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Beta Strength of 92 and 93Rb Measured with the Total Absorption Spectroscopy Technique

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Beta decay of fission products is at the origin of decay heat and antineutrino emission in nuclear reactors. Decay heat strongly impacts reactor safety since it is about 7% of the nominal reactor power during operation and the only power after reactor stop. Reactor antineutrino detection is used in several fundamental neutrino physics experiments and it can also be used for reactor monitoring and non-proliferation purposes since this flux is directly proportional to reactor power and fuel composition.
92 and 93Rb are two fission products highly impacting reactor antineutrino spectra and decay heat. 92Rb is the most important contributor in reactor antineutrino spectrum between 5 and 8 MeV and 93Rb is in the top five contributors [1]. Moreover, 92Rb is indicated as measurement priority 2 for decay heat calculation of U/Pu cycle and priority 1 for the Th/U cycle [2].

They are candidates for the 'Pandemonium' effect [3] which arises from the difficulty that can occur in reconstructing nuclear level patterns for complex decays via measurements with Germanium detectors, especially when transitions are of high-energy or in regions of high-level density, leading to a distortion in the beta decay feeding.

Measurements of 92 and 93Rb β-decay have been performed at the IGISOL facility (Jyväskylä, Finland) using Total Absorption Gamma-Ray Spectroscopy (TAGS). TAGS is complementary to Germanium technique and uses a calorimeter to measure the total gamma intensity de-exciting each level of the daughter nucleus providing a direct measurement of the beta feeding. Results of 92Rb measurements have been discussed in [4]. At this conference we will present a new ground state to ground state feeding estimation for 92Rb, the measured beta feedings for 93Rb and show the impact of these results on reactor antineutrino spectra.

[1] Total Absorption Gamma-ray Spectroscopy for Decay Heat Calculations and Other Applications (INDC(NDS)-0676)
[2] A. Nichols et al., EPJ A 59:78, 2023
[3] J. C. Hardy et al., Phys. Lett. 71B, 307, (1977)
[4] A.-A. Zakari-Issoufou et al., Phys. Rev. Lett. 115, 102503 (2015).

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