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Analysis of Gamma Ray Emissions From Fission Product Contributors to the Antineutrino Spectrum

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Controversy and disagreements exist among different approaches to reproducing the overall normalization and possible structures in the reactor antineutrino energy spectrum. This situation is often referred to as the Reactor Anti-Neutrino Anomaly (RAA). One recent paper [Dwyer and Langford 2015], suggests that an experimentally observed bump at antineutrino energy 5 to 7 MeV (Positron energy at 4 to 6 MeV), which is not reproduced by other spectral reconstruction methods, could be due to anomalous strengths of eight beta decay branches: 93-Rb, 100-Nb, 140-Cs, 95-Sr, 92-Rb, 96-Y, 142-Cs and 97-Y. Most of these decay rates are accessible by HP-Ge gamma ray spectroscopy of freshly fissioned material. We have analyzed new gamma ray spectra immediately following in-core irradiation of a 235-U sample at the Oak Ridge National Laboratory High Flux Isotope Reactor, Neutron Activation Analysis facility. Preliminary analysis of these spectra shows that several of the expected and measured gamma emissions do agree with tabulated fission yields within 2 standard deviations. Further work is planned to observe the remaining branches and clarify the origin of the 5-7 MeV bump.

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