Contribution ID: **73** Type: **Invited Talk**

First-forbidden transitions in the reactor antineutrino ux and spectral anomalies

Wednesday, 26 February 2020 09:00 (30 minutes)

It has been almost a decade since the reactor antineutrino anomaly entered the stage, where the number of experimentally detected antineutrinos emerging from a nuclear power reactor interior was signicantly less than theoretically predicted from nuclear decay. This has, in turn, motivated the search for an eV-scale sterile neutrino in several very short baseline experiments, none of which have so far confirmed its existence. From the theory point of view, initial analyses introduced a signicant number of approximations, in particular for the treatment of so-called forbidden transitions. We report on the first large-scale calculation of the influence of first-forbidden transitions using state-of-the-art nuclear shell model calculations for a select number of highly-contributing branches. We use these results to propose a probability distribution for first-forbidden spectral shapes and employ Monte Carlo techniques to translate this into a detailed construction of theoretical uncertainties for the remaining forbidden transitions. We observed signicant changes in both the integrated ux and spectral shape of the cumulative antineutrino spectra spectra for all ssion actinides [1, 2], and discuss both a mitigation of the so-called reactor shoulder and changes in the reactor antineutrino anomaly. Finally, we will comment how an improved treatment of allowed transitions [2, 3] can further signicantly change both ux and spectral shape.
[1] L. Hayen, J. Kostensalo, N. Severijns, and J. Suhonen, Physical Review C 99, 031301(R) (2019).
[2] L. Hayen, J. Kostensalo, N. Severijns, and J. Suhonen, Physical Review C 100, 054323 (2019), arXiv:1805.12259.
[3] L. Hayen, N. Severijns, K. Bodek, D. Rozpedzik, and X. Mougeot, Reviews of Modern Physics 90, 015008 (2018),
arXiv:1709.07530.

Primary author: HAYEN, Leendert (North Carolina State University & Triangle Universities Nuclear Laboratory)

Presenter: HAYEN, Leendert (North Carolina State University & Triangle Universities Nuclear Laboratory)

Session Classification: Invited Talks

Track Classification: Invited Talk