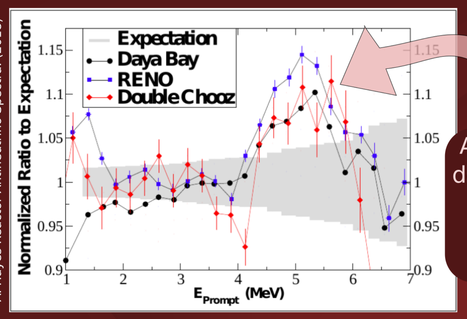
Updated ^{238}U Fission Yields show no "bump" in reactor antineutrino spectra

BACKGROUND

"The Bump"



A. Hayes Reactor Antineutrino Spectra. (2018)

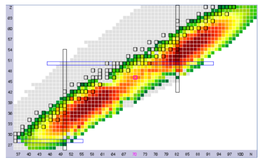
All experiments detect an excess of ν in the 4-5 MeV energy range

It has been suggested (A.Hayes) that a possible explanation could lie in the $S_\nu(E)$ from fast fission of ^{238}U

Predictions: The Summation Method

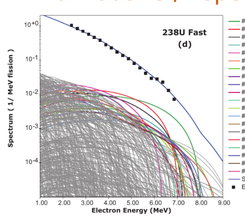
$$S(E) = \sum_i CFY_i \, S_i(E)$$

Cumulative Fission Yields



Evaluated Data Libraries: ENDF/B-VIII, JEFF 3.3, ...

Individual e-/ν spectra



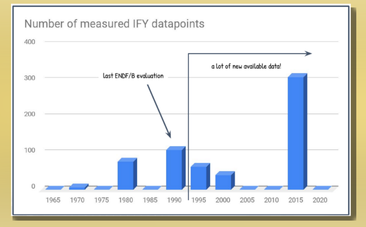
A.A. Sonzogni, et al. Phys. Rev. C 91, 0.11301 (2015)

Fission Yields Evaluations are one of the key ingredients of summation calculations: ^{238}U evaluations are based on measurements dating back 15 (JEFF-3.1), or 40 years (ENDF/B-VIII.0).

[T.R.England & B.F.Rider LA-UR-3106]

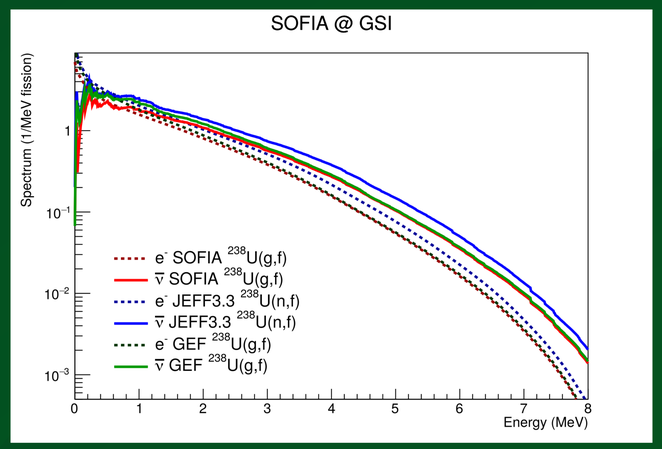
WHAT'S NEW?

Since the last FY evaluation, the number of available datapoints for IFYs of ^{238}U has nearly doubled



The majority of new data points come from experiments using novel INVERSE KINEMATICS techniques, that measure for the first time dozens of short-lived fission products

RESULTS



SOFIA @ GSI: ^{238}U*

1. pronounced difference with electron/neutrino spectra from JEFF3.3 libraries

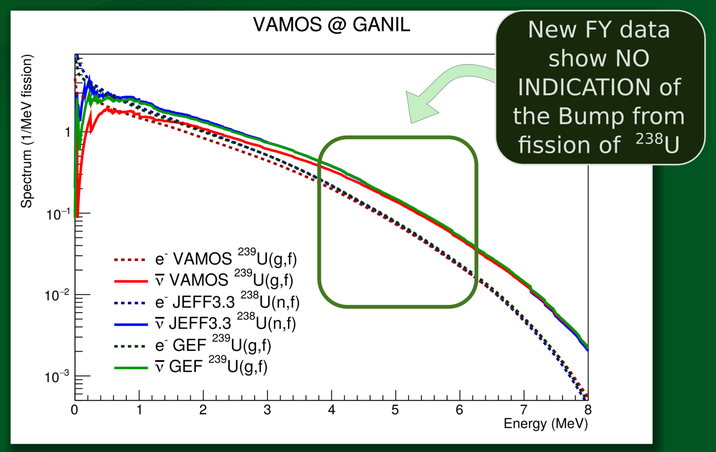
2. A GEF simulation mostly agrees with SOFIA data

3. The difference can be traced back to the different Compound Nucleus and Excitation Energy

VAMOS @ GANIL ^{239}U*

1. no indication of any major difference above 4 MeV vs JEFF3.3 or GEF.

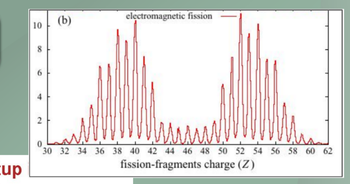
2. Some deviations start to appear at E < 4 MeV

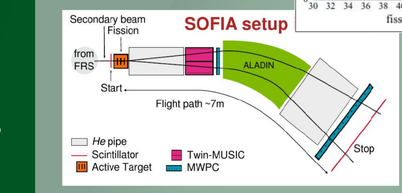


New FY data show NO INDICATION of the Bump from fission of ^{238}U

EXPERIMENTAL

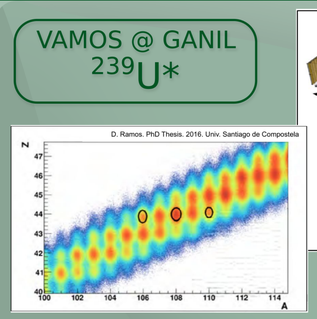
SOFIA @ GSI: ^{238}U*

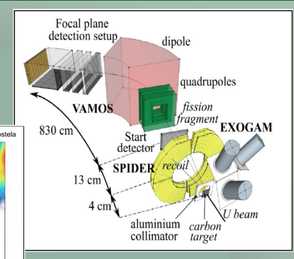




Coulomb Excitation (EM-induced fission of ^{238}U), at E_{ex} = 14.7 MeV. CN (^{238}U) and Eex are NOT the same as ^{238}U(n,f) in a reactor!

VAMOS @ GANIL ^{239}U*





A spectrometer identifies Z/A of fission fragments produced in ^{238}U+^{9}Be reactions (surrogate for fast n-induced fission of ^{238}U)

NEUTRINO 2020

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