Double hypernuclei experiment with hybrid emulsion method at J-PARC

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Double hypernuclei are important probes to study the system with strangeness -2. Several emulsion experiments were performed to search for them. A double hypernucleus ${}^{6}_{\Lambda\Lambda}$He was clearly identified in the KEK E373 experiment (NAGARA event). The binding energy was obtained as $B_{\Lambda\Lambda}$ = 6.91 ± 0.16 MeV and $\Delta B_{\Lambda\Lambda}$ = 0.67 ± 0.17 MeV, respectively [1]. In order to investigate the interaction between two lambdas and S = -2 system in nuclei systematically, more samples are needed.

We are planning an upgrade experiment to search for double hypernuclei at the K1.8 beam line in the Hadron Experimental Facility (J-APRC E07 experiment) [2]. In the experiment, the KURAMA spectrometer system will detect Ξ^- production in the (K^-, K^+) reaction on a diamond target. SSDs located the upstream and the downstream of emulsion plates will record Ξ^- tracks which flight toward emulsion plates precisely. Tracks in SSDs and emulsion will be automatically connected by a hybrid method. By using K^- beam with high intensity (3×10^5/spill) and purity ($K/\pi > 6$), we will achieve observation of about 10^4 Ξ^- stopped events in the emulsion stacks for one month data taking. This statistics is more than 10 times as high as that of the KEK E373 experiment. Discoveries of more than 10 new double hypernuclear species are expected, which enable us to discuss binding energy in terms of mass number dependence. On the other hand, we will also observe X rays from Ξ^- atoms with a Germanium detector array installed close to the emulsion by tagging Ξ^- stopped events. This will be the first measurement in the world and give information on the Ξ^- potential shape at the nuclear surface region.

Preparation for E07 is ongoing and emulsion production has been done. In this talk physics motivation and current status of the J-PARC E07 experiment will be presented.

References

[1] J. K. Ahn *et al.*, Phys. Rev. C **88**, 014003 (2013)
[2] K. Nakazawa *et al.*, J-PARC E07 proposal.