

High resolution Λ hypernuclear spectroscopy with electron beam

T. Gogami [#] for the HES-HKS collaboration

Tohoku University, Sendai, Miyagi 980-8578, Japan

a corresponding author: gogami@lambda.phys.tohoku.ac.jp

Since 2000, Λ hypernuclear spectroscopy with the $(e,e'K^+)$ reaction have been performed at Jefferson National Accelerator Facility (JLab). The experimental feasibility was proven by measuring $^{12}\Lambda\text{B}$ with sub-MeV energy resolution in 2000 [1][2]. Largest advantages of the $(e,e'K^+)$ reaction experiment are 1) a high energy resolution (FWHM of sub-MeV) and 2) an absolute energy measurement by using proton (H nucleus) target in contrast with experiments by the (K^-, π^-) and (π^+, K^+) reaction which convert a neutron into a Λ . However, it is necessary to deal with huge amount of background particles which originate from electromagnetic processes in the $(e,e'K^+)$ experiment [3]. The $(e,e'K^+)$ experiment becomes harder as the target proton number is increased since the rate of background particles is roughly in proportion to Z^2 (Z : target proton number). Up to now, several $(e,e'K^+)$ experiments have been carried out at JLab [4][5][6][7][8], and experimental techniques were developed and established.

In 2009, JLab E05-115 experiment have been performed to investigate Λ hypernuclei in a wide mass region up to medium heavy ($^7\Lambda\text{He}$, $^9\Lambda\text{Li}$, $^{10}\Lambda\text{Be}$, $^{12}\Lambda\text{B}$ and $^{52}\Lambda\text{V}$). It is the first challenge to measure a medium heavy mass region by the $(e,e'K^+)$ reaction. In the presentation, preliminary experimental results will be reported with discussions of charge symmetry breaking effect in ΛN interaction, glue-like role of Λ hyperon, single particle potential and so on. Importance of complemental measurements of Λ hypernuclei by the $(e,e'K^+)$ reaction at JLab/MAMI and by the (π^+, K^+) and (K^-, π^-) reactions at J-PARC will be also discussed.

References

- [1] T.Miyoshi et al, Physical Review Letters 90, 23 (2003)
- [2] L.Yuan et al., Physical Review C73, 044607 (2006).
- [3] O.Hashimoto, S.N.Nakamura, L.Tnag, J.Reinhold et al., Proposal for JLab E05-115 (2005)
- [4] J.J.JeRose et al., Nuclear Physics A 804, 116-124 (2008)
- [5] F. Cusanno et al., Physical Review Letters 103, 202501 (2009)
- [6] F.Cussanno et al., Nuclear Physics A 835, 129-135 (2010)
- [7] O.Hashimoto et al., Nuclear Physics A 835, 121-128 (2010)
- [8] S.N.Nakamura et al., Physical Review Letters 110, 012502 (2013)