

GLOBAL 2026 Modification Details

Release notes for project-file, build, batch-mode, CSV, numerical-accuracy, benchmark, and LISE++ 18.7.0 integration updates. GLOBAL implementation details are documented through version 4.8.0 (21-AUG-2026); the LISE++ 18.7.0 development report records GLOBAL 4.8.1 as the bundled package version.

Release Overview

Version	Area	Summary	Primary files
4.6.23	Build/project	Local MinGW/MSVC output folders, MinGW release no-strip flag, and richer executable metadata to reduce McAfee false-positive risk.	Global.pro
4.7.0	Batch mode	Added ETACHA-style batch-file loading from the File menu using rows: Ab Zb Qb Eb At Zt thickness density.	g_mainwindow.ui; g_mainwindow.h; g_mainwindow.cpp; g_FileReadWrite.cpp
4.7.1	Batch outputs	Generated row .global and .gloutput files are written to LISEcute/results; batch calculations force option #0 and write BatchName_resGLOBAL.csv.	g_mainwindow.cpp; g_ftype.h; Global.pro
4.7.2	Batch completion UI	The completion/result-location message auto-closes only when /q or -q was supplied; otherwise it remains open for operator review.	g_main.cpp; g_mainwindow.cpp; g_ftype.h; Global.pro
4.7.3	Batch CSV columns	Added iQmax and dQ(calc-set), where $dQ(\text{calc-set}) = Q_{\text{calc}} - Q_{\text{b}}$.	g_mainwindow.cpp; g_ftype.h; Global.pro
4.7.4	Batch CSV status	Renamed Result to Status, reports iQmax as charge state with maximum fraction, initializes result buffers, and marks rows without physical Qcalc output as Status 0.	g_mainwindow.cpp; g_ftype.h; Global.pro
4.7.5	ETACHA charge conversion	Treats ETACHA Qb as the beam charge state and converts it to GLOBAL Z-q before each calculation.	g_mainwindow.cpp; g_ftype.h; Global.pro
4.7.6	Batch CSV fractions	Limits batch CSV fraction output to Fq0 through Fq9.	g_mainwindow.cpp; g_ftype.h; Global.pro
4.8.0	Numerical accuracy	Numerical refinements proposed by Masahiro Yoshimoto, RIKEN BigRIPS team <masahiro.yoshimoto@riken.jp>: EDIFF divisor changed from 200 to 2000 and integration coefficients changed from {1,10,100,1000,10000,100000} to {1,1,10,100,1000,10000}.	L_Atima/global/glo_Run.cpp; g_ftype.h; Global.pro

Version	Area	Summary	Primary files
4.8.1	Bundled release	Recorded as the GLOBAL version integrated in LISE++ 18.7.0. The supplied GLOBAL modification log documents implementation details through 4.8.0.	LISE++ 18.7.0 development report

LISE++ 18.7.0 Integration

The GLOBAL batch work is now connected to the LISE++ 18.7.0 charge-state workflow. LISE++ can generate a common .betacha file directly from the current separator configuration and fragment of interest and, after file creation, optionally launch GLOBAL and ETACHA4 from the same run-selection dialog.

- GLOBAL is launched from the LISE++ package root with the generated .betacha filename and -r.
- The same LISE++-generated material sequence can be processed by GLOBAL and ETACHA4, supporting direct comparison of calculated charge states and Fq0-Fq9 fractions.
- The LISE++ completion dialog preserves the generated-file path and material-block count and remembers the GLOBAL/ETACHA4 checkbox selections between runs.
- Version scope: the LISE++ 18.7.0 development report records GLOBAL 4.8.1 as bundled. No additional 4.8.1 code-change details are documented in the supplied GLOBAL modification report, so the implementation discussion below remains explicitly grounded through 4.8.0.

Operator Behavior

- Batch mode is available from File -> Batch mode...
- GLOBAL accepts the ETACHA batch row format: Ab Zb Qb Eb At Zt thickness density.
- Blank lines and lines beginning with ! or ; are treated as comments.
- No ETACHA command-line mode keys (-v, -i, -e, -L) were added for GLOBAL.
- Batch calculations force option #0: Q-state at target exit with initial energy.

Batch Outputs

- The batch summary CSV is written next to the selected batch file.
`<Batch file path>/<Batch file name without extension>_resGLOBAL.csv`
- Generated per-row GLOBAL input and text-output files are written to the LISE document results folder.
`LISEcute/results/*.global`
`LISEcute/results/*.gloutput`

- The CSV includes the batch input columns, Status, Qcalc, dQ, iQmax, dQ(calc-set), equilibrium thickness, output energy, Fq0 through Fq9 charge fractions, and generated file paths.

Command-Line /q Behavior

- GLOBAL now recognizes /q and -q while preserving the first non-option argument as the input file path.
- When /q or -q is used, the batch completion message closes automatically after 5 seconds.
- Without /q or -q, the completion message remains open until the operator closes it.

Build Notes

- MSVC output is written to _install_MSVC.
- MinGW output is written to _install.
- The MinGW release link flags remove -WL,-s to avoid producing a stripped executable that McAfee has historically flagged.
- Windows file version is 4.8.0.1; displayed GLOBAL version is 4.8.0.

4.8.0 Numerical Refinements

GLOBAL 4.8.0 incorporates two independent numerical refinements proposed by Masahiro Yoshimoto (RIKEN BigRIPS team). **EDIFF** was refined by changing the divisor from 200 to 2000, while the integration coefficient sequence **coef_TXA** changed from {1,10,100,1000,10000,100000} to {1,1,10,100,1000,10000}.

EDIFF controls how frequently energy-dependent charge-changing cross sections are recalculated. The /2000 setting makes this energy-change threshold about ten times finer than the former /200 setting. In the 345 MeV/u benchmark, the characteristic interval is reduced from roughly 11 MeV/u to about 1.1 MeV/u.

coef_TXA controls the thickness/integration-step sequence. The revised sequence delays rapid step coarsening by one decade, providing a finer integration history without changing the ETACHA-style batch input format or the resGLOBAL output naming convention.

Because EDIFF and coef_TXA act on different numerical approximations, the benchmark tested them independently and together.

Benchmark: 238U86+ at 345 MeV/u

The supplied benchmark calculates charge-state fractions as a function of Be and Ta target thickness for four cases: Original, EDIFF only, coef_TXA only, and Both modifications. The modified calculations produce visibly smoother charge-state curves, consistent with reduced numerical discretization.

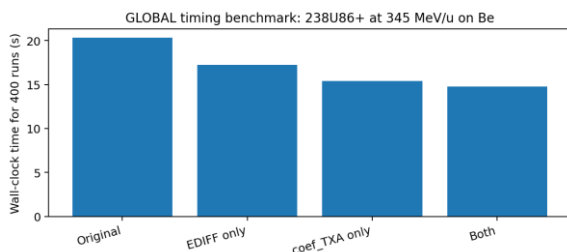


Figure 2a. GLOBAL timing benchmark on Be: the combined numerical refinement was faster than the original case in this test.

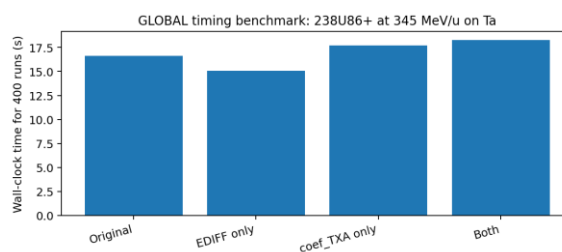


Figure 2b. GLOBAL timing benchmark on Ta: the combined refinement was about 10% slower than the original case in this test.

Condition	Be, 400 runs (s)	Ta, 400 runs (s)	Comment
Original	20.304	16.638	Baseline
EDIFF only	17.237	15.068	Faster in both tests
coef_TXA only	15.420	17.691	Be faster; Ta ~6% slower
Both	14.765	18.256	Be ~27% faster; Ta ~10% slower

Table 1. GLOBAL calculation-time benchmark for 400 runs. No significant systematic increase in calculation time was observed in these tests.

Timing interpretation. The combined modification is substantially faster for Be and about 10% slower for Ta in this benchmark. The individual calculations are short, so the timing result should be treated as system- and load-dependent rather than as a universal performance gain or penalty.

Recommended numerical-convergence check

The smoother curves are a strong numerical indicator, but a short convergence test provides the cleanest validation that the new settings are sufficiently fine. For one representative Be case and one Ta case, compare:

- Proposed settings: EDIFF /2000 + the new coef_TXA sequence.
- Finer EDIFF: /20000 + the new coef_TXA sequence.
- Finer integration: /2000 + one additional decade of integration-step refinement.

For the comparison, report the maximum absolute change in each populated charge-state fraction, verify charge-fraction normalization, and confirm that no new negative-population artifacts appear. If

the finer calculations lie essentially on top of the proposed result, the new defaults can be regarded as numerically converged for those benchmark systems.

Benchmark source: Masahiro Yoshimoto (RIKEN BigRIPS team), benchmark summary used for the LISE++ 18.7.0 release documentation: <https://gist.github.com/yoshimotomasahir/34305a6e0bb60a410b40aa78925e90ef>

Changed Source Files

File	Reason
Global.pro	Version metadata, local output folders, MinGW release no-strip flag, product metadata.
g_Global/g_fctype.h	Version string and 2026 change-history notes.
g_Global/g_main.cpp	Parsing for /q and -q.
g_Global/g_mainwindow.cpp	Batch parser, batch execution, CSV writer, results-folder output, completion-message timer.
g_Global/g_mainwindow.h	Batch state and helper declarations.
g_Global/g_mainwindow.ui	File-menu Batch mode action.
g_Global/g_FileReadWrite.cpp	Helper to save generated .global files without disturbing the active file.
L_Atima/global/glo_Run.cpp	Numerical refinements proposed by Masahiro Yoshimoto, RIKEN BigRIPS team <masahiro.yoshimoto@riken.jp>: EDIFF divisor and integration-step coefficient updates.