

CEBAF EXPERIMENT 91-014

Quasi-Free Strangeness Production in Nuclei

Charles E. Hyde-Wright, Spokesperson

This experiment will use tagged photons (1 to 2 GeV) in the CLAS to measure the differential $A(\gamma, K)$ and $A(\gamma, KY)$ cross sections on ${}^3\text{He}$, ${}^4\text{He}$, and ${}^{12}\text{C}$, in quasi-free kinematics. Both K^+ and K^0 , as well as $Y = \Lambda$ and Σ production will be measured. These measurements complement similar CLAS experiments on H and D. We expect photo-kaon production to be dominated by incoherent production on individual nucleons (quasi-free production). However, the results from quasi-free (e, e') and $(e, e'p)$ measurements demonstrate that the quasi-free mechanism can be substantially altered by two-nucleon currents and possibly by polarization of the static properties of nucleons in nuclei.

This experiment is designed to study the relative importance of the one-nucleon (γ, K) current, two-nucleon (γ, K) currents, and kaon and hyperon final state interactions (FSI). We define FSI as interactions that are incoherent with the $N(\gamma, K)Y$ vertex: coherent interactions must be considered as two-nucleon currents. These different mechanisms can be identified at least partially phenomenologically by examining specific observables.

Due to strangeness conservation, the total photo-kaon cross section should be insensitive to kaon FSI. Furthermore, the D: ${}^4\text{He}$:C ratio in a quasi-free model is relatively insensitive to the extraction of the $n(\gamma, K)Y$ amplitude from the data on Deuterium. Thus the A-dependence of the total cross section is primarily a search for medium effects on the elementary amplitude (either nucleon polarization or two-nucleon currents).

The differential ${}^3\text{He}$ data will be a detailed test of the quasi-free model, in a context where the (e, e') data suggest the nuclear medium effects are small.

The A-dependence (for N=Z) of the K^+/K^0 ratio is largely insensitive to the details of the quasi-free mechanism. Thus this ratio is a probe for either two-nucleon currents, or charge-exchange final state interactions.

In order to trigger on both K^0 and K^+ events, we require a minimum bias trigger. Thus our data stream will include copious non-strangeness events, such as $(\gamma, NN)X$, or $(\gamma, N\pi)X$. A particularly interesting class of events are ${}^3\text{He}(\gamma, ppn)$ events with all three nucleons carrying large transverse momentum in the final state. These events necessarily involve three-nucleon correlations: in either the initial state, final state, or in the current.