STUDY OF NEUTRON-RICH Λ HYPERNUCLEI

Tomokazu FUKUDA

Osaka Electro-Communication University
Hatsu-cho 18-8, Neyagawa, Osaka 572-8530, Japan

The study of neutron-rich Λ hypernuclei has attracted much interest because it will provide new information on hypernuclear physics as follows : 1) To expand the S(strangeness) = -1 sector towards very exotic nuclei. 2) To reveal new phenomena such as coherent $\Lambda - \Sigma$ coupling [1]. This coherent coupling becomes larger as the excess neutron number becomes larger, and eventually affects the baryon interaction in high-density nuclear matter, like neutron stars [2].

We performed the first successful observation of the neutron-rich hypernucleus ${}^{10}_{\Lambda}$Li in the (π^-, K^+) reaction on ^{10}B target at the K6 beam line of KEK 12-GeV PS by using the Superconducting Kaon Spectrometer (SKS) [3]. The cross section for the Λ bound region was found to be 11.3 ± 1.9 nb/sr with the 1.2 GeV/c incident momentum, which is compared with the ordinary ${}^{10}_{\Lambda}$B hypernucleus production cross section, 7.8 ± 0.3 μb/sr, in the (π^+, K^+) reaction with the 1.05 GeV/c incident momentum. A theoretical analysis indicated a dominance of the single-step process via a Σ^- admixture in the Λ hypernuclear state appearing due to $\Sigma^- p \leftrightarrow \Lambda n$ coupling, and about 0.6 % Σ^- admixture was suggested to account for the data [4].

Recently, the FINUDA collaboration reported observation of 3 candidate events for the production of the ${}^{6}_{\Lambda}$H hypernucleus in the stopped K^- reaction [5]. On the other hand, an intensive calculation by E. Hiyama et al. showed a resonance state for ${}^{6}_{\Lambda}$H ground state if no $\Lambda - \Sigma$ coupling and the precise determination of the ground state energy of ${}^{6}_{\Lambda}$H is crucial to study the $\Lambda - \Sigma$ coupling effect [6]. Keeping this in mind, we have carried out ${}^{6}_{\Lambda}$H hypernucleus production experiment in the (π^-, K^+) reaction on a ^{6}Li target with 1.2 GeV/c pion beam momentum [7]. The data have been collected for an integrated beam intensity of 1.65x10^{12} pions at the K1.8 beamline, Hadron Hall, J-PARC during Dec. 2012 to Jan. 2013. The results will be also discussed.

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E-mail: fukuda@isc.osakac.ac.jp