

- LISE<sup>++</sup> uses optical matrices ONLY for optical blocks. Phase space changes by wedge blocks are calculated during transmission calculation in case of both (Distribution and MC) modes. The user should not be care for providing special matrices for the transmission calculation.
- In order to plot the Matrix envelope (or run Optics minimization procedure) properly in the case of special wedge optics as momentum compression or dispersion inversion, the Wedge block has been modified to implement special virtual optical matrices.
- Momentum compression: set local element (6,6) or (d/d) equal to  $1/M_f$ , where  $M_f$  is the momentum compression factor.
- Dispersion inversion: set local element (6,6) or (d/d) equal to -1

v.12.0.7  
12/12/19

Wedge dialog v.12.0.7

Wedge 1

Al Density [g/cm3] 2.702

calculate reactions in this material

Z Element Mass

13 Al PT 26.982

14

14

14

14

Compound dictionary

General setting of block

OK Cancel

State

Solid  Gas

Dimension

mg/cm2 & micron  g/cm2 & mm

Thickness defect (!)

% 0.2  micron 9

Calculate the Wedge thickness from Previous & Next optical blocks for the setting fragment

Set the spectrometer after this block using changes

Thickness at 0 degrees

4.5 mm  1.2159 g/cm2

Position - thickness

-120 coordinate, mm +120

5.56 thickness, mm 3.44

d / R = 0.481

Atoms/cm2 = 2.71e+22

Degraded profile

Wedge profile Angle (mrad) -8.81 Calculate angle

Homogeneous

Curved profile no current profile! Curved profile dialog

Custom shape no current profile! Custom shape dialog

Optical Matrix

For experts only: use in the case of momentum compression or dispersion inversion

Matrix element (6,6) or d/d

0.533

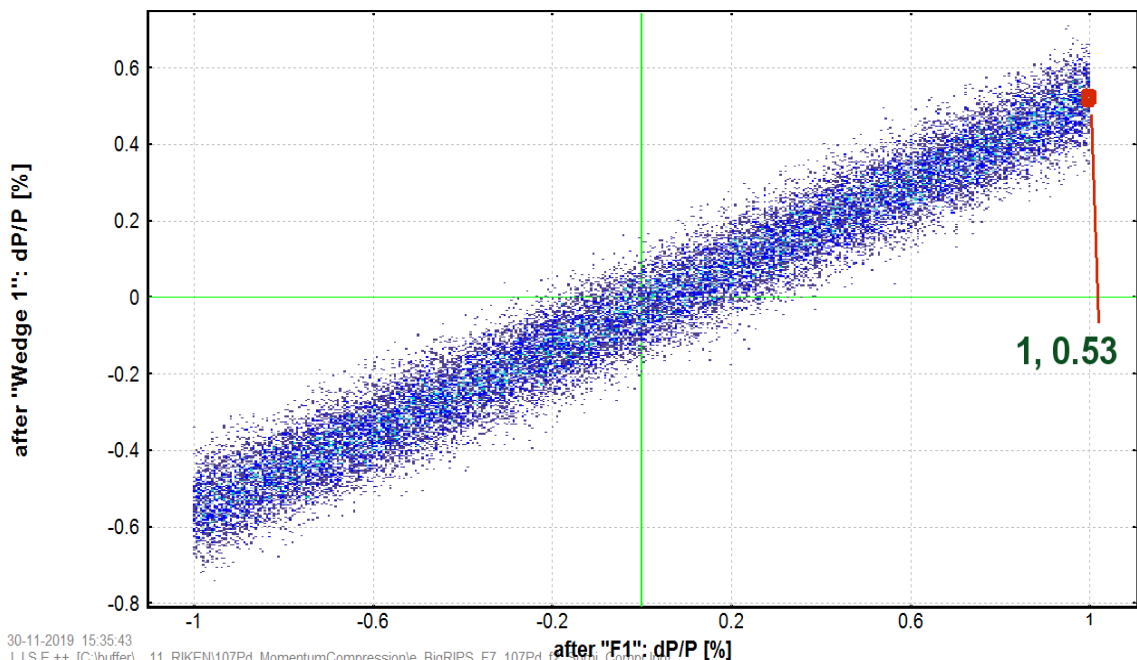
default 1

Block matrix

|      |   |   |   |   |   |       |
|------|---|---|---|---|---|-------|
| 1. X | 1 | 0 | 0 | 0 | 0 | 0     |
| 2. T | 0 | 1 | 0 | 0 | 0 | 0     |
| 3. Y | 0 | 0 | 1 | 0 | 0 | 0     |
| 4. P | 0 | 0 | 0 | 1 | 0 | 0     |
| 5. L | 0 | 0 | 0 | 0 | 1 | 0     |
| 6. D | 0 | 0 | 0 | 0 | 0 | 0.533 |

# Momentum compression

- Momentum compression factor for given Wedge thickness (4.5 mm), wedge angle (-8.89 mrad) with F0-F1 optics was extracted from LISE++ simulations



Wedge 1

Material: Al, Density [g/cm3]: 2.702

State:  Solid,  Gas

Dimension:  mg/cm2 & micron,  g/cm2 & mm

Thickness defect (!!):  %,  micron

Thickness at 0 degrees:  4.5 mm,  1.2159 g/cm2

Degrader profile:  Wedge profile, Angle (mrad): -8.81

Optical Matrix: Matrix element (6,6) or d/d: 0.533

Select Element to Fit **F0→F2** v.12.0.7

| Global Block matrix : 1st order |                       |         |                       |         |                       |                       |                       |                       |                       |                       |          |
|---------------------------------|-----------------------|---------|-----------------------|---------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|
| 1. X                            | <input type="radio"/> | 1.219   | <input type="radio"/> | 0       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | -1.57e-8 |
| 2. T                            | <input type="radio"/> | -0.7926 | <input type="radio"/> | 0.8204  | <input type="radio"/> | 0                     | <input type="radio"/> | 0                     | <input type="radio"/> | 0                     | -2.08e-6 |
| 3. Y                            | <input type="radio"/> | 0       | <input type="radio"/> | 0       | <input type="radio"/> | -2.0656               | <input type="radio"/> | 1.19e-6               | <input type="radio"/> | 0                     | 0        |
| 4. P                            | <input type="radio"/> | 0       | <input type="radio"/> | 0       | <input type="radio"/> | -12.2486              | <input type="radio"/> | -0.4841               | <input type="radio"/> | 0                     | 0        |
| 5. L                            | <input type="radio"/> | 0.9656  | <input type="radio"/> | -0.8345 | <input type="radio"/> | 0                     | <input type="radio"/> | 0                     | <input type="radio"/> | 1                     | -2.1707  |
| 6. D                            | <input type="radio"/> | 0       | <input type="radio"/> | 0       | <input type="radio"/> | 0                     | <input type="radio"/> | 0                     | <input type="radio"/> | 0                     | 0.533    |
|                                 |                       | /[mm]   |                       | /[mrad] |                       | /[mm]                 |                       | /[mrad]               |                       | /[mm]                 | /[%]     |

| "Opt.Beam" at this point |   |
|--------------------------|---|
| 1. X                     | <input checked="" type="radio"/> 1.219 [mm] |
| 2. T                     | <input type="radio"/> 24.624 [mrad]         |
| 3. Y                     | <input type="radio"/> 2.066 [mm]            |
| 4. P                     | <input type="radio"/> 18.999 [mrad]         |
| 5. L                     | <input type="radio"/> 25.427 [mm]           |
| 6. D                     | <input type="radio"/> 1.066 [%]             |
| 7. R                     | <input type="radio"/> 2.398 [mm]            |

Select Element to Fit **F0→F2** v.12.0.6

| Global Block matrix : 1st order |                       |        |                       |         |                       |          |                       |         |                       |                       |   |
|---------------------------------|-----------------------|--------|-----------------------|---------|-----------------------|----------|-----------------------|---------|-----------------------|-----------------------|---|
| 1. X                            | <input type="radio"/> | 1.2187 | <input type="radio"/> | 3.49e-5 | <input type="radio"/> | 0        | <input type="radio"/> | 0       | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> -10.1687 |
| 2. T                            | <input type="radio"/> | -0.793 | <input type="radio"/> | 0.8206  | <input type="radio"/> | 0        | <input type="radio"/> | 0       | <input type="radio"/> | 0                     | -1.3067                                   |
| 3. Y                            | <input type="radio"/> | 0      | <input type="radio"/> | 0       | <input type="radio"/> | -2.0939  | <input type="radio"/> | 2.86e-5 | <input type="radio"/> | 0                     | 0   |
| 4. P                            | <input type="radio"/> | 0      | <input type="radio"/> | 0       | <input type="radio"/> | -12.2438 | <input type="radio"/> | -0.4774 | <input type="radio"/> | 0                     | 0   |
| 5. L                            | <input type="radio"/> | 0.9656 | <input type="radio"/> | -0.8344 | <input type="radio"/> | 0        | <input type="radio"/> | 0       | <input type="radio"/> | 1                     | -2.8321                                   |
| 6. D                            | <input type="radio"/> | 0      | <input type="radio"/> | 0       | <input type="radio"/> | 0        | <input type="radio"/> | 0       | <input type="radio"/> | 0                     | 1   |
|                                 |                       | /[mm]  |                       | /[mrad] |                       | /[mm]    |                       | /[mrad] |                       | /[mm]                 | /[%]                                      |

| "Opt.Beam" at this point |                                     |
|--------------------------|-------------------------------------|
| 1. X                     | <input type="radio"/> 20.374 [mm]   |
| 2. T                     | <input type="radio"/> 24.768 [mrad] |
| 3. Y                     | <input type="radio"/> 2.094 [mm]    |
| 4. P                     | <input type="radio"/> 18.843 [mrad] |
| 5. L                     | <input type="radio"/> 25.683 [mm]   |
| 6. D                     | <input type="radio"/> 2 [%]         |
| 7. R                     | <input type="radio"/> 20.481 [mm]   |

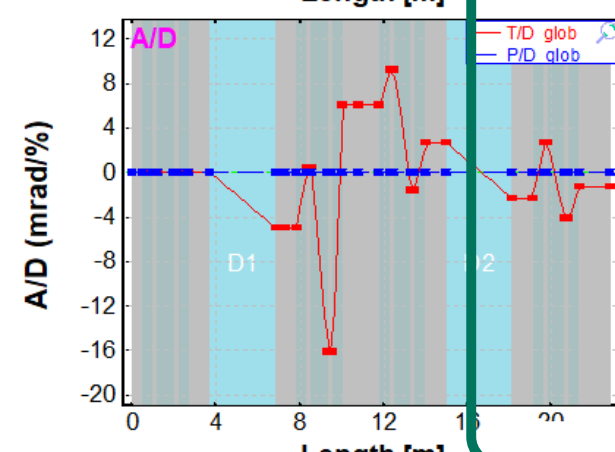
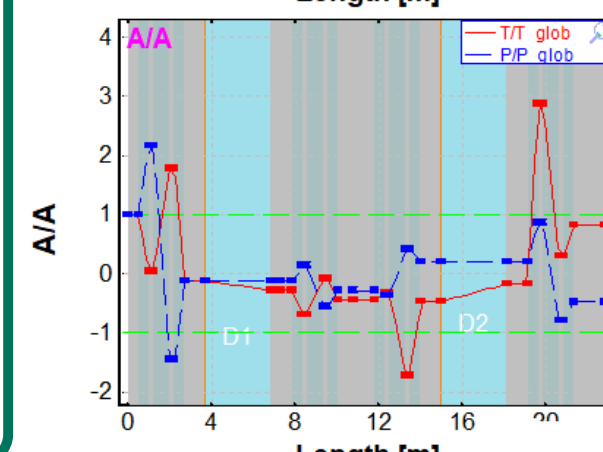
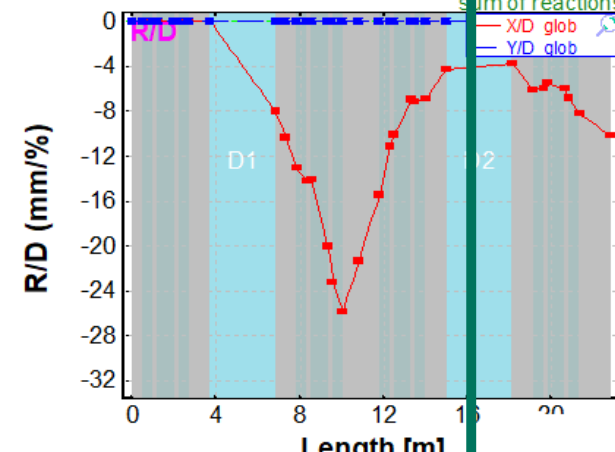
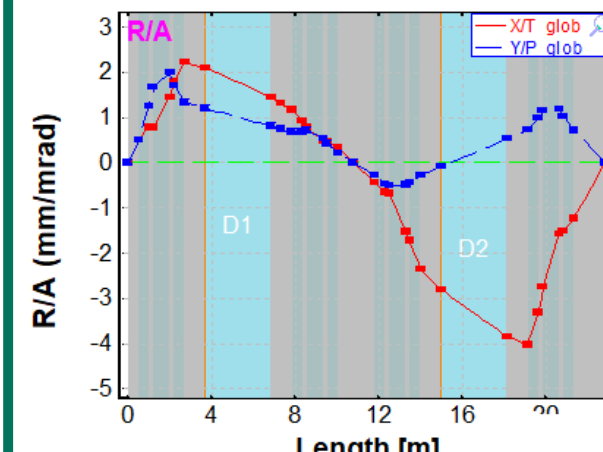
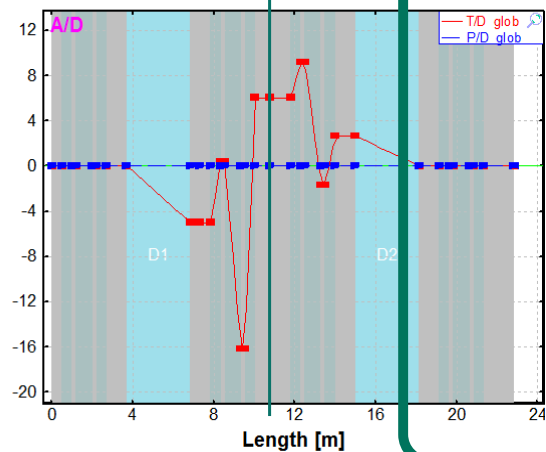
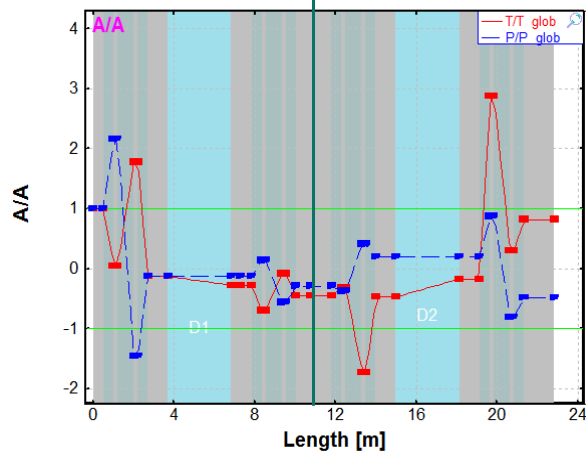
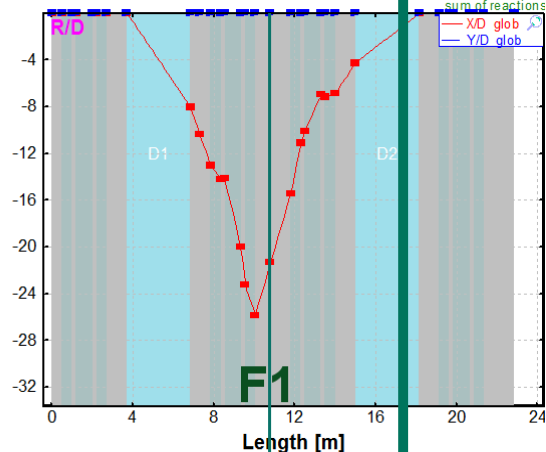
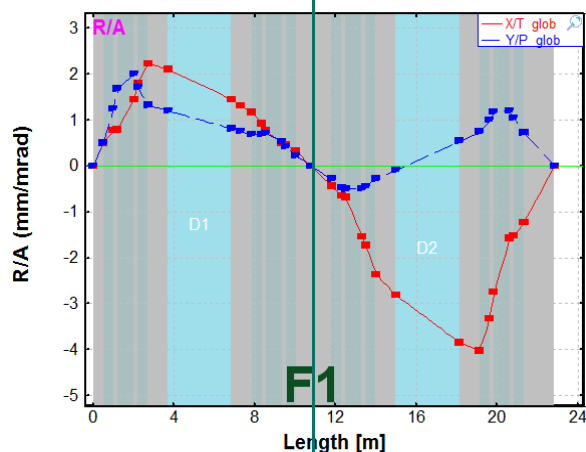
F0 → F2

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v.12.0.6

## First order matrix elements

<sup>107</sup>Pd (249.08 MeV/u); Settings on <sup>107</sup>Pd; Config: DSSSSSSFFDFSSSSSSSSFFFF.  
 dp/p=8.88% ; Wedges: Al (4.5 mm); Brho(Tm): 5.6213, 5.6213, 4.4821

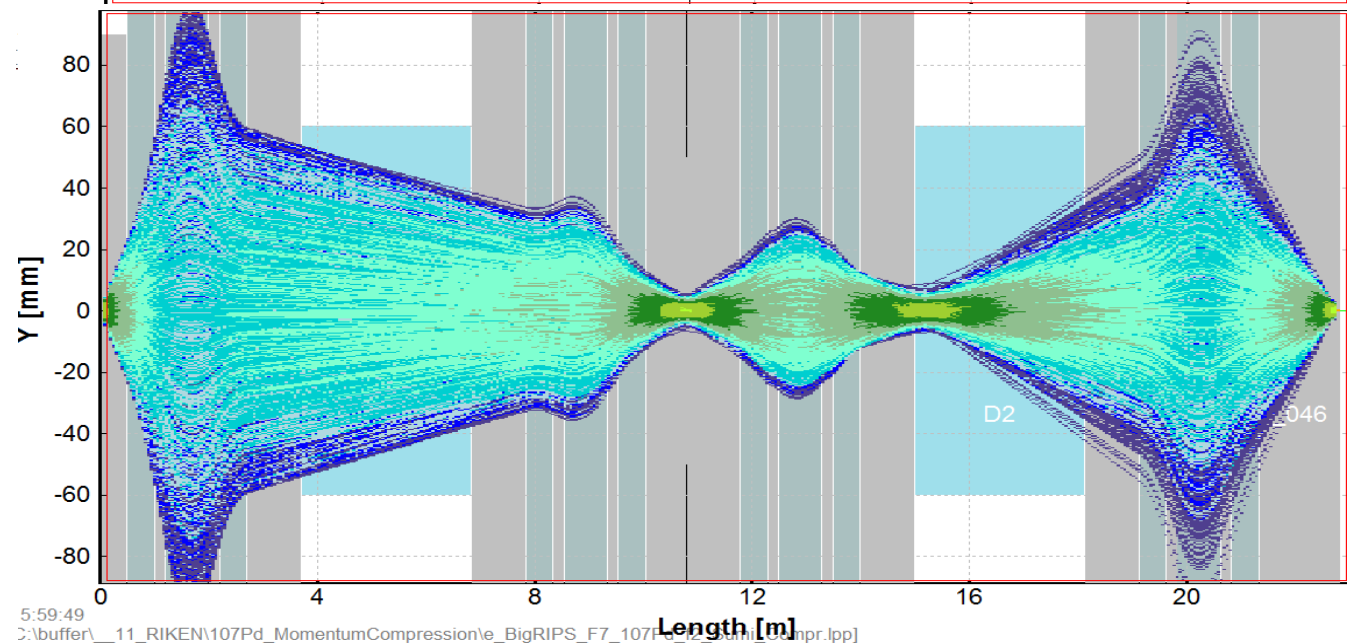
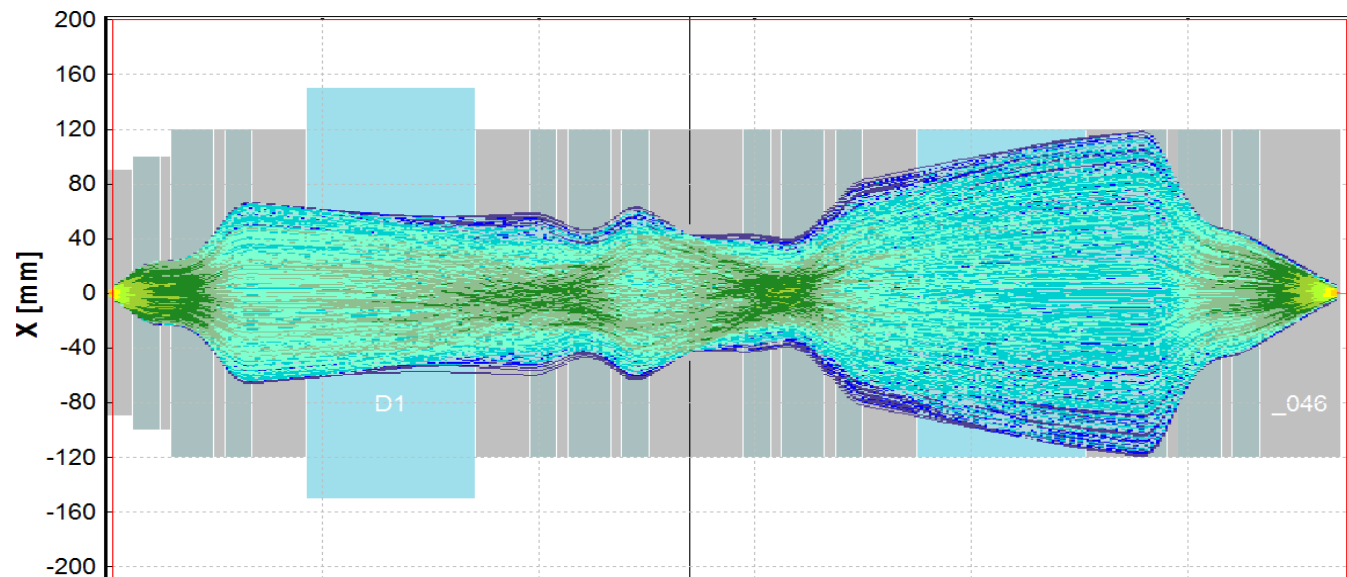
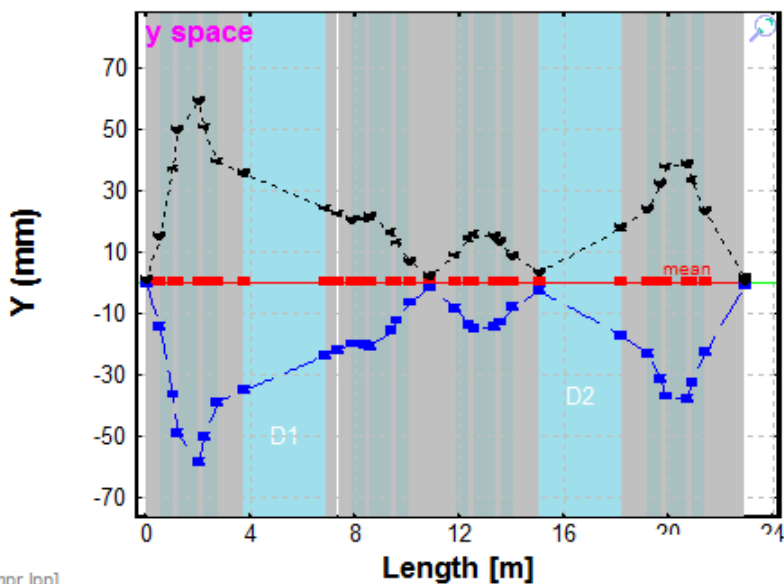
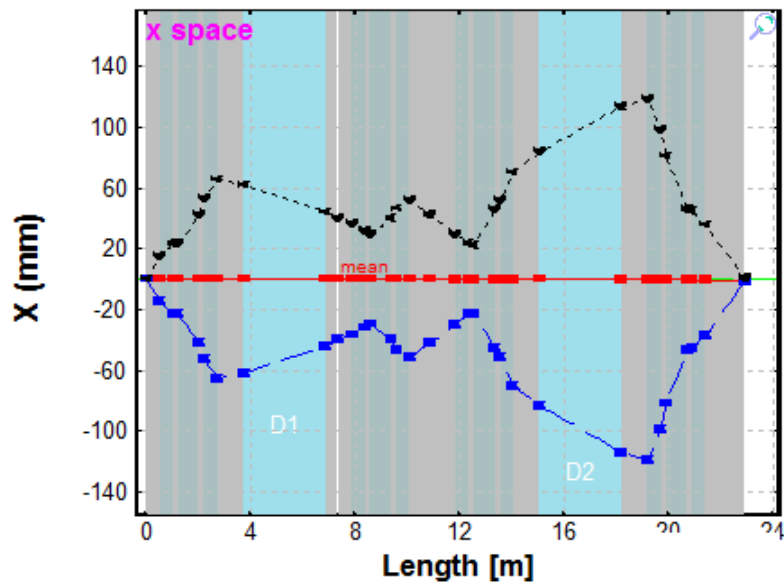


107Pd\_f2\_Sumi\_Compr.lpp

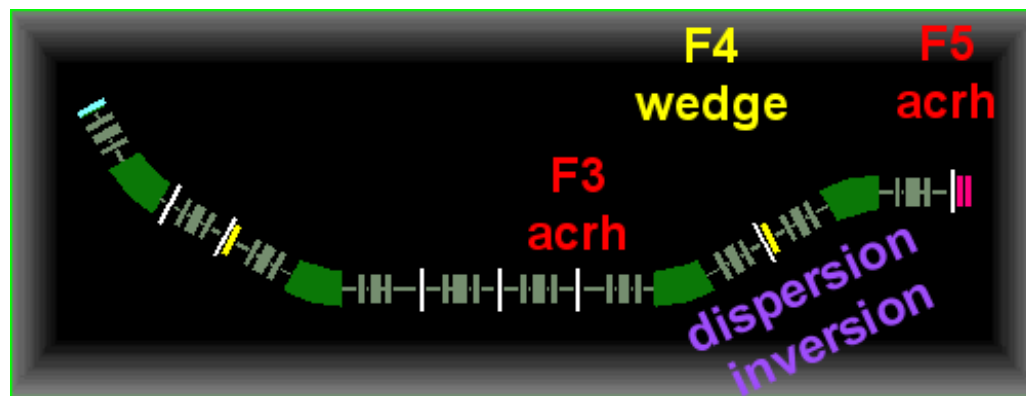
## “Distribution” : Sigma envelope

## Monte Carlo

Before transmission calculations do not forget to disable the virtual wedge matrix



# Momentum dispersion inversion



**F4\_wedge**

Material: Al, Density [g/cm<sup>3</sup>]: 2.702

calculate reactions in this material

| Z                                   | Element | Mass      |
|-------------------------------------|---------|-----------|
| <input checked="" type="checkbox"/> | 13 Al   | PT 26.982 |
| <input type="checkbox"/>            | 14      |           |
| <input type="checkbox"/>            | 14      |           |
| <input type="checkbox"/>            | 14      |           |
| <input type="checkbox"/>            | 14      |           |

Compound dictionary

General setting of block

OK Cancel

State:  Solid,  Gas

Dimension:  mg/cm<sup>2</sup> & micron,  g/cm<sup>2</sup> & mm

Thickness defect (!):  % (0.1),  micron (15)

Calculate the Wedge thickness from Previous & Next optical blocks for the setting fragment

Set the spectrometer after this block using changes

Thickness at 0 degrees:  15 mm,  4.053 g/cm<sup>2</sup>

Position - thickness: -120 coordinate, mm, +120; 29.19 thickness, mm, 0.81

d / R = 0.289, Atoms/cm<sup>2</sup> = 9.05e+22

Degrader profile:  Wedge profile (Angle [mrad]: -117.715),  Homogeneous,  Curved profile (no current profile!),  Custom shape (no current profile!)

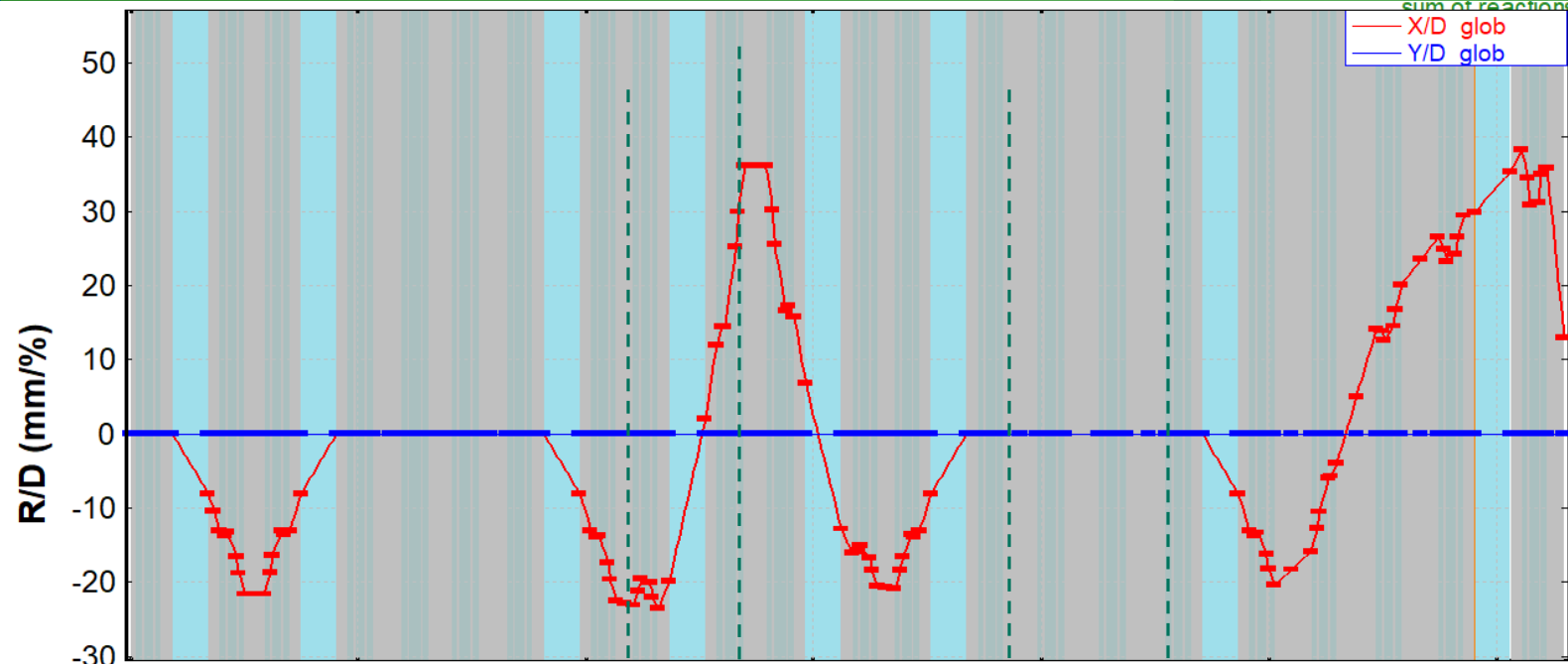
Optical Matrix: For experts only: use in the case of momentum compression or dispersion inversion. Matrix element (6,6) or d/d: -1, default 1

Block matrix

|      |       |         |       |         |       |      |
|------|-------|---------|-------|---------|-------|------|
| 1. X | 1     | 0       | 0     | 0       | 0     | 0    |
| 2. T | 0     | 1       | 0     | 0       | 0     | 0    |
| 3. Y | 0     | 0       | 1     | 0       | 0     | 0    |
| 4. P | 0     | 0       | 0     | 1       | 0     | 0    |
| 5. L | 0     | 0       | 0     | 0       | 1     | 0    |
| 6. D | 0     | 0       | 0     | 0       | 0     | -1   |
|      | /[mm] | /[mrad] | /[mm] | /[mrad] | /[mm] | [mm] |

# Momentum dispersion inversion

v.12.0.6



v.12.0.7

