

Abstract

We propose to make a detailed study of $(e,e'p)$ reactions at high missing energy for selected kinematics. R_L and R_T separations will be performed for ^{12}C at the quasielastic peak for a Q^2 range from 0.2 to 1.5 $(\text{GeV}/c)^2$, and also for $^{3,4}\text{He}$ at $Q^2 = 1(\text{GeV}/c)^2$. Existing $(e,e'p)$ data at high missing energy, especially the transverse response at low q , show excessive strength beyond the one nucleon process. By studying the Q^2 and A dependence, we hope to learn the nature of this phenomenon and the relationship to the (e,e') phenomenology, and therefore to improve our understanding of the nucleon-nucleon interactions as well as two- and multi-nucleon correlations. We will also perform a quick measurement of the energy transfer dependence by measuring cross sections (without L/T separation) at several ω 's for ^{12}C at $Q^2 = 1(\text{GeV}/c)^2$. We hope to learn more about the contributions from processes other than quasielastic scattering.

I. BACKGROUND AND MOTIVATION

1. INTRODUCTION

Recent studies of the $^{12}\text{C}(e,e'p)$ and other $(e,e'p)$ reactions show that the (e,e') reaction in the quasifree region is very complex. It appears that the (e,e') reaction proceeds in part via a simple one-nucleon interaction and in part via two-nucleon and maybe even multi-nucleon components. These two- and multi-nucleon components could be as important as the one-body process and cannot be fully attributed to final state rescattering. They are part of the (e,e') interaction.

Below, we describe the difficulties which exist with our understanding of the (e,e') reaction. We also present evidence for what appears to be multi-hadron processes. We emphasize evidence from the (e,e') and $(e,e'p)$ reactions, but we note also observations from measurements in other fields of nuclear physics which could very well be related. These include photo- and pion absorption. At present, conventional theories are unable to properly account for these results. Regardless of the origin of these phenomena, it is clear that they are not well understood. Systematic experimental work is needed if we are to have any chance of theoretical understanding. For the case of electron scattering, CEBAF is the natural place to investigate the systematics of these phenomena. Indeed, efforts directed at the detection of multi-hadrons is planned for CLAS. However, certain important aspects of the reaction can be measured only in Hall A. These include the separated $(e,e'p)$ responses (particularly at deep missing energies where the cross sections are small), and their systematic dependence on Q^2 , nuclear density, and nucleon initial