HAW14-2014-000346

Abstract for an Invited Paper
for the HAW14 Meeting of
the American Physical Society

Neutron-rich Lambda Hypernuclei

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The J-PARC E10 experiment aims to produce Λ hypernuclei close to the neutron drip-line to investigate hyperon-nucleon interactions in the asymmetric nuclear medium. Although the Λ hyperon has an isospin I=0, a dependence of the ΛN interaction on the overall isospin of Λ hypernuclei may arise due to a coupling to $\Sigma(I=1)$ channel known as the "ΛN-ΣN mixing" and may be investigated in structures of the neutron-rich Λ hypernuclei. The structure of a highly neutron-rich hypernucleus, ${}^{6}_{\Lambda}$H, is discussed theoretically quite extensively in connection with the contribution of the ΛN-ΣN mixing to the binding. One of promising methods to produce the neutron-rich Λ hypernuclei is the application of the double charge-exchange (DCX) reactions, such as the (K^-, π^+) and the (π^-, K^+) reactions. Recently, we carried out the first phase of the J-PARC E10 experiment to search for ${}^{6}_{\Lambda}$H by utilizing the ^{6}Li(π^-, K^+) reaction. The experiment was designed to have a high sensitivity to search for the neutron-rich Λ hypernuclei with high-resolution magnetic spectrometers and high-intensity pion beams available at the K1.8 beam line of the J-PARC 50 GeV Proton-Synchrotron facility. The yield of the reaction was extremely smaller than that in the ^{10}B$(\pi^-, K^+)^{10}_{\Lambda}$Li reaction obtained in the previous KEK-E521 experiment at KEK-PS. A comparison will be made with the result of the measurement of the ^{6}Li$(K^-_{\rm stopped}, \pi^+)$ reaction to search for ${}^{6}_{\Lambda}$H reported by the FINUDA experiment at DAΦNE.