

Spin Physics in Deep-Inelastic Semi-Inclusive Reactions with a 12-GeV Electron Beam at Hall A of the Jefferson Laboratory

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With the planned 12 GeV upgrade at the Thomas Jefferson National Accelerator Facility in Newport News, Virginia, the combination of a high current CW polarized electron beam and the use of high density polarized targets presents many new physics opportunities, especially in the measurements of spin observables in deep inelastic semi-inclusive scattering (SIDIS) reactions.

If factorization between quark scattering and parton fragmentation can be clearly demonstrated, SIDIS can provide direct accesses to quark distributions. The unique feature of quark-flavor tagging capability allows us to study the flavor decomposition of the nucleon spin structure and to access the transversity distributions. At Hall A of the Jefferson Laboratory, a new large-acceptance spectrometer is under design which will be combined with the existing high resolution spectrometer to provide unprecedented opportunities for high precision SIDIS measurements.

In this paper, the perspective of SIDIS measurements at 12 GeV in Hall A with polarized Helium-3, polarized NH_3 and ND_3 targets will be discussed. Tests of factorization are suggested for both polarized and unpolarized measurements. The expected sensitivities to valence and sea polarizations as well as transversity distributions will be shown.