

//-----
 // 14.10.5 08/07/20
 // d_Fusion_plot dialog : DONE!

NOTE: this week -- Low Energy Community Meeting

// Fix of bug with char arrays (non-compatible with Qt)
 // Managing font, font size for LISEQt shell
 // Exploration of DPI scaling functions

Fusion cross-section plot

Plot type: Energy dependence Fixed energy reaction

Plot : Energy dependence

Function of

- Beam energy (Lab) MeV/u
- Beam energy (Lab) MeV
- Center of mass energy MeV
- Excitation energy MeV
- Compound recoil energy MeV

Center of mass energy

min = 34.5

max = 450.1

Fusion calculator

Fission fragment excitation function

- No (faster)
- Yes

Suggest for the fission fragment ex.function that Fusion CS equal to 1 barn

Create excitation function file

Number points for the plot: 32

Show fission & breakup channels

Plot : Fixed energy from reaction

cross-section calculation method to draw a plot: LisFus v.4.0

Plot type

- Isotopes, Z=const
- Isobars, A=const
- Isotones, N=const
- Isospin, N-Z=const
- Isospin, N-2Z=const
- <N>/Z
- sum(CS); Z=const
- sum(CS); A=const
- sum(CS); N=const

Vertical Axis

- Z (protons)
- A (nucleons)
- N (neutrons)
- N-Z (isospin)
- N-2Z

Dimension of the plot

- ONE - dimensional
- TWO - dimensional

NZ chart

All Odd Even Even

N_{min} = 0

N_{max} = 200

238U_9Be_FR_132Sn.lexf

OK Cancel

Fusion cross-section plot

Plot type: Energy dependence Fixed energy reaction

Plot : Energy dependence

Function of

- Beam energy (Lab) MeV/u
- Beam energy (Lab) MeV
- Center of mass energy MeV
- Excitation energy MeV
- Compound recoil energy MeV

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- Isospin, N-Z=const
- Isospin, N-2Z=const
- <N>/Z
- sum(CS); Z=const
- sum(CS); A=const
- sum(CS); N=const

function of

- Z (protons)
- A (nucleons)
- N (neutrons)
- N-Z (isospin)
- N-2Z

Dimension of the plot

- ONE - dimensional
- TWO - dimensional

NZ chart

All Odd Even Even

Z_{min} = 50

Z_{max} = 50

238U_9Be_FR_132Sn.lexf

OK Cancel

//-----

// 14.10.6 08/08/20

// d_FusFission_plot dialog : DONE!

// MakeFusionCompound() has been implemented from Borland

// Left Setup-Panel modification for Compound nucleus

// modification of LiseQt function "numberKillZero"

// using "numberKillZero" 'g'-format for Optical matrices

Fusion-Fission cross section plot

Plot type: Energy dependence Fixed energy reaction

Plot : Energy dependence

Function of:

- Beam energy (Lab) [MeV/u]
- Beam energy (Lab) [MeV]
- Center of mass energy [MeV]
- Excitation energy [MeV]
- Compound recoil energy [MeV]

Center of mass energy: min = 34.5, max = 450.1

Fusion calculator

Fission fragment excitation function:

- No (faster)
- Yes

Number points for the plot: 32

Suggest for the fission fragment ex.function that Fusion CS equal to 1 barn

Create excitation function file

238U_9Be_FF_132Sn.lexf

Plot : Fixed energy from reaction

Fusion-Fission E' = 35.35 MeV Fission barrier = 6.06 MeV

Fusion-Fission CS = 11.59 mb Fusion CS = 11.59 mb

Cross section are:

- Final (after deexcitation)
- Initial (before light particle emission)

Plot type:

- Isotopes, Z=const
- Isobars, A=const
- Isotones, N=const
- Isospin, N-Z=const
- Isospin, N-2Z=const
- <N>/Z
- sum(CS); Z=const
- sum(CS); A=const
- sum(CS); N=const

function of:

- Z (protons)
- A (nucleons)
- N (neutrons)
- N-Z (isospin)
- N-2Z

Dimension of the plot:

- ONE - dimension
- TWO - dimension

NZ chart

Dimensional: mm cm

Z_{min} = 50, Z_{max} = 50

Projectile 238 U⁹²⁺
5 MeV/u 1 pA

Compound 247 Cm

Fragment 132 Sn

Target: 9 Be 1 mg/cm²

Stripper

D1: Bp=9.7941 T·m

Fit XX: R11 < 12

I1_slits: slits

Fusion information window

238 U(5.0 MeV/u) + Be → 247 Cm* → 132 Sn

Q-value of reaction = -6.877 MeV

Fusion max. barrier = 42.97 MeV

Fusion radius = 11.5 fm

Depending on a place of reaction in the target:

	beginning	middle	end
Beam energy (Lab) [MeV/u]	5	4.74	4.47
Beam energy (Lab) [MeV]	1190	1127.2	1064.4
Center of mass energy [MeV]	43.41	41.11	38.83
Excitation energy [MeV]	36.53	34.24	31.95
Compound recoil energy [MeV]	1146.6	1086.1	1025.6
Compound formation CS [mb]	76.7	7.48	0.467
Compound Surv. Prob. (L=0)	5.27e-01	3.86e-01	2.62e-01
Fusion cross section [mb]	40.4	2.89	0.122
Compound-1stFission CS [mb]	38.8	2.78	0.118
Compound-Breakup CS [mb]	0	0	0

for setting residue after the stripper:

	beginning	middle	end
Energy diapason (MeV/u)	4.128	--	4.152
corresponding ion charge state	40.96	--	40.99

Plot the excitation function

Fusion-Residue calculator

Quit

Inverse to Global

1. X	0.4	0.00767	0	0	0	0.025	[mm]
2. T	1.06	2.52	0	0	0	0.058	[mrad]
3. Y	0	0	0.47	-0.019	0	-1.2e-05	[mm]
4. P	0	0	-6.446	2.393	0	6.32e-05	[mrad]
5. L	0.000349	0.00628	0	0	1	-30.14	[mm]
6. D	0	0	0	0	0	1	[%]

Dimensional: mm cm

Det = 1.00000

Ok Cancel

//-----
 // 14.10.7 09/08/20
 // d_AbrFission_plotTKE dialog : DONE!

Choose item to plot

KE(TKE) Kinetic energy in CMS (final fragment(s))

Velocity Velocity in CMS (final fragment)

TXE Excitation energy of fragment(s)

to get FINAL fragment

dA_in Number of evaporated nucleons

dN_in Number of evaporated neutrons

dZ_in Charge change due to p,a-emission

from EXCITED fragment

dA_out

dN_out

dZ_out

One or Two fragments?

Just one fragment

Conjugated fragment

Show for the excitation energy region(s)

Low ²³⁷U* E_x = 25 MeV CS =300 mb

Middle ²³²Th* E_x = 100 MeV CS =1000 mb

High ²²⁶Ra* E_x = 250 MeV CS =800 mb

Weighted Average (Low + Middle + High)

All listed above (Low, Middle, High, AverageWeighted)

Plot type

Isotopes, Z=const

Isobars, A=const

Isotones, N=const

Isospin, N-Z=const

Isospin, N-2Z=const

<V>; Z=const

<V>; A=const

<V>; N=const

function of

Z (protons)

A (nucleons)

N (neutrons)

N-Z (isospin)

N-2Z

Dimension of the plot

ONE - dimensional

TWO - dimensional

/ NZ chart

All

Odd

Even

Z_{min} =

Z_{max} =

OK Cancel

//-----
 // 14.10.8 10/08/20
 // d_PlotCS_DB dialog (Database) : dialog : redesign 100%, connection 60%
 // connection of all actions and slots for Database plots in CmPlotDatabase(int)

last CS&TKE&DB Plot dialog

Choose a Plot Type ✕

Select a data set to plot

plot one data set

 Show extrapolated values based on selected LDM for missing data in databases

difference between data sets

Database: 0 - AME2016 (database) ▼

Calculation: 0 - Liquid Drop Model (regular) ▼

<p>Plot type</p> <p> <input type="radio"/> Isotopes, Z=const <input type="radio"/> Isobars, A=const <input checked="" type="radio"/> Isotones, N=const <input type="radio"/> Isospin, N-Z=const <input type="radio"/> Isospin, N-2Z=const <input type="radio"/> <N>/Z <input type="radio"/> sum(CS); Z=const <input type="radio"/> sum(CS); A=const <input type="radio"/> sum(CS); N=const </p>	<p>Vertical Axis</p> <p> <input checked="" type="radio"/> Z (protons) <input type="radio"/> A (nucleons) <input type="radio"/> N (neutrons) <input type="radio"/> N-Z (isospin) <input type="radio"/> N-2Z </p> <p> <input checked="" type="radio"/> All <input type="radio"/> Odd <input type="radio"/> Even </p>	<p>Dimension of the plot</p> <p> <input type="radio"/> ONE - dimensional <input checked="" type="radio"/> TWO - dimensional </p> <p style="text-align: center; border: 1px solid gray; padding: 2px;"> NZ chart </p> <p>N_{min} = <input type="text" value="0"/></p> <p>N_{max} = <input type="text" value="200"/></p>
--	---	---

2D: Color scale board based on

Internal database values or calculations

 ISO file (external database)
 table2016

External source (iso & isolist files)

 ISOLIST file (description of database)
 decay_mode2012

Decay mode filter

All modes ▼

OK
 Cancel

//-----
 // 14.11.1 11/08/20
 // d_PlotCS2_DB dialog (Database) : dialog : DONE!
 // all 5 modes done : DB, FissionBarrier, T12, Alpha-decay, Spont.Fis

// Last Plot_CS dialogs has been completed (total 16)
 // the middle version has been increased

// d_Bi dialog : redesign 80%, connection 10%

T 1/2

Choose a Plot Type

Select a data set to plot

Exper,Beta,Alpha,Proton Include "unbound" isotopes

Exper or compilation set: min(Beta,Alpha,Proton)

1 - Min (Beta,Alpha,Proton)

Plot type

Isotopes, Z=const

Isobars, A=const

Isotones, N=const

Isospin, N-Z=const

Isospin, N-2Z=const

Vertical Axis

Z (protons)

A (nucleons)

N (neutrons)

N-Z (isospin)

N-2Z

Dimension of the plot

ONE - dimensional

TWO - dimensional

NZ chart

All

Odd

Even

N_{min} = 0

N_{max} = 200

2D: Color scale board based on

Internal database values or calculations

ISO file (external database) table2016

External source (iso & isolist files)

ISOLIST file (description of database) decay_mode2012

Decay mode filter

Beta+ decay

OK Cancel

Fission Barrier

Choose a Plot Type

Select a data set to plot

plot one data set

difference between data sets

1 - "FisRot" - S.Cohen et al.,An.P 82(1974)

2 - LDM - W.Myers & W.Swiatecki,NP81(1966)

Plot type

Isotopes, Z=const

Isobars, A=const

Isotones, N=const

Isospin, N-Z=const

Isospin, N-2Z=const

function of

Z (protons)

A (nucleons)

N (neutrons)

N-Z (isospin)

N-2Z

Dimension of the plot

ONE - dimensional

TWO - dimensional

NZ chart

All

Odd

Even

Z_{min} = 50

Z_{max} = 50

2D: Color scale board based on

Internal database values or calculations

ISO file (external database)

External source (iso & isolist files)

ISOLIST file (description of database)

Decay mode filter

All modes

OK Cancel

Spont.Fission

Choose a Plot Type

Select a data set to plot

plot one data set

difference between data sets

formula 1 [NPA759(05)64]

Karpov,Zagrebaev,JMPE21(12)1250013

Plot type

Isotopes, Z=const

Isobars, A=const

Isotones, N=const

Isospin, N-Z=const

Isospin, N-2Z=const

Vertical Axis

Z (protons)

A (nucleons)

N (neutrons)

N-Z (isospin)

N-2Z

Dimension of the plot

ONE - dimensional

TWO - dimensional

NZ chart

All

Odd

Even

N_{min} = 0

N_{max} = 200

2D: Color scale board based on

Internal database values or calculations

ISO file (external database)

External source (iso & isolist files)

ISOLIST file (description of database)

Decay mode filter

All modes

OK Cancel

"BI" - the automatized search of two (& one)-dimensional peaks in spectra

Spectrum dimension

One-dimensional Two-dimensional

Input spectrum file

Output files

Information about input file

X size = 350

Y size = 350

format = F*4

Setting for search of peaks

X

min = 1205.2

max = 1256

sigma = 120

Y

min = 1205.2

max = 1205.2

sigma = 200

min N of lines in peak2 = edit9

step between lines2 = edit13

minimum sum of peak2 = edit10

sigma relation2 = edit14

smooth sigma L = edit11

smooth step L = edit15

Value relation P = edit12

sigma coef P = edit16

Search

Plot

Show results

Subtract background from results

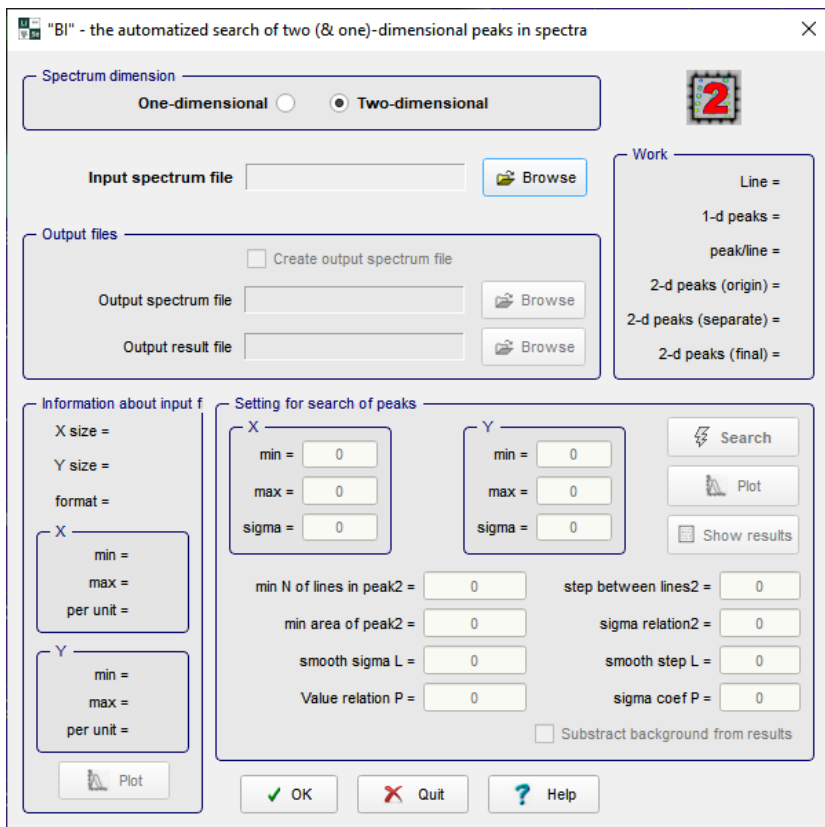
Quit Help WAIT!

// w_BI library implementation from Borland
 // NSCLspectre library implementation from Borland

// d_Bi dialog : redesign 90%, connection 50%

http://lise.nslc.msu.edu/doc/bi_doc_eng.pdf

- w_nscl
- d_BI
- d_BI
- d_BI
- d_BI_HeaderSpectre
- enum_bi
- extern
- fstruct
- global
- o_bi
- o_BI_init
- o_bidi
- o_lin
- o_pik
- o_rw
- struct



Contents:

1. THE "BI" CODE - SEARCH TWO-DIMENSIONAL OF PEAKS AND DEFINITION OF THEIR CHARACTERISTICS . 1
2. VERSION N°5.8: ON-LINE LISE ANALYSIS OF EXPERIMENTAL PLOTS..... 6
3. INPUT DATA FILE FORMAT..... 8
 - 3.1. 1D..... 8
 - 3.2. 2D..... 8

1. The "Bi" code - search two-dimensional of peaks and definition of their characteristics

• Definition of outputs of nuclei rather labor-consuming process: it is necessary to analyze tens matrixes, each of which carries the information on several tens ions. So in case of the experiment with the beam ^{112}Sn the nuclei with mass numbers from 8 up to 53 were identified [Lew94]. For each meaning of magnetic rigidity there were four matrixes for various charging states of products, and in everyone more than five hundred ions. After measurement of outputs all data are brought in to the computer for the further analysis. Enormous volume of work can be estimated:

$$500 \text{ ions} * 4 \text{ matrixes for charge states} * 10 \text{ values of magnetic rigidity} = 20\,000 \text{ values!}$$

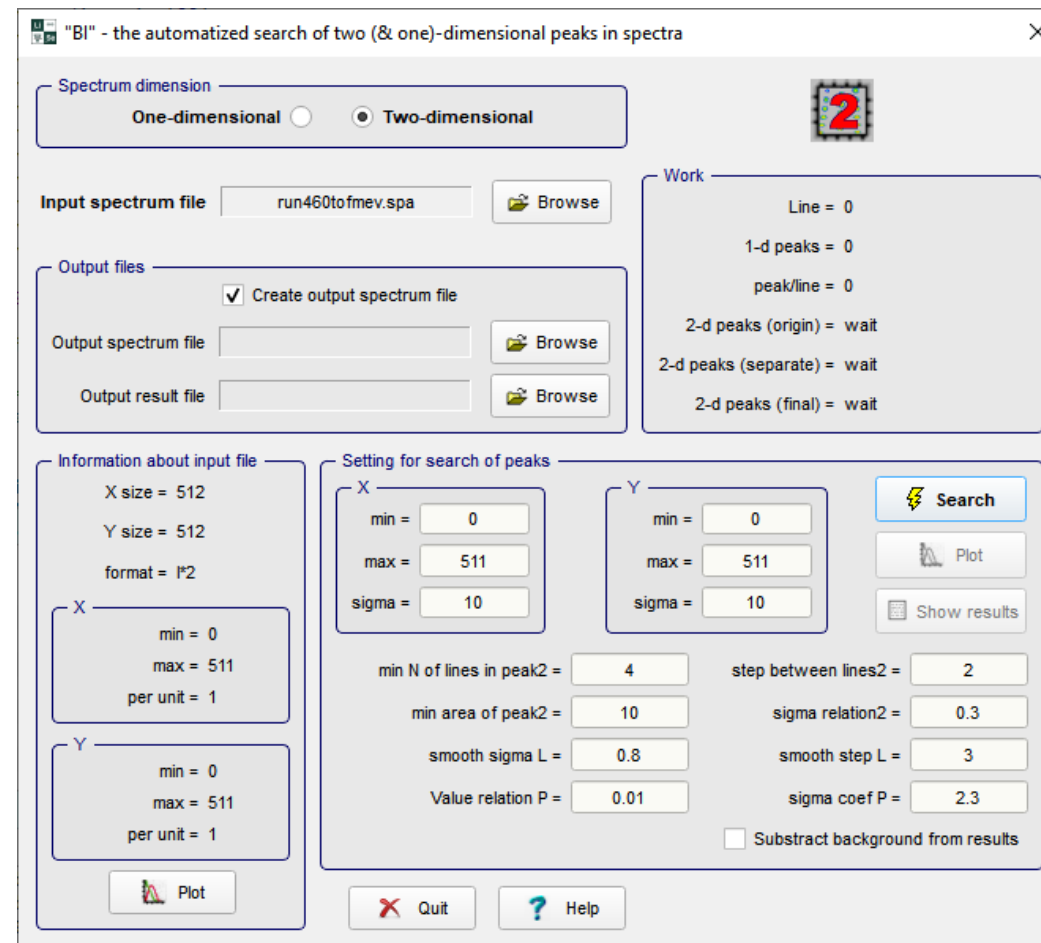
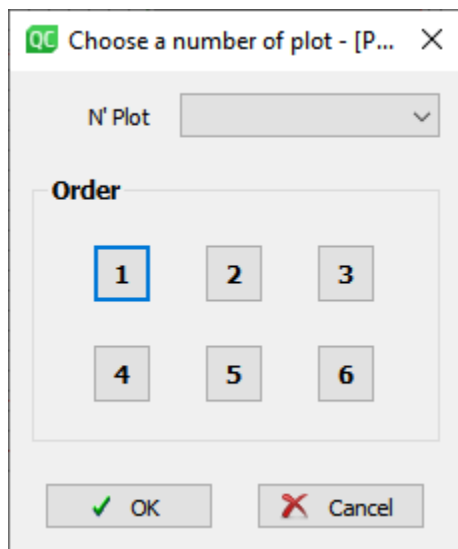
• It is necessary also to note a high probability of subjective mistakes of the experimenters connected, both with the analysis two-dimensional of peaks, and at carry of the information to the computer. In this connection, for the automated search of two-dimensional peaks and definition of statistical parameters the program "Bi" were created (spelling [bi]).

• There are three versions of the program:

	Operating system	Programming language	Spectrum format
1	VMS 5.1 and higher	Fortran	GANIL Acquisition
2	MS DOS 3.3 and higher	C	The code "Athene" /format "SURFER/

```
//-----
// 14.11.3 13/08/20
// d_Bi dialog : redesign 100%, connection 75%
// d_Choise_plot dialog : DONE!
```

```
// The Plot-phase starts!
// implementation file c_Graph.* c_Plot.* from Borland; adapted 5%
```



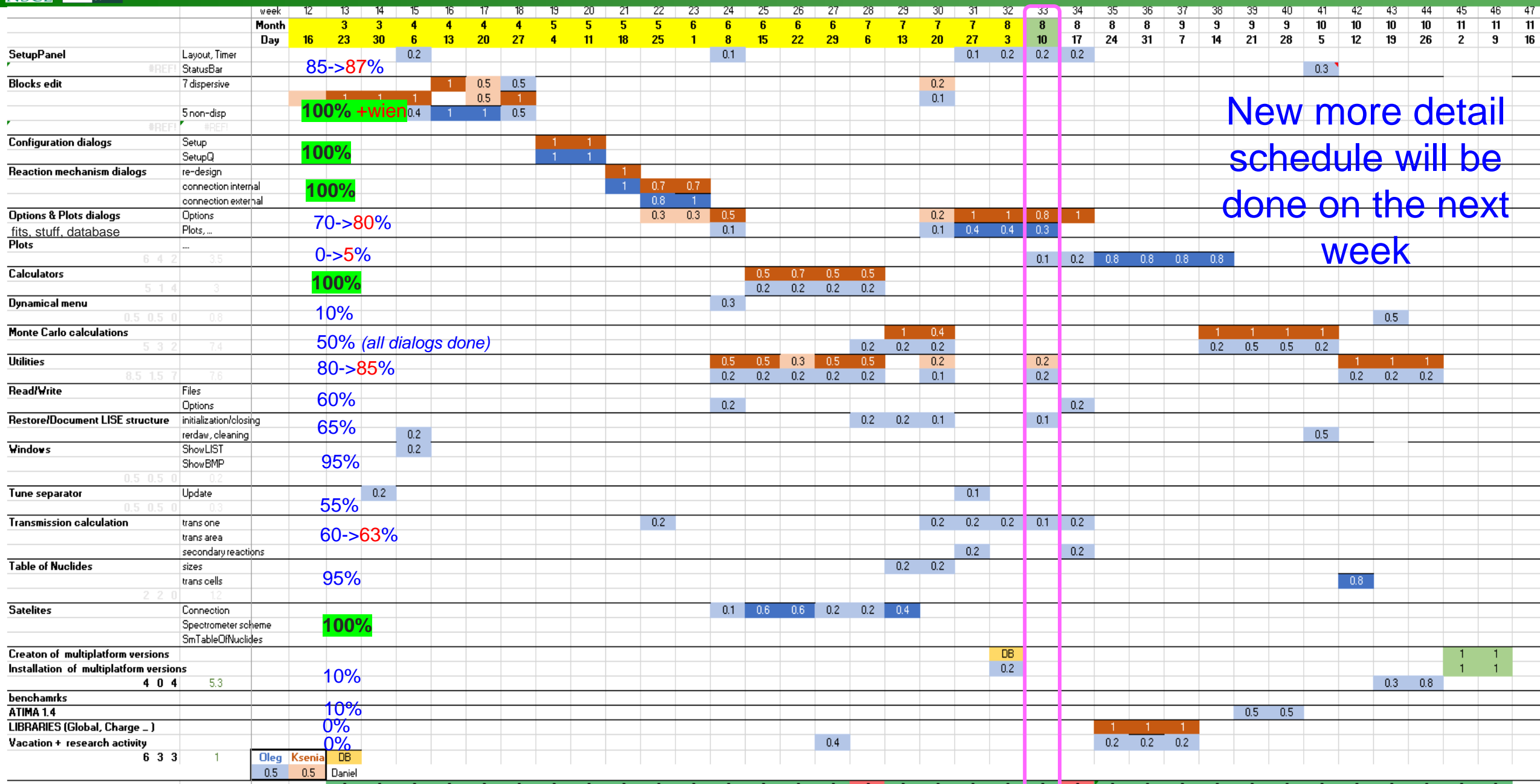
08/06

1	Directory	Subdirectory	Dialog	re-Design, %	Link, %	DONE	Plots total	Plots done	Bench-mark	Comments	date	size	size done	
215	w_Stuff		d_Value_input	100	100	1					04/15/20	3401	3401	
216	w_Stuff		w_Gauge	100	100	1					03/31/20	5122	5122	
217														
218		total		215	sum	193	89.8%					4.96E+06	4.43E+06	89.4%
219		procent			completely done	167	77.7%							

08/13

1	Directory	Subdirectory	Dialog	re-Design, %	Link, %	DONE	Plots total	Plots done	Bench-mark	Comments	date	size	size done	
212	w_Stuff		d_FRIB_isotopes	100	100	1	0				03/31/20	3078	3078	
213	w_Stuff		d_Password	100	100	1	0				03/31/20	2234	2234	
214	w_Stuff		d_Transmission_statistics	100	100	1	0				05/28/20	60991	60991	
215	w_Stuff		d_Value_input	100	100	1					04/15/20	3401	3401	
216	w_Stuff		w_Gauge	100	100	1					03/31/20	5122	5122	
217														
218		total		215	sum	198	92.1%					4.96E+06	4.53E+06	91.4%
219		procent			completely done	172	80.0%							

LISE++ porting schedule (v.16)



New more detail schedule will be done on the next week