

Manual light particle correction factors

Subject 12 | Development entry 18.8.118 | Active LISE version 18.9.0 | 23 October 2026

The Fragmentation Cross Sections dialog now exposes the manual enhancement factors used for light charged-particle yields. Users edit absolute charge totals for Z=1 through 8 and separate totals for 1H and 4He. Legacy defaults and strict beam-charge thresholds are preserved; accepted custom values enter the existing EPAX yield-correction path. [1, 2]

1 Dialog access and controls

In the Default Model to use in calculations frame, keep the manual-corrections checkbox enabled to apply these factors and select Manual corrections to edit them. Disabling the checkbox bypasses the correction. The editor provides OK, Cancel, Restore Defaults and Help.

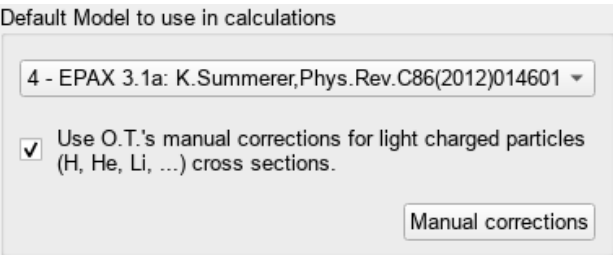


Figure 1. The Manual corrections button in the parent default-model frame, captured by the production integration check. [4]

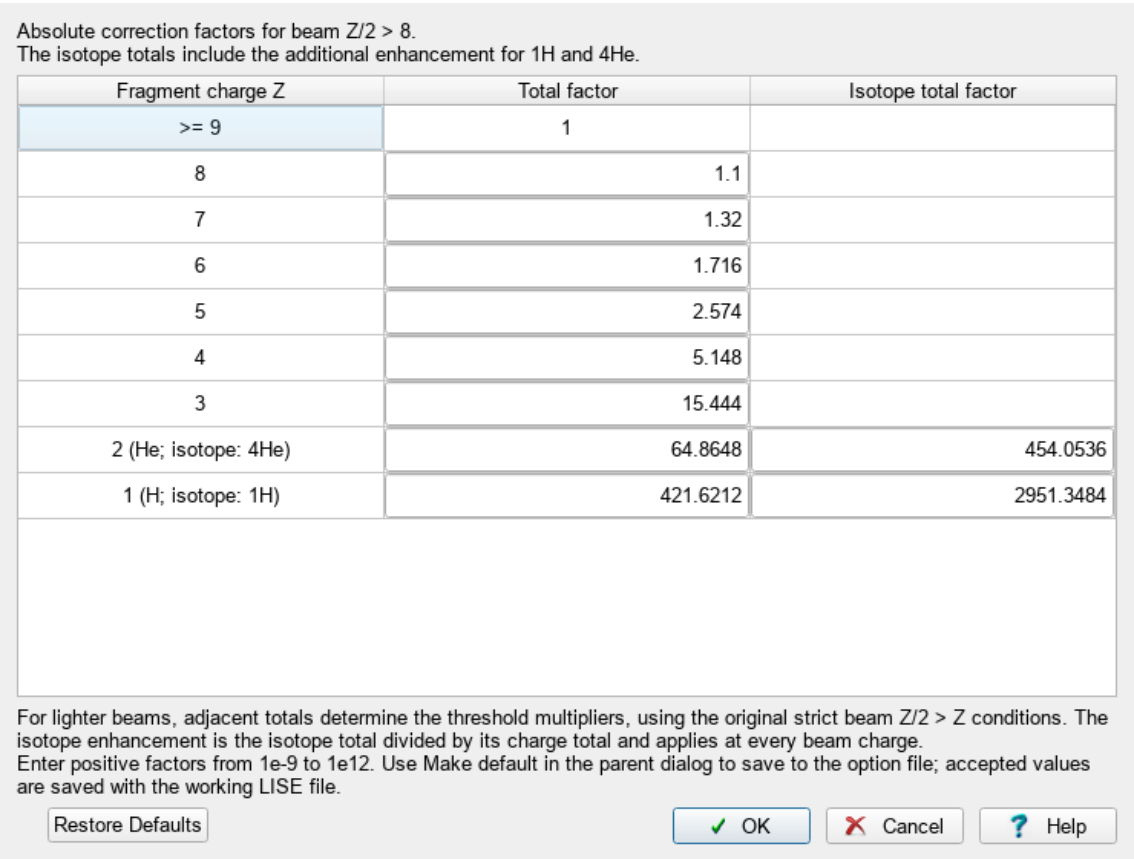


Figure 2. The actual Qt Manual corrections editor at legacy defaults, captured by the focused dialog test. Its isotope column includes the extra enhancement for 1H and 4He. [3]

2 Absolute totals and beam charge thresholds

The Total factor column specifies the complete charge enhancement when beam charge divided by two is greater than 8. It contains totals rather than the incremental multipliers at each threshold. Fragments with charge 9 or higher have factor 1. The isotope column specifies complete totals for 1H and 4He under the same high-beam-charge condition. [2]

Fragment charge	Legacy absolute total	Adjacent threshold multiplier
8	1.1	1.1
7	1.32	1.2
6	1.716	1.3
5	2.574	1.5
4	5.148	2
3	15.444	3
2	64.8648	4.2
1	421.6212	6.5

The separate legacy isotope totals are 2951.3484 for 1H and 454.0536 for 4He. Each is seven times its charge total. For other isotopes, the isotope enhancement is one. These defaults reproduce the historical coefficients; the editor does not impose monotonic ordering on custom totals. [2, 3]

Deriving the applied factor

For each charge threshold, divide its absolute total by the next higher charge total, using 1 above Z=8. Multiply the applicable adjacent ratios only when beam charge divided by two is strictly greater than that threshold and the fragment charge is at or below it. The implementation evaluates the equivalent telescoping ratio to avoid large intermediate products. [2]

At beam Z=16, the Z=8 threshold is not active because $16/2$ equals 8. For a fragment with charge at most 7, the charge factor is its absolute total divided by the Z=8 total; a Z=8 fragment has factor 1. Just above beam Z=16, the Z=8 multiplier becomes active. Equality is deliberately excluded. [2, 3]

For 1H or 4He, additionally multiply by the isotope total divided by that isotope's charge total. This enhancement applies independently of the beam threshold, including for lighter beams. Thus the edited isotope total is the complete result only in the high-beam-charge regime; it is not a replacement constant at every beam charge. [2]

3 Empirical origin of the isotope enhancement

Oleg Tarasov's Light Particle Production in LISE++ analysis compares AA-evaporated light particles with EPAX3 including the earlier Oleg factors. The illustrated case uses ^{82}Se at 227 MeV/u on an 8 mm carbon target. The reported comparison motivates a further proton/alpha enhancement. [5]

Particle	EPAX3 plus earlier factors (mb)	AA evaporated particles (mb)	Ratio
p	160	1120	7.0
d	310	248	0.8
t	150	135	0.9
^3He	28	37	1.3
^4He	52	379	7.3

Table 1. Rounded cross sections and ratios from page 1 of the linked analysis. [5]

Page 2 records an additional factor of 7 for proton and alpha production in LISE 18.5.13. Other light charged-particle yields appeared consistent without that extra enhancement. The change aligned standard production and power-deposition calculations with Prompt Radiation using a Light-Z yield factor of 1. [5]

Connection to the editable totals

The current default proton total is the charge- $Z=1$ total multiplied by that isotope factor: 421.6212 times 7 gives 2951.3484. For ^4He , 64.8648 times 7 gives 454.0536. The adjacent charge multipliers remain the historical ladder described in Section 2. The linked analysis specifically explains the additional isotope enhancement; it does not independently derive every charge-ladder coefficient.

Empirical interpretation

The source identifies missing breakup/multifragmentation and target multistep contributions, and calls for further laboratory-kinematics analysis of evaporated particles. Its separate discussion of a radiation factor near 10 remains empirical. That radiation multiplier should not be confused with the extra factor of 7 now included in the standard proton/alpha totals. [5]

Read the author's explanation: [Light Particle Production in LISE++ - page 2](#)

4 Acceptance persistence and compatibility

The child editor keeps edits local. Its OK accepts valid values into the parent dialog's pending copy; its Cancel discards those child edits. The global correction settings change only when the Fragmentation Cross Sections parent dialog is accepted. Cancelling the parent therefore discards pending corrections, including values restored in the child. [1, 2]

Restore Defaults fills the editor with the historical totals. Every entry must be finite and within $1e-9$ to $1e12$. Invalid values block child acceptance and identify the field. Loaded invalid coefficients are replaced individually with their corresponding defaults. [2, 3]

Working LISE files store all ten totals with 17 significant digits through the production registry, writer and parser. Older working files lacking these fields start from legacy totals, independently of the preceding file or personal defaults. In option files, Make default saves them in the Mechanism group. The enable flag remains separate. [1, 2, 4]

Persistence keys: EPAX_manual_Z1 through EPAX_manual_Z8, EPAX_manual_H1 and EPAX_manual_He4. The related enable key is EPAX_p_H. These totals are yield multipliers, not cross sections in mb.

5 Recorded validation and scope

The focused test records 20,280 comparisons against the historical factor calculation, plus strict-threshold checks at equality and immediately above it. Custom absolute totals, isotope ratios, unchanged heavy fragments, exact option-file round trips, missing/invalid settings, dialog precision, OK/Cancel and Restore Defaults also passed. [3]

The MSVC production integration log records exact option-file and working-file round trips, correction enable/disable behavior through four EPAX models, and placement of the Manual corrections button in the requested frame. The screenshots in this report are the retained Qt test captures. These software checks do not calibrate new factors against measured yields. This report introduces no new physics benchmark. [4]

6 Version and source references

The change is recorded under development entry 18.8.118; the active application version remains 18.9.0. Custom factors modify yields when corrections are enabled, so comparisons should retain the working file and record whether legacy or edited totals were used. The dialog Help link points to 18/18_9/12_LISE_LightParticleFactors.pdf. [1, 2]

[1] L_Init/lise_version.h, entry 18.8.118. [2] o_Phys/o_EPAX_manualCorrections.h; o_Phys/c_EPAX.cpp; d_Mechanism/d_EPAX_manualCorrections.cpp; d_Mechanism/d_Mechanism_fragmentation.cpp; c_Config/c_ConfigPP1.h and c_ConfigPP_read.cpp; L_Init/L_Init_options.cpp.

[3] tests/epax_manual_corrections_test.cpp and build/epax_manual_corrections_test/results.log, including manual-corrections-dialog.png.

[4] tests/epax_manual_corrections_integration.cpp.py and build/epax_manual_corrections_integration_msvc/results.log, including the parent-frame capture.

[5] O. Tarasov, Light Particle Production in LISE++, 29 July 2026, pages 1-2. Page 1 supplies the comparison above; page 2 records the 18.5.13 update. [Open source at page 2](#)