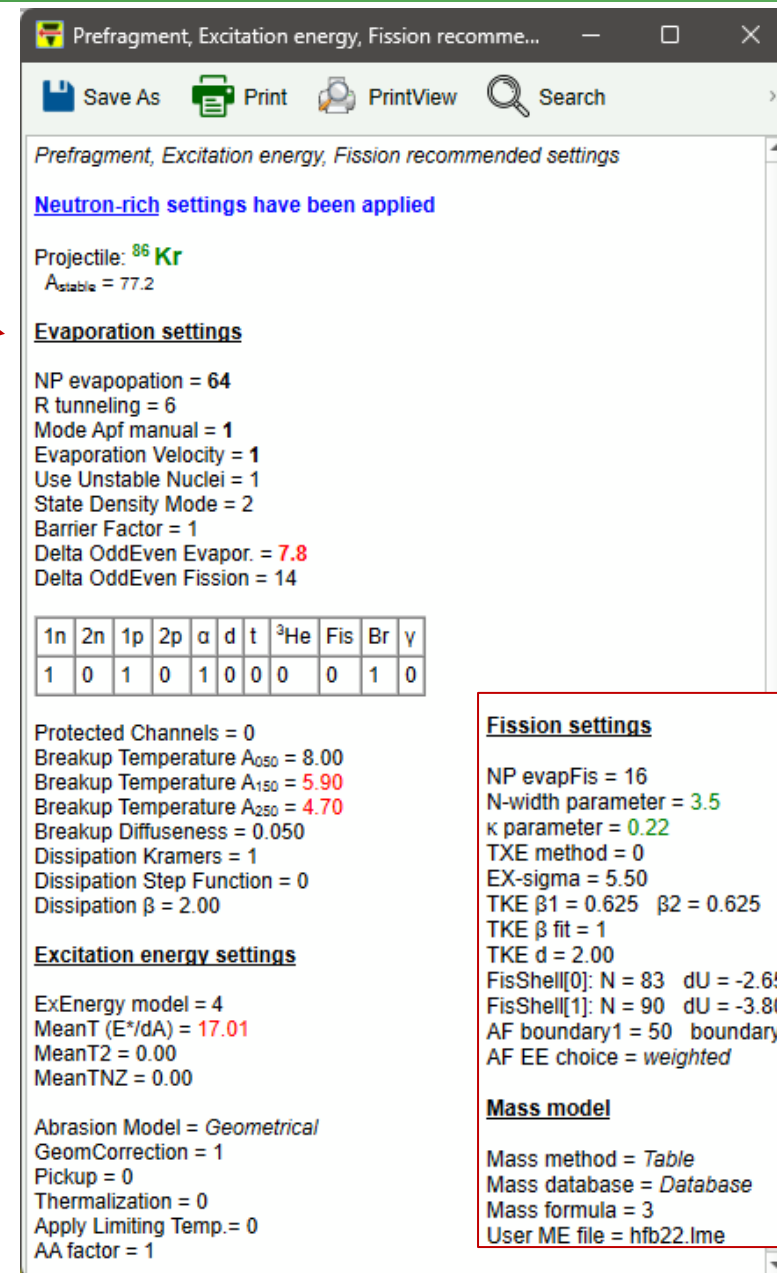
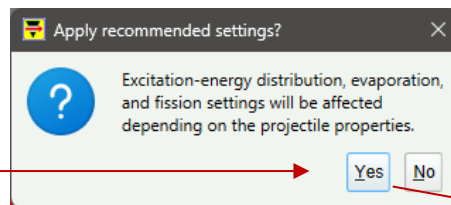
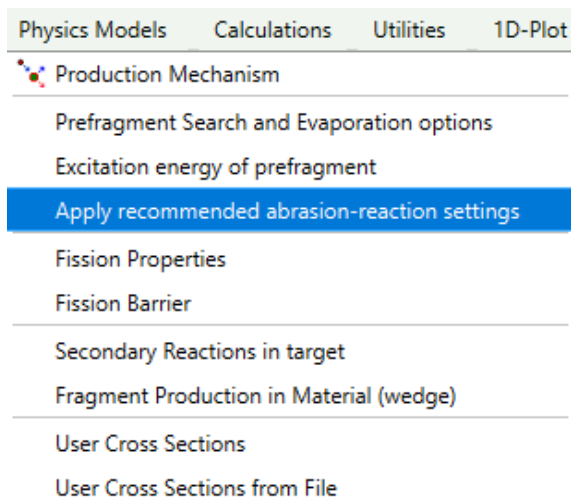


From 11/26/25

- Recommended abrasion-reaction settings
- AA Minimization / Cross-Section Systematics
- Fission Model Improvements (N-width, κ , curvature smoothing)
- FRACS / SPACS / Reaction Models
- Graphs / UI Enhancements
- Data / Publications / Tables
- Miscellaneous & Integration



- The **Excitation-Energy #4** (“Tmean”) model is selected as the primary option
- Parameters shown in **red** depend on the **beam properties**
- The **fission channel** is enabled for $Z > 70$
- Several parameters were predefined based on the recent AA analyses using ^{82}Se , ^{78}Kr , and ^{124}Xe data
- The tunneling radius $R_{\text{tunneling}}$ is now fixed to **6 fm** instead of using the previous $f(A)$ dependence
- The former “**auto**” mode has been removed
- The default distribution dimension (**NP**) is set to **64** for evaporation and **16** for fission

Mass-Model Warning Behavior

- A warning message appears when:
- **AME** mass model is selected
- **LDM** is chosen as the primary approach
- The **old LDM** model is activated to assist with unknown masses

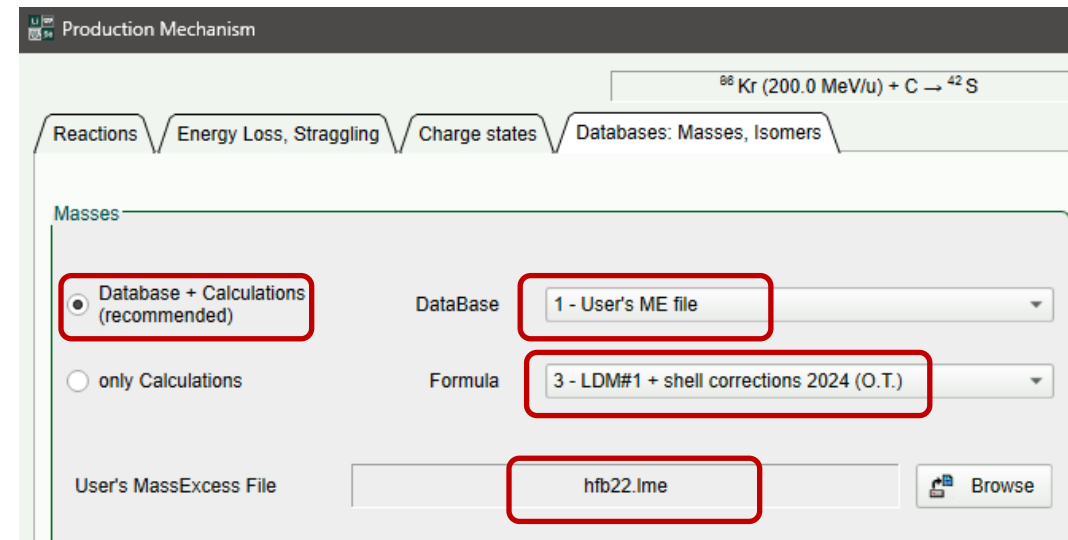
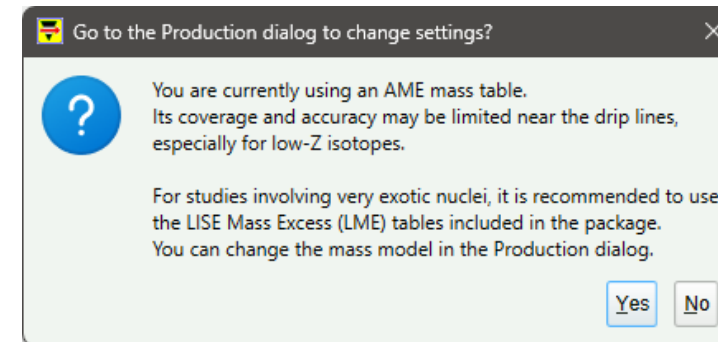
Reason:

AME tables are based on *measured* masses, and their predictive performance becomes unreliable near the **drip lines**.

LISE therefore displays a warning when AME/LDM is used in these regions.

Recommendation:

Recent cross-section analyses indicate that the **HFB-22** mass table provides the most reliable results near the drip lines.



We (Oleg, Shane, and Isaiah) are still actively finalizing parameter adjustments prior to the release of **version 18**. At this stage, the expected release timeline has been **postponed to January–February 2026**.

- AA minimization dialog: odd-even Δ display, CS plots (17.16.16–22)
- Enable/disable Δ parameters in prefragment dialog
- New penalty $\log(v_0/v_1)$ for CS minimization
- Strong revision of CmPlotCS_chi; soft pow10 introduced (17.16.23–32)
- New AA minimization options:
 - show results,
 - penalty for unbound nuclei (17.17.0–8)
- ENTER-key support in AA minimization dialog (17.17.9–14)

User Cross-Section analysis using the Abrasion-Ablation model : MINIMIZATION ==> Tmean_auto_hfb22_2t_np64.mfit

AA minimization Settings

Variable

Use in Fitting process

Use Bounds constraints

Lower bound

Upper bound

ExE <T>, model #4

Exponent

k_1 (base)	k_2 $(\Delta A)^2$	k_{Nz} $(\Delta N - \Delta Z)$
14.65878	-0.2559	0.16392
☒	☒	☒
☒	☒	☒
10	-0.5	-0.4
16	0.2	0.4

Common parameters

AA X-sections

Amplitude factor

1.0987

☒

☒

0.5

1.5

dR correction

"manual" Eff. C.B.

6

☐

☒

4

6.5

new

Odd-Even

delta Evaptn

8.355

☒

☒

5

12

Break-up channel parameters

Limiting temperature

T_{lim} @ A=050	T_{lim} @ A=150	T_{lim} @ A=250
8	6	4.7005
☐	☐	☐
☒	☒	☒
3	2	1
15	10	5

Local line to analyze

Z = 30

Calculate down to Z = 26

Universal analysis value

Weights

	χ^2	LoD
Local	0.1	2
Global	0.2	4

☒ Use experimental CS errors in analysis

☒ Use Reduced chi-square (divide by "n-p")

if exp.error is absent, then error=coef*CS, where coef is 0.5

Fitting

N iterations = 50

☒ Plot Product values from the chi2-table

Target value = 2.60e+00

Number of user CSs = 9(81)

☐ Show intermediate results

Operations

This utility can be used if—

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

Analysis Log-file

☐ Show Log-File after analysis is complete

Tmean_auto_hfb22_2t_np64

Cascade Info & Dialog operations

Press "Escape" to interrupt the analysis.

"d_abr" is the number of abraded nucleons

mass model

User's ME file [hfb22] + LDM#1

decay channels

Np=64: Modes=1010 1000 010: 2t

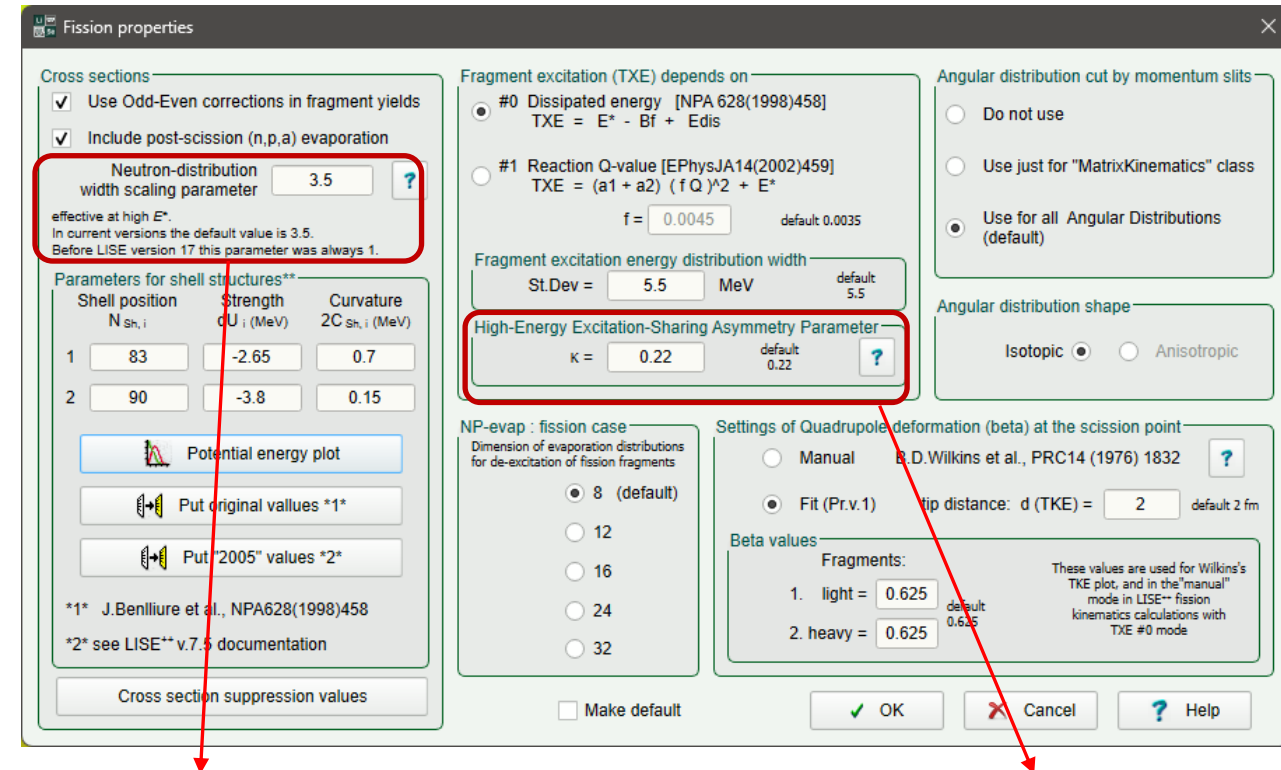
odd-even delta-s: 8.4, 14.0

E* model

4 - Exponential distribution

☐ Make default

- New parameter FisNwidth for neutron-distribution width (17.17.0–8)
- Z^2/A macroscopic curvature smoothing implemented (17.17.0–14)
- Transition smoothing for all fission curvatures.
- New κ (kappa) high-energy L/H excitation-sharing parameter (17.17.15–17)
- κ and FisNwidth were integrated into Fission_compare and recommended settings
- Help links for FisNwidth and κ added



[LISE : Neutron-Distribution Width Parameter \(N-width\)](https://lise.frib.msu.edu/17/FisNwidth.pdf)
<https://lise.frib.msu.edu/17/FisNwidth.pdf>

[LISE : \$\kappa\$ \(Kappa\) in High-Energy Abrasion–Fission](https://lise.frib.msu.edu/17/FisKappa.pdf)
<https://lise.frib.msu.edu/17/FisKappa.pdf>

Final LISE v17 Development Tasks Before Transition to v18

- Determine the optimal combination of E^* , Nwidth, and κ to describe experimental data across a broad range of Z
- Prepare a **USER cross-section table** based on these results
- Create a new **LISE fission-settings file** to replace the current RIKEN CS table, which is fragmented across multiple Z regions

Projectile fragmentation

^{78}Kr (140.0 MeV/u) + Be $\rightarrow$ ^{54}Zn

Fragment velocity | Momentum distribution | Cross section, Excitation energy and etc.

Prefragment and Evaporation options | Excitation energy for Abrasion-Ablation model

Cross Sections

Default Model to use in calculations: 5 - FRACS 1.1: B.MeI,Phys.Rev.C95(2017)034608

Models to plot in "All methods": Yes: 0 - AA

☒ Use O.T.'s manual corrections for light charge particles (H, He, Li, ...) production cross sections. Version from 06/12/2025

☒ Plot

Fast mode

☐ "FAST" mode for Abrasion-Ablation calculations*
* use this mode only for heavy projectiles as Uranium, and for AA in Secondary Reactions

0. NPevap=8; velocity: fast
1. NPevap=8; velocity: qualitative
2. NPevap=16; velocity: fast
3. NPevap=16; velocity: qualitative

Coefficients for modified EPAX 2.15 (user)

normalization: U_norm [1.0] 1

p-rich slope: U1 [1.7808] 1.79

n-rich slope: U2 [4.721e-3] 0.00472

Un [1.65] 1.65

U3 [-1.303e-5] -1.3000e-05

FRACS 1.1 parameters

☒ Apply OES (staggering)

☒ Use built-in energy dependence

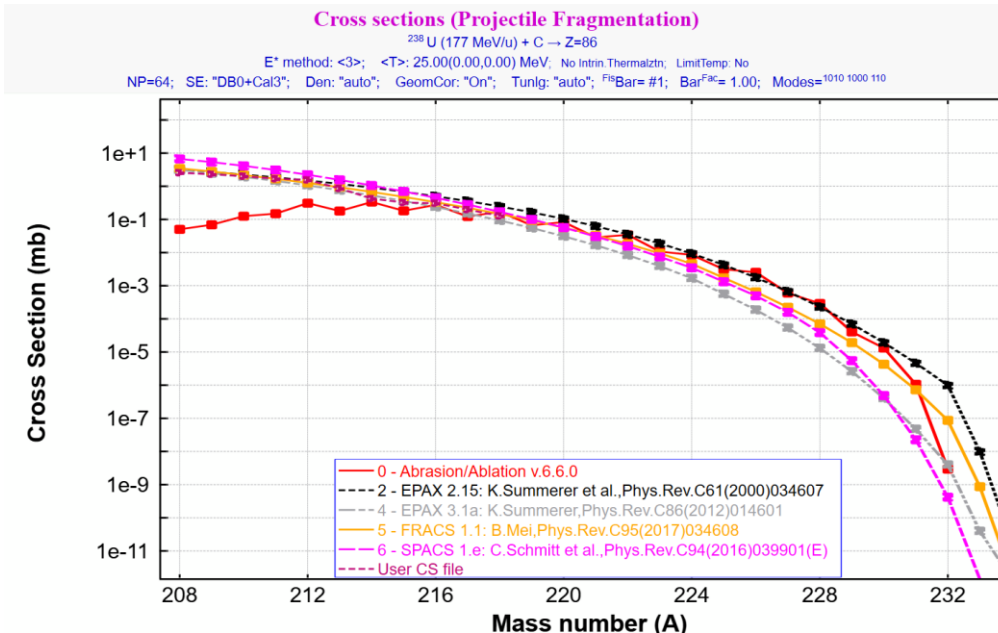
☐ Use fixed energy

Fixed at E = 300 MeV/u

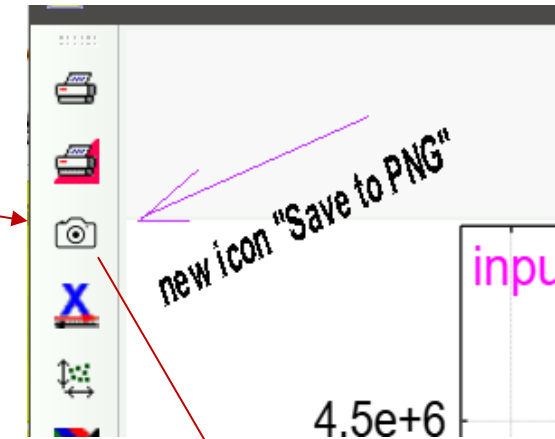
☐ Make default

OK Cancel Help

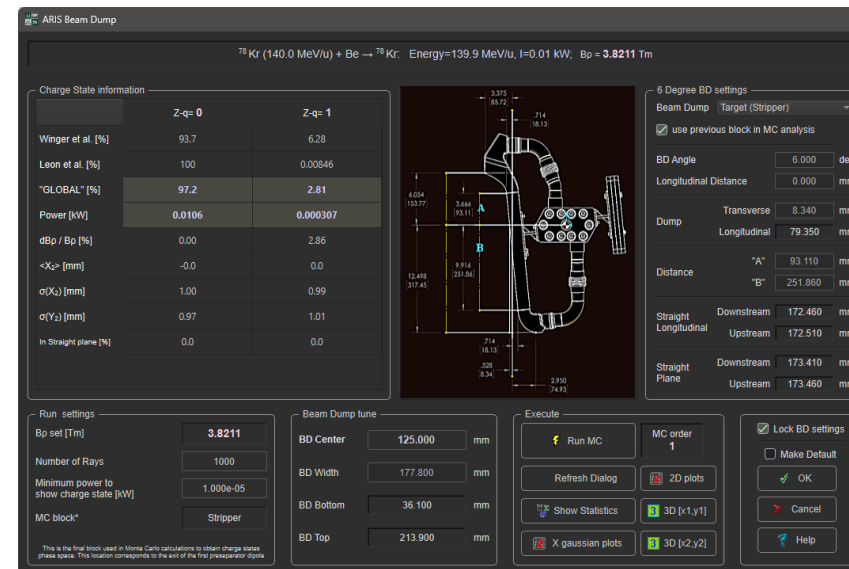
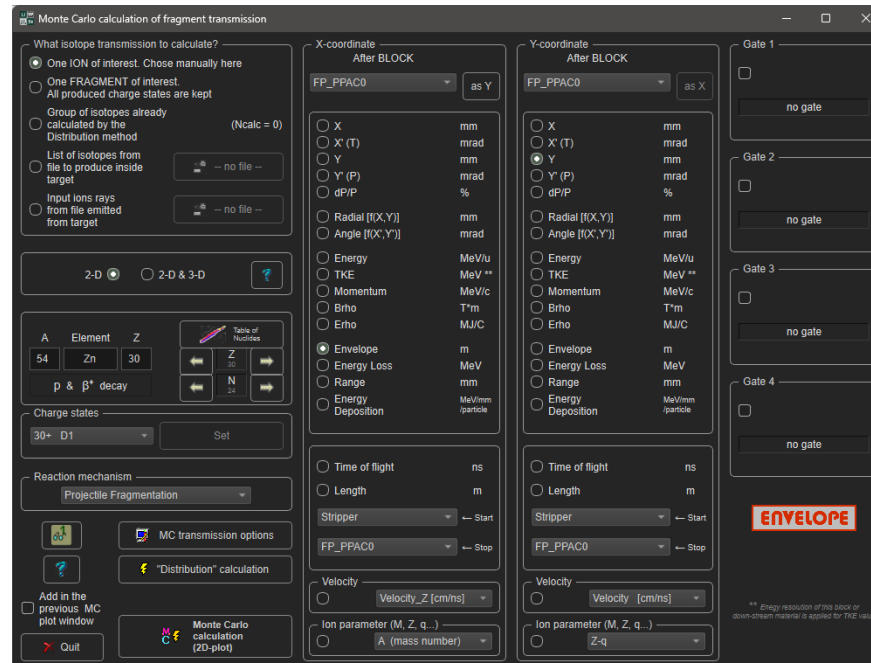
- FRACS: odd-even staggering (OES) implemented from FRACS paper
the currently selected LISE mass table is used to calculate staggering
- FRACS: new UI options and initialization logic
- Projectile energy is now applied in FRACS
*in versions < 17.17, the energy was fixed at 300 MeV/u.
Please pay attention to the beam energy when using FRACS!*
- =====
- SPACS model implemented (17.15.28–33)
- SPACS updated for $A > 2$ targets (17.16.16–22)
- SPACS low-energy σ_R corrections
- SPACS temporarily disabled (17.17.0–8)
- SPACS is currently hidden in 17.17.17*



- New graph action: Save Plot to PNG + Clipboard copy
- Monte-Carlo icon background fixes for Dark Mode
- Dark-mode color revision for MC and Beam-Dump plots
- File-name length warnings (Windows 240 / POSIX 4096)
- ENTER-key support in multiple dialogs (AA, Fission)
- Correction in CS-file plotting dialog (17.17.15–17)



“Save Graph to PNG” — when saving a plot to a PNG file, the plot’s **QPixmap** is now automatically copied to the clipboard. You may simply cancel the **Save dialog** if you only want the plot in the clipboard.



Data / Tables / Publications

- [Bayesian-Averaged Cross-Section Analysis](#)
- Unpublished cross-sections updated (17.15.27)
- Bayesian-Average cross-section sets for ^{144}Sm and ^{92}Mo
- Table of nuclides updated from BigRIPS proton-rich publication

Miscellaneous / System

- General code corrections and optimization of recommended parameters
- LISE-file preview enabled directly from Windows Explorer (Hudson Miltner's project)

Windows Explorer view showing the file structure of the LISE++ working files. The file `21023_224Th_1W_c_PSk3a0_CB2tweake...` is selected, and its preview is shown on the right.

New INFO block in LISE file

```

===== Info Part =====
238U (177 MeV/u, 0.000195 kW) + C (1.2 mm) --> PF,AF; dP/P=1.31%
FOI --> 212Rn 84+ 84+ 84+ 84+ 84+ 84+ 84+ 84+ 84+ 84+
FOI --> Rate=3.70e+01 (3.70e+01) pps, Trans=7.3% (7.3%)
ALL --> Ncalc=2805, Sum=3.538e+2 pps
Brho--> First "BTS01b_D1ex"=4.5016 Tm, Last "CD4_BTS08"=3.6685 Tm
Wedges :
#1: A1977Mg115Si7Fe4Cu (1.075 mm) angle[Wedge]=--1.954 mrad

===== Main Part =====
[general]
File = S:/experiments/_FRIB/e21023_224Th/Part A
(224Th)/LISE_prep/Development/21023_224Th_1W_c_PSk3a0
_CB2tweaked_N4S__lookForIsomers01.lpp
Date = 21-09-2025
Time = 03:38:56
Configuration =
I:/departments/ARIS/beamlines/optics/CB/CB_ds_xd23_v2310/foc/c_CB2a0.lcn
Optionsfile =
I:/departments/ARIS/sdt_templates/LISE_templates/FRIB_2023.lopt
Title = ----- F1S1v2308a0 ----- <BR>- PS
target to wedge (front end)<BR>- First order solution "a" with parallel y
at dump position, (x|d)=25 mm/% at wedge<BR>-- "0" = higher-order
correctors OFF<BR>-- Source: \\intranet\files\departments\ARIS\beamlines
  
```

Version 17.15.27 (01-Sep-2025)

- LISE for Excel: two updates.
- Unpublished cross-sections updated and corrected in package.

Version 17.15.28–17.15.33 (Sep 2025)

- Implementation of SPACS model.
- Projectile energy properly used in FRACS and SPACS.
- Temporary fixed energies for FRACS=300 MeV/u and SPACS=1000 MeV/u.
- Update in wedge-angle reduction method (profile-based).
- LISE file preview from Windows Explorer.

Version 17.16.0–17.16.7 (Sep–Oct 2025)

- New Bayesian-Average cross-section sets for 144Sm and 92Mo.
- Etacha 4.7/4.8 updates including perturbation-parameter diagnostics and equilibrium-thickness support.
- New graph action: Save plot to PNG (CmSavePng), with clipboard copy.

Version 17.16.8–17.16.15 (Oct 2025)

- Dark-mode icon background fixes for Monte-Carlo.
- File-name length warnings (Windows 240 / other OS 4096).
- Dark-mode color revisions for MC and Beam-Dump plots.
- Table of nuclides updated from BigRIPS proton-rich publication.

Version 17.16.16–17.16.22 (Nov 2025)

- AA minimization dialog improvements: odd-even Δ display and CS plots.
- ETACHA v4.8 batch file added.
- SPACS modified to support heavy targets ($A > 2$).
- SPACS low-energy σ_R corrections.
- Enable/disable Δ parameters in prefragment dialog.
- New $\log(v_0/v_1)$ penalty for cross-section minimization.

Version 17.16.23–17.16.32 (Nov 2025)

- Strong revision of CmPlotCS_chi; soft pow10 introduced.
- OES (odd-even staggering) from FRACS paper implemented in FRACS.
- New FRACS options in UI, lise-file, and initialization logic.

Version 17.17.0–17.17.8 (Nov 2025)

- SPACS commented out (temporarily removed).
- New AA minimization options: show results, penalty for unbound nuclei.
- New parameter opt->FisNwidth to control neutron-distribution width in fission at high E^* .
- Fission plots & compare updated for N-width.
- Z^2/A transition smoothing in fission macroscopic curvature.

Version 17.17.9–17.17.14 (21–23 Nov 2025)

- Smooth Z^2/A curvature transition fully implemented.
- ENTER-key support in fission & AA minimization dialogs.
- Recommended abrasion-reaction settings + link to mass-model dialog.
- Optimization of recommended parameters.

Version 17.17.15–17.17.17 (23–24 Nov 2025)

- New high-energy excitation-sharing parameter κ (opt->FisKappa) added to Fission Properties.
- κ used in Fission_compare and recommended-settings engine.
- Help links for κ and N-width inserted.
- Correction in user cross-section plotting from CS-file dialog.