

// 14.3.38 05/01/20

- // * d_Buncher (RF-buncher) dialog: DONE!
- // * d_Fit dialog: redesign 100%, connection 40% (last "Block dialog"!!!)
- // * d_Brho_analyzer dialog: redesign 80%, connection 30%
- // * d_Calculator_phys dialog: redesign 70%, connection 10%

Fit XX

This constraint is ACTIVE (will be used in the minimization process)

Desired parameters of element to fit

Constraint: Lower limit is

Desired Value = -2

Desired Accuracy = 0.001

Constraint name = Fit XX

TRANSPORT notation

10.1 6. 6. -2 0.001 "Fit XX"

Global Block matrix : 1st order

1. X	-2.28459	0.0009	0	0	0	2.92533	[cm]
2. T	10.6245	-0.44189	0	0	0	-0.00283	[mrad]
3. Y	0	0	0.73853	0.00022	0	0	[cm]
4. P	0	0	37.4271	1.36526	0	0	[mrad]
5. L	3.10738	-0.12927	0	0	1	0.57769	[cm]
6. D	0	0	0	0	0	1	[%]
	/[cm]	/[mrad]	/[cm]	/[mrad]	/[cm]	/[%]	

Det= 1.00000

Global Block matrix : 1st order

M1 1 1

Dimension: mm cm

Initial Beam ("Opt.Beam") for Optical Optimization

Global Block matrix : 2nd order

T2 1 1 1

Matrix Element Value R.Aberration

+0.000e+000 +0.00e+000

2nd order maps Aberrations list

OK Cancel Help

RFbuncher 1

RF separator settings

Select method

Electric field E = 1000.00 kV/m

Voltage U = 500.0 kV

Geometry

La = 0.2 m

L (gap) = 0.5 m

Lb = 0.2 m

RF settings

RF (MHz) Phase shift

use Beam settings 20 0

manually 97 [deg]

Calculate the RF buncher settings

ttf (transit time factor)

$V(t) = V_0 * ttf * \sin(\omega t + \text{phase_shift})$

parameterization 300.569

manually 1

tuning chose d-mode

d5

Calculations for the setting fragment

Values corresponding to Energy in middle of the gap

	<E>-dE	<E>	<E>+dE
Before the buncher gap			
Energy [MeV/u]	102.71	122.36	142.01
Time of flight [ns]	259.9	259.6	259.4
Phase [deg]	71.1	69.3	67.9

After the RF buncher

	<E>-dE	<E>	<E>+dE
Energy [MeV/u]	102.89	122.54	142.19

Buncher plots : $E = f(p,x), V = f(x), dE = f(p)$

Optimization utility : Phase & V

Optical block properties and data

Section-Element construction property

S-block (Section) E-block (Element)

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

Tweak 1.000 %

Calculate Values using

Setting fragment from

D4

RFsepar 1

Calculate other blocks

Up-stream

ALL

Down-stream

Matrix calculation

Matrix calculations Allow remote matrices calculations

OK Cancel Help

//-----

// 14.3.39 05/02/20

// * d_Brho_analyzer dialog: DONE!

// * d_Calculator_phys dialog: redesign 80%, connection 20%

Brho(Erho) Analyzer
✕

Dipole

Magnetic

Brho_0 Tm

B_0 T

Electrostatic

Erho_0 MJ/C

E_0 KV/m

Radius m

d Radius (for Plot only) m

Angle deg

Drift block after the dipole

Use the drift block

Length m

Local * -- at the beam position;
For dispersion calculation:
X corresponds to V (Brho, Erho),
position 0 mm to V_0 (Brho_0, Erho_0)

Beam

Projectile

Energy MeV/u

d P / P (+/-) %

dErho / Erho %

d X (+/-) mm

Brho Tm

Erho MJ/C

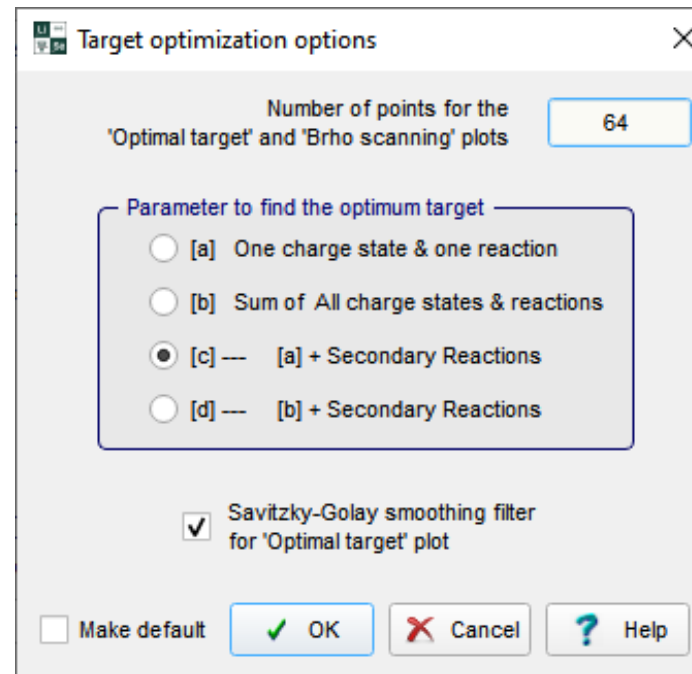
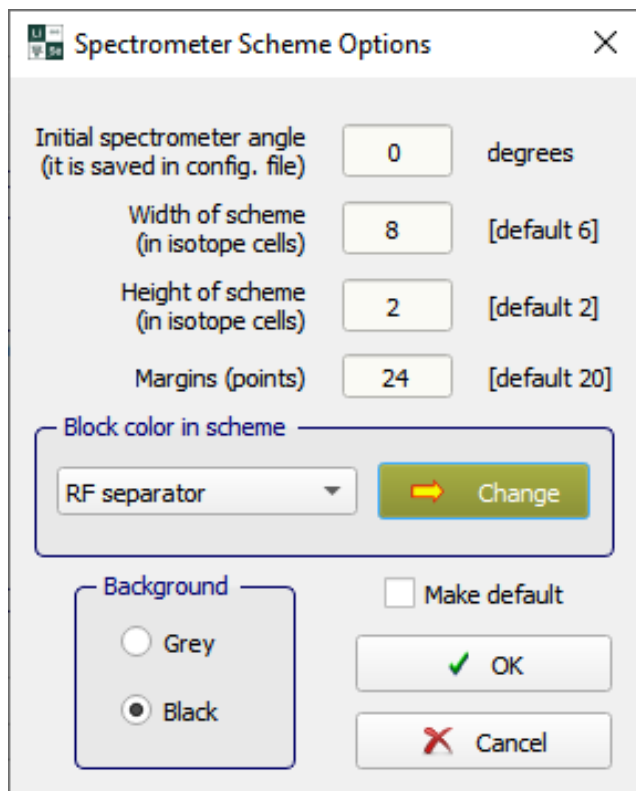
MAGNETIC

Shift(mm) from central axis at the end of DIPOLE

	- dX	0	+ dX
- d P / P	14.8	7.66	0.542
0	23.9	16.7	9.53
+ d P / P	32.8	25.6	18.4
Local* Brho dispersion	8.94	mm / %	
Local* Erho dispersion	5.02	mm / %	

✕ Quit
? Help
⚡ Calculate
📊 Plot

```
//-----
// 14.3.40 05/04/20
// * d_option_targetOptimization: DONE!
// * d_option_scheme dialog:   DONE!
// * d_CS_files  dialog:      redesign 100%, connection 60%
// * d_Plot_options dialog:    redesign 90%, connection 80%
```



```
//-----
// 14.3.40 05/04/20
// * d_Option_targetOptimization: DONE!
// * d_Option_scheme dialog:   DONE!
// * d_CS_files  dialog:      redesign 100%, connection 60%
// * d_Plot_options dialog:    redesign 90%, connection 80%
```

Cross section file

Cross section file: --no file --

Buttons: Browse, CS dialog, View, Save As

Load cross sections from file

- Load CS to memory
- Append to existing CS
- Overwrite existing CS

Method to keep User CS

- Attached CS file
- Inside LISE ++ file

Operations with User (memory) CS

- 2D-Plot of User (memory) CS
- Copy AA (LisFus,Fiss) CS to memory
- Remove all CS from memory

Number of User CS for this reaction = 0

Total number of User CS = 0

- Show User CS in Cross section plots
- Calculate and show Chi2 between User and Calculated cross-sections

Cross section file format

The CS file is in ASCII format. Comment strings begin with " ! ".

There are five columns: "Z", "N", "CS value", "CS error", "R#" where Z is atomic number, N is number of neutrons. CS value error is equal to 0 if fourth column is absent. Columns can be separated by space, tabulation sign, or comma. R# - reaction order number

where CS - cross sections; "User" is identical to "memory CS"; Calculated CS: AA ("Abrasion-Ablation"), Fusion-Evap. ("LisFus"), Coulomb Fission, Abrasion-Fission

Buttons: Make default, OK, Cancel, Help

Plot Options

Output in plots

- Charge states**
 - One (set by user)
 - All (separate)
 - All (summed)
- Reactions**
 - One (set by user)
 - All (separate)
 - All (summed)

Outputs in plots just for one selected isotope

Yield gate from downstream block (consider it as "trigger")

- Use yields after the following downstream block for "Distribution" plots of upstream blocks
- D1

Number of one-dimensional distributions: 30

Threshold for two-dimensional plots: 1e-10 pps

PRINT mode

- Include upper rate for each fragment
- Turn Y-title at 180 degrees

SCREEN mode

- Turn Y-title at 180 degrees

"Distribution" solution & Kinematics: Monte Carlo 2D-plot

Distribution compression: 2 (recommended: 1)

Pixels for one event: 1 x 1 (recommended: 1x1)

Monte Carlo calculation of transmission

Pixels for one event: 2 x 2 (recommended: 5x5)

Make default

Default Dispersive Block for "Bhro"-plot (T m): D1

Default Dispersive Block for "Wedge"-plot (mm): FP_slits

X space detector: FP_PPAC0

X2 space detector: FP_PPAC0

Y space detector: FP_PPAC0

dE - detector: FP_PIN

dE2 - detector: FP_SCI

1 st TKE detector (Range - detector): FP_PIN

Acquisition Start of TOF: RF

Start of TOF calculated: Target

Stop of TOF calculated: FP_PIN

RadioFrequency of Accelerator

Shift of TOF (delay): 0 ns

Fraction of RF trigger: 2

Note: These default values will be used only for new created materials!

Default Resolutions for plots (sigma)

RF frequency: see "bunch length" in the BEAM dialog

Time: 0.1 ns

X (horizontal space): 0.3 mm

Y (vertical space): 0.3 mm

Energetic

- %
- MeV: 0.2

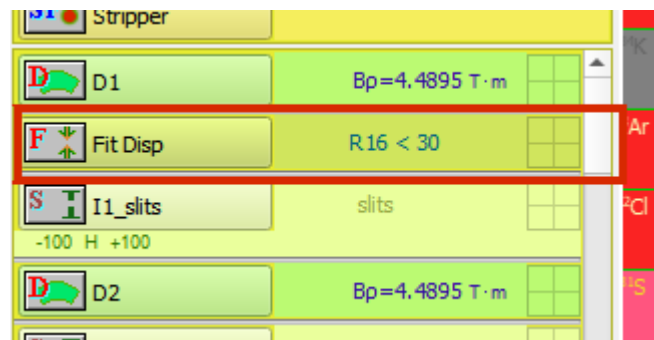
Default Detector Thickness defect (sigma)

- %: 0.1
- micron at 0 deg: 0.5

Buttons: TKE calibration, Make default, OK, Cancel, Help

//-----
 // 14.4.1 05/05/20
 // * d_Fit dialog: DONE!
 // it was the last "Block dialog".
 // Middle version number has been increased

// * d_CS dialog: redesign 100%, connection 80%



Fit XX
✕

This constraint is ACTIVE
(will be used in the minimization process)

Desired parameters of element to fit

Constraint : Upper limit is

Desired Value = 30

Desired Accuracy = 0.001

Constraint name = Fit Disp

TRANSPORT notation

10.2 -1. 6. 30 0.001 "Fit Disp"

Typical TRANSPORT constraints

OK Cancel Help

Global Block matrix : 1st order

1. X	-2.28459	0.009	0	0	0	29.2533	[mm]
2. T	1.06245	-0.44189	0	0	0	-0.00283	[mrad]
3. Y	0	0	0.73853	0.0022	0	0	[mm]
4. P	0	0	3.74271	1.36526	0	0	[mrad]
5. L	3.10738	-1.2927	0	0	1	5.7769	[mm]
6. D	0	0	0	0	0	1	[%]
	/[mm]	/[mrad]	/[mm]	/[mrad]	/[mm]	/[%]	

Det= 1.00000

Global Block matrix : 1st order

M1 1 6

Dimension mm cm

Global Block matrix : 2nd order

T2 1 1 1

Matrix Element Value R.Aberration

+0.000e+000 +0.00e+000

2nd order maps Aberrations list

"Opt.Beam" at this point

1. X 43.94 [mm]

2. T 13.299 [mrad]

3. Y 0.741 [mm]

4. P 41.128 [mrad]

5. L 39.859 [mm]

6. D 1.5 [%]

7. R 43.946 [mm]

Initial Beam ("Opt.Beam") for Optical Optimization

//-----
 // 14.4.2 05/06/20
 //// * d_CN_CS dialog: DONE!
 //// * global code revision due to new "fabs,min,max" definitions
 //// * d_Setup (spectrometer design) : redesign 90%, connection 10%
 //// learning QTableView, QWidget and QStandardItemModel classes

Enter/Read a Cross-section value

Number of saved cross sections

	All CS	Intgd CS	Diff CS
All reactions	2	2	0
This reaction	2	2	0

Reaction: $^{48}\text{Ca} + \text{Be}$

Selected Reaction: Projectile Fragmentation

Integral cross sections from models for selected reaction

0 - Abrasion/Ablation v.6.4	---	mb
1 - EPAX 1.00: K.Summerer et al.,Phys.Rev.C42(1990)2546	2.78e-001	mb
2 - EPAX 2.15: K.Summerer et al.,Phys.Rev.C61(2000)034607	1.75e-001	mb
3 - EPAX 2.15 + user modifications	1.75e-001	mb
4 - EPAX 3.1a: K.Summerer,Phys.Rev.C86(2012)014601	1.37e-001	mb
5 - FRACS 1.1: B.Mei,Phys.Rev.C95(2017)034608 [E=300MeV/u]	2.42e-001	mb

Intgd CS - Integrated Cross Section
 Diff CS - Differential Cross Section

Preferences: cross sections from (set in the "Preference" dialog) **FILE**

Spectrometer design

Block	Given Name	Z-q	Length, m	Enable
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

Insert Mode: before after

Move element: **Up** **Down** **Edit** **Delete** **Array operations** **Help** **OK**

Insert block:

Materials: **Wedge** **Target** **Material (Detector)** **Stripper after Target** **Faraday cup**

Optical:

dispersive **non-dispersive**

dispersive RF-based **special (no beam dynamics charges)**

Selected block: **Block type** **Block Length [m]** **Length after this block [m]** **Charge State (Z-q)** **Sequence number**

Total: **Number of Blocks** **Length [m]**

- //-----
- // 14.4.3 05/07/20
- // * d_LastZ dialog: **DONE!**
- // * d_CS_differFile dialog: redesign 100%, connection 80%
- // * Goodies dialog: redesign 100%, connection 30%
- // * gauge windows in ablation calculations: **DONE!**
- // * d_Setup (spectrometer design) : redesign 90%, connection 20%

Choose a range to calculate

Abrasion-Ablation **DONE!**

Calculate

All nudei

down to Z= 16

Calculate

Manually

mb

Input value

Cancel after 5 seconds the dialog automatically will be closed

Differential cross section file

$^{48}\text{Ca} (140.0 \text{ MeV/u}) + ^9\text{Be} \rightarrow ^{12}\text{S} (+^{15}\text{O})$

Data File (d Sigma / d Omega in CMS)

Load from file **View data** **Clear data**

--- absent ---

Number of rows

Data	Comments	Total
<input type="text"/>	<input type="text"/>	<input type="text"/>

Excitation energies of products (MeV)

E* of ^{12}S = E* of ^{15}O =

Integrated Cross Section (mb) =

100%, 80%

Note

The Differential Cross Section file (dSigma/dOmega in CMS) is in ASCII format. Comment string begin with "!" or ";"

Two columns, where the 1st is Angle in [degrees], the 2nd is Diff.CS in System of Center mass [mb/sr]

The columns can be separated by a Space, a Comma or a Tabulation. User can put comments also at the end of data line

Utilities

Kinematics Plots

2D Kinematics (MC)

Differential Cross Section Plots **OK** **Quit** **Help**

//-----
 // 14.4.3 05/07/20
 // * d_LastZ dialog: DONE!
 // * d_CS_differFile dialog: redesign 100%, connection 80%
 // * Goodies dialog: redesign 100%, connection 30%
 // * gauge windows in ablation calculations: DONE!
 // * d_Setup (spectrometer design) : redesign 90%, connection 20%

Calculation utilities 100%, 30%

A Element Z Table of Nuclides

42 S 16 ← Z →

Beta- decay ← N →

Charge states: 16+ D1 Set

Quit Help Print

calculated by "Ellipse" method

AFTER

Energy 2.00 MeV/u
 sig.(Energy) --- MeV/u
 Brho 2.00 Tm
 Energy Stragglng 2.00 MeV/u
 Angular Stragglng 2.00 MeV/u
 Velocity 2.00 cm/ns
 Beta 2.00
 Rest after reactions 2.00 %

Range to static 2.00 mg/cm²
 2.00 micron

Energy Loss to Si 250.2 mg/cm²
 2.00 MeV

INTO

into material #1

Energy 2.00 MeV
 sig.(Energy) --- MeV
 Energy Stragglng 2.00 MeV/u
 Angular Stragglng 2.00 mrad
 Loss due to reactions in this material (%) 2.00

Time of Flight

Start of TOF
 Stop of TOF
 Time of Flight 2.00 ns
 sig.(TOF) 2.00 ns
 Length 2.00 m

Spectrometer design 90%, 20%

Block	Given Name	Z-q	Length, m	Enable
1	Target			+
2	Stripper			+
3	Delay		0	NO
4	Shift		0	NO
5	Rotate		0	NO
6	Dipole		0 8.719	+
7	Fit		0	+
8	Drift		0	+
9	Wedge			NO
10	Dipole		0 8.767	+
11	Material			NO
12	FaradayCup			NO
13	Drift		0	+
14	Wedge			+

Insert Mode

before
 after

Move element

Up Down

Edit Delete

Array operations

Help

Ok

Insert block

Materials

Wedge Target
 Material (Detector) Stripper after Target
 Faraday cup

Optical

dispersive **non-dispersive**

Dispersive (M-dipole) Drift (multipole, slits)
 Wien velocity filter Beam Rotation
 Electrostatic dipole Shift of Optical Axis
 Gas-filled separator Solenoid
 Compensation Dipole

dispersive RF-based **special** (no beam dynamics charges)

RF-separator Delay (efficiency) block
 RF buncher Fitting constraints

Selected block

Enable Delay (efficiency) block

Let call automatically Block Length [m] 0
 Length after this block [m] 0
 Sequence number 3

Total

Number of Blocks 38
 Length [m] 125.32

