

Transverse Spin Effects in Proton-Proton Scattering and $Q \bar{Q}$ Production

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Spin effects in diffractive polarized proton-proton and lepton-proton reactions at high energy are discussed. They are expressed in term of Pomeron exchange which is represented as a two-gluon object. The two-gluon coupling with the proton at small x has been used in the form

$$V_{p \text{ } gg}^{\alpha \text{ } \alpha'}(p, t, xp, \dots) = (\gamma^{\alpha} p^{\alpha'} p^{\alpha}) B(t, xp, \dots) + iK(t, xp, \dots) (p^{\alpha} \sigma^{\alpha\rho} \Delta_{\rho} + p^{\alpha'} \sigma^{\alpha\rho} \Delta_{\rho}) \quad (1)$$

The distribution $B(t, \dots)$ in (1) determines the spin-non-flip contributions. The term $K(t, \dots)$ leads to the transverse spin-flip in the coupling (1).

The model for the coupling [1] predicts a value of single spin transverse asymmetry of about 10% for $|t| \sim 3\text{GeV}^2$ at RHIC energies [2]. The large negative asymmetry near the diffraction minimum $|t| \sim 1 - 1.3\text{GeV}^2$ is predicted to be about 30-50%. The weak -energy dependence of spin asymmetries in exclusive reactions obtained in the model is not in contradiction with the experiment [1, 2].

The double spin asymmetries for longitudinally polarized leptons and transversely polarized protons in diffractive $Q \bar{Q}$ production at high energies within the model (1) is calculated. This asymmetry is found to be proportional to the ratio of KIB structures which are connected with the polarized skewed gluon distributions K and F [3]. The predicted A_{LT} asymmetry in diffractive $Q \bar{Q}$ production is about 10-15% at eRHIC energy range. This shows the possibility to study the ratio of polarized gluon distributions K/F in future polarized experiments on proton-proton scattering at the RHIC PP2PP experiment for momentum transfer $|t| \geq 1\text{GeV}^2$ and on diffractive $Q \bar{Q}$ leptonproduction at the eRHIC.

References

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