

Measurements Of The Gluon Polarization In The Nucleon

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The COMPASS Collaboration has measured double-spin cross-section asymmetries for the production high- p_T hadron pairs by 160 GeV polarized muons scattering off a polarized deuteron target. From these cross-section asymmetries the gluon polarization $\Delta G/G$ was determined in leading order, separately for events with momentum transfers $Q^2 < 1\text{GeV}^2$ and $Q^2 > 1\text{GeV}^2$. The two kinematic regions were studied using the PYTHIA and LEPTO generators, respectively. The most precise result is obtained from the large statistics event sample with small Q^2 . From the data taken 2002–2004 we obtain

$$\Delta G / G(x_g = 0.09) = 0.016 \pm 0.058(\text{stat.}) \pm 0.036(\text{syst.}) \quad (1)$$

for hadron pairs with $\sum p_T^2 > 2.5 \text{ GeV}^2$. In average the gluon distribution is probed at about 3 GeV^2 . This small value for $\Delta G/G$ implies that earlier expectations of a very large gluon polarization are unlikely to be correct. However, the measurement does not yet exclude a considerable contribution of the gluon spin to the nucleon spin.

The data for hadron pairs with $Q^2 > 1\text{GeV}^2$ represent an independent measurement, both concerning the event sample and used Monte Carlo generator.

Time permitting, data will also be presented for the gluon polarization obtained from asymmetries in D meson production. This method is the least model dependent, but limited by the obtainable statistics.