Posible sensibility of nuclear fission to the mass of W

Draft note

Alejandro Rivero

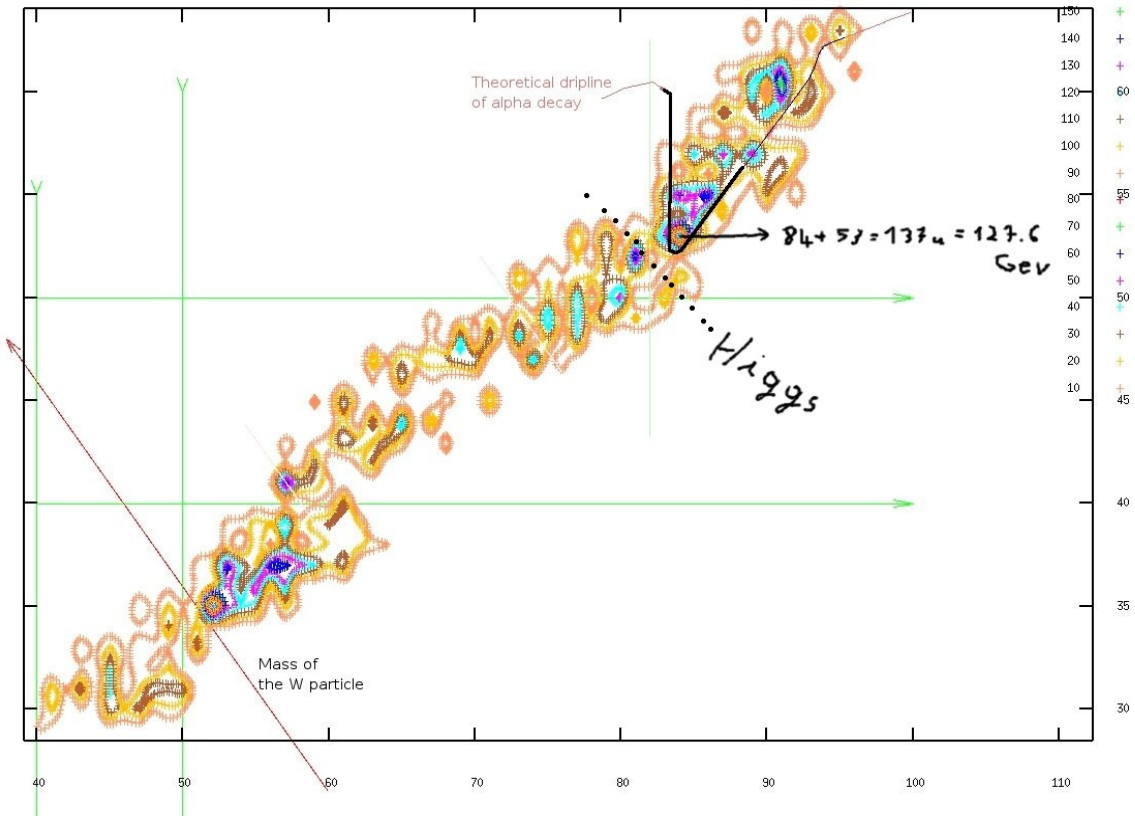
September 2015

The idea is to revisit
http://dftuz.unizar.es/~rivero/research/0405076.pdf
http://cdsweb.cern.ch/search.py?recid=737095&ln=en
http://dftuz.unizar.es/~rivero/research/bhist.jpg
http://dftuz.unizar.es/~rivero/research/NZ.jpg

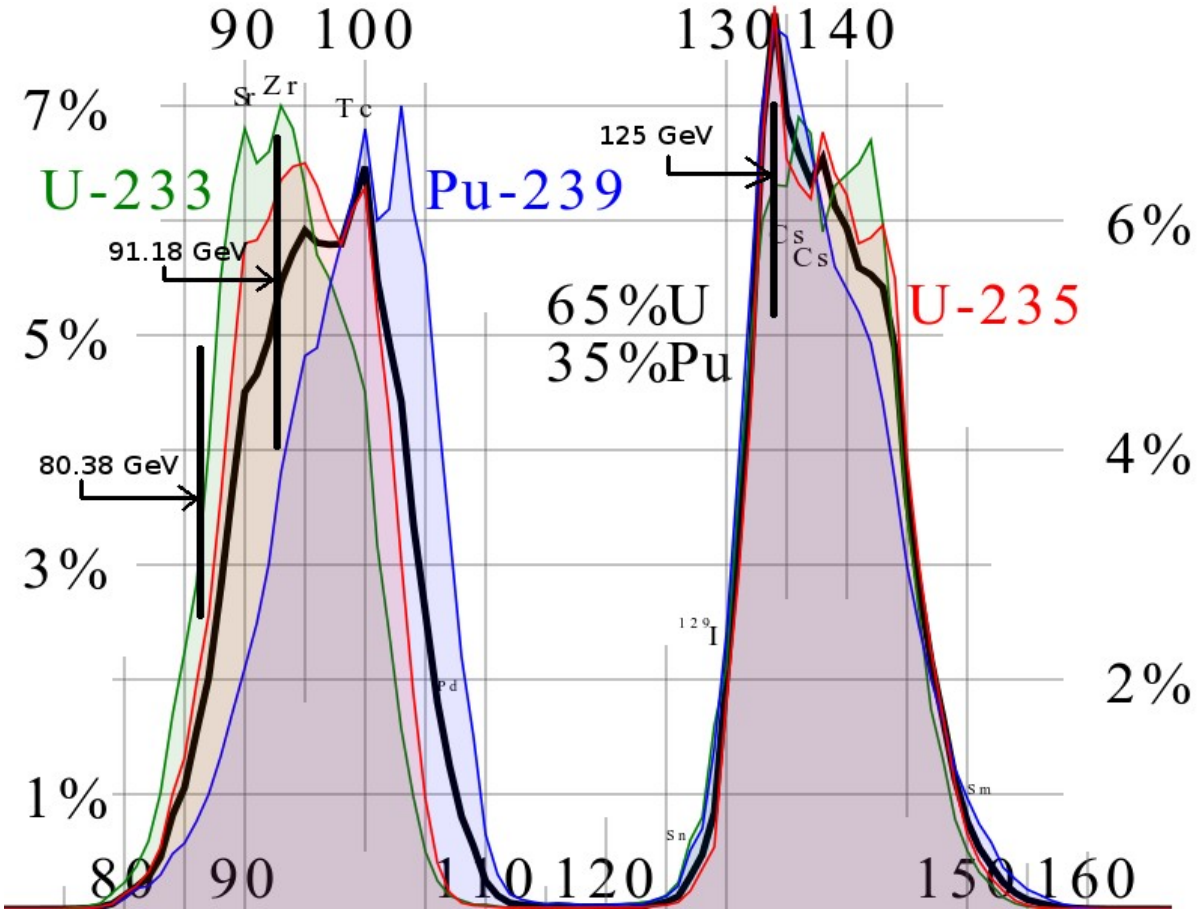
1 u = 0.9315 GeV
134.28
97.89
86.29

Also, there are new evaluations of the FRDM mass model, but we will look later

The thing I am more interested now is fission yields. This is the histogram of known beta decays. Of course, they are abundant in the fission yield peaks, because the databases have a lot more data



and from the wikipedia we can look at the yields for thermal neutron reactors:



This of course is naively explained with

Magic numbers Z=50, N=50, Z=82

Stable nuclei:
N=50, Z=38-40
Z=50, N=64-72
N=82, Z=56-60

so three possible preferential A

88...90
114...122
138..142

and they coincide more or less with the asymmetrical channels and the symmetrical, central one.

And of course there is a state-of.-art deformation model:

Möller – Madland – Sterk – Iwamoto

in Nature, 15 FEB 2001., p 765

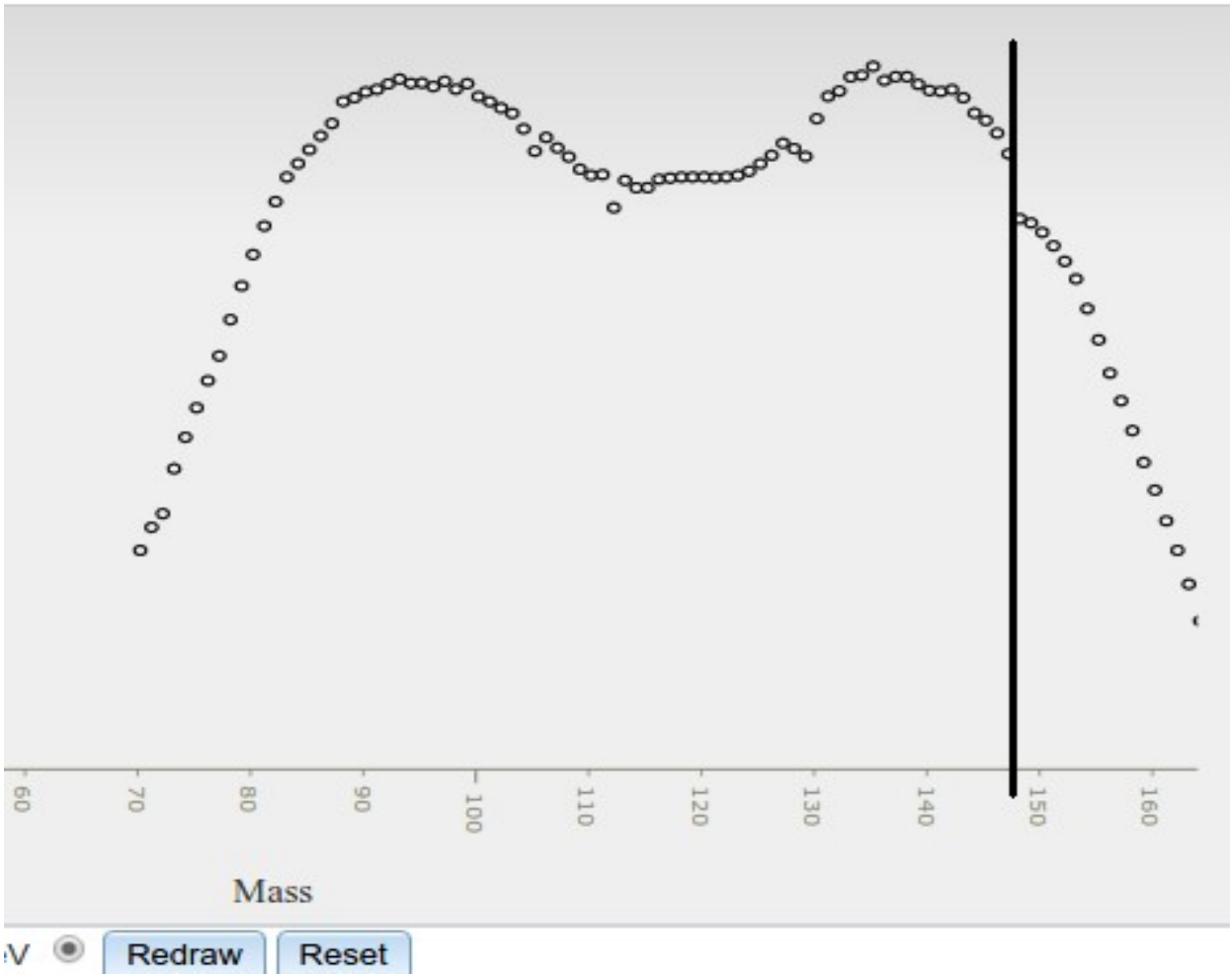
On other hand the droplet could be more complex
20,28,50,82,126, 184
without spin orbit strong coupling they are pure harmonic oscillator
20, -, 40, 70, 112, 168
or it could be pure bag (square well) ...
20, 34, 58, 92, 138 or a lot of intermediate decomps

Data from https://www-nds.iaea.org/

Most funny thing is U235 14 Mev “hot” neutrons, A-chain yield

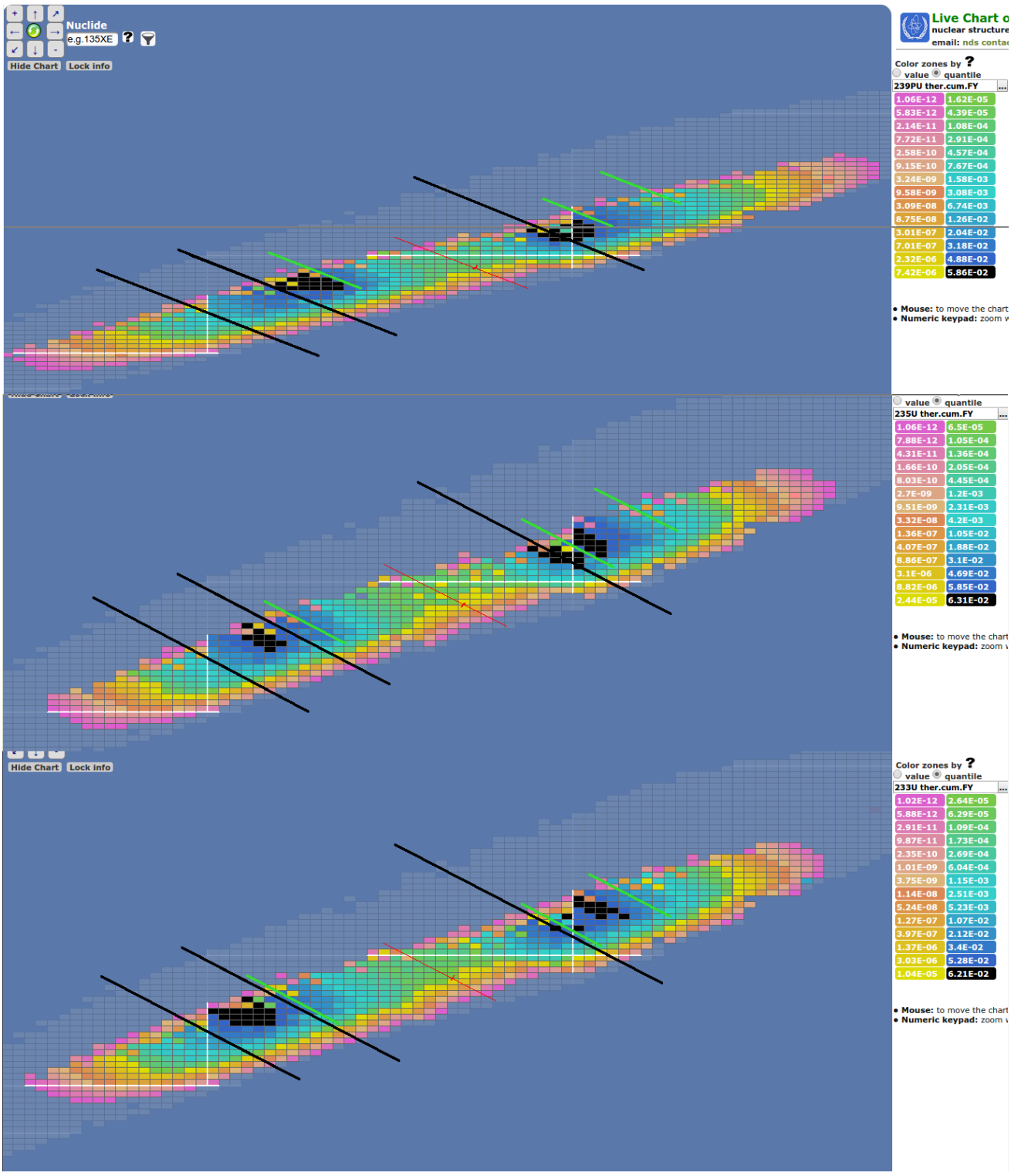
I have asked about it here

http://physics.stackexchange.com/questions/205620/what-is-this-jump-in-u235-fission-yields



235-86.29=148.71 so the jump could be a measurement of W

Also the same website allows to plot thermal yields. Overt it, I have painted W,Z,H and their mirrors (in green)



It is interesting that the yields, even if they touch some of the magic areas, show a dependence on A.

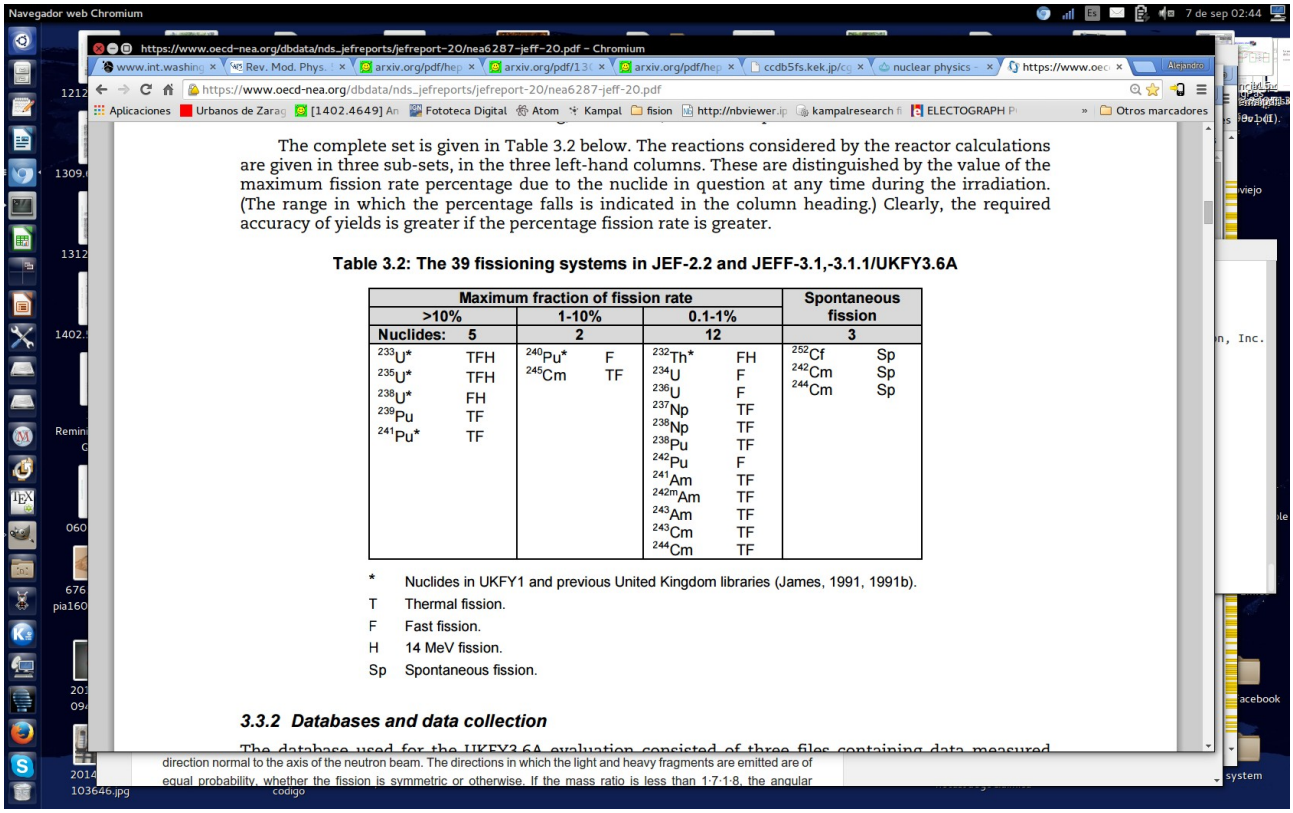
theories:

- collective, coherent recoil?

- infrared cutoff of electreoweak corrections of set at M_A instead of M_p?

See

http://journals.aps.org/rmp/abstract/10.1103/RevModPhys.50.573 Sirlin
in KEK http://ccdb5fs.kek.jp/cgi-bin/img/allpdf?198511386 f 6
http://arxiv.org/pdf/hep-ph/0309187v1.pdf
http://www.int.washington.edu/talks/WorkShops/int_07_1/People/Glueck_F/Glueck.pdf Gluk
http://arxiv.org/pdf/hep-ph/0302149v1.pdf f 13
http://arxiv.org/pdf/1301.1358v1.pdf



The complete set is given in Table 3.2 below. The reactions considered by the reactor calculations are given in three sub-sets, in the three left-hand columns. These are distinguished by the value of the maximum fission rate percentage due to the nuclide in question at any time during the irradiation. (The range in which the percentage falls is indicated in the column heading.) Clearly, the required accuracy of yields is greater if the percentage fission rate is greater.

Table 3.2: The 39 fissioning systems in JEF-2.2 and JEFF-3.1,-3.1.1/UKFY3.6A

Maximum fraction of fission rate						Spontaneous fission	
>10%		1-10%		0.1-1%			
Nuclides:	5		2		12		3
^{233}U*	TFH	^{240}Pu*	F	^{232}Th*	FH	^{252}Cf	Sp
^{235}U*	TFH	^{245}Cm	TF	^{234}U	F	^{242}Cm	Sp
^{238}U*	FH			^{236}U	F	^{244}Cm	Sp
^{239}Pu	TF			^{237}Np	TF		
^{241}Pu*	TF			^{238}Np	TF		
				^{238}Pu	TF		
				^{242}Pu	F		
				^{241}Am	TF		
				^{242m}Am	TF		
				^{243}Am	TF		
				^{243}Cm	TF		
				^{244}Cm	TF		

* Nuclides in UKFY1 and previous United Kingdom libraries (James, 1991, 1991b).
T Thermal fission.
F Fast fission.
H 14 MeV fission.
Sp Spontaneous fission.

3.3.2 *Databases and data collection*

The database used for the UKFY3.6A evaluation consisted of three files containing data measured

direction normal to the axis of the neutron beam. The directions in which the light and heavy fragments are emitted are of equal probability, whether the fission is symmetric or otherwise. If the mass ratio is less than 1·7·1·8, the angular