Search for N* Resonances in Double-Polarization Experiments using the CLAS Spectrometer

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Discussion will be given on the investigation of the nucleon excitation spectrum using a polarized tagged-photon beam, a polarized target (FROST), and a large acceptance spectrometer (CLAS) at Jefferson Laboratory. The excited states of the nucleon cannot simply be inferred from cleanly separated spectral lines. Quite the contrary, a *spectral analysis* in nucleon resonance physics is complicated by the fact that the resonances are broadly overlapping states which decay into a multitude of final states involving mesons and baryons. In order to provide a consistent and complete picture of an individual nucleon resonance, the various possible production and decay channels must be treated in a multichannel framework that permits separating resonance from background contributions. Very often, resonances reveal themselves more clearly through interference with dominant amplitudes. These interference terms can be isolated via polarization observables. However, in the absence of experimental data on polarization observables, in particular for multi-meson final states, the predictive power of currently used theoretical models is unclear.

The upcoming FROST program anticipates to take data for all four combinations of beam and target polarization, thus providing almost complete sets of measurements for π^0, η, and $\pi^+\pi^-$ photoproduction. The additional determination of the recoil polarization in hyperon production, completes polarization measurements for these reactions. The experimental setup and studies of the sensitivity of polarization observables to baryon resonances, in particular for double-pion production, will be discussed. In the past, the $p\pi^+\pi^-$ final state has been treated often as arising from either of the quasi two-body states $\Delta\pi$ or $N\rho$, followed by the decay of the Δ or the ρ. This approach has been reasonably successful. However, it is considered important that the polarization observables for such processes be measured and elucidated in a more general framework, one that goes beyond the quasi two-body asumption.