

Measuring the Neutron Spin Asymmetry A_1^n in the Valence Quark Region in Hall C at Jefferson Lab

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Due to the non-perturbative nature of QCD, making absolute predictions of nucleon spin structure is generally difficult, and there remains little known about the contribution of quark orbital angular momentum (OAM) to the total nucleon spin. The neutron spin asymmetry A_1^n at high x_{bj} is a key observable for probing nucleon spin structure since the valence domain ($x_{bj} > 0.5$) is free of sea effects, where the total nucleon spin is considered to be carried by the valence quarks, and can enable us to discriminate between models that include and exclude the role quark orbital angular momentum plays in forming the nucleon spin. A_1^n was measured in the deep inelastic scattering region of $0.3 < x < 0.77$ and $3 < Q^2 < 10 \text{ (GeV/c)}^2$ in Hall C at Jefferson Lab using a 10.4 GeV longitudinally polarized electron beam, upgraded polarized ^3He target, and the High Momentum Spectrometer (HMS) and Super High Momentum Spectrometer (SHMS). The wide Q^2 range will explore possible Q^2 dependence on A_1^n , provide the first precision data in the valence quark region above $x = 0.61$, and therefore test various predictions from the relativistic constituent quark model and perturbative QCD.¹

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