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Precision Polarized SIDIS Experiments in Hall-A at 12 GeV JLab

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One of the cleanest ways to access the Transverse Momentum Dependent (TMD) parton distribution functions of the nucleon is to measure single (SSA) and double spin asymmetries (DSA) in semi-inclusive DIS reactions using polarized nucleon targets. The Jefferson Lab 12 GeV upgrade will provide a unique opportunity to perform such precision measurements and to map these multi-dimensional PDFs. In this talk, we will present our plans for performing these precision measurements in Hall-A using Large acceptance SoLID spectrometer and polarized proton and ^3He (neutron) targets. In particular, we will focus on two approved A-rated experiments using both longitudinally and transversely polarized ^3He targets, and a conditionally approved experiment with a transversely polarized proton target. The high luminosities from these targets and the large acceptance of the SoLID spectrometer will allow for a precise 4-dimensional (x, Q^2, z, P_T) mapping of SSA and DSA. The full azimuthal angular coverage is necessary to untangle various angular moments and thereby reduce the systematic uncertainties. These experiments will provide the most precise data to extract transversity, Sivers and Worm-gear distributions of u and d-quarks and provide comprehensive information on the correlation between quark angular momentum and the nucleon's spin.

Author: Mr ALLADA, Kalyan (Jefferson Lab)

Presenter: Mr ALLADA, Kalyan (Jefferson Lab)

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