

# Double hypernuclei search experiment with hybrid emulsion method at J-PARC (J-PARC E07)

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Understanding of baryon-baryon interaction is a main topic of hadron physics. Among them, hyperon-hyperon interaction is difficult to study in experiment because of their short lifetimes. In order to study about  $\Lambda$ - $\Lambda$  interaction, double hypernuclei are good probes. By measuring mass of double hypernuclei,  $\Lambda$ - $\Lambda$  interaction can be calculated. Double hypernuclei had been studied with emulsion in several experiments, since emulsion can record sequential weak decays of double hypernuclei with  $1\mu\text{m}$  position resolution. In KEK E373 experiment, a clearly identified double hypernucleus  ${}^6_{\Lambda\Lambda}\text{He}$  was observed (NAGARA event) which gave a binding energy between  $\Lambda$ - $\Lambda$  as  $\Delta B_{\Lambda\Lambda} = 0.67 \pm 0.17$  MeV [1]. However, there are no other identified double hypernuclei. More species are desired which allow us to discuss about nuclear mass dependency.

J-PARC E07 is double hypernuclei search experiment with new hybrid emulsion method. Double hypernuclei are generated as a consequence of interaction between  $\Xi^-$  and nucleus in emulsion.  $\Xi^-$  are produced in  $(K^-, K^+)$  reaction with a diamond target and injected into emulsion plates through SSDs which are located between the target and emulsion plates. By losing their kinetic energy,  $\Xi^-$  are absorbed by nuclei in emulsion through atomic orbits.  $(K^-, K^+)$  events are tagged by two spectrometer systems at J-PARC K1.8 beam line. Therefore, injection points and angles of  $\Xi^-$  tracks in emulsion plates can be predicted from those of SSDs. By following  $\Xi^-$  tracks in emulsion stacks automatically, double hypernuclei can be observed efficiently.  $10^4$   $\Xi^-$  are expected to stop in emulsion stacks. This statistics are 10 times higher than that of KEK E373 experiment. Observation of 100 double hypernuclei including 10 identified species is a goal of E07 experiment. Additionally,  $\Xi^-$  atom X ray measurement is another goal. By tagging  $\Xi^-$  stops in emulsion, X rays can be observed with low background. These X rays are detected by Ge detector array which is located around a emulsion stack.

110 emulsion stacks were made by 2.1 t emulsion gel and stocked in Kamioka Mine to prevent radiation damage. New detectors were developed and their performance were checked by test experiment. I will report about the current preparation status of J-PARC E07 experiment.

[1] J. K. Ahn, *et al.* Phys. Rev. C **88** (2013) 014003.