

Gamma-ray spectroscopy of hypernuclei –Recent results and prospect at J-PARC–

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(Received September 20, 2016)

The present status and future prospects of precision γ -ray spectroscopy of Λ hypernuclei are described. A new experiment (J-PARC E13) has been performed at the J-PARC K1.8 line employing a newly-developed germanium (Ge) detector array, Hyperball-J, via the (K^-, π^-) reaction on ${}^4\text{He}$ and ${}^{19}\text{F}$ targets. This is the first study of s -shell and sd -shell Λ hypernuclei with Ge detectors. The ${}^4\text{He}$ target spectrum exhibited a γ -ray peak of ${}^4_\Lambda\text{He}(1^+ \rightarrow 0^+)$ at $1.406 \pm 0.002 \pm 0.002$ MeV. Compared with the energy (1.09 ± 0.02 MeV) of the corresponding transition for the mirror hypernucleus, ${}^4_\Lambda\text{H}(1^+ \rightarrow 0^+)$, the present result clearly indicates a large charge symmetry breaking (CSB) effect. This decisive data for CSB allows a stringent test of baryon-baryon interaction models. As for the ${}^{19}\text{F}$ target run, a preliminary spectrum shows several γ -ray peaks assigned to ${}^{19}_\Lambda\text{F}$ transitions. Future plans of γ -ray spectroscopy are also discussed.

KEYWORDS: Λ hypernuclei, γ -ray spectroscopy, hyperon-nucleon interaction, charge symmetry breaking, J-PARC