Spin structure functions of the proton and the neutron at low to moderate Q^2

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Abstract

The physics program at the Jefferson Lab has collected a large amount of data on the spin structure functions of the nucleon by using polarized electron beam directed on polarized NH_3 and ND_3 targets. In these experiments, the virtual photon asymmetry A_1 and the spin structure function g_1 were measured with an unprecedented precision in a large kinematic range of 0.01 $GeV^2 < Q^2 < 6.0$ GeV^2 and 1.08 GeV $< W <$ 3.0 GeV. The data help us to better understand the spin structure of the nucleon, especially in the transition region between hadronic and quark-gluon degrees of freedom. Therefore, it will be possible to put limits on quark-hadron duality, test pQCD predictions for the quark polarization at large x, perform more precise calculations of higher-twist matrix elements in the framework of the Operator Product Expansion and get a glimpse of A_1 at high x. In addition, using available proton and deuteron data together and utilizing a new unfolding technique, the spin structure functions for the neutron in the resonance region are extracted.