

# Using Polarized $^3\text{He}$ to Study the Spin Structure of the Neutron at Jefferson Lab

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## Abstract

The study of the nucleon spin structure has been an active field for over twenty years. The ultimate goal of this work is to understand the structure and interactions of protons and neutrons in terms of quarks and gluons. The Gerasimov-Drell-Hearn (GDH) sum rule is an important tool available to study nucleon spin structure. Originally derived for real photon absorption, the GDH sum rule has been extended for absorption of virtual photons with electron scattering. An overview of measurements on both the GDH sum rule and its extension will be given. Emphasis will be placed on the recent Jefferson Lab Hall A experiment E97-110, which used a polarized  $^3\text{He}$  target to measure the extended sum rule for the neutron and  $^3\text{He}$  near the real photon limit. This data allows us to test low energy theory predictions and verify the extension of the sum rule. The target, polarization technique, and why polarized  $^3\text{He}$  is a key nucleus to study the neutron will be explained. The status of the data analysis will also be discussed.