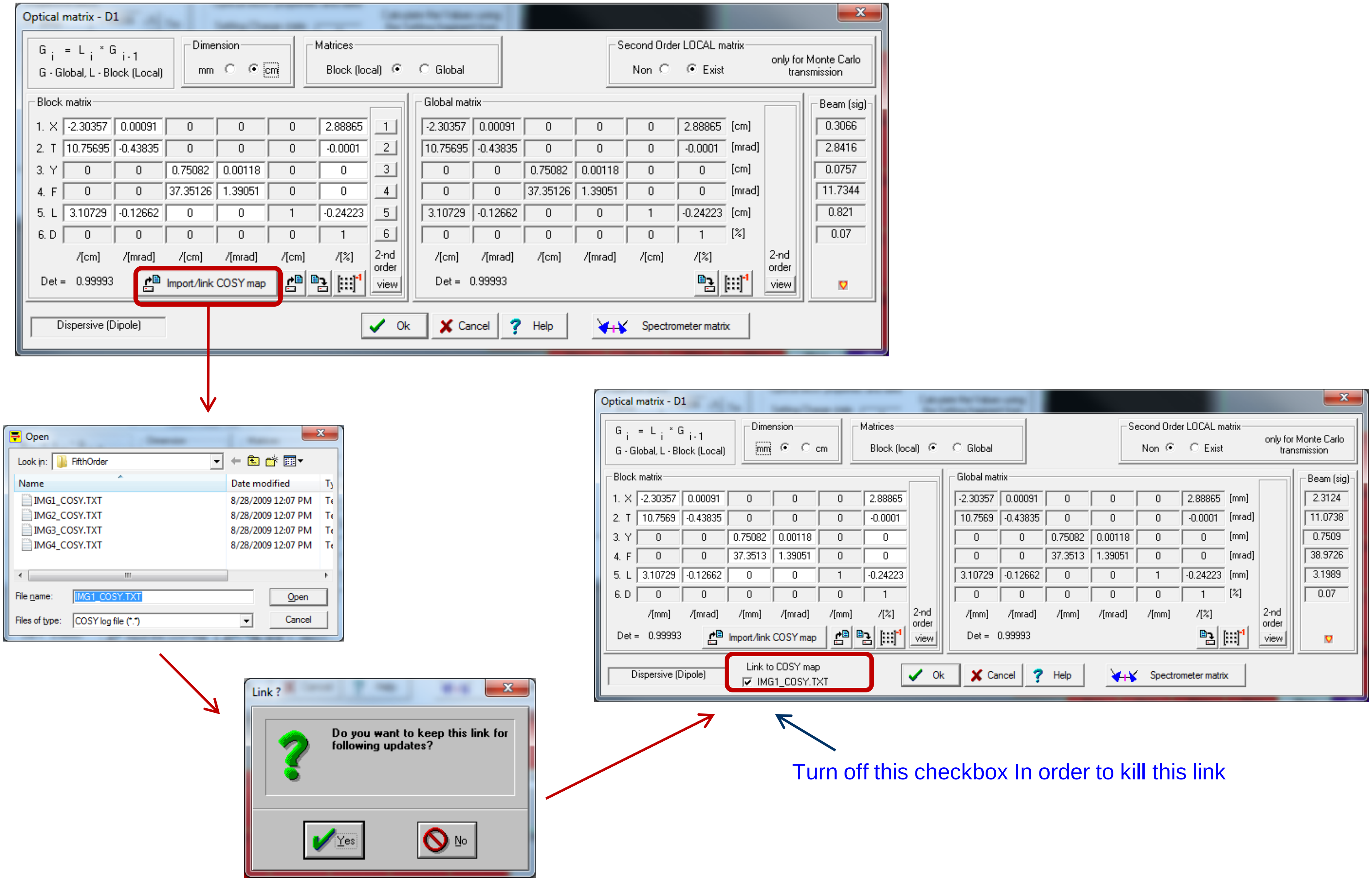
Working under Optics

LISE++ beta v.9.2.33

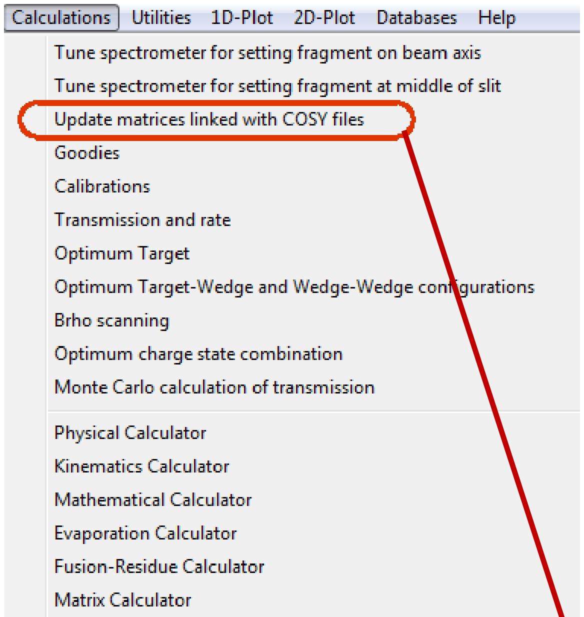
- Update of links with COSY maps
- Automatic calculation of Drift-block (quadrupoles, sextupoles) matrices, new options
- New utility dialog: "The First- and Second-Order Matrix Elements for an Ideal Magnet“
- Dipole (dispersive block): Transport solution (1st and 2-nd orders) including fringing fields
- Edge effect option for transmission calculation (the "Option" dialog)
- Analyzing ROOT histogram files by the BI code
- Corrections, Some Improvements
- Requests to increase
- LISE++ development priorities

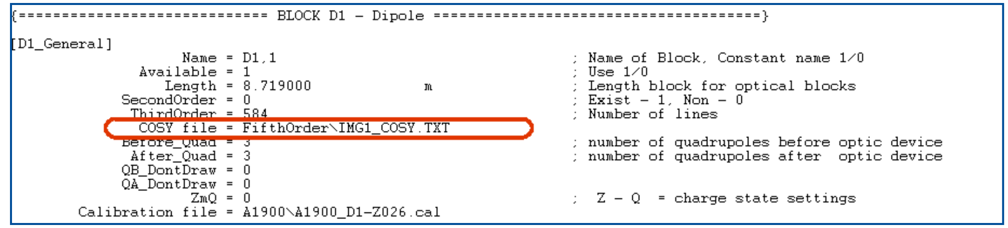
The code operates under MS Windows environment and provides a highly user-friendly interface.
It can be freely downloaded from the following internet addresses:
http://www.nscl.msu/edu/lise

9.2.23 11/17/10 Update COSY links

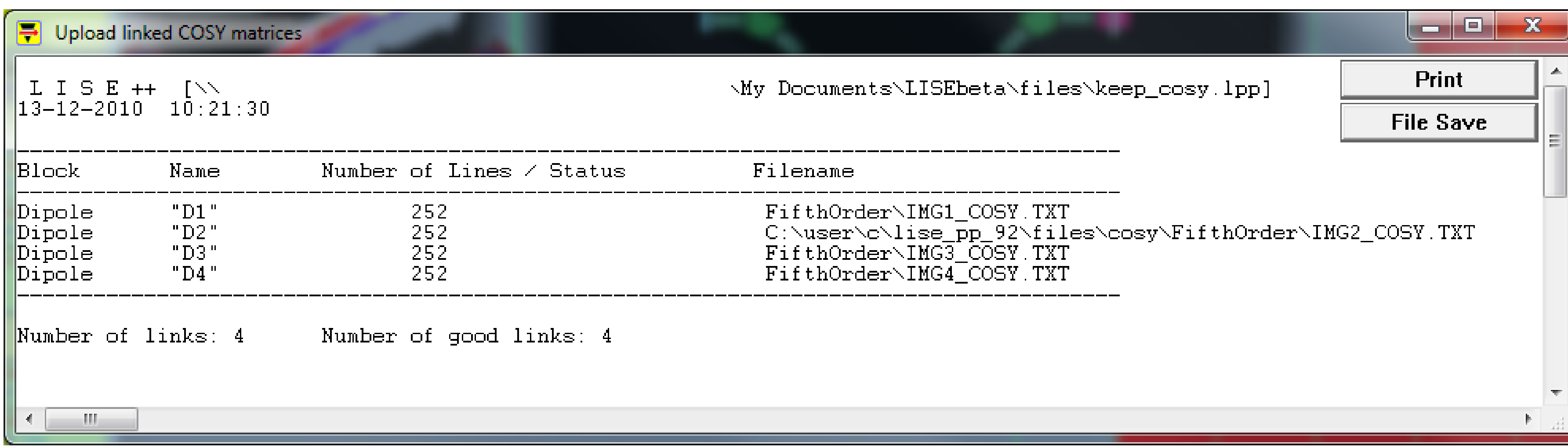


Update of links with COSY maps





- default directory is **\My Documents\LISE\files
- https://www.msu.edu/~portill2/cosy_tools/
the algorithms in the COSY language that are required to be used for writing readable higher order maps in LISE++ from M.Portillo



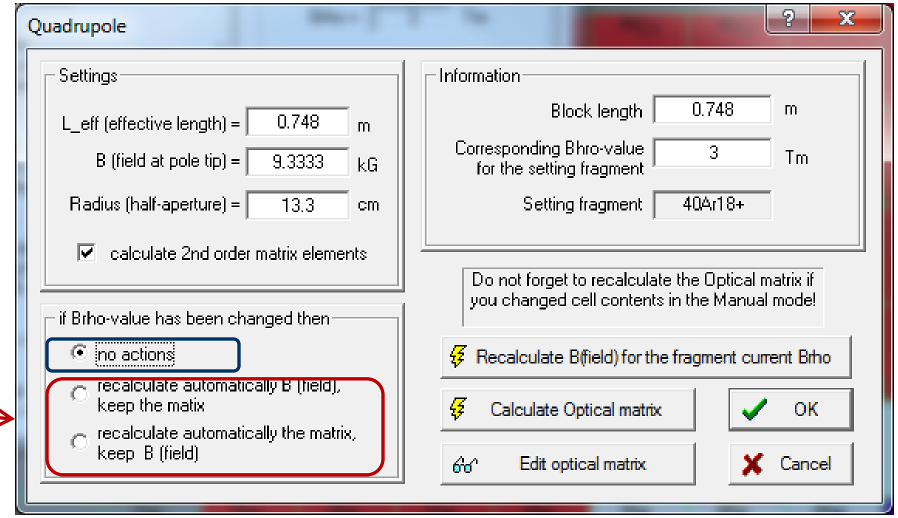
Drift block matrices (Quadrupoles,Sextupoles…)

9.2.22 11/15/10 Calculate automatically Drift-block matrices

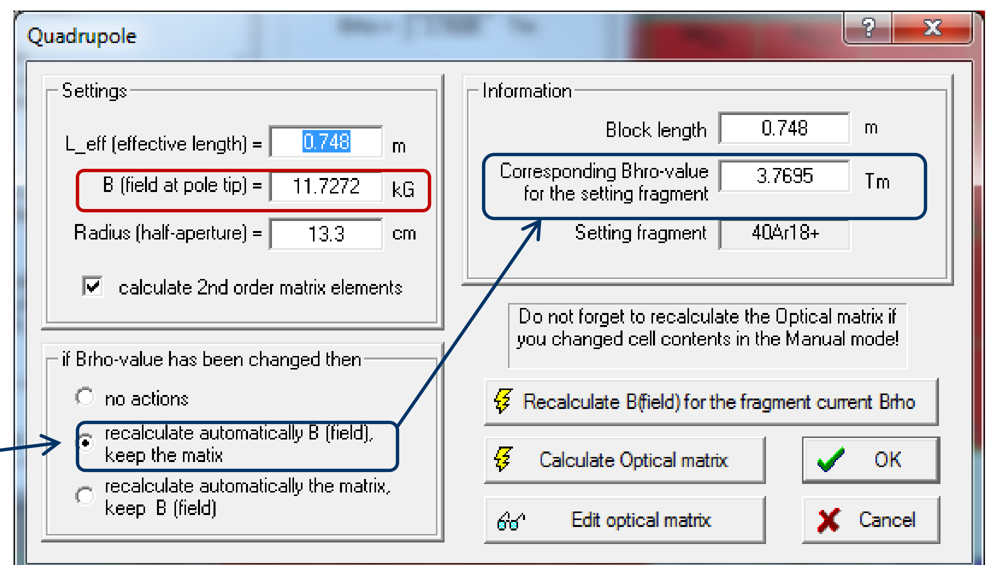
9.2.24 11/18/10 New option for quadrupoles : keep matrices, calculate fields

9.2.21 and older

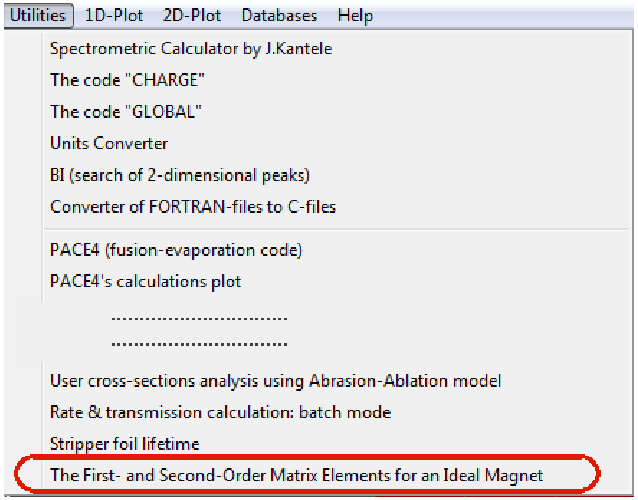
9.2.22

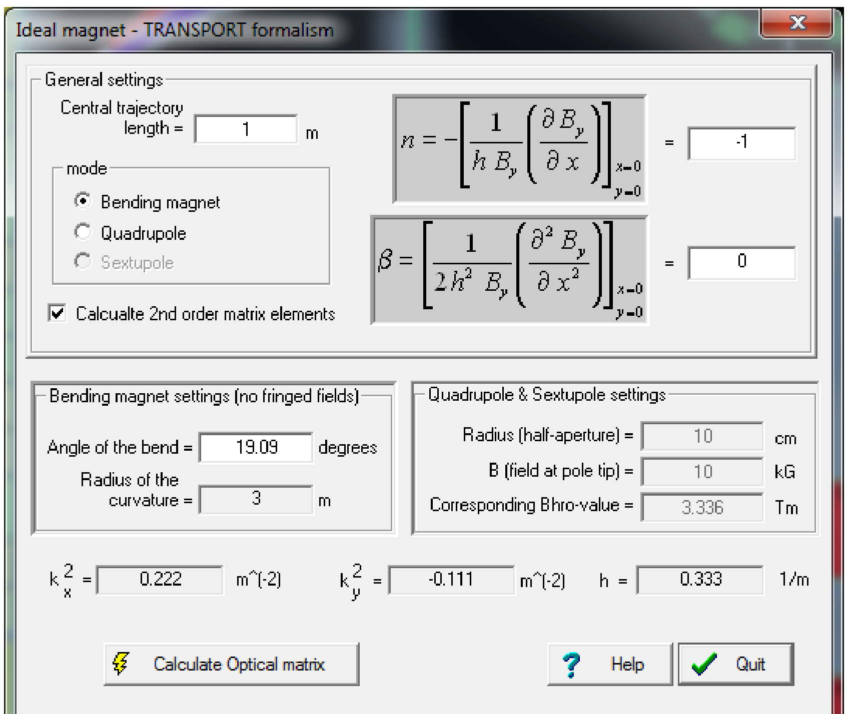


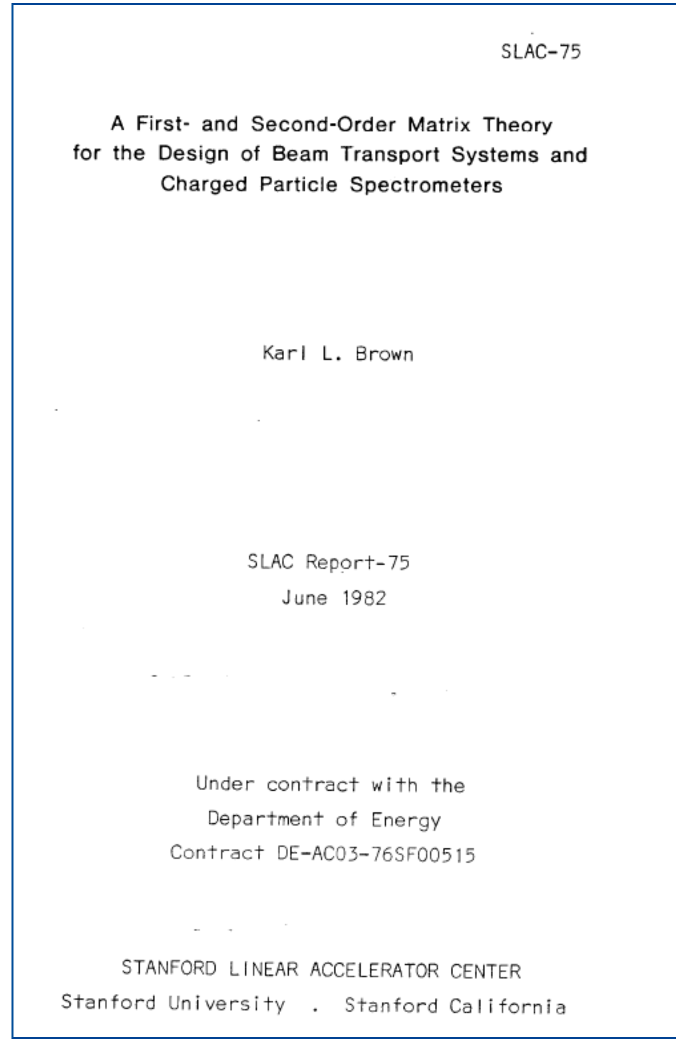
For example, if Brho has been changed, and option "keep matrix" was set



New utility dialog: "The First- and Second-Order Matrix Elements for an Ideal Magnet"






SLAC-75

A First- and Second-Order Matrix Theory for the Design of Beam Transport Systems and Charged Particle Spectrometers

Karl L. Brown

SLAC Report-75

June 1982

Under contract with the Department of Energy

Contract DE-AC03-76SF00515

STANFORD LINEAR ACCELERATOR CENTER

Stanford University . Stanford California

SLAC-75 report by Karl L. Brown

TABLE VIa

Tabulation of the First- and Second-Order Matrix Elements for an Ideal Magnet in Terms of the Key Integrals Listed in Table VIb

Definitions: $k_x^2 = (1 - n)h^2$, $k_y^2 = nh^2$, $h = 1/\rho_0$

$$
\begin{aligned}
R_{11} &= (x \mid x_0) = c_x(t) = \cos k_x t \\
R_{12} &= (x \mid \theta_0) = s_x(t) = (1/k_x) \sin k_x t \\
R_{16} &= (x \mid \delta) = d_x(t) = (h/k_x^2)[1 - c_x(t)] \\
T_{111} &= (x \mid x_0^2) = (2n - 1 - \beta)h^3 I_{111} + \tfrac{1}{2}k_x^4 h I_{122} \\
T_{112} &= (x \mid x_0\theta_0) = hs_x(t) + 2(2n - 1 - \beta)h^3 I_{112} - k_x^2 h I_{112} \\
T_{116} &= (x \mid x_0\delta) = (2 - n)h^2 I_{11} + 2(2n - 1 - \beta)h^3 I_{116} - k_x^2 h^2 I_{122} \\
T_{122} &= (x \mid \theta_0^2) = (2n - 1 - \beta)h^3 I_{122} + \tfrac{1}{2}h I_{111} \\
T_{126} &= (x \mid \theta_0\delta) = (2 - n)h^2 I_{12} + 2(2n - 1 - \beta)h^3 I_{126} + h^2 I_{112} \\
T_{166} &= (x \mid \delta^2) = -hI_{10} + (2 - n)h^2 I_{16} + (2n - 1 - \beta)h^3 I_{166} + \tfrac{1}{2}h^3 I_{122} \\
T_{133} &= (x \mid y_0^2) = \beta h^3 I_{133} - \tfrac{1}{2}k_y^2 h I_{10} \\
T_{134} &= (x \mid y_0\varphi_0) = 2\beta h^3 I_{134} \\
T_{144} &= (x \mid \varphi_0^2) = \beta h^3 I_{144} - \tfrac{1}{2}h I_{10} \\
R_{21} &= (\theta \mid x_0) = c_x'(t) = -k_x^2 s_x(t) \\
R_{22} &= (\theta \mid \theta_0) = s_x'(t) = c_x(t) \\
R_{26} &= (\theta \mid \delta) = d_x'(t) = hs_x(t) \\
T_{211} &= (\theta \mid x_0^2) = (2n - 1 - \beta)h^3 I_{211} + \tfrac{1}{2}k_x^4 h I_{222} - hc_x(t)c_x'(t) \\
T_{212} &= (\theta \mid x_0\theta_0) = hs_x'(t) \; 2(2n - 1 - \beta)h^3 I_{212} - k_x^2 h I_{212} - h[c_x(t)s_x'(t) + c_x'(t)s_x(t)] \\
T_{216} &= (\theta \mid x_0\delta) = (2 - n)h^2 I_{21} + 2(2n - 1 - \beta)h^3 I_{216} - k_x^2 h^2 I_{222} - h[c_x(t)\, d_x'(t) + c_x'(t)\, d_x(t)] \\
T_{222} &= (\theta \mid \theta_0^2) = (2n - 1 - \beta)h^3 I_{222} + \tfrac{1}{2}h I_{211} - hs_x(t)s_x'(t) \\
T_{226} &= (\theta \mid \theta_0\delta) = (2 - n)h^2 I_{22} + 2(2n - 1 - \beta)h^3 I_{226} + h^2 I_{212} - h[s_x(t)\, d_x'(t) + s_x'(t)\, d_x(t)]
\end{aligned}
$$

$$
\begin{aligned}
T_{266} &= (\theta \mid \delta^2) = -hI_{20} + (2 - n)h^2 I_{26} + (2n - 1 - \beta)h^3 I_{266} + \tfrac{1}{2}h^3 I_{222} - h\, d_x(t)\, d_x'(t) \\
T_{233} &= (\theta \mid y_0^2) = \beta h^3 I_{233} - \tfrac{1}{2}k_y^2 h I_{20} \\
T_{234} &= (\theta \mid y_0\varphi_0) = 2\beta h^3 I_{234} \\
T_{244} &= (\theta \mid \varphi_0^2) = \beta h^3 I_{244} - \tfrac{1}{2}h I_{20} \\
R_{33} &= (y \mid y_0) = c_y(t) = \cos k_y t \\
R_{34} &= (y \mid \varphi_0) = s_y(t) = (1/k_y) \sin k_y t \\
T_{313} &= (y \mid x_0 y_0) = + 2(\beta - n)h^3 I_{313} + k_x^2 k_y^2 h I_{324} \\
T_{314} &= (y \mid x_0\varphi_0) = hs_y(t) + 2(\beta - n)h^3 I_{314} - k_x^2 h I_{323} \\
T_{323} &= (y \mid \theta_0 y_0) = + 2(\beta - n)h^3 I_{323} - k_y^2 h I_{314} \\
T_{324} &= (y \mid \theta_0\varphi_0) = + 2(\beta - n)h^3 I_{324} + h I_{313} \\
T_{336} &= (y \mid y_0\delta) = k_y^2 I_{33} + 2(\beta - n)h^3 I_{336} - k_y^2 h^2 I_{324} \\
T_{346} &= (y \mid \varphi_0\delta) = k_y^2 I_{34} + 2(\beta - n)h^3 I_{346} + h^2 I_{323} \\
R_{43} &= (\varphi \mid y_0) = c_y'(t) = -k_y^2 s_y(t) \\
R_{44} &= (\varphi \mid \varphi_0) = s_y'(t) = c_y(t) \\
T_{413} &= (\varphi \mid x_0 y_0) = 2(\beta - n)h^3 I_{413} + k_x^2 k_y^2 h I_{424} - hc_x(t)c_y'(t) \\
T_{414} &= (\varphi \mid x_0\varphi_0) = hs_y'(t) + 2(\beta - n)h^3 I_{414} - k_x^2 h I_{423} - hc_x(t)s_y'(t) \\
T_{423} &= (\varphi \mid \theta_0 y_0) = 2(\beta - n)h^3 I_{423} - k_y^2 h I_{414} - hs_x(t)c_y'(t) \\
T_{424} &= (\varphi \mid \theta_0\varphi_0) = 2(\beta - n)h^3 I_{424} + h I_{413} - hs_x(t)s_y'(t) \\
T_{436} &= (\varphi \mid y_0\delta) = k_y^2 I_{43} + 2(\beta - n)h^3 I_{436} - k_y^2 h^2 I_{424} - h\, d_x(t)c_y'(t) \\
T_{446} &= (\varphi \mid \varphi_0\delta) = k_y^2 I_{44} + 2(\beta - n)h^3 I_{446} + h^2 I_{423} - h\, d_x(t)s_y'(t)
\end{aligned}
\tag{54}
$$

TABLE VIb

Tabulation of Key Integrals Required for the Numerical Evaluation of the Second-Order Aberrations of Ideal Magnets

The results are expressed in terms of the five characteristic first-order matrix elements $s_x(t)$, $c_x(t)$, $d_x(t)$, $c_y(t)$, and $s_y(t)$ and the quantities h and n (assumed to be constant for the ideal magnet over the interval of integration $\tau = 0$ to $\tau = t$). The path length of the central trajectory is t. From the solutions of the differential equations [Eq. (29) of Sec. II], the first-order matrix elements for the ideal magnet are:

$$c_x(t) = \cos k_x t \qquad s_x(t) = (1/k_x) \sin k_x t \qquad d_x(t) = (h/k_x^2)[1 - c_x(t)] \qquad c_y(t) = \cos k_y t \qquad s_y(t) = (1/k_y) \sin k_y t$$

where

$$k_x^2 = (1 - n)h^2, \quad k_y^2 = nh^2, \quad \text{and} \quad h = 1/\rho_0$$

ρ_0 is the radius of curvature of the central trajectory.

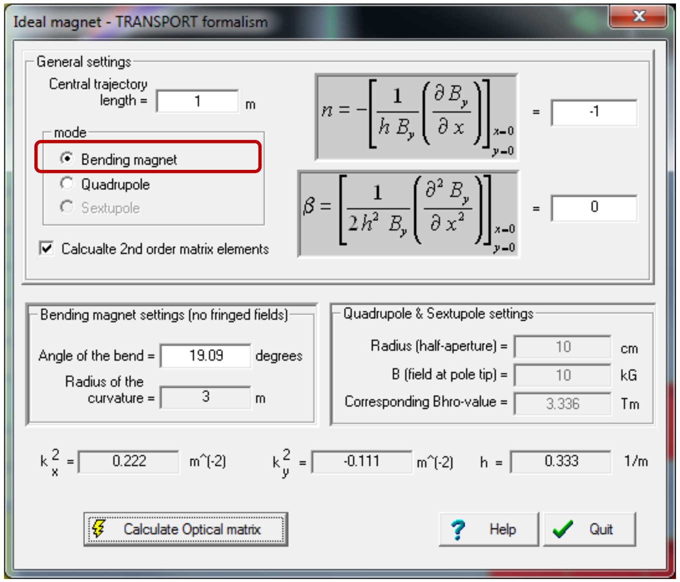
$$
\begin{aligned}
I_{10} &= \int_0^t G_x(t, \tau)\, d\tau = \left[\frac{d_x(t)}{h}\right] \\
I_{11} &= \int_0^t c_x(\tau)G_x(t, \tau)\, d\tau = \frac{1}{2} ts_x(t) \\
I_{12} &= \int_0^t s_x(\tau)G_x(t, \tau)\, d\tau = \frac{1}{2k_x^2}[s_x(t) - tc_x(t)] \\
I_{16} &= \int_0^t d_x(\tau)G_x(t, \tau)\, d\tau = \frac{h}{k_x^2}(I_{10} - I_{11}) = \frac{h}{k_x^2}\left[\frac{d_x(t)}{h} - \frac{t}{2}s_x(t)\right] \\
I_{111} &= \int_0^t c_x^2(\tau)G_x(t, \tau)\, d\tau = \frac{1}{3}\left[s_x^2(t) + \frac{d_x(t)}{h}\right] \\
I_{112} &= \int_0^t c_x(\tau)s_x(\tau)G_x(t, \tau)\, d\tau = \frac{1}{3} s_x(t)\left[\frac{d_x(t)}{h}\right]
\end{aligned}
$$

$$
\begin{aligned}
I_{116} &= \int_0^t c_x(\tau)\, d_x(\tau)G_x(t, \tau)\, d\tau = \frac{h}{k_x^2}(I_{11} - I_{111}) = \frac{h}{k_x^2}\left\{\frac{t}{2}s_x(t) - \frac{1}{3}\left[s_x^2(t) + \frac{d_x(t)}{h}\right]\right\} \\
I_{122} &= \int_0^t s_x^2(\tau)G_x(t, \tau)\, d\tau = \frac{1}{k_x^2}(I_{10} - I_{111}) = \frac{1}{3k_x^2}\left[2\frac{d_x(t)}{h} - s_x^2(t)\right] \\
I_{126} &= \int_0^t s_x(\tau)\, d_x(\tau)G_x(t, \tau)\, d\tau = \frac{h}{k_x^2}(I_{12} - I_{112}) = \frac{h}{k_x^2}\left\{\frac{1}{2k_x^2}[s_x(t) - tc_x(t)] - \frac{1}{3}s_x(t)\left[\frac{d_x(t)}{h}\right]\right\} \\
&= \frac{h}{6k_x^4}[s_x(t) + 2s_x(t)c_x(t) - 3tc_x(t)] \\
I_{166} &= \int_0^t d_x^2(\tau)G_x(t, \tau)\, d\tau = \frac{h^2}{k_x^4}(I_{10} - 2I_{11} + I_{111}) = \frac{h^2}{k_x^4}\left\{\frac{4}{3}\left[\frac{d_x(t)}{h}\right] + \frac{1}{3}s_x^2(t) - ts_x(t)\right\} \\
I_{133} &= \int_0^t c_y^2(\tau)G_x(t, \tau)\, d\tau = \left[\frac{d_x(t)}{h}\right] - \left[\frac{k_y^2}{k_x^2 - 4k_y^2}\right]\left[s_y^2(t) - 2\frac{d_x(t)}{h}\right] \\
I_{134} &= \int_0^t c_y(\tau)s_y(\tau)G_x(t, \tau)\, d\tau = \frac{1}{k_x^2 - 4k_y^2}[s_y(t)c_y(t) - s_x(t)] \\
I_{144} &= \int_0^t s_y^2(\tau)G_x(t, \tau)\, d\tau = \frac{1}{k_x^2 - 4k_y^2}\left[s_y^2(t) - 2\frac{d_x(t)}{h}\right] \\
I_{20} &= I_{10}' = \frac{d}{dt}\int_0^t G_x(t, \tau)\, d\tau = s_x(t) \\
I_{21} &= I_{11}' = \frac{d}{dt}\int_0^t c_x(\tau)G_x(t, \tau)\, d\tau = \frac{1}{2}[s_x(t) + tc_x(t)] \\
I_{22} &= I_{12}' = \frac{d}{dt}\int_0^t s_x(\tau)G_x(t, \tau)\, d\tau = \frac{1}{2}ts_x(t) = I_{11} \\
I_{26} &= I_{16}' = \frac{d}{dt}\int_0^t d_x(\tau)G_x(t, \tau)\, d\tau = \frac{h}{2k_x^2}[s_x(t) - tc_x(t)] \\
I_{211} &= I_{111}' = \frac{d}{dt}\int_0^t c_x^2(\tau)G_x(t, \tau)\, d\tau = \frac{s_x(t)}{3}[1 + 2c_x(t)]
\end{aligned}
$$

(*continued*)

and so on…

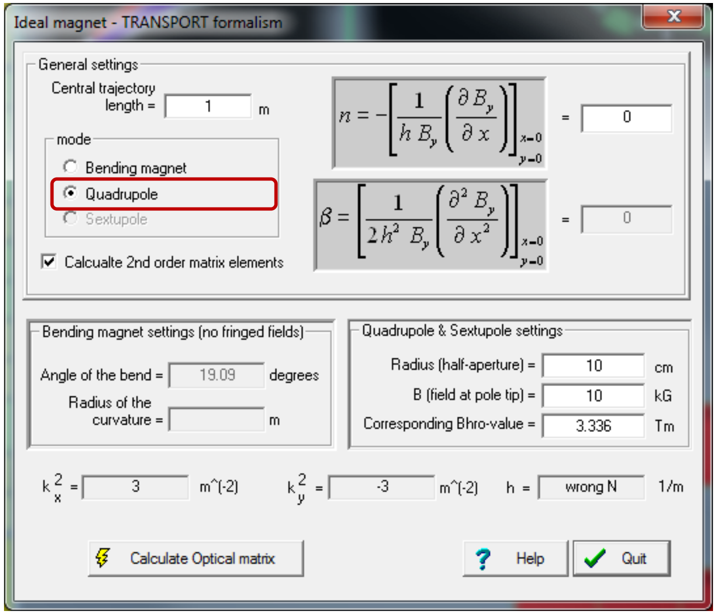
Bending magnet (dipole) example



Utility: The First- and Second-Order Matrix Elements for an Ideal Magnet

```
Bending magnet

Length = 1
     n = -1
  beta = 0
 angle = 19.09
radius = 3
   k2x = 0.222
   k2y = -0.111
     h = 0.333

------------------------------------------------------------------------------------------

                                                      transport format [cm-mrad]

                         * TRANSFORM 1 *

  1 [X]:     +8.9103e-01  +9.6340e-02  0            0            0            +1.6353e-01
  2 [T]:     -2.1390e+00  +8.9103e-01  0            0            0            +3.2099e+00
  3 [Y]:     0            0            +1.0560e+00  +1.0186e-01  0            0
  4 [F]:     0            0            +1.1308e+00  +1.0560e+00  0            0
  5 [L]:     -3.2099e-01  -1.6353e-02  0            0            +1.0000e+00  -1.8298e-02
  6 [D]:     0            0            0            0            0            +1.0000e+00

------------------------------------------------------------------------------------------

                         * TRANSFORM 2 *

  1    1:    -5.1824e-04
  1    2:    +2.7435e-04  +6.9886e-06
  1    3:    0            0            +9.0769e-05
  1    4:    0            0            0            -8.1766e-06
  1    5:    0            0            0            0            0
  1    6:    +1.5554e-03  +6.9990e-05  0            0            0            -1.5759e-03
------------------------------------------------------------------------------------------
  2    1:    -3.3045e-03
  2    2:    -3.3670e-04  -1.7215e-04
  2    3:    0            0            +1.7817e-03
  2    4:    0            0            0            -1.6050e-04
  2    5:    0            0            0            0            0
  2    6:    +2.0613e-02  +5.0528e-04  0            0            0            -3.1516e-02
------------------------------------------------------------------------------------------
  3    1:    0
  3    2:    0            0
  3    3:    +3.6296e-04  +1.8492e-05  0
  3    4:    +3.3897e-04  +1.7269e-05  0            0
  3    5:    0            0            0            0            0
  3    6:    0            0            -5.4469e-04  +6.1453e-07  0            0
------------------------------------------------------------------------------------------
  4    1:    0
  4    2:    0            0
  4    3:    +3.7630e-03  +1.9397e-04  0
  4    4:    +3.6749e-04  +1.8492e-05  0            0
  4    5:    0            0            0            0            0
  4    6:    0            0            -1.1301e-02  -5.4469e-04  0            0
------------------------------------------------------------------------------------------
```

Quadrupole example



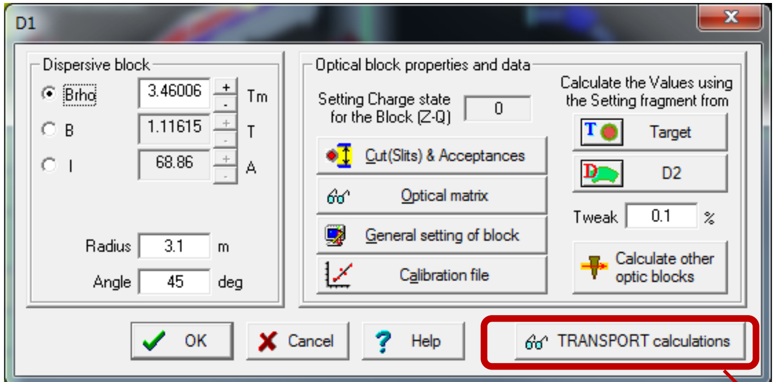

```
Utility: The First- and Second-Order Matrix Elements for an Ideal Magnet

Quadrupole

Length = 1
     n = 0
  beta = 0
half-ap= 10
Bfield = 10
  Brho = 3.336
   k2x = 3
   k2y = -3
     h = 1e-12
----------------------------------------------------------------------------------------

                                                    transport format [cm-mrad]

                        * TRANSFORM 1 *

  1 [X]:   -1.5987e-01  +5.7015e-02   0             0             0             0
  2 [T]:   -1.7091e+01  -1.5987e-01   0             0             0             0
  3 [Y]:    0            0           +2.9127e+00   +1.5801e-01    0             0
  4 [F]:    0            0           +4.7364e+01   +2.9127e+00    0             0
  5 [L]:    0            0            0             0            +1.0000e+00    0
  6 [D]:    0            0            0             0             0            +1.0000e+00
----------------------------------------------------------------------------------------

                        * TRANSFORM 2 *

  1   1:    0
  1   2:    0            0
  1   3:    0            0            0
  1   4:    0            0            0             0
  1   5:    0            0            0             0             0
  1   6:   +8.5454e-03  +3.6501e-04   0             0             0             0
----------------------------------------------------------------------------------------
  2   1:    0
  2   2:    0            0
  2   3:    0            0            0
  2   4:    0            0            0             0
  2   5:    0            0            0             0             0
  2   6:   +6.1493e-02  +8.5454e-03   0             0             0             0
----------------------------------------------------------------------------------------
  3   1:    0
  3   2:    0            0
  3   3:    0            0            0
  3   4:    0            0            0             0
  3   5:    0            0            0             0             0
  3   6:    0            0           -2.3682e-02   -6.6631e-04    0             0
----------------------------------------------------------------------------------------
  4   1:    0
  4   2:    0            0
  4   3:    0            0            0
  4   4:    0            0            0             0
  4   5:    0            0            0             0             0
  4   6:    0            0           -6.7337e-01   -2.3682e-02    0             0
----------------------------------------------------------------------------------------
  5   1:    0
  5   2:    0            0
```

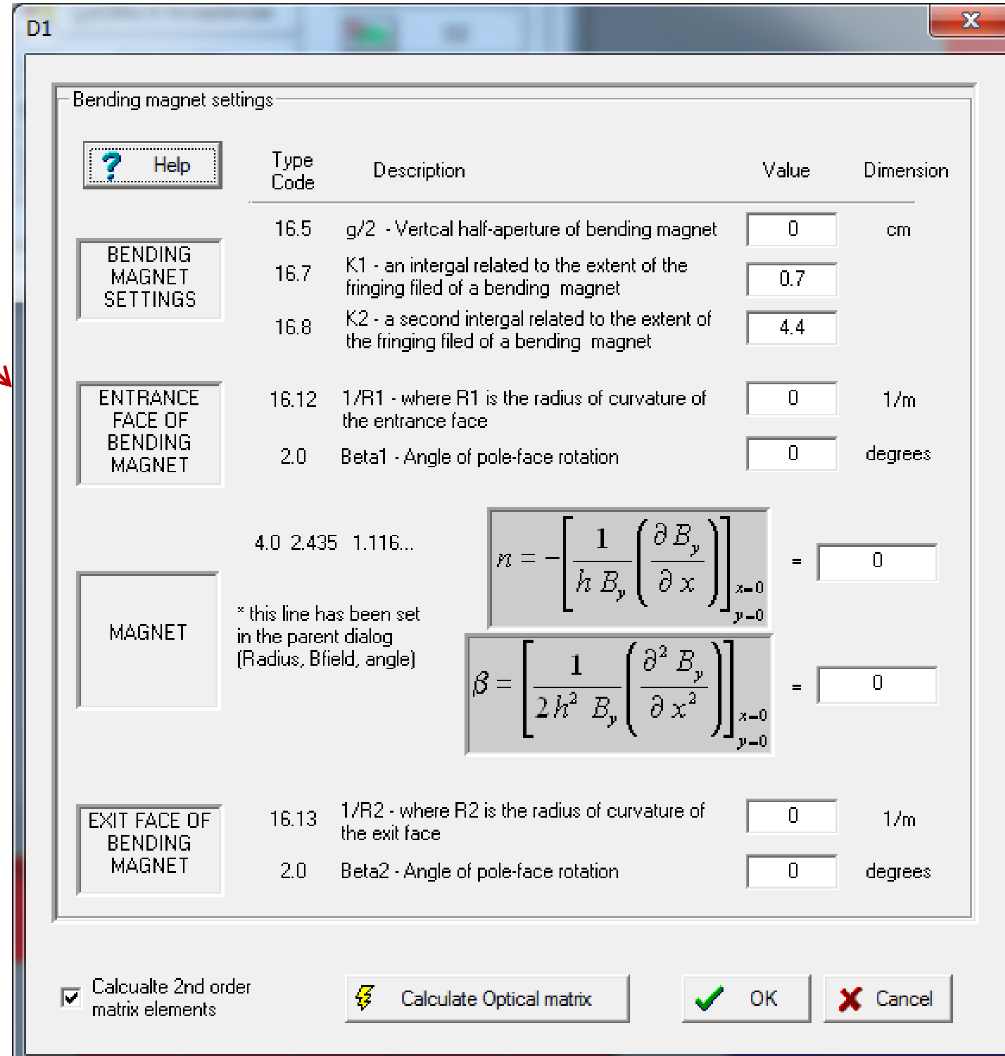
1. Matrix Elements for a Pure Quadrupole Field

For a pure quadrupole, the matrix elements are derived from those of the general case by letting $\beta = 0$, $k_x^2 = k_q^2$ and $k_y^2 = -k_q^2$, where

$$k_q^2 = -nh^2 = (B_0/a)(1/B\rho)$$

9.2.32 Dipole (dispersive block): Transport solution of 1st and 2-nd orders including fringing fields





Entrance Face +
Bending Magnet +
Exit Face

Three optical arrays (1st and 2nd) inside the dispersive block class are calculated the final dispersive block matrices, which will be used in transmission calculations.

LISE++ dispersive block : Transport solution

Bending magnet.

Solution from the new utility dialog: "The First- and Second-Order Matrix Elements for an Ideal Magnet"

8. Evaluation of the First-Order Matrix for Ideal Magnets

From the results of Section III, we conclude that for an ideal magnet the matrix elements of R are simple trigonometric or hyperbolic functions. The general result for an element of length L is

$$R = \begin{bmatrix} \cos k_x L & \frac{1}{k_x}\sin k_x L & 0 & 0 & 0 & \frac{h}{k_x^2}[1 - \cos k_x L] \\ -k_x \sin k_x L & \cos k_x L & 0 & 0 & 0 & \left(\frac{h}{k_x}\right)\sin k_x L \\ 0 & 0 & \cos k_y L & \frac{1}{k_y}\sin k_y L & 0 & 0 \\ 0 & 0 & -k_y \sin k_y L & \cos k_y L & 0 & 0 \\ \frac{h}{k_x}\sin k_x L & \frac{h}{k_x^2}[1 - \cos k_x L] & 0 & 0 & 1 & \frac{h^2}{k_x^3}[k_x L - \sin k_x L] \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \quad (77)$$

where for a dipole (bending) magnet, we have defined

$$k_x^2 = (1 - n)h^2 \quad \text{and} \quad k_y^2 = nh^2$$

For a pure quadrupole, the R matrix is evaluated by letting

$$k_x^2 = k_q^2 \quad \text{and} \quad k_y^2 = -k_q^2$$

Entrance face

SYSTEM AND SPECTROMETER DESIGN

The results of these calculations yield the following matrix ele[ments] for the fringing fields of the entrance face of a bending magnet:

$$\begin{aligned}
R_{11} &= 1 \\
R_{12} &= 0 \\
T_{111} &= -(h/2)\tan^2\beta_1 \\
T_{133} &= (h/2)\sec^2\beta_1 \\
R_{21} &= -(1/f_x) = h\tan\beta_1 \\
R_{22} &= 1 \\
T_{211} &= (h/2R_1)\sec^3\beta_1 - nh^2\tan\beta_1 \\
T_{212} &= h\tan^2\beta_1 \\
T_{216} &= -h\tan\beta_1 \\
T_{233} &= h^2(n + \tfrac{1}{2} + \tan^2\beta_1)\tan\beta_1 - (h/2R_1)\sec^3\beta_1 \\
T_{234} &= -h\tan^2\beta_1 \\
R_{33} &= 1 \\
R_{34} &= 0 \\
T_{313} &= h\tan^2\beta_1 \\
R_{43} &= -(1/f_y) = -h\tan(\beta_1 - \psi_1) \\
R_{44} &= 1 \\
T_{413} &= -(h/R_1)\sec^3\beta_1 + 2h^2 n\tan\beta_1 \\
T_{414} &= -h\tan^2\beta_1 \\
T_{423} &= -h\sec^2\beta_1 \\
T_{436} &= h\tan\beta_1 - h\psi_1\sec^2(\beta_1 - \psi_1)
\end{aligned} \quad (57)$$

All nonlisted matrix elements are equal to zero. The quantity ψ_1 is the correction to the transverse focal length when the finite extent of the fringing field is included.[9]

$$\psi_1 = Khg\sec\beta_1(1 + \sin^2\beta_1) + \text{higher order terms in } (hg)$$

Exit face

118 K. L. BROWN

The matrix elements for the fringing fields of the exit face of a bending magnet are:

$$\begin{aligned}
R_{11} &= 1 \\
R_{12} &= 0 \\
T_{111} &= (h/2)\tan^2\beta_2 \\
T_{133} &= -(h/2)\sec^2\beta_2 \\
R_{21} &= -1/f_x = h\tan\beta_2 \\
R_{22} &= 1 \\
T_{211} &= (h/2R_2)\sec^3\beta_2 - h^2(n + \tfrac{1}{2}\tan^2\beta_2)\tan\beta_2 \\
T_{212} &= -h\tan^2\beta_2 \\
T_{216} &= -h\tan\beta_2 \\
T_{233} &= h^2(n - \tfrac{1}{2}\tan^2\beta_2)\tan\beta_2 - (h/2R_2\sec^3\beta_2 \\
T_{234} &= h\tan^2\beta_2 \\
R_{33} &= 1 \\
R_{34} &= 0 \\
T_{313} &= -h\tan^2\beta_2 \\
R_{43} &= -1/f_y = -h\tan(\beta_2 - \psi_2) \\
R_{44} &= 1 \\
T_{413} &= -(h/R_2)\sec^3\beta_2 + h^2(2n + \sec^2\beta_2)\tan\beta_2 \\
T_{414} &= h\tan^2\beta_2 \\
T_{423} &= h\sec^2\beta_2 \\
T_{436} &= h\tan\beta_2 - h\psi_2\sec^2(\beta_2 - \psi_2)
\end{aligned} \quad (58)$$

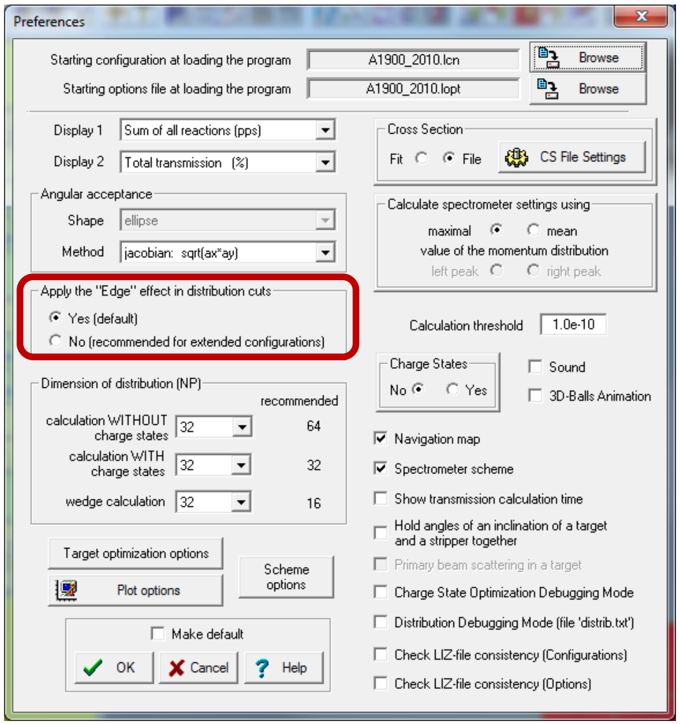
All nonlisted matrix elements are zero.

$$\psi_2 = Khg\sec\beta_2(1 + \sin^2\beta_2) + \text{higher order terms in } (hg)$$

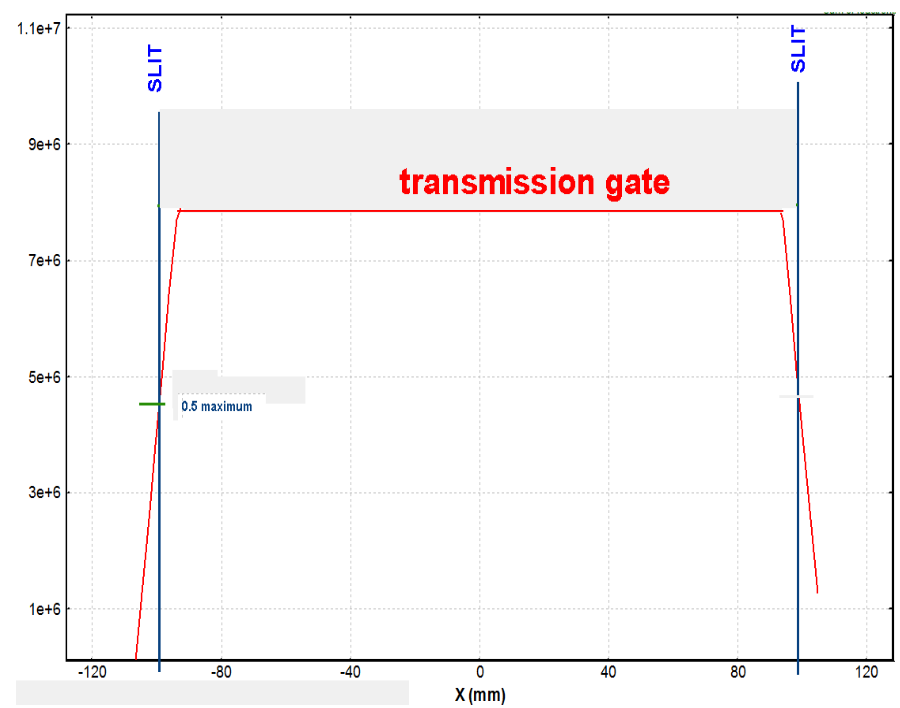
and K is evaluated for the exit fringing field.

Edge effect for transmission distribution cuts

9.2.33 12/10/10 Edge cut effect option for transmission calculation (the "Option" dialog)

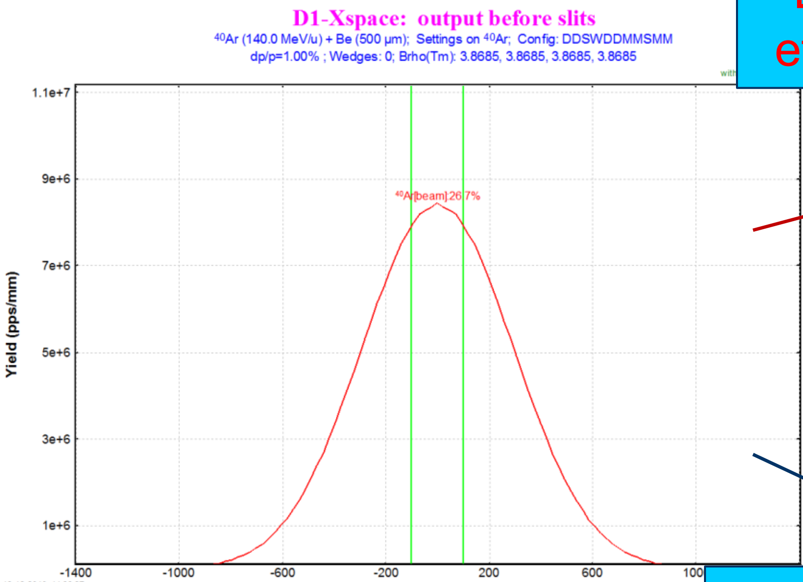


Recommended to turn off the “edge effect” for extended configurations to prevent decrease of transmission due to multiple cut of tails

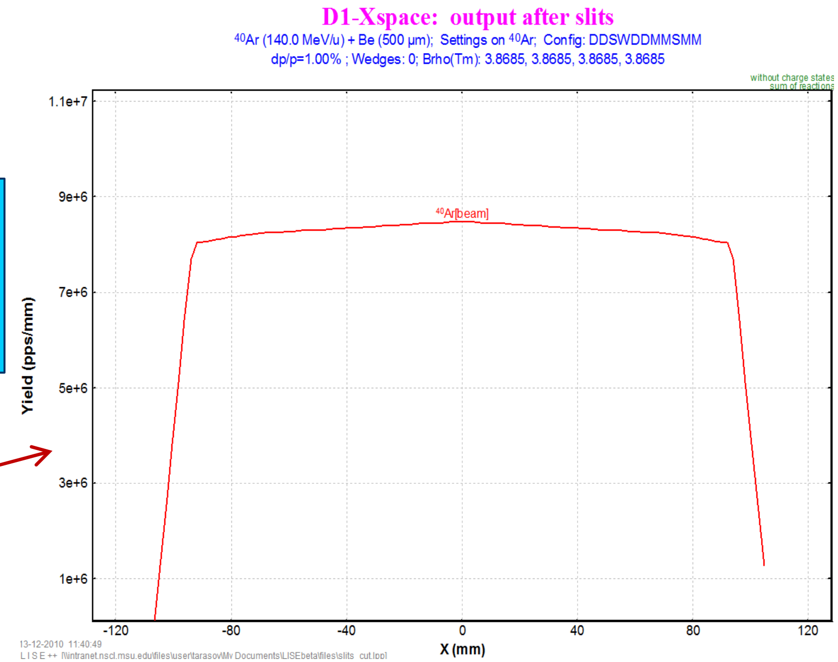


Edge effect for transmission distribution cuts

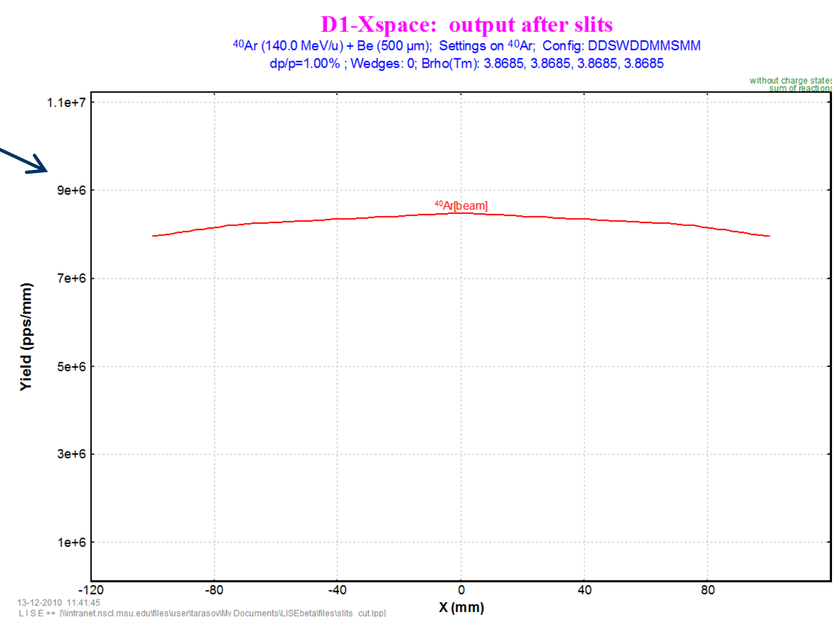
MICHIGAN STATE UNIVERSITY



Using "Edge effect"



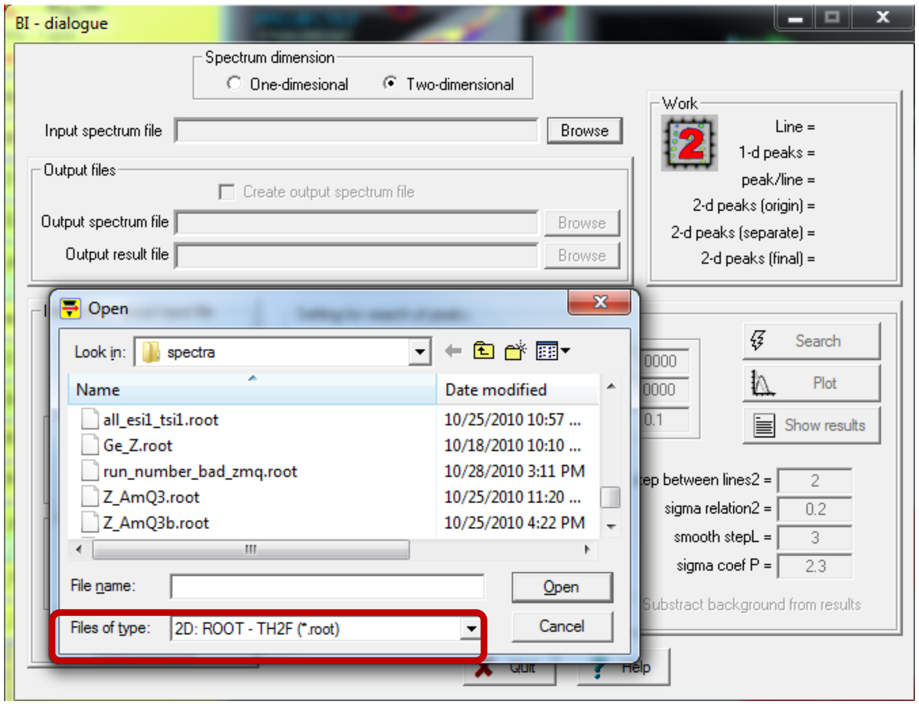
No "Edge effect"

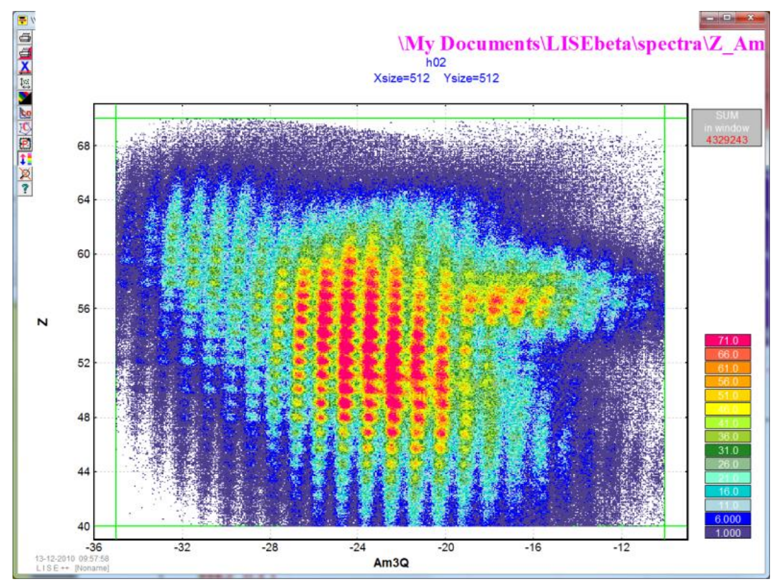


ROOT histogram vs. BI code in LISE++

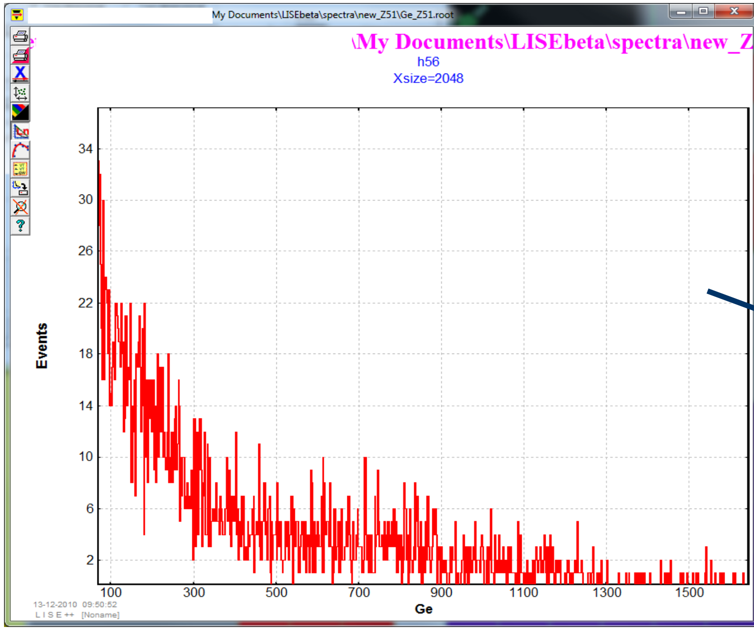
9.2.18 10/07/10 **Analyzing 1D-historgam ROOT files by the BI code**
9.2.21 10/26/10 **Analyzing 2D-historgam ROOT files by the BI code**

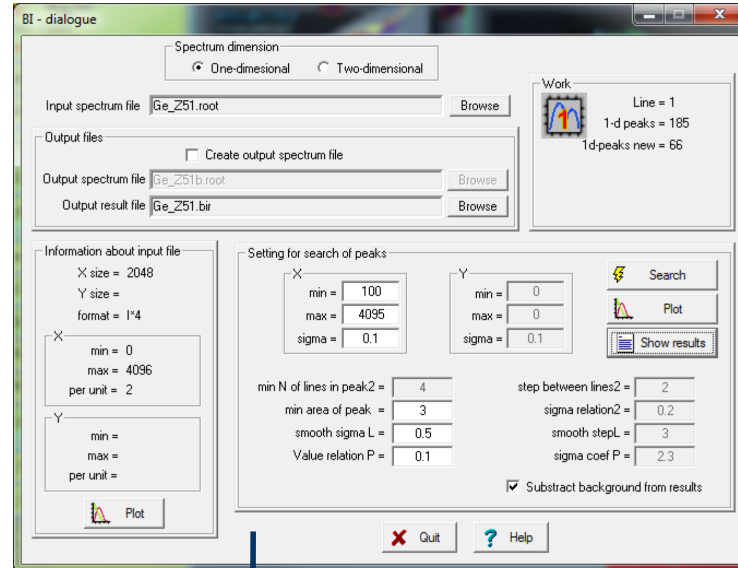
```
{
//========= Macro generated from object: h02/Z:Am3Q
//========= by ROOT version5.26/00
TH2F *h02 = new TH2F("h02","Z:Am3Q",512,-35,-10,512,40,70);
h02->SetBinContent(40,1);
h02->SetBinContent(61,1);
 h02->SetBinContent(63,2);
 h02->SetBinContent(64,1);
 h02->SetBinContent(67,3);
h02->SetBinContent(73,1);
h02->SetBinContent(77,1);
h02->SetBinContent(79,3);
h02->SetBinContent(80,2);
……………….
```

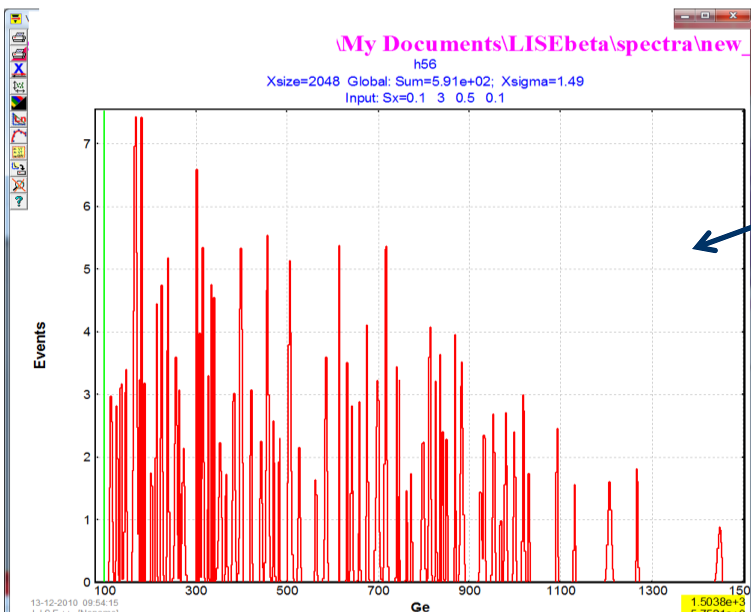




ROOT histogram vs. BI code in LISE++







\My Documents\LISEbeta\spectra\new_Z51\Ge_Z51.bir

N ,	Area ,	Amp ,	xmean ,	xmax ,	Sigx,	Name,	Good
1,	9.4,	3.1,	115.6,	115.0,	2.21,	*,	1
3,	4.5,	3.3,	127.7,	127.0,	1.28,	*,	1
4,	10.3,	5.2,	138.0,	139.0,	1.00,	*,	1
5,	4.8,	3.8,	148.2,	149.0,	1.82,	*,	1
8,	32.8,	7.6,	168.3,	171.0,	3.13,	*,	1
9,	3.2,	3.2,	179.0,	179.0,	0.10,	*,	1
10,	7.4,	7.4,	183.0,	183.0,	0.10,	*,	1
11,	3.2,	3.2,	189.0,	189.0,	0.10,	*,	1
14,	5.1,	2.7,	203.9,	203.0,	1.00,	*,	1
15,	8.4,	5.7,	214.4,	215.0,	0.94,	*,	1
17,	7.2,	4.8,	226.8,	227.0,	1.53,	*,	1
18,	6.8,	5.7,	240.4,	241.0,	1.47,	*,	1
19,	8.1,	3.6,	257.1,	259.0,	2.18,	*,	1
20,	5.9,	3.9,	265.7,	265.0,	0.94,	*,	1
21,	6.1,	2.1,	274.9,	277.0,	2.52,	*,	1
24,	6.6,	6.6,	303.0,	303.0,	0.10,	*,	1
25,	8.8,	5.4,	310.2,	311.0,	0.97,	*,	1
26,	9.9,	5.4,	317.1,	317.0,	1.35,	*,	1
27,	5.7,	4.0,	328.4,	329.0,	0.91,	*,	1
28,	4.8,	4.8,	335.0,	335.0,	0.10,	*,	1
29,	4.5,	4.5,	341.0,	341.0,	0.10,	*,	1
30,	4.4,	2.3,	354.6,	357.0,	3.56,	*,	1
32,	4.0,	2.0,	368.2,	367.0,	1.38,	*,	1
33,	6.5,	3.3,	384.1,	383.0,	2.31,	*,	1
34,	9.4,	5.3,	400.8,	403.0,	2.91,	*,	1
37,	6.2,	3.6,	422.3,	423.0,	1.22,	*,	1
39,	5.8,	2.3,	444.9,	447.0,	1.92,	*,	1
40,	9.6,	5.7,	458.4,	459.0,	2.25,	*,	1
41,	6.6,	3.1,	471.8,	471.0,	1.23,	*,	1
43,	6.4,	3.5,	484.1,	485.0,	1.00,	*,	1
46,	14.0,	5.1,	507.1,	505.0,	2.68,	*,	1
47,	7.3,	2.4,	528.0,	529.0,	2.33,	*,	1
51,	3.9,	2.0,	563.9,	565.0,	1.31,	*,	1
54,	6.2,	3.7,	586.6,	585.0,	1.98,	*,	1

Requests to increase… v.9.2.8-33

9.2.9 09/01/10 Request to increase a number of isotopes for MC group *// MP*

9.2.12 09/03/10 Number of possible MC generator rays has been increased to 1 000 000 *// MP*

9.2.19 10/14/10 Increasing number of rows in the "Show Transmission" window, as well string size to avoid crash *// MH*

9.2.30 11/30/10 Increasing possible number of blocks from 94 to 194 *// MP*

Corrections, Improvements v.9.2.8-33

9.2.8 08/27/10	Corrections in MC transmission calculation against crash in reaction place with negative energy *// MP*
9.2.10 09/02/10	Energy loss in detector, where particle is stopped
9.2.11 09/02/10	Normalization in Energy deposition for group of isotopes *// MP*
9.2.13 09/07/10	New isotopes history added for Z=26,27,48,56 *//MT*
9.2.14 09/15/10	New isotopes history added for Z=23,36,47; neutron-rich observed isotopes line updated for Z=63-92 *// MT*
9.2.15 09/15/10	Corrections for TKE-calculations in pseudo MC plot *// JB*
9.2.16 09/23/10	MC - List of isotopes: modification to pass the target block for initialization *// MP*
9.2.17 10/05/10	correction: crash with rotation blocks in PseudoMC mode
9.2.20 10/20/10	Mouse position: fonts; no initial identification in the case of a lot of isotopes
9.2.25 11/21/10	correction: indexation in dynamical submenu has been changed *// MP*
9.2.26 11/24/10	correction: links to COSY matrices *// MP*
9.2.27 11/24/10	correction: the transmission statistics dialog

LISE++ development priorities

1	Subject	priority	
2	>>> ADA (Abrasion-Dissipation-Ablation) model creation	LongTerm project	
3	>>> ETACHA implementation	LongTerm project	
4	>>> Evaporation cascade: create Monte Carlo version	LongTerm project	
5	>>> Develop a subroutine to calculate a reduced dispersion for large values of dP/P	LongTerm project	
6	>>> Implementation of Intranuclear cascade (INC) model in LISE++ Windows	LongTerm project	
7	>>> Ray tracing in LISE++	LongTerm project	
8	>>> The "MOTER" code development	LongTerm project	
9	>>> Custom shape degfrader optimization in MC mode for high order optics	LongTerm project	
10	>>> Minimization in LISE++ (which can be used for MC, TRANSPORT, Ray tracing cases)	LongTerm project	
11	Linked COSY matrices reload in LISE++ by user demand in the LISE code	high priority	done
12	Recalculate optical matrices of quadropoles according to Brho by pressing one button	high priority	done
13	increasing number block limit up to 200 (was 100)	high priority	done
14	quadrupoles: option matrix or field calculations	high priority	done
15	second order martrix for dipole and entrance and exit face of dipoles	high priority	done
16	ideal magnet solution (tabulation) : first and second order	high priority	done
17	Cross section for stripper	medium	
18	High order : write documentation and put source for COSY files	medium	done?
19	Target thickness deffect	medium	
20	Discovery of isotopes : utilities, database, plots	medium	
21	Wedge (including curved profile wedge) inclination	medium	
22	Write full LISE++ documentation	medium	
23	Brho method to measure T1/2 (MC: possibility of decay in flight)	low	
24	Create possibility to Insert a material before the target	low	
25	Dispersion method for secondary target: check DJM case	low	
26	Fission without angular acceptances: low transmission for analytical solution	low	
27	High order optics calculation: improvement, adaptation GICOSY format	low	
28	MOCADI <-> LISE++ converter	low	
29	Transport <-> LISE++ converter	low	
30	m-rad dimensions for LISE++ optics	low	
31	PACE4 : request from TRIUMF	low	
32	Problem with Projectile Fragmentation in the Catcher utility	low	
33	Simulation reactions in Si-telescope in MC mode	low	
34	Three-body kinematics relativistic calculator	low	
35	Water wedge procedure (wedge with one moving plane and filled by liquid)	low	