New $(e, e'K^+)$ hypernuclear spectroscopy with a high resolution kaon spectrometer

Yuu Fujii *on behalf of the Jlab E01-011 collaboration*

Department of Physics, Tohoku University, Sendai, Miyagi, 980-8578 Japan

A new $(e, e'K^+)$ hypernuclear spectroscopy was proposed at Thomas Jefferson National Accelerator Facility[1]. It is expected to realize much higher yield rate and hypernuclear mass resolution than those of the first successful E89-009 experiment[2], which demonstrated value of hypernuclear electroproduction for Λ hypernuclear spectroscopy. The E89-009 experiment, however, suffered from huge background due to bremsstrahlung electrons and the energy resolution was limited by the existing kaon arm spectrometer.
The experimental conditions of the proposed experiment, E01-011, are summarized as follows : 1) the electron arm spectrometer is vertically tilted("Tilt method") to avoid 0-degree peaked background from bremsstrahlung, 2) the kaon spectrometer is replaced by a high-resolution kaon spectrometer(HKS), which is presently under construction, and has a good momentum resolution of 2×10^{-4}(FWHM) and a large solid angle of 18 msr with a splitter magnet + QQD configuration. In table 1, parameters of two experiments are compared. By employing the HKS and "Tilt method", hypernuclear production rates will be improved by more than 50 times and energy resolution better than 400 keV will be achieved.
The proposed $(e, e'K^+)$ hypernuclear spectroscopy experiment enables us to investigate not only light Λ hypernuclei but also medium-heavy ones through observation of high-resolution and high-statistics hypernuclear mass spectra.

Table 1: The parameters for E89-009 and E01-011

	E89-009 Enge+SOS	E01-011 Tilted Enge+HKS
Beam energy (GeV)	1.72	1.85
e' scattering angle (Vert.)	0°	4.5°
K^+ scattering angle (Hor.)	1.9°	7°
Kaon solid angle (msr)	5	18
Target thickness (mg/cm^2)	22	100
Beam intensity (μA)	0.66	30
K^+ arm singles rate (MHz)	0.1	2
e arm singles rate (MHz)	200	3
Yield for ${}^{12}_{\Lambda}B_{\text{g.s.}}$ (/h)	0.9(measured)	60(estimated)

References

[1] E01-011 proposal to Jlab PAC19, 2001, spokespersons, O. Hashimoto, L. Tang, J. Reinhold, and S. N. Nakamura.
[2] L. Tang, contribution to this conference.