral. Such a 1% measurement would require the measurement of many ($\sim 10^7$) dijet events. If only 10^5 events were collected, the double spin longitudinal asymmetry would not be observable unless the gluon polarization in that region where to approach 10%.

1st Moment of the Gluon Polarization

$$\Delta G(x\min) = \int_{x\min}^{1} dx G(x)\left[\frac{\Delta G(x)}{G(x)}\right]$$

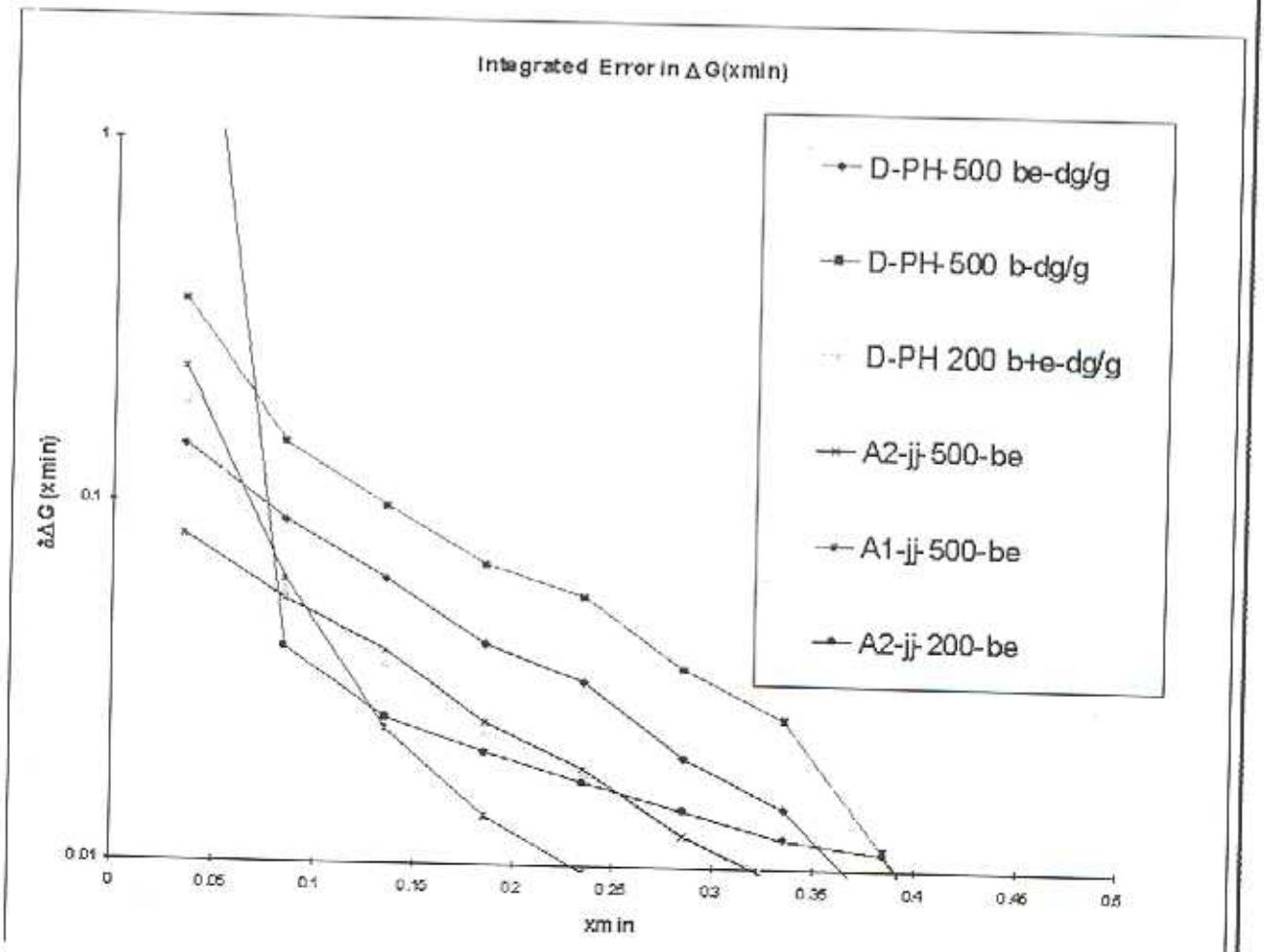
$$\delta[\Delta G(x\min)] = \int_{x\min}^{1} dx G(x)\delta\left[\frac{\Delta G(x)}{G(x)}\right]$$





Error in Integral ΔG(xmin) For Various Measurements

Integrated Error in DG(xmin)

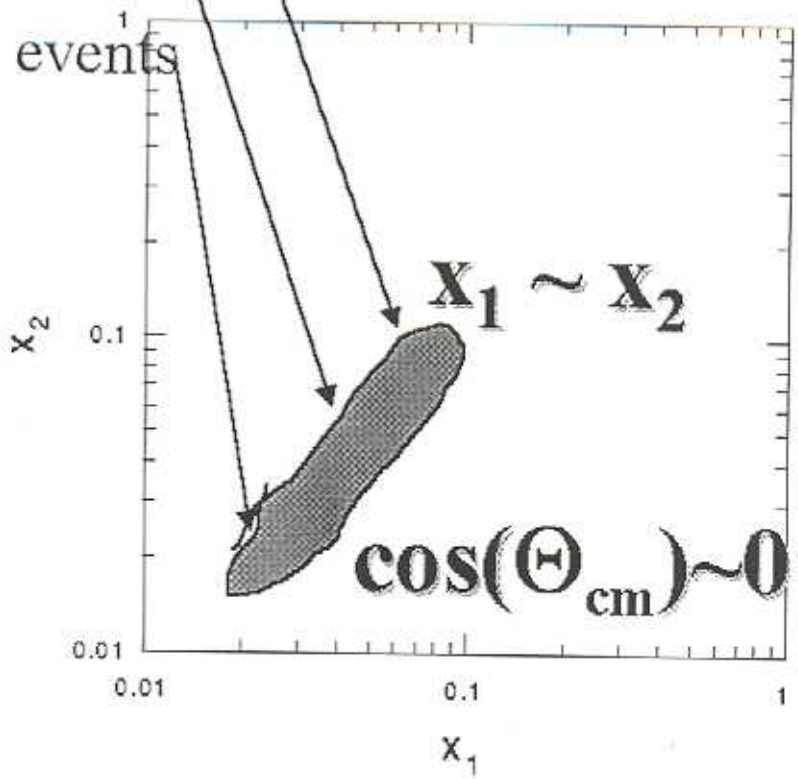
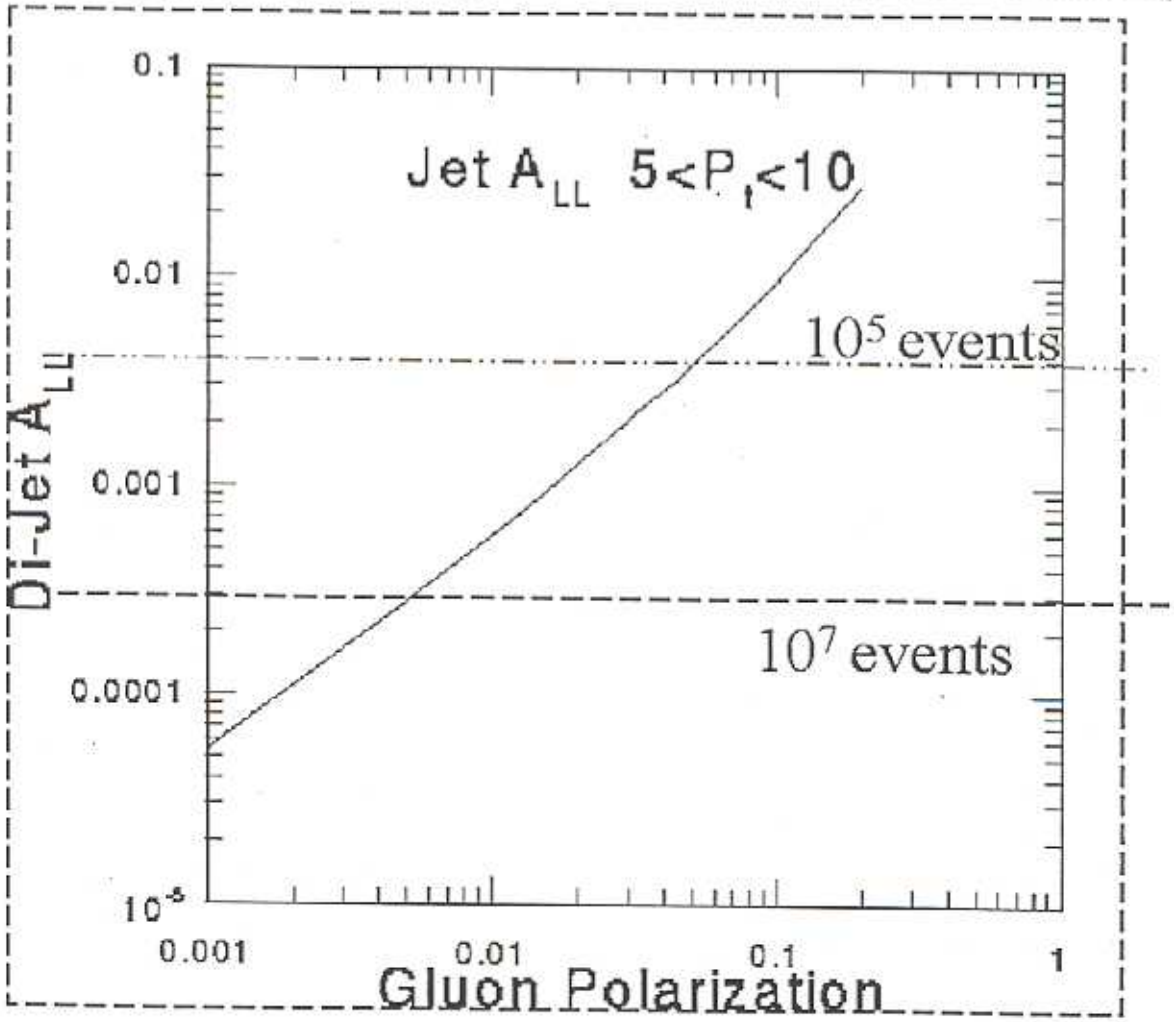


Using Jets

1. To many events.
2. Small x <=> low pt
3. Messy

Selection: $|Y_1|<.2$ $|Y_2|<.2$

- $P_t>20$ 10^5 events
- $P_t>10$ 10^6events
- $P_t>5$ 10^7 events



Asymmetry vs Gluon Polarization around x~.02