Structure of $^{13}_{\Lambda}$C Hypernucleus Studied by the (K^-,$\pi^-\gamma$) Reaction

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The structure of the $^{13}_{\Lambda}$C hypernucleus was studied by measuring γ-rays in coincidence with the ^{13}C(K^-,π^-) reaction at BNL/AGS. An energy resolution of 240 keV (FWHM) was obtained for 4.4 MeV γ-rays with arrays of NaI(Tl) detectors, and the fine energy resolution enabled us a detailed study on the structure of the $^{13}_{\Lambda}$C hypernucleus in the excitation energy region up to 12 MeV.

A detailed analysis on the γ-ray energies from the $p_{1/2\Lambda}\rightarrow s_{1/2\Lambda}$ and the $p_{3/2\Lambda}\rightarrow s_{1/2\Lambda}$ transitions was done, and the splitting energy between the $p_{1/2\Lambda}$ and the $p_{3/2\Lambda}$ states was estimated as: $\Delta E = 152\pm54(\mathrm{stat})\pm36(\mathrm{syst})$ keV. This result provided information on the spin dependent Λ-nucleus interactions in the p-shell hypernuclei especially on the Λ spin-orbit interaction.

The excitation energy of the first $3/2^+$ state in the $^{13}_{\Lambda}$C hypernucleus was precisely estimated by measuring the $3/2^+\rightarrow1/2^+$ E2 transition. The estimated excitation energy of the $3/2^+$ state was $4.880\pm0.010(\mathrm{stat})\pm0.017(\mathrm{syst})$ MeV which was consistent with the value 4.89 ± 0.07 MeV previously measured at KEK-PS[1]. The state have dominant configulation of ^{12}C(2^+,4.439MeV)$\oplus s_{1/2\Lambda}$, and the increase of the excitation energy 4.439 MeV $\rightarrow$ 4.880 MeV suggested additive contribution from the nucleon spin-orbit component of the Λ-N effcetive interaction.

References

[1] O. Hashimoto, *et al.*, the KEK-PS E336 Collaboration, Nucl. Phys. **A639** (1998) 93c–102c.