

FYI: O. is all 5 days partially in vacation on this week

```
//-----
// 14.7.2 06/04/20
// * d_Data_fitMatrix : redesign 100%, connection 50%
// * d_Data_fitMinimization : redesign 100%, connection 50%
// * d_Optics_fitSet : redesign 100%, connection 50%

// total in the code revision(substitution) of functions max,min,fabs
// for qMax,qMin,qFaba after Qt-update
```

This utility can be used if

- "Projectile Fragmentation" reaction mode is selected
- Abrasion-Ablation is the selected cross-section method
- "File" cross section option is set to "on"
- There are more than 2 user cross-sections in memory for this reaction.

Local line to analyze: Z = 55

Parameter variations

Parameter	Min Value	Max Value	Number of Points
<E*> - excitation energy per abraded nucleon (MeV)	8	16	9
sigma (standard deviation in MeV)	4	10	13

Universal analysis value

Analysis value	Local		Global		Correct for the number of data points used
	Ch2	LoD	Ch2	LoD	
weights	3	2	0.5	1	<input checked="" type="checkbox"/>

Analysis Log-file: L

statistics file: L

Buttons: Make Analysis, Cancel, Help, Make default

Error! It is impossible to make analysis! See condition #1

This utility can be used if

- "Projectile Fragmentation" reaction mode is selected
- Abrasion-Ablation is the selected cross-section method
- "File" cross section option is set to "on"
- There are more than 2 user cross-sections in memory for this reaction.

Local line to analyze: Z = 55

E\* : quadratic polynomial

	0	1	2
<E*> - excitation energy per abraded nucleon (MeV)	0	27	0
		* d_abr	* d_abr <sup>2</sup>
Use in Fitting process	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Use Bounds constraints	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Lower bound	0	10	-2
Upper bound	15	30	2

AA X-section Amplitude factor: 1

sigma(E\*) : quadratic plnln

	0	1	2
Sigma (standard deviation)	0	18	0
		* d_abr <sup>(1/2)</sup>	* d_abr
Use in Fitting process	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Use Bounds constraints	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Lower bound	0	4	-2
Upper bound	10	20	2

Thermalization Time Coefficient: 3

Buttons: Save Settings, Evaporation Settings, Load Settings, Prefragment excit.energy

Error! It is impossible to make analysis! See condition #1

Press "Escape" to interrupt analysis

d\_abr is the number of abraded nucleons

Options

Maximum number of iterations: 2

Use Lower & Upper bounds:

LevMar package samples

Choose example (0-15): 4

Run minimization

Stopping thresholds

Options	Value	Stopping threshold	Default value
tau	1.00e-03	mu/qMax[J]_ii	1e-03
epsilon 1	1.00e-15	J <sup>T</sup> e   _inf	1e-15
epsilon 2	1.00e-15	Dp   _2	1e-15
epsilon 3	1.00e-20	e   _2	1e-20
delta	1.00e-06	approximation step*	1e-06

LevMar package info

LEVMAR: Levenberg-Marquardt nonlinear least squares algorithms by M.I.A.Lourakis

levmar link

Buttons: Make default, OK, Cancel

\* delta -- difference approximation step, used only in the Bounds mode. If delta < 0, the Jacobian is approximated with central differences which are more accurate (but slower!) compared to the forward differences employed by default.

//-----

// 14.7.3 06/05/20

// \* d\_Pickup : DONE!

// \* d\_Data\_fitMatrix : DONE!

// \* d\_Optics\_fitSet : redesign 100%, connection 70%

// \* d\_Evaporation\_calcFiles : redesign 100%, connection 20%

// \* d\_Optics\_fit : redesign 90%, connection 10%

User Cross-Section analysis Abrasion-Ablation model: MATRIX

This utility can be used if

- "Projectile Fragmentation" reaction mode is selected
- Abrasion-Ablation is the selected cross-section method
- "File" cross section option is set to "on"
- There are more than 2 user cross-sections in memory for this reaction.

Local line to analyze

Z = 55

Change

Make items 1-3

Calculate down to Z 40

Parameter	Min Value	Max Value	Number of Points
<E*> - excitation energy per abraded nucleon (MeV)	8	16	9
sigma (standard deviation in MeV)	4	10	13

Universal analysis value

Analysis value	Local		Global		Correct for the number of data points used
	Ch2	LoD	Ch2	LoD	
weights	3	2	0.5	1	<input checked="" type="checkbox"/>

Analysis Log-file: LISE\_net.fit

statistics file: LISE\_min.fit

Make Analysis Cancel Help Make default

Error! It is impossible to make analysis! See condition #4

Press "Escape" to interrupt analysis

```
c:/LISEcute/_install/CrossSections/pickup2.csev
! 238U(600.0 MeV/u) + Be -> pickup
! E_abrasion=11.0, E_pickup=7.0, E_start=10.0, Width=0.640, lambda=1.0e+020, CS=1e+002
! Z      N      CS      dCS      Shape      ExLow      ExHigh
82      147    0.00128  0        RO         90.249     143.751
83      147    0.00352  0        RO         80.567     131.433
84      147    0.00965  0        RO         70.957     119.043
85      147    0.0262   0        RO         61.433     106.567
86      147    0.0707   0        RO         52.012     93.988
87      147    0.189    0        RO         42.720     81.280
88      147    0.504    0        RO         33.594     68.406
89      147    1.33     0        RO         24.697     55.303
90      147    3.49     0        RO         16.139     41.861
91      147    9.08     0        RO         8.170      27.830
92      147    23.5     0        RO         1.723     12.277
93      147    4.73     0        RO         6.537     21.463
94      147    0.409    0        RO         11.859     30.141
95      147    0.0183   0        RO         17.445     38.555
96      147    0.000369 0        RO         23.199     46.801
82      148    0.000129 0        RO         96.734     151.266
83      148    0.000355 0        RO         87.025     138.975
84      148    0.000972 0        RO         77.385     126.615
85      148    0.00264  0        RO         67.824     114.176
86      148    0.00713  0        RO         58.358     101.642
87      148    0.0191   0        RO         49.010     88.990
88      148    0.0507   0        RO         39.812     76.188
89      148    0.134    0        RO         30.813     63.187
90      148    0.351    0        RO         22.098     49.902
```

File with initial settings for the Evaporation calculator (CSEV)

File with initial set of excited nuclei

pickup2.csev

Save View

Lambda = 1e+20 1/s

Statistics of the initial set

2D-Plot of initial CS of excited nuclei

2D-Plot of excitation energy

Number of initial excited nuclei = 119

Sum of CS = 100

Pick-up Mode

proton

neutron

proton & neutron

Excitation Energy (E\*)

for Abrasion = 11 MeV/dA

for Pick-up = 7 MeV/dA

Start = 10 MeV

Sigma / Mean = 0.64

E\* = Start + E\_abrasion \* dA\_abrasion + E\_pickup \* dA\_pickup

Calculate Quit

Cross sections

Geometrical overlapping (from AA)

Manually: Total pick-up cross section (mb) = 100

Make default

```
//-----
// 14.7.3 06/05/20
// * d_Pickup      : DONE!
// * d_Data_fitMatrix : DONE!
// * d_Optics_fitSet   : redesign 100%, connection 70%
// * d_Evaporation_calcFiles : redesign 100%, connection 20%
// * d_Optics_fit     : redesign 90%, connection 10%
```

**File with initial settings for the Evaporation calculator (CSEV) - [Preview] - Qt Creator**

File with initial set of excited nuclei:

Automatically rename output files

**Statistics of the initial set**

Number of initial excited nuclei =

Sum of CS =

**CSEV file format (extension \*.csev)**

The CSEV file is in ASCII format. Comment strings begin with "!". Columns can be separated by space, tabulation sign, or comma.

There are SEVEN columns: "Z", "N", "CS value", "CS error", "Ex.En.Shape", "Lower", "Upper", where Z is atomic number, N is number of neutrons. "CS error" is not used by Evaporation Calculator (it was done for compatibility). There are 4 kinds of "Excitation Energy Shape": 0 - Gaussian, 1 - Rectangle, 2 - UpLeft Triangle, 3 - UpRight Triangle. Lower and Upper boundaries are the same as in the EvapCalculator dialog: for Gaussian they correspond to FWHM.

**Optics fit - [Preview] - Qt Creator**

Blocks with parameters to vary	Active Constraint blocks
Item1	Item1
Item2	Item2
Item3	Item3
Item4	Item4
Item5	Item5

No Constraints or Blocks with varying parameters. Cannot be fitted!

N iter =

```
// 14.7.4 06/06/20
// * d_Optics_fitSet : redesign 100%, connection 95%
// * d_Evaporation_calcFiles : DONE!
// * d_Optics_fit : redesign 90%, connection 60%
// * d_UtilDifCS : redesign 100%, connection 70% --- removed from LISE++ package

// * Global revision : QString substitution .data() --> .toString().c_str()
```

File with initial settings for the Evaporation calculator (CSEV)

File with initial set of excited nuclei: pickup2.csev

Buttons: Browse, View

Automatically rename output files

Statistics of the initial set

2D-Plot of initial CS of excited nuclei

Number of initial excited nuclei = 119

Sum of CS = 99.97

CSEV file format (extension "\*.csev")

The CSEV file is in ASCII format. Comment strings begin with "!". Columns can be separated by space, tabulation sign, or comma.

There are SEVEN columns: "Z", "N", "CS value", "CS error", "Ex.En.Shape", "Lower", "Upper", where Z is atomic number, N is number of neutrons. "CS error" is not use by Evaporation Calculator (it was done for compatibility). There are 4 kinds of "Excitation Energy Shape": 0 - Gaussian, 1 - Rectangle, 2 - UpLeft Triangle, 3 - UpRight Triangle. Lower and Upper boundaries are the same as in the EvapCalculator dialog: for Gaussian they corresponds to FWHM.

Buttons: Calculate, Quit

Levmar minimization settings

Options

Maximum number of iterations: 2

Use Lower & Upper bounds:

LevMar package samples

Choose example (0-15): 4

Run minimization

Stopping thresholds

Options	Value	Stopping threshold	Default value
tau	1.00e-03	mu/qMax[J] <sub>ii</sub>	1e-03
epsilon 1	1.00e-15	J <sup>T</sup> e    <sub>inf</sub>	1e-15
epsilon 2	1.00e-15	Dp    <sub>2</sub>	1e-15
epsilon 3	1.00e-20	e    <sub>2</sub>	1e-20
delta	1.00e-06	approximation step*	1e-06

\* delta -- difference approximation step, used only in the Bounds mode. If delta < 0, the Jacobian is approximated with central differences which are more accurate (but slower!) compared to the forward differences employed by default.

LevMar package info

LEVMAR:  
Levenberg-Marquardt nonlinear least squares algorithms by M.I.A.Lourakis

levmar link

Make default

Buttons: OK, Cancel

// 14.7.5 06/07/20

// \* d\_Optics\_fit : redesign 100%, connection 90%  
 // \* start of "recently used files" class development

### Optics fit

Blocks with parameters to vary	Active Constraint blocks
#01-q Position@005: Q017TA	#01 @008: s R < 100 Fit z19R
#02-q Position@007: Q019TB	#02 @012: s Y < 45 D1-Y
#03-q Position@010: Q021TC	#03 @014: s X < 100 D1-X
#04-q Position@016: Q031TA	#04 @022: R12 = 0 I1-focX
#05-q Position@018: Q033TB	#05 @023: R34 = 0 I1-focY
#06-q Position@020: Q035TC	#06 @024: R26 = 0 I1-AD
#07-q Position@029: Q039TA	#07 @035: s Y < 45 D2-Y
#08-q Position@031: Q041TB	#08 @037: s X < 100 D2-X
#09-q Position@033: Q043TC	#09 @045: R12 = 0 I2-focX
#10-q Position@039: Q053TA	#10 @046: R34 = 0 I2-focY
#11-q Position@041: Q055TB	#11 @047: R26 = 0 I2-AD
#12-q Position@043: Q057TC	#12 @059: s Y < 45 D3-Y
#13-q Position@053: Q062TA	#13 @061: s X < 100 I3-X
#14-q Position@055: Q064TB	#14 @069: R12 = 0 I3-focX
#15-q Position@057: Q066TC	#15 @070: R34 = 0 I3-focY
#16-q Position@063: Q076TA	#16 @071: R26 = 0 I3-AD
#17-q Position@065: Q078TB	#17 @080: s Y < 45 D4-Y
#18-q Position@067: Q080TC	#18 @082: s X < 100 D4-X
#19-q Position@074: Q084TA	#19 @093: R12 = 0 FP-focX
#20-q Position@076: Q086TB	#20 @094: R34 = 0 FP-focY
#21-q Position@078: Q088TC	#21 @095: R16 = 0 FP-XD

N iter = 10

**FIT**

Restore previous value

Exit

Help

Optics Settings (fast editing)

Show initial conditions

Beam Sigma Edit [#2]

Fit Options

Browse output file

Matrix Plot

Beam Sigma Plot [#2]

e\_A1900\_LISE\_2018.fit

c:/LISEcute/\_install/results/e\_A1900\_LISE\_2018.fit\_init

Save Print

chi2: Initial 0.0118576 LISE fit reduced values  
 chi1: Initial 0.501378 LISE fit reduced values

Parameters:	LeftBound	Initial	RightBound
#01-q: Q017TA	-1.0e+099	+1.048e+001	+1.0e+099
#02-q: Q019TB	-2.0e+001	-9.768e+000	+0.0e+000
#03-q: Q021TC	+0.0e+000	+7.057e+000	+2.0e+001
#04-q: Q031TA	+0.0e+000	+8.590e+000	+2.0e+001
#05-q: Q033TB	-2.0e+001	-1.058e+001	+0.0e+000
#06-q: Q035TC	+0.0e+000	+9.304e+000	+2.0e+001
#07-q: Q039TA	-1.0e+099	+9.320e+000	+1.0e+099
#08-q: Q041TB	-2.0e+001	-1.045e+001	+0.0e+000
#09-q: Q043TC	+0.0e+000	+8.573e+000	+2.0e+001
#10-q: Q053TA	+0.0e+000	+8.009e+000	+2.0e+001
#11-q: Q055TB	-2.0e+001	-1.063e+001	+0.0e+000
#12-q: Q057TC	+0.0e+000	+9.655e+000	+1.0e+001
#13-q: Q062TA	+0.0e+000	+9.661e+000	+2.0e+001
#14-q: Q064TB	-2.0e+001	-1.064e+001	+0.0e+000
#15-q: Q066TC	+0.0e+000	+8.009e+000	+2.0e+001
#16-q: Q076TA	+0.0e+000	+8.573e+000	+2.0e+001
#17-q: Q078TB	-2.0e+001	-1.044e+001	+0.0e+000
#18-q: Q080TC	+0.0e+000	+9.310e+000	+2.0e+001
#19-q: Q084TA	+0.0e+000	+9.122e+000	+2.0e+001
#20-q: Q086TB	-2.0e+001	-1.013e+001	+0.0e+000
#21-q: Q088TC	+0.0e+000	+8.261e+000	+2.0e+001
#22-q: Q098TA	+0.0e+000	+7.670e+000	+2.0e+001
#23-q: Q100TB	-2.0e+001	-8.789e+000	+0.0e+000
#24-q: Q102TC	+0.0e+000	+4.213e+000	+1.0e+001

---

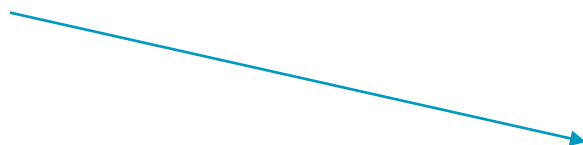
Constraint values:	Initial	Y-value	Precision	(Init-Des)/P	Desired
#01: Fit z19R	+9.749e+001	+1.000e+002	1.0e-001	+8.130e-004	< 100
#02: D1-Y	+3.983e+001	+4.500e+001	1.0e-001	+5.700e-005	< 45
#03: D1-X	+7.136e+001	+1.000e+002	1.0e-001	0	< 100
#04: I1-focX	-9.199e-006	-9.199e-006	1.0e-004	+9.199e-002	= 0
#05: I1-focY	-8.766e-005	-8.766e-005	1.0e-002	+8.766e-003	= 0
#06: I1-AD	-7.583e-005	-7.583e-005	1.0e+000	+7.583e-005	= 0
#07: D2-Y	+3.093e+001	+4.500e+001	1.0e+000	0	< 45
#08: D2-X	+7.795e+001	+1.000e+002	1.0e+000	0	< 100
#09: I2-focX	+3.369e-006	+3.369e-006	1.0e-003	+3.369e-003	= 0
#10: I2-focY	-1.004e-004	-1.004e-004	1.0e-002	+1.004e-002	= 0
#11: I2-AD	-1.839e-005	-1.839e-005	1.0e-001	+1.839e-004	= 0
#12: D3-Y	+3.033e+001	+4.500e+001	1.0e+000	0	< 45
#13: I3-X	+7.025e+001	+1.000e+002	1.0e-001	0	< 100
#14: I3-focX	-3.677e-006	-3.677e-006	1.0e+000	+3.677e-006	= 0
#15: I3-focY	-8.288e-005	-8.288e-005	1.0e-002	+8.288e-003	= 0
#16: I3-AD	-2.497e-005	-2.497e-005	1.0e-002	+2.497e-003	= 0
#17: D4-Y	+3.718e+001	+4.500e+001	1.0e+000	+4.030e-007	< 45
#18: D4-X	+7.006e+001	+1.000e+002	1.0e+000	0	< 100
#19: FP-focX	-4.300e-006	-4.300e-006	1.0e-003	+4.300e-003	= 0
#20: FP-focY	-1.627e-004	-1.627e-004	5.0e-001	+3.255e-004	= 0

//-----

// 14.7.6 06/08/20

// \* d\_Decay\_channelAnalysis dialog : DONE!

// working under "recently used files" class : 40%

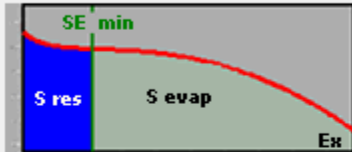


Decay Channel Analysis
✕

**Channels**

- 1n
- 2n
- 1p
- 2p
- alpha
- d
- t
- 3He
- Fission
- Break-up
- Initial

**Current mode: 1p -> [ (So total) evap ] / [ So total ]**



**Mode**

Absolute value

Ratio

**Value (selected channel)**

- S parent
- S residue
- S evap
- (So total) evap

**Take ratio to**

- S parent
- Si total
- Sr total
- So total

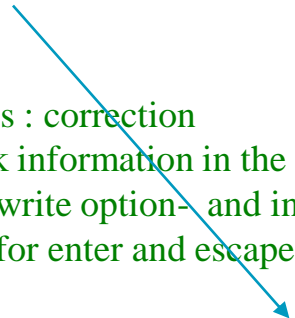
**Description**

SE min = minimum separation energy  
 S residue = residue cross-section from this channel  
 S evap = decay channel in the daughter nucleus from this parent channel  
 S parent = excitation function incoming from the parent nucleus  
 Si total = sum of all incoming (from parents) channels including Init CS  
 Sr total = sum of all outgoing (into daughters) channels  
 (So total) evap = decay channel into the daughter from ALL parent incoming channels

Fission and Break-up are only output channels; Init (AA) is only input channel

```
//-----
// 14.7.8 06/10/20
// d_MSP144 dialog : DONE!
// d_MSP144_det dialog : DONE!
```

```
// "recently used files" class : correction
// Update of "Rotate" block information in the LeftSetup Panel
// Update(porting) of read/write option- and ini- files
// d_Beam dialog : update for enter and escape keys, Ok & Cancel buttons
```



**MSP144** [X]

Registered particle

Particle:

Energy after stripper =  MeV/u

---

Focal plane detector

Detector:

Effective Length =  cm

---

FIND VALUE of

Distance X =  m  chan

Energy E =  MeV  MeV/u

Magnetic field B =  T

Coefficient =

Gas pressure to stop the particle at the end =  torr

**MSP144 focal detector** [X]

$X[m] = A * (X[chan] - X1) / (X2 - X1) + B$   
 $X1 < X[chan] < X2$  or  $B < X[m] < A+B$

X

Meters

Channels

A =  m

B =  m

X1 =  chan

X2 =  chan

// 14.7.9 06/11/20

// d\_Append\_block dialog : DONE!

// d\_Lise3\_angle dialog : DONE!

// menu "File->Append Blocks" : DONE!

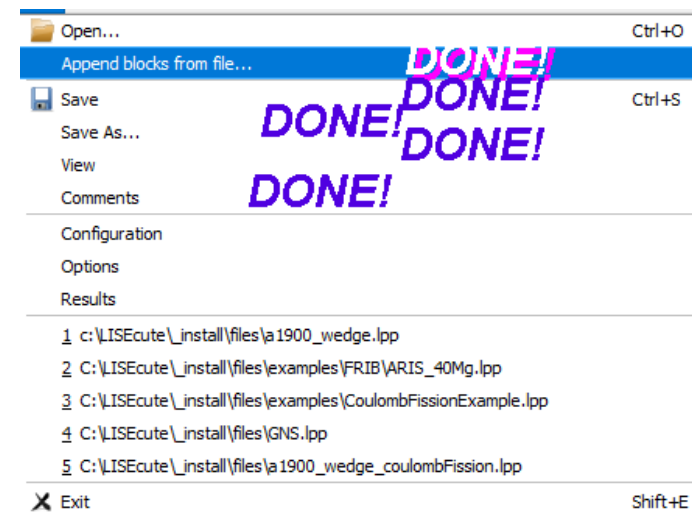
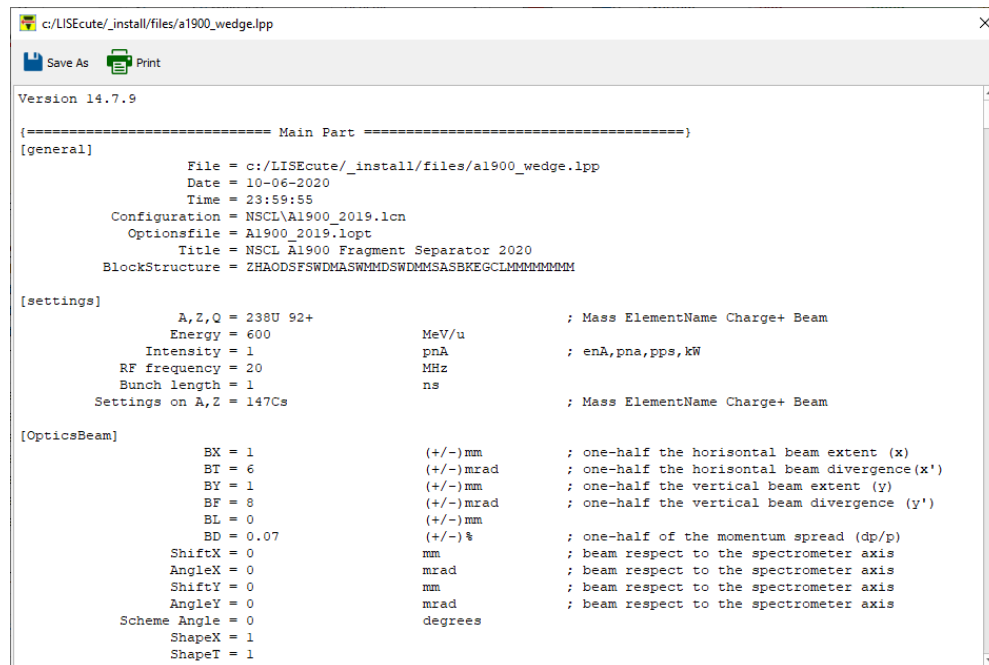
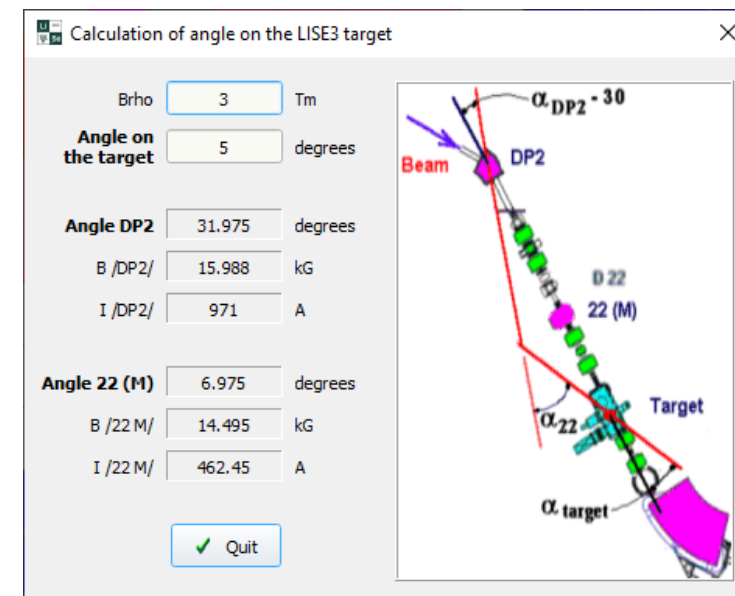
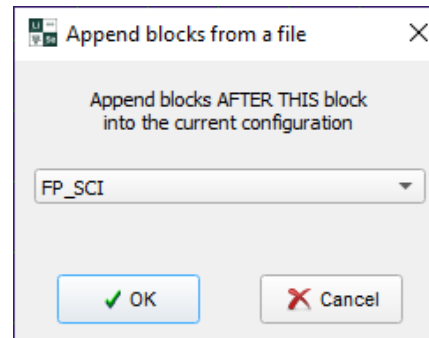
// menu "File->Save" : DONE!

// menu "File->SaveAs" : DONE!

// menu "File->View" : DONE!

// menu "File->Comments" : DONE!

// update of Read/Write subroutines (v.10) by v.13





# LISE dialogs porting status

06/03

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	Directory	Subdirectory	Dialog		re-Design, %	Link, %	DONE	Plots total	Plots done	Bench-mark		Comments		date	size	size done		
209	d_Uilities	Reaction	d_RCE		100	100	1	0						05/30/20	47274	47274		
210	d_Uilities	Reaction	d_ReactionCharacter		100	100	1	0						05/30/20	49303	49303		
211	d_Uilities	Solenoid	d_Solenoid											03/31/20	17507	0		
212	d_Uilities	Solenoid	d_Twinsol											03/31/20	65380	0		
213	w_Bi		d_BI											03/31/20	20524	0		
214	w_Converter		converter		100	100	1							03/31/20	64297	64297		
215	w_IsoTable		NuclideInfo		90	70	0.7							03/31/20	12906	9034.2		
216	w_Main		MainWindow		90	70	0.7							05/19/20	89905	62933.5		
217	w_Stuff		d_about											04/01/20	18415	0		
218	w_Stuff		d_FRIB_isotopes											03/31/20	3078	0		
219	w_Stuff		d_Password											03/31/20	2234	0		
220	w_Stuff		d_Transmission_statistics		100	100	1	0						05/28/20	60991	60991		
221	w_Stuff		d_Value_input		100	100	1							04/15/20	3401	3401		
222	w_Stuff		w_Gauge		100	100	1							03/31/20	5122	5122		
223																		
224		total		221		sum	108	48.9%							5.16E+06	3.21E+06	62.2%	
225		procent				completely done	96	43.4%										
226																		

06/11

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	Directory	Subdirectory	Dialog		re-Design, %	Link, %	DONE	Plots total	Plots done	Bench-mark		Comments		date	size	size done		
218	w_Stuff		d_Password											03/31/20	2234	0		
219	w_Stuff		d_Transmission_statistics		100	100	1	0						05/28/20	60991	60991		
220	w_Stuff		d_Value_input		100	100	1							04/15/20	3401	3401		
221	w_Stuff		w_Gauge		100	100	1							03/31/20	5122	5122		
222																		
223		total		220		sum	126	57.3%							5.15E+06	3.42E+06	66.5%	
224		procent				completely done	110	50.0%										

