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Knowledge on doubly-strange hypernuclei and experimental prospect

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The interaction energy between Lambda; hyperons and the presence or absence of Xi; hypernuclei (is Xi; hyperons bound to the nuclei?), which can be obtained from doubly-strange hypernuclei, are essential information for a unified understanding of baryons under $SU(3)_f$ symmetry. Especially in recent years, they are also valuable information for understanding the existence of neutron stars. Over the past 40 years, doubly-strange hypernucleus search experiments have been conducted in Japan using nuclear emulsion, and 47 samples of doubly-strange hypernuclei have been detected. From the double-Lambda; hypernuclei, we know that the Lambda;-Lambda; interaction between two Lambda; hyperons is weakly attractive and that the binding energy of two Lambda; hyperons by the nucleus seems to depend linearly on the nuclear mass number. In addition, the Xi; hypernucleus does indeed exist, the attraction between Xi; hyperon and nucleon works, and the level structure of the $^{15}_{\text{Xi}}$ hypernucleus can now be inferred. Efforts are being made to further explore the entire emulsion volume to dramatically improve the number of the samples of doubly-strange hypernuclei.

Collaboration

KEK-E176, E373, J-PARC E07, and Emulsion-ML

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