

LISE⁺⁺ menu → Results: output options

User guide for interpreting result files produced by the LISE Results menu

Source basis. This document describes the seven result-output modes implemented in the uploaded source file L_Lisefile.cpp, function results(..., flag). The flag number below is the internal option value used by the writer function.

Practical point. Options 0, 1, and 2 are full human-readable reports and include the standard calculation header and configuration summary. Options 3, 4, 5, and 6 are compact tab-separated exports intended mainly for spreadsheet import, batch processing, or AI/post-processing.

Flag	Menu/result option	Best use	Main contents
0	Transmission + Energy, TOF, Energy loss	Complete report for checking one setting	Standard header; configuration table; transmission/rate table; three energy/TOF/energy-loss tables
1	Transmission	Rate and transmission checks	Standard header; isotope-by-isotope production rate, cross section, total/target/block transmissions, half-life
2	Energy, TOF, Energy loss	Detector/TOF and energy-loss checks	Standard header; TOF table; energy after each block; energy loss in material blocks
3	Transmission A,Z,q-first summarized by reaction	Compact charge-state-at-production export	Tab-separated table grouped by A, Z, first charge state q[0], and reaction bit mask
4	Transmission A,Z,q-last summarized by reaction	Compact final-charge-state export	Tab-separated table grouped by A, Z, last charge state q[last], and reaction bit mask
5	Rates	Spreadsheet-style block-by-block rate matrix	Rows for A, Z, N, charge states, reaction, then rate after each block
6	FOI spatial distributions	FOI spatial/momentum distribution export	X, Y, and momentum-distribution arrays at each block, up to the first Faraday block

1. Standard header used by options 0, 1, and 2

For flags lower than 3, LISE writes a common report header before the calculation table. This header is useful because it records enough context to understand the result file without reopening the .lpp configuration.

- LISE⁺⁺ version, file name, configuration name, option file name, date, time, and title
- Projectile name, beam energy in MeV/u, and beam intensity with the selected LISE intensity unit
- Target material, target thickness in mg/cm² and microns, and target angle
- Stripper material and thickness when a stripper is present
- Fragment/settings name, reaction model, reaction mechanism options, cross-section model, charge-state model, energy-loss model, NP, and NPevap
- Secondary-reaction status
- Compact block-configuration string and momentum acceptance dp/p in percent
- Block table with block type, user name, and principal characteristics such as Brho, slit limits, material thickness, or wedge angle

The block table is especially helpful for manual checking. Dipoles print Brho in Tm and magnetic field B in tesla. Drifts print slit limits when they are enabled. Compound blocks print material and effective current thickness. Wedges additionally print the reduced wedge angle in mrad.

2. Options 0 and 1: Transmission and rate calculations

Option 1 writes only the transmission/rate table. Option 0 writes the same transmission/rate table first, then appends the energy/TOF/energy-loss tables described in Section 3.

The source labels this calculation method as Distribution. The table is isotope-by-isotope and, when charge-state calculations or abrasion-fission mode are active, LISE also writes a Sum line for each isotope group.

Column	Meaning
A El	Nuclide label written as mass number plus element symbol, for example 59Cr

Column	Meaning
A	Mass number
Z	Atomic number
Q1, Q2, ...	Charge-state values included when charge-state tracking is enabled
Re	Short reaction-code label
Rate (pps)	Calculated production rate in particles per second
Total* / Trans%	Total transmission in percent; when secondary reactions are enabled, the printed total is corrected by the secondary-reaction coefficient
CS (mb)	Production cross section in millibarns
SecReact coef.	Secondary-reaction coefficient; printed only when secondary reactions are enabled
Target Trans%	Transmission through the production target, corrected by the secondary-reaction coefficient when applicable
block trans columns	Transmission through each block, printed using the block private name as the column label
T 1/2 (sec)	Half-life in seconds when known; otherwise printed as unknown

Useful interpretation. Rate is the main yield quantity. CS is the physics production cross section. The target and block transmission columns are transport/acceptance factors. The total transmission combines transport, charge-state effects, and related corrections used by the calculation.

Printed note. If secondary reactions are enabled, LISE writes a note that Total and Target transmissions are decreased by the secondary-reaction coefficient.

3. Options 0 and 2: Energy, TOF, and energy loss

Option 2 writes three energy-related tables. Option 0 includes these same three tables after the transmission/rate table.

The source labels this calculation method as Ellipse. Before Table 1 is written, LISE checks that the Start of TOF and Stop of TOF blocks are defined. If either is missing, the result file contains the warning “Start of TOF or Stop of TOF is not defined!!!!” and the energy/TOF output stops.

Table	Title in result file	Units	Description
1	Time of flight, Energy after stripper	ns and MeV/u	For each isotope: TOF between selected start/stop blocks, TOF spread, energy after the stripper, and energy spread. An additional TOF HF column is printed when the acquisition-start option is enabled
2	Energy after blocks	MeV/u	For each block after the stripper: mean energy and energy spread. For fragments produced in a secondary target, blocks before the production point are printed as dashes
3	Energy loss in materials	MeV	For each material block with nonzero thickness: mean energy loss and energy-loss spread. For secondary-target products, blocks before the production point are printed as dashes

Table 1 also prints the selected TOF start block, TOF stop block, acquisition-start mode, and the calculated flight length in meters. This makes the result file self-documenting for timing checks.

4. Options 3 and 4: compact summarized transmission tables

Options 3 and 4 are compact tab-separated files. They do not include the long standard header. They are useful when the same LISE calculation is being processed by another program, Excel, Python, or an AI workflow.

Option	Grouping	Charge-state meaning	Typical use
3	A, Z, q[0]	q[0] is the first charge state stored for the ion. In practice this corresponds to the charge state at the initial charge-state-defining material: target, or stripper if the stripper is used for Q states	Compare production-side charge-state contributions and summarized rates
4	A, Z, q[last]	q[last] is the last charge-state value in the tracked charge-state list	Compare final selected charge states, especially when multiple charge-state-changing materials are present

Column	Meaning
A	Mass number
Z	Atomic number
q[0] or q[last]	Charge state used for grouping
Reaction	Integer reaction bit mask. One or more reaction contributions may be combined into one row
Rate	Summed production rate in pps for the grouped A,Z,q row
Trans,%	Grouped transmission percentage. In the source this is calculated from summed yield divided by the corresponding untransmitted yield estimate
CrossSec	Summed cross section in mb, with each contributing reaction added once
q[0]-trans or q[L]-trans	Weighted charge-state transmission for the first or last charge-state position
q_All-trans%	Weighted product of charge-state transmissions through all relevant charge-state-changing materials

Practical warning. The Reaction column in options 3 and 4 is not the short text reaction label from the human-readable report. It is an integer bit mask, so a value may represent more than one reaction channel contributing to the same grouped A,Z,q row.

5. Option 5: Rates matrix

Option 5 is a spreadsheet-oriented rate export. It is organized with isotopes across columns rather than down rows. The first rows identify each isotope and charge state, then the remaining rows give rates after successive blocks.

Row type	Meaning
A, Z, N	Mass number, atomic number, and neutron number for each calculated isotope column
Q1, Q2, ...	Charge-state values for each calculated isotope column
React	Reaction index for each calculated isotope column
Rate(pps) after:	Text separator before the block-rate rows
block-name rows	Each row is one block name followed by the calculated production rate after that block for every isotope column

The block-rate rows start at the stripper block and continue through the beam line using the non-fit/non-drift block sequence. The export stops when a Faraday block is reached.

Best use. This option is convenient for making an Excel map of rates after important separator elements or for comparing how rate changes from block to block.

6. Option 6: FOI spatial distributions

Option 6 exports distributions for the fragment of interest. The file begins with the FOI name, reaction name, distribution dimension NP, and the definition of the bin step:

$$\text{Step} = (x_N - x_0) / NP$$

If transmission of the FOI is zero, LISE writes “Transmission of the Fragment of Interest is 0” and no distribution table is produced.

Part of export	Meaning
Block Name	User/private name of the block
XYP	Distribution type: X horizontal spatial distribution, Y vertical spatial distribution, or P momentum distribution
rot	Marker printed for X and Y if the block has a nonzero rotation angle larger than about 1 degree
x0, xN, Step	Distribution lower limit, upper limit, and bin step. X and P rows explicitly print these values. Y rows print the distribution values after the label without repeating these three numbers
0, 1, 2, ...	Distribution bin values from index 0 through NN

The export is written block by block up to the first Faraday block. For each block LISE prints all X rows first, then all Y rows, then all P rows. This format is useful for plotting spatial acceptance, momentum acceptance, and block-by-block transport of the FOI.

7. Which option should a user choose?

- For a normal user report: choose option 0
- For a fast yield/transmission check: choose option 1
- For detector energy, TOF, and energy-loss checks: choose option 2
- For charge-state grouped spreadsheet processing: choose option 3 or 4
- For block-by-block rate matrices: choose option 5
- For spatial or momentum distributions of the FOI: choose option 6

For manual editing of a .lpp file, the Results options do not change the configuration itself. They control how LISE writes the calculation output after the configuration has already been loaded and calculated.