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β -decay studies of $A = 107$ nuclei using the Modular Total Absorption Spectrometer (MTAS)

Determination of the true feeding intensities ($I\beta$) in β -decay of fission products is very important in addressing the reactor antineutrino anomaly and modeling the reactor decay heat. β -decay measurements with high-resolution but low-efficiency detectors may be affected by the Pandemonium effect. This effect may lead to underestimation of the feeding to high excited levels, thus systematically biases the calculation of reactor antineutrino spectrum and decay heat calculation.

Modular Total Absorption Spectrometer (MTAS), which has almost 99% gamma detection efficiency, is an ideal spectrometer to determine not only the true β feeding intensities free from Pandemonium effect, but also the intensity of ground state to ground state feeding. MTAS has been utilized to measure the beta decay pattern of several fission products that are high-priority contributors to reactor decay heat and antineutrino spectrum.

In this talk, we will present some preliminary results of $A = 107$ decays measured at CARIBU (ANL) in March, 2020. The β -branchings of ^{107}Tc and ^{107}Mo , which have incomplete data in current nuclear dataset, is determined experimentally using MTAS. We found the Pandemonium Effect in the β -decay measurements of ^{107}Tc and ^{107}Mo . Plenty of new levels with high excitation energy are required to reproduce the experimental spectra. This suggests a large shift of the antineutrino spectrum of ^{107}Tc and ^{107}Mo towards lower energy.

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