Spin observable measurements in pseudo scalar-meson polarized photo-production using polarized neutrons in solid HD

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Abstract

Recent Lattice QCD calculations have confirmed the long standing quark model expectation of many more excited states of the nucleon than have as yet been experimentally observed. These missing states are expected to be broad and overlapping and require detailed partial wave analyses (PWA) to disentangle. Measurements of many polarization observables are required to constrain PWA. Furthermore, while I = 3/2 Δ amplitudes can be determined from proton targets alone, descriptions of I = 1/2 N* production necessarily require neutron reaction data as well, about which comparatively little is known. To address the latter, the g14/E06-101 experiment at Jlab completed data taking in 2012 using the CLAS with circularly and linearly polarized photons incident on longitudinally polarized neutrons in solid deuterium-hydride (HD) frozen-spin targets. The combination of small dilution and low Z with this target has enabled running at an order of magnitude higher fluxes than previous experiments. CLAS calibrations are in the final stage. Corrections have been performed for energy loss of charged particles passing through materials on the cryogenic target including the super conducting solenoid, NMR coils and radiation shields. Analysis has been on-going for the data with not only circularly but also linearly polarized photon beams. Preliminary analyses for double-spin asymmetries on the neutron, such as γ + n(p) $\rightarrow \pi^-$ + p (p) will be discussed.