

Double Lambda hypernuclei at J-PARC

Sunday, 27 October 2013 15:10 (20 minutes)

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Kazuma NAKAZAWA on behalf of the KEK-E176, E373, and J-PARC E07 collaborations
Physics Department, Gifu University, Gifu 501-1193, Japan.
(nakazawa@gifu-u.ac.jp)

Double-L hypernuclei give us information about the L-L interaction which is valuable for unified understanding of Baryon-Baryon interaction in SU(3)-flavor symmetry. Nuclear physics with double strangeness also guides us to multi-strangeness systems such as “strange matter” and is closely related to the H-dibaryon. However experimental knowledge is very limited so far.

Recently, we have succeeded to detect nearly one thousand events with Xi- hyperon capture at rest in nuclear emulsion. Among them, production and decay topology of double-L hypernucleus has been shown in 7 events. Regarding uniquely identified Nagara event (LL6He), although it was published in PRL(2001) [1], the binding energy (B_LL) and the interaction energy (DB_LL) of two Lambda hyperons should be revised due to the change of the mass of Xi- hyperon by 0.4 MeV in Particle Data (2008). Under the check of the consistency of the DB_LL with that of Nagara event, other three events, named Mikage, Demachi-yanagi and Hida event, were found to be LL6He, LL10Be and (LL11Be or LL12Be) as the most probable nuclear species, respectively [2, 3].

We developed a fast system for overall scanning of the emulsion to detect more events of double-L hypernuclei, very recently. The system consists of taking microscope image in whole area of the emulsion and the image processing so as to pick up the topologies of production and the decay of double-L hypernuclei with multi-vertices. The scanning is on-going for the emulsion of the E373 experiment and we detected some new events with double units of strangeness.

At J-PARC, we will carry out the E07 experiment which can provide nearly 10^2 double-L hypernuclei with newly developed hybrid-emulsion method. In the experiment, we will use 2.1 t emulsion gel and measure X rays from Xi-atom to study Xi-N interaction for the first time.

In our contribution, we will discuss the B_LL and the DB_LL using data of the above nuclei and newly found candidate events of double-L hypernuclei which are introduced in International Symposium for the first time. Brief introduction of E07 at J-PARC shall be also discussed.

References

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Primary author: Dr NAKAZAWA, Kazuma (Physics Department, Gifu University)

Presenter: Dr NAKAZAWA, Kazuma (Physics Department, Gifu University)

Track Classification: Parellel A