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

The Gerasimov-Drell-Hearn (GDH) sum rule, as a fundamental relation between real photon absorption and the anomalous magnetic moment to the spin structure of the target. The generalized form of GDH sum rule extends this relation to finite four-momentum transfer squared (Q^2). Jefferson Lab experiment E97-110 was carried out with longitudinally polarized electron beam scattering off the polarized ^3He target in Hall A. The experiment measured the spin dependent structure functions g_1 and g_2 for ^3He at small scattering angles of 6° and 9° with a beam energy from 1.1 GeV to 4.4 GeV. The generalized GDH sum and moments of the spin dependent structure functions were extracted by integrating the measured g_1 and g_2 over the quasi-elastic and resonance region, and beyond at low Q^2

from 0.02 to 0.3 GeV^2 . The data in this low Q^2 region benchmarks predictions regarding the neutron spin structure by Chiral Perturbation Effective Field Theories. Recovery of the real-photon point ($Q^2 \rightarrow 0$) for the generalized GDH sum rule is also tested with the low Q^2 results. In this talk, we will present the experimental results of various moments for ^3He .

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