“Monte Carlo simulation” upgrade

version 9.1

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- *Rays generator*
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- *MC Envelope mode*
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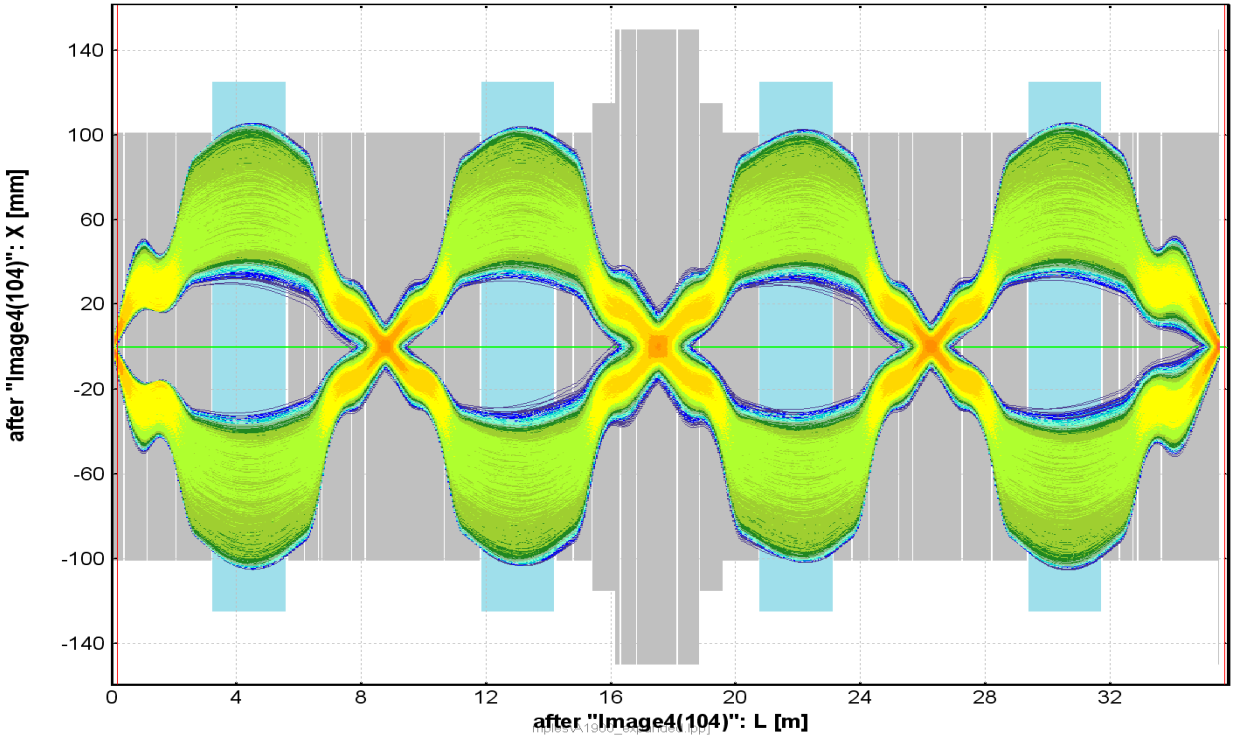
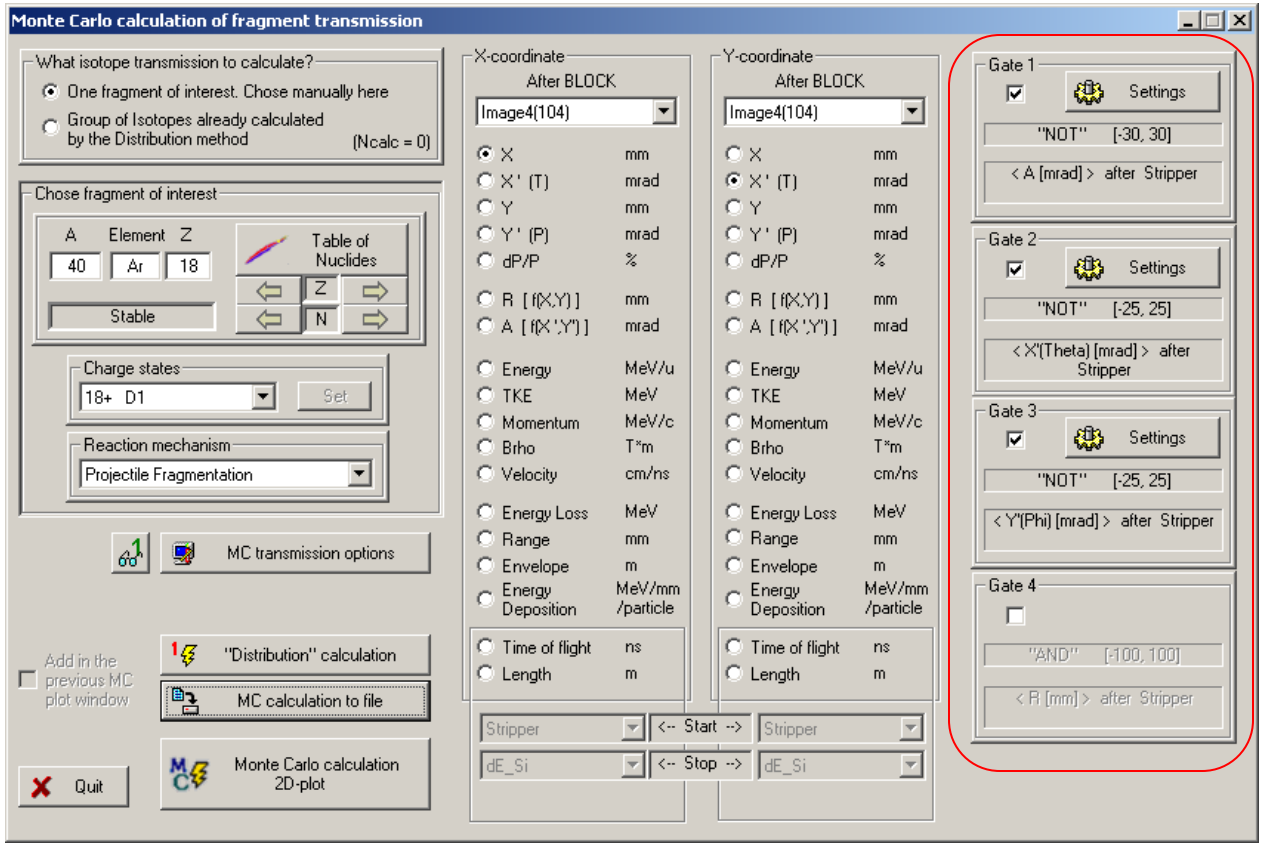


The code operates under MS Windows environment and provides a highly user-friendly interface.
It can be freely downloaded from the following internet addresses:
http://www.nscl.msu/edu/lise

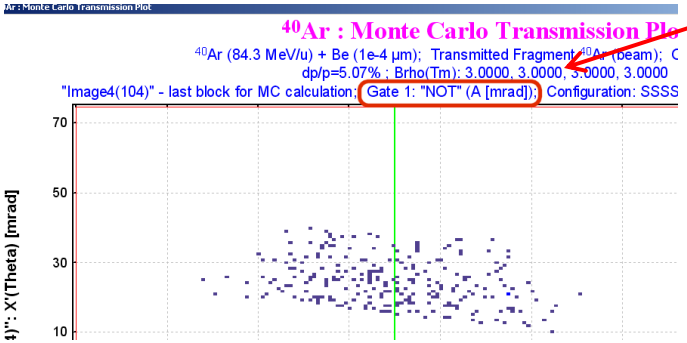
Four gates instead one

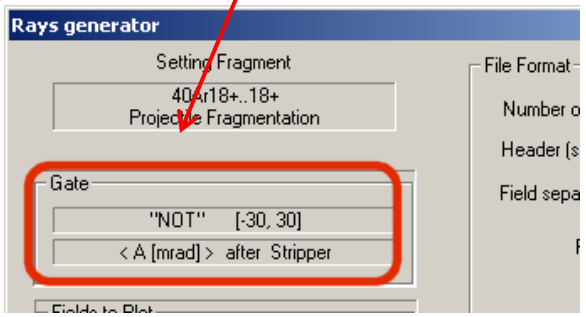


In the new version there are 4 gates

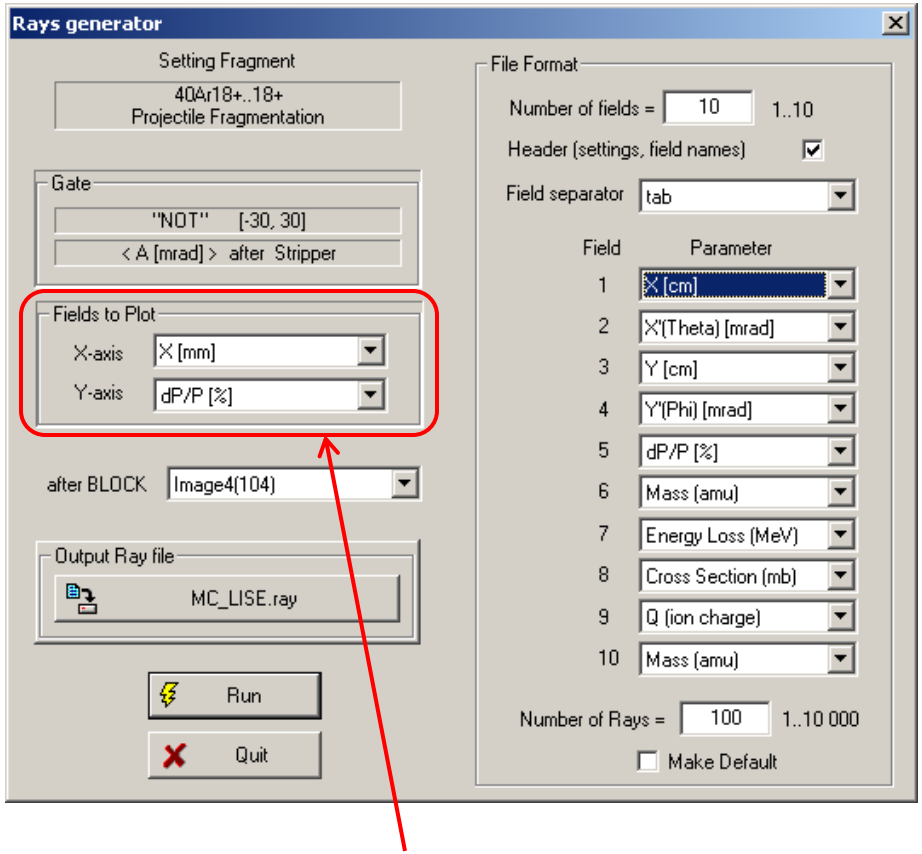
The gate can be easily turned on/off

Even there are several active gates, Only one gate will be shown in the Plot window and the Rays generator dialog

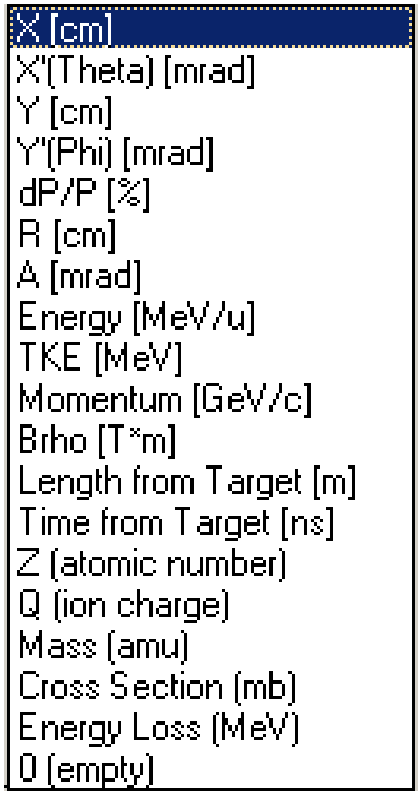




Rays generator



The user can chose X & Y axes to plot rays generated to file



New parameters can be written to file:
Energy loss
Cross sections

MC transmission statistics block by block

Monte Carlo transmission statistics by blocks

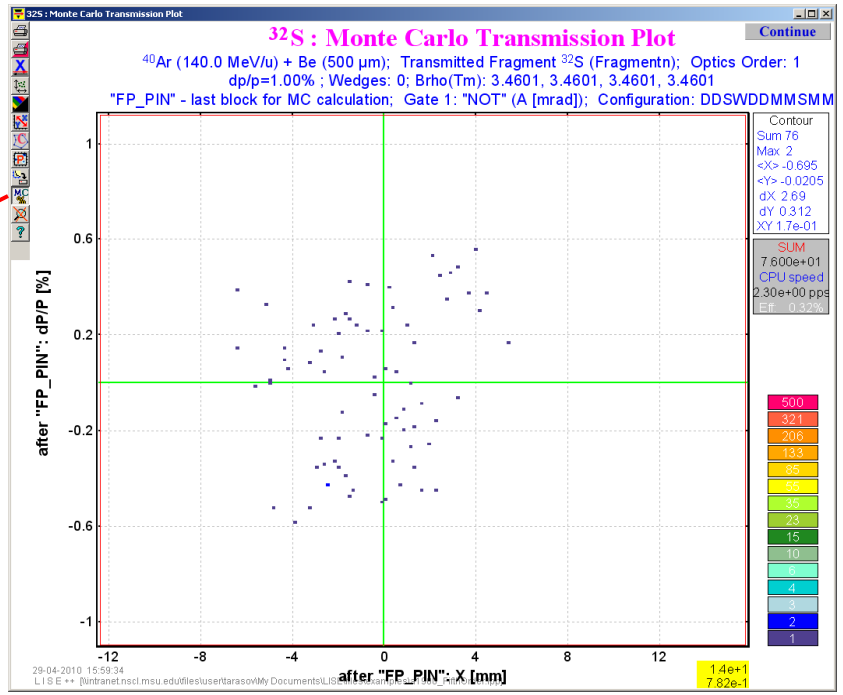
Print

File Save

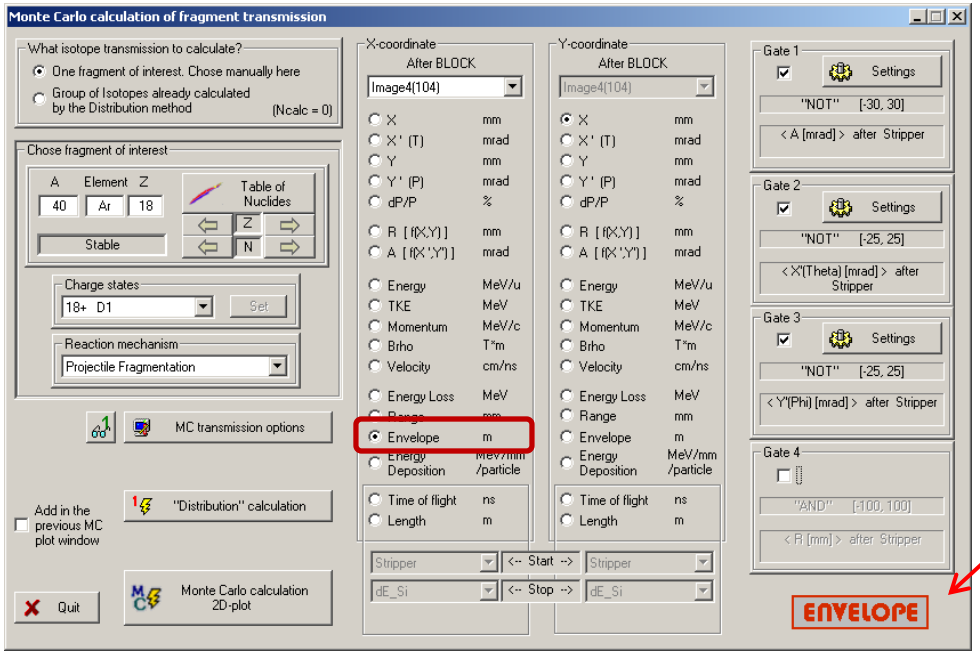
32S : Monte Carlo Transmission Plot

40Ar (140.0 MeV/u) + Be (500 µm); Transmitted Fragment 32S (Fre
dp/p=1.00% ; Wedges: 0; Brho(Tm): 3.4601, 3.4601, 3.4601, 3.4601
"FP_PIN" - last block for MC calculation; Gate 1: "NOT" (A [mra
Number of passed ions 163

Global Transmission	0.3082%
Target	99.01%
Material, Q-state	99.01%
D1	88.52%
Slits	94.26%
Angular acceptance	94.26%
D2	93.28%
Slits	93.36%
Angular acceptance	99.92%
I2_slits	30.54%
Slits	30.54%
I2_wedge	100.0%
D3	99.45%
Angular acceptance	99.45%
D4	94.62%
Angular acceptance	94.62%
FP_PPAC0	100.0%
FP_PPAC1	100.0%
FP_slits	100.0%
FP_PIN	100.0%
Filter-gate 1	23.76%
Filter-gate 2	64.42%
Filter-gate 3	8.57%



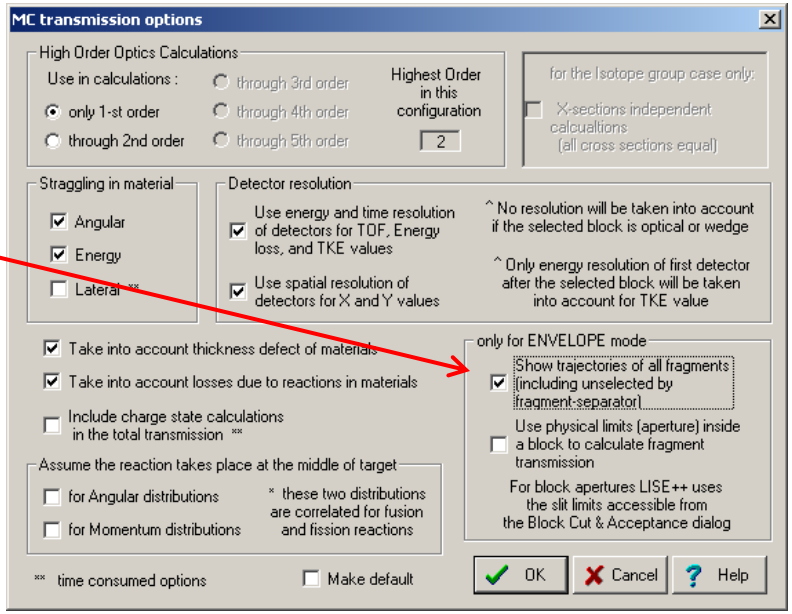
Envelope mode



This mode is more effective for "expanded" configurations, where not dispersive blocks joining dipole, quadrupoles and drifts.

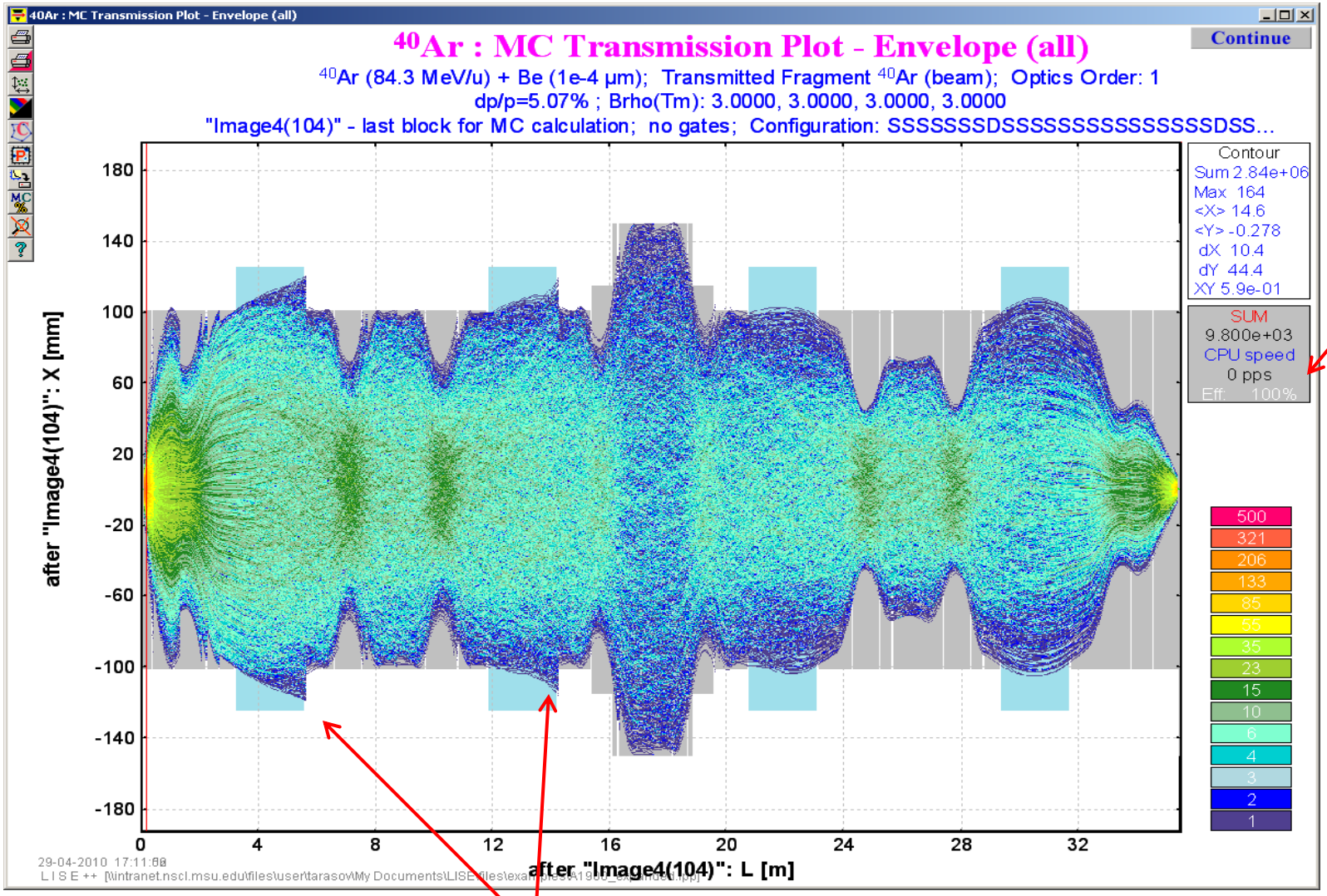
In the Envelope mode you can see the red sign in right bottom corner.

Two options only for the Envelope mode are accessible through the MC options dialog



Trajectory is drawn based on a third order polynomial using two input X_i,X'_i and two output X_o, X'_o coordinates

Option "Show all trajectories" : ON



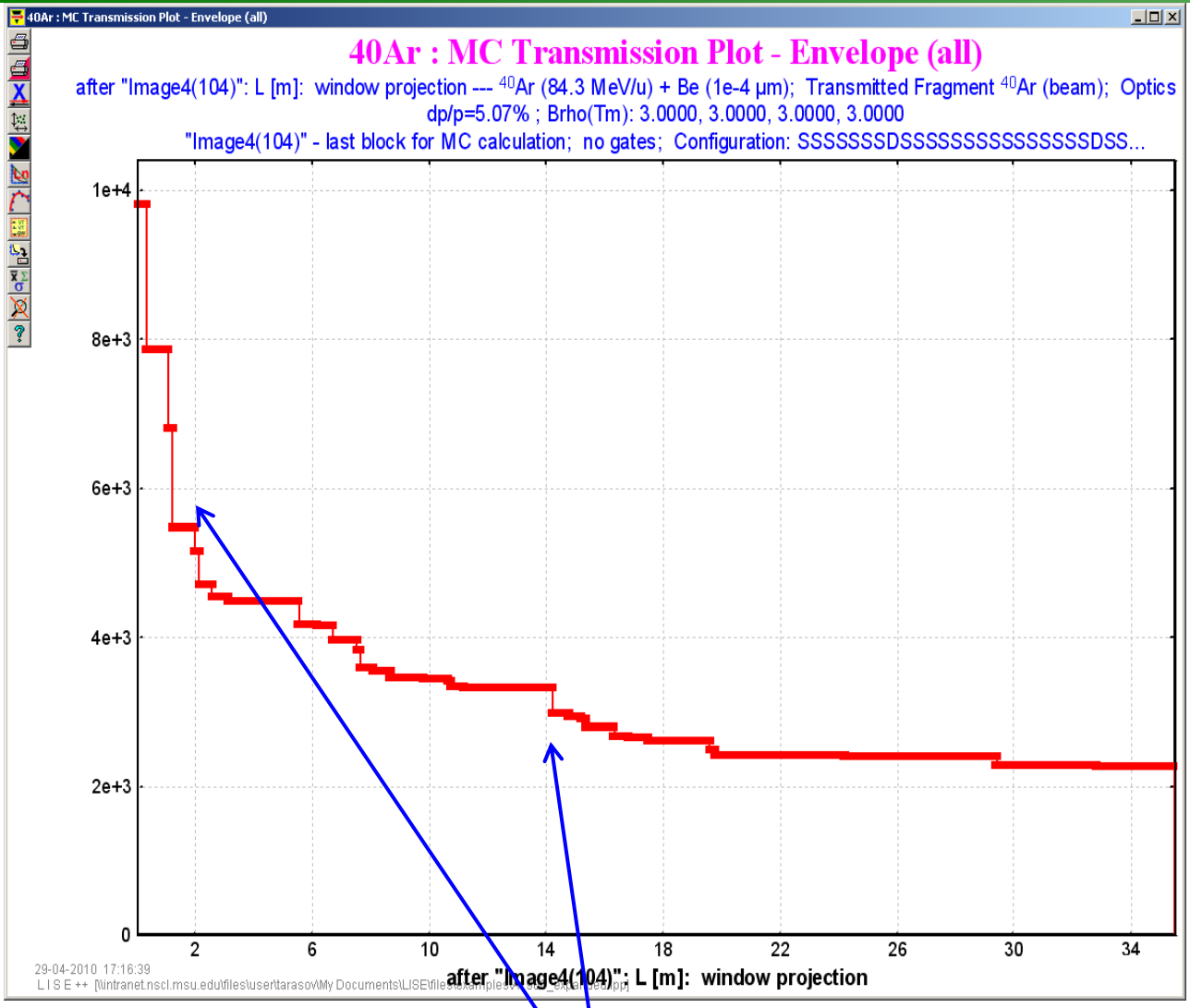
100% efficiency in this mode

It is possible to see the particle is out of the device

Very good tools for this option is using "projection on X-axis!

See the next slide

Option “Show all trajectories”: ON. Projection



Monte Carlo transmission statistics by blocks

40Ar : MC Transmission Plot - Envelope (all)

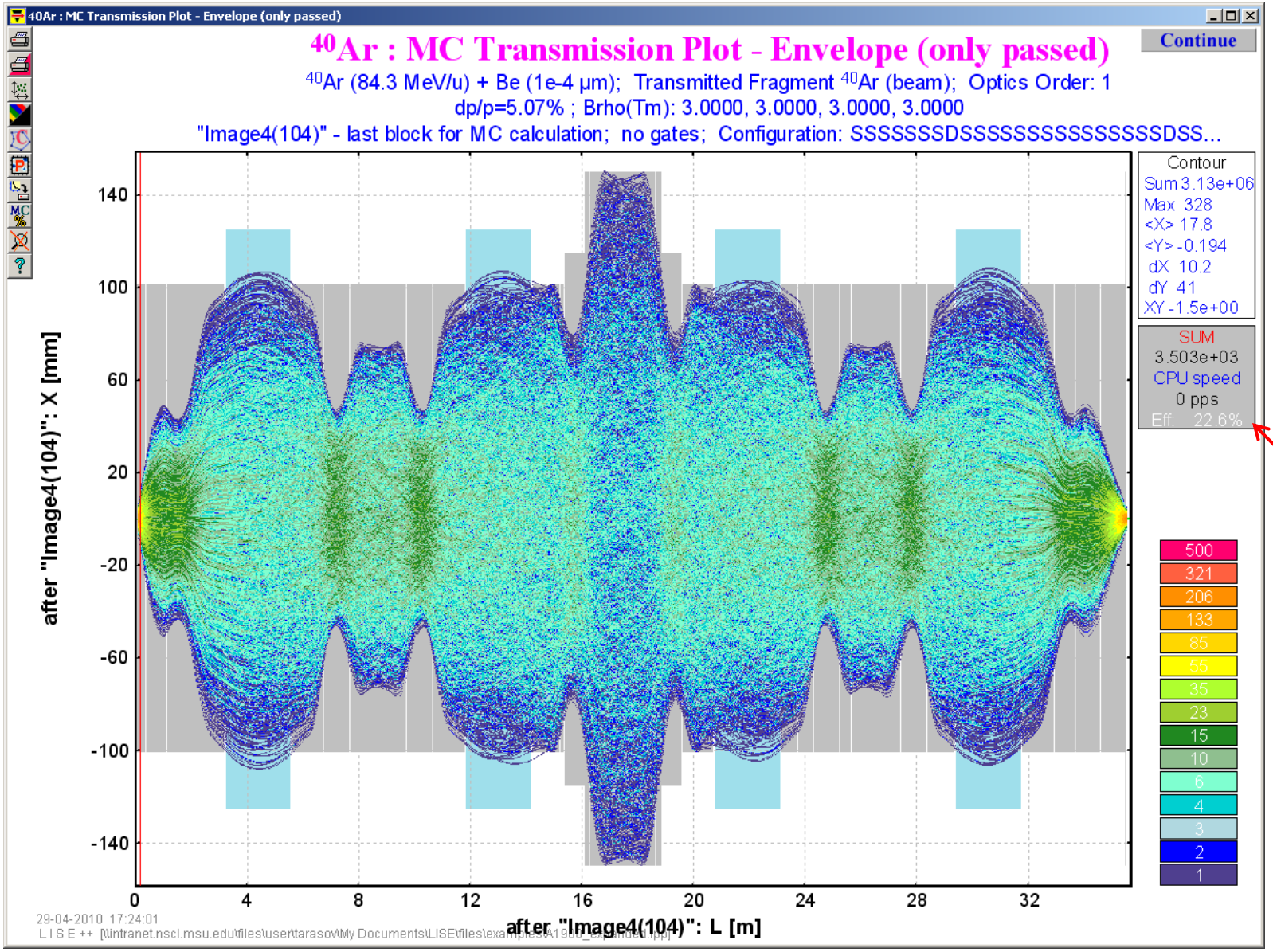
40Ar (84.3 MeV/u) + Be (1e-4 μm); Transmitted Fragment 40A
dp/p=5.07% ; Brho(Tm): 3.0000, 3.0000, 3.0000, 3.0000
"Image4(104)" - last block for MC calculation; no gates;
Number of passed ions 0

Global Transmission	23.12%
Target	100.0%
dr L1A (016)	100.0%
QL1TA-017	80.11%
Slits	80.11%
dr L1AB	86.65%
Slits	86.65%
QL1TB-019	80.44%
Slits	80.44%
dr L1BC	94.26%
Slits	94.26%
QL1TC-021	91.14%
Slits	91.14%
dr L1C	96.70%
Slits	96.70%
D1	98.39%
Slits	98.39%
dr R1A (026)	93.16%
Slits	93.16%
QR1TA-031	99.74%
Slits	99.74%
dr R1AB	99.78%
Slits	99.78%
QR1TB-033	95.39%
Slits	95.39%
dr R1BC	96.84%
Slits	96.84%
QR1TC-035	93.89%
Slits	93.89%
dr R1C	98.30%
Slits	98.30%

You can see how transmission is changed from block to block, where are main lost and so on

MC transmission statistics block by block is also available in the Envelope mode

Option “Show all trajectories” : OFF



Real efficiency is shown if this option turned off

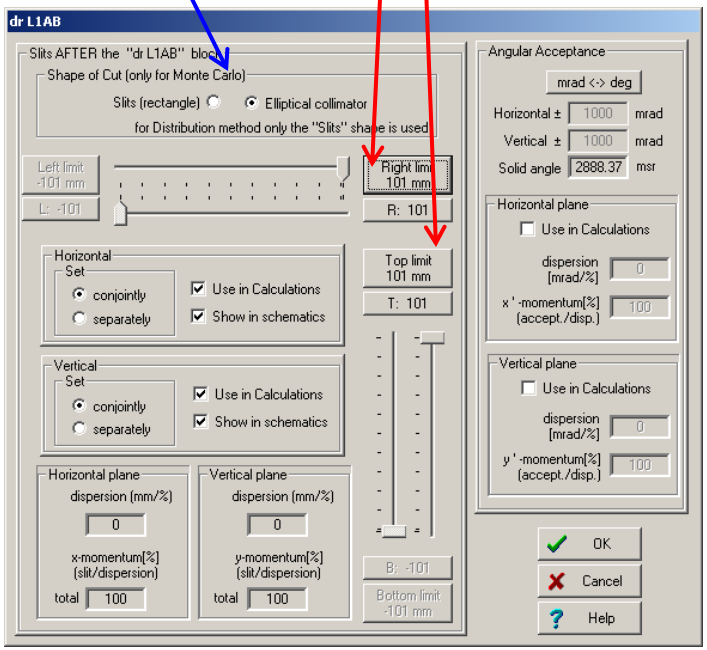
Use physical limits (aperture) option

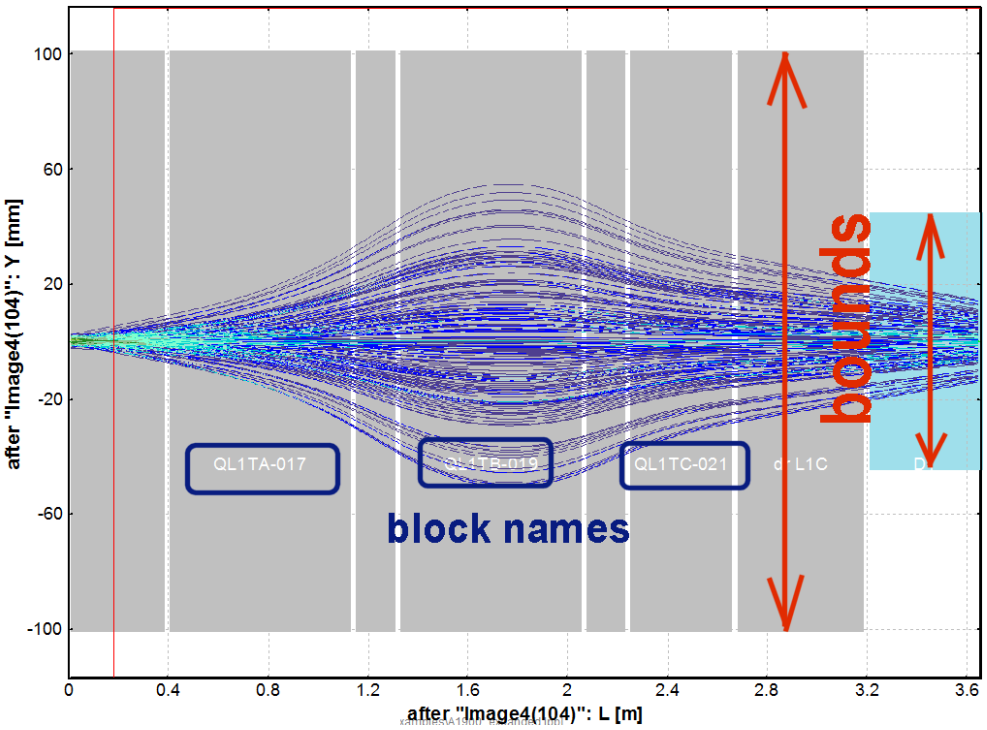
Use physical limits (aperture) inside a block to calculate fragment transmission

For block apertures LISE++ uses the slit limits accessible from the Block Cut & Acceptance dialog

Even if the slit is not used in transmission calculations, its LIMIT will be used with this option turned ON.

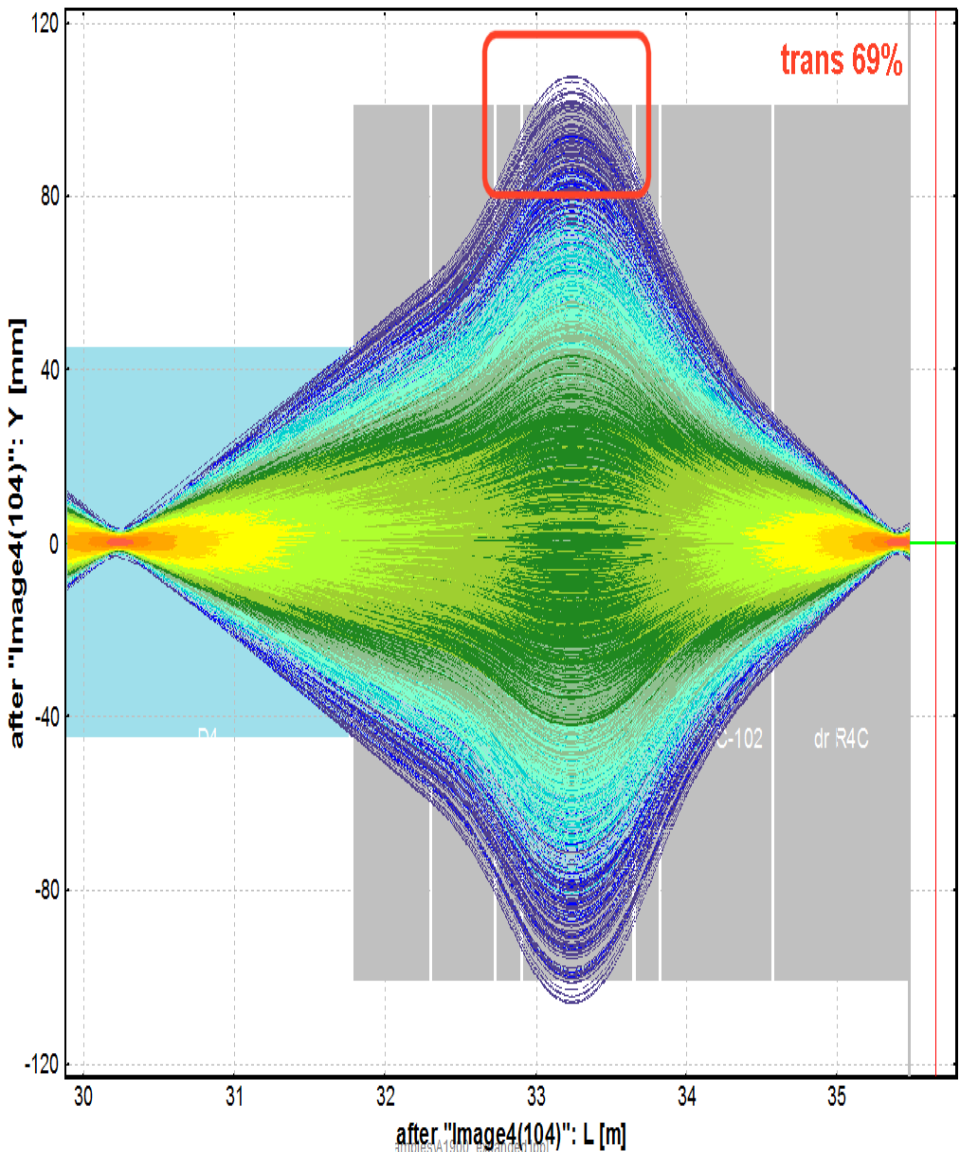
Pay attention for the shape of aperture!



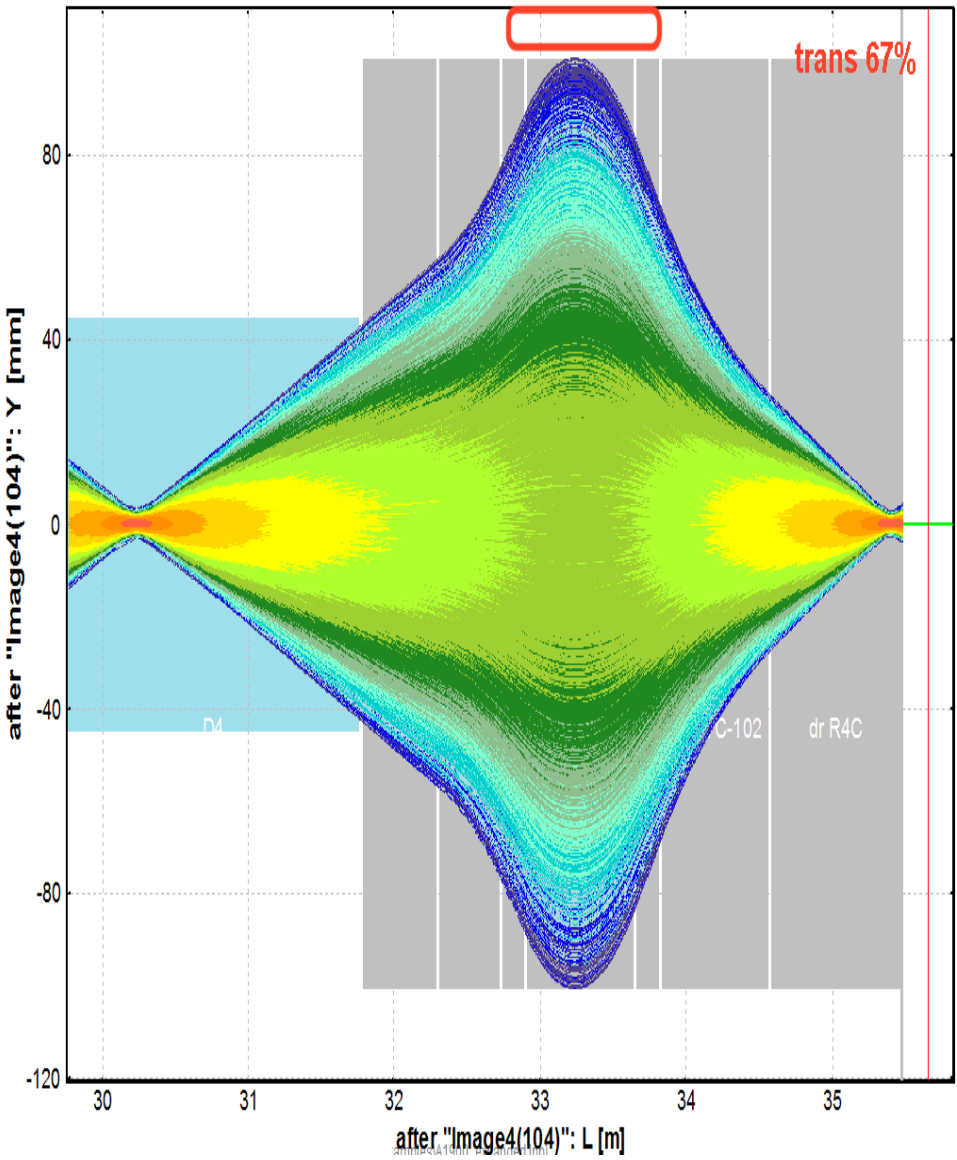


Use physical limits (aperture) option. Examples

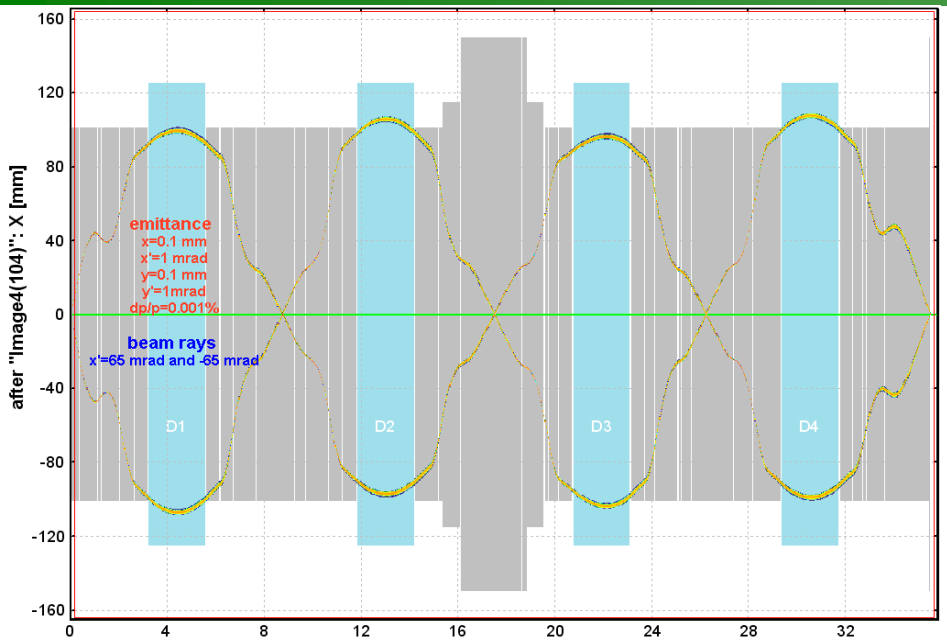
Use limits: No

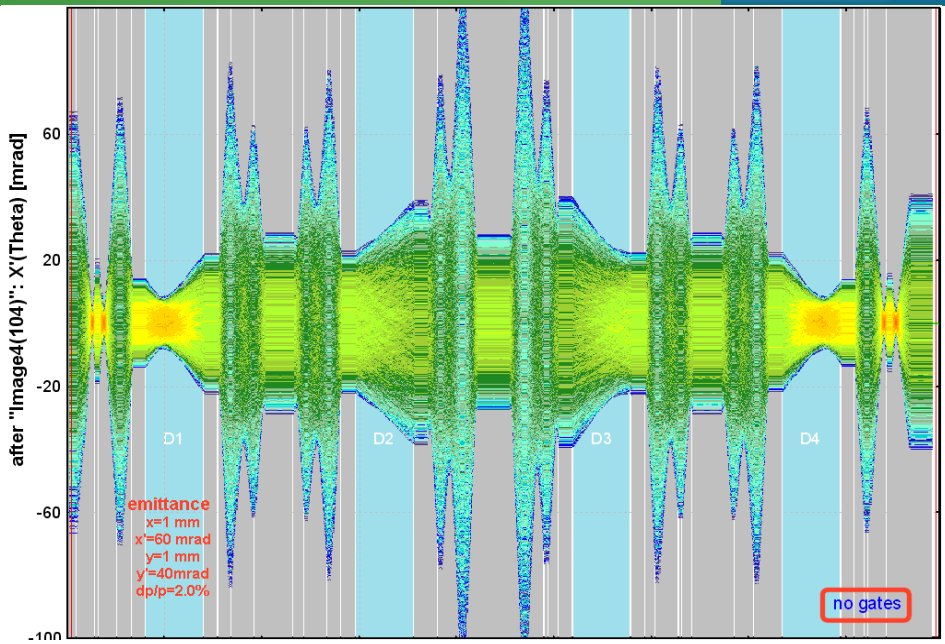


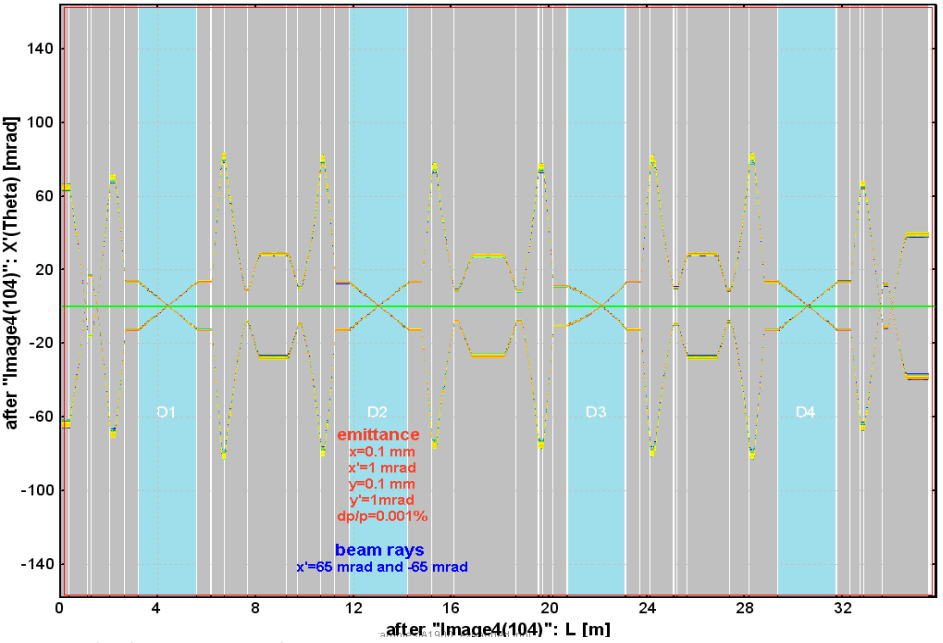
Use limits: Yes

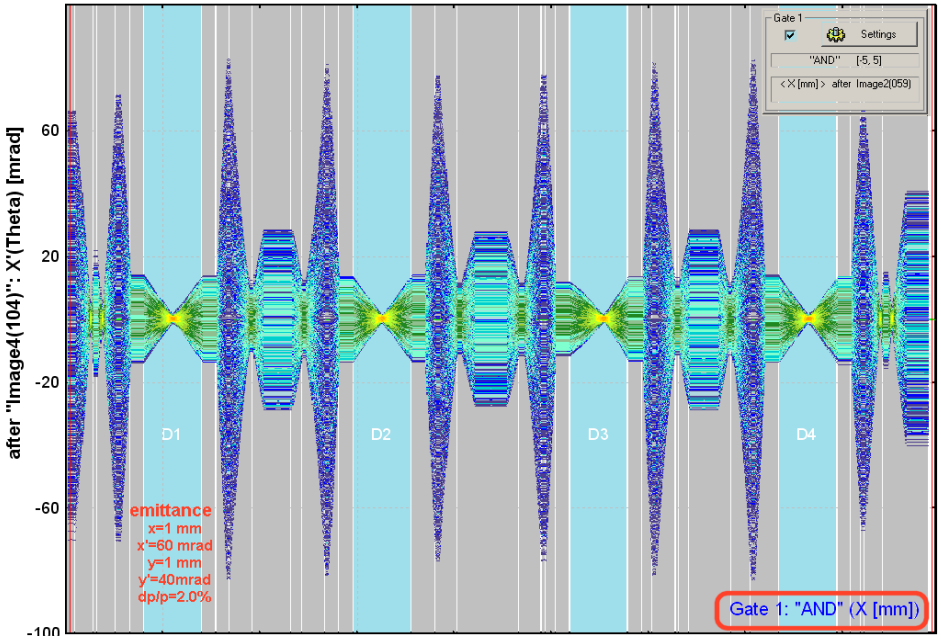


Envelope examples

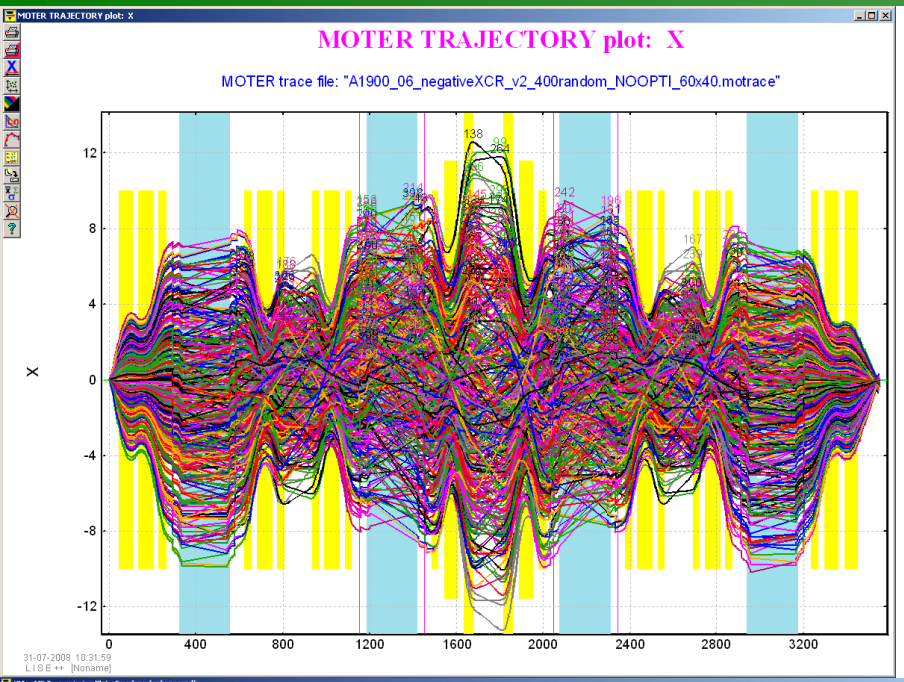








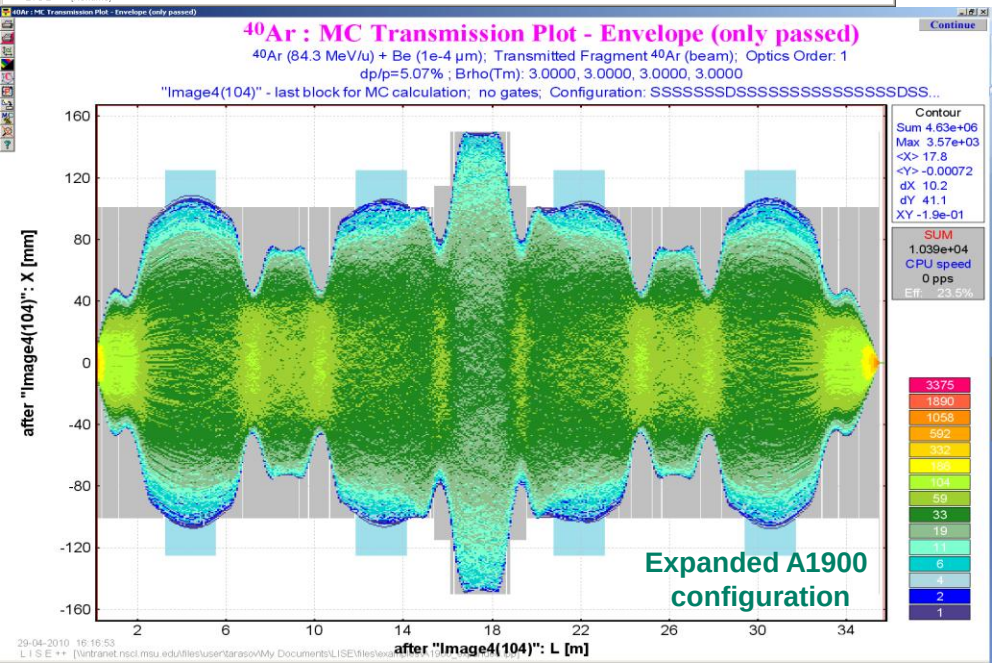
Examples of A1900 different envelope calculations (X)

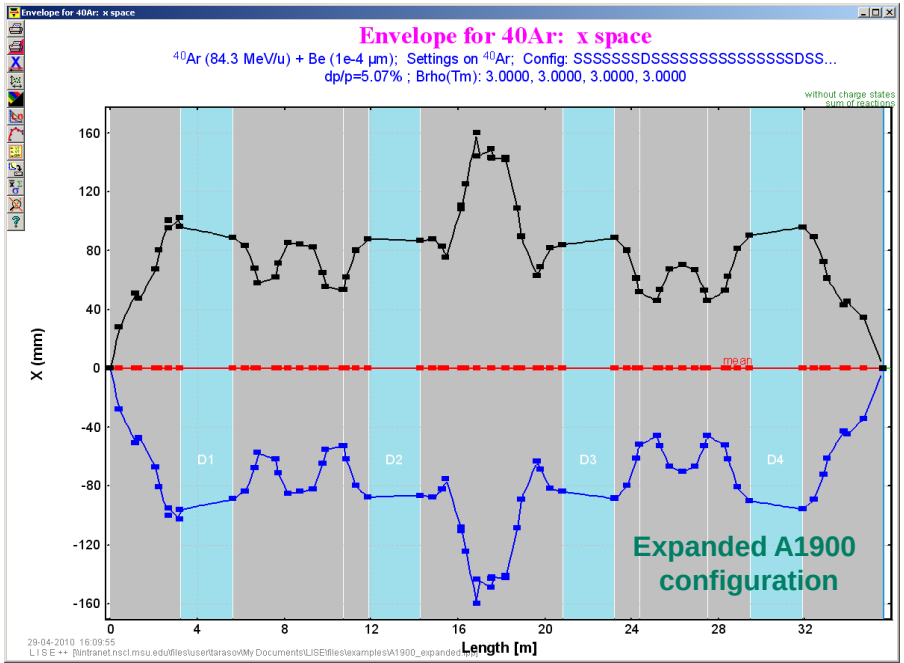


Initial Phase space:
60 mrad (x), 40 mrad (y), 2.5 % (dp/p)

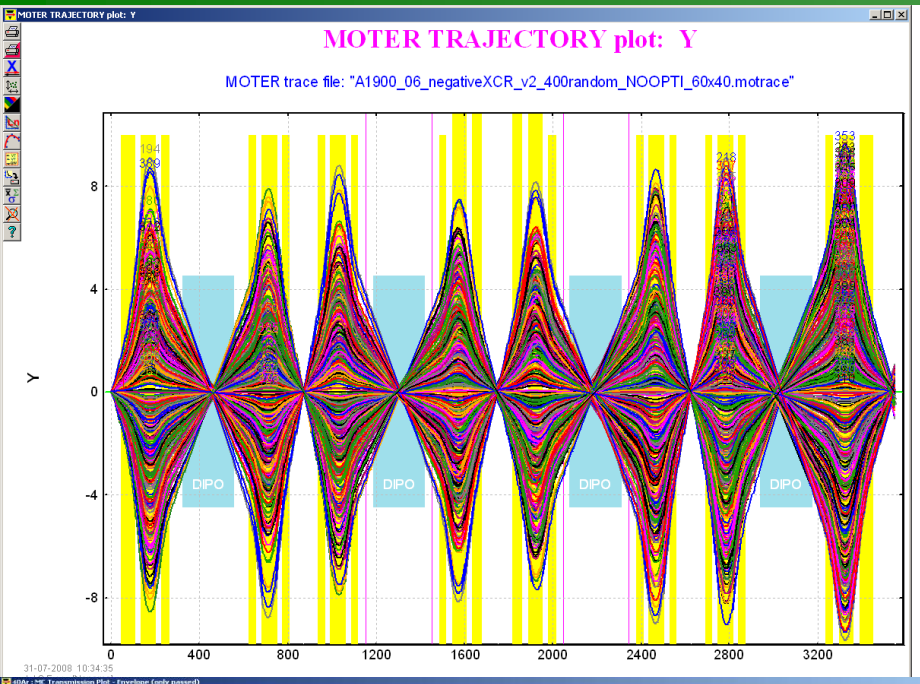
Standard A1900 configuration
LISE++ distribution : 23%
LISE++ MC (1st order): 22%
LISE++ MC (5th order): 12%

Expanded A1900 configuration
LISE++ distribution : 11%
LISE++ MC (1st order): 23%

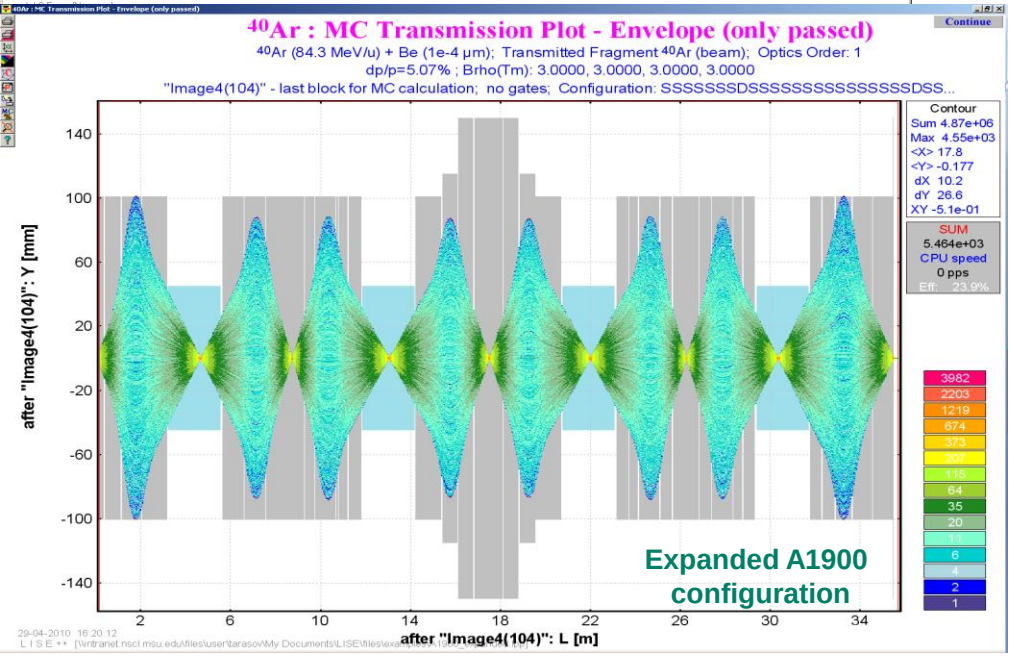


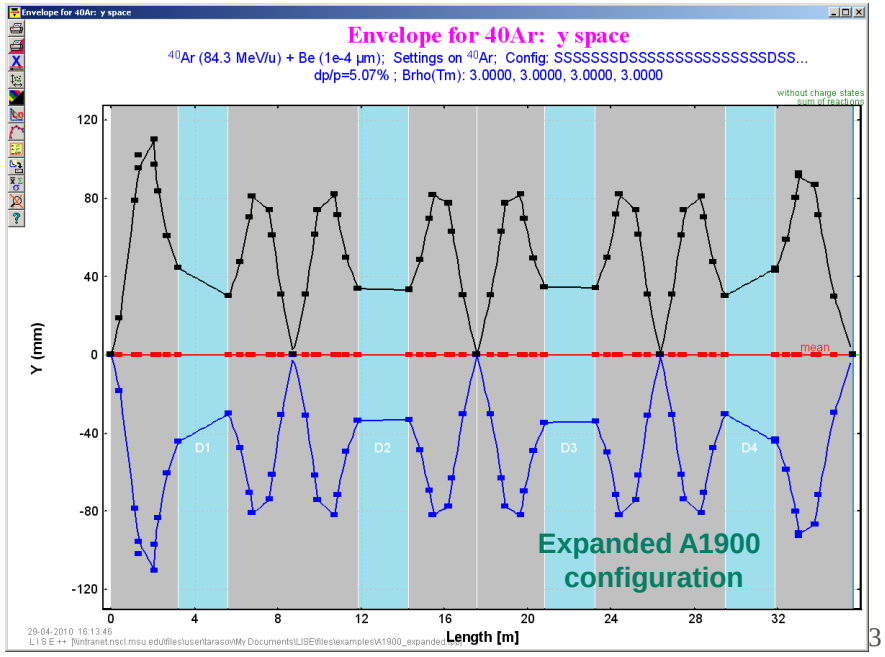


Examples of A1900 different envelope calculations (Y)



Initial Phase space:
60 mrad (x), 40 mrad (y), 2.5 % (dp/p)





Miscellaneous; Acknowledgements

Version	Date	Subject
9.0.40	24.04.10	The setting fragment (including reaction, charge states) is initially in the MC dialog
8.5.50	28.02.10	Optimization for speed: timer interruption, division coefficient to redraw
8.5.47	18.02.10	Modifications of ToF calculations in MC mode
8.5.46	16.02.10	Corrections for Q-state calculations in MC mode
8.5.44	09.02.10	Corrections for MC high order calculations
8.5.38	02.02.10	Monte Carlo transmission: Isotope group calculation -> secondary target

Thanks to
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