Isobar configurations in ^{3}He ground state

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Studying the short-distance structure, the probabilities of short-range correlations (SRC) and meson-exchange currents in nuclei are important subjects in experimental nuclear physics that still have not been resolved. These processes, together with final-state interactions, contribute to the measured observables that are mostly being interpreted within strongly model-dependent pictures.

The study of virtual nucleon excitations, specifically isobar configurations in the nuclear ground state, is an important part of this effort. Since the SRC are local high-density regions, it is likely that the quark distributions of nucleons would make a transition to non-nucleonic configurations. A number of theoretical calculations predict the probability of finding one or more nucleons in an excited state. In some studies, isobar excitations have been explicitly included in the few-body problem.

Recent experiments at JLab provide an extensive data set of photon-induced reactions from nuclear targets. In this work we study various photoproduction channels that contain one or more Δ-isobar configurations using an incident photon-beam energy of 0.5-1.5 GeV on a ^{3}He target, for example, the $\gamma^3\mathrm{He} \rightarrow \Delta^{++}nn$ or $\gamma^3\mathrm{He} \rightarrow \Delta^{++}\Delta^0 n$ reactions. Preliminary results from these analyses and future plans will be discussed.