

v.18.3
04/30/26

This release introduces integration of the LSODA adaptive solver, enabling improved numerical stability and performance for decay and implantation calculations, particularly for large isotope networks.

- LSODA added as a new integration model and set as default
- Improved handling of stiff systems
- Optimization of Radiation Calculator routines
- Updated interface elements and default settings
- Various bug fixes and technical improvements



Radiation residue calculator settings

Integration model

- ODE (ordinary differential equation solver) ISBN: 0716704617
- RKF45 (Runge-Kutta-Fehlberg ODE solver)
- Numerical Recipes: ODEINT
- LSODA (Stiff Solver)

Isotopes to plot

- ALL (Stable & Radioactive)
- only Radioactive
- only Stable

2D-plot

- Z vs. N
- Z vs. N-Z
- Z vs. N-2Z

Option	Value	Description	Default value
N_Implant	100	number of points : Irradiation	100
N_Decay	1000	number of points : Decay	1000
AbsError	1.000e-09	absolute error tolerance	1e-9
RelError	1.000e-04	relative error tolerance	1e-4
Y_thrshld	1.000e-08	Minimum yield value	1e-8

Half-life boundaries (sec)

T_{1/2} min = 1.0e-04 "unbound" below this value

T_{1/2} max = 1.0e+15 "stable" above this value

"Isotope conservation law" (apply primary irradiation rates of eliminated nuclei to their daughters)

Maximum number of one-dimensional distributions: 20

Make default

At each step for first two models, the code requires
 $\text{abs (local error)} \leftarrow \text{abs (Y)} \cdot \text{RelErr} + \text{AbsErr}$

New default settings

Radiation Calculator

Radiation residue calculator

Mode to implant

- 1. One nucleus to implant. Chose manually here
- 2. List of isotopes to implant from file N of isotopes = 0
- 3. Select detector to obtain the list of isotopes stopped in Refresh N of isotopes = 101

Press "Escape" to interrupt calculations

A	Element	Z
42	S	16

β^- decay

Designations

Yield = Number of atoms;
 N of DI = Number of Different Isotopes;
 FinalTime (FT) = IrradiationTime (IT) + DecayTime (DT)

Irradiation (Implantation)

IT : Irradiation Time [sec] = N of DI @ time (IT) =

2.3. Total Irradiation Rate

Rate = pps

Radiation Residues as Function of time (DT)

DT : Decay Time after irradiation (sec) = N of DI @ time (FT) = Total Yield @ time (FT) =

Model =

Calculate

Options

1D : Residues as function of time

1D : Activity as function of time

2D : Final Residues (@ TF)

CAUTION RADIATION AREA

View Results (Text)

Elapsed time is 00:00:02.29 or 2.03 sec

Quit Link



List from 100

10 hours

100 hours

No stiffness!

Very fast!

LSODA implemented in Radiation Calculator

- Adaptive solver (stiff + non-stiff switching)
- Successfully integrated into LISE workflow
- Now available as default integration model

Key benefits

- Improved robustness for large isotope networks
- Better handling of coupled decay chains
- Automatic stiffness detection

Numerical Stability Improvements

- Handling of LSODA work-limit (`istate = -1`)
- Improved startup behavior (init-implantation stage)
- Suppression of unnecessary warnings
- Better compatibility with large isotope sets (100+)

Performance Improvements

- Optimized `o_Radiation.cpp` and `.h`
- Reduced overhead in RHS evaluation
- Improved memory handling (vectors / arrays)
- Faster execution for multi-isotope calculations

New Integration Structure

Radiation Calculator now supports:

- ODE (legacy)
- RKF45
- ODEINT
- **LSODA (default)**

New internal functions:

- `RadiationF_core`
- `RadiationF_LSODA`
- `RunModelStep()` unified interface

Radiation Calculator Updates

- New integration model selector label
- Updated default settings (LSODA enabled)
- Improved dark-mode compatibility
- Cleaner user interaction and feedback

Validation

- Verified against existing models:
- ODE
- RKF45
- ODEINT
- Consistent results across integration methods
- Stable behavior for:
 - single isotope
 - large isotope lists (100+)

18.2.1

Corrected links for LISE website pages (4/4_*)

18.2.2

PS wedge slit shift range increased from 30 mm to 50 mm

18.2.3

Resolved User LME path issue (Tong)

18.2.4

Updated Radiation Calculator figure for dark mode compatibility