Investigation of octupole correlations of neutron-rich $Z \sim 56$ isotopes by β-γ spectroscopy

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Neutron-rich Ba isotopes ($Z = 56$, $N \sim 88$) are expected to have a significant octupole collectivity due to the interactions between orbitals with $\Delta j = \Delta l = 3$ around the Fermi surface. Recently, the reflection-asymmetric shape, octupole deformation, has been reported in ^{144}Ba by Bucher *et al.*[1] The theoretical calculations exhibit different predictions for octupole correlations in this region. For example, the microscopic-macroscopic method[2] predicts some β_3 values, whereas the Hartree-Fock calculation[3] argues that there is no state with a dipole moment relevant to the octupole collectivity. Therefore, experimental studies of more neutron-rich Ba isotopes are required.

We performed the β-γ spectroscopy of the ^{150}Cs decay at RIBF using the in-flight fission of a 345 MeV/nucleon ^{238}U beam bombarding a 3-mm thick Be target. Fission fragments were identified by the TOF-Bρ-ΔE method using BigRIPS.[4] The secondary beam was implanted into an active stopper WAS3ABi,[5] which consists of five layers of double-sided-silicon-strip detectors for ion-β correlation. The γ rays from the implanted nuclei were detected using EURICA,[6] an array of 12-cluster Ge detectors.

The γ-ray energy spectrum of the ^{150}Cs decay is shown in Fig. 1. The ion-β time window was set to 0.2 s considering the previously reported half-life of ^{150}Cs, 0.84(8) ms.[7] Since the peak count was small, a log-likelihood ratio test was performed for the energy spectrum. The significance spectrum is shown in Fig. 1(b). The background was estimated by smoothing and scaling the energy spectrum with a time window of 2-to-10 s after ion implantation. We requested 4σ as a confidence level to identify significant peaks in the spectrum. There are three significant peaks at energies of 100, 200, and 597 keV. The peak at 200 keV is not assigned to an excited state of ^{150}Ba because it became more pronounced in a spectrum with a longer time window up to 2 s than 0.2 s. Analysis on the 100- and 597-keV γ-ray is in progress.

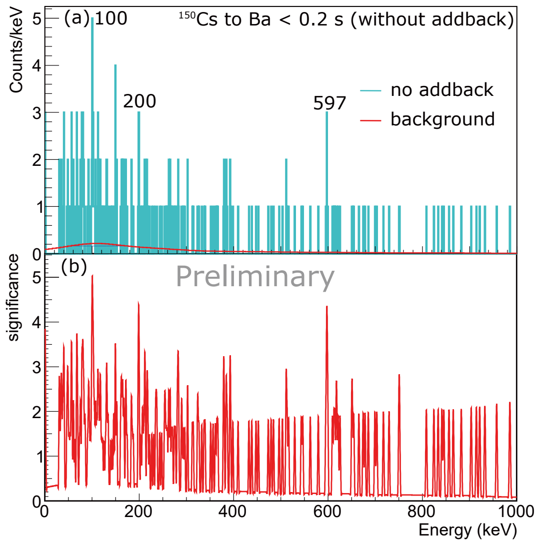

Fig. 1. (a) The preliminary γ-ray energy spectrum of the β decay from ^{150}Cs to ^{150}Ba. The red curve shows the estimated continuum background. (b) The significance spectrum by a likelihood ratio test.

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