Abstract

We propose to study the reaction $^3He\,(\vec{\gamma},\pi^+)\,^3H$ at momentum transfers, Q^2, ranging up to 20 fm^{-2} using polarized photons with energies between 300 MeV and 650 MeV. Both the differential cross section, $d\sigma/d\Omega_\pi$, and the photon asymmetry, Σ, will be measured. The broad kinematic range spanned by the data will enable us to investigate a possible breakdown of DWIA arising from two-body mechanisms and possible changes in elementary amplitudes, the influence of two-step processes in the ^3He nucleus, and the magnitude of D-state components in the nuclear three-body wave function. Of these, the principal focus will be on the possible breakdown of the impulse approximation arising from modifications of the $E_{1^+}(\Delta)$ amplitude in a dense nuclear system. The D-wave admixture in the trinucleon wave function gives rise to a potentially large SD interference contribution to Σ. This contribution is approximately proportional to the $E_{1^+}(\Delta)$ amplitude so the photon asymmetry Σ provides a sensitive measure of the $E_{1^+}(\Delta)$ amplitude. However, the extraction of such effects will require a simultaneous, accurate determination of the D-wave admixture. The contributions of each of these factors to the cross section and to the photon asymmetry have characteristic dependencies upon photon energy, photon polarization, and pion emission angle. Isolation of a particular contribution will require simultaneous analysis of data over a broad kinematic range. As a result, the experiment will require the unique combination of properties provided by the CLAS detector and the Coherent 0 Source or the proposed Compton High Intensity Photon Source, should it become available.