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Measurements of Spin Structure Function G1(P) and G1(D) for Proton and Deuteron at SLAC E143*

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MEASUREMENTS OF SPIN STRUCTURE FUNCTION g_1^p AND g_1^d FOR PROTON AND DEUTERON AT SLAC E143

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Abstract

E143 [1] [2] was a high precision measurement of the proton and deuteron spin structure functions g_1 and g_2 in SLAC's End Station A facility, with longitudinally and transversely polarized NH3 and ND3 targets, and a longitudinally polarized electron beam. The experiment was done at beam energies of 29, 16 and 9.7 Gev. The deeply inelastic scattered electrons were detected by two independent spectrometers at $4.5°$ and $7°$ relative to the incident electron beam. At a beam energy of 29 Gev, the measurements covered the Bjorken x range from 0.03 to 0.8, and the Q^2 range from 1.2 $(GeV/c)^2$ to 9.8 $(GeV/c)^2$. It was found that the $\int_0^1 g_1^p(x, Q_2)dx$ is more than two standard deviations away from the Ellis-Jaffe sum rule, and the corresponding deuteron integral is more than three standard deviations away from the Ellis-Jaffe's rule, but the Bjorken sum rule is consistent with the experimental data. Tests of the sum rules at different values of Q^2, and the implications of these results for the quark-parton model have also been done.

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To my parents and family,

for their love, and confidence,

in everything I do.

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