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Measuring the Production Cross Sections of the Ground State Cascade in Photoproduction

For decades an assortment of quark models and more recently lattice QCD calculations have predicted many more Cascade baryon states than have been experimentally observed. Furthermore, SU(3) flavor symmetry indicates that there should be a Cascade partner for every N^*- and Δ^*- resonance. The spectrum of the doubly strange Ξ baryons is poorly known and only a few states have been experimentally observed. Moreover, the photoproduction mechanism for these states is not well understood. It is assumed that Ξ resonances are photoproduced in the strong decay of intermediate highly excited singly strange hyperons.

The GlueX experiment in Hall D at Jefferson Lab has accumulated high-statistics samples of photoproduction data. Using these high-statistics data and the fact that the lowest-lying Cascade states are expected to have very narrow widths, GlueX will be able to shed light on the systematics of the spectrum. In addition, the high statistics data in conjunction with the linearly polarized photon beam at GlueX makes it possible to measure the differential cross section and various polarization observables with high accuracy. Consequently, the measurement of these observables will allow for the composition of a full partial wave analysis to fully understand the production mechanism.

I will give a broad overview of the Cascade physics program being conducted using GlueX data. Furthermore, I will report the preliminary differential cross section for $\Xi(1320)^-$ in the exclusive t-channel production reaction $\gamma p \to K^+ Y^* \to K^+(K^+\Xi^-)$ where $\Xi^- \to \Lambda\pi^-$.

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