HAW14-2014-000337

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

Double Lambda and Xi hypernuclei[1]

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Nuclei with double strangeness (S = -2) provide the key information to understand Baryon-Baryon interaction under the $SU(3)_f$ symmetry. Therefore we have carried out the experiments at KEK for quarter a century. Recently, the interaction in S = -2 sector is noted to derive the information of the EOS of neutron star. The Lambda-Lambda interaction has been presented to be weak attractive by NAGARA event which showed the production and decay of 6He double-hypernucleus. The event also presented the lower mass limit of H dibaryon. In other five events, we obtained the knowledge about an excitation level of 10Be double-hypernucleus under the consistency with NAGARA event. Moreover, very recently, we have discovered a Xi-14N system which was deeply bound far from the atomic 3D level (0.17 MeV) for a captured Xi hyperon. Since a 8Li nucleus was associated with the decay of one of twin-hypernuclei, the event was uniquely identified as Xi- + 14N $\Rightarrow$ $^{10}\mathrm{Be}_L$ + $^{5}\mathrm{He}_L$. The system was selected from 8 million pictures on the test running for development of "Overall Scanning" to be used in the coming experiment. This is the first evidence of Xi hypernucleus to be bound and it is impacting for the study of Xi-N interaction. At J-PARC facility, for the further study of hyperon-hyperon interaction, we plan to perform the E07 experiment at J-PARC. In the workshop, we will review the above knowledge obtained by the experiments at KEK-PS, and discuss developed technologies to detected 10^2 or more double-hypernuclei in the E07 experiment at J-PARC.

[1]The author thanks members of KEK-E176, E373 and E07 at J-PARC. This work was supported by the Endo Seijiro Science Foundation in 2007, by JSPS Grants No.14340069 and No.23224006, and by MEXT Grants No.08239103 and No.15001001.