version 9.2.57

Since “Working under Optics” v.9.2.33 (12/10/2010)

- Stripper Lifetime utility v. 9.2.38 IV Expert meeting
- New options for Target & Stripper v. 9.2.43 MP
- Range of Momentum distribution for the Convolution model has been increased v. 9.2.47 GANIL
- Nucleus identification in 2d-plot v. 9.2.52
- Customizable Chart of the Nuclides v.9.2.56 MT, ZC
- MC rays generator: new option “Range” v. 9.2.57 MP

The code operates under MS Windows environment and provides a highly user-friendly interface. It can be freely downloaded from the following internet addresses:
http://www.nscl.msu.edu/lise
- Target initial temperature
- Modification for "stationary beam" models in the case of pulsing beams
- Rotation target: modifications for a reduced beam pulse length
- New flux structure: Pulsing beam & rotating target
Calculations of high-power production target and beam dump for the GSI

Pulsing beam

Rotating target

Pulsing beam + Rotating target

Probability with rotating target is defined as 

\[ \frac{X}{\text{spot size}} / \text{Target Length} = 0.127\% \]

where the target length is \( 2\pi R \),

Therefore distance between reduced “pulses” is 787 seconds, with the pulse length equal to 50 ns


Figure 5. (a) Temperature versus time in the target during 1000 irradiations by a 1 GeV u\(^{-1}\) U bunch with \( N = 10^{10} \) and \( \tau = 50 \) ns, \( \sigma_x = 1 \) mm and \( \sigma_y = 6 \) mm.
New options for Target & Stripper for Distribution and MC modes
Range of Momentum distribution for the Convolution model

F1 slit-Xspace: output before slits

$^{86}\text{Kr} (345.0 \text{ MeV/u}) + \text{Be (4 mm)}$: Settings on $^{60}\text{Ge}^{32+ 32+ 32+ 32+ 32+ 32+ 32+}$. Config: DSWSMSMMDMSWDSMMI
dp/p=0.56% ; Wedges: Be (5000 µm), 0; Brhoa(Tm): 5.1255, 4.6678, 4.6484, 4.6484, 4.6425, 4.5845, 4.5845
MC rays generator: new option "Range"
Nucleus identification in 2d-plot (so called RGD, mode =25,35)
### Identification

<table>
<thead>
<tr>
<th>Element</th>
<th>Mass Number</th>
<th>Cross Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>23</td>
<td>$1.1 \times 10^{-7}$ mb</td>
</tr>
<tr>
<td>P</td>
<td>24</td>
<td>$1.6 \times 10^{-6}$ mb</td>
</tr>
<tr>
<td>Si</td>
<td>22</td>
<td>$2.5 \times 10^{-6}$ mb</td>
</tr>
<tr>
<td>Si</td>
<td>23</td>
<td>$3.8 \times 10^{-5}$ mb</td>
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</tr>
<tr>
<td>O</td>
<td>19</td>
<td>$1.9 \times 10^{-1}$ mb</td>
</tr>
<tr>
<td>O</td>
<td>20</td>
<td>$2.4 \times 10^{-2}$ mb</td>
</tr>
<tr>
<td>N</td>
<td>17</td>
<td>$1.1 \times 10^{-1}$ mb</td>
</tr>
<tr>
<td>N</td>
<td>18</td>
<td>$1.3 \times 10^{-2}$ mb</td>
</tr>
<tr>
<td>N</td>
<td>19</td>
<td>$1.1 \times 10^{-3}$ mb</td>
</tr>
<tr>
<td>Na</td>
<td>22</td>
<td>$2.6 \times 10^{-3}$ mb</td>
</tr>
<tr>
<td>Na</td>
<td>23</td>
<td>$2.3 \times 10^{-4}$ mb</td>
</tr>
<tr>
<td>Ne</td>
<td>28</td>
<td>$8.5 \times 10^{-5}$ mb</td>
</tr>
<tr>
<td>Ne</td>
<td>29</td>
<td>$5.7 \times 10^{-6}$ mb</td>
</tr>
</tbody>
</table>
# Values, Dimension

<table>
<thead>
<tr>
<th>180(^{\text{Hf}})</th>
<th>181(^{\text{Hf}})</th>
<th>182(^{\text{Hf}})</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>stable</strong></td>
<td><strong>42.39 d</strong></td>
<td>9 My</td>
</tr>
<tr>
<td>179(^{\text{Lu}})</td>
<td>180(^{\text{Lu}})</td>
<td>181(^{\text{Lu}})</td>
</tr>
<tr>
<td>4.59 h</td>
<td>5.7 m</td>
<td>3.5 m</td>
</tr>
<tr>
<td>178(^{\text{Yb}})</td>
<td>179(^{\text{Yb}})</td>
<td>180(^{\text{Yb}})</td>
</tr>
<tr>
<td>1.23 h</td>
<td>8 m</td>
<td>2.4 m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>180(^{\text{Hf}})</th>
<th>181(^{\text{Hf}})</th>
<th>182(^{\text{Hf}})</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0e+20</td>
<td>3.7e+06</td>
<td>2.8e+14</td>
</tr>
<tr>
<td>1.7e+04</td>
<td>3.4e+02</td>
<td>2.1e+02</td>
</tr>
<tr>
<td>4.4e+03</td>
<td>4.8e+02</td>
<td>1.4e+02</td>
</tr>
</tbody>
</table>

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OT. 01/21/11, East Lansing
Printing to Adobe PDF - Example 1:
Color scale board based on the internal database or calculations

$T_{1/2}$ (sec)

<Experiment>
N=0-200

Protons (Z)

Neutrons (N)
Printing to Adobe PDF – Example 2:
Color scale board based on the internal database or calculations

$T_{1/2}$ (sec)

$\langle$Experiment$\rangle$

$N=0-200$
Color scale board based on the internal database or calculations
Printing to Adobe PDF – Example 3: Color scale board based on the internal database or calculations

\[ T_{1/2} \text{ (sec)} \]

<Experiment>

N=0-200
Printing to Adobe PDF – Example 4:
Color scale board based on the internal database or calculations

$T_{1/2}$ (sec)

$\langle$Experiment$\rangle$

$N=0-200$
Why in database plots?

LISE++ Database (based on AME2003) values or calculations could be joined with the user color board.

Default location of ISO and ISOLIST files is the “My Documents\LISE\bin” directory.
ISO file

ASCII file

201 rows : correspond to Z
501 columns: corresponds to N

1st row : Z=0
1st column: N=0

Empty.iso is a template in the LISE++ package

Nuclides corresponded to “0” char are not drawn by LISE++ in plots.

No restrictions for number of colors.

All chars should be above or equal “0” char.

Number 10 corresponds to char “.:”
Number 11 corresponds to char “;:”
Number 12 corresponds to char “<”
and so on
ASCII file

LISE++ reads first two columns

1st column is name (should be in quotation marks)
2nd column is color (decimal base)
Printing to Adobe PDF – Example 5:
Color scale board based on the “decay modes” files

$T_{1/2} \text{ (sec)}$ (compilation)

$\text{N}=0-200$

The color scale board is based on "table.iso" & "decay_mode.isolist" files
Printing to Adobe PDF – Example 6:
Color scale board based on the “decay modes” files

\[ T_{1/2} \text{ (sec) (compilation)} \]
\[ <\text{Compilation}> \]
\[ N=0-200 \]

The color scale board is based on "table.iso" & "decay_mode.isolist" files
Printing to Adobe PDF – Example 6 (zoom):
Color scale board based on the “decay modes” files
Color scale board based on the “DISCOVERY” files

"Discovery_lab.iso" from M.Thoennessen (thoennessen@nscl.msu.edu)

The color scale board is based on "discovery_lab.iso" & "discovery_lab.isolist" files
Example 8:
Color scale board based on the “DISCOVERY” files.

The color scale board is based on "discovery_lab.iso" & "discovery_lab.isolist" files.

“Discovery_lab.iso” from M.Thoennessen (thoennessen@nscl.msu.edu)
Printing to Adobe PDF – Example 9:
Color scale board based on the “DISCOVERY” files

The color scale board is based on "discovery_lab.iso" & "discovery_lab.isolist" files

"Discovery_lab.iso" from M.Thoennessen
(thoennessen@nscl.msu.edu)
Color board example

$S_{2p}$

(Database: AME2003 (A&W) + LDM2)

N=0-200

The color scale board is based on "welcome.iso" & "welcome.isolist" files
Color board example

$S_{2p}$

(Database: AME2003 (A&W) + LDM2)  
N=0-200

The color scale board is based on "welcome.iso" & "welcome.isolist" files
Next step: User database

Excel file → DBF (dBASE) → LISE++

For the user database just we need INDEX, other columns are user information. Restriction: < 15 fields

User database fields

Dynamical menus should be
# Outlooks

## Long Term

<table>
<thead>
<tr>
<th>Subject</th>
<th>Priority</th>
<th>New Order</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custom shape degrader optimization in MC mode for high order optics</td>
<td>High priority</td>
<td>1</td>
<td>&lt;2 weeks</td>
</tr>
<tr>
<td>Input angles in wedge in MC mode</td>
<td>High priority</td>
<td>X</td>
<td>1 week</td>
</tr>
<tr>
<td>PACE4 generator of one event (creation dll-library)</td>
<td>High priority</td>
<td>4</td>
<td>1 week</td>
</tr>
<tr>
<td>PACE4 in MC LISE++ (using PAVE4 dll-library)</td>
<td>High priority</td>
<td>3</td>
<td>1 week</td>
</tr>
<tr>
<td>EFAHCA implementation</td>
<td>High priority</td>
<td></td>
<td>1.5 months</td>
</tr>
<tr>
<td>ABA (Abrasion-Dissipation-Ablation) model creation</td>
<td>Medium</td>
<td></td>
<td>2 months</td>
</tr>
<tr>
<td>Evaporation cascade: create Monte Carlo version</td>
<td>Medium</td>
<td></td>
<td>1 month</td>
</tr>
<tr>
<td>Abrasion-Fission: create Monte Carlo version</td>
<td>Medium</td>
<td>X</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Implementation of Intranuclear cascade (INC) model in LISE++ Windows</td>
<td>Medium</td>
<td></td>
<td>3 months</td>
</tr>
<tr>
<td>Ray tracing in LISE++</td>
<td>Medium</td>
<td></td>
<td>1 year</td>
</tr>
<tr>
<td>Minimization in LISE++ (which can be used for MC, TRANSPORT, Ray tracing cases)</td>
<td>Medium</td>
<td></td>
<td>2 months</td>
</tr>
<tr>
<td>Write full LISE++ documentation</td>
<td>Medium</td>
<td></td>
<td>1-2 months</td>
</tr>
<tr>
<td>The “MOTER” code development</td>
<td>Low</td>
<td></td>
<td>1 year</td>
</tr>
<tr>
<td>Energy loss in PACE4 (low priority)</td>
<td>Low</td>
<td></td>
<td>1 week</td>
</tr>
<tr>
<td>Three-body kinematics relativistic calculator</td>
<td>Low</td>
<td></td>
<td>1 month</td>
</tr>
<tr>
<td>Water wedge procedure (wedge with one moving plane and filled by liquid)</td>
<td>Low</td>
<td></td>
<td>2 weeks</td>
</tr>
</tbody>
</table>

## Short Term

<table>
<thead>
<tr>
<th>Subject</th>
<th>Priority</th>
<th>New Order</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop a subroutine to calculate a reduced dispersion for large values of dp/P</td>
<td>High priority</td>
<td>2</td>
<td>&lt;3 days</td>
</tr>
<tr>
<td>PACE4: request from TRIUMF</td>
<td>High priority</td>
<td>3</td>
<td>2 days</td>
</tr>
<tr>
<td>Cross section for stripper</td>
<td>Medium</td>
<td></td>
<td>2 days</td>
</tr>
<tr>
<td>High order: write documentation and put source for COSY files</td>
<td>Medium</td>
<td></td>
<td>5 days</td>
</tr>
<tr>
<td>User database: import, edit, plot</td>
<td>Medium</td>
<td>X</td>
<td>5 days</td>
</tr>
<tr>
<td>Discovery of isotopes: utilities, database, plots (see row above)</td>
<td>Medium</td>
<td></td>
<td>5 days</td>
</tr>
<tr>
<td>Wedge (including curved profile wedge) inclination</td>
<td>Medium</td>
<td></td>
<td>4 days</td>
</tr>
<tr>
<td>Create possibility to insert a material before the target</td>
<td>Medium</td>
<td></td>
<td>2 days</td>
</tr>
<tr>
<td>Bhre method to measure T1/2 (MC: possibility of decay in flight)</td>
<td>Low</td>
<td></td>
<td>5 days</td>
</tr>
<tr>
<td>Dispersion method for secondary target: check DIM case</td>
<td>Low</td>
<td></td>
<td>2 days</td>
</tr>
<tr>
<td>Fission without angular acceptances: low transmission for analytical solution</td>
<td>Low</td>
<td></td>
<td>2 days</td>
</tr>
<tr>
<td>High order optics calculation: improvement, adaptation GICOSSY format</td>
<td>Low</td>
<td></td>
<td>2 days</td>
</tr>
<tr>
<td>MOCADI &lt;= LISE++ converter</td>
<td>Low</td>
<td></td>
<td>3 days</td>
</tr>
<tr>
<td>Transport &lt;= LISE++ converter</td>
<td>Low</td>
<td></td>
<td>4 days</td>
</tr>
<tr>
<td>m aud dimensions for LISE++ optics</td>
<td>Low</td>
<td></td>
<td>2 days</td>
</tr>
<tr>
<td>Problem with Projectile Fragmentation in the Catcher utility</td>
<td>Low</td>
<td></td>
<td>1 day</td>
</tr>
<tr>
<td>Simulation reactions in Siteoscope in MC mode</td>
<td>Low</td>
<td></td>
<td>4 days</td>
</tr>
</tbody>
</table>

## Done

<table>
<thead>
<tr>
<th>Subject</th>
<th>Priority</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linked COSY matrices reload in LISE++ by user demand in the LISE code</td>
<td>High priority</td>
<td>done</td>
</tr>
<tr>
<td>Recalculate optical matrices of quadrupoles according to Bhre by pressing one button</td>
<td>High priority</td>
<td>done</td>
</tr>
<tr>
<td>Increasing number block limit up to 200 (was 100)</td>
<td>High priority</td>
<td>done</td>
</tr>
<tr>
<td>Quadrupoles: option matrix or field calculations</td>
<td>High priority</td>
<td>done</td>
</tr>
<tr>
<td>Second order matrix for dipole and entrance and exit face of dipole</td>
<td>High priority</td>
<td>done</td>
</tr>
<tr>
<td>Ideal magnet solution (tabulation): first and second order</td>
<td>High priority</td>
<td>done</td>
</tr>
<tr>
<td>Stripper foil half-life: initial temperature</td>
<td>Medium</td>
<td>1 day</td>
</tr>
<tr>
<td>Stripper foil half-life: pulsing beam &amp; rotating target together</td>
<td>Medium</td>
<td>2 days</td>
</tr>
<tr>
<td>Target and stripper thickness defects</td>
<td>Medium</td>
<td>2 days</td>
</tr>
<tr>
<td>Range option in MC rays generator</td>
<td>Medium</td>
<td>1 day</td>
</tr>
<tr>
<td>Customizable chart of Nuclides</td>
<td>High priority</td>
<td>5 days</td>
</tr>
</tbody>
</table>

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Date: 15 February - 31 March

- LISE++: Custom shape degrader optimization in MC mode, high orders: <2 weeks to 3 February
- Input angles in wedge in MC mode: <1 week to 10 February
- FRIB yields: <7 days to 17 February
- #9016 experiment preparation: 1 April to 10 April
- #9016 experiment performance: 11 April to 25 April, June-July
- PACE4 dll: <1 week
- PACE4 in LISE++ MC: <1 week
- dp/p subroutine: <3 days
- TRIUMF requests: <2 days
- SL3 in LISE++: <1 week