Customizable Chart of the Nuclides in LISE++

version 9.2.57

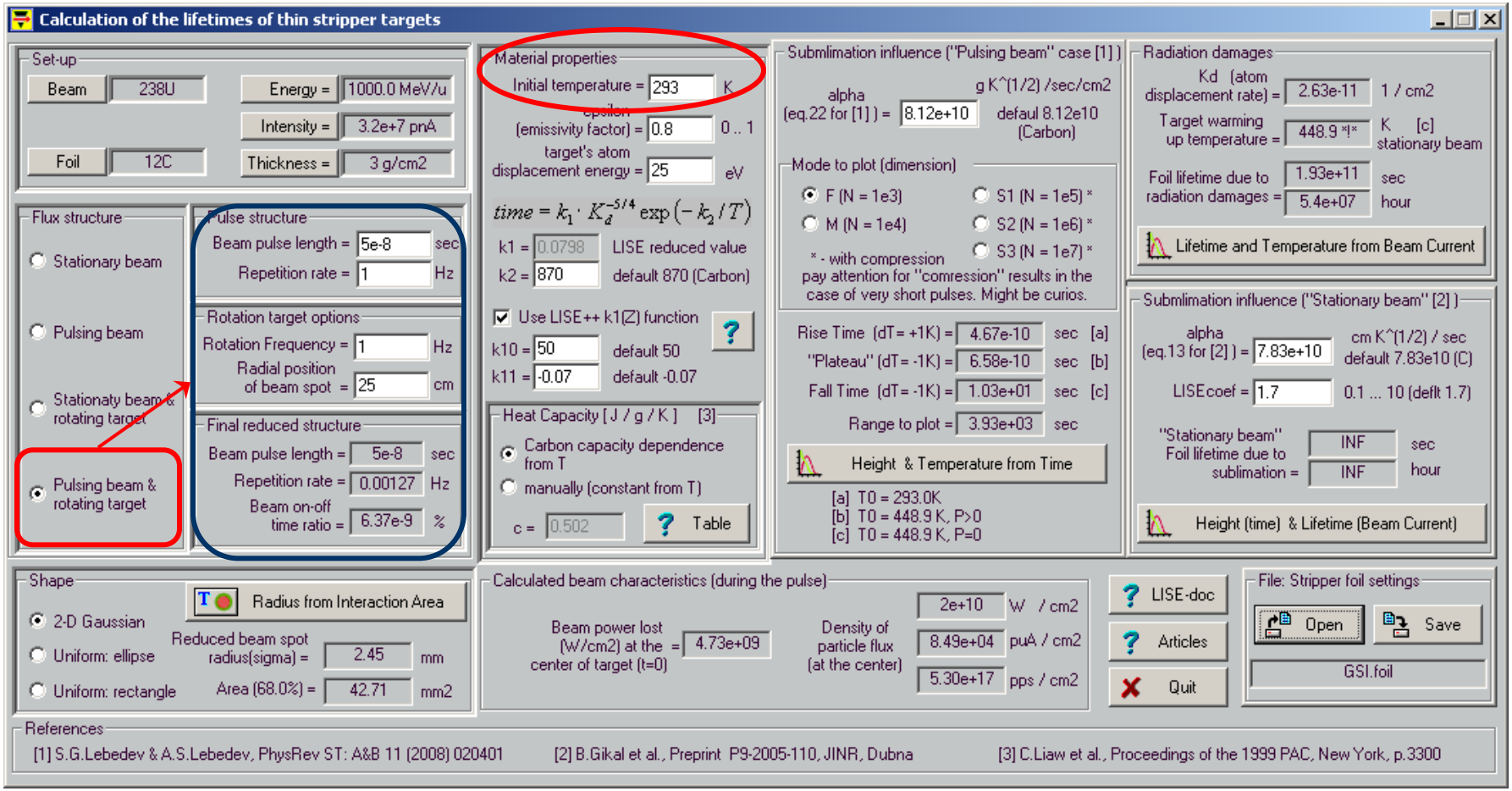
Since "Working under Optics"	**v.9.2.33 (12/10/2010)**	
❖ **Stripper Lifetime utility**	**v. 9.2.38**	*IV Expert meeting*
❖ **New options for Target & Stripper**	**v. 9.2.43**	*MP*
❖ **Range of Momentum distribution for the Convolution model has been increased**	**v. 9.2.47**	*GANIL*
❖ **Nucleus identification in 2d-plot**	**v. 9.2.52**	
❖ **Customizable Chart of the Nuclides**	**v.9.2.56**	*MT, ZC*
❖ **MC rays generator: new option "Range"**	**v. 9.2.57**	*MP*

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

Stripper Lifetime utility

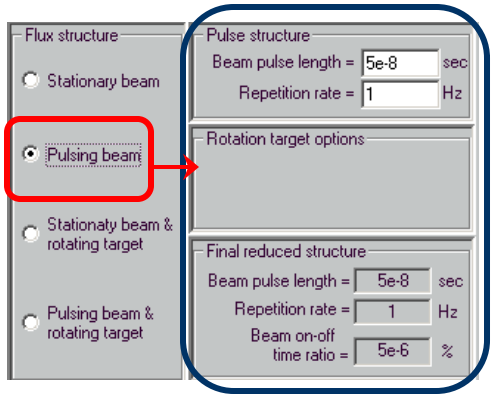
v. 9.2.38

- Target initial temperature
- Modification for “stationary beam” models in the case of pulsing beams
- Rotation target: modifications for a reduced beam pulse length
- New flux structure: Pulsing beam & rotating target

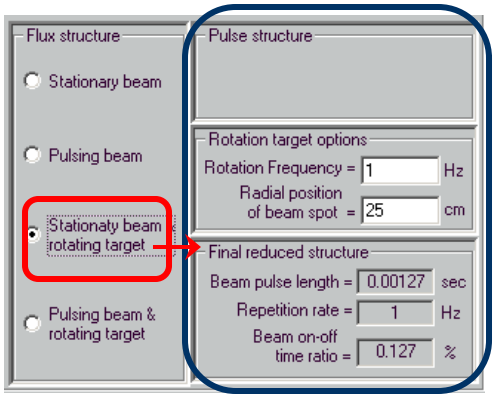


Calculations of high-power production target and beam dump for the GSI

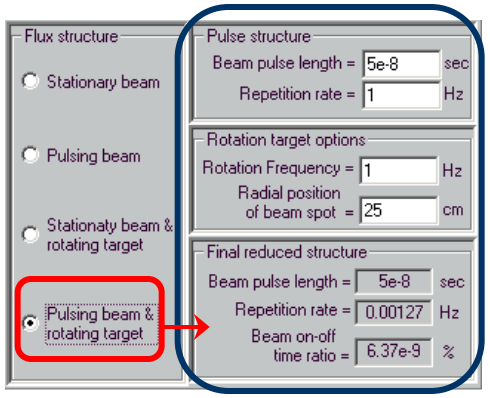
Pulsing beam



Rotating target



Pulsing beam + Rotating target



Probability with rotating target Is defined as X-spot size / Target Length = 0.127%,

where the target length is 2 Pi R,

Therefore distance between reduced "pulses" is 787 seconds, with the pulse length equal to 50 ns

N.A.Tahir et al., J. Phys. D: Appl. Phys. 38 (2005) 1828–1837.

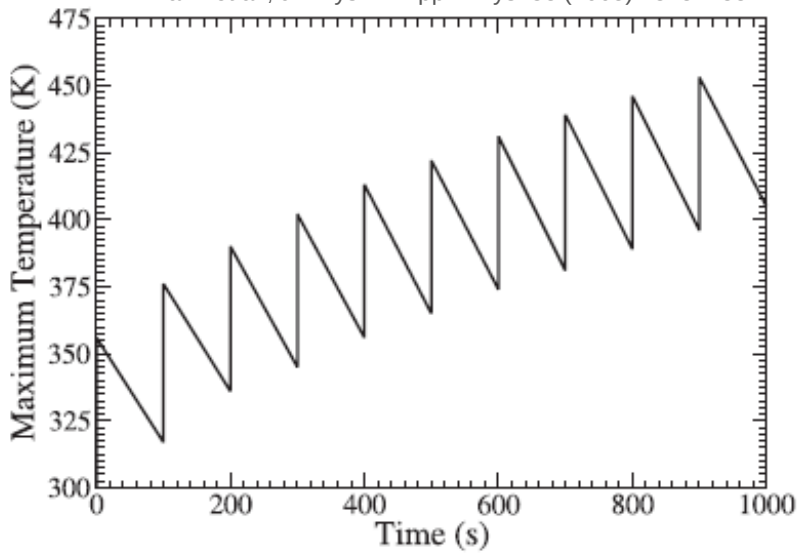
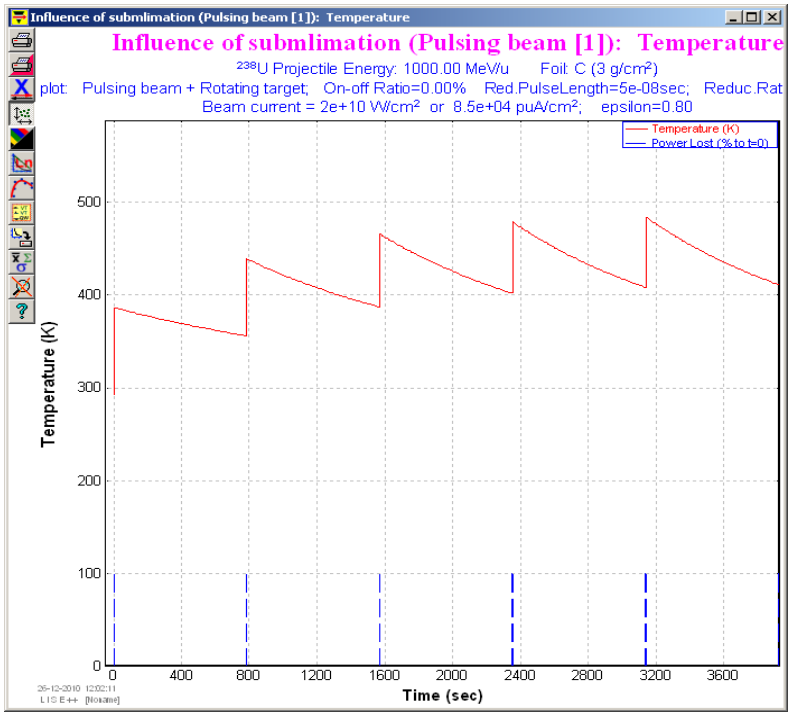
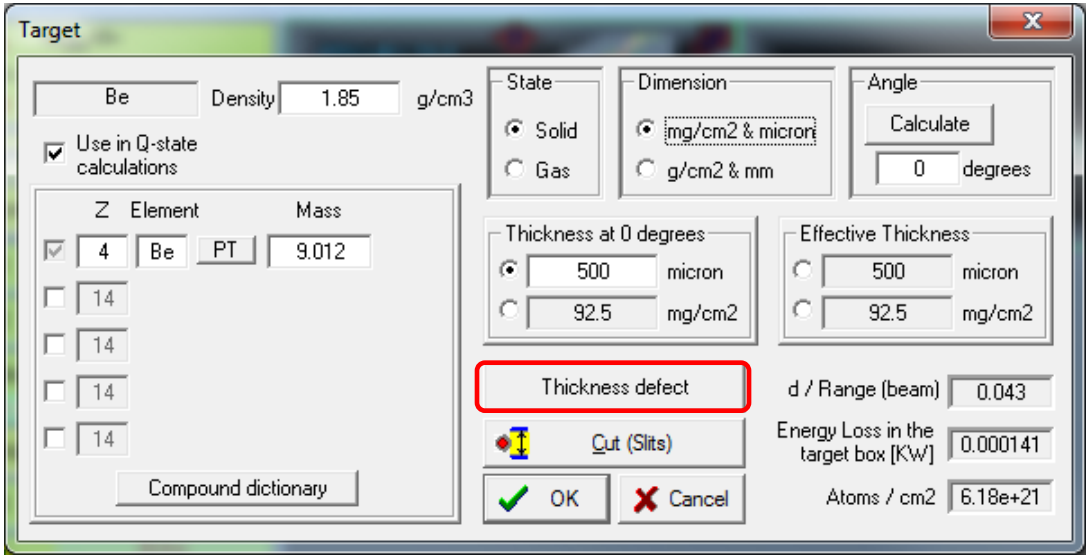


Figure 5. (*a*) Temperature versus time in the target during 1000 irradiations by a 1 GeV u^{-1} U bunch with $N = 10^{10}$ and $\tau = 50$ ns, $\sigma_x = 1$ mm and $\sigma_y = 6$ mm.

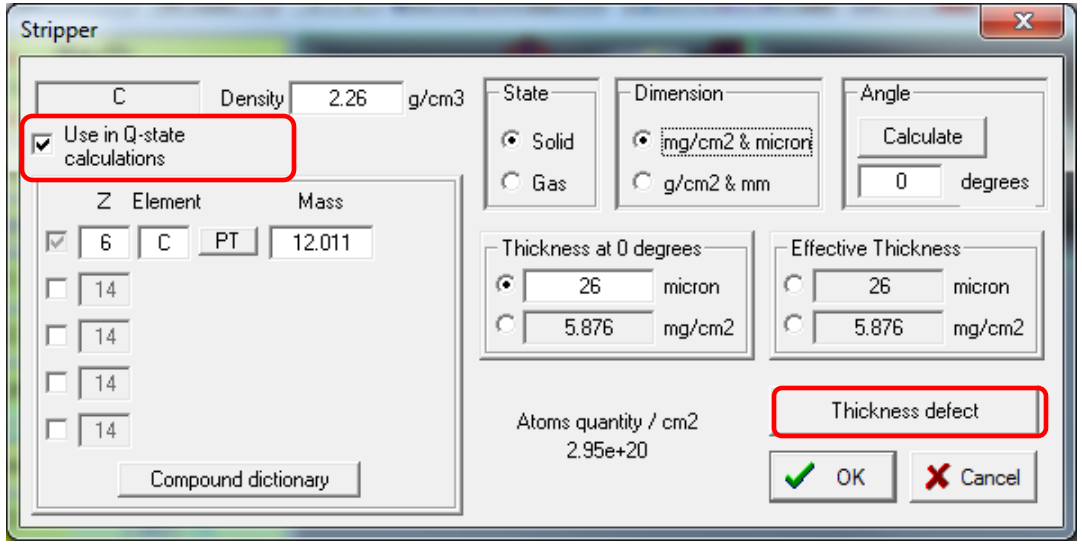
LISE++



New options for Target & Stripper



for Distribution and MC modes



Range of Momentum distribution for the Convolution model

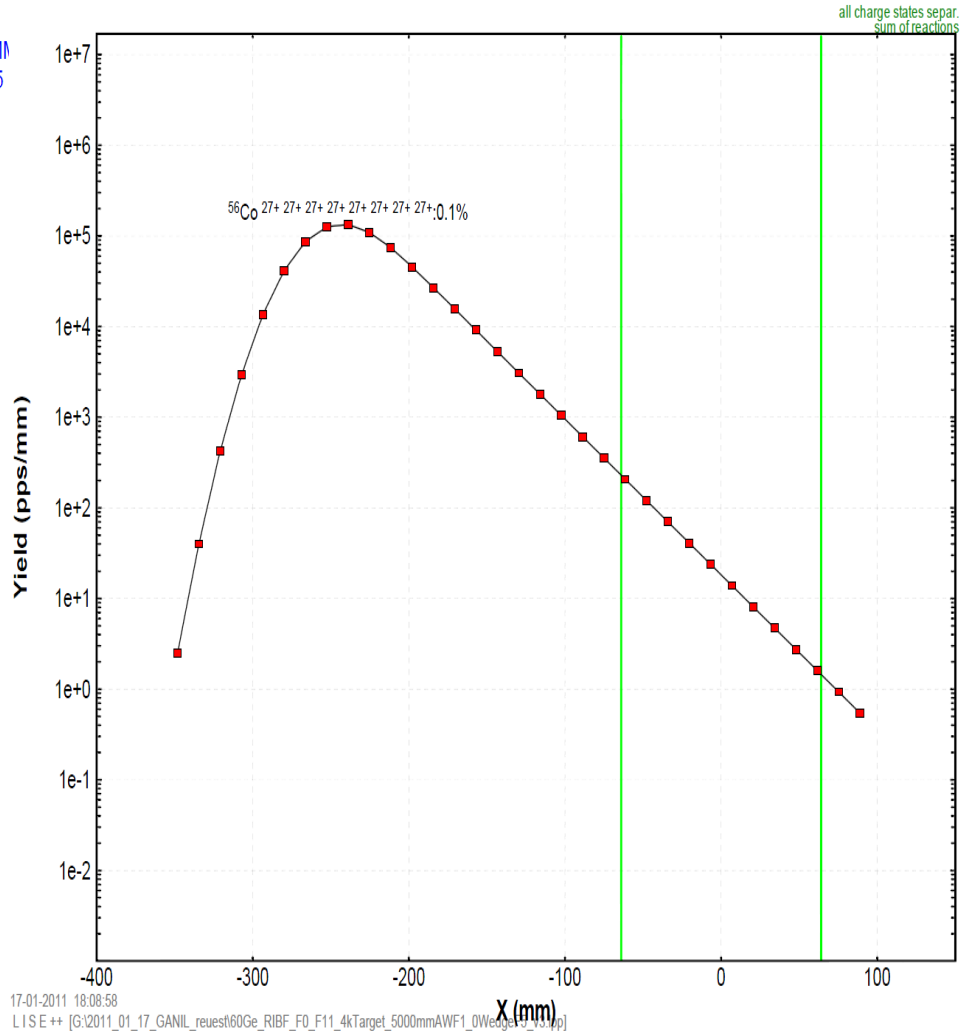
old

← new

↓

F1 slit-Xspace: output before slits

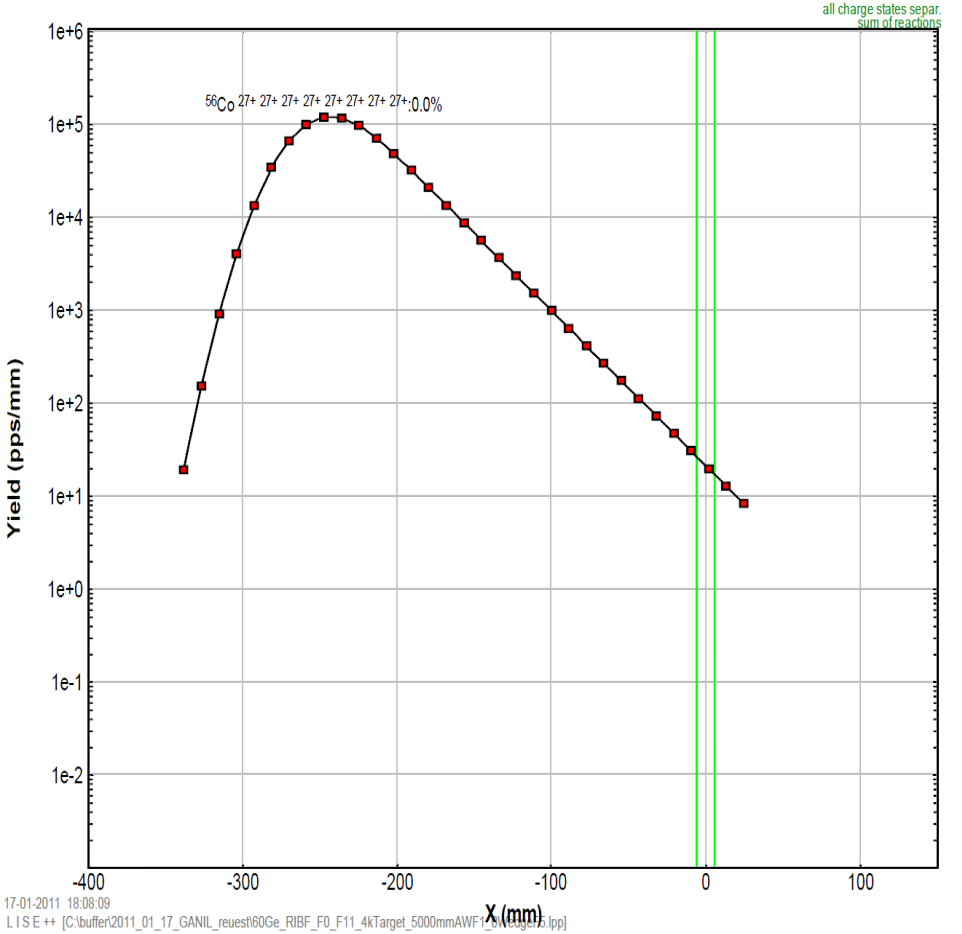
^{86}Kr (345.0 MeV/u) + Be (4 mm); Settings on ^{60}Ge $^{32+}$ $^{32+}$ $^{32+}$ $^{32+}$ $^{32+}$ $^{32+}$ $^{32+}$ $^{32+}$; Config: DSWDSMSMMMDDMSWDDSMM
dp/p=5.98% ; Wedges: Be (5 mm), 0; Brho(Tm): 5.1255, 4.6678, 4.6484, 4.6484, 4.6425, 4.6425



17-01-2011 18:08:58
LISE++ [G:\2011_01_17_GANIL_reuest\60Ge_RIBF_F0_F11_4kTarget_5000mmAWF1_0Wedge0_v8.lpp]

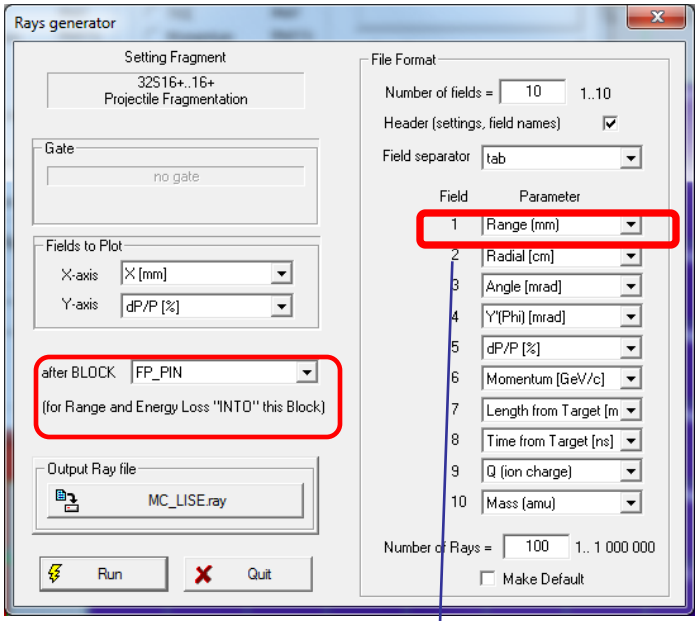
F1 slit-Xspace: output before slits

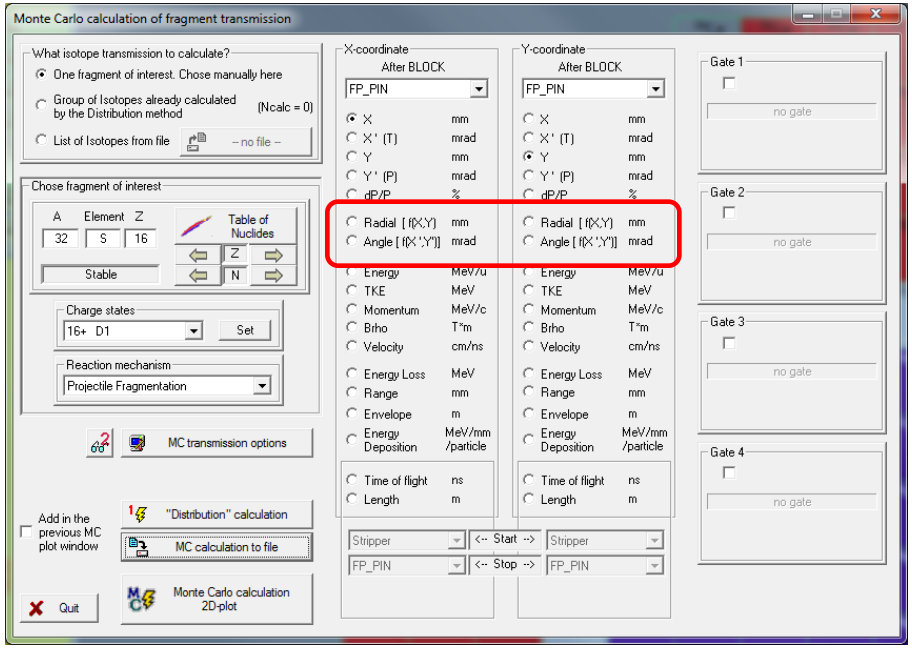
^{86}Kr (345.0 MeV/u) + Be (4000 µm); Settings on ^{60}Ge $^{32+}$ $^{32+}$ $^{32+}$ $^{32+}$ $^{32+}$ $^{32+}$ $^{32+}$ $^{32+}$; Config: DSWDSMSMMMDDMSWDDSMM
dp/p=0.56% ; Wedges: Be (5000 µm), 0; Brho(Tm): 5.1255, 4.6678, 4.6484, 4.6484, 4.6425, 4.6425, 4.5845, 4.5845



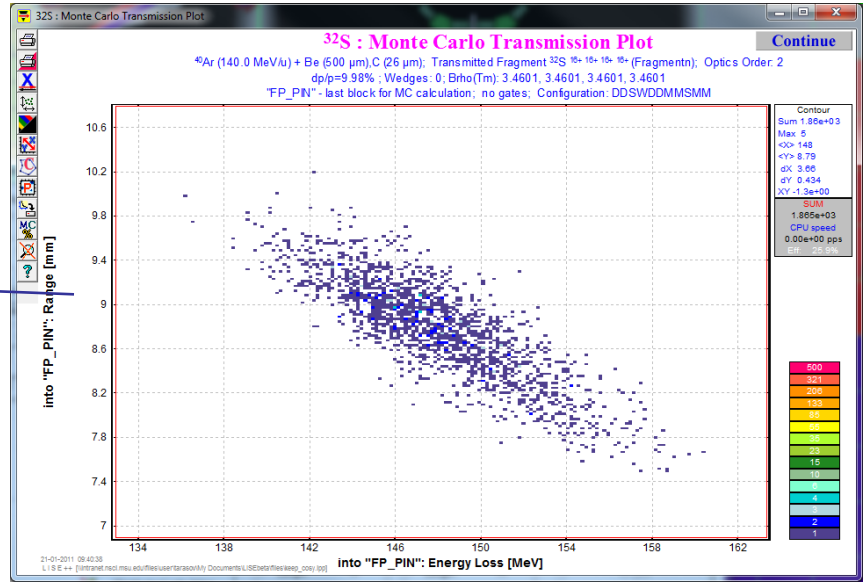
17-01-2011 18:08:09
LISE++ [C:\buffer\2011_01_17_GANIL_reuest\60Ge_RIBF_F0_F11_4kTarget_5000mmAWF1_0Wedge0.lpp]

MC rays generator: new option "Range"

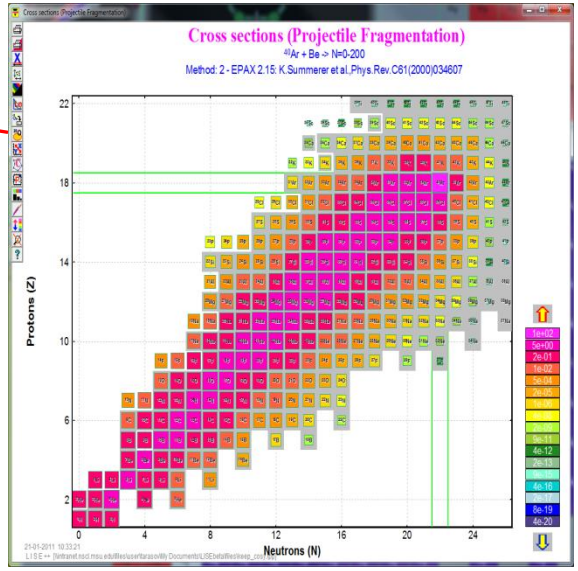




	A	B	C	D	E	F
1	! after block "FP_PIN", setting fragment: 32S16+..16+ (Projectile Fragmentation); N_fields=10; N					
2	Radial [cm]	Angle [mrad]	Energy Loss (MeV)	Range (mm)	TKE [MeV]	Energy [M
3	-0.25369	12.782	151	8.6977	4092.4	12
4	0.21045	-20.866	149.39	8.5034	4041.5	126.
5	-0.24698	25.099	149.83	8.6106	4074.2	127.
6	0.13704	-12.096	151.6	8.3224	3990.7	124.
7	0.2919	-38.156	148.21	9.066	4208.2	131.
8	-0.48393	18.256	143.91	9.4614	4316.3	13
9	0.27305	-11.93	149.43	8.7154	4099.7	128.
10	-0.33784	15.972	156.32	7.6081	3772.7	11
11	-0.32898	29.754	152.25	8.4022	4011.5	125.
12	-0.0627	-25.006	143.89	9.275	4269.3	133.
13	0.11389	-15.64	145.62	9.1745	4237.1	132.
14	-0.17274	-10.084	146.18	9.0563	4203.4	131.
15	0.10981	12.201	146.45	8.845	4142.7	129



Nucleus identification in 2d-plot (so called RGD, mode =25,35)



2D-plot: Identification, values

Identification labels (A,Z)

settings

Height : +2
Width : +1
Italic : no
Bold : Yes
ULine : no
Show : If good seen
Color : Black+Shading

Make it default

OK Cancel

Values (CS,T_1/2 and so on)

Show Dimension text

settings

Height : -2
Width : -3
Italic : Yes
Bold : no
ULine : no
Show : If good seen
Color : Black Color

for T1/2 plots SHOW

all in seconds
ms,sec,day,year..

Options

Draw grids

Draw vertical and horizontal green lines to undeline the projectile

Draw cell borders

change

Option: Identification

Show mode

Show Always
Show if good seen
Do not show

Font Colors

Black Color
Black Color + White Shading
White Color + Black Shading
Palette

Font Options

Italic
Bold
Underline
+2 Height
+0 Width

OK Cancel

Color

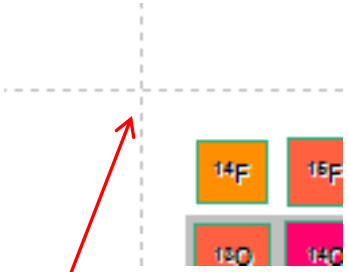
Basic colors:

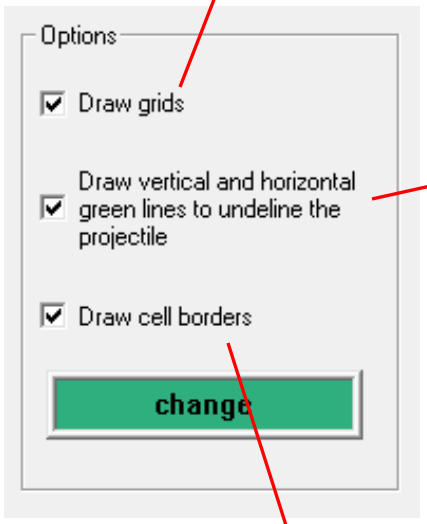
Custom colors:

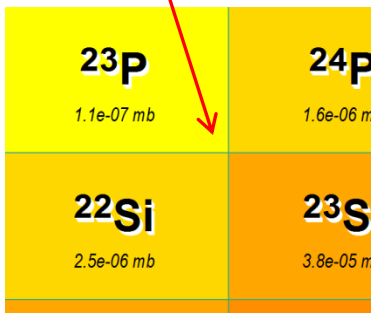
Define Custom Colors >>

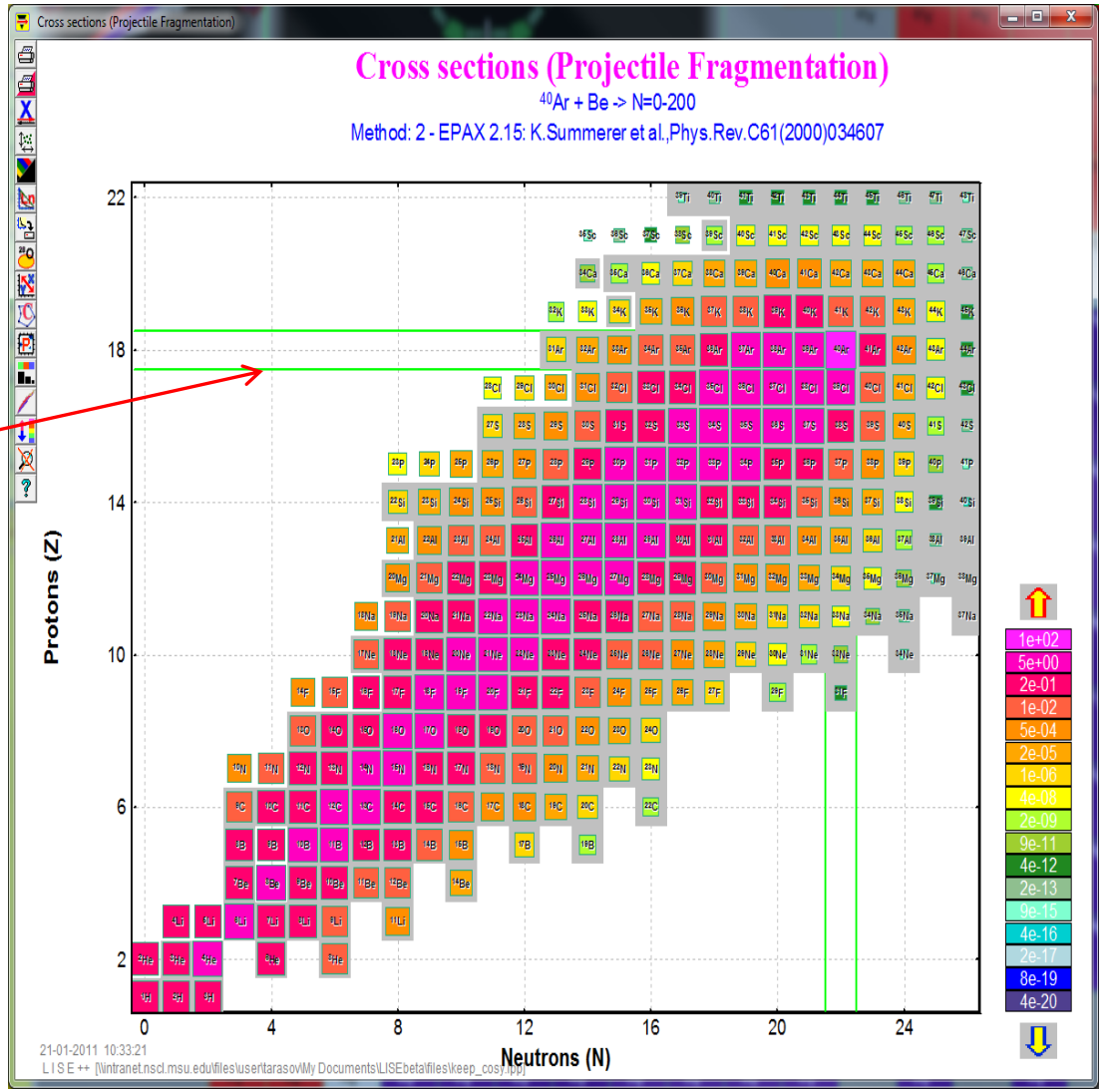
OK Cancel

Options

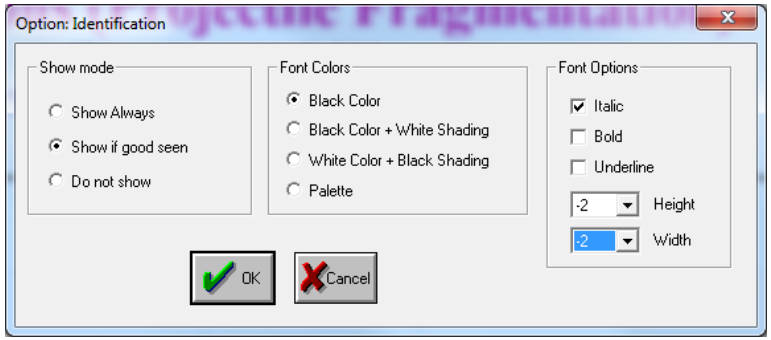

14F
15F
13O
14O

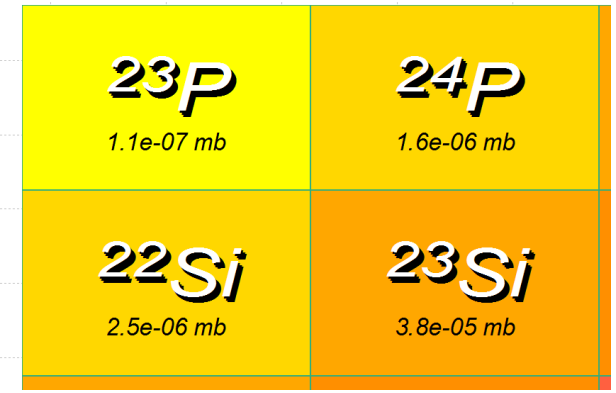

Options
Draw grids
Draw vertical and horizontal green lines to undeline the projectile
Draw cell borders
change

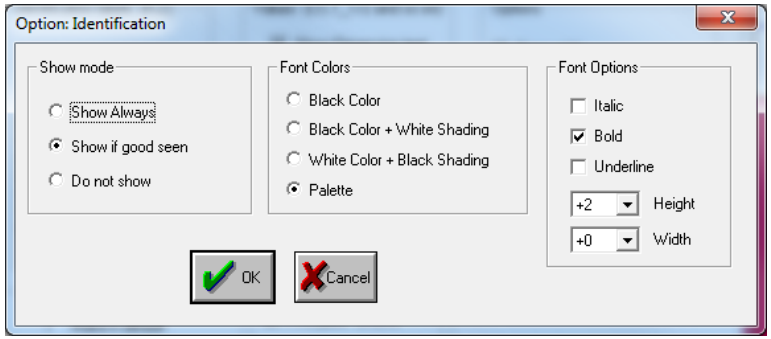

23P
1.1e-07 mb
24P
1.6e-06 m
22Si
2.5e-06 mb
23S
3.8e-05 m

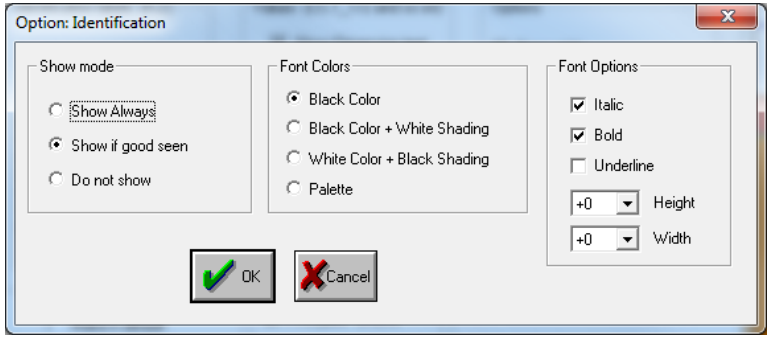

Cross sections (Projectile Fragmentation)
Cross sections (Projectile Fragmentation)
40Ar + Be -> N=0-200
Method: 2 - EPAX 2.15: K.Summerer et al.,Phys.Rev.C61(2000)034607
Protons (Z)
Neutrons (N)
22
18
14
10
6
2
0
4
8
12
16
20
24
1e+02
5e+00
2e-01
1e-02
5e-04
2e-05
1e-06
4e-08
2e-09
9e-11
4e-12
2e-13
9e-15
4e-16
2e-17
8e-19
4e-20
21-01-2011 10:33:21

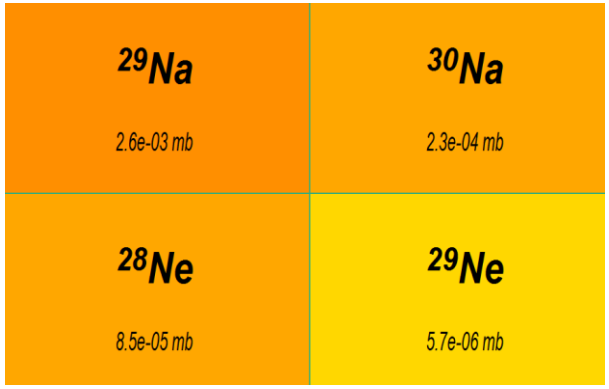
Identification



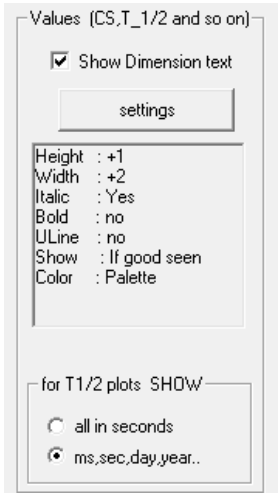


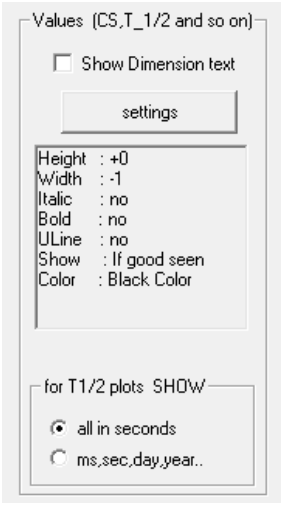


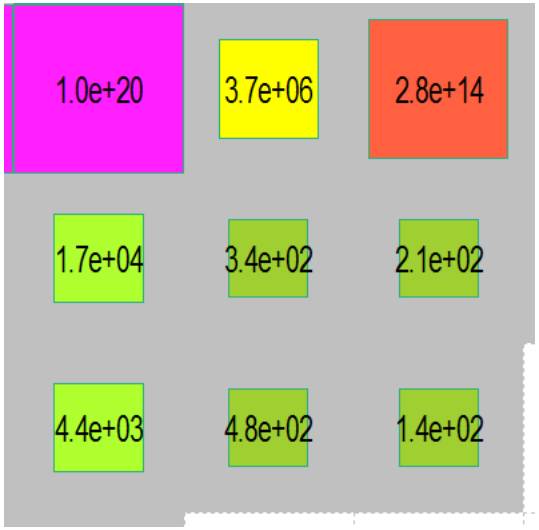


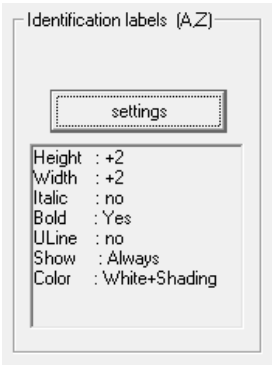


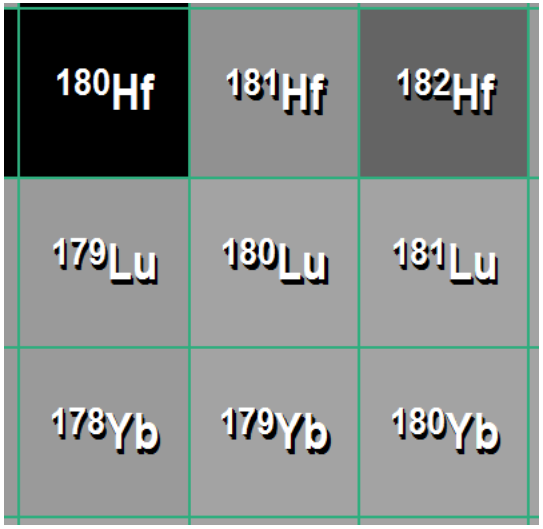
Values, Dimension



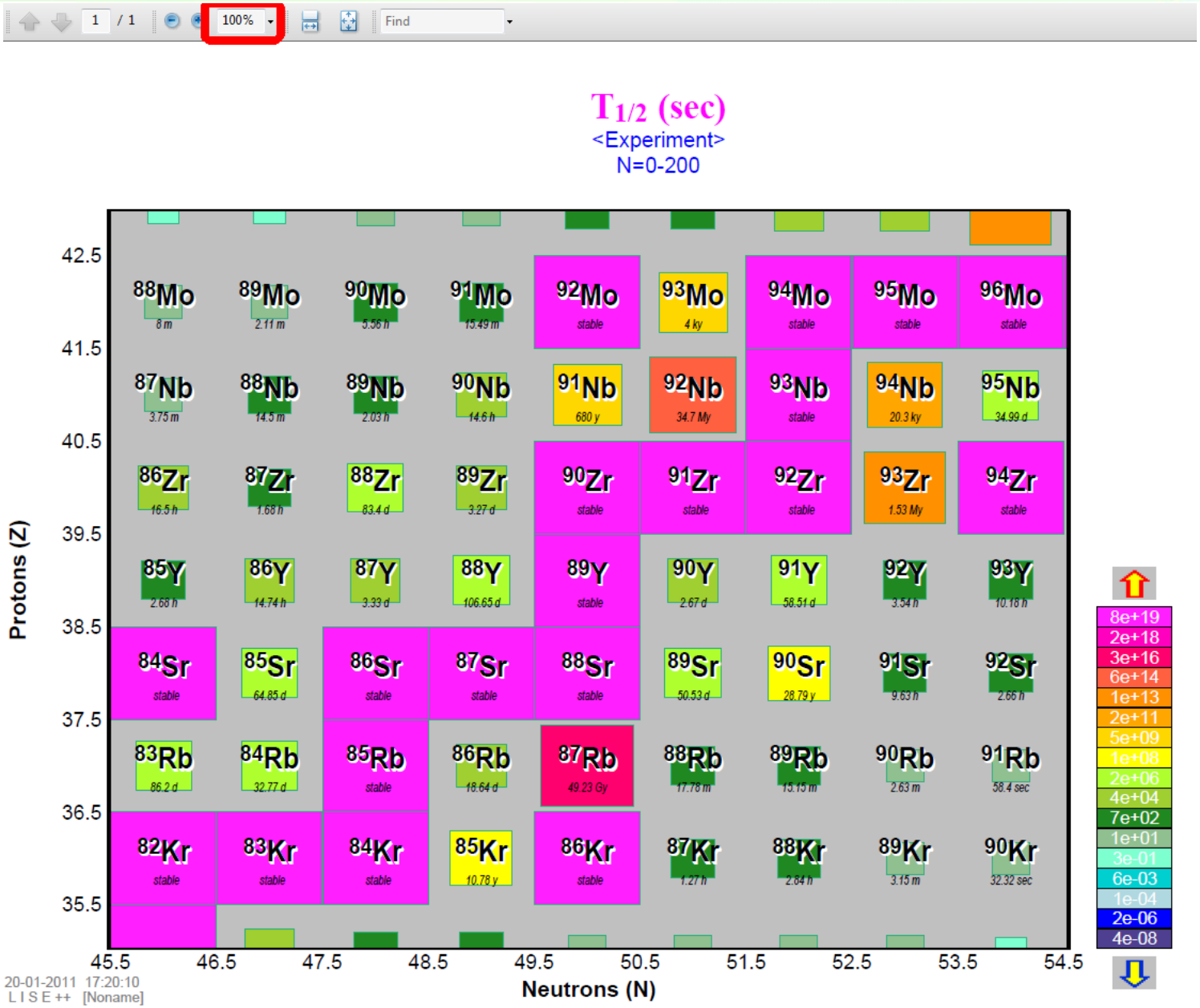




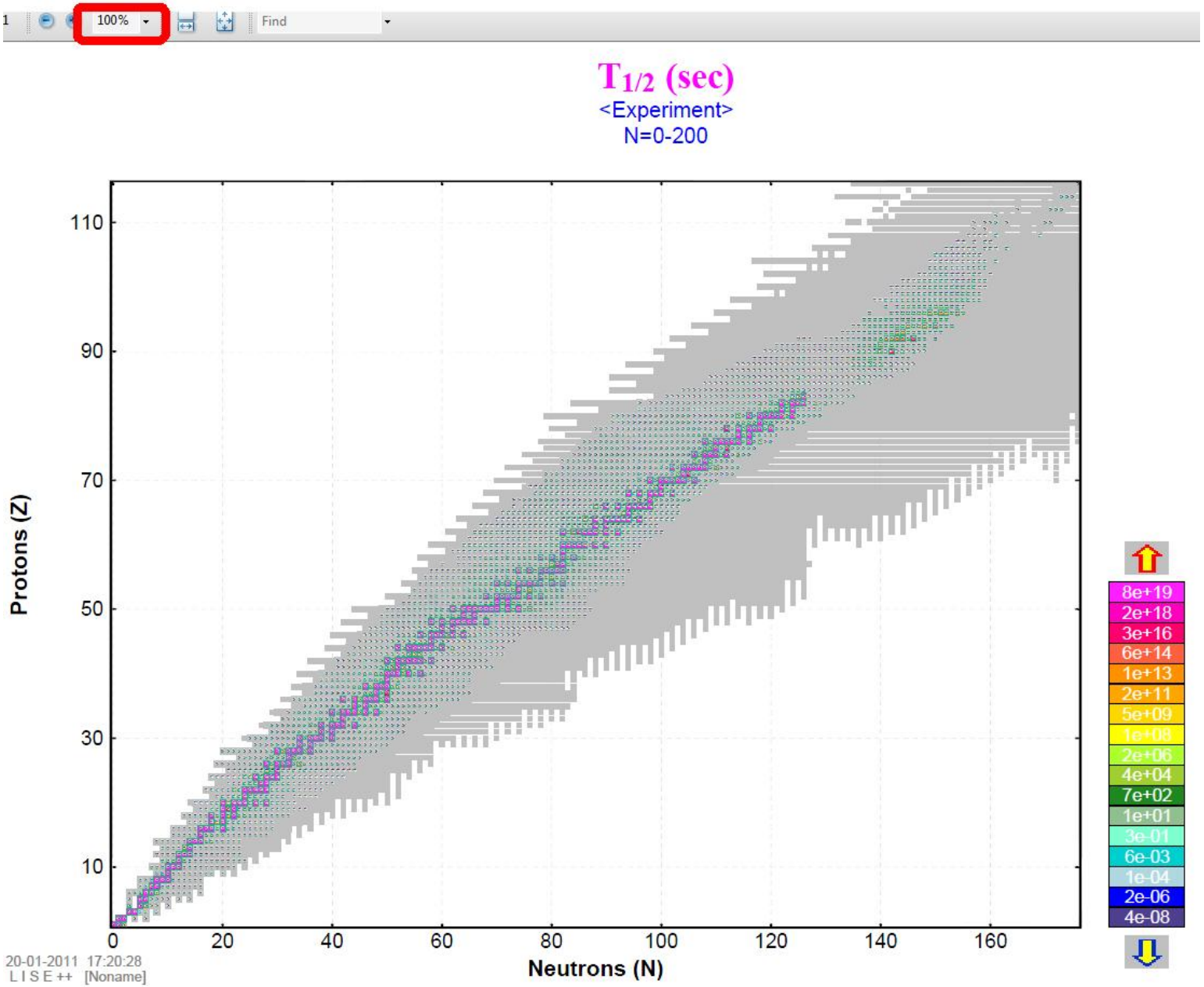




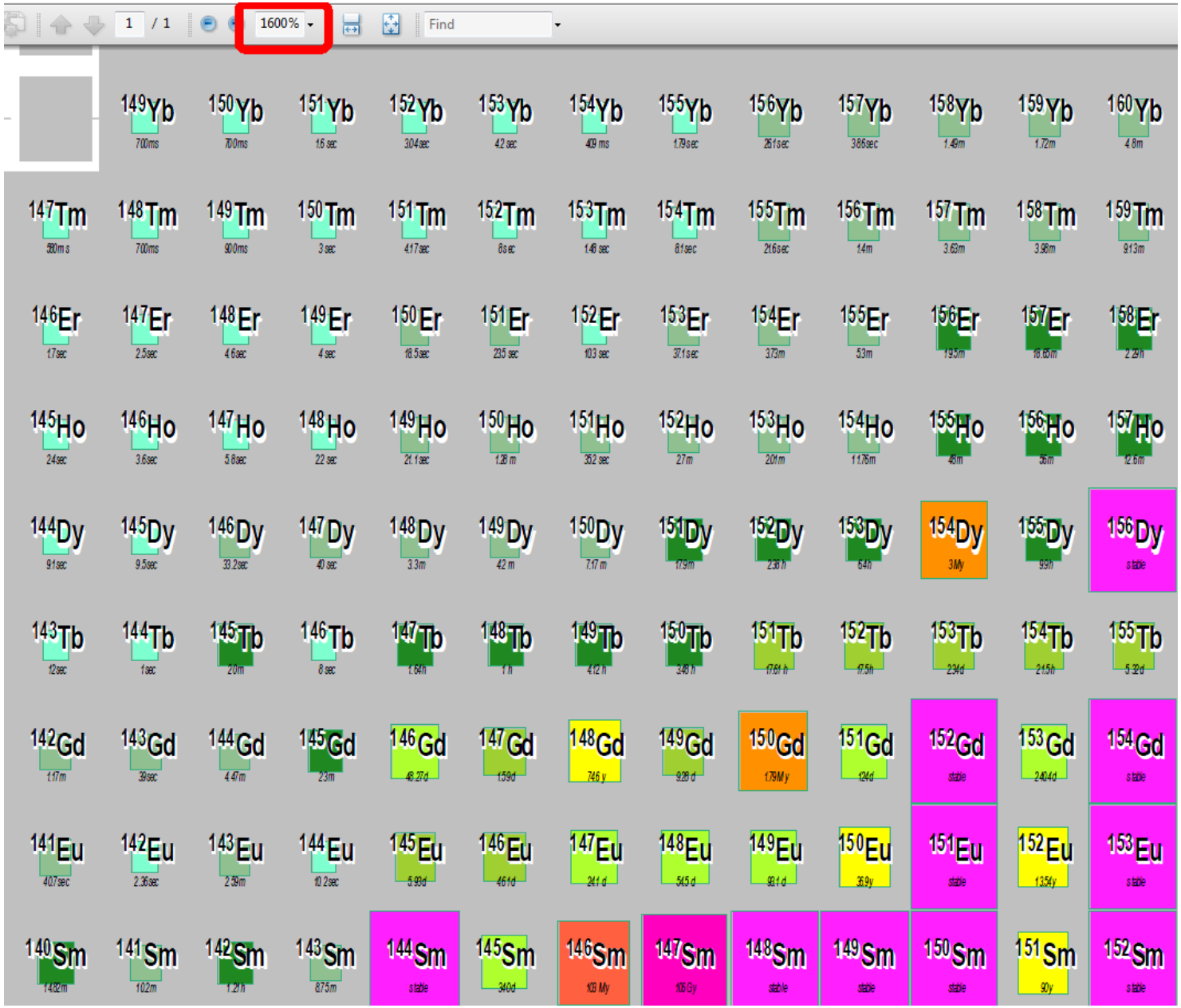
Printing to Adobe PDF - Example 1:
Color scale board based on the internal database or calculations



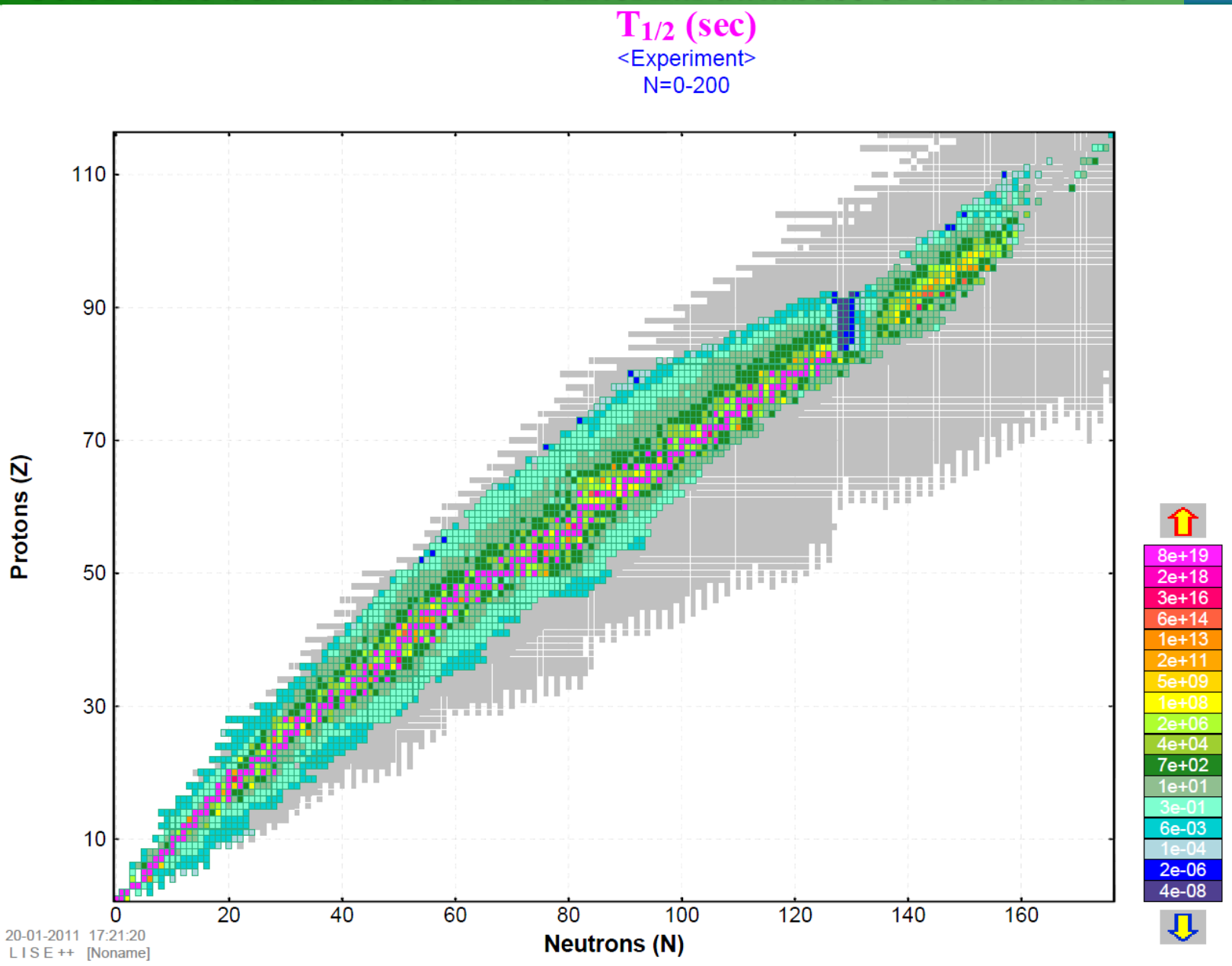
Printing to Adobe PDF – Example 2: Color scale board based on the internal database or calculations



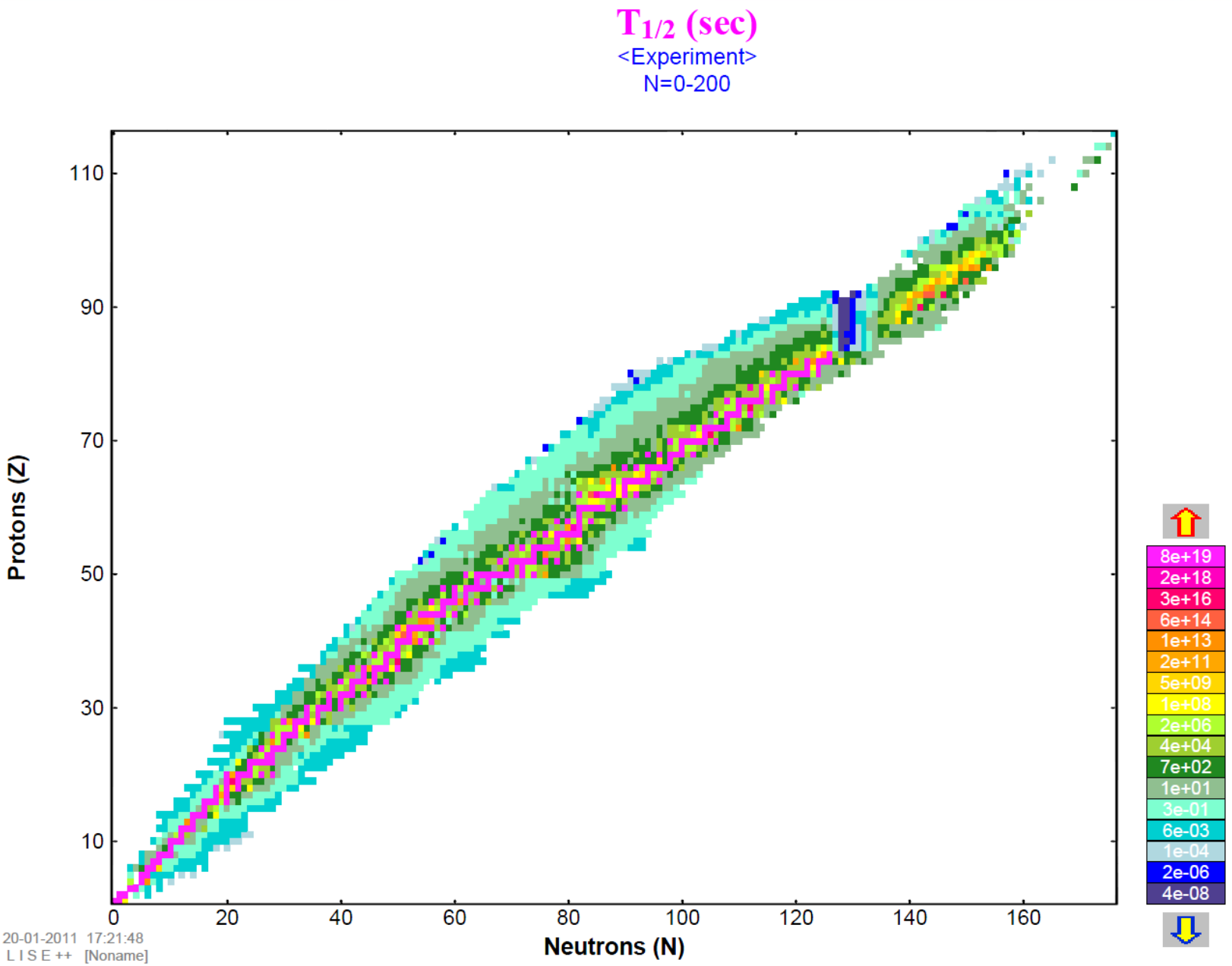
Printing to Adobe PDF – Example 2 (zoom) : Color scale board based on the internal database or calculations



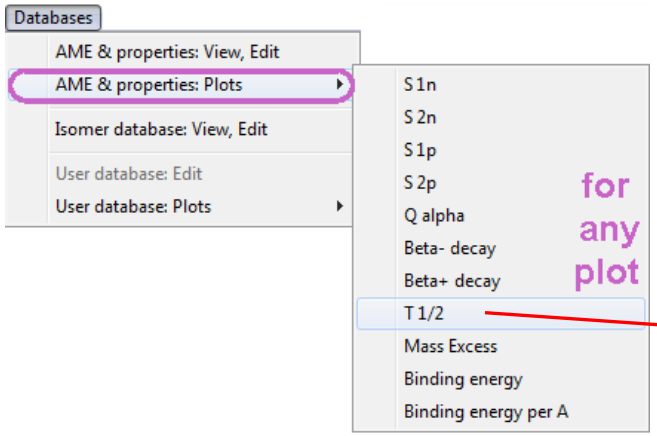
Printing to Adobe PDF – Example 3: Color scale board based on the internal database or calculations

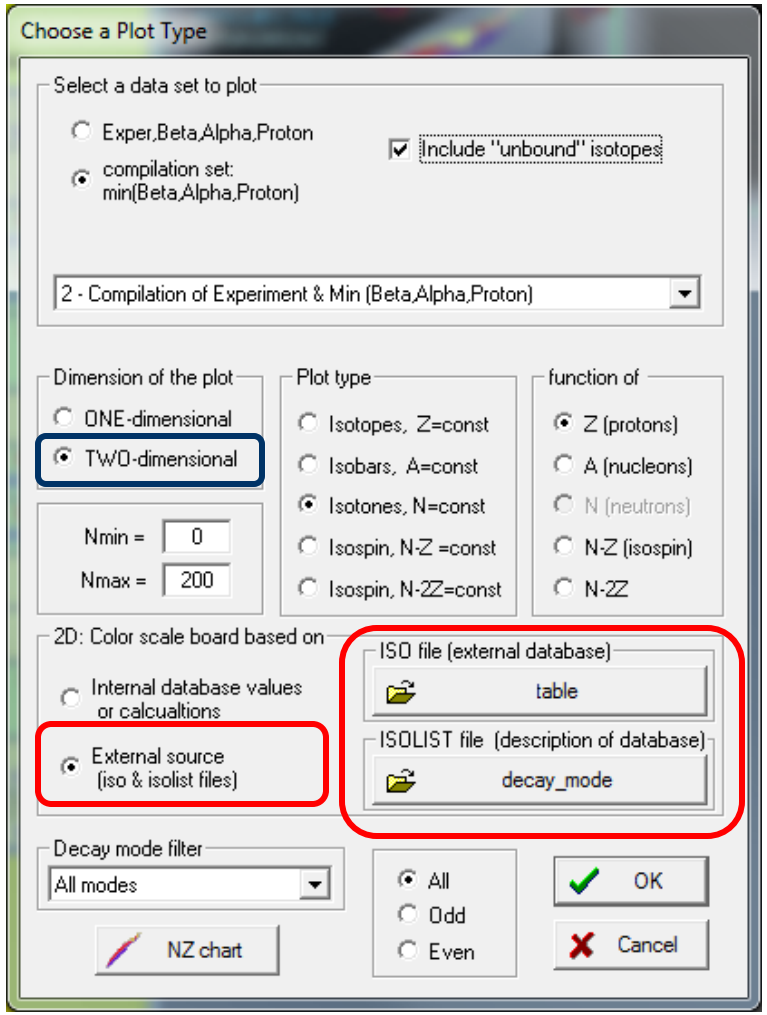


Printing to Adobe PDF – Example 4: Color scale board based on the internal database or calculations



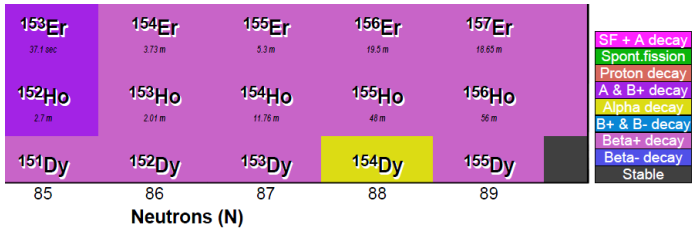
Customizable Chart of the Nuclides





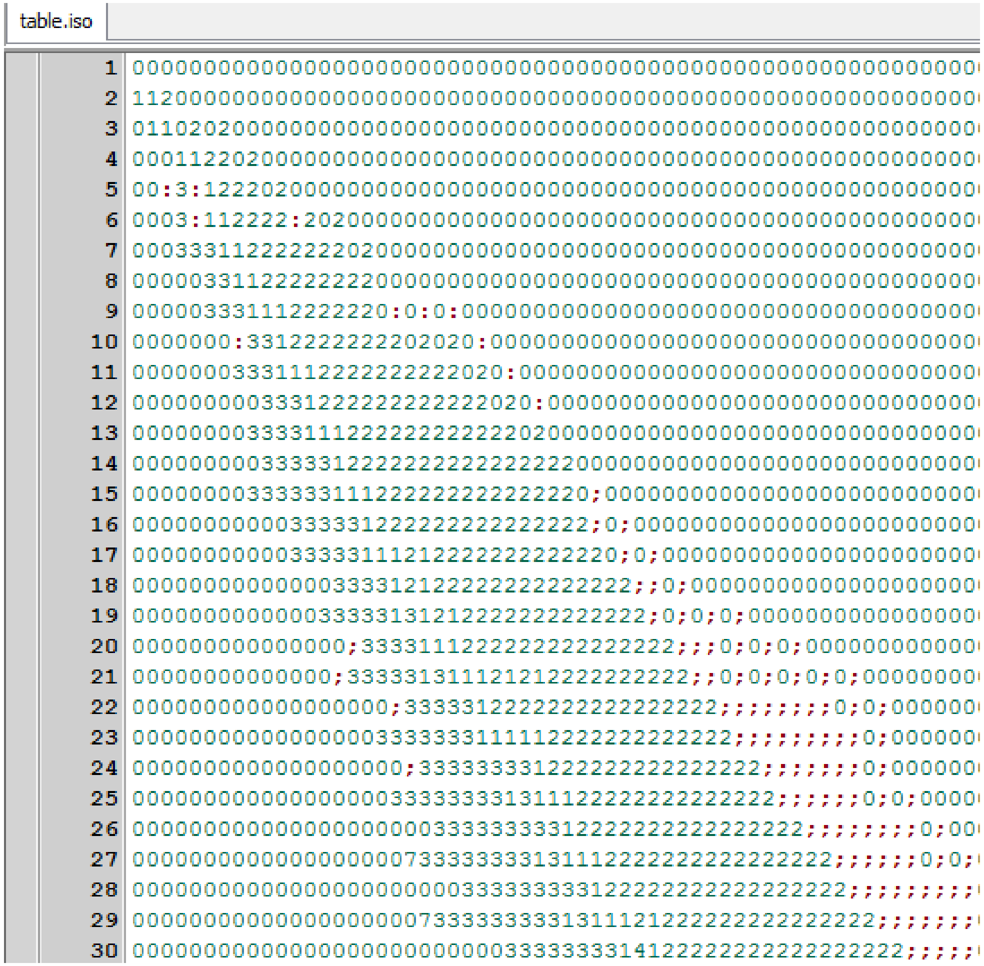
Why in database plots?

LISE++ Database (based on AME2003) values or calculations could be joined with the user color board



Default location of ISO and ISOLIST files is the "My Documents\LISE\bin" directory

ISO file



ASCII file

201 rows : correspond to Z
501 columns: corresponds to N

1st row : Z=0
1st column: N=0

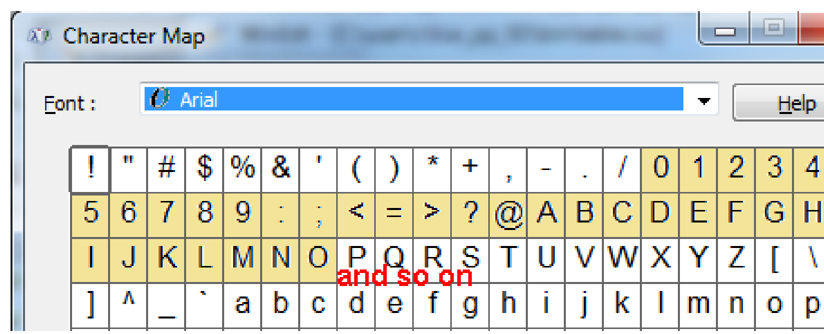
Empty.iso is a template in the LISE++ package

Nuclides corresponded to "0" char are not drawn by LISE++ in plots.

No restrictions for number of colors.

All chars should be above or equal "0" char.

Number 10 corresponds to char ":"
Number 11 corresponds to char ";"
Number 12 corresponds to char "<"
and so on



ISOLIST file

ASCII file

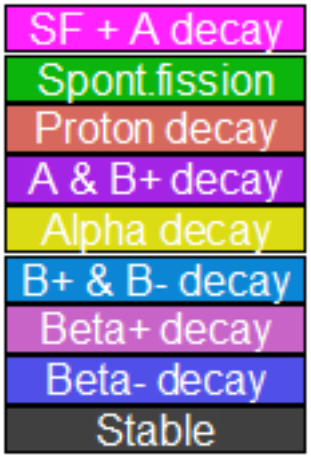
LISE++ reads first two columns

1st column is name (should be in quotation marks)
2nd column is color (decimal base)

\bin\decay_mode.isolist]

File

```
"Stable"        4210752
"Beta- decay"  15224912
"Beta+ decay"  13133000
"B+ & B- decay" 13993481
"Alpha decay"   1367260
"A & B+ decay" 15016867
"Proton decay"   6121687
"Spont.fission" 767243
"SF + A decay"   16720639
```



?\bin\discovery_lab.isolist]

File

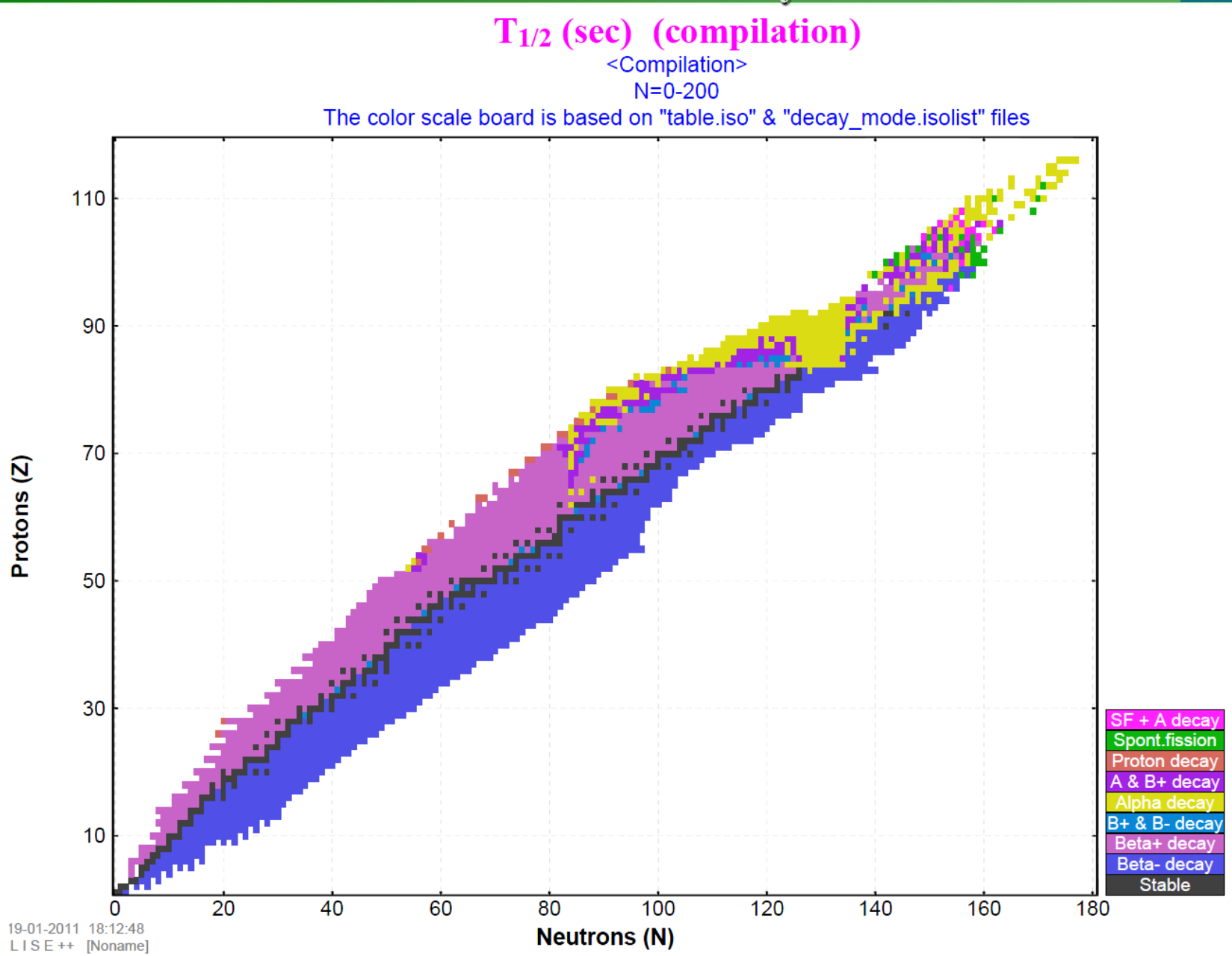
```
"MSU"        2523917
"GSI"        481967
"RIKEN"       11470694
"Dubna"      598489
"GANIL"      11804186
"Argonne"    12871363
"Cern"       10593035
"Oak Ridge" 2007034
"Berkeley"   3666870
"other"      6579300
```

welcome.isolist

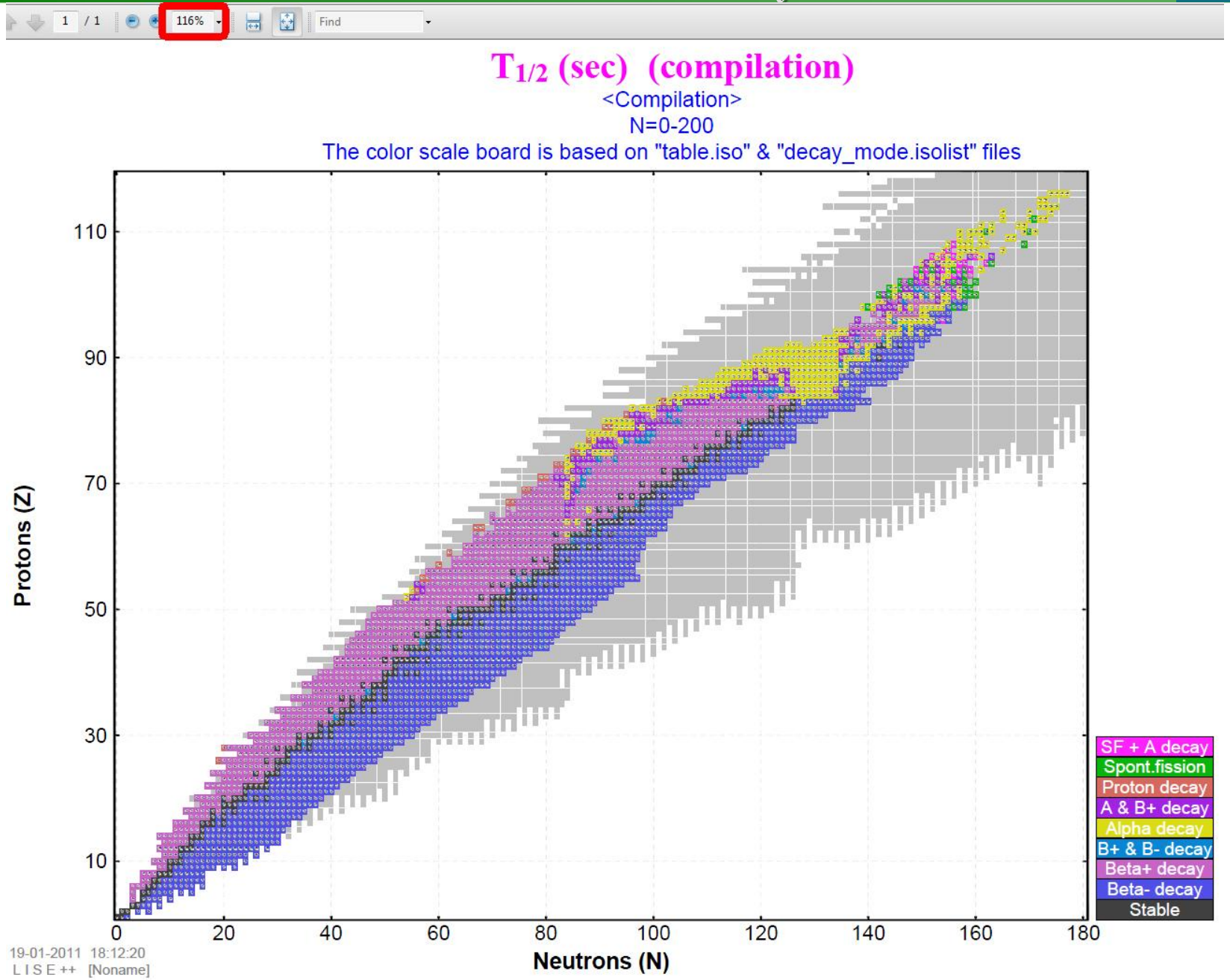
File

```
"2011"      2523917
"++"        481967
"LISE"      11470694
"to"        598489
"welcome"   11804186
```

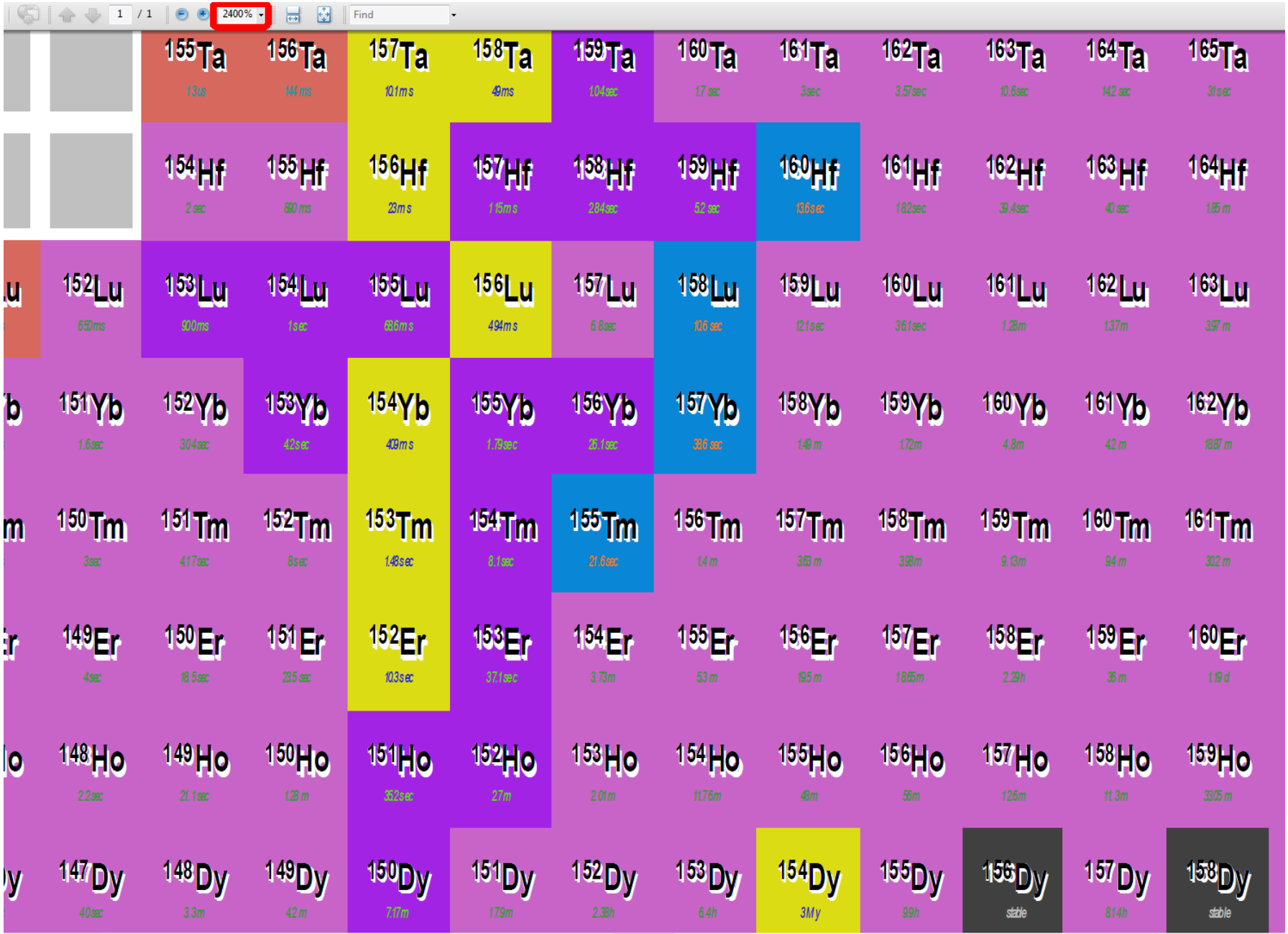
Printing to Adobe PDF – Example 5: Color scale board based on the “decay modes” files



Printing to Adobe PDF – Example 6: Color scale board based on the "decay modes" files



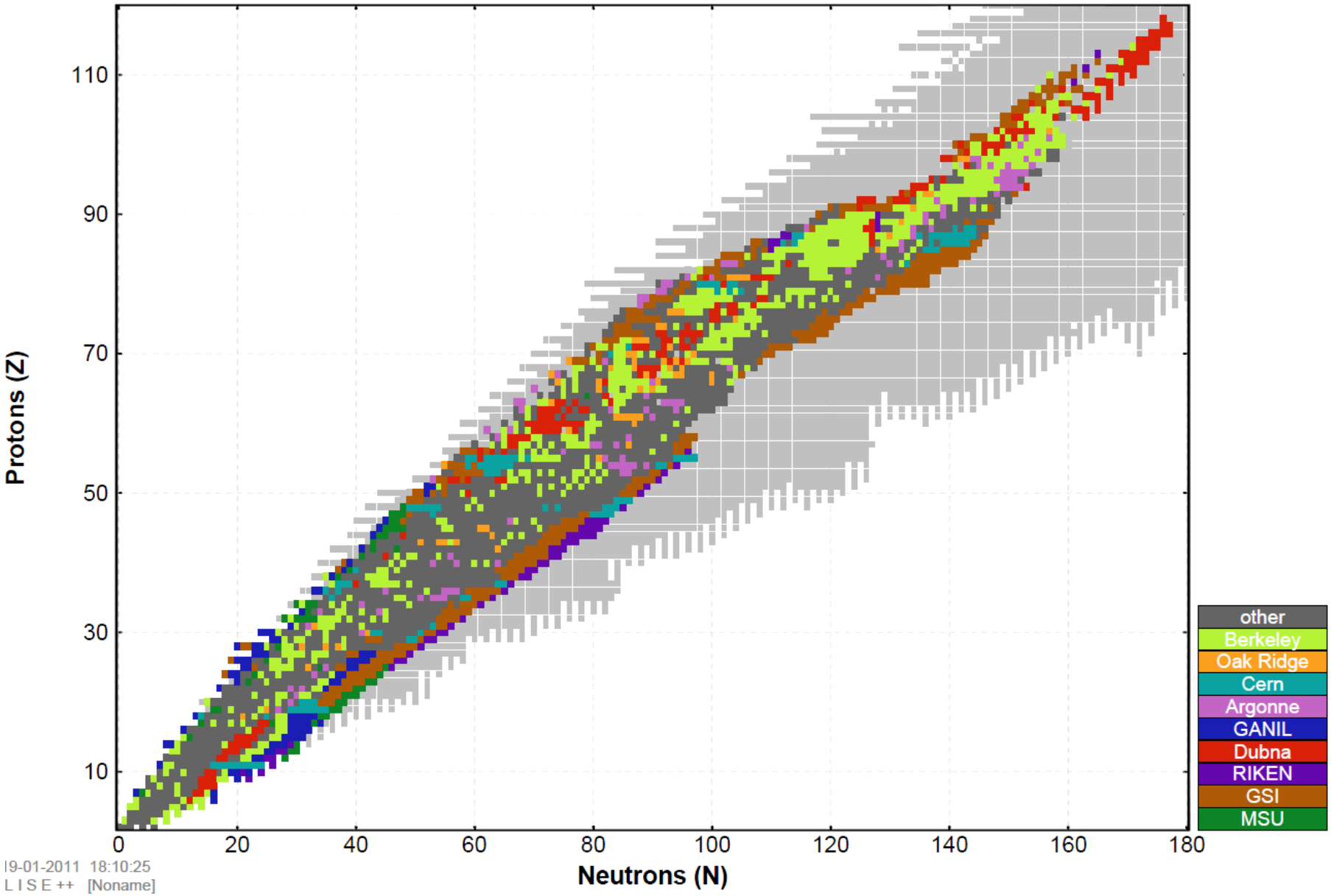
Printing to Adobe PDF – Example 6 (zoom): Color scale board based on the "decay modes" files



Printing to Adobe PDF – Example 7: Color scale board based on the "DISCOVERY" files

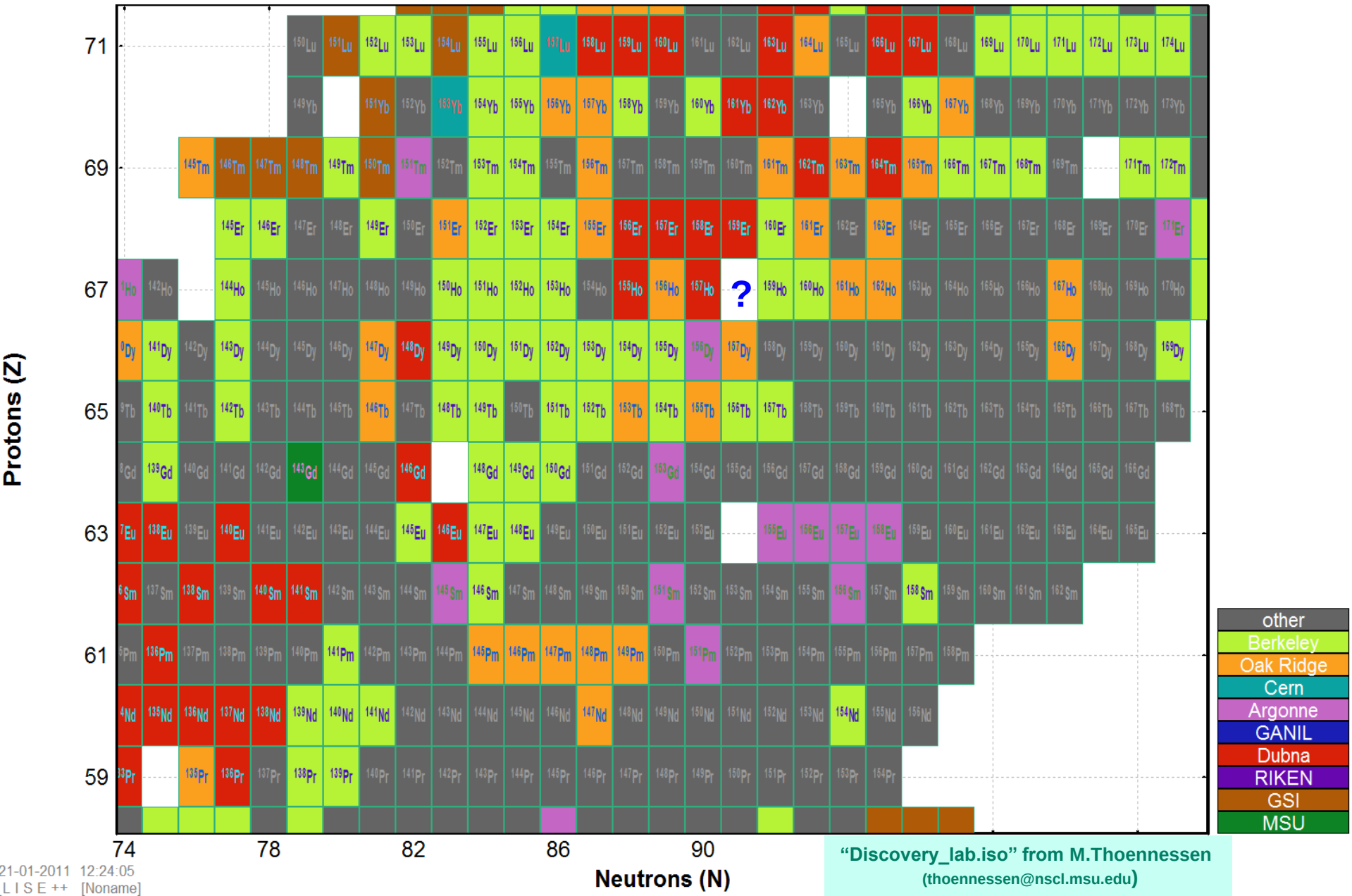
"Discovery_lab.iso" from M.Thoennessen (thoennessen@nscl.msu.edu)

The color scale board is based on "discovery_lab.iso" & "discovery_lab.isolist" files



Printing to Adobe PDF – Example 8: Color scale board based on the "DISCOVERY" files

The color scale board is based on "discovery_lab.iso" & "discovery_lab.isolist" files

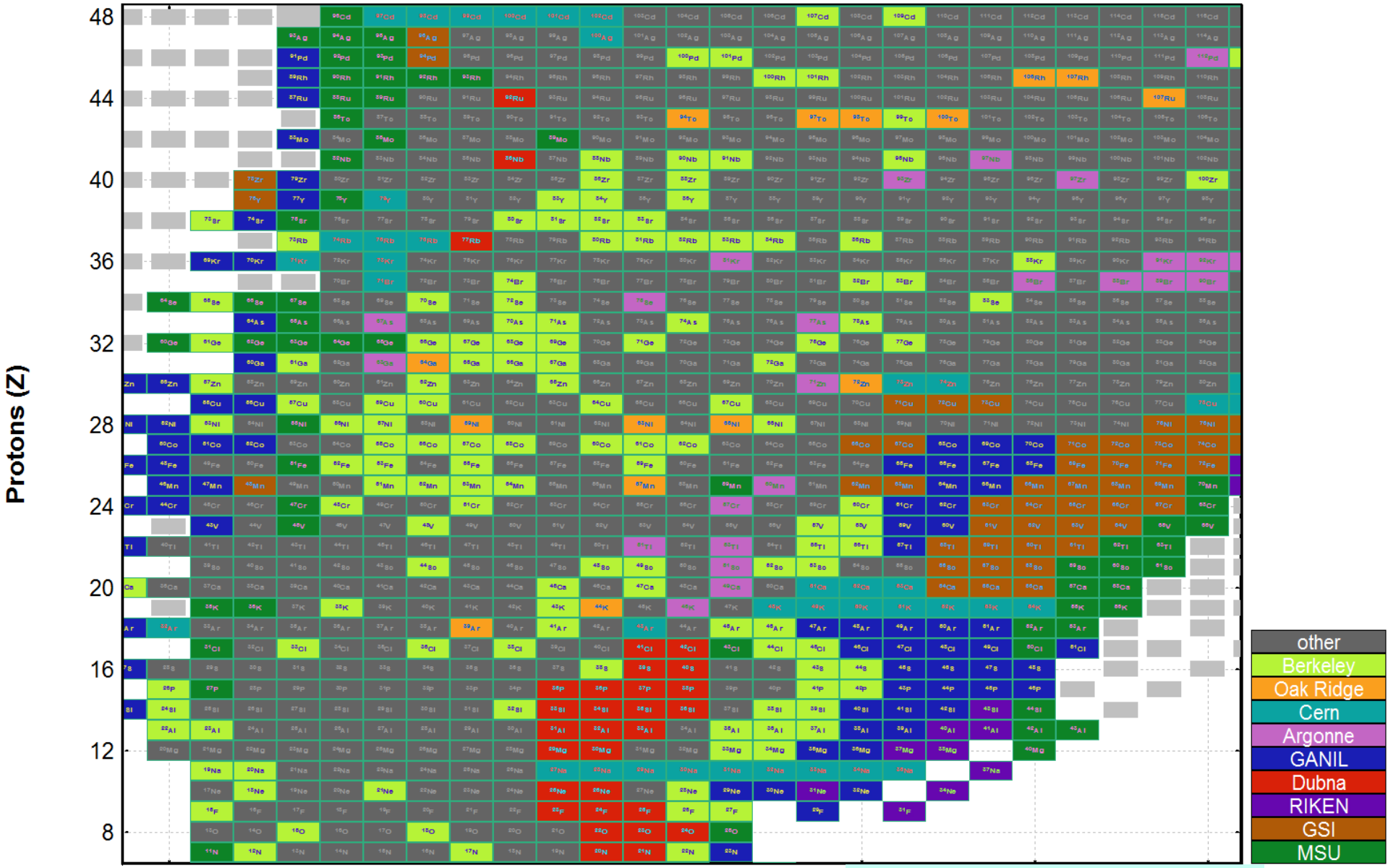


"Discovery_lab.iso" from M.Thoennessen
(thoennessen@nscl.msu.edu)

21-01-2011 12:24:05
LISE++ [Noname]

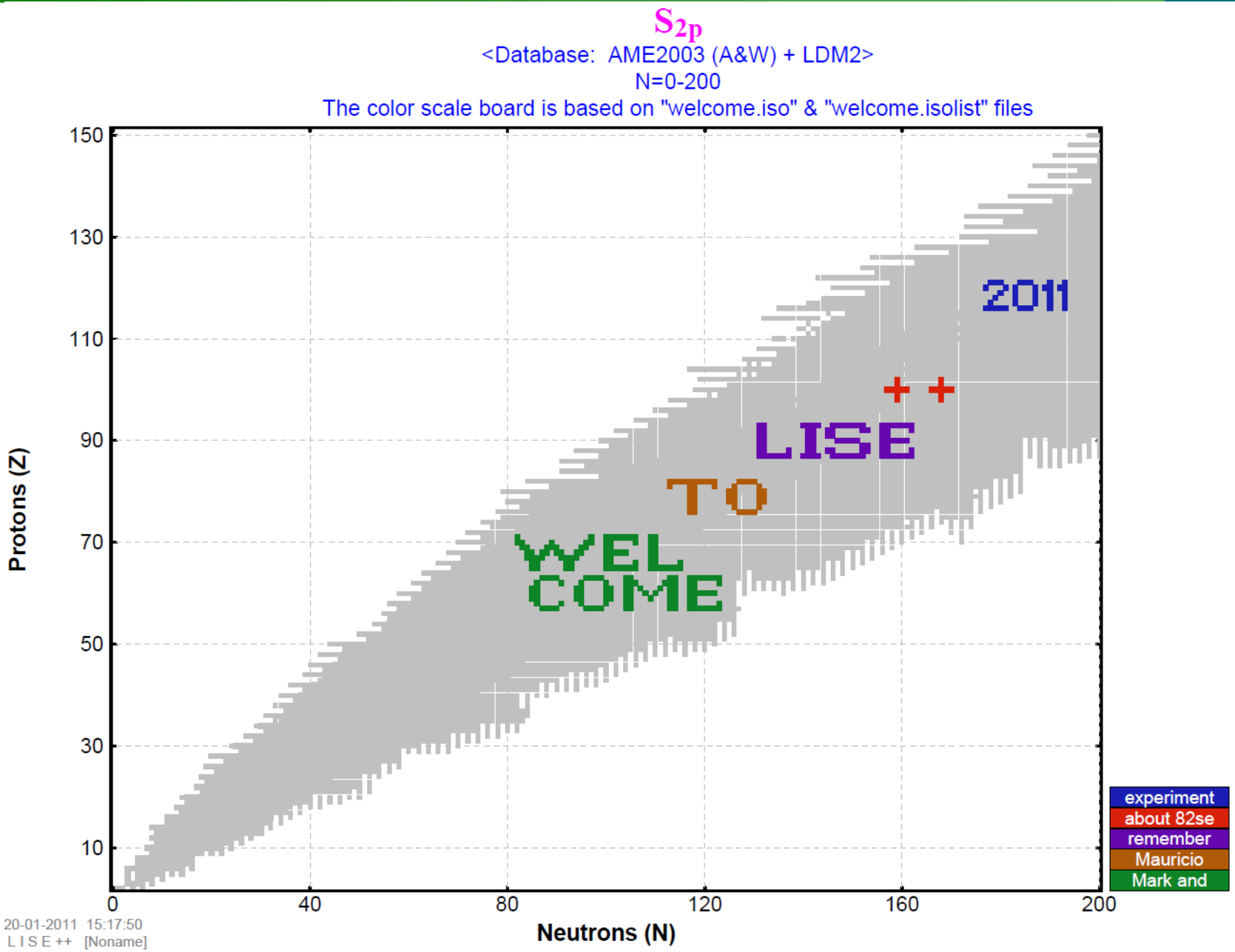
Printing to Adobe PDF – Example 9: Color scale board based on the "DISCOVERY" files

The color scale board is based on "discovery_lab.iso" & "discovery_lab.isolist" files



"Discovery_lab.iso" from M.Thoennessen
(thoennessen@nscl.msu.edu)

Color board example



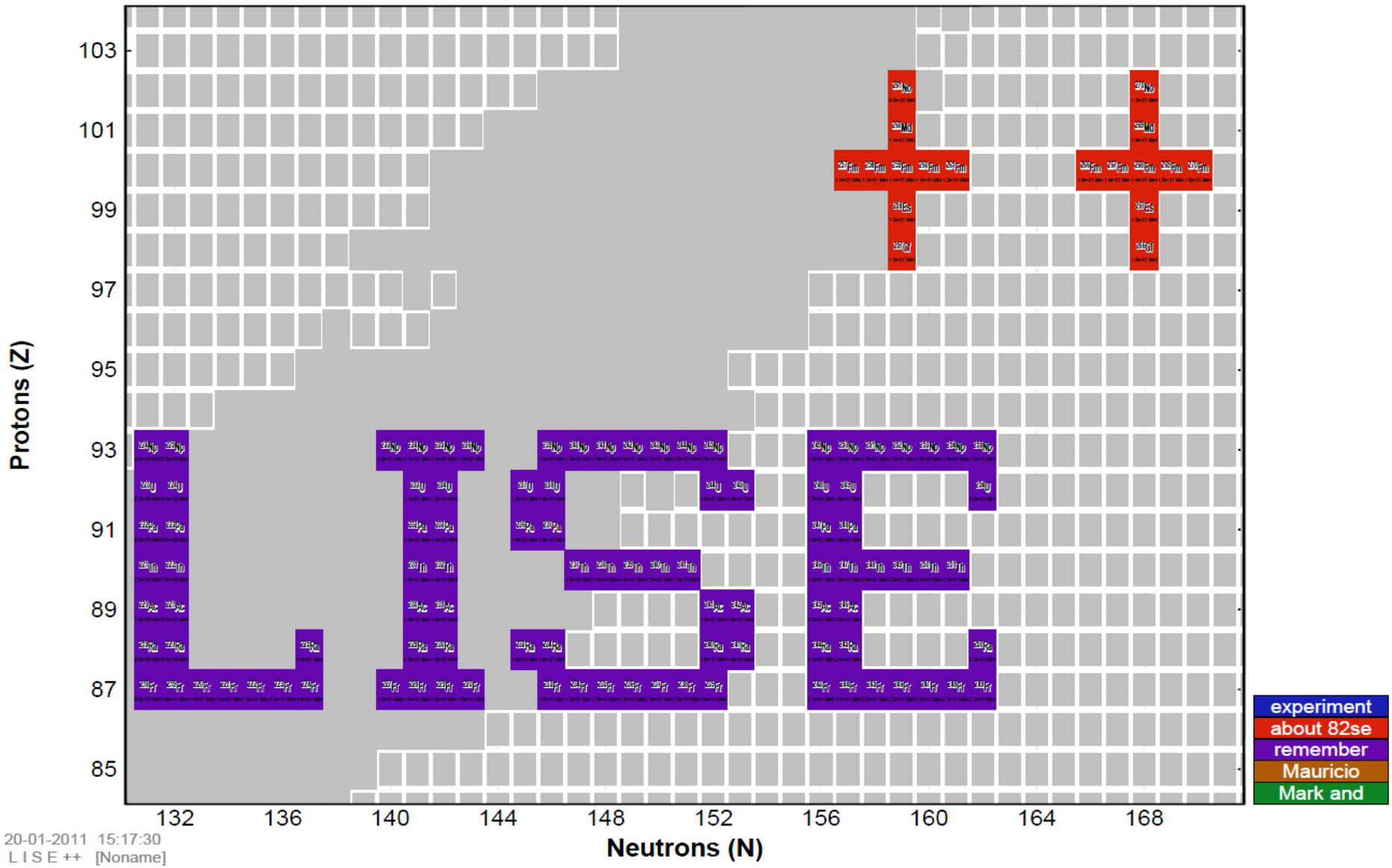
Color board example

S_{2p}

<Database: AME2003 (A&W) + LDM2>

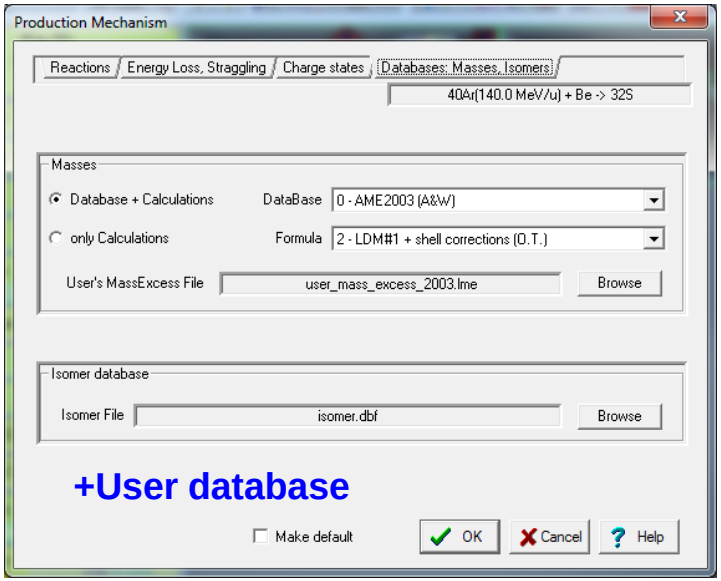
N=0-200

The color scale board is based on "welcome.iso" & "welcome.isolist" files



20-01-2011 15:17:30
LISE++ [Noname]

Next step : User database

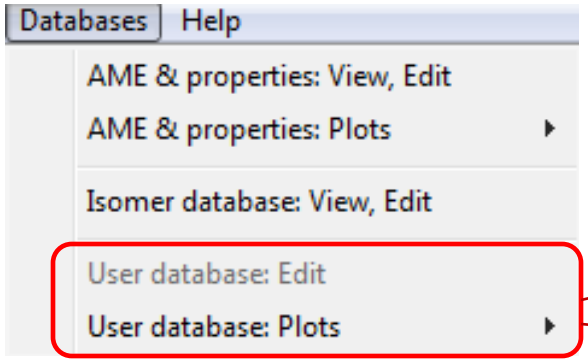


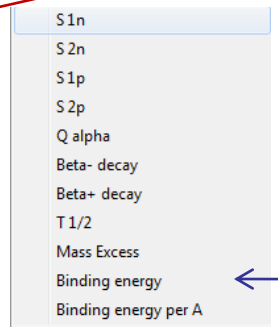
Excel file → DBF (dBASE) → LISE++

L13 | 23.0517

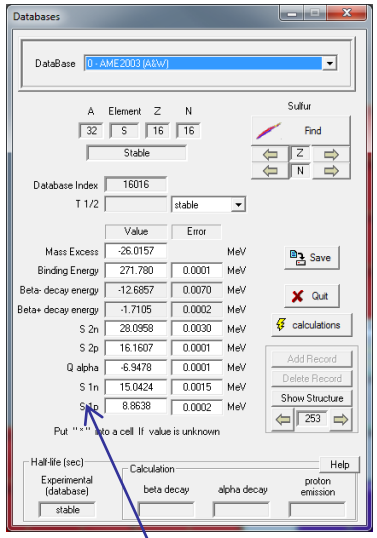
	A	B	C	D	E	F	G	H
1	INDEX	A	EL	Z	MASS_EXCES	BINDING_EN	BETA-DEC	S(2N)
2	1000	1	H	1	7.2890	0.000	*	*
3	1001	2	H	1	13.1357	2.225	*	*
4	1002	3	H	1	14.9498	8.482	0.0186	8.4818
5	1003	4	H	1	25.9000	5.600	23.4800	3.3768
6	1004	5	H	1	32.8900	6.680	21.5100	-1.8000
7	1005	6	H	1	41.8600	5.760	24.2700	0.1804
8	1006	7	H	1	49.1400	6.580	23.0300	-0.1000
9	2001	3	He	2	14.9312	7.718	*	*
10	2002	4	He	2	2.4249	28.296	*	*

For the user database just we needs INDEX, other columns are user information.
Restriction : < 15 fields





dynamical menus should be



User database fields

Outlooks

MICHIGAN STATE UNIVERSITY
LISE++

Subject	priority	new	order	time
LongTerm				
>>> Custom shape degrader optimization in MC mode for high order optics	high priority		1	< 2 weeks
>>> Input angles in wedge in MC mode	high priority	X	1a	< 1 week
>>> PACE4 generator of one event (creation dll-library)	high priority		4	< 1 week
>>> PACE4 in MC LISE++ (using PAVE4 dll-library)	high priority		5	< 1 week
>>> ETACHA implementation	high priority			1.5 months
>>> ADA (Abrasion-Dissipation-Ablation) model creation	medium			2 months
>>> Evaporation cascade: create Monte Carlo version	medium			1 month
>>> Abrasion-Fission: create Monte Carlo version	medium	X		2 weeks
>>> Implementation of Intranuclear cascade (INC) model in LISE++ Windows	medium			3 months
>>> Ray tracing in LISE++	medium			1 year
>>> Minimization in LISE++ (which can be used for MC, TRANSPORT, Ray tracing cases)	medium			2 months
>>> Write full LISE++ documentation	medium			1-2 months
>>> The "MOTER" code development	low			1 year
>>> Energy loss in PACE4 (low priority)	low			< 1 week
>>> Three-body kinematics relativistic calculator	low			1 month
>>> Water wedge procedure (wedge with one moving plane and filled by liquid)	low			< 2 weeks
ShortTerm				
Develop a subroutine to calculate a reduced dispersion for large values of dP/P	high priority		2	< 3 days
PACE4 : request from TRIUMF	high priority		3	< 2 days
Cross section for stripper	medium			< 2 days
High order : write documentation and put source for COSY files	medium			done?
User database: import, edit, plot	medium	X		< 5 days
Discovery of isotopes : utilities, database, plots (see row above)	medium			< 5 days
Wedge (including curved profile wedge) inclination	medium			< 4 days
Create possibility to Insert a material before the target	medium			< 2 days
Brho method to measure T1/2 (MC: possibility of decay in flight)	low			< 5 days
Dispersion method for secondary target: check DJM case	low			< 2 days
Fission without angular acceptances: low transmission for analytical solution	low			< 3 days
High order optics calculation: improvement, adaptation GICOSY format	low			< 3 days
MOCADI <-> LISE++ converter	low			< 4 dyas
Transport <-> LISE++ converter	low			< 1 day
m-rad dimensions for LISE++ optics	low			< 2 dasy
Problem with Projectile Fragmentation in the Catcher utility	low			< 1 day
Simulation reactions in Si-telescope in MC mode	low			< 4 days
DONE				
Linked COSY matrices reload in LISE++ by user demand in the LISE code	high priority		done	
Recalculate optical matrices of quadropoles according to Brho by pressing one button	high priority		done	
increasing number block limit up to 200 (was 100)	high priority		done	
quadrupoles: option matrix or field calculations	high priority		done	
second order martrix for dipole and entrance and exit face of dipoles	high priority		done	
ideal magnet solution (tabulation) : first and second order	high priority		done	
Stripper foil halflife : initial temperature	medium		12/23/2010	1 day
Stripper foil halflife : pulsing beam & rotating target together	medium		12/23/2010	2 days
Target and stripper thickness deffects	medium		1/7/2011	2 days
Range option in MC rays generator	high priority		1/21/2011	1 day
Customizable chart of Nuclides	high priority		1/20/2011	5 days

Tasks	time	dates
LISE++ : Custom shape degrader Vs. MC, high orders	< 2 weeks	to 3 February
Input angles in wedge in MC mode	< 1 week	to 10 February
FRIB yields	< 7 days	to 17 February
#9016 experiment preparation		15 February - 31 March
#9016 experiment perfomance		1 April - 10 April
#9016 experiment analysis		11 April - 29 April , June-July
PACE4 dll	< 1 week	
PACE4 in LISE++ MC	< 1 week	
dp/p subroutine	< 3 days	
Triumf requests	< 2 days	
S3 in LISE++	< 1 week	