LISE^{++} : Fall 2011 update

LISE^{++} version 9.2.126

from 11/11/11

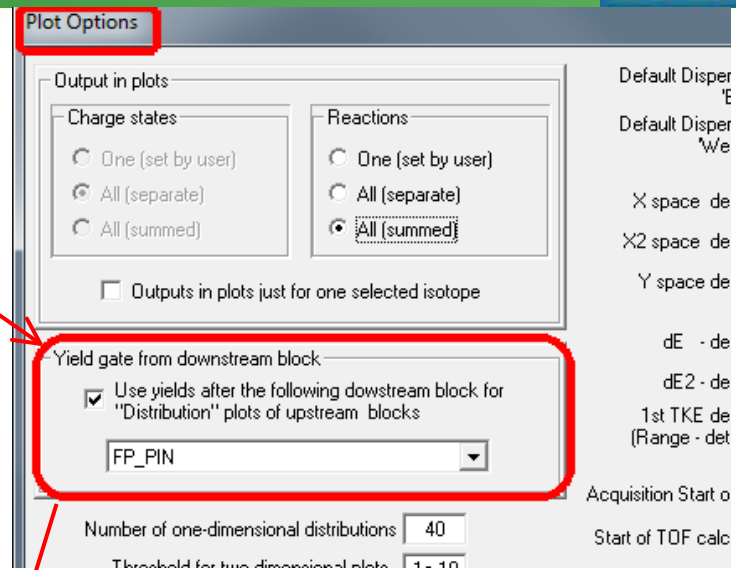
- Yield Plot (“Distribution” method) gated on downstream block
- Spontaneous fission dialog & plots
- Corrections: potential energy at fission barrier
- Corrections: Electromagnetic Excitation plot
- New Options for nucleus identification in 2d-plot
- Modification of the "Utilities" menu
- Message (Gauge) how many blocks have remained at reading file

The code operates under MS Windows environment and provides a highly user-friendly interface.
It can be freely downloaded from the following internet addresses:
http://www.nscl.msu/edu/lise

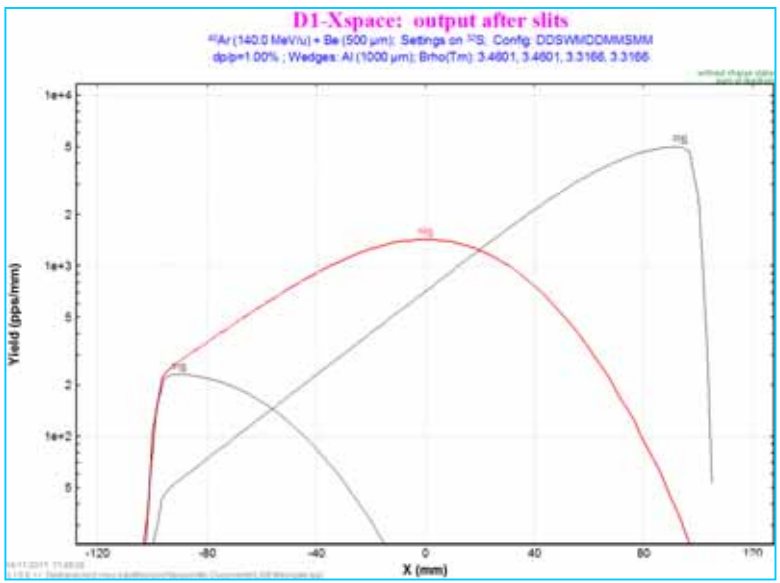
Yield Plot gated on downstream block (1)

- Only for "Distribution" method **1-D plots** & 2-D PseudoMC plots
- For "Distribution" method just yield is gated, not a shape!
- Use the MC transmission dialog to see shape changes due to gates on downstream blocks

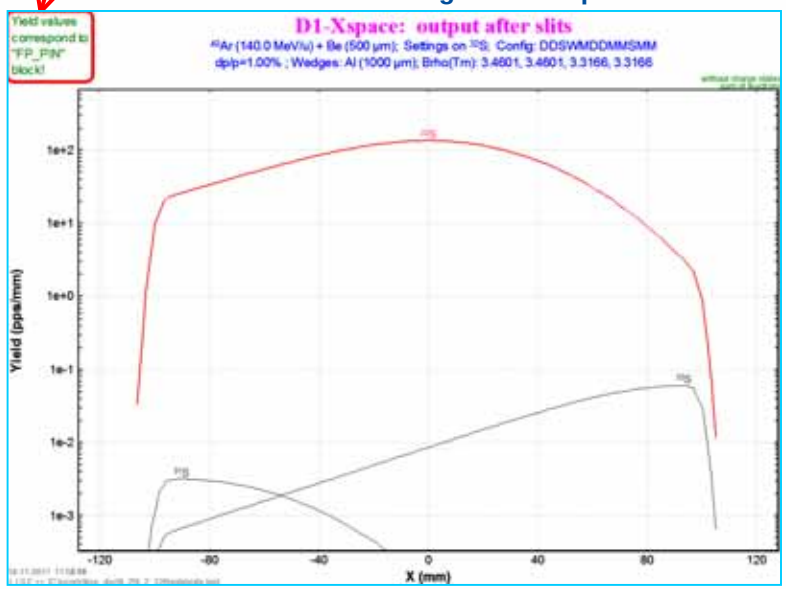
Example File: **gate.lpp**



No gates



With applied gate.
You should see a message in the top left corner



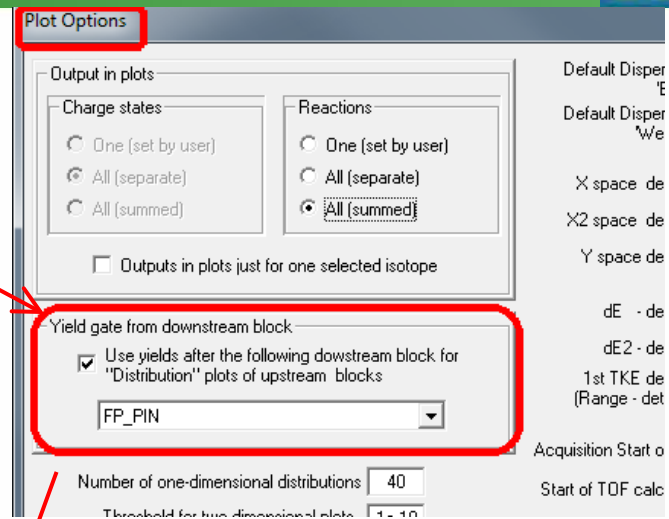
Yield Plot gated on downstream block (2)

- **2-D PseudoMC plot**

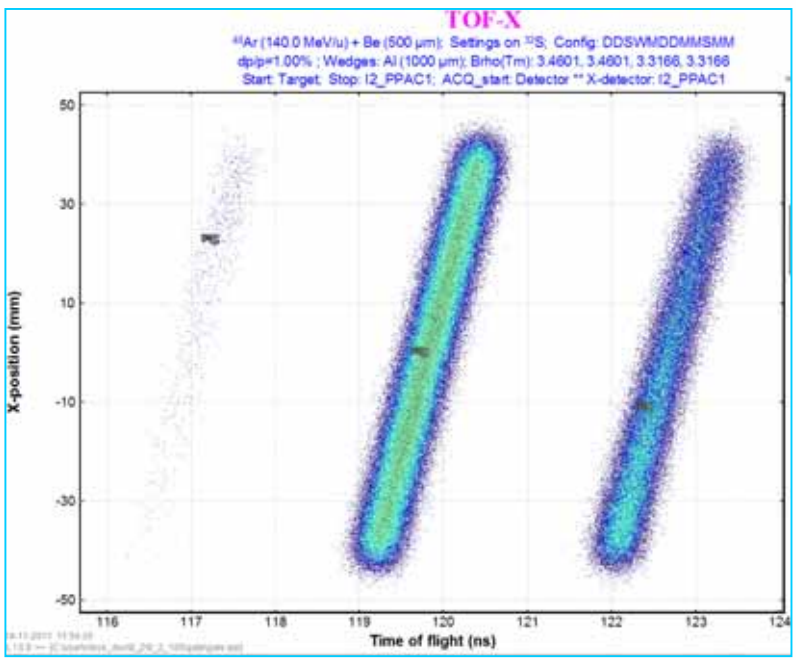
- **For "Distribution" method just yield is gated, not a shape!**

- **Use the MC transmission dialog to see shape changes due to gates on downstream blocks**

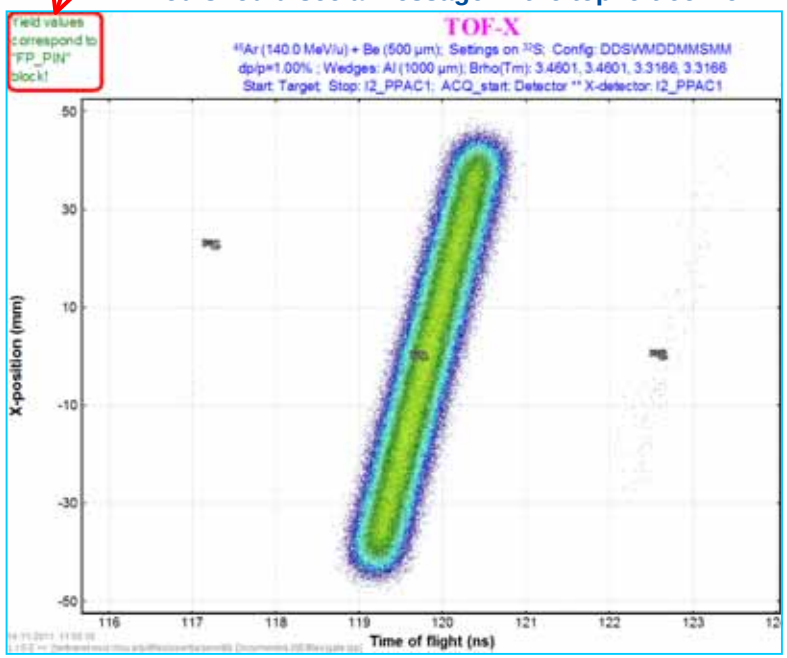
Example File: **gate.lpp**



No gates

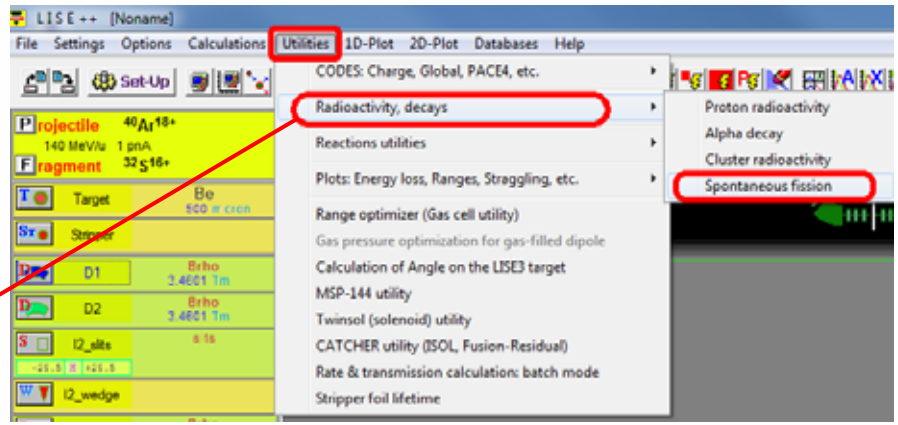


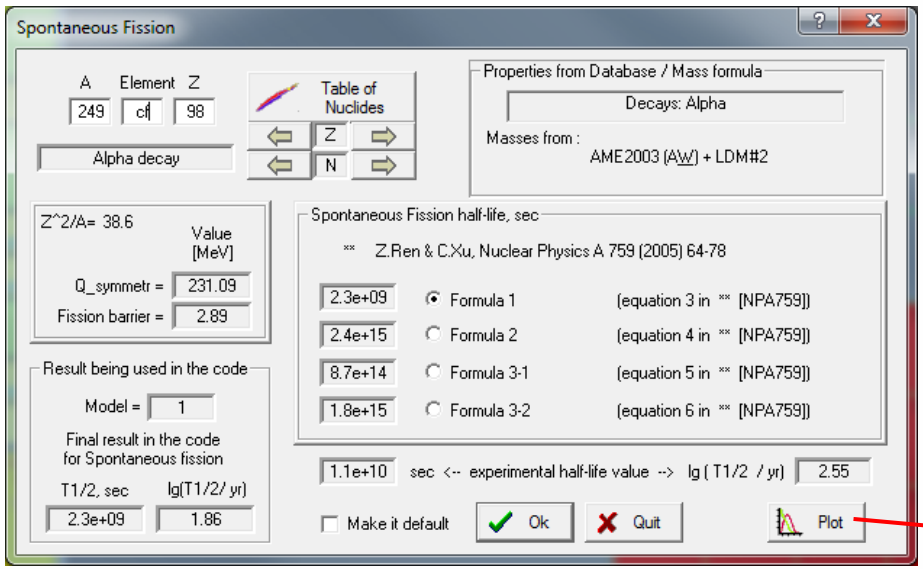
With applied gate.
You should see a message in the top left corner

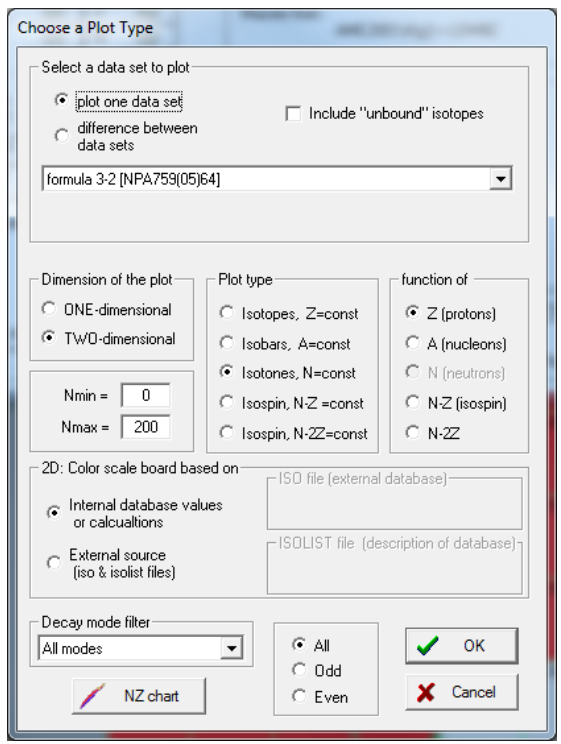


Spontaneous fission dialog & plots (1)

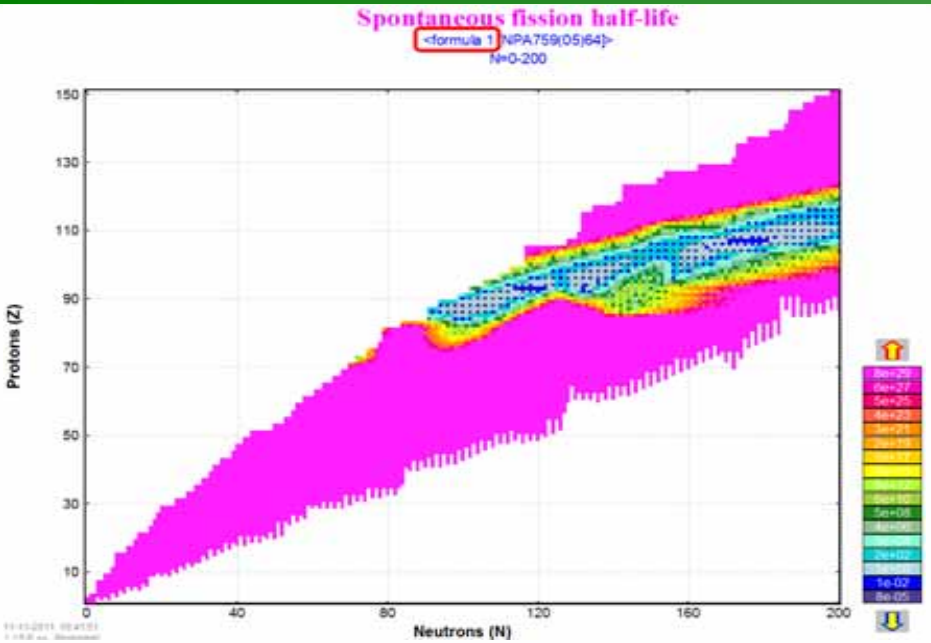
- **Based on 4 parameterizations from Z.Ren, and C.Xu, Nuclear Physics A 759 (2005) 64-78**
- **Take care! These parameterizations might be applied for the limited region (see the next slides)**

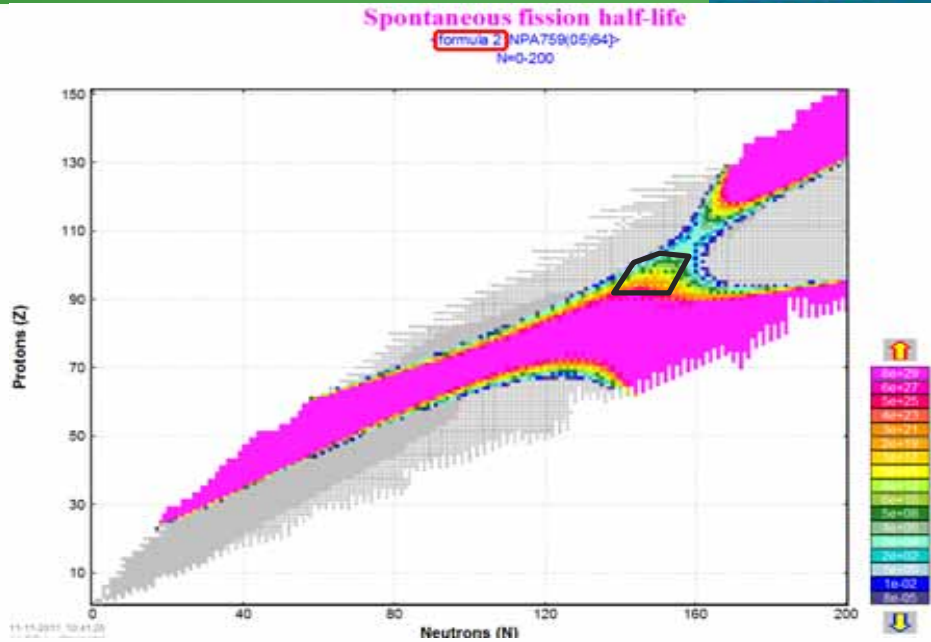


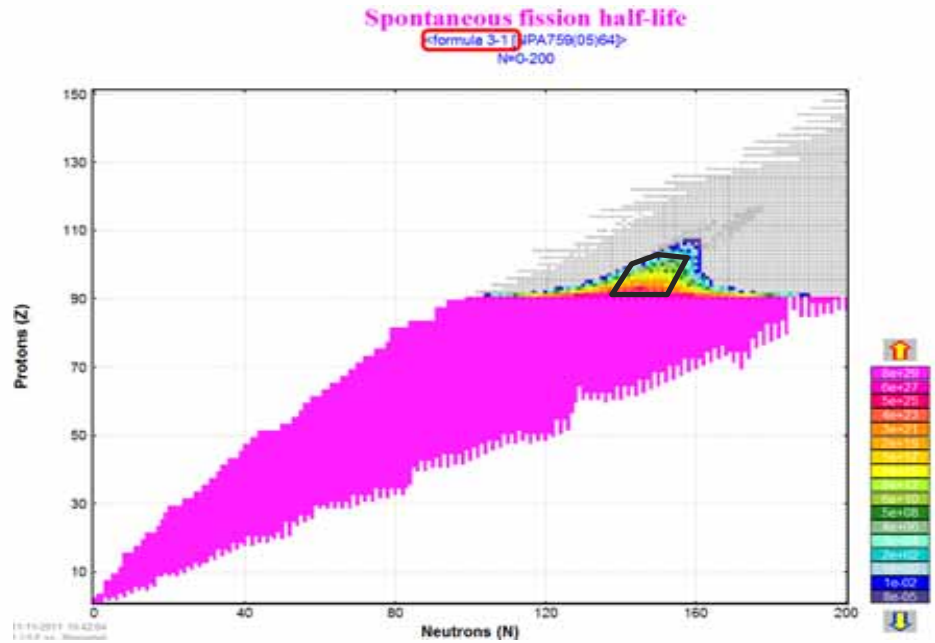


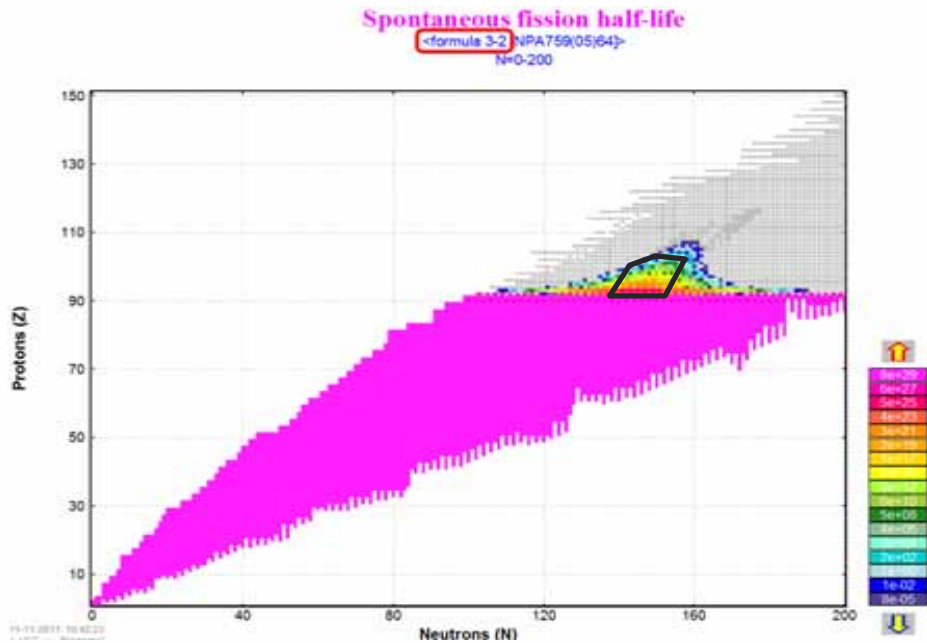


Spontaneous fission plots : 4 formulas from NPA759

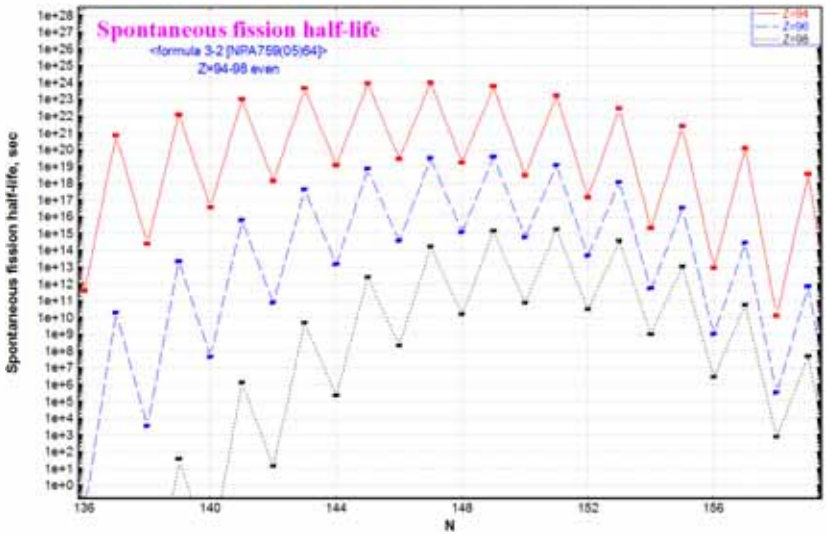








Spontaneous fission dialog & plots (3)



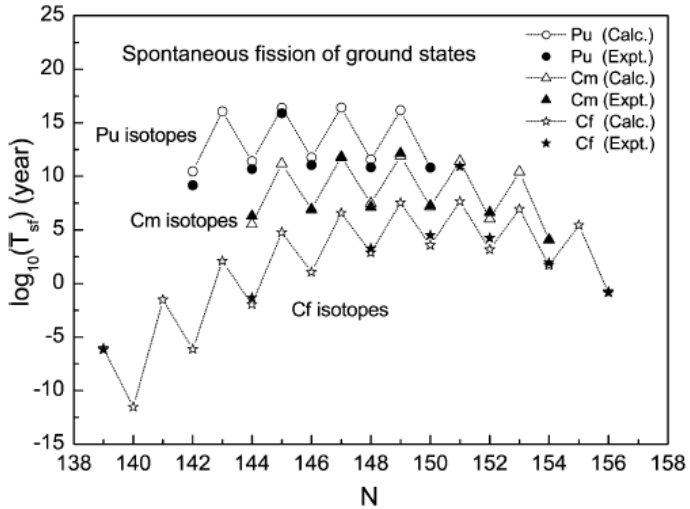
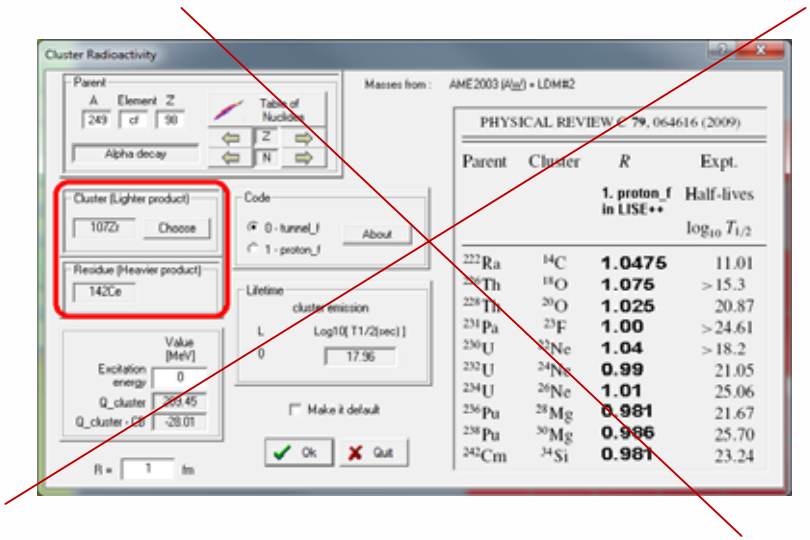


Fig. 4. Comparison of experimental half-lives and theoretical ones of spontaneous fission for nuclear ground state of Pu, Cm, and Cf isotopic chains. The even–odd effect of half-lives for an isotopic chain is clearly seen although some experimental points of odd–A nuclei are not available now.



The cluster radioactivity dialog cannot be used to estimate spontaneous fission half-lives. Fission barrier penetration* should be used (instead using CB).

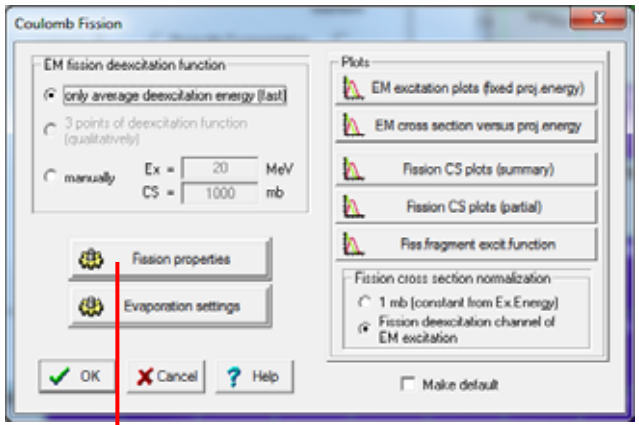
Under construction

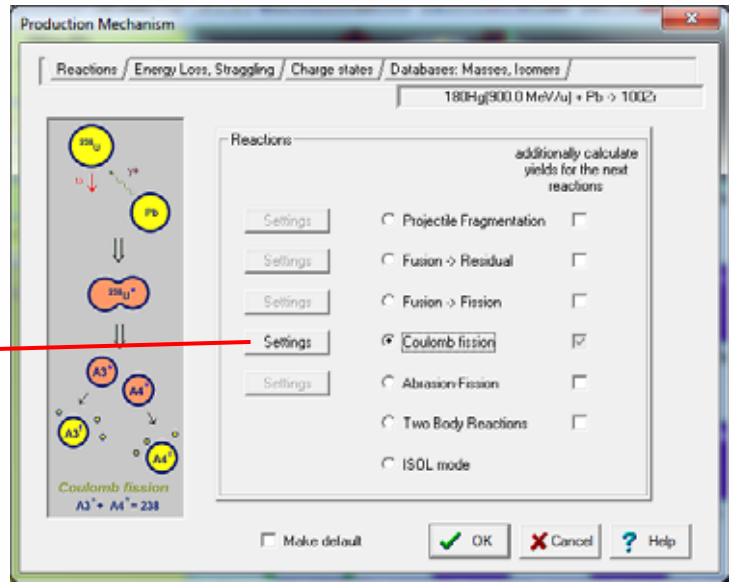
**** For example***
N.R.Dagdeviren and H.Aweidenmuller, PLB 186 (1987) 267
S.Levit et al., PRC 22 (1980) 1979
R.Smolanczuk et al., PRC 52 (1995) 1871

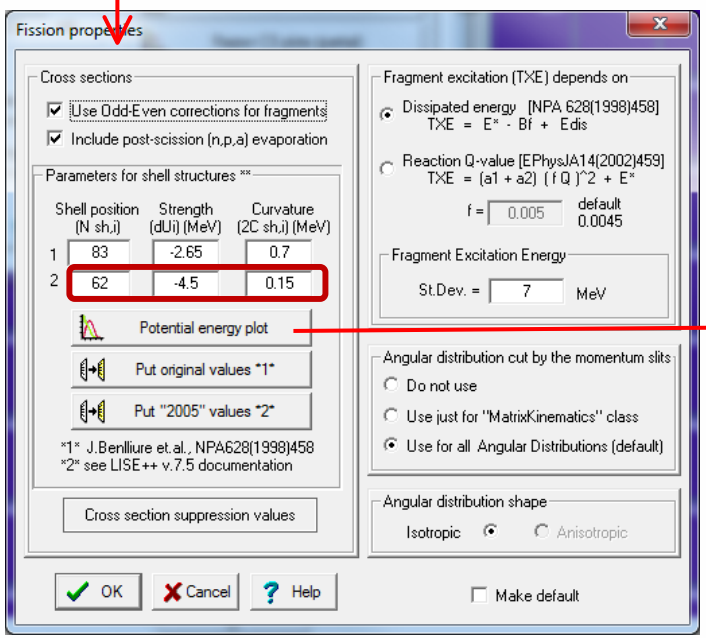
Corrections: potential energy at fission barrier (1)

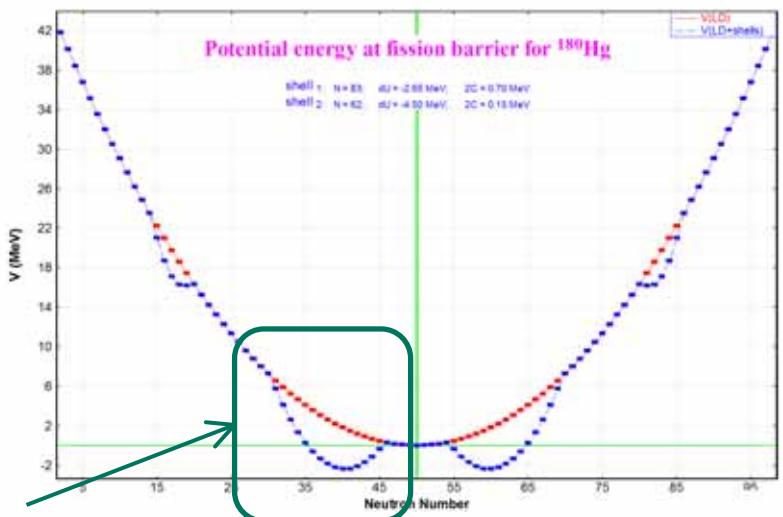
Correction were done with connection to the work of A.N.Andreev et al., PRL 105, 252502 (2010)

File: 180Hg_Coulex.lpp







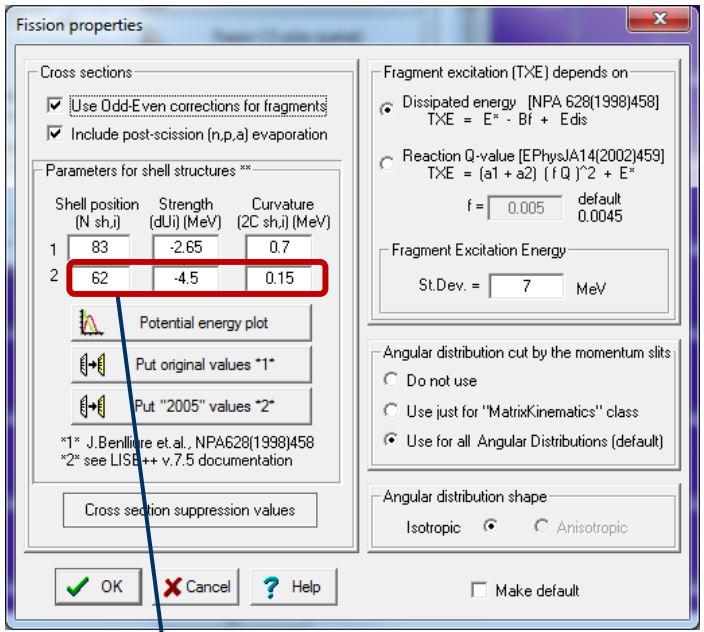


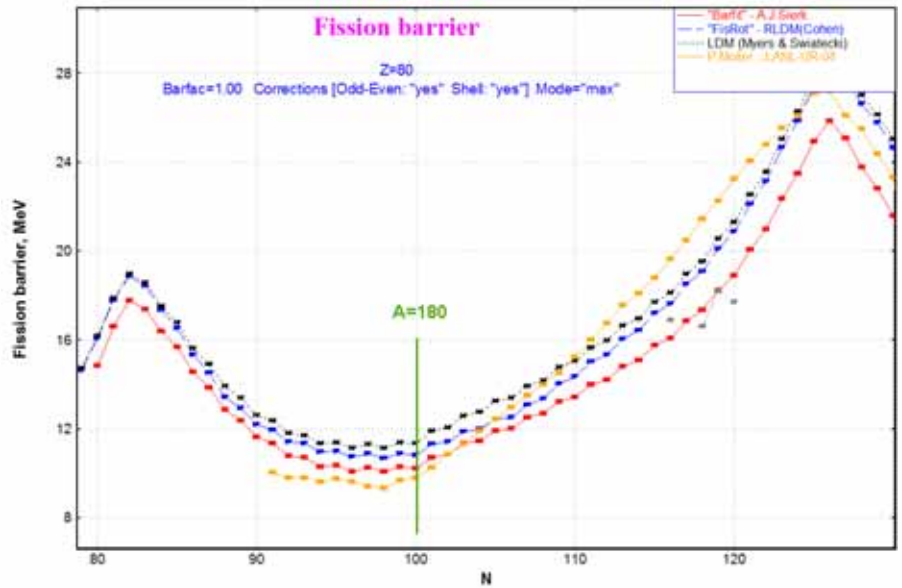
The Mirror part location of the shell has been corrected

Coulomb fission of ^{180}Hg : fission properties (2)

Correction were done with connection to the work of A.N.Andreev et al., PRL 105, 252502 (2010)

File: 180Hg_Coulex.lpp





- **The "shell" position N=62 has been chosen in order to correspond Z=48, because**

- **C. Böckstiegel et al., Nuclear Physics A 802 (2008) 12–25 :**

"The most salient feature is that the positions of the heavy components of the asymmetric fission channels do not vary in atomic number, while they move strongly in mass as well as in neutron number."

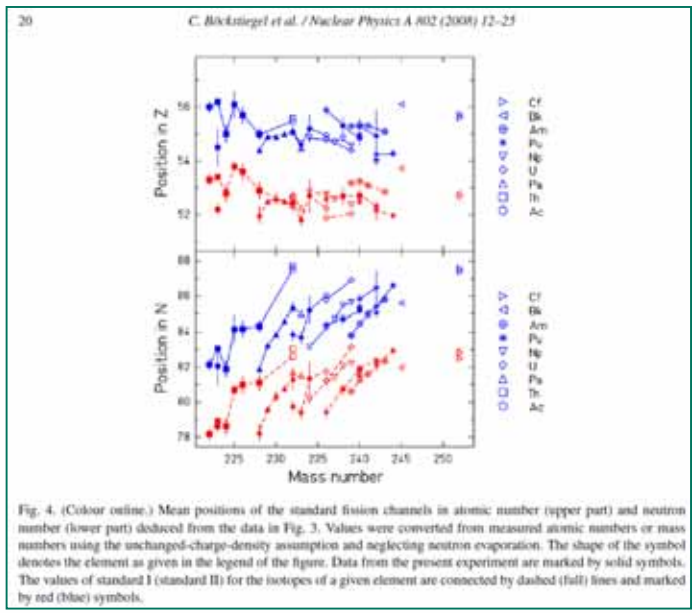


Fig. 4. (Colour online.) Mean positions of the standard fission channels in atomic number (upper part) and neutron number (lower part) deduced from the data in Fig. 3. Values were converted from measured atomic numbers or mass numbers using the unchanged-charge-density assumption and neglecting neutron evaporation. The shape of the symbol denotes the element as given in the legend of the figure. Data from the present experiment are marked by solid symbols. The values of standard I (standard II) for the isotopes of a given element are connected by dashed (full) lines and marked by red (blue) symbols.

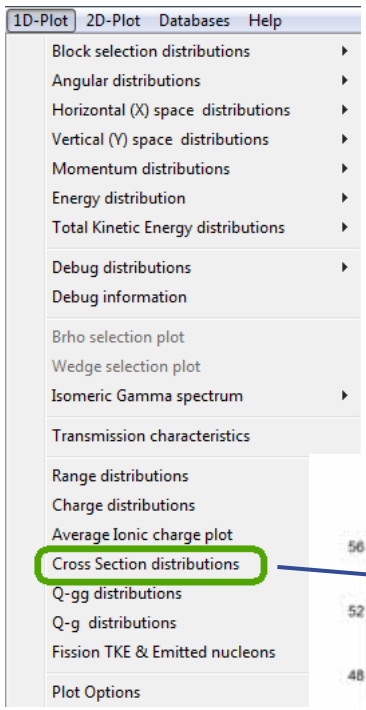
LISE^{++} perspective:

create an option to set Z-shell positions for potential energy

Coulomb fission of ^{180}Hg (3)

Correction were done with connection to the work of A.N.Andreev et al., PRL 105, 252502 (2010)

File: 180Hg_Coulex.lpp



According to the authors $Z_H = 44(2)$ and $Z_L = 36(2)$. Set in LISE++ the "shell" position at N=56?

Should be explained why this position… Deformation should be taken into account according to the work of P.Moller et al., PHYSICAL REVIEW C 79, 064304 (2009)

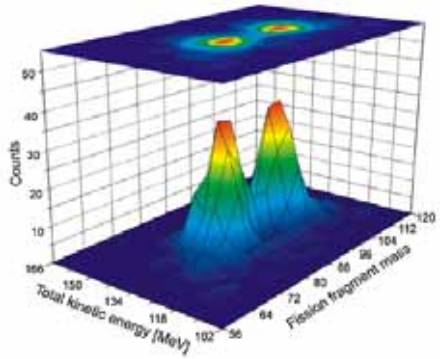
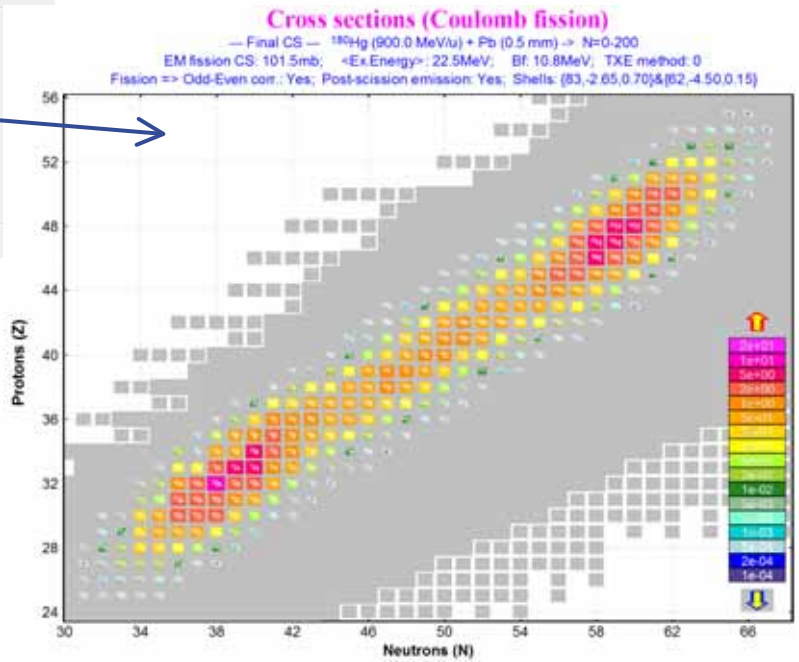
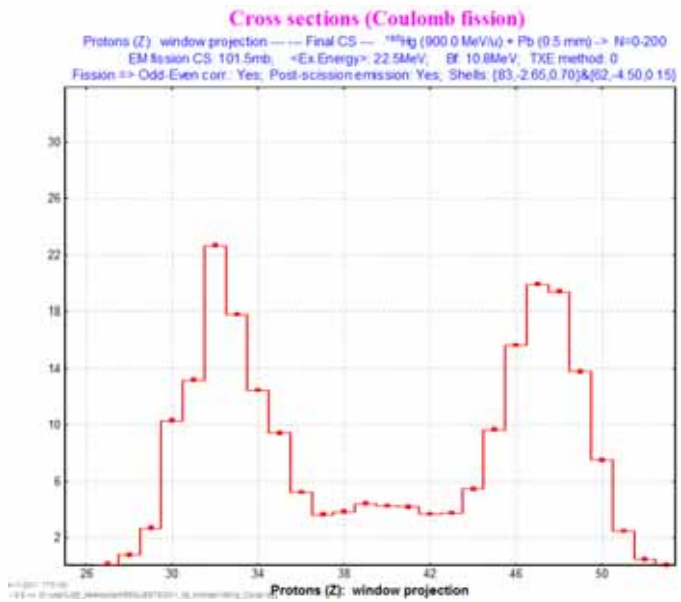


FIG. 4 (color online). The derived fission-fragment distribution of ^{180}Hg as a function of the fragment mass and the total kinetic energy.

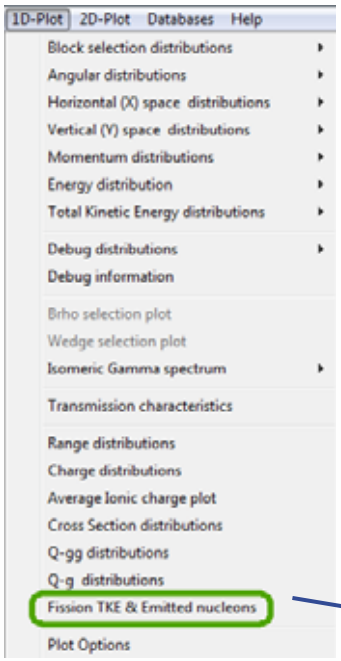




Coulomb fission of ^{180}Hg (4)

Correction were done with connection to the work of A.N.Andreev et al., PRL 105, 252502 (2010)

File: 180Hg_Coulex.lpp



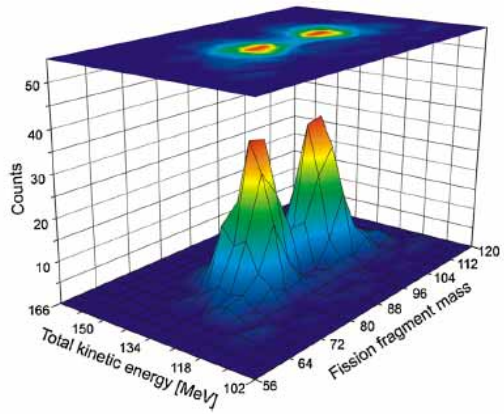
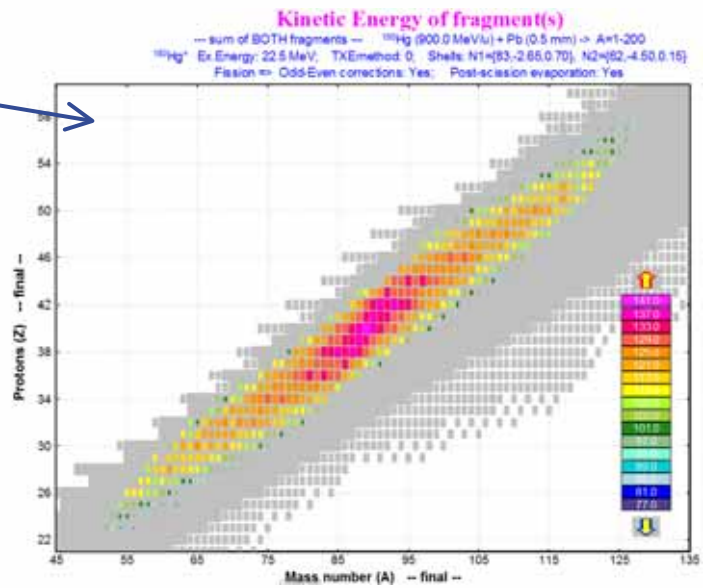
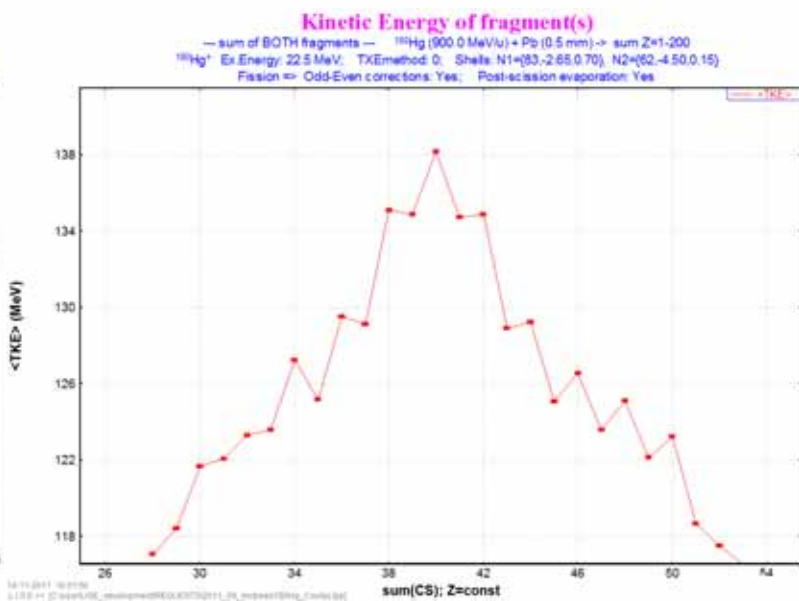


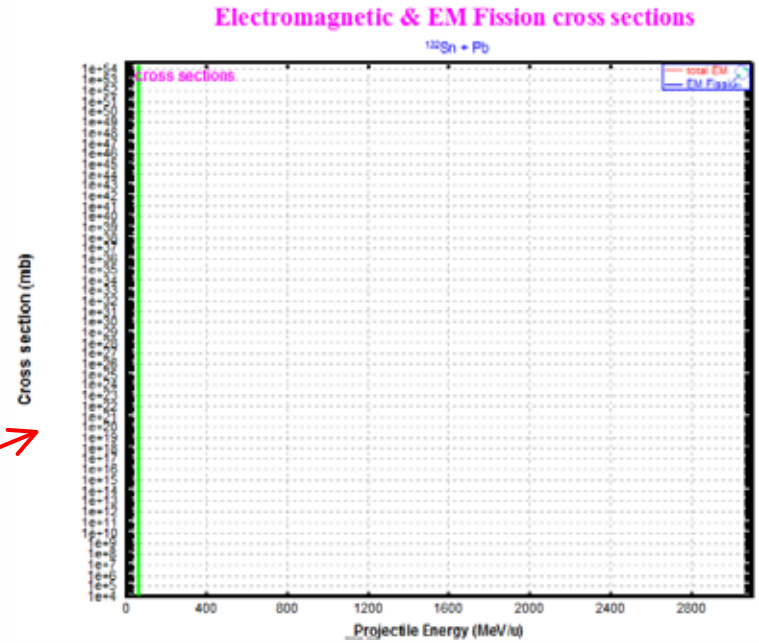
FIG. 4 (color online). The derived fission-fragment distribution of ^{180}Hg as a function of the fragment mass and the total kinetic energy.

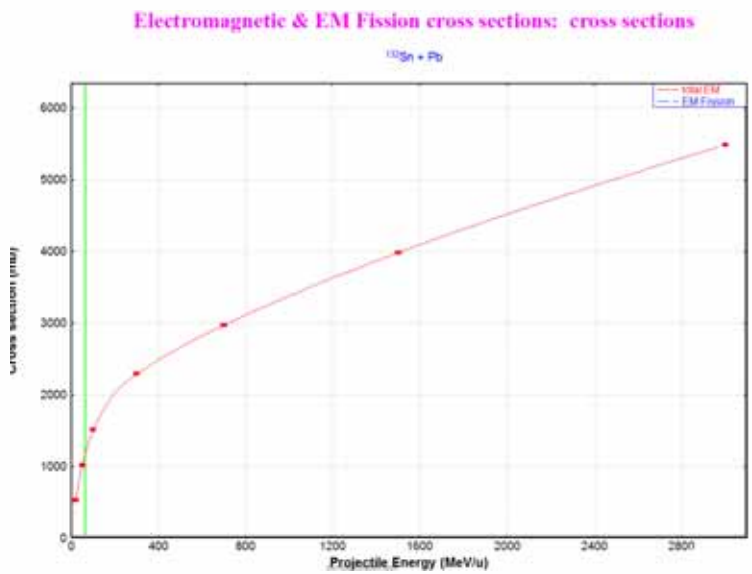




Corrections: Electromagnetic Excitation plot

In the case of EM fission CS equal to 0, the EM cross section plot was not shown. FIXED





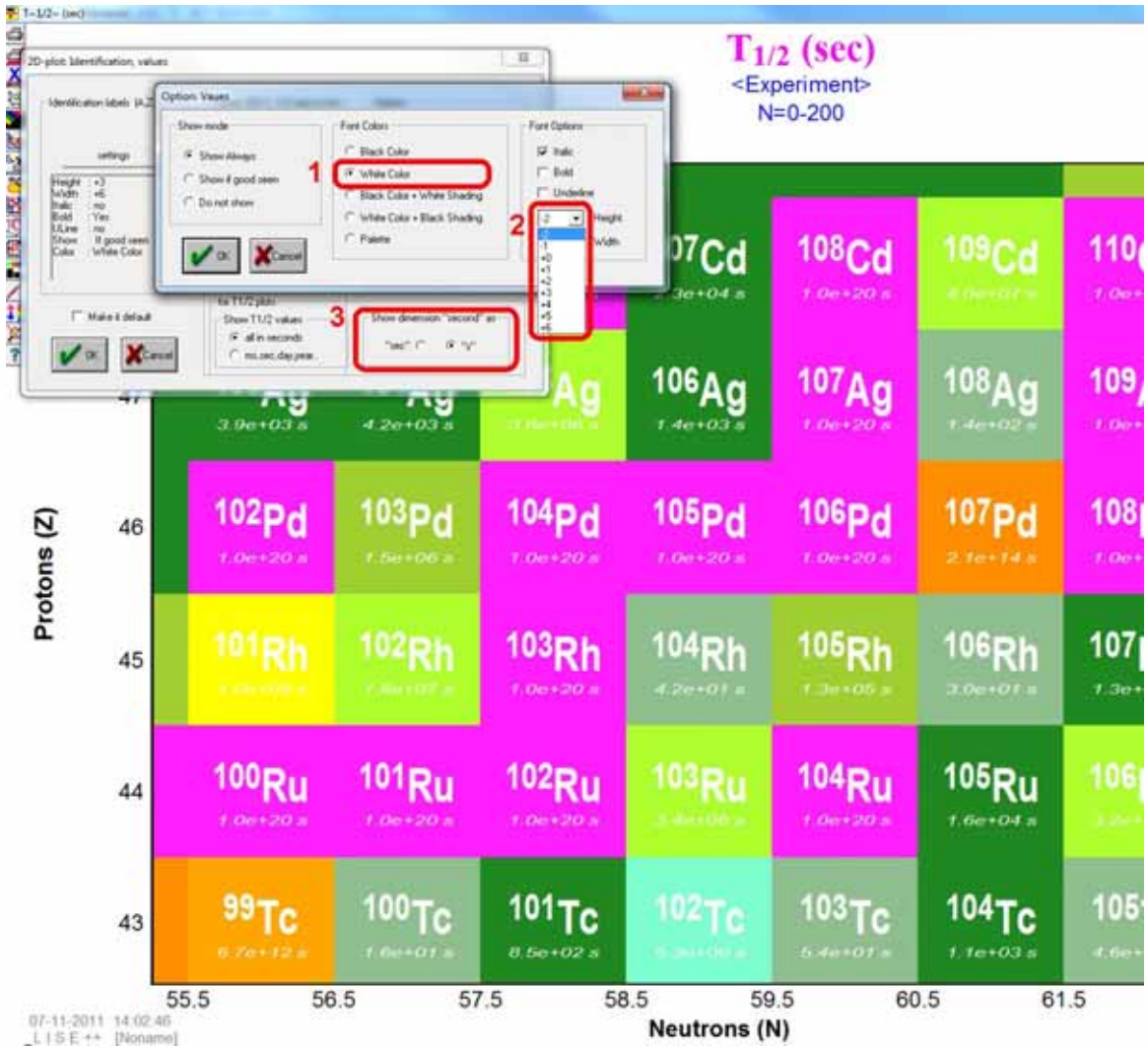
New Options for nucleus identification in 2d-plot

See more for PID plots at : http://groups.nscl.msu.edu/lise/9_2/9_2_57.pdf (page 7)

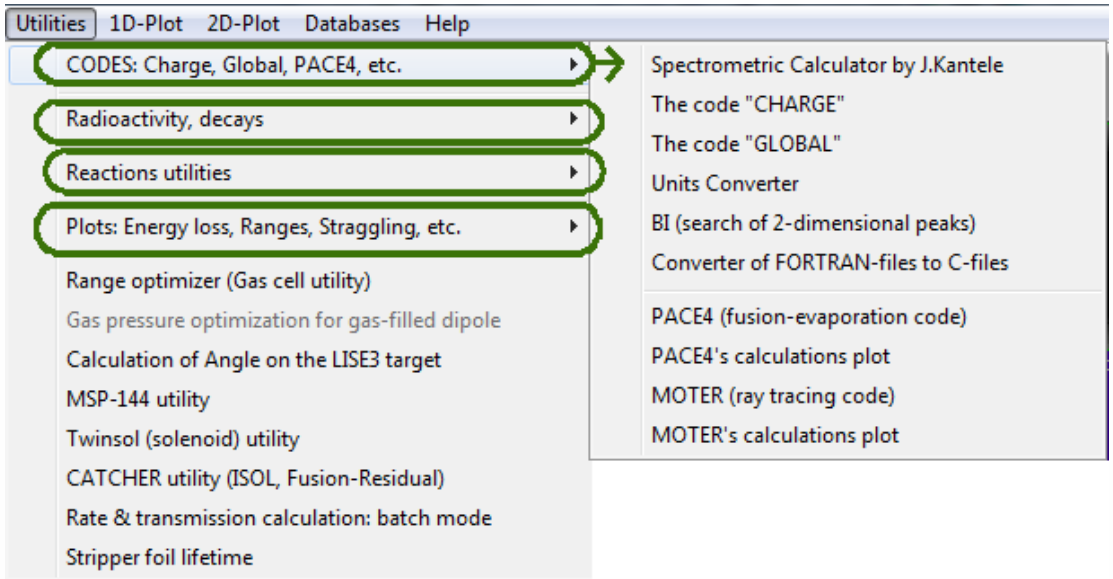
1) white color is available

2) "+4,+5,+6" sizes are available

3) option using "s" or "sec" is available.



Modification of the "Utilities" menu & Message (Gauge) : how many blocks have remained at reading file



If the number of blocks in a file is more than 30