Abstract

Electroproduction of K^+ and K^- from nuclei below the free space production thresholds on the nucleon is an exciting, new probe of the predicted medium modification of K^- mass inside nuclei. We propose measurements in electroproduction of K^+ and K^- from liquid Hydrogen and solid Carbon targets at energy transfers ranging from 0.8 to 1.8 GeV which correspond to $K^\pm$ momenta of 0.3-0.4 GeV. The proposed measurement will at the same time allow a study of the short-range correlations by probing the high momentum components of the nuclear wave function. A total beam-time of 774 hours is requested for this experiment.

I. INTRODUCTION

In 1986 Kaplan and Nelson [1] pointed out the possibility for a kaon condensed phase in dense nuclear matter, arising out of the large explicit chiral symmetry breaking (which gives rise to the strange quark mass.) Ever since this pioneering work on the possibility of kaon condensation in nuclear matter, a significant amount of theoretical and experimental efforts has been devoted to the study of kaon properties in dense matter. The properties of the K^+ and K^- in the nuclear medium are essential in determining the possible occurrence of such kaon condensation which would have dramatic consequences in stellar collapse and neutron star cooling [2]. Extensive studies based on such diverse approaches as chiral perturbation theory [3], mean field theory [4] and Nambu-Jona-Lasino model [5] have suggested that in nuclear matter the K^+ feels a weak repulsive potential, whereas the K^- feels a strong attractive potential. This indicates that the K^+ effective mass increases in dense matter and it will not condense, however, the effective mass of K^- meson decreases with increasing nuclear density, leading to K^- condensation at densities above 3 times saturation density ρ_0. More importantly, all models suggest that the effective mass of the K^- is substantially lowered [2] even at normal nuclear density, which allows for sensitive experiments designed