

**v.15**  
**12/30/20**

- Ported**  
(without satellites)
- 224 dialogs
  - 116 plots
  - 587 cpp-files
  - 13 c-files
  - 418 h-files

The LISE<sup>++</sup> package has been ported to Qt-framework for compatibility with multiple operating systems. The benefits include 64-bit operation, cross-platform compatibility (Windows, macOS, Linux), and the ability to take advantage of future computational improvements.

LISE<sup>++</sup> version 15, created using the Qt framework, is named LISE<sup>++</sup><sub>*cute*</sub> to indicate a new generation different from the previous LISE<sup>++</sup> Borland-based versions. Pronunciation: still [lis plʌs plʌs] or [lis kyo̯o̯t̪].

In the near future, the creation of a LISE<sup>++</sup><sub>*core*</sub> library will be undertaken. This library will allow to integrate LISE<sup>++</sup> calculations within control systems, in order to directly assist the tuning of fragment separators. This functionality will be tested at FRIB and FAIR. For example, the direct integration of LISE<sup>++</sup> software with the ARIS controls at FRIB will enable operators to update inputs to calculations based on experimental measurements.



Nuclear Instruments and Methods in Physics Research B 376 (2016) 168–170

## 2016

Plans for performance and model improvements in the LISE<sup>++</sup> software  
 M.P. Kuchera, O.B. Tarasov, D. Bazin, B.M. Sherrill, K.V. Tarasova

## 2020

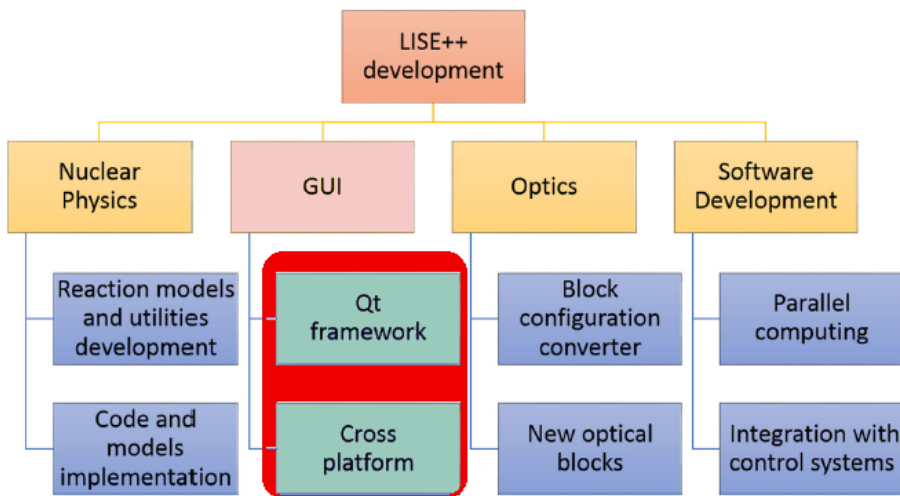


Fig. 1. A schematic diagram of the LISE<sup>++</sup> development plans.

The LISE<sup>++</sup> software suite is undergoing a major transportation to a new graphics framework in order to support modern compilers and computing methods.

**Qt framework.** For compatibility with future operating systems, the graphics framework is being transported to Qt. Benefits include provisions for 64-bit operation, cross-platform compatibility, and the ability to take advantage of computational advances. Qt was chosen as the graphics framework based on its cross-platform capabilities, large feature set, and widespread use in cross-platform C++ applications. Qt is a package of C++ graphics libraries that has great benefits for developing applications for nearly all operating systems and devices. The code remains essentially identical for all platforms, which allows for easy compilation of executable programs for any operating system or device. We will release Windows, Mac, and Linux versions of the software.

## Version availability

- Windows: 12/30/20
- macOS: 12/30/20
- Linux: 12/30/20

## Contact for operations

- TARASOV@FRIB.MSU.EDU
- BAZIN@FRIB.MSU.EDU
- ZHANGT@FRIB.MSU.EDU

Help	
Documentaton	
Production of Fast Rare Ion Beams (lectures)	
Check for new version	
Contact to us (e-mail)	General questions, Reaction mechanism
Register now	Operations in MS Windows
Our web-sites	Operations in Mac OS
Partner sites	Operations in Linux(UNIX)
Update My Documents\LISE with last installation	
View of spectrometer	
Periodic Table of Elements	
About ...	

[lise.nsl.msu.edu/download/](http://lise.nsl.msu.edu/download/)

## Index of /download

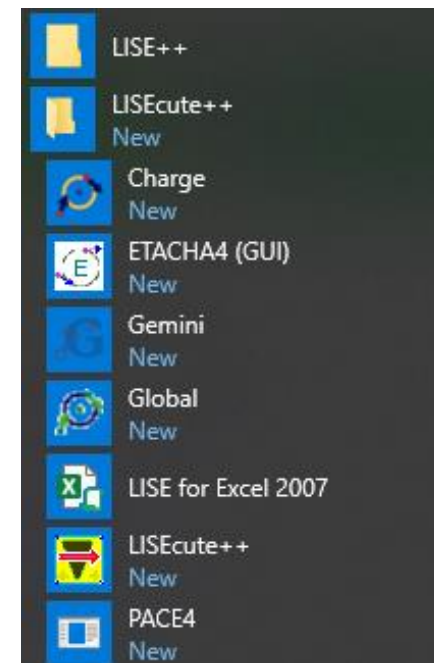
<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
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 <a href="#">Parent Directory</a>		-	
 <a href="#">Linux/</a>	2020-12-12 03:48	-	
 <a href="#">Windows/</a>	2020-12-26 11:39	-	
 <a href="#">macOS/</a>	2020-12-11 13:55	-	
 <a href="#">other/</a>	2019-09-16 12:41	-	

<http://lise.nsl.msu.edu/download/>

LISE<sup>++</sup><sub>cute</sub> as 64-bit code is installed in “/Program Files/LISEcute” folder, that allows to keep the previous Borland version in “/Program Files (x86)/LISE” folder.

	LISE <sup>++</sup> <sub>cute</sub> (64 bits)	LISE <sup>++</sup> (32 bits)
Versions:	≥ 14	≤ 13
Icon on Desktop :	LISEcute <sup>++</sup>	LISE <sup>++</sup>
Folder in Program Files :	LISEcute	LISE
App name in Program Files:	LISE <sup>++</sup> .exe	LISE <sup>++</sup> .exe
Folder in Documents :	LISEcute	LISE
Folder in StartUp menu:	LISEcute <sup>++</sup>	LISE <sup>++</sup>
Associations with lpp & lcn files	Yes	No



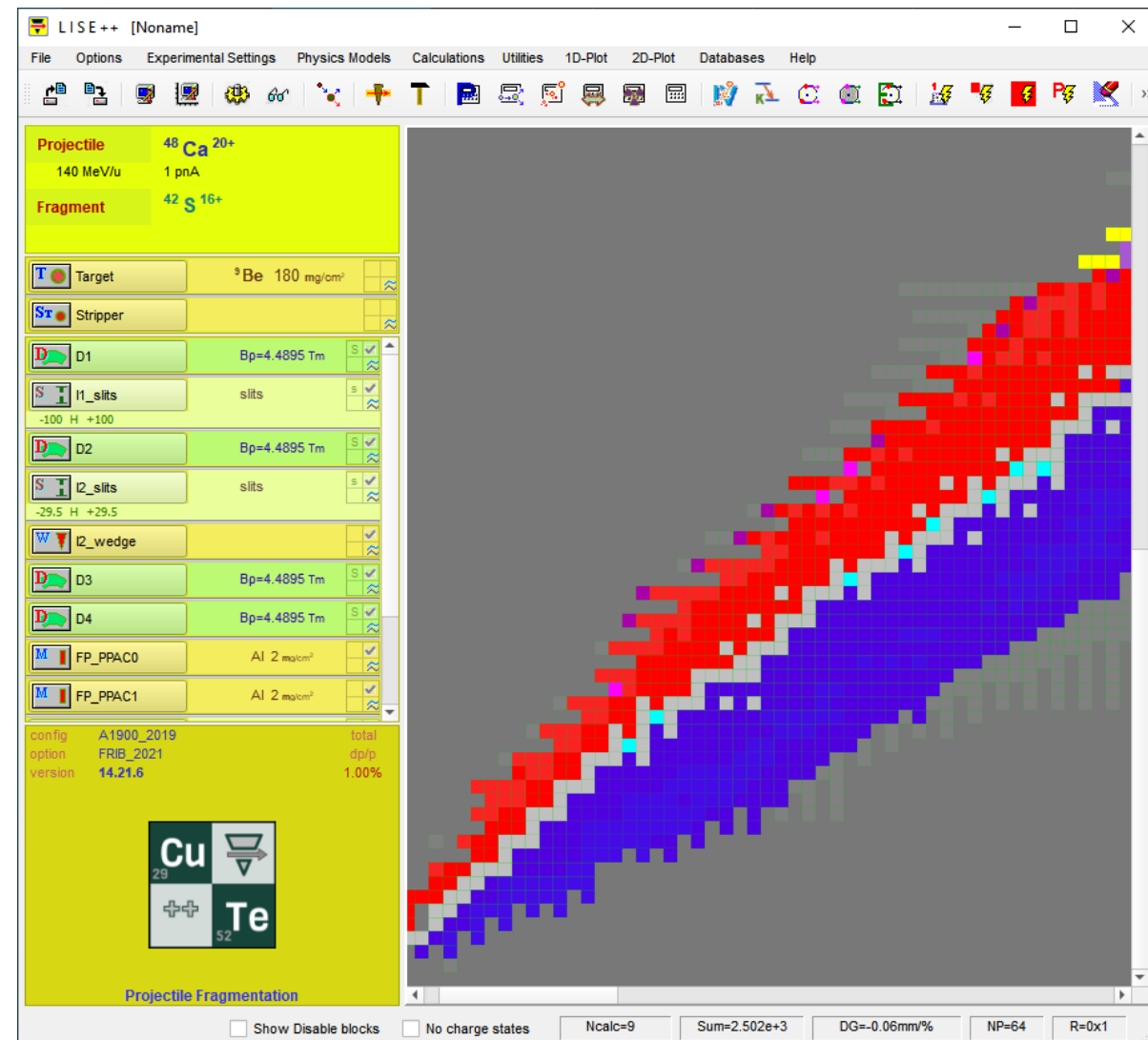
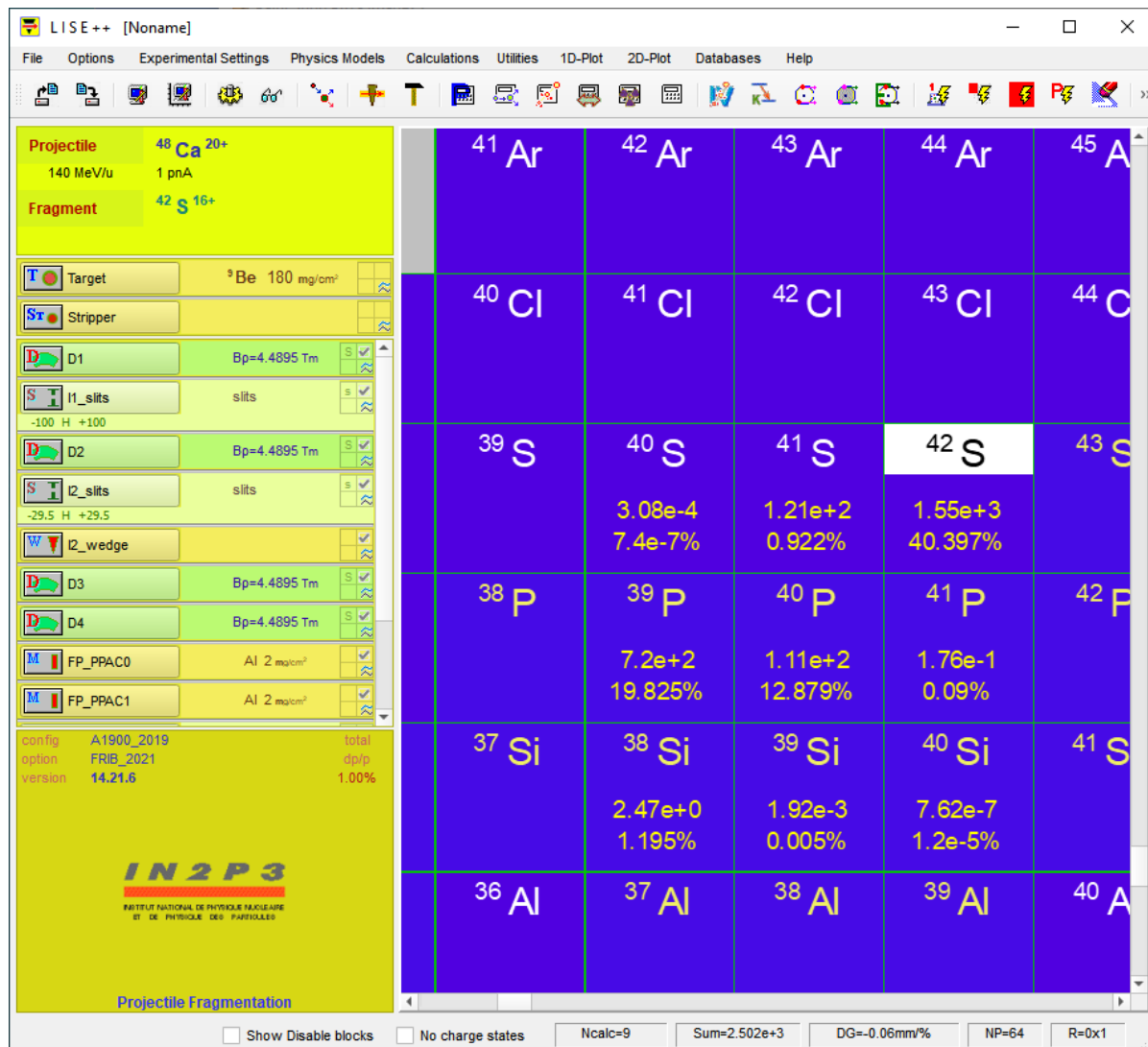
by D.Bazin

- LISE<sup>++</sup><sub>cute</sub> is installed as a macOS app bundle that can be placed anywhere.
- However, it is recommended to place the LISE<sup>++</sup> app bundle in the “Applications” folder.
- When starting LISE<sup>++</sup><sub>cute</sub> for the first time, a working folder named “LISEcute” is created in the “Documents” folder if it doesn’t exist.
- This version has been tested on Catalina (10.15.7) as well as High Sierra (10.13.6)
- Some caveats and details specific to the macOS implementation.
  - LISE<sup>++</sup><sub>cute</sub> doesn’t display well in dark mode (work in progress).
  - When used on a laptop, it is preferable to use an external mouse rather than the trackpad: the zoom in and out actions are difficult to control.
  - A mouse with clickable wheel is the best choice: click wheel to calculate isotope, double-click to erase calculation.
  - The default font size might be too small: please change it in the preference panel (size 12 seems to work best on macOS).

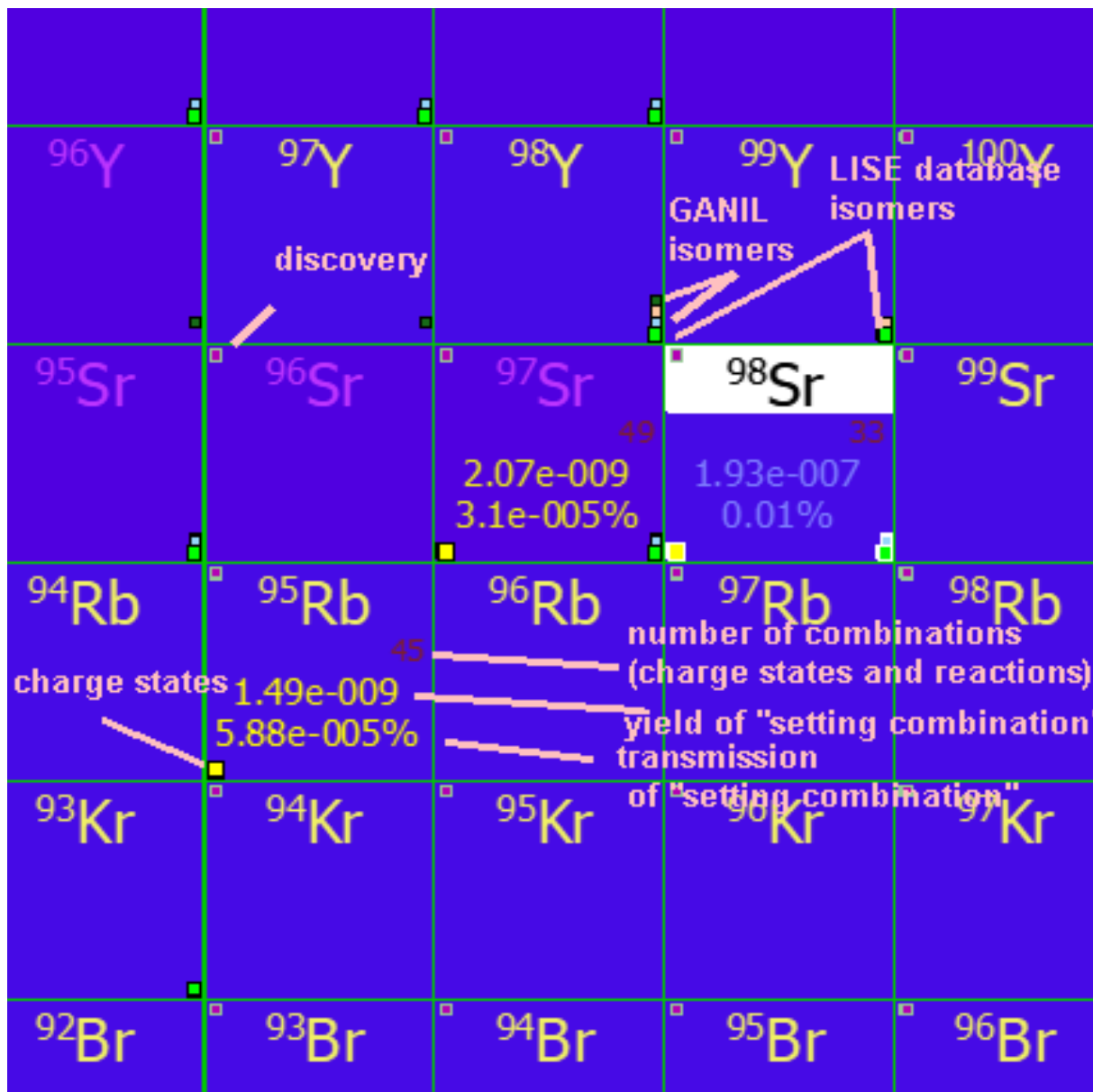
by T.Zhang

- Tested on Debian Buster (10), distributions released later than Ubuntu Xenial (16.04) should work as well
- Run with self-extractable script:
  - Download lise-<version>.run file, `chmod +x lise-<version>.run` if it is not runnable
  - Type `./lise_<version>.run` in the directory where the file is
  - Get into the new created folder 'lise-app' and type `./run_lise.sh` to start
- Run with Debian package (for Debian, Ubuntu, etc.)
  - Install lise-app\_<version-string>.deb by `dpkg -i` or by double-clicking on Ubuntu (Debian may need extra packages)
  - Menu entry named LISE++ should appear in your system menu, or type `lise++` in the Terminal to start LISE<sup>++</sup><sub>cute</sub>
- Known issues:
  - Dialogs pop up from the sub-controls in device setting dialog appear behind

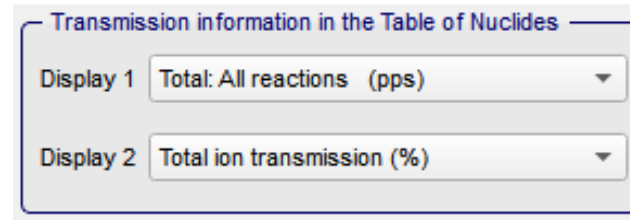
## Zooming In / Out : mouse wheel rotation



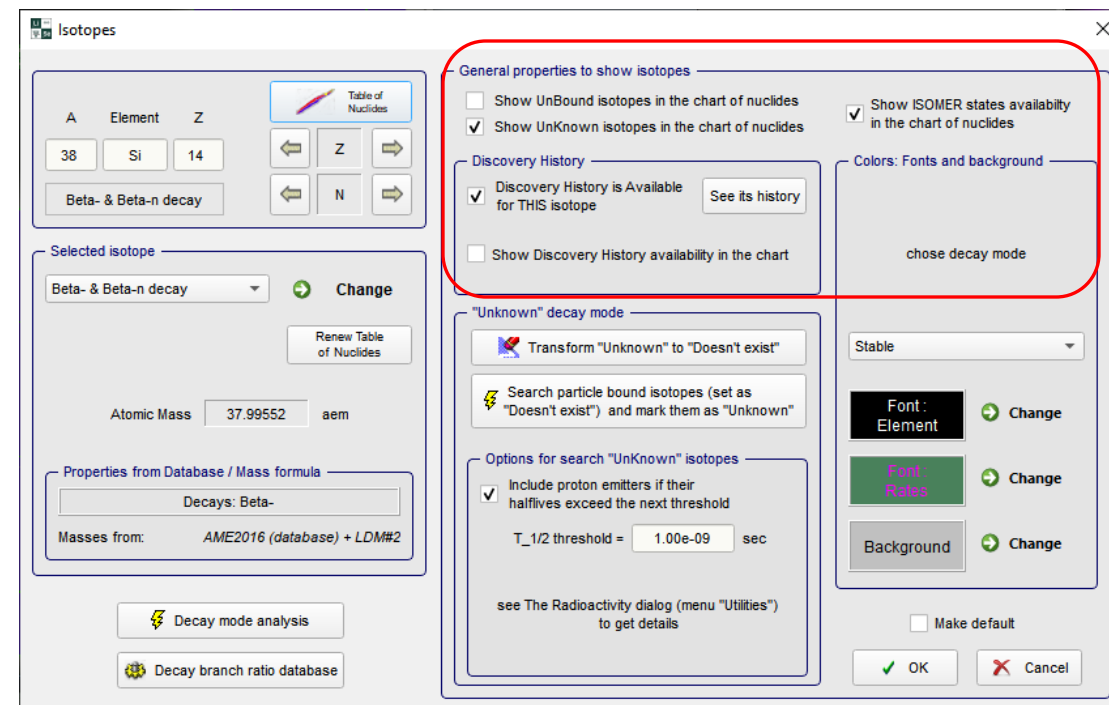
button	click	action
Left	single	drag mode (press and release)
Left	double	show database information
Middle	single	calculate transmission (no transmission statistics window)
Middle	double	clear transmission information of this isotope
Middle	rotation	zoom in/out
Right	single	calculate transmission, show transmission statistics window
Right	double	calculate transmission, show transmission statistics window, and then close

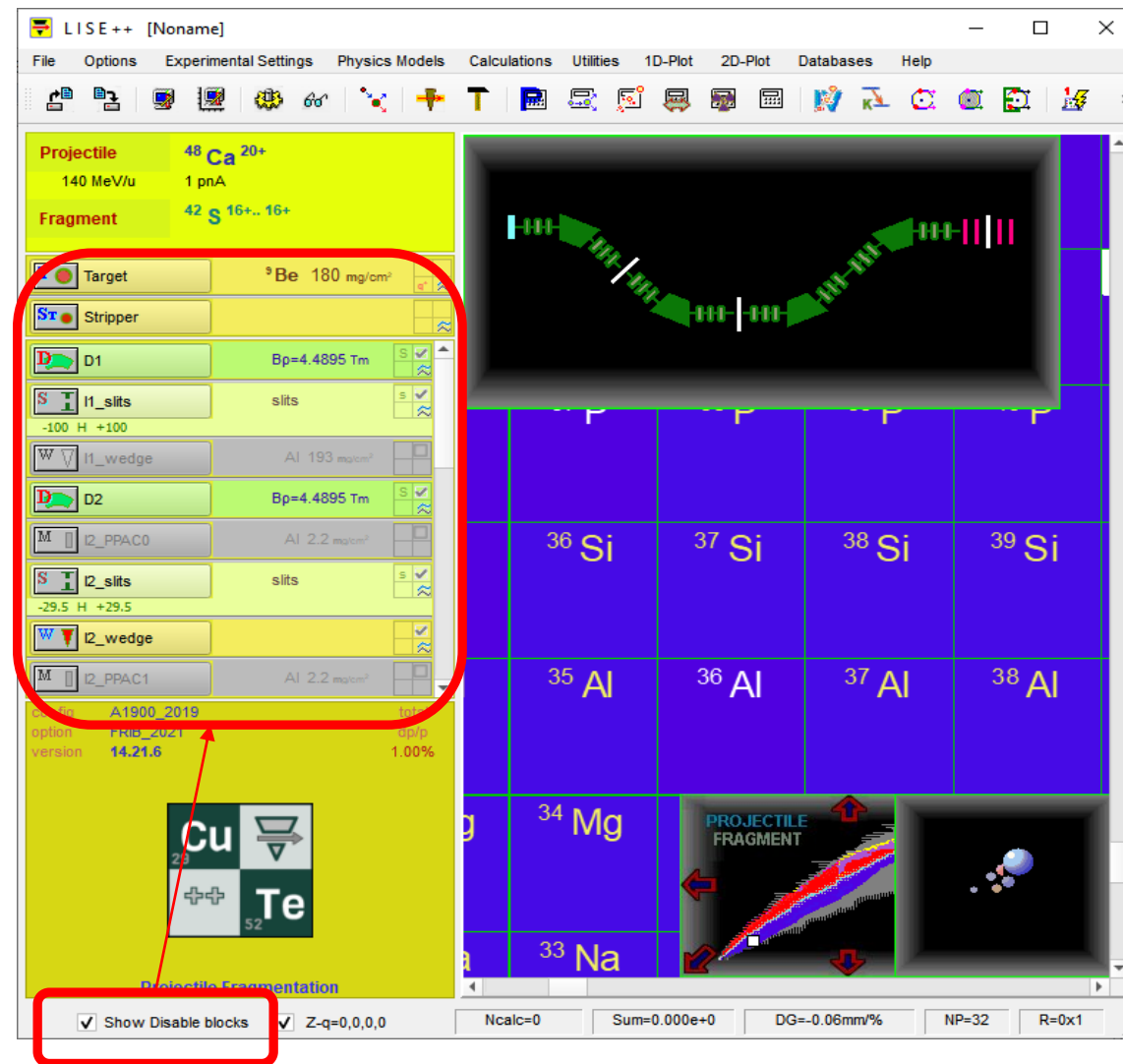
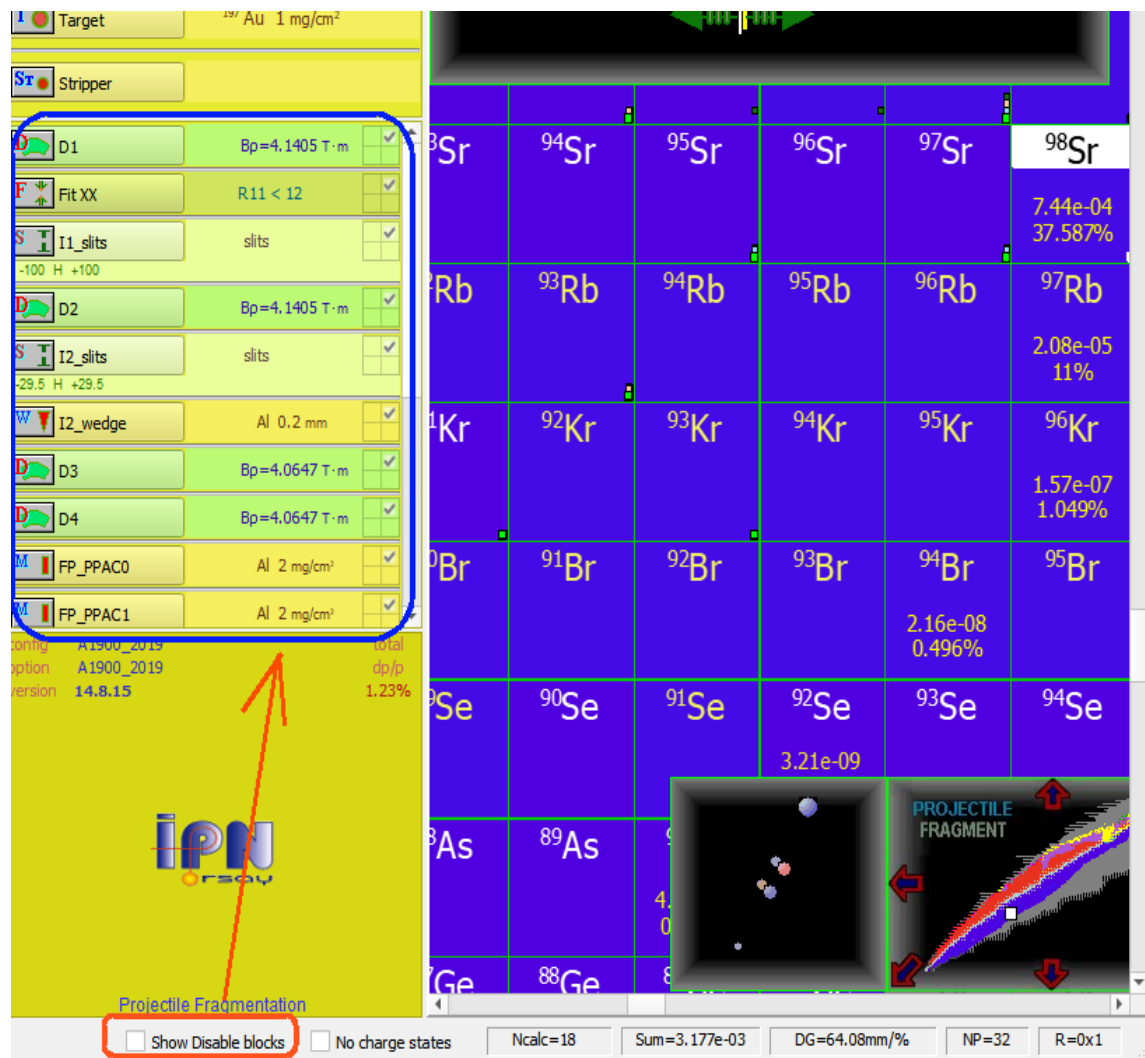


## Preference dialog in Options menu

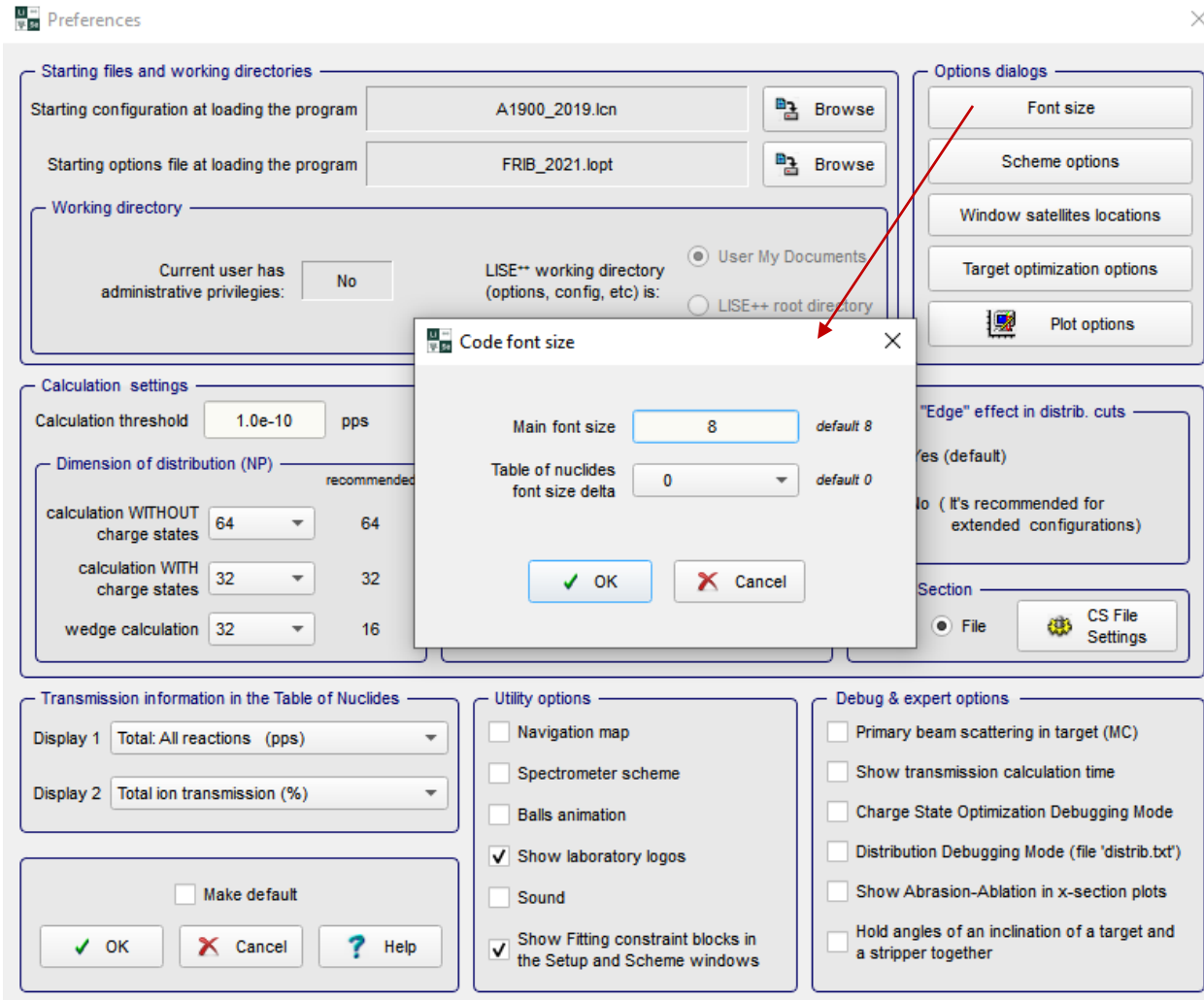


## Isotopes dialog in Options menu





Show Disable blocks
  No charge states
 Ncalc=18
 Sum=3.177e-03
 DG=64.08mm/%
 NP=32
 R=0x1



or editing “lisepp.ini” file  
(by default after installation in Documents/LISEcute/)

```
lisepp - Notepad
File Edit Format View Help
[[font]
size=9
table=0
```

After it is necessary to reload the application

1. select by mouse a range of blocks

2. click "Array operations" ×

**Spectrometer design**

Block	Given Name	Z-q	Length, m	Enable
Stripper	Stripper			<input checked="" type="checkbox"/>
Delay	Delay 1		0	<input type="checkbox"/>
Shift	Shift 1		0	<input type="checkbox"/>
Rotate	Rotate 1		0	<input type="checkbox"/>
Dipole	D1	0	8.719	<input checked="" type="checkbox"/>
Fit	Fit XX		0	<input checked="" type="checkbox"/>
Drift	I1_slits		0	<input checked="" type="checkbox"/>
Wedge	I1_wedge			<input type="checkbox"/>
Dipole	D2	0	8.767	<input checked="" type="checkbox"/>
Material	I2_PPAC0			<input type="checkbox"/>
FaradayCup	FaradayCup 1			<input type="checkbox"/>
Drift	I2_slits		0	<input checked="" type="checkbox"/>
Wedge	I2_wedge			<input checked="" type="checkbox"/>
Material	I2_PPAC1			<input type="checkbox"/>
Material	I2_SCI			<input type="checkbox"/>
Dipole	D3	0	8.767	<input checked="" type="checkbox"/>
Drift	I3_slits		0	<input type="checkbox"/>
Wedge	I3_wedge			<input type="checkbox"/>
Dipole	D4	0	9.39	<input checked="" type="checkbox"/>
Material	FP_PPAC0			<input checked="" type="checkbox"/>

**Selected block**

Enable  Dispersive (M-dipole)

Let call automatically  Block Length [m] 8.719

Block name = D1 Length after this block [m] 8.719

Charge State (Z-Q) = 0 Sequence number 6

**Total**

Number of Blocks 39

Length [m] 52.793

**Operations with block arrays**

Operations:

- make Enable
- make Disable
- Delete
- Copy
- Move

Array definition:

First (or Last) Block of Array D1

Last (or First) Block of Array D4

Number of blocks in the Array = 15

Execute Quit

3. The selected range appears in "Operation with block arrays" dialog

## Reactions

<b>Projectile</b>	208 <b>Pb</b> 82+	<b>beam</b>
100 MeV/u	400 kW	
<b>Fragment</b>	208 <b>Pb</b> 82+.. 82+	
Projectile Fragmentation		

<b>Projectile</b>	208 <b>Pb</b> 82+	<b>beam</b>
100 MeV/u	400 kW	
<b>Compound</b>	217 <b>Rn</b>	
<b>Fragment</b>	208 <b>Pb</b> 82+.. 82+	
Fusion → Residual		

<b>Projectile</b>	208 <b>Pb</b> 82+	<b>residue</b>
20 MeV/u	400 kW	
<b>Compound</b>	212 <b>Po</b>	
<b>Fragment</b>	208 <b>Pb</b> 82+.. 82+	
Fusion → Residual		

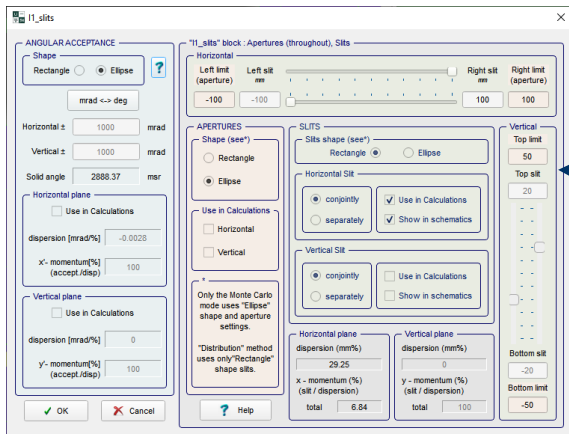
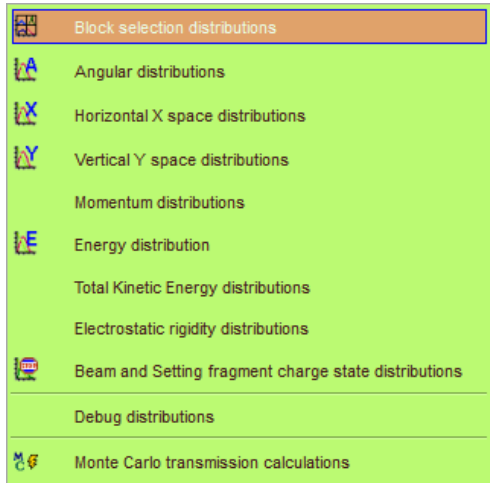
## “Secondary Target” Production material

<b>T</b> Target	<sup>9</sup> Be 10 μm	
<b>Str</b> Stripper		
<b>D1</b>	Bp=4.1531 Tm	S ✓
-129 H +129		
<b>F</b> Fit XX	R11 < 12	e ✓
<b>S I</b> I1_slits	slits	e ✓
-100 H +100		
<b>D2</b>	Bp=4.1531 Tm	S ✓
<b>S I</b> I2_slits	slits	S ✓
-150 H +150		
<b>W</b> I2_wedge	Al 1 mm	✓
<b>D3</b>	Bp=4.0353 Tm	S ✓
<b>D4</b>	Bp=4.0353 Tm	S ✓

## New class "ClickableLabel"

<b>Projectile</b>	208 <b>Pb</b> 82+	
100 MeV/u	400 kW	
EERs: <sup>195</sup> Au*(186) <sup>194</sup> Re*(310)		
<b>Fragment</b>	157 <b>Sm</b> 62+.. 62+	
config A1900_2019		Total
option A1900_2019		dp/d
version 14.13.11		8.82%
Abrasion-Fission (Mid Ex)		

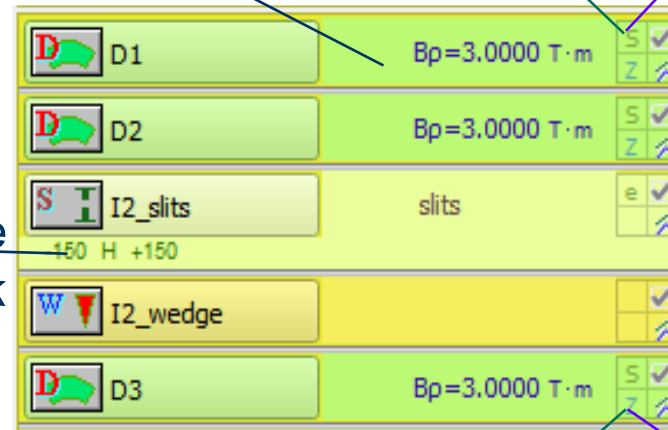
*all these labels are clickable*



Right mouse button click

Compound block:  
G – gas

Optical block:  
S,s – section  
E,e – element



Left mouse button click

MC plots after this block

Block Enable/Disable

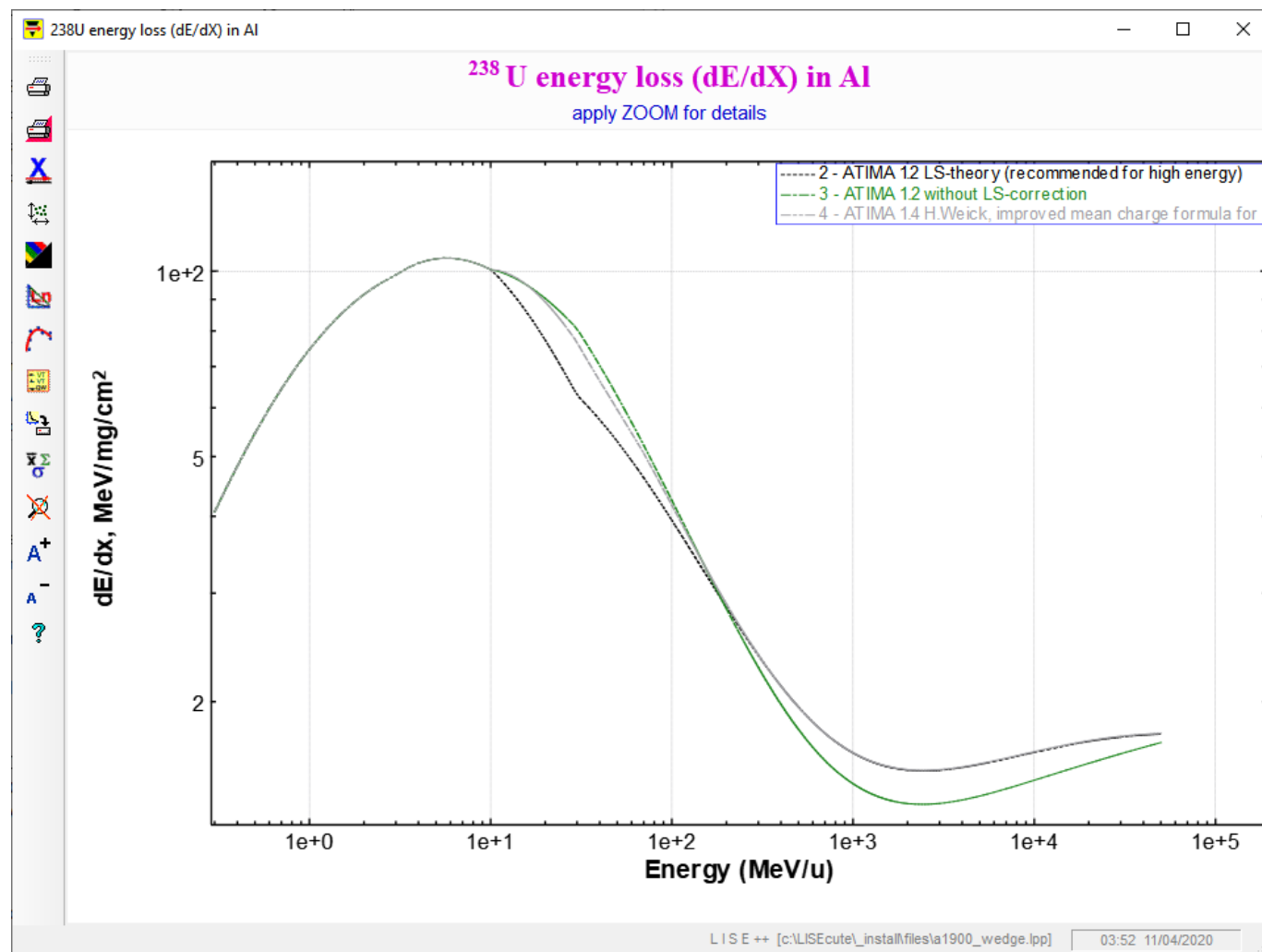
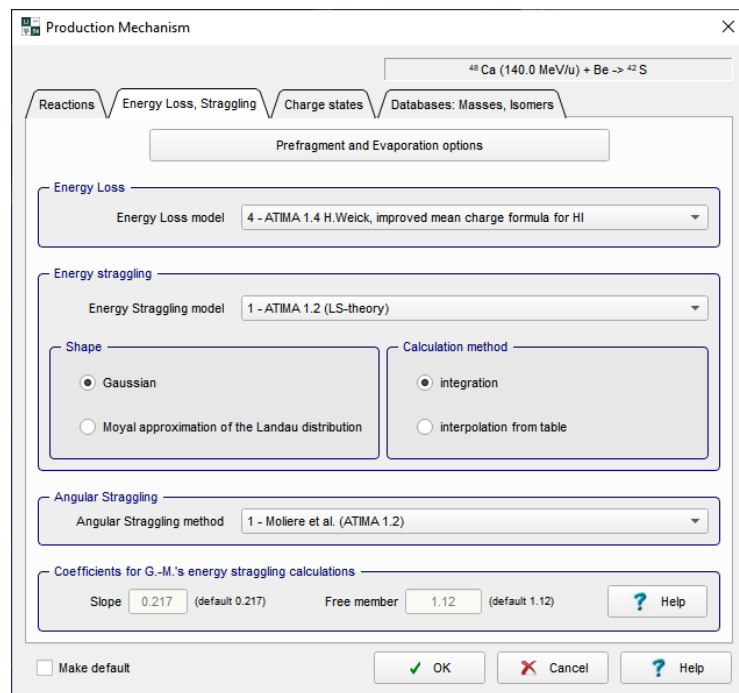
Optical block:  
Z – COSY map  
f – used in optics minimization

Compound block:  
q+ – use in Q-state calculations

## Implementation of ATIMA1.4 (catima1.5)

Complete agreement with ATIMA14 site results were obtained

ATIMA 1.4 is set as default Eloss model in version 15



Acknowledgements to Drs. H.Weick and A.Prochazka

Monte Carlo calculation of fragment transmission

What isotope transmission to calculate?

One fragment of interest. Chose manually here  
 Group of isotopes already calculated by the Distribution method  
 List of isotopes from file to produce inside target  
 Input ions rays from file emitted from target

X-coordinate: After BLOCK  
 Y-coordinate: After BLOCK  
 Gate 1:

lise.nsci.msu.edu/MClinks.htm

LISE<sup>++</sup> Monte Carlo documentation links

Topic	details	Version, date
<a href="#">Monte Carlo calculation of fragment transmission</a>		8.0 04-05-07
<a href="#">Energy deposition in materials (Monte Carlo solution)</a>		8.0.29 21-09-07
<a href="#">High order optics in LISE<sup>++</sup></a>		8.3.158 04-09-09
<a href="#">Monte Carlo: Isotope Group</a>	isotope group, writing to file, new MC features	8.5.34
<a href="#">Monte Carlo simulation upgrade</a>	Gates, rays generator, transmission statistics, envelopes, new features	9.1.19 09-08-10
<a href="#">Use of Apertures in MC calculations</a>	Bounds, apertures	9.2.97 12-05-11
<a href="#">New features of Monte Carlo calculations</a>	New fields (A,Z,...), locations in MC file, input ion rays	9.6.29 19-04-13
<a href="#">Discussion of configurations in LISE<sup>++</sup></a>	Using Quad & Dipole fast editing dialog, concept of "Tuning" dipole, Definition of the cuts by the block, ..	9.9 30-12-14
<a href="#">Rays file generation in LISE<sup>++</sup> for reverse configurations</a>		10.0 18-11-16

A Element Z  
 42 S 16  
 Beta-decay

Charge states: 16+ D1

Reaction mechanism: Projectile Fragmentation

MC trar

"Distribution" calculation  
 MC calculation to file  
 Monte Carlo calculation (2D-plot)

Velocity: Velocity\_Z [cm/ns]  
 Ion parameter (M, Z, q...): A (mass number)

NEW: Using detector resolution in the MC ray generator (MC file) for Detector (material) blocks

Rays generator

Setting Fragment: 40 p 15+.. 15+ Projectile Fragmentation

Locations: Number of locations = 3

Fields: Number of fields = 10

Rays: Number of Rays = 100

Gate: no gate

Field to Plot: X-axis X [mm], Y-axis dP/P [%]

after BLOCK: FP\_PIN

Output Ray file: MC\_LISE.ray

Detector resolution info:  Make default

File format: Field separator = tab,  Header (settings, field names),  Column for event number

Run

Exit

Rays generator: resolution of detectors

**Resolution of detectors can be used in the Rays generator for detector locations starting v. 14.20.8.**

Preliminary the corresponding checkboxes should be set on in the MC options dialog.

**for Energy loss, TKE, and ToF:**

- ✓ Use energy and time resolution of detectors for TOF, Energy loss, and TKE values

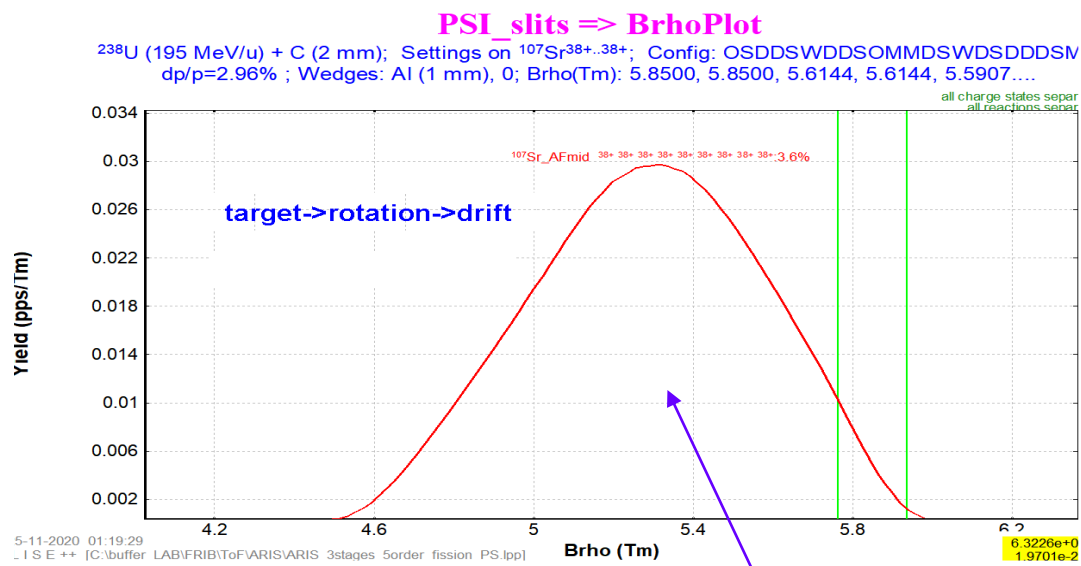
**for X and Y**

- ✓ Use spatial resolution of detectors for X and Y values

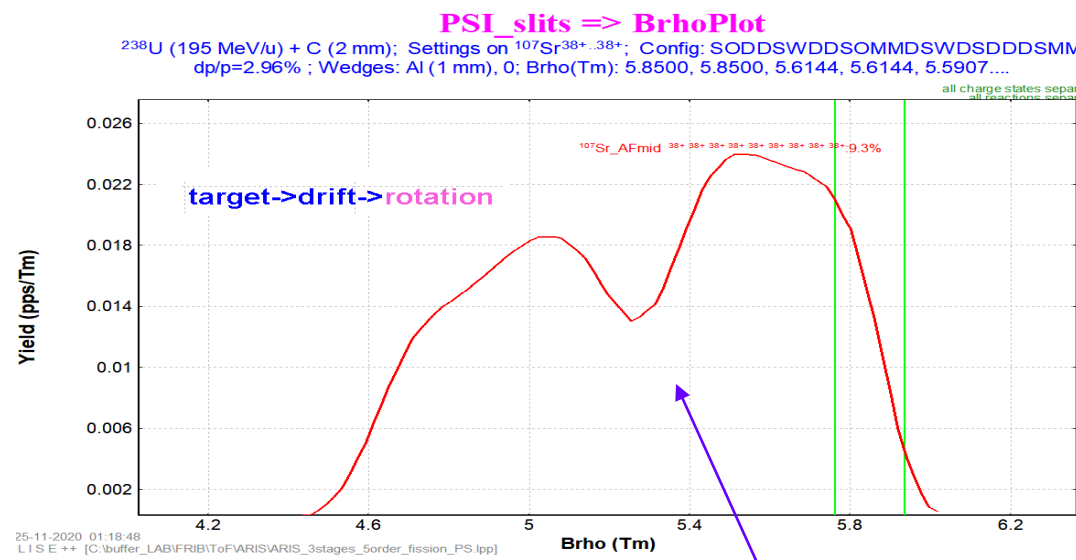
**Pay attention:**

- ⚠ No resolution will be taken into account if the selected block is optical or wedge.
- ⚠ Only energy resolution of first detector after the selected block will be taken into account for TKE value.
- ⚠ RF timing resolution is not used in the Rays generator. Only in Monte Carlo plots

1. Takes only place if the rotation block is located just after target in the Fission mode
2. In ARIS configuration the “dummy dipole” is used to be after a target, it is a reason why this bug was not observed.
3. The bug was fixed in version 14.
4. Bug’s origin is DF-energy distribution in the D4-distribution class



wrong



correct

Borland versions ( $\leq 13$ ) is not longer supported.  
Bugs in these versions will only be fixed in LISE<sup>++</sup><sub>cute</sub> ( $\geq 14$ )

lise.nslc.msu.edu/porting/porting\_team.html

**LISE<sup>++</sup>**

Overview

Utilities ▾

Download

Team

## The LISE<sup>++</sup> Transportation Team

Members working on the transportation of the LISE<sup>++</sup> Software Suite to Qt.

<b>D. Bazin</b>	physics & ion optics consulting, benchmarks, adaptation to macOS
<b>M. Hausmann</b>	physics & ion optics consulting, benchmarks
<b>M. Kuchera</b>	source porting, development of porting process base
<b>P. Ostroumov</b>	supervision, funding acquisition
<b>M. Portillo</b>	physics & ion optics consulting, benchmarks
<b>B. Sherrill</b>	supervision, funding acquisition
<b>O.B. Tarasov</b>	leading porting process worker
<b>K.V. Tarasova</b>	source porting, benchmarks
<b>T. Zhang</b>	process administration, IT consulting, adaptation to Linux

[http://lise.nslc.msu.edu/porting/porting\\_team.html](http://lise.nslc.msu.edu/porting/porting_team.html)

NEXT

Creation of LISE<sup>++</sup><sub>core</sub> library