

I. Introduction

This proposal requests approval for early beam time using the CLAS at CEBAF at a priority sufficient to continue the design of and preparation for the experimental program described herein. The purpose of this program is to measure the nuclear mass (A) dependence of neutral vector meson photoproduction amplitudes by detecting lepton pairs. Such measurements are relatively free from non-resonant backgrounds such as those which result from pions produced in the initial state and from final state interactions of the pions resulting from the vector meson decay. The proposed measurements can even determine the phase of the photoproduction amplitudes in the region of interference with the QED Bethe-Heitler pairs. By relating the measured phase to the meson-nucleus amplitude it should be possible to test models for the meson-nucleon amplitudes and models for the modification of those amplitudes in nuclear matter. While such measurements have been made on H, Be, and C targets, no systematic study of the A -dependence of the phases exists.

The design of CEBAF and the CLAS detector are uniquely suited for this study. The energy region of 1 to 4 GeV (to 6 to 10 GeV) is the transition region in which the photon acquires hadronic dressing, the CW nature of the beam facilitates coincidence measurements, and the CLAS detector has a large acceptance in angle and momentum with good resolution.

II. The Past

The experimental and theoretical situation concerning the hadronic properties of the photon, photonuclear shadowing, vector meson production, etc. is summarized (up to 1978) in the excellent review by T.H.