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The g_2 Spin Structure Function

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Jefferson Lab has been at the forefront of a program to study the polarized structure of nucleons. Measurements of the spin-dependent structure functions, g_1 and g_2, have proven to be powerful tools in testing and understanding Quantum Chromodynamics. To measure g_2 a transversely polarized target is needed, which proves to be challenging experimentally. Prior to JLab, the only dedicated experiment to measure g_2 was SLAC E155x, which shows consistency with the leading twist g_2^{WW} prediction, but has large uncertainties. The function g_2^n has been measured extensively in Hall A at JLab over a wide range of Q^2. The Resonances Spin Structure (RSS) experiment in Hall C gave a precision measurement of g_2 for the proton and deuteron at intermediate Q^2, providing the first world data for $g_2^{p,d}$ in the nucleon resonance region. The Spin Asymmetries of the Nucleon experiment (SANE), also performed in Hall C, provided a measurement of g_2 in the high Q^2 (DIS) region. More recently, the g_2^p experiment took data covering the low Q^2 region. The 0^{th} moment of g_2 provides a test of the Burkhardt-Cottingham sum rule, which states that the integral of g_2 over the Bjorken scaling variable x goes to zero. This sum rule, valid for all values of Q^2, has been satisfied for the neutron, but a violation is suggested for the proton at high Q^2. The 2^{nd} moment allows for a benchmark test of lattice QCD predictions at high Q^2 with d_2, and a test of Chiral Pertubation Theory at low Q^2. Specifically, the behavior of the longitudinally-transverse spin polarizability (δ_{LT}), as χPT calculations of this quantity deviate significantly from the measured neutron data. This talk will provide an overview of the JLab effort to measure g_2, with a focus on the more recent g_2^p experiment; the current status of the analysis will be discussed along with preliminary results.

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