

THE NEW STAGE OF $S = -2$ HYPERNUCLEAR STUDY OPENED WITH A NEW HIGH-RESOLUTION SPECTROMETER

Shunsuke Kanatsuki¹, Nobuaki Amano¹, Hiroyuki Ekawa^{1,2}, Toshiyuki Gogami³, Erina Hirose⁴, Yudai Ichikawa², Seigo Kato⁵, Manabu Moritsu⁶, Takuya Nanamura¹, Tomofumi Nagae¹, Hitoshi Takahashi⁴, Toshiyuki Takahashi⁴, and Kohei Takenaka¹

¹ Department of Physics, Kyoto University

² Advanced Science Research Center, Japan Atomic Energy Agency

³ Research Center for Nuclear Physics, Osaka University

⁴ Institute of Particle and Nuclear Studies, KEK

⁵ Department of Physics, Yamagata University

⁶ Department of Physics, Osaka University

Spectroscopy of Ξ hypernuclei via the (K^-, K^+) reaction is in progress at the J-PARC K1.8 beam line. A pilot run of the J-PARC E05 experiment has already been successfully performed by using the SKS spectrometer in 2015. First, the production rate of Ξ^- was measured through the $p(K^-, K^+)$ reaction at 1.5–1.9 GeV/ c , and found to be maximum at 1.8 GeV/ c . Then we irradiated $56.6 \times 10^9 K^-$ s at 1.8 GeV/ c on the carbon target to search for a Ξ bound state with an expected energy resolution of 7 MeV (FWHM). Preliminary result of the analysis will be presented in another contribution by T. Nagae *et al.* in this conference. As a next step, a new spectrometer, “Strangeness -2 Spectrometer (S-2S)” is in preparation for further improvement in the energy resolution. It has been designed to analyse K^+ s at 1.2–1.4 GeV/ c with a momentum resolution of $\Delta p/p \simeq 5 \times 10^{-4}$ (FWHM), while that of the SKS is $\Delta p/p \simeq 3 \times 10^{-3}$ (FWHM). It enables us to have an energy resolution of < 2 MeV (FWHM) in the hypernuclear spectrum. Only with this good resolution, we could have a chance to observe peak structures of bound states of Ξ hypernucleus complicated by the nuclear core excitation and $\Lambda\Lambda$ hypernucleus whose production cross section is expected to be < 10 nb/sr. The preparation status including magnets, detectors, optics simulations etc., expected achievement, and schedule of our experiment will be presented.