

The screenshot shows the LISE++ software interface with the Utilities menu open. The menu items are as follows:

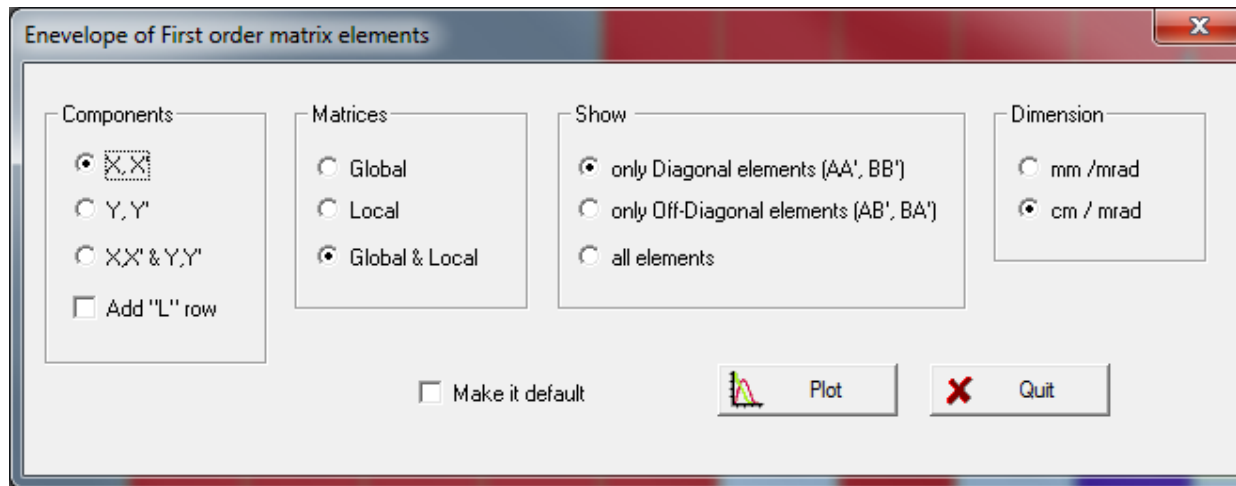
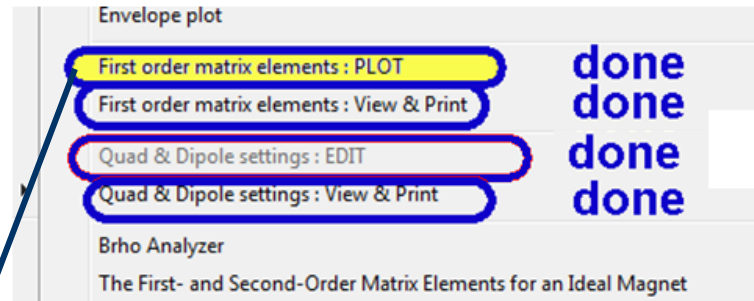
- Calculations
- Utilities (selected)
- 1D-Plot
- 2D-Plot
- Databases
- Help

The Utilities sub-menu is expanded, showing the following options:

- Optics (highlighted with a red box)
- Goodies
- Calibrations
- Transmission and rate
- Optimum Target
- Optimum Target-Wedge and Wedge-Wedge configurations
- Brho scanning
- Optimum charge state combination
- Monte Carlo calculation of transmission
- Physical Calculator
- Kinematics Calculator

The Optics sub-menu is further expanded, showing the following options:

- Tune spectrometer for setting fragment on beam axis
- Tune spectrometer for setting fragment at middle of slit
- Update matrices linked with COSY files
- Envelope plot
- First order matrix elements : PLOT (highlighted with a red box)
- First order matrix elements : View & Print (highlighted with a red box)
- Quad & Dipole settings : EDIT
- Quad & Dipole settings : View & Print
- Brho Analyzer
- The First- and Second-Order Matrix Elements for an Ideal Magnet

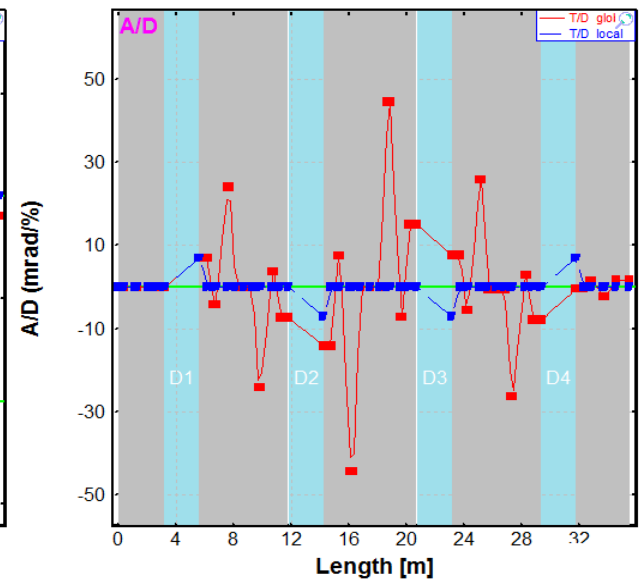
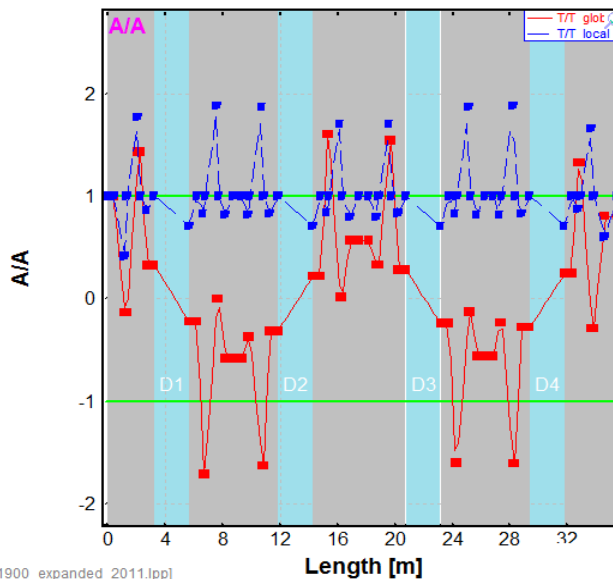
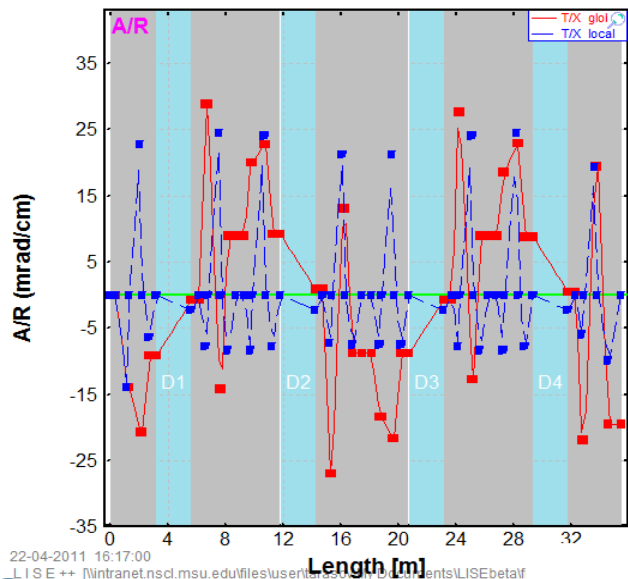
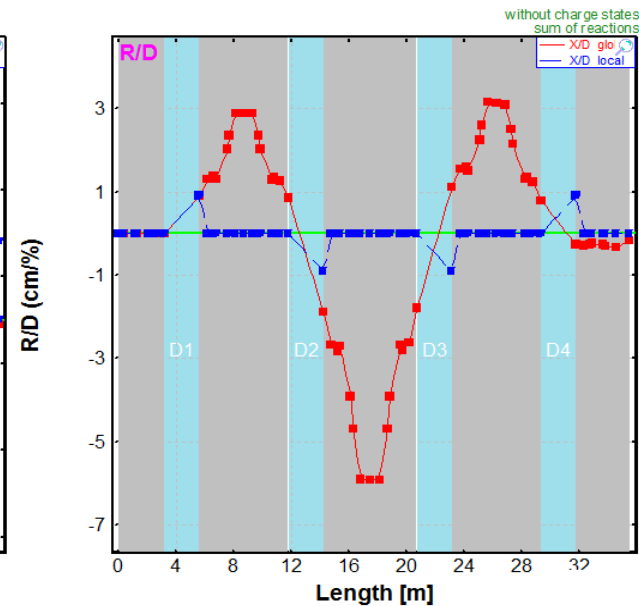
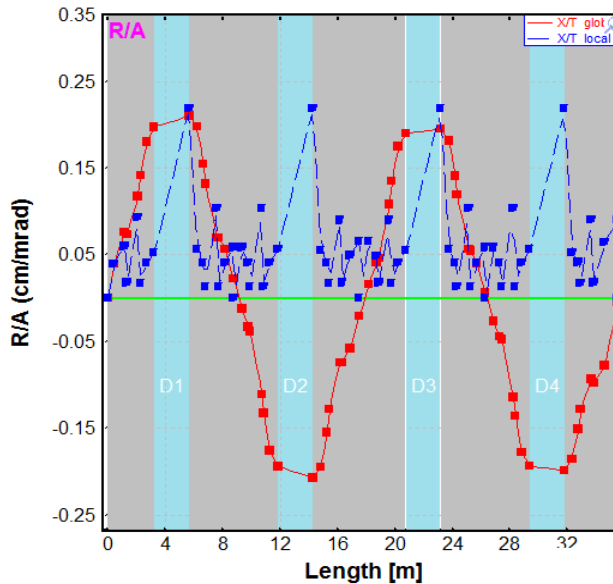
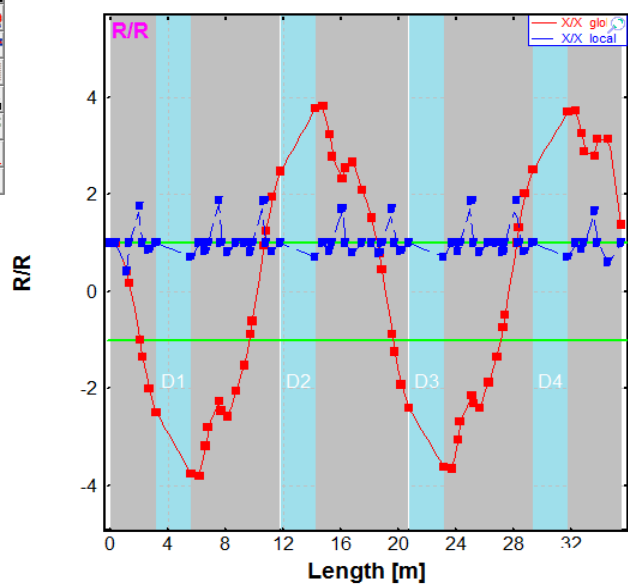


# Envelope of First order matrix elements

First order matrix elements

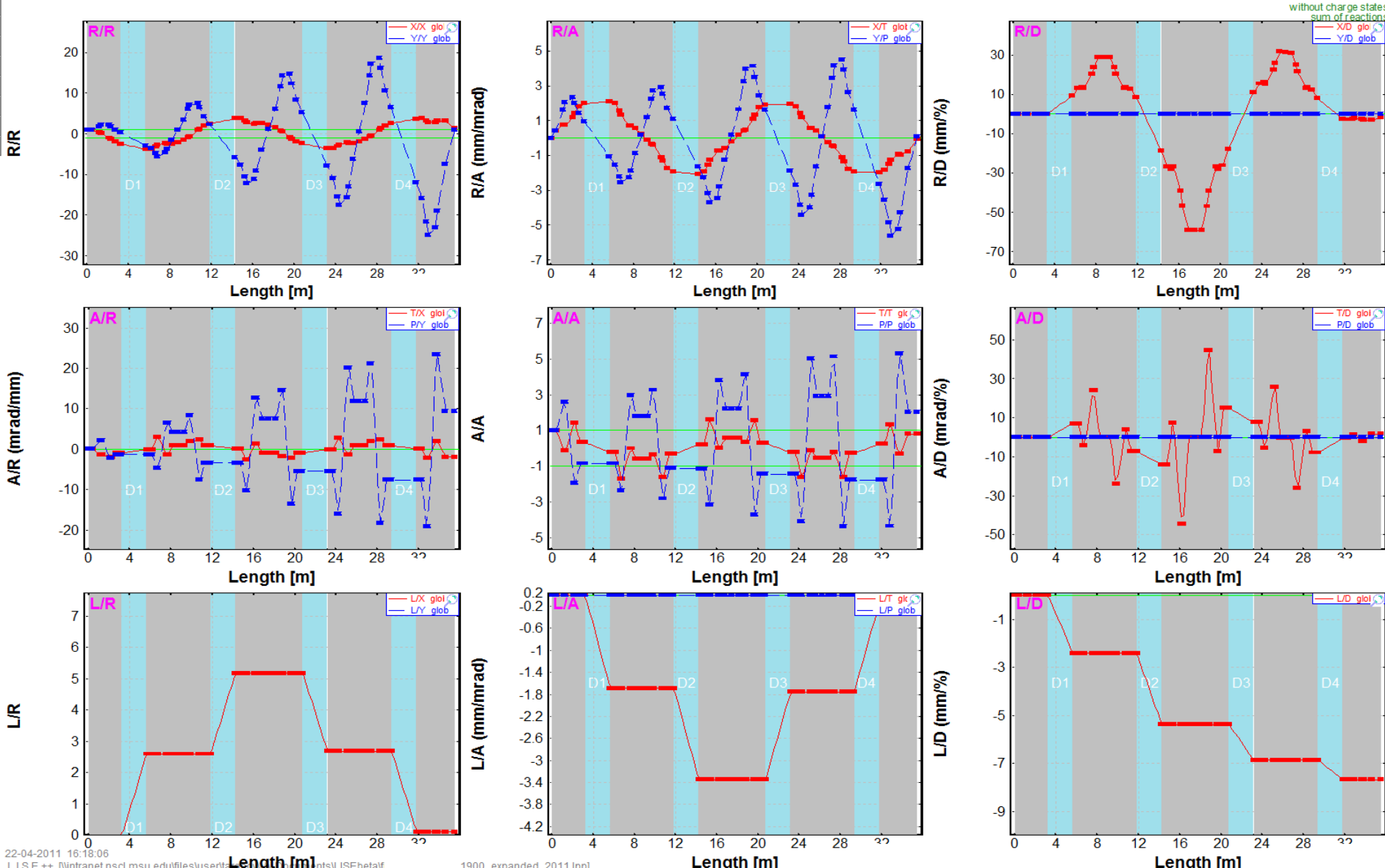
## First order matrix elements

$^{40}\text{Ar}$  (84.3 MeV/u) + Be (1e-4  $\mu\text{m}$ ); Settings on  $^{40}\text{Ar}$ ; Config: SSSSSSDSSSSSSSSSSSSSSSSSDSS...  
dp/p=5.07% ; Brho(Tm): 3.0000, 3.0000, 3.0000, 3.0000



## First order matrix elements

$^{40}\text{Ar}$  (84.3 MeV/u) + Be ( $1e-4 \mu\text{m}$ ); Settings on  $^{40}\text{Ar}$ ; Config: SSSSSSDSSSSSSSSSSSSSSSSSSDSS...  
 $dp/p=5.07\%$ ;  $\text{Brho}(\text{Tm}): 3.0000, 3.0000, 3.0000, 3.0000$

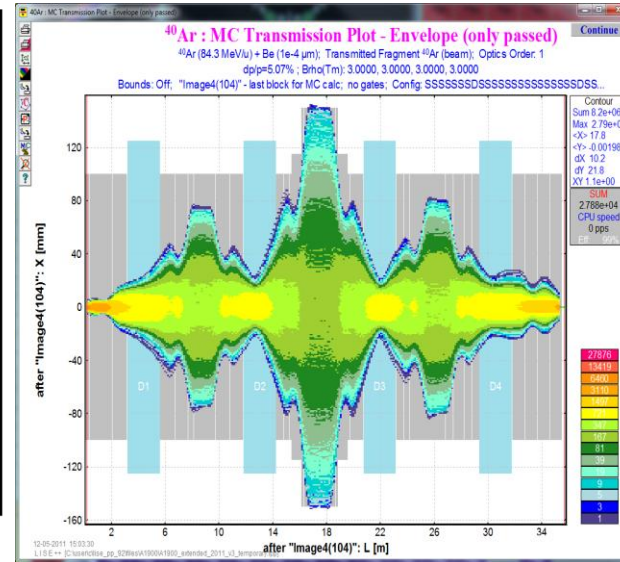
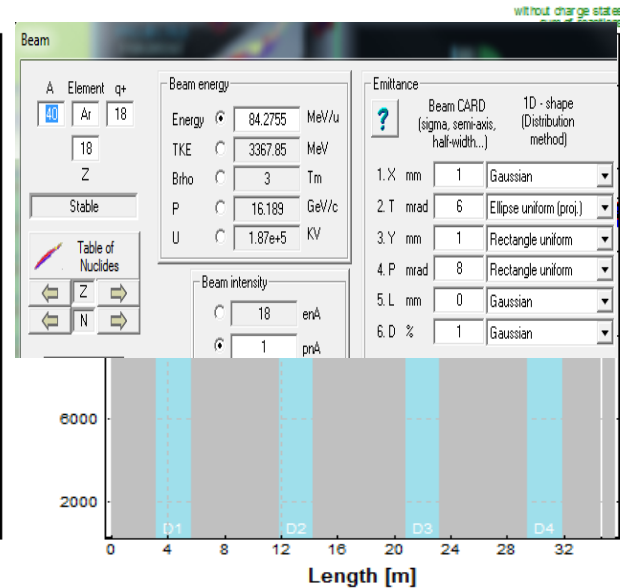
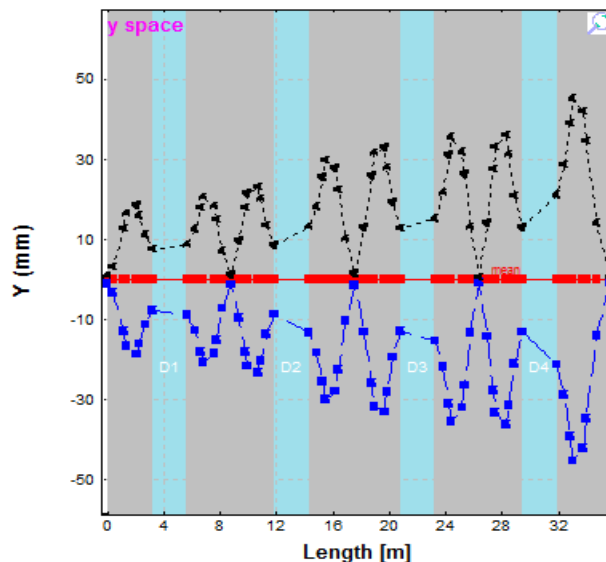
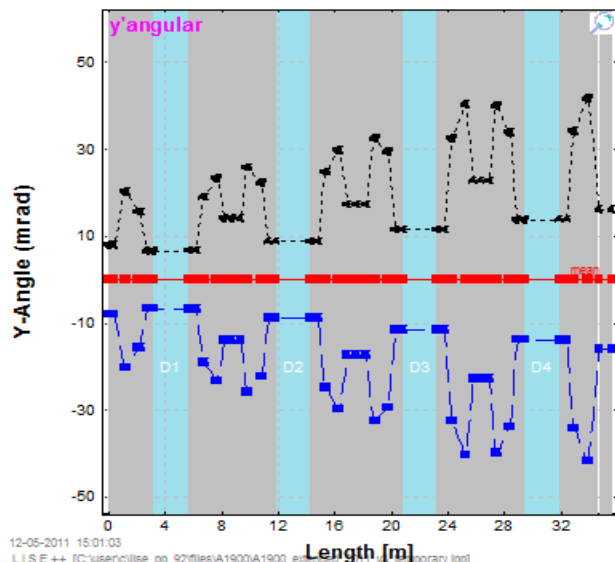
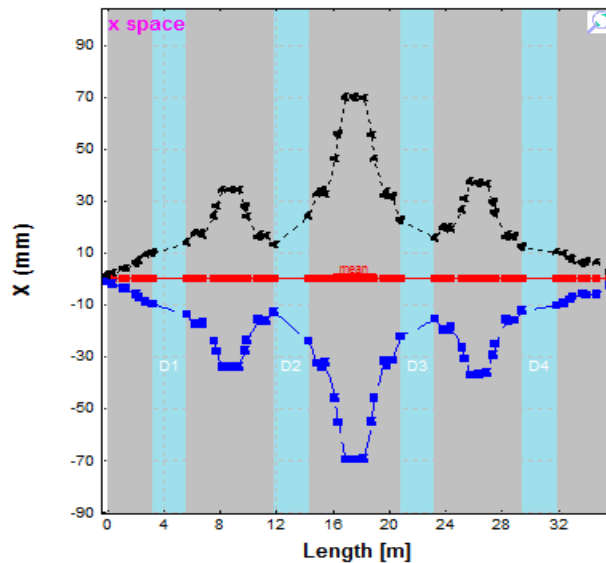
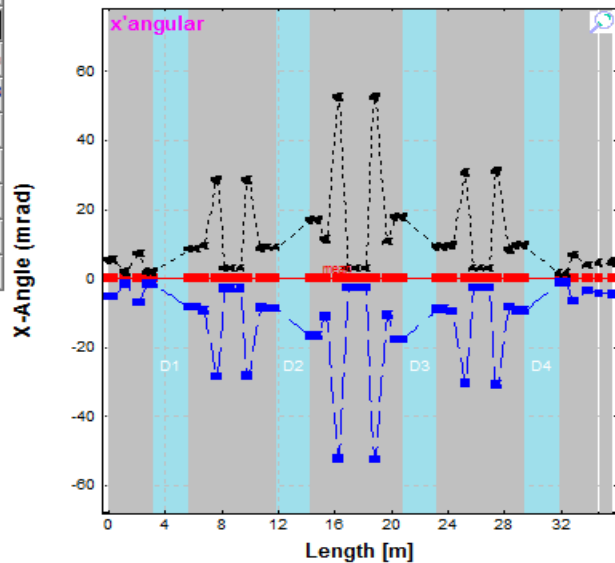


# X,X',Y,Y' envelope for $^{40}\text{Ar}$ beam

Envelope for 40Ar\_Fragmentm

## Envelope for $^{40}\text{Ar}$ \_Fragment

$^{40}\text{Ar}$  (84.3 MeV/u) + Be (1e-4  $\mu\text{m}$ ); Settings on  $^{40}\text{Ar}$ ; Config: SSSSSSDSSSSSSSSSSSSSSSSSSSDSS...  
 dp/p=5.07%; Brho(Tm): 3.0000, 3.0000, 3.0000, 3.0000





# First order matrix elements : VIEW & PRINT

First order matrix elements

FILE: C:\user\c\lise\_pp\_92\files\A1900\A1900\_extended\_2011\_v5.lpp; First order matrix elements, Transport format [cm-mrad]

LOCAL matrix						GLOBAL matrix						Beam (sigma)
1. Block "dr L1A (016)": Drift, Start: 0.000 m, Length : 0.396 m #standard												
+1.000e+00	+3.960e-02	0	0	0	0	+1.000e+00	+3.960e-02	0	0	0	0	+1.913e+00
0	+1.000e+00	0	0	0	0	0	+1.000e+00	0	0	0	0	+3.000e+01
0	0	+1.000e+00	+3.960e-02	0	0	0	0	+1.000e+00	+3.960e-02	0	0	+1.276e+00
0	0	0	+1.000e+00	0	0	0	0	0	+1.000e+00	0	0	+2.000e+01
0	0	0	0	1.0	0	0	0	0	0	1.0	0	0
2. Block "QL1TA-017": Drift, Start: 0.396 m, Length : 0.748 m #quadrupole: B0 = 9.333 kG; Rapp = 13.30 cm; Leff = 0.75 m; Mode = 1												
+4.139e-01	+5.952e-02	0	0	0	0	+4.139e-01	+7.591e-02	0	0	0	0	+2.360e+00
-1.392e+01	+4.139e-01	0	0	0	0	-1.392e+01	-1.374e-01	0	0	0	0	+2.129e+01
0	0	+1.729e+00	+9.222e-02	0	0	0	0	+1.729e+00	+1.607e-01	0	0	+3.649e+00
0	0	+2.157e+01	+1.729e+00	0	0	0	0	+2.157e+01	+2.583e+00	0	0	+5.599e+01
0	0	0	0	1.0	0	0	0	0	0	1.0	0	0
3. Block "dr L1AB": Drift, Start: 1.144 m, Length : 0.176 m #standard												
+1.000e+00	+1.756e-02	0	0	0	0	+1.695e-01	+7.350e-02	0	0	0	0	+2.220e+00
0	+1.000e+00	0	0	0	0	-1.392e+01	-1.374e-01	0	0	0	0	+2.129e+01
0	0	+1.000e+00	+1.756e-02	0	0	0	0	+2.108e+00	+2.060e-01	0	0	+4.629e+00
0	0	0	+1.000e+00	0	0	0	0	+2.157e+01	+2.583e+00	0	0	+5.599e+01
0	0	0	0	1.0	0	0	0	0	0	1.0	0	0
4. Block "QL1TB-019": Drift, Start: 1.320 m, Length : 0.748 m #quadrupole: B0 = -8.674 kG; Rapp = 13.30 cm; Leff = 0.75 m; Mode = 1												
+1.766e+00	+9.306e-02	0	0	0	0	-9.964e-01	+1.170e-01	0	0	0	0	+3.815e+00
+2.276e+01	+1.766e+00	0	0	0	0	-2.073e+01	+1.430e+00	0	0	0	0	+5.299e+01
0	0	+3.904e-01	+5.887e-02	0	0	0	0	+2.093e+00	+2.325e-01	0	0	+5.099e+00
0	0	-1.440e+01	+3.904e-01	0	0	0	0	-2.192e+01	-1.958e+00	0	0	+4.488e+01
0	0	0	0	1.0	0	0	0	0	0	1.0	0	0
5. Block "dr L1BC": Drift, Start: 2.068 m, Length : 0.172 m #standard												
+1.000e+00	+1.720e-02	0	0	0	0	-1.353e+00	+1.416e-01	0	0	0	0	+4.708e+00
0	+1.000e+00	0	0	0	0	-2.073e+01	+1.430e+00	0	0	0	0	+5.299e+01
0	0	+1.000e+00	+1.720e-02	0	0	0	0	+1.716e+00	+1.988e-01	0	0	+4.331e+00
0	0	0	+1.000e+00	0	0	0	0	-2.192e+01	-1.958e+00	0	0	+4.488e+01
0	0	0	0	1.0	0	0	0	0	0	1.0	0	0
6. Block "QL1TC-021": Drift, Start: 2.240 m, Length : 0.430 m #quadrupole: B0 = 6.240 kG; Rapp = 15.00 cm; Leff = 0.43 m; Mode = 1												
+8.592e-01	+4.096e-02	0	0	0	0	-2.011e+00	+1.802e-01	0	0	0	0	+6.192e+00
-6.390e+00	+8.592e-01	0	0	0	0	-9.164e+00	+3.240e-01	0	0	0	0	+1.684e+01
0	0	+1.148e+00	+4.510e-02	0	0	0	0	+9.803e-01	+1.399e-01	0	0	+2.965e+00
0	0	+7.035e+00	+1.148e+00	0	0	0	0	-1.309e+01	-8.485e-01	0	0	+2.143e+01
0	0	0	0	1.0	0	0	0	0	0	1.0	0	0
7. Block "dr L1C": Drift, Start: 2.670 m, Length : 0.526 m #standard												
+1.000e+00	+5.260e-02	0	0	0	0	-2.493e+00	+1.973e-01	0	0	0	0	+7.001e+00
0	+1.000e+00	0	0	0	0	-9.164e+00	+3.240e-01	0	0	0	0	+1.684e+01
0	0	+1.000e+00	+5.260e-02	0	0	0	0	+2.916e-01	+9.526e-02	0	0	+1.927e+00
0	0	0	+1.000e+00	0	0	0	0	-1.309e+01	-8.485e-01	0	0	+2.143e+01
0	0	0	0	1.0	0	0	0	0	0	1.0	0	0
8. Block "D1": Dipole, Start: 3.196 m, Length : 2.430 m : Erho = 3.0000 Tm; B0 = 1.000 kG; R = 3.090 m; Angle = 45.0 deg; Length = 2.43 m												



# Quads & Dipoles settings : View & Print

Quads & Dipoles settings

FILE: C:\user\c\nlise\_pp\_92\files\A1900\A1900\_extended\_2011\_v3\_temporary.lpp

Example of extended configuration

1 N	2 Block name	3 Kind of Block	4 Start (m)	5 Length (m)	6 DriftMode Angle(°)*	7 B0(kG)	8 Br-corrsp Br-dip*	9 Rapp(cm) R(m)*	10 L_eff(m) Len(m)*	11 2nd order	12 Calc Mode	13 AngAcc mode	14 Slits shape	15 Xmin slit	16 Xmax slit	17 Ymin slit	18 Ymax slit	19 Apert shape	20 Xmin limit	21 Xmax limit	22 Ymin limit	23 Ymax limit
1	dr L1A (016)	Drift	0.000	0.396	standard								rectn					ellps	-100	+100	-100	+100
2	QL1TA-017	Drift	0.396	0.748	quadrupole	+9.333	3.0000	13.30	0.75	yes	1	--	rectn					ellps	-100	+100	-100	+100
3	dr L1AB	Drift	1.144	0.176	standard								rectn					ellps	-100	+100	-100	+100
4	QL1TB-019	Drift	1.320	0.748	quadrupole	-8.674	3.0000	13.30	0.75	yes	1	--	rectn					ellps	-100	+100	-100	+100
5	dr L1BC	Drift	2.068	0.172	standard								rectn					ellps	-100	+100	-100	+100
6	QL1TC-021	Drift	2.240	0.430	quadrupole	+6.240	3.0000	15.00	0.43	yes	1	--	rectn					ellps	-100	+100	-100	+100
7	dr L1C	Drift	2.670	0.526	standard								ellps	-100	+100	-100	+100	ellps	-100	+100	-100	+100
8	D1	Dipole	3.196	2.430	+45.0 *	+10.000	3.0000*	3.09*	2.43*	yes		--	rectn	-100	+100	-100	+100	ellps	-125	+125	-45	+45
9	dr R1A (026)	Drift	5.626	0.564	standard								rectn					ellps	-100	+100	-100	+100
10	QR1TA-031	Drift	6.190	0.430	quadrupole	+6.897	3.0000	15.00	0.43	yes	1	--	rectn					ellps	-100	+100	-100	+100
11	dr R1AB	Drift	6.620	0.136	standard								rectn					ellps	-100	+100	-100	+100
12	QR1TB-033	Drift	6.755	0.812	quadrupole	-8.508	3.0000	15.00	0.81	yes	1	--	rectn					ellps	-100	+100	-100	+100
13	dr R1BC	Drift	7.567	0.136	standard								rectn					ellps	-100	+100	-100	+100
14	QR1TC-035	Drift	7.703	0.430	quadrupole	+7.476	3.0000	15.00	0.43	yes	1	--	rectn					ellps	-100	+100	-100	+100
15	dr R1C	Drift	8.133	0.586	standard								rectn					ellps	-100	+100	-100	+100
16	Image1(037)	Drift	8.719	0.000	SLITS								rectn	-100	+100	-100	+100	ellps				
17	dr L2A (038)	Drift	8.719	0.586	standard								rectn					ellps	-100	+100	-100	+100
18	QL2TA-039	Drift	9.305	0.430	quadrupole	+7.476	3.0000	15.00	0.43	yes	1	--	rectn					ellps	-100	+100	-100	+100
19	dr L2AB	Drift	9.735	0.136	standard								rectn					ellps	-100	+100	-100	+100
20	QL2TB-041	Drift	9.871	0.812	quadrupole	-8.397	3.0000	15.00	0.81	yes	1	--	rectn					ellps	-100	+100	-100	+100
21	dr L2BC	Drift	10.683	0.136	standard								rectn					ellps	-100	+100	-100	+100
22	QL2TC-043	Drift	10.819	0.430	quadrupole	+6.903	3.0000	15.00	0.43	yes	1	--	rectn					ellps	-100	+100	-100	+100
23	dr L2C	Drift	11.249	0.563	standard								ellps	-100	+100	-100	+100	ellps	-100	+100	-100	+100
24	D2	Dipole	11.812	2.430	-45.0 *	+10.000	3.0000*	3.09*	2.43*	yes		--	rectn	-100	+100	-100	+100	ellps	-125	+125	-45	+45
25	dr R2A (047)	Drift	14.242	0.552	standard								rectn					ellps	-100	+100	-100	+100
26	QR2TA-053	Drift	14.794	0.430	quadrupole	+6.442	3.0000	15.00	0.43	yes	1	--	rectn					ellps	-100	+100	-100	+100
27	dr R2AB	Drift	15.224	0.170	standard								rectn					ellps	-100	+100	-100	+100
28	QR2TB-055	Drift	15.394	0.732	quadrupole	-8.540	3.0000	15.00	0.73	yes	1	--	rectn					ellps	-115	+115	-115	+115
29	dr R2BC	Drift	16.126	0.176	standard								rectn					ellps	-150	+150	-150	+150
30	QR2TC-057	Drift	16.302	0.526	quadrupole	+7.750	3.0000	21.00	0.53	yes	1	--	rectn					ellps	-150	+150	-150	+150
31	dr R2C	Drift	16.828	0.658	standard								rectn					ellps	-150	+150	-150	+150
32	Image2(059)	Drift	17.486	0.000	SLITS								rectn	-150	+150	-150	+150	ellps				
33	dr L3A (060)	Drift	17.486	0.658	standard								rectn					ellps	-150	+150	-150	+150
34	QL3TA-062	Drift	18.143	0.526	quadrupole	+8.735	3.0000	21.00	0.53	yes	1	--	rectn					ellps	-150	+150	-150	+150
35	dr L3AB	Drift	18.669	0.176	standard								rectn					ellps	-150	+150	-150	+150
36	QL3TB-064	Drift	18.845	0.732	quadrupole	-9.573	3.0000	15.00	0.73	yes	1	--	rectn					ellps	-115	+115	-115	+115
37	dr L3BC	Drift	19.577	0.170	standard								rectn					ellps	-100	+100	-100	+100
38	QL3TC-066	Drift	19.747	0.430	quadrupole	+7.479	3.0000	15.00	0.43	yes	1	--	rectn					ellps	-100	+100	-100	+100
39	dr L3C	Drift	20.177	0.553	standard								ellps	-100	+100	-100	+100	ellps	-100	+100	-100	+100
40	D3	Dipole	20.730	2.430	-45.0 *	+10.000	3.0000*	3.09*	2.43*	yes		--	rectn	-100	+100	-100	+100	ellps	-125	+125	-45	+45
41	dr R3A (070)	Drift	23.160	0.563	standard								rectn					ellps	-100	+100	-100	+100
42	QR3TA-076	Drift	23.723	0.430	quadrupole	+7.728	3.0000	15.00	0.43	yes	1	--	rectn					ellps	-100	+100	-100	+100
43	dr R3AB	Drift	24.153	0.136	standard								rectn					ellps	-100	+100	-100	+100
44	QR3TB-078	Drift	24.289	0.812	quadrupole	-9.399	3.0000	15.00	0.81	yes	1	--	rectn					ellps	-100	+100	-100	+100
45	dr R3BC	Drift	25.101	0.136	standard								rectn					ellps	-100	+100	-100	+100
46	QR3TC-080	Drift	25.237	0.430	quadrupole	+8.379	3.0000	15.00	0.43	yes	1	--	rectn					ellps	-100	+100	-100	+100
47	dr R3C	Drift	25.667	0.586	standard								rectn					ellps	-100	+100	-100	+100
48	Image3(082)	Drift	26.253	0.000	SLITS								rectn	-100	+100	-100	+100	ellps				
49	dr L4A (083)	Drift	26.253	0.586	standard								rectn					ellps	-100	+100	-100	+100
50	QL4TA-084	Drift	26.839	0.430	quadrupole	+8.379	3.0000	15.00	0.43	yes	1	--	rectn					ellps	-100	+100	-100	+100
51	dr L4AB	Drift	27.269	0.136	standard								rectn					ellps	-100	+100	-100	+100
52	QL4TB-086	Drift	27.405	0.812	quadrupole	-9.536	3.0000	15.00	0.81	yes	1	--	rectn					ellps	-100	+100	-100	+100
53	dr L4BC	Drift	28.217	0.136	standard								rectn					ellps	-100	+100	-100	+100
54	QL4TC-086	Drift	28.353	0.430	quadrupole	+7.731	3.0000	15.00	0.43	yes	1	--	rectn					ellps	-100	+100	-100	+100
55	dr L4C	Drift	28.783	0.564	standard								ellps	-100	+100	-100	+100	ellps	-100	+100	-100	+100
56	D4	Dipole	29.347	2.430	+45.0 *	+10.000	3.0000*	3.09*	2.43*	yes		--	rectn	-100	+100	-100	+100	ellps	-125	+125	-45	+45
57	dr R4A (097)	Drift	31.777	0.526	standard								rectn					ellps	-100	+100	-100	+100
58	QR4TA-098	Drift	32.303	0.430	quadrupole	+5.895	3.0000	15.00	0.43	yes	1	--	rectn					ellps	-100	+100	-100	+100
59	dr R4AB	Drift	32.733	0.172	standard								rectn					ellps	-100	+100	-100	+100
60	QR4TB-100	Drift	32.905	0.748	quadrupole	-7.669	3.0000	13.30	0.75	yes	1	--	rectn					ellps	-100	+100	-100	+100
61	dr R4BC	Drift	33.653	0.176	standard								rectn					ellps	-100	+100	-100	+100
62	QR4TC-102	Drift	33.828	0.748	quadrupole	+5.524	3.0000	13.30	0.75	yes	1	--	rectn					ellps	-100	+100	-100	+100
63	dr R4C	Drift	34.576	0.904	standard								rectn					ellps	-100	+100	-100	+100
64	Image4(104)	Drift	35.480	0.000	SLITS								rectn	-150	+150	-150	+150	ellps				

! symbol "\*" after values denotes, that these values belongs to Dipole settings, where column names are found in the second row of titles, and also marked by "\*"
! Column 08: "Br-corrsp" - quadrupole(sextupole) field is scaled to this Brho-value; "Br-dip\*" - dipole magnetic rigidity [T\*m]
! Column 09: "Rapp(cm)" - radius(half-aperture) of quadrupole(sextupole) in cm; "R(m)-dip\*" - dipole radius [m]
! Column 10: "L\_eff(m)" - effective length of quadrupole(sextupole) in m, wich is used for Optical matrix calculations; "Len(m)\*" - dipole length at ther central axis [m]
! Column 12: "Calc mode" - only for quadrupole(sextupole); 0 - no actions; 1 - recalculate automatically B(field), keep matrix; 2 - recalculate automatically the matrix, keep B(field)
! Column 13: "AngAcc mode" "H(V)": horizontal(vertical) angular acceptance will be applied for this block
! Columns 15-18, 20-23: slits and aperture(limit) sizes in [mm]. If slit or aperture(limit) does not have action, then its size value is absent

It's easy access to edit all kind of slits

Example of extended configuration

**Quadrupoles and dipoles fast editing**

Block	Given Name	Start(m)	Length(m)	B0(kG)	Br(Tm)corr/*real	DriftM/*Angle	Rapp(cm)/*R(m)	L_eff(m)/*L_dip(m)	2nd order	CalcM/*Z-Q	AngAcc.Apps.Slits	
S	Drift	dr L1A (016)	0.00	0.40		standard					-- HV --	
S	Drift	QL1TA-017	0.40	0.75	+9.333	3.0000	quadrupole	13.30	0.75	yes	1	-- HV --
S	Drift	dr L1AB	1.14	0.18		standard					-- HV --	
S	Drift	QL1TB-019	1.32	0.75	-8.674	3.0000	quadrupole	13.30	0.75	yes	1	-- HV --
S	Drift	dr L1BC	2.07	0.17		standard					-- HV --	
S	Drift	QL1TC-021	2.24	0.43	+6.240	3.0000	quadrupole	15.00	0.43	yes	1	-- HV --
S	Drift	dr L1C	2.67	0.53		standard					-- HV HV	
D	Dipole	D1	3.20	2.43	+10.000	* 3.0000	* 45.0	* 3.09	* 2.43	yes	* 0	-- HV HV
S	Drift	dr R1A (026)	5.63	0.56		standard					-- HV --	
S	Drift	QR1TA-031	6.19	0.43	+6.897	3.0000	quadrupole	15.00	0.43	yes	1	-- HV --
S	Drift	dr R1AB	6.62	0.14		standard					-- HV --	
S	Drift	QR1TB-033	6.76	0.81	-8.508	3.0000	quadrupole	15.00	0.81	yes	1	-- HV --
S	Drift	dr R1BC	7.57	0.14		standard					-- HV --	
S	Drift	QR1TC-035	7.70	0.43	+7.476	3.0000	quadrupole	15.00	0.43	yes	1	-- HV --
S	Drift	dr R1C	8.13	0.59		standard					-- HV --	
S	Drift	Image1(037)	8.72	0.00		SLITS					-- -- HV	
S	Drift	dr L2A (038)	8.72	0.59		standard					-- HV --	
S	Drift	QL2TA-039	9.31	0.43	+7.476	3.0000	quadrupole	15.00	0.43	yes	1	-- HV --
S	Drift	dr L2AB	9.74	0.14		standard					-- HV --	
S	Drift	QL2TB-041	9.87	0.81	-8.397	3.0000	quadrupole	15.00	0.81	yes	1	-- HV --
S	Drift	dr L2BC	10.68	0.14		standard					-- HV --	
S	Drift	QL2TC-043	10.82	0.43	+6.903	3.0000	quadrupole	15.00	0.43	yes	1	-- HV --
S	Drift	dr L2C	11.25	0.56		standard					-- HV HV	

Selected block

Dispersive (Dipole)

Let call automatically

Block name = D1

Charge State (Z-Q) = 0

Block Length [m]

2.43

Length after this block [m]

5.626

Selected Block Edit

Quadr/Sextu-pole Edit

Cuts (Acceptances)

Optical Matrix

Angular acceptance (mrad)

Horizontal ±

Vertical ±

Shape

Rectangle   Ellipse

Inside Aperture (mm)

min max Use

X = -125 125

Y = -45 45

Shape

Rectangle   Ellipse

Slits (mm) after this BLOCK

min max Use

X = -120 120

Y = -45 45

Shape

Rectangle   Ellipse

1st order Matrix Elements

Plot

View

Quit Help

H – horizontal  
V – vertical