KamLAND

Mateus Marques

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1 LEMBRETE

Uma linha do ano de 2022 para o reator `hanbit-6` (Yonggwang) tem dados faltantes. Estimei o dado de `LF-An` com base no `TimeOnLine` e `RefUnitPow`, supondo que `LF-An` seja proporcional ao `TimeOnLine`, e que o funcionamento é o mesmo para um ano de mesma `RefUnitPow`.

2 "Evidence of Spectral Distortion"

2.1 Fission rates

"*KamLAND is surrounded by 53 Japanese power reactor units. The reactor operation data, including thermal power generation, fuel burn up, exchange and enrichment records, are provided by all Japanese power reactors and are used to calculate fission rates of each isotope. The averaged relative fission yields for the run period were*

$^{235}\mathrm{U} :^{238} \mathrm{U} :^{239} \mathrm{Pu} :^{241} \mathrm{Pu} = 0.563 : 0.079 : 0.301 : 0.057.$

The expected $\overline{\nu}_e$ flux is calculated using fission rates and $\overline{\nu}_e$ spectra; the spectra are from Ref. [3]."

Se olharmos a referência [3] citada acima, vemos:

- $^{235}\mathrm{U}$: K. Schreckenbach et al., Phys. Lett. B 160, 325 (1985); `schrecken1985`.
- $^{239,241}\mathrm{Pu}$: A. A. Hahn et al., Phys. Lett. B 218, 365 (1989); `hahn1989`.
- $^{238}\mathrm{U}$: P. Vogel et al., Phys. Rev. C 24, 1543 (1981); `vogel1981`.

Esses três artigos estão na pasta `ccc`.

2.2 General

Essa análise é entre 9 de Maio, 2002 e 11 de Janeiro, 2004.

3 DetwillerThesis

The remaining ingredients in the signal calculation (see Equation 2.3) are the resolution function $R(E_p, E'_{\overline{\nu}_e})$ described by Equations 2.2 and 4.10, the number of target protons n_p calculated in Section 5.6, the cross-section $\sigma_{E_{\overline{\nu}_e}}$ taken from [52]

[52] P. Vogel and J.F. Beacom, Phys. Rev. D 60, 053003 (1999); radiative correction from A. Kurylov, et al., Phys. Rev. C 67, 035502 (2003).

Temos $E = E_p$ e $E' = E'_{\overline{\nu}_e}$.

$$\frac{\mathrm{d}^2 N_{\overline{\nu}_e}}{\mathrm{d}E\,\mathrm{d}t} = \int_0^\infty \mathrm{d}E' \; R(E,E')\, n_p\, \sigma(E')\epsilon(E') \sum_i^{\text{reactors}} \frac{I_i(E',t)}{4\pi L_i^2} P_{\overline{\nu}_e \to \overline{\nu}_e}(E', L_i).$$

$$I_i(E) = \sum_k^{\text{isotopes}} f_{i,k}(t) \frac{\mathrm{d}N_{\overline{\nu}_e,k}(E)}{\mathrm{d}E}.$$

$$\phi_{\overline{\nu}_e}(t) = \sum_i^{\text{reactors}} \phi_{\overline{\nu}_e,i}(t) = \sum_i^{\text{reactors}} \frac{1}{4\pi L_i^2} \int_0^\infty I_i(E'_{\overline{\nu}_e}, t)\, \mathrm{d}E'_{\overline{\nu}_e}\,.$$

Definindo então

$$\Phi_{\overline{\nu}_e,i} = \int_{\text{start}}^{\text{end}} \phi_{\overline{\nu}_e,i}(t)\, \mathrm{d}t\,,$$

temos

$$something.$$

4 Tohoku website

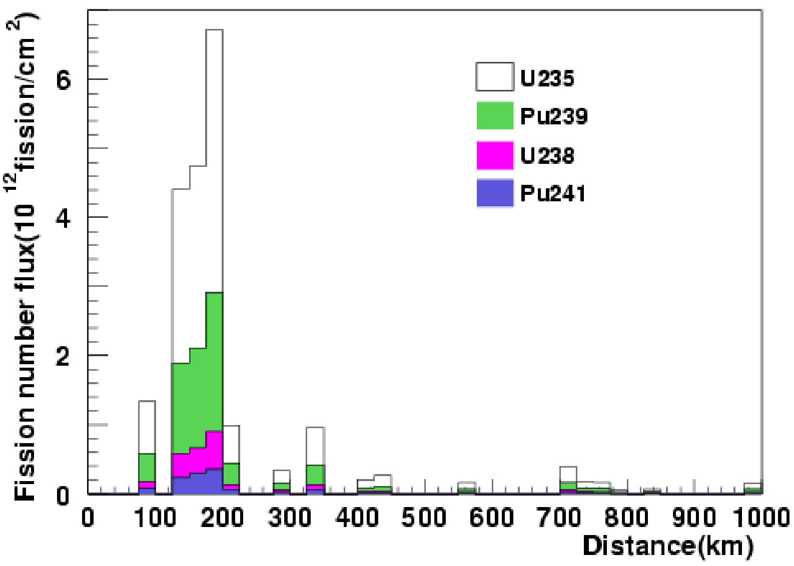

Figura 1: Integrated fission flux at the Kamioka site for the four main nuclei that have fission products contributing to the anti-neutrino flux from reactors up to a distance of 1000km from the experimental site

The four main fission nuclei are U-235, U-238, Pu-239 and Pu-241 and their fission fluxes, integrated over the total detector livetime, are provided in the data file `fission_flux_distance.dat`.