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3 - 8 β-decay Feeding Intensities of ^{88}Rb and ^{88}Kr Determined by Using the Modular Total Absorption Spectrometer*

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Precise determination of ground-state feeding in the β decay of fission products is an important but challenging task in modeling reactor anti-neutrino flux and reactor decay heat. The Modular Total Absorption Spectrometer (MTAS) is a versatile NaI(Tl) detector array that determines the accurate β-decay pattern and precise ground-state feeding intensities by avoiding the Pandemonium effects. The β feeding intensities of ^{88}Rb and ^{88}Kr, which are two main fission products with large cumulative yields in nuclear reactors, has been determined using MTAS with improved precision. The MTAS ability to determine ground-state feedings in β decays has been validated by remeasuring the well known data of ^{88}Rb. The MTAS results of the ^{88}Kr ground-state feeding is improved when compared with the Evaluated Nuclear Structure Data File (ENSDF). The sources that contribute to β feeding branching uncertainties in MTAS experiments have been investigated. It turned out that the largest uncertainty comes from geant4 simulation, whose contribution is at the magnitude of 2% assuming the MTAS spectra was not contaminated by other radioactive sources(Fig. 1). The de-convolution of ^{88}Rb β-decay spectra suggests that MTAS can distinguish an allowed β spectral shape from a unique first forbidden β spectral shape, see Fig. 1. Moreover, the de-convolution algorithm has been extended to multiple $\gamma\gamma$ correlation spectra, which greatly reduce the uncertainty of the determination of γ-cascade multiplicity. Detailed results can be found in Ref. [1].

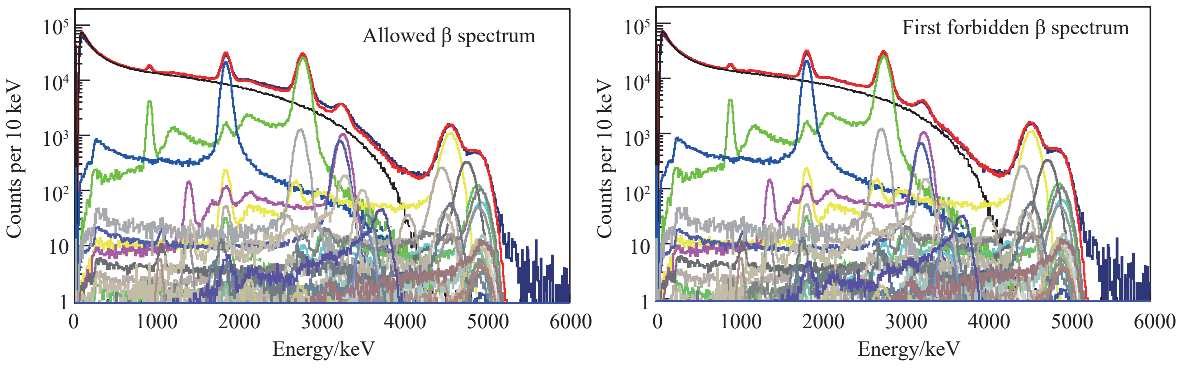

Fig. 1 (color online) De-convolution results of the center-module-only β spectra using two different simulated response functions. The I, M, O modules in MTAS are used as an active veto. In the left figure, the response function of ground-state feeding is simulated as an allowed transition. In the right figure, the response function of ground-state feeding is simulated as a first forbidden unique transition. By comparing the two figures, we conclude that MTAS spectra is described better if ground-state feeding is assumed as a unique first forbidden transition.

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