I. Abstract

We are interested in electroproduction of hypernuclei to investigate Λ and bound Σ hypernuclear states for the ^{3}H and ^{4}H nuclei. In this study angular distributions of the kaons at forward angles are measured to identify J^π of the hypernuclear states. In order to allow measurements at very forward angles, the septum magnets for the Hall A spectrometers are used. The proposed experiments will provide information on the Λ-N spin-spin interaction and bound Σ hypernuclei.

II. Introduction

Hypernuclear states have been studied by the (K^-, π^-), (π^+, K^+) and stopped K reactions. Each reaction has different characteristics. The (K^-, π^-) reaction at small angles is a process with small momentum transfer. In this case it preferentially populates substitutional hypernuclear states in which a nucleon is replaced by a Λ particle. This transition is characterized by an orbital angular momentum transfer of $\Delta L=0$. The (π^+, K^+) reaction favors the formation of high spin states due to large momentum transfer. The stopped K reaction is a special case of the (K^-, π^-) reaction where a kaon is captured at rest. In this reaction variety of hypernuclear states is populated by a sizable momentum transfer.

For the Λ hypernuclei up to ^{89}Y , the binding energies of the single particle states of the Λ were obtained by the (π^+, K^+) experiments at BNL[1]. On the other hand for the Σ hypernuclei, many candidates for narrow Σ states in the continuum in light nuclei have been found, but not confirmed as the Σ hypernuclei[2]. The first evidence of a bound Σ state for A = 4 was reported through the ^{4}He(K^-, π^-) reaction at rest[3]. Recently clear evidence of a bound Σ state for A=4 was observed in the (K^-, π^-) experiments at BNL[4]. The hypernuclear production so far reported have been done with an energy resolution of 2~3MeV. Thus, it is highly desirable to study the hypernuclear states by another probe with much higher resolution.

The (e, e' K^+) and (γ, K^+) reactions are expected to provide a useful alternative to the (π^+, K^+) and (K^-, π^-) reactions. The (e, e' K^+) reaction is similar to (π^+, K^+) reaction in regard to variable momentum transfer, but the former has some advantages for studying deeply-bound Λ orbits. The electrons are very weakly absorbed in compared with the pions. In addition the (e, e' K^+) reaction excites both natural and unnatural parity hypernuclear states with comparable strength. Many theoretical predictions have been