



High Energy Physics - Phenomenology

On the determination of anti-neutrino spectra from nuclear reactors

Patrick Huber

(Submitted on 3 Jun 2011 (v1), last revised 17 Jan 2012 (this version, v4))

In this paper we study the effect of, well-known, higher order corrections to the allowed beta decay spectrum on the determination of anti-neutrino spectra resulting from the decays of fission fragments. In particular, we try to estimate the associated theory errors and find that induced currents like weak magnetism may ultimately limit our ability to improve the current accuracy and under certain circumstance could even largely increase the theoretical errors. We also perform a critical evaluation of the errors associated with our method to extract the anti-neutrino spectrum using synthetic beta spectra. It turns out, that a fit using only virtual beta branches with a judicious choice of the effective nuclear charge provides results with a minimal bias. We apply this method to actual data for U235, Pu239 and Pu241 and confirm, within errors, recent results, which indicate a net 3% upward shift in energy averaged anti-neutrino fluxes. However, we also find significant shape differences which can in principle be tested by high statistics anti-neutrino data samples.

Comments: 20 pages, 5 figures, 9 tables, added references, version accepted for publication in Phys. Rev. C. Corrected errors in tab. 1 and eqs. 18 and 19. Results and conclusion unchanged

Subjects: **High Energy Physics - Phenomenology (hep-ph)**; High Energy Physics - Experiment (hep-ex); Nuclear Experiment (nucl-ex); Nuclear Theory (nucl-th)

Journal reference: Phys.Rev.C84:024617,2011

DOI: [10.1103/PhysRevC.84.024617](https://doi.org/10.1103/PhysRevC.84.024617)

Cite as: [arXiv:1106.0687](https://arxiv.org/abs/1106.0687) [hep-ph]
(or [arXiv:1106.0687v4](https://arxiv.org/abs/1106.0687v4) [hep-ph] for this version)

Submission history

From: Patrick Huber [[view email](#)]

[v1] Fri, 3 Jun 2011 15:29:53 GMT (138kb,D)

[v2] Thu, 16 Jun 2011 18:30:17 GMT (134kb,D)

[v3] Mon, 25 Jul 2011 18:50:12 GMT (135kb,D)

[v4] Tue, 17 Jan 2012 21:06:44 GMT (135kb,D)

Download:

- [PDF](#)
- [Other formats](#)

Current browse context:

hep-ph

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1106](#)

Change to browse by:

[hep-ex](#)

[nucl-ex](#)

[nucl-th](#)

References & Citations

- [INSPIRE HEP](#)
([refers to](#) | [cited by](#))
- [NASA ADS](#)

[1 blog link](#)([what is this?](#))

[Bookmark](#)([what is this?](#))



Which authors of this paper are endorsers?

Link back to: [arXiv](#), [form interface](#), [contact](#).