ON THE POSSIBILITY TO TEST HOW MUCH OF THE PROTON SPIN IS CARRIED BY GLUONS IN THE PROCESSES OF HADROPRODUCTION OF CHARMONIUM

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The production of C-even charmonium states χ_2 and χ_1 (χ_2 and χ_1 are the states with total angular momentum $J = 2$ and 1), in $p_{\text{polarized}} + p_{\text{polarized}} \to \chi + \text{all}$, may be a good test of how much of the proton spin is carried by gluons if we believe that χ states are produced by gluon fusion. The reason is that by studying the angular distributions in the sequential decays $\chi \to \gamma + J/\psi$, $J/\psi \to \mu^+\mu^-$ (or e^+e^-) we can have detailed information on the polarization states of χ.[1] However, it is not clear that perturbative QCD-gluon fusion is responsible for the production of charmonium states in hadronic collisions. It is very probable that in these processes nonperturbative effects are of importance. For this reason from the theoretical point of view much more preferable are experiments on bottomium production (but unfortunately the cross sections of bottomium production are very small).

References

1. B. L. Ioffe, Phys. Rev. Lett. **39**, 1589 (1977).