The Generalized GDH Sum Rule: Measuring the Neutron and ^{3}He Spin Structure at Low Q^2

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For the JLab Hall A and E97-110 Collaborations

The Gerasimov-Drell-Hearn (GDH) sum rule, as a fundamental sum rule for real photon absorption, relates the anomalous magnetic moment to the spin structure of the nucleon. The generalized form of GDH sum rule extends this relation to finite four-momentum transfer squared (Q^2). Jefferson Lab experiment E97-110 was performed with a High Resolution Spectrometer (HRS) and a septum magnet in Hall A at Jefferson Lab. The experiment aims to precisely extract the first moments of the neutron spin structure functions g_1 and g_2 using polarized electron scattering from a polarized ^{3}He target. The covered kinematics comprised the quasi-elastic, resonance and deep inelastic regions in a Q^2 range from 0.02 to 0.24 (GeV/c)^2. This low Q^2 range allows us to extrapolate the generalized GDH integrand to the real photon point. Predictions by Chiral Perturbation Theory of various sum rules will be used to make a bench-mark test in this low Q^2 region. In this talk, we will present the results on the moments of the neutron spin structure functions and the current status of the analysis.