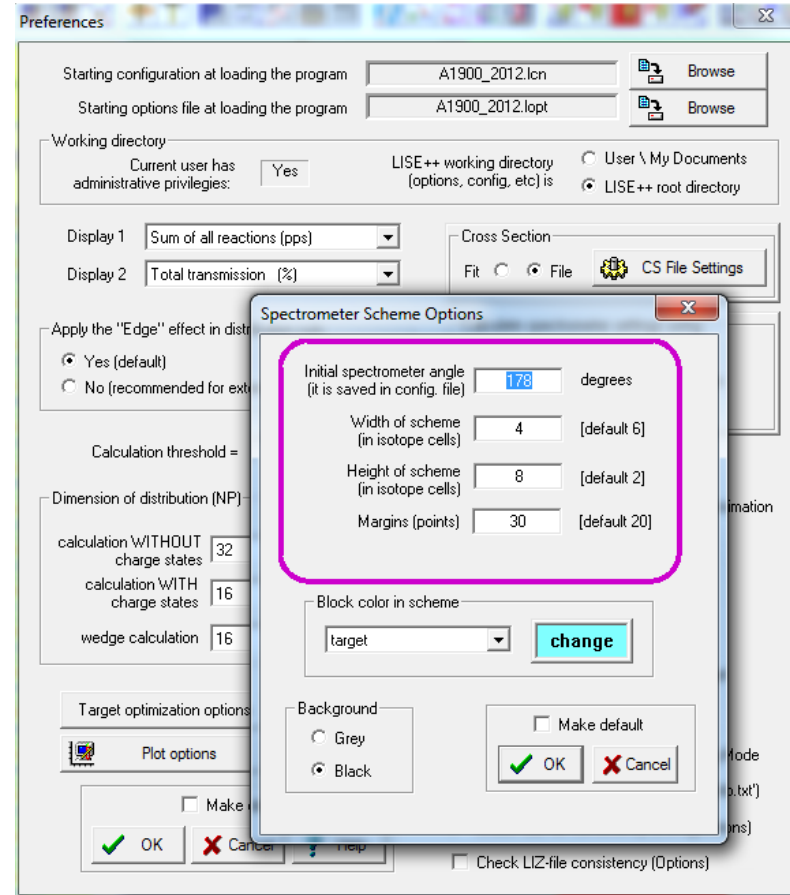
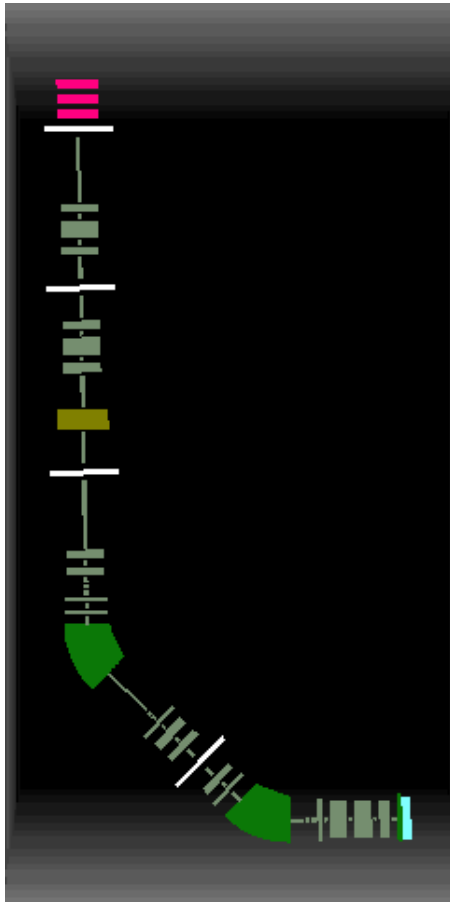


LISE++ version 9.4.93

From 18.02.2013

LISE++ file : `files\examples\dubna\acculinna2_extended.lpp`  
 Configuration: `\config\Dubna\Acculinna2_extended.lcn`



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://lise.nsci.msu.edu>

See [http://lise.nsci.msu.edu/9\\_2/9\\_2\\_85/9\\_2\\_95\\_optical\\_utilities.pdf](http://lise.nsci.msu.edu/9_2/9_2_85/9_2_95_optical_utilities.pdf)

Quadrupoles and dipoles fast editing

Block	Given Name	Start(m)	Length(m)	B0(kG)	B1(Tm)corr/*real	DriftM/*Angle	Rapp(cm)/*R(m)	L_eff(m)/*L_dip(m)	2nd order	CalcM/*Z-Q	AngAcc.Apps.Slits	COSY_link
Dipole	tuning	0.000	0.0010	+13.0000	* 3.9000	* 0.0	* 3.0000	* 0.0000	no	* 0	-- -- --	-
Drift	Drift	0.001	0.3500			standard					-- HV --	-
Drift	Quad1	0.351	0.5420	+8.6129	3.9000	quadrupole	4.7000	0.5420	yes	1	-- HV --	-
Drift	Drift	0.893	0.2500			standard					-- HV --	-
Drift	Quad2	1.143	0.8570	-5.6099	3.9000	quadrupole	8.0000	0.8570	yes	1	-- HV --	-
Drift	Drift	2.000	0.2560			standard					-- HV --	-
Drift	Quad3	2.256	0.8570	+4.4404	3.9000	quadrupole	13.0000	0.8570	yes	1	-- HV --	-
Drift	Drift	3.113	0.2560			standard					-- HV --	-
Drift	Sext1	3.369	0.2860	-0.2622	3.9000	sextupole	5.0000	0.2860	yes	1	-- HV --	-
Drift	Drift	3.655	0.3000			standard					-- HV --	-
Drift	octupole1	3.955	0.2860			standard					-- HV --	-
Drift	L_M1	4.241	0.6500			standard					-- HV --	-
Dipole	D1	4.891	2.3570	+13.0000	* 3.9000	* 45.0	* 3.0000	* 2.3562	yes	* 0	-- HV --	-
Drift	Drift	7.248	0.6500			standard					-- HV --	-
Drift	Sext2	7.898	0.2860	+1.2249	3.9000	sextupole	8.0000	0.2860	yes	1	-- HV --	-
Drift	Drift	8.184	0.3320			standard					-- HV --	-
Drift	Quad4	8.516	0.4590	+2.3830	3.9000	quadrupole	8.0000	0.4590	yes	1	-- HV --	-
Drift	Drift	8.975	0.5320			standard					-- HV --	-
Drift	F2_slits	9.507	0.0000			SLITS					-- HV HV	-
Drift	Drift	9.507	0.5000			standard					-- HV --	-
Drift	Quad5	10.007	0.4590	-6.4597	3.9000	quadrupole	8.0000	0.4590	yes	1	-- HV --	-
Drift	Drift	10.466	0.3000			standard					-- HV --	-
Drift	Quad6	10.766	0.5230	+7.9632	3.9000	quadrupole	13.0000	0.5230	yes	1	-- HV --	-

Selected block

Dispersive (Dipole)

Block Length [m] 0.001

Let call automatically

Block name = tuning

Charge State [Z-Q] = 0

Length after this block [m] 0.001

Selected Block Edit

Quadr/Sextu-pole Edit

Cuts (Acceptances)

Optical Matrix

Angular acceptance (mrad)

Horizontal ±  Use

Vertical ±  Use

Shape

Rectangle  Ellipse

Inside Aperture (mm)

X = min: -50 max: 50 Use

Y = min: -50 max: 50 Use

Shape

Rectangle  Ellipse

Slits (mm) after this BLOCK

X = min:  max:  Use

Y = min:  max:  Use

Shape

Rectangle  Ellipse

1-st order Matrix Elements

Plot

View

Quit  Help

Optical matrix - F2\_slits

$G_i = L_i * G_{i-1}$   
 G - Global, L - Block (Local)

Dimension:  mm  cm

Matrices:  Block (local)  Global

Second Order LOCAL matrix:  Non  Exist only for Monte Carlo transmission

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. F	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]	/[%]

Det = 1.00000

Global matrix

-0.99986	-0.00013	0	0	0	19.74298	[mm]
0.82851	-0.99991	0	0	0	0.45134	[mrad]
0	0	-7.42295	-0.00042	0	0	[mm]
0	0	-2.87686	-0.13488	0	0	[mrad]
1.68087	-1.97413	0	0	1	-2.34874	[mm]
0	0	0	0	0	1	[%]
	/[mm]	/[mrad]	/[mm]	/[mrad]	/[mm]	/[%]

Det = 0.99989

Beam (sig)	
1.0001	
10.0334	
7.423	
3.1774	
19.8127	
0.001	

Drift (space)

Ok Cancel Help Spectrometer matrix

!!! Should be checked y/y ??

Optical matrix - F3 slit

$G_i = L_i * G_{i-1}$   
 G - Global, L - Block (Local)

Dimension:  mm  cm

Matrices:  Block (local)  Global

Second Order LOCAL matrix:  Non  Exist only for Monte Carlo transmission

Block matrix							Global matrix							Beam (sig)	
1. X	1	0	0	0	0	0	0.76277	0.93238	0	0	0	0.00062	[mm]	9.3549	
2. T	0	1	0	0	0	0	-0.637	0.53217	0	0	0	0.00044	[mrad]	5.3597	
3. Y	0	0	1	0	0	0	0	0	6.23033	-1.22179	0	0	[mm]	13.7147	
4. F	0	0	0	1	0	0	0	0	1.00222	-0.03604	0	0	[mrad]	1.065	
5. L	0	0	0	0	1	0	0	-0.0001	0	0	1	-4.69588	[mm]	0.0048	
6. D	0	0	0	0	0	1	0	0	0	0	0	1	[%]	0.001	
	/[mm]	/[mrad]	/[mm]	/[mrad]	/[mm]	/[%]	/[mm]	/[mrad]	/[mm]	/[mrad]	/[mm]	/[%]			
Det = 1.00000	Import/link COSY map		view		2-nd order		Det = 0.99982	view		2-nd order					

Drift (space)

Ok Cancel Help Spectrometer matrix

Optical matrix - F4 slits

$G_i = L_i * G_{i-1}$   
 G - Global, L - Block (Local)

Dimension:  mm  cm

Matrices:  Block (local)  Global

Second Order LOCAL matrix:  Non  Exist only for Monte Carlo transmission

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. F	0	0	0	1	0	0
5. L	0	0	0	0	1	0
6. D	0	0	0	0	0	1

Det = 1.00000

Beam (sig): 2.1696, 14.8056, 1.4104, 8.9813, 4.6959, 1

Global matrix						
-0.83519	0.20024	0	0	0	0.00022	[mm]
1.16254	-1.47599	0	0	0	-0.00118	[mrad]
0	0	0.43105	0.13429	0	0	[mm]
0	0	-5.06647	0.74159	0	0	[mrad]
0	-0.0001	0	0	1	-4.69588	[mm]
0	0	0	0	0	1	[%]

Det = 0.99999

Drift (space)

Ok Cancel Help Spectrometer matrix

Let's start calculations with the following beam

**Beam**

A	Element	q+
18	0	8
	8	
Z		
Stable		

Table of Nuclides

← Z →  
← N →

Ok  
Cancel

**Beam energy**

Energy  135.1513 MeV/u  
 TKE  2432.61 MeV  
**Brho  3.9 Tm**  
 P  9.354 GeV/c  
 U  3.04e+5 KV

**Beam intensity**

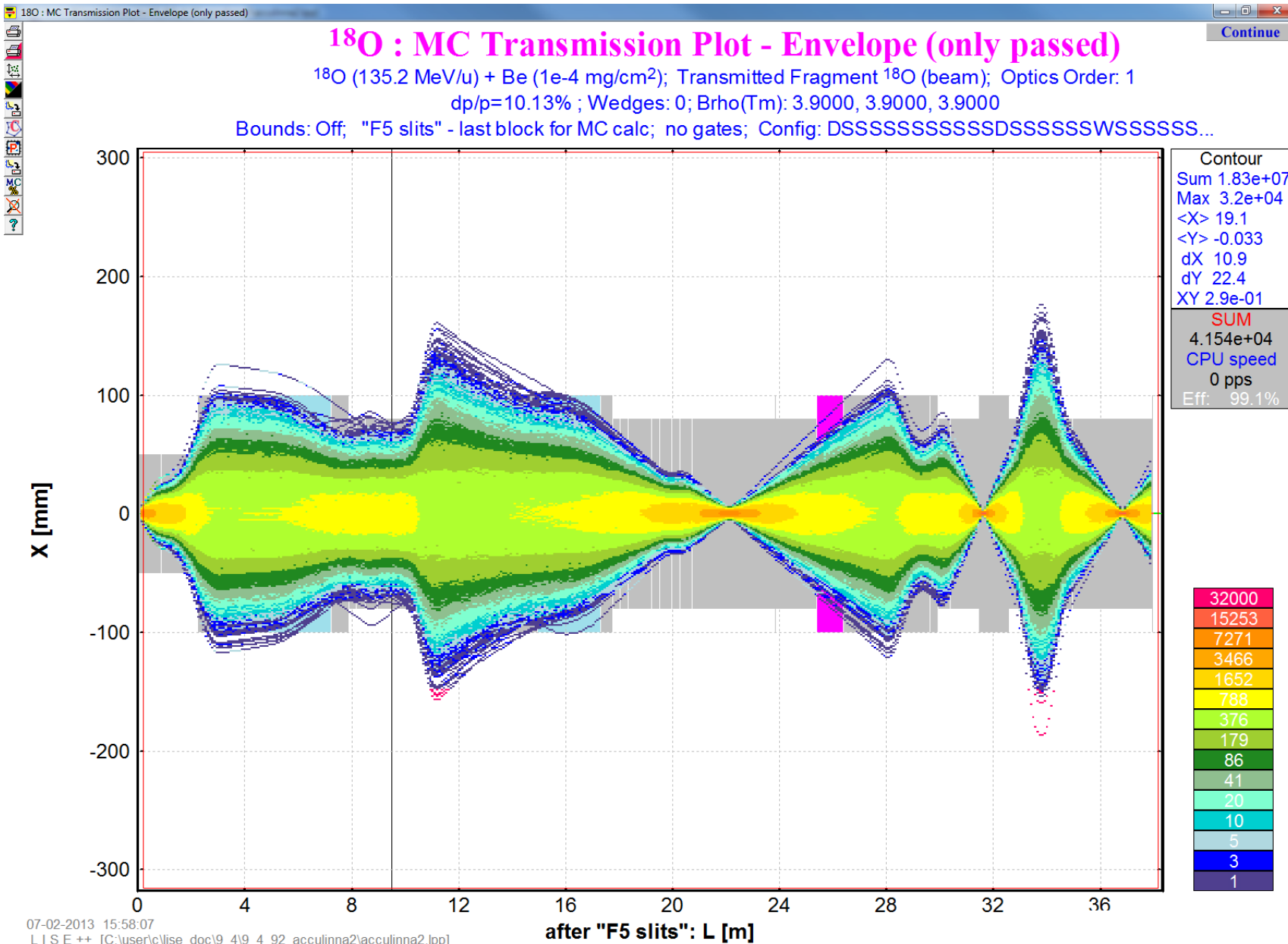
8000 enA  
 1000 pnA  
 6.25e+12 pps  
 2.433 KW

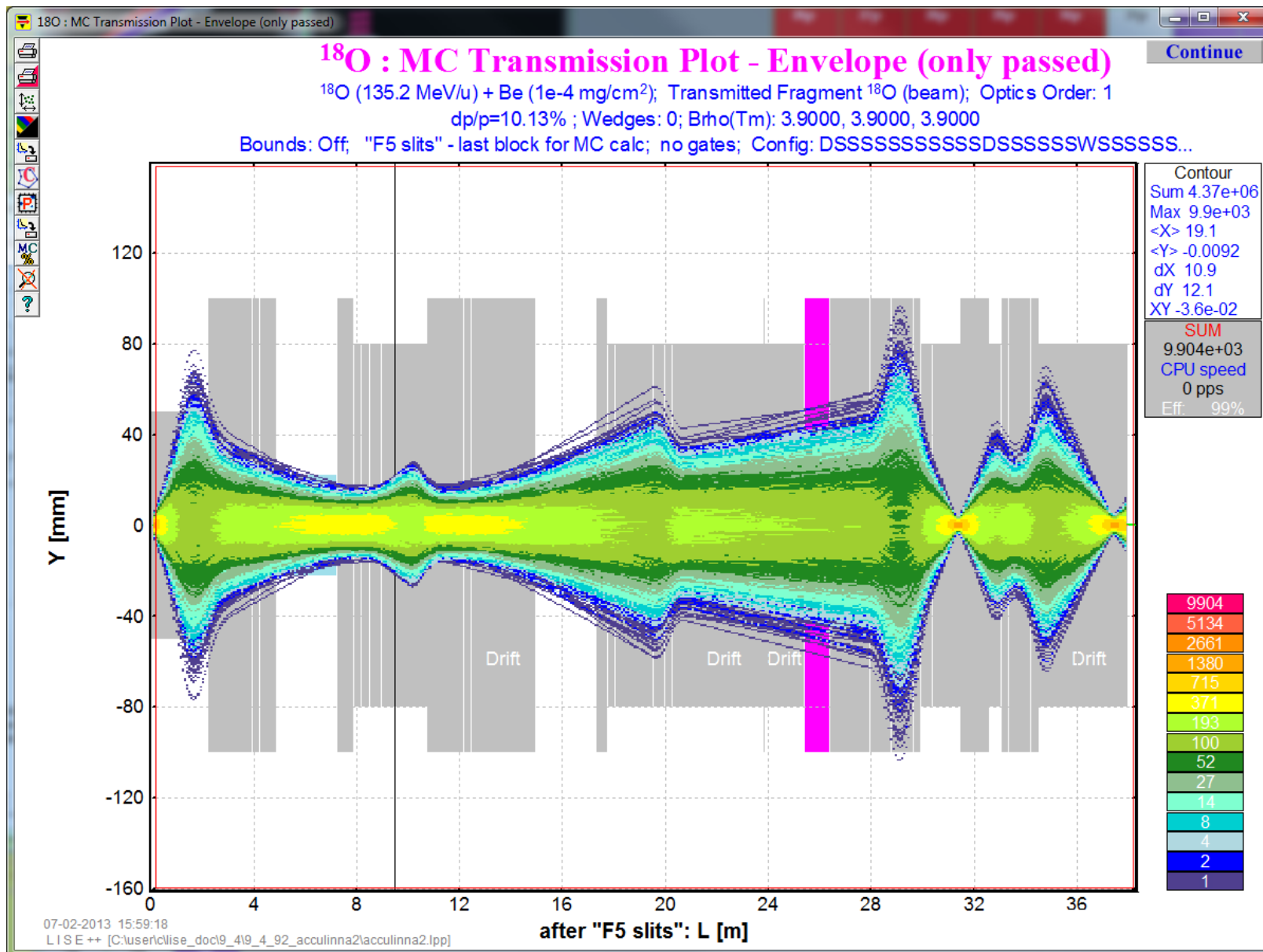
**Emittance**

Beam CARD (sigma, semi-axis, half-width...)  
 1D - shape (Distribution method)

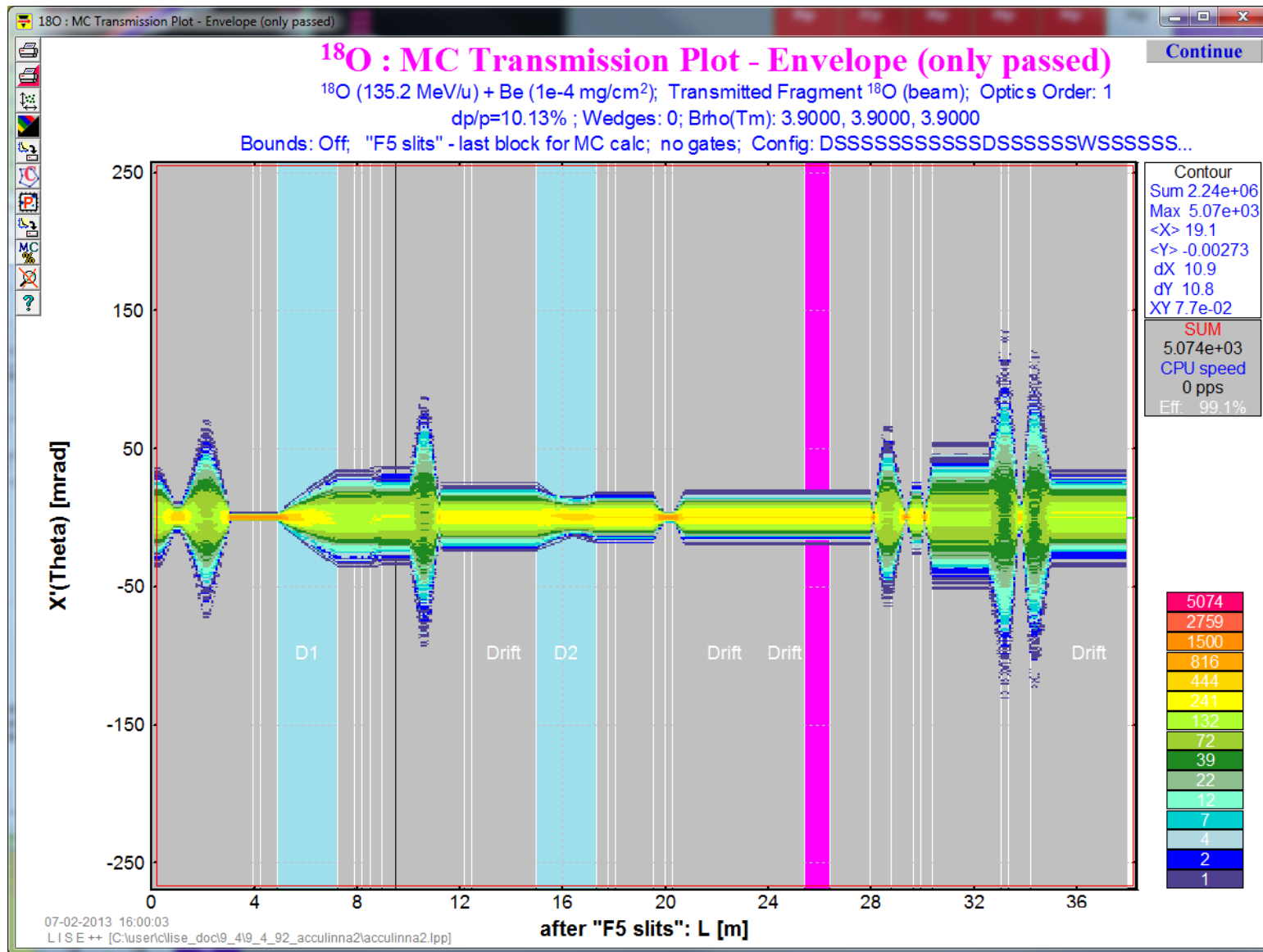
1. X	mm	1	Gaussian
2. T	mrاد	10	Gaussian
3. Y	mm	1	Gaussian
4. P	mrاد	10	Gaussian
5. L	mm	0	Gaussian
6. D	%	1	Gaussian

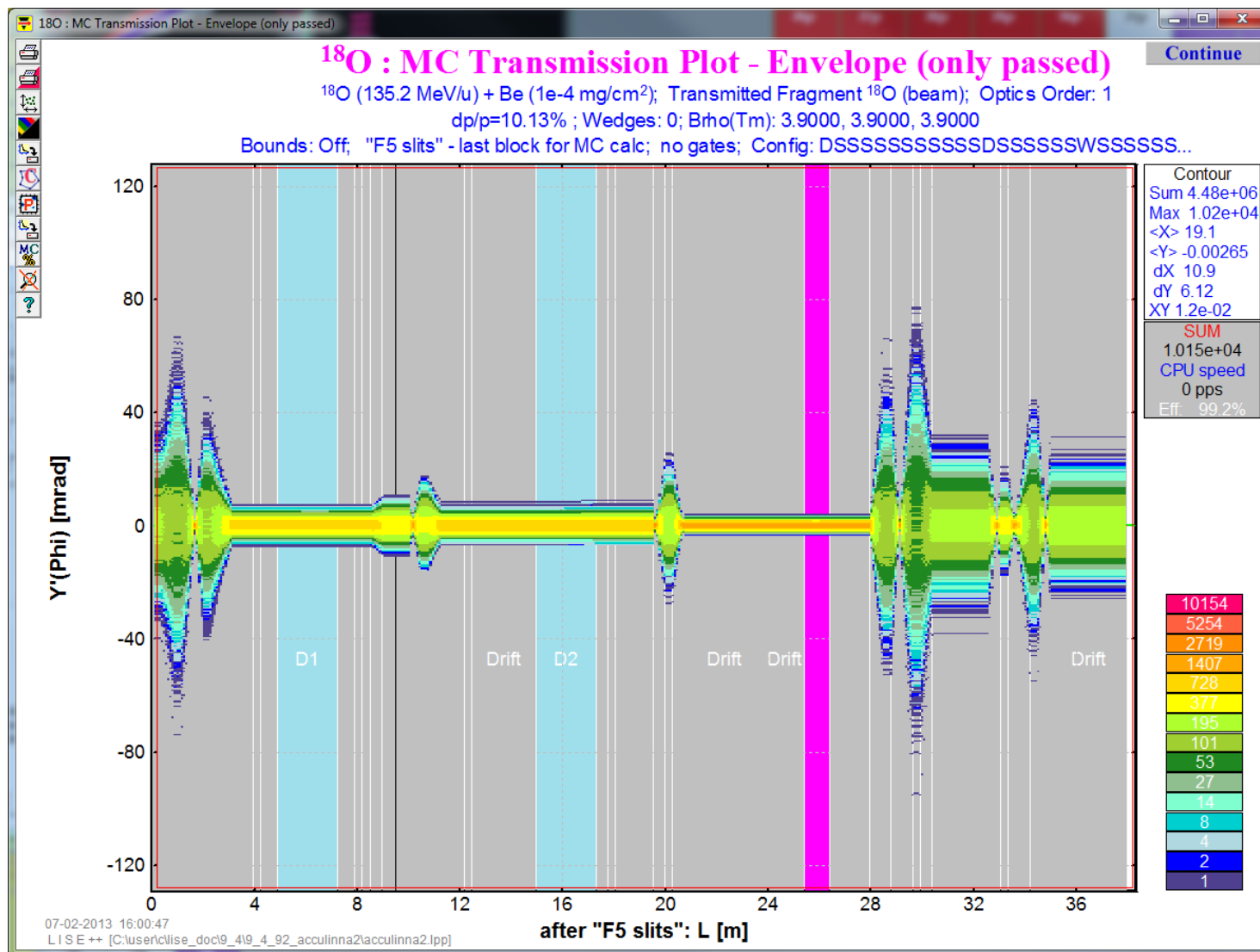
Energy Loss in the target box [KW] 3.05e-8



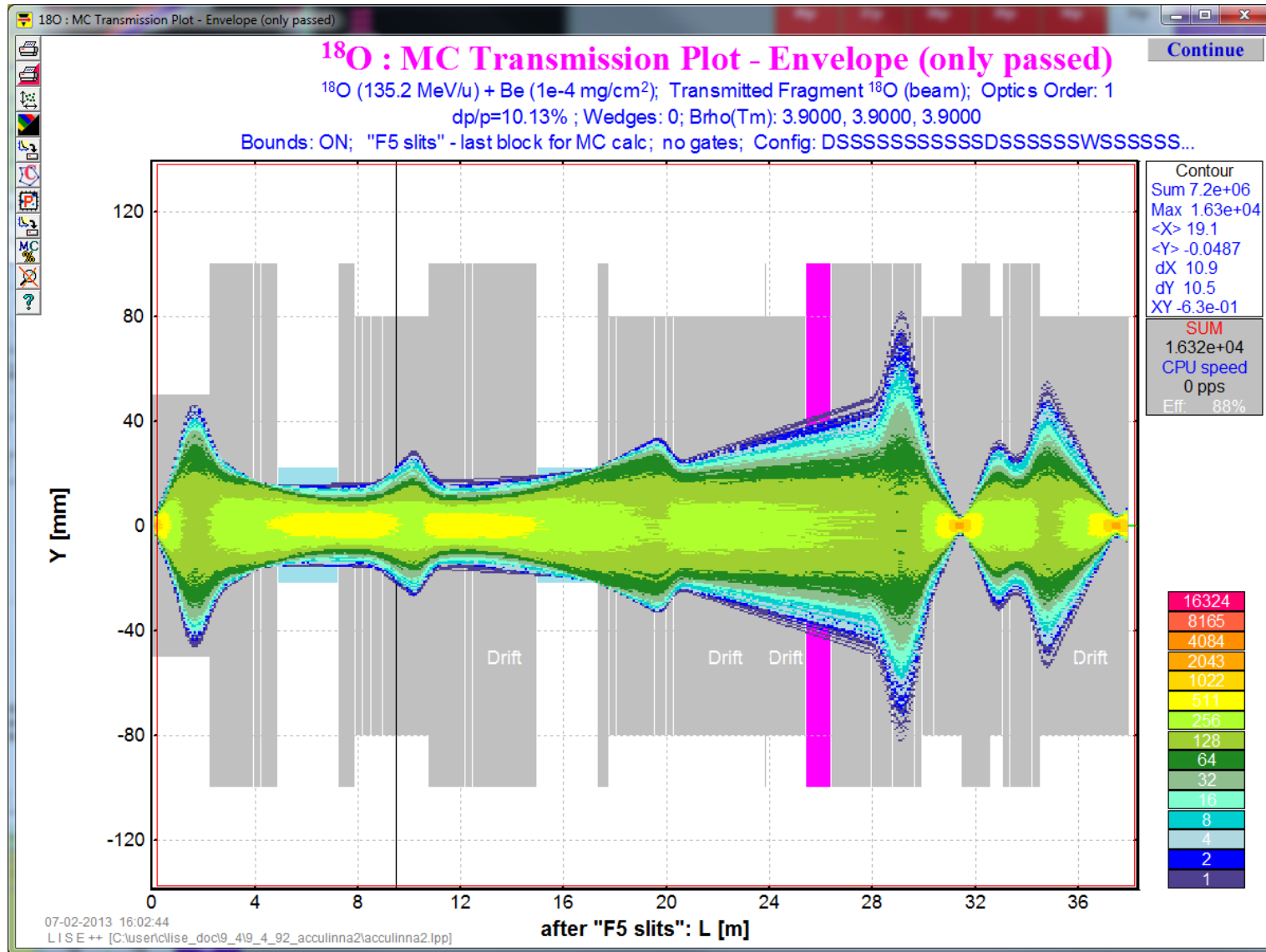








## 88% transmission



Let's start calculations with the following beam

**Beam**

A	Element	q+
18	O	8
	8	
Z		
Stable		

Table of Nuclides

Z N

Ok Cancel

**Beam energy**

Energy  135.1513 MeV/u

TKE  2432.61 MeV

Brho  3.9 Tm

P  9.354 GeV/c

U  3.04e+5 KV

**Beam intensity**

8000 enA

1000 p nA

6.25e+12 pps

2.433 KW

**Emitance**

	Beam CARD (sigma, semi-axis, half-width)	1D - shape (Distribution method)	2D mode	2D - shape (Monte Carlo method)	Correlated with
1. X mm	1	Rectangle uniform	<input checked="" type="checkbox"/>	Rectangle uniform	T
2. T mrad	20	Rectangle uniform	<input checked="" type="checkbox"/>	Rectangle uniform	X
3. Y mm	1	Rectangle uniform	<input checked="" type="checkbox"/>	Rectangle uniform	P
4. P mrad	20	Rectangle uniform	<input checked="" type="checkbox"/>	Rectangle uniform	Y
5. L mm	0	Gaussian	<input type="checkbox"/>		
6. D %	3	Rectangle uniform	<input type="checkbox"/>		

mm  cm

beam respect to spectrometer

dX  mm

dT  mrad

dY  mm

dP  mrad

dT  degrees

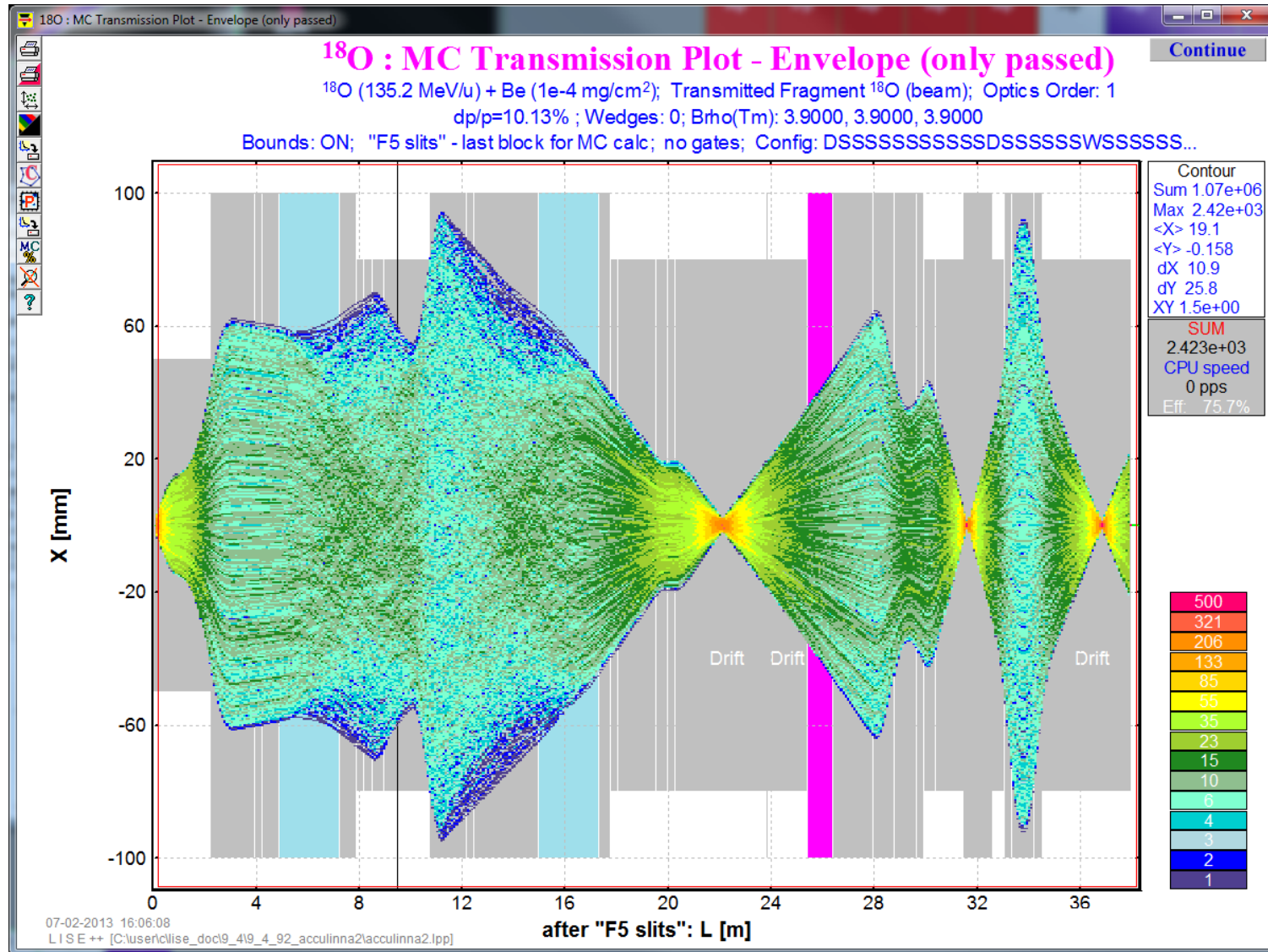
dP  degrees

Energy Loss in the target box [KW]

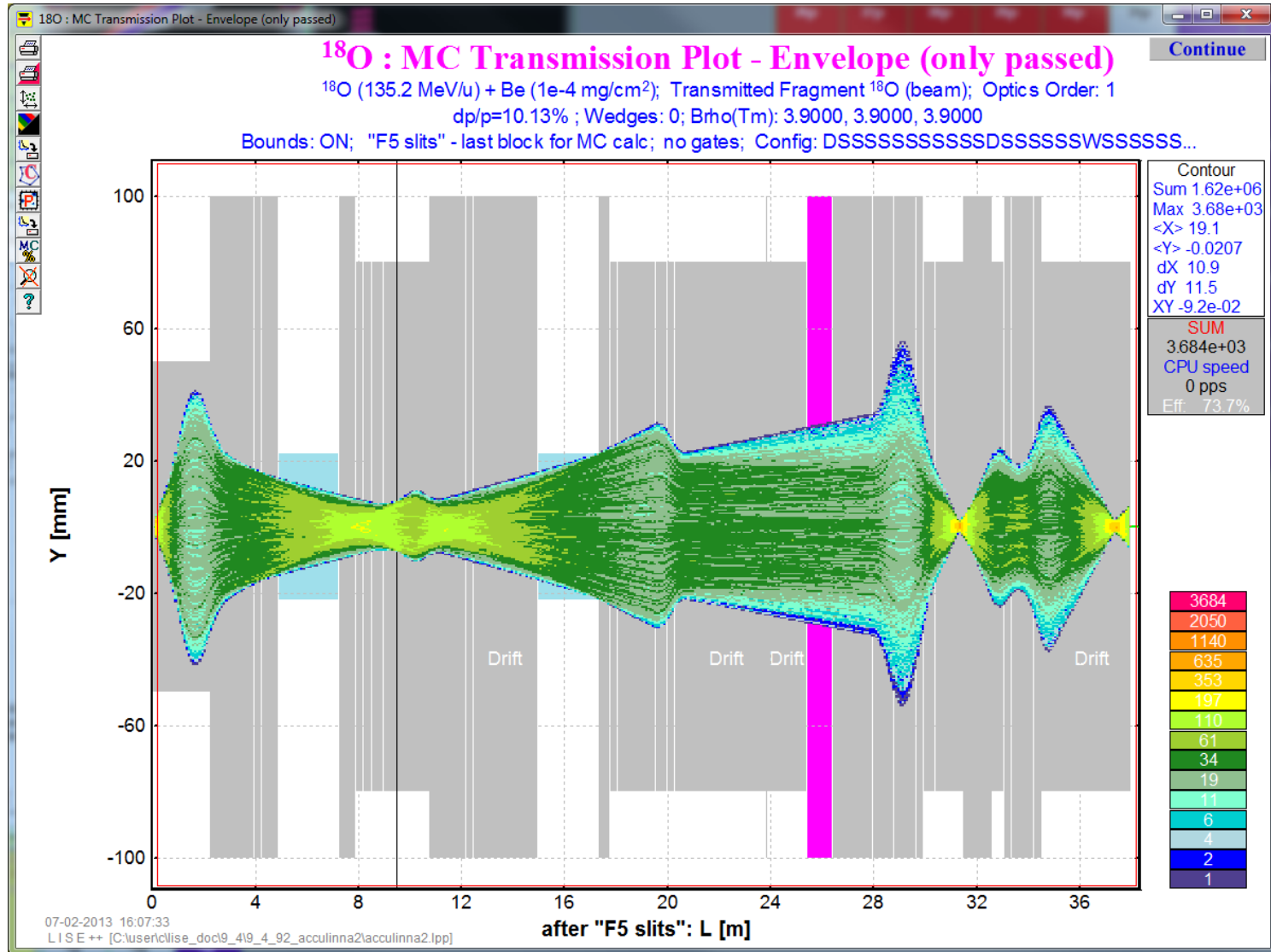
RF frequency  MHz

Bunch length  ns

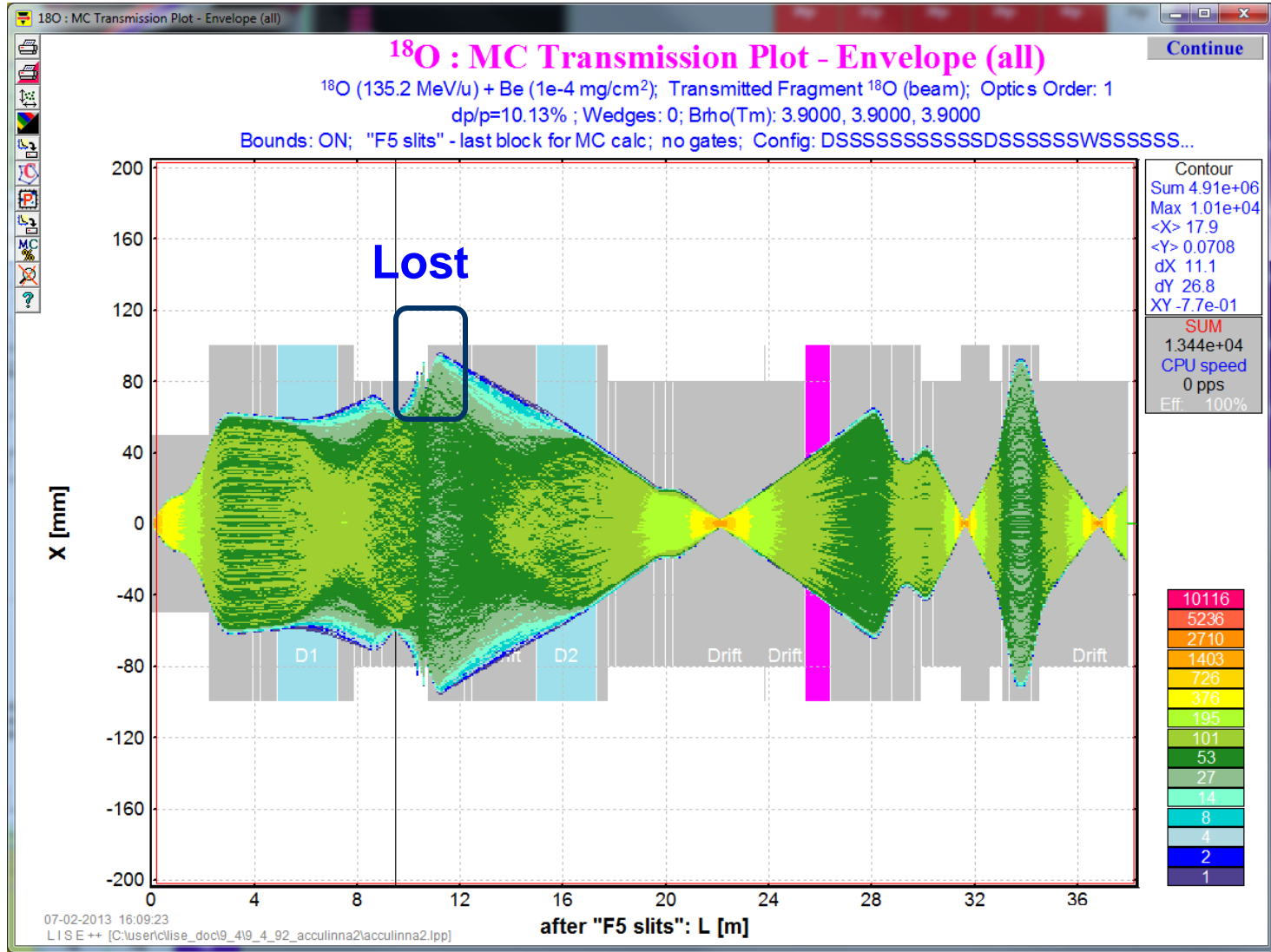
## 76% transmission



## 76% transmission

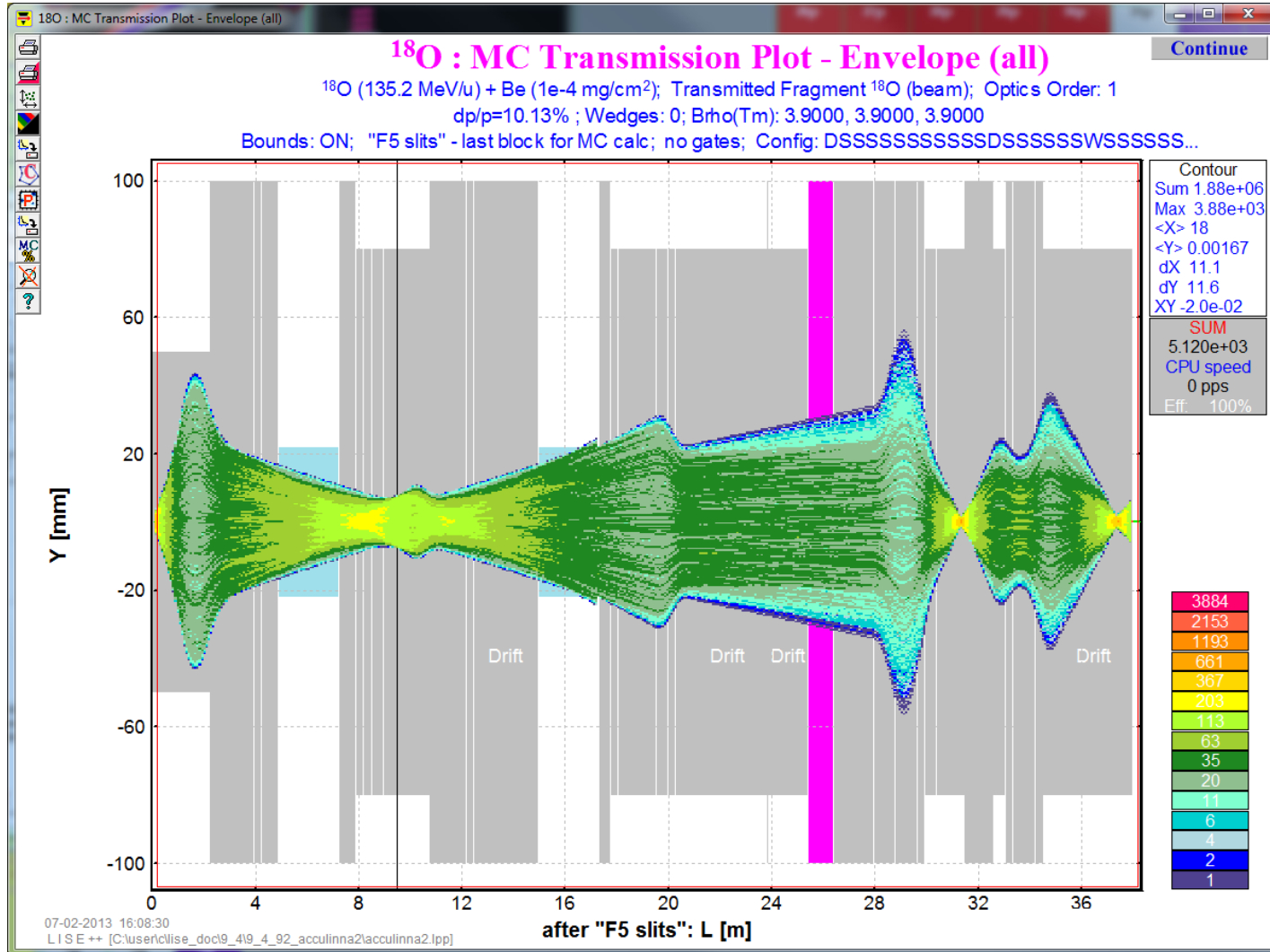


Show all





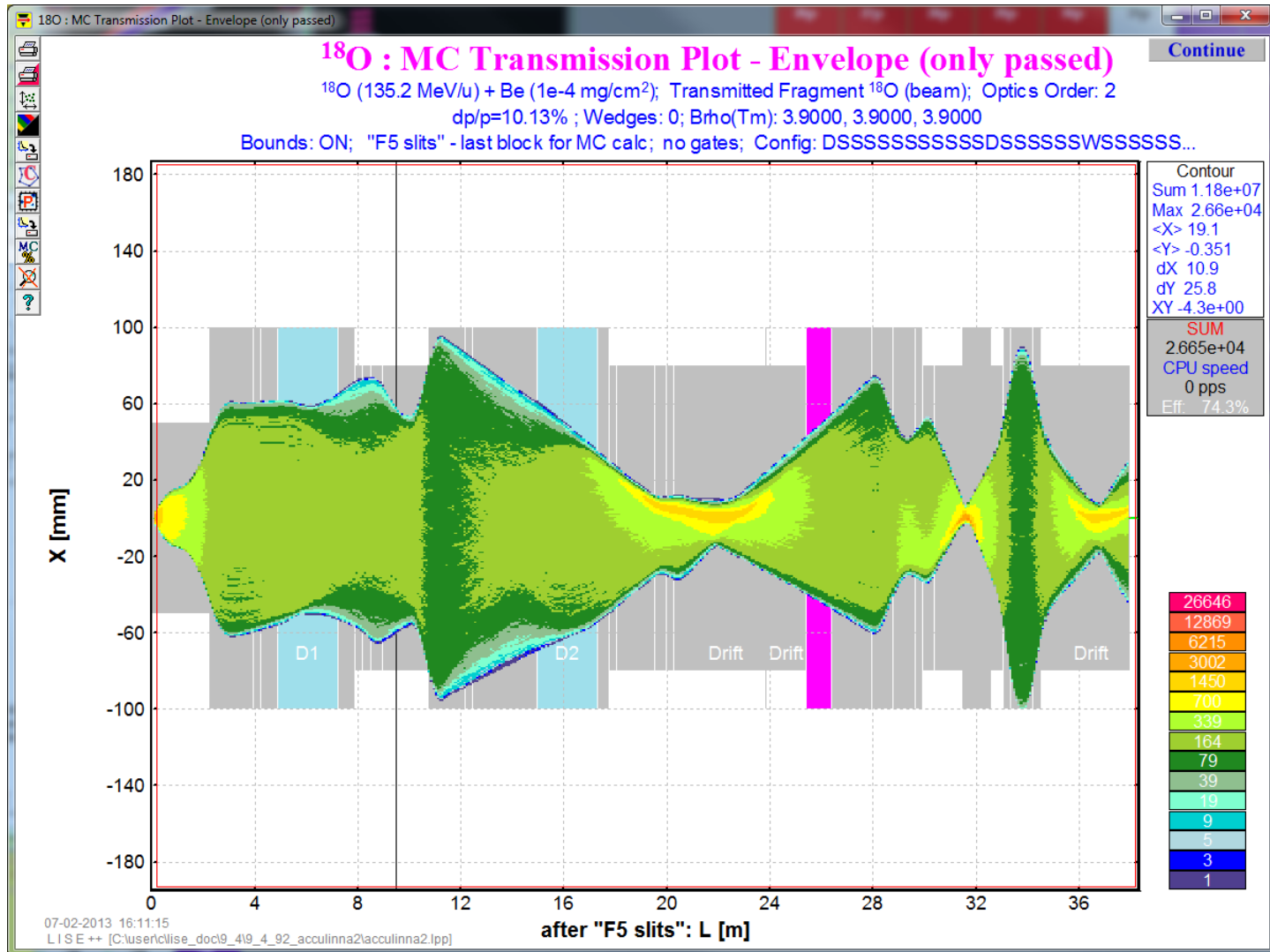
Show all





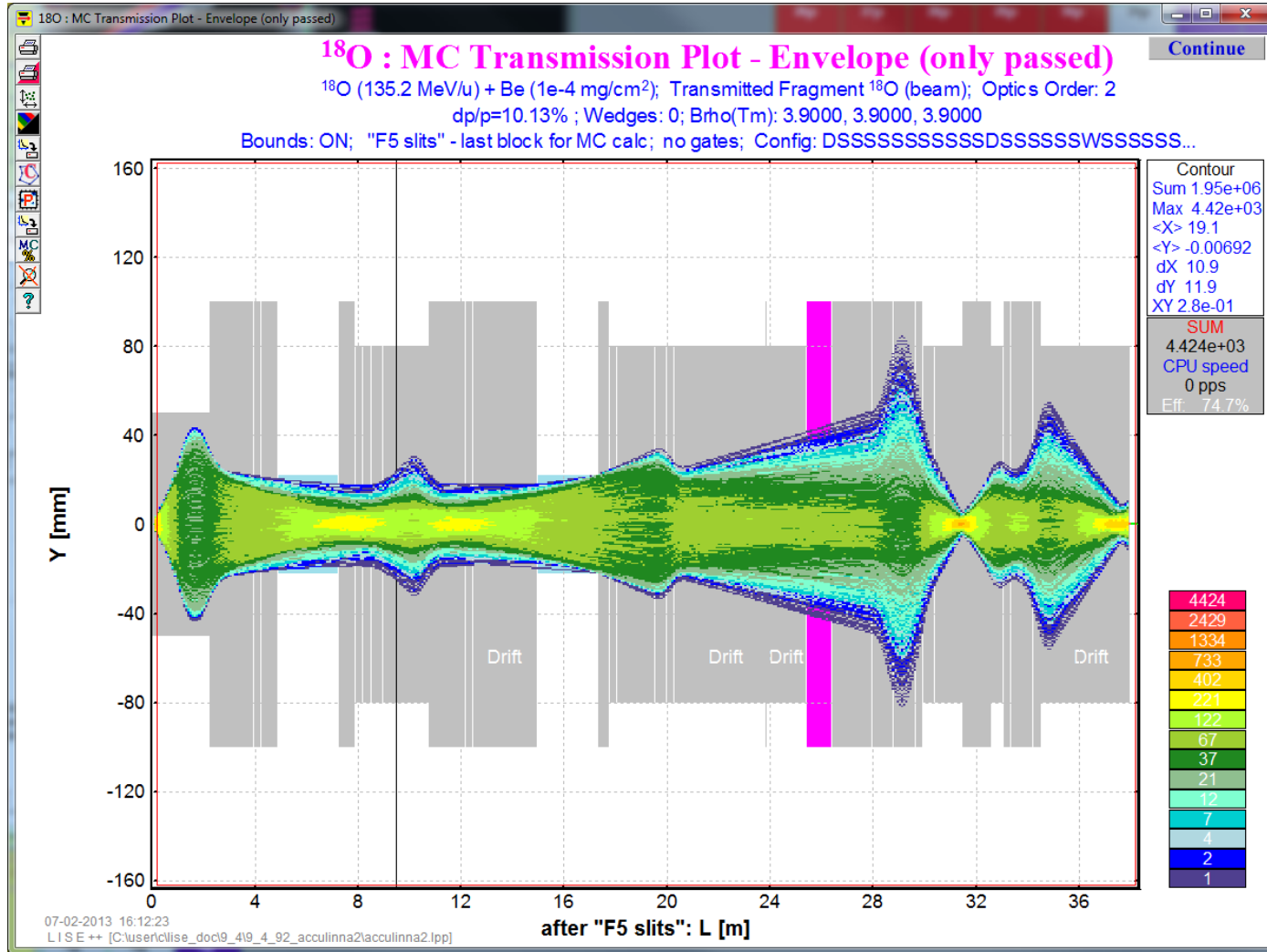
74% transmission

2<sup>nd</sup> order



74% transmission

2<sup>nd</sup> order



Let's start calculations with the following beam

**Beam**

A: 18 Element: 0 q+: 8  
Z: 8  
Stable

Table of Nuclides  
Z: N

Beam energy:  
Energy: 135.1513 MeV/u  
TKE: 2432.61 MeV  
Brho: 3.9 Tm  
P: 9.354 GeV/c  
U: 3.04e+5 KV

Beam intensity:  
8000 enA  
1000 pnA  
6.25e+12 pps  
2.433 KW

**Emittance**

	Beam CARD (sigma, semi-axis, half-width...)	1D - shape (Distribution method)	2D mode	2D - shape (Monte Carlo method)	Correlated with
1. X mm	1	Rectangle uniform	<input checked="" type="checkbox"/>	Rectangle uniform	T
2. T mrad	20	Rectangle uniform	<input checked="" type="checkbox"/>	Rectangle uniform	X
3. Y mm	1	Rectangle uniform	<input checked="" type="checkbox"/>	Rectangle uniform	P
4. P mrad	20	Rectangle uniform	<input checked="" type="checkbox"/>	Rectangle uniform	Y
5. L mm	0	Gaussian	<input type="checkbox"/>		
6. D %	0.001	Rectangle uniform	<input type="checkbox"/>		

mm  cm

beam respect to spectrometer:  
dX: 0 mm  
dT: 0 mrad  
dY: 0 mm  
dP: 0 mrad  
dT: 0 degrees  
dP: 0 degrees

Energy Loss in the target box [KW]: 3.05e-8

RF frequency: 20 MHz  
Bunch length: 1 ns

Ok Cancel

RF-kicker test

## RF-kicker test

**RFsepar**

**RF separator settings**

Select method

Electric field E = 25000 KV/m

**Voltage** U = 1000 KV

Gap = 40 mm

Separation plane

Horizontal

Vertical

Beam profile for different phase shifts

**Geometry**

La = 0 m

L = 1 m

Lb = 0 m

**RF settings**

use Beam settings RF (MHz) 20 Phase shift 98.93

manually RF (MHz) 19 Phase shift [deg]

**Optical block properties and data**

Setting Charge state for the Block (Z-Q) 0

Calculate the RF separator using the Setting fragment

Tweak 0.1 %

**Calculations for the setting fragment**

	<E>-dE	<E>	<E>+dE
Before the RF separator			
Energy [MeV/u]	135.15	135.15	135.15
Values corresponding to Energy			
Time of flight [ns]	173.96	173.96	173.96
Phase [deg]	73.58	73.57	73.57
After the RF separator			
Position [mm]	24.62	24.62	24.62

**Reduced values**

Dispersion (X/P) -0.371 mm/%

Slits after the RF separator corresponding to the separation plane (Centre +,87.08)

12.92 +/- mm

