

G14 Polarization Observables for Double Pion Photo-production

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A successful description of the excited levels of a composite system is a basic test of how well the underlying forces are understood. While Quantum-Chromodynamics (QCD) is regarded as a mature theory describing the interactions of quarks within hadrons, the excited states of the nucleon present many challenges. Recent Lattice-QCD calculations have confirmed the long-standing predictions of effective quark models for about three times more resonance states than experimentally observed (the “missing resonance” or N^* problem). From the experimental stand-point, most of these “missing resonances” are high in mass and short-lived, which results in broad and overlapping peaks that are not readily identified in a cross section plot. The work to be presented is part of the JLab N^* program to search for new resonances by partial wave analysis of many polarization observables. This talk will describe the recently completed g14/E06-101 experiment on polarized HD in Hall B of Jefferson Lab, including preliminary results for 2 pion photo-production asymmetries on both polarized protons and polarized neutrons. The same polarization observables for a proton target are compared with previous g1c and g9a experiments with good agreement, and the new results for quasi-free neutrons will also be given. Significant differences between proton and neutron targets are evident in both the Dalitz distributions and the polarization observables.