



国立研究開発法人理化学研究所 仁科加速器研究センター
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Study of charge symmetry breaking in $A=4$ hypernuclear system
via the gamma-ray spectroscopy experiment at J-PARC

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The charge symmetry breaking (CSB) effect reported in the $A=4$ mirror hypernuclei ($4\Lambda\text{H}$ and $4\Lambda\text{He}$) is one of the hot topics in strangeness nuclear physics. Unexpectedly large CSB effect reported in old experiments was long standing puzzle and may become key to understand ΛN interaction. High accuracy data, with modern experimental technique, was long time awaited to confirm existence of CSB effect. Precise gamma-ray spectroscopy with an energy resolution of a few keV is a powerful tool to investigate such an effect. In fact, a gamma-ray spectroscopy study of $4\Lambda\text{He}$ was performed at the J-PARC K1.8 beam line (J-PARC E13, 2015) for this purpose. $4\Lambda\text{He}$ hypernuclei were produced by the direct $4\text{He}(K^-, \pi^-)4\Lambda\text{He}$ reaction with a high intensity kaon beam. Gamma rays were measured with a newly developed Ge detector array, Hyperball-J. The excitation energy of first excited state of $4\Lambda\text{He}(1^+)$ was successfully determined to be 1.406 ± 0.004 MeV. By comparing to that of the mirror hypernucleus ($4\Lambda\text{H}$) from previous old studies, we confirmed the existence of CSB effect and its spin dependence. Our next step is a more precise and conclusive measurement of the excitation energy of $4\Lambda\text{H}(1^+)$ to experimentally establish the $A=4$ mirror hypernuclei system. We are planning gamma-ray spectroscopy of $4\Lambda\text{H}$ at the J-PARC K1.1 beam line (J-PARC E63) via the $7\text{Li}(K^-, \pi^-)$ reaction. The results of the gamma-ray spectroscopy of $4\Lambda\text{He}$ and an outline of the future experiment will be given.

* The talk will be given in Japanese language..

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