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Measurement of Anti-Quark Sivers Asymmetry at FNAL-SpinQuest

SpinQuest at Fermilab is a fixed-target experiment to primarily measure the Drell-Yan process using transversely polarized NH_3 and ND_3 targets and unpolarized 120-GeV proton beam. In the Drell-Yan process, a quark in one scattering hadron and an anti-quark in the other hadron annihilate into a virtual photon and then decay into a muon (lepton) pair. The angular distribution of final-state muon pairs with respect to the target polarization is sensitive to the Sivers function of light anti-quarks in the nucleon, which is one of the eight leading-twist Transverse Momentum Dependent (TMD) parton distribution functions. The Sivers function of each anti-up and anti-down quarks can be extracted by the use of the NH_3 and ND_3 targets for p+p and p+d reactions. The intensity of the proton beam is as high as 2×10^{12} protons/second, in order to accumulate the required number of Drell-Yan events. The J/ψ and ψ' productions are measured together, which is also sensitive to the Sivers functions of light anti-quarks and gluons. SpinQuest commissioned the target and the spectrometer with the proton beam in May-July 2024. The status of analyses of the commissioning data and preparation for the next data taking will be presented.

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