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Updated Summation Method Model and New Prediction for the Reactor Antineutrino Flux and Energy Spectrum

The accurate determination of reactor antineutrino spectra is still a challenge. In 2017 the Daya Bay collaboration has released a measurement of the evolution of the antineutrino flux with the fuel content of the reactor [1]. The observed deficit of the flux compared with the predictions of the conversion model was quasi totally explained by the data arising from the fissions of 235U while the part dominated by the fissions of 239Pu was in good agreement with the model. The distortion of the measured antineutrino energy spectrum at reactors in the 5 to 7 MeV range in comparison with the conversion model (shape anomaly) is not yet understood as well. The understanding of the underlying components of the antineutrino spectrum is possible using the nuclear beta decay data and the fission yields. This computation method, called the summation method [2], was re-developed in 2011 in order to predict reactor antineutrino spectra from any fuel under any irradiation condition without restriction of the antineutrino energy range. It was shown that the Pandemonium effect [3] affects the evaluated nuclear databases containing the required beta decay data. In [4] new Total Absorption Gamma-ray Spectroscopy (TAGS) results revealed to have a major impact on the antineutrino spectral shape. Since then the Nantes-Valencia collaboration has carried out two experimental campaigns during the last decade at the University of Jyväskylä, Finland, measuring a large set of data in order to improve the quality of the predictions of the summation method [5]. The summation model of [3] has been updated using the most recent evaluated beta decay databases and the TAGS measurements performed by our collaboration during the last decade [5] have been included in a new summation calculation. The impact of the TAGS results for these 15 nuclei on the detected antineutrino flux and on the energy spectrum will be shown [6]. These studies give an indication of the improvement of the quality of the nuclear data since 2011 and some hints about the effort that still needs to be done. The resulting detected antineutrino spectrum and flux has been compared without any renormalization with that obtained by the Daya Bay experiment showing a remaining difference in flux of only 1.9%, that should be further reduced with the inclusion of more Pandemonium free data in the calculation.

[1] F. P. An et al. (Daya Bay Collaboration), Phys. Rev. Lett. 118, 251801 (2017) and APS Viewpoint by M. Fallot.
[2] T. A. Mueller et al., Phys. Rev. C 83, 054615 (2011).
[3] J. C. Hardy et. al., Phys. Lett. B 71, 307 (1977)
[4] M. Fallot et al., Phys. Rev. Lett. 109 , 202504 (2012).
[5] A.-A. Zakari-Issoufou et al., Phys. Rev. Lett. 115 , 102503 (2015). J.L. Tain et al., Phys. Rev. Lett. 115, 062502. E. Valencia et al., Phys. Rev. C 95, 024320 (2017). S. Rice et al., Phys. Rev. C 96, (2017) 014320. V. Guadilla et al., Phys. Rev. Lett. 122, (2019) 042502.
[6] M. Estienne et al., Phys. Rev. Lett. 123, 022502 (2019).

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