

1. Main menu modifications:

Gadget and menu orders have been changed
New item "Physics Models"

2. Range table up to 50 AGeV

3. Number of blocks increased up to 500

4. Plots:

Plotting method : V-Histogram
1D-plot : user line thickness

5. Modification in "Find_Simple_Wedge_Anlge" subroutine for zero-dispersion of the 2nd half

6. Range Gas Cell : modifications of energy loss distribution for material passing and stopping

7. Angular Momentum in the Plots of the "Excitation energy of prefragments" dialog

8. Others up to 9.10.59

9. MC output to file : update (v.163)

10. Spikes in energy distributions (v.245)

11. Q_{optimal} value in Two-body mode of the Kinematics Calculator (v.279)

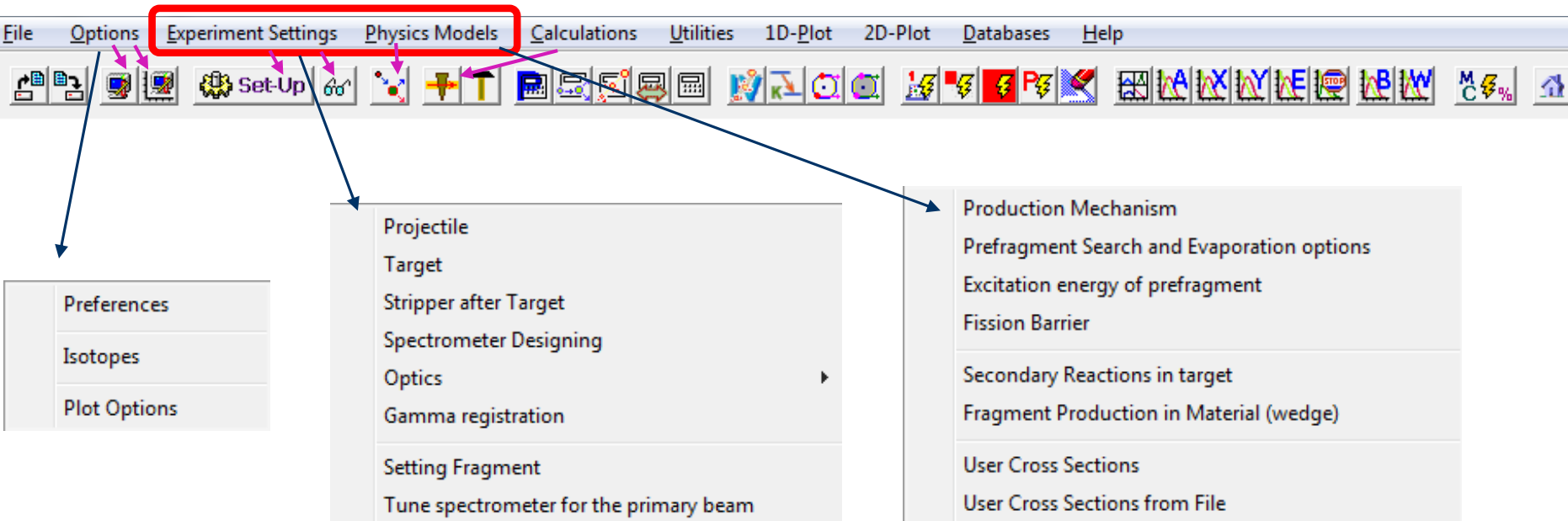
12. Others from 9.10.60

- ❑ *Menu and gadget and orders have been changed*
- ❑ *New item "Physics Models"*

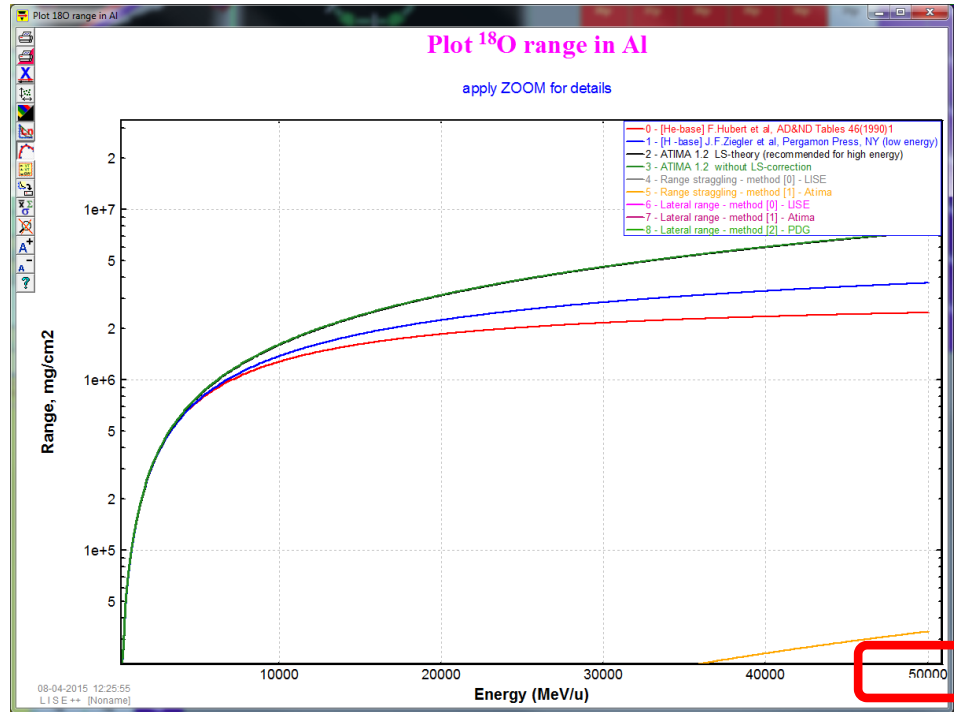
Version 9.9



Version 9.10



H.W.'s request



LISE v.9.9

Range and Energy Loss to Al

Range	dRange (sigma)	Unit
5.52107e+6	20620	mg/cm ²
2.04333e+7	76312	micron

LISE v.9.10

Range and Energy Loss to Al

Range	dRange (sigma)	Unit
4.15358e+6	14840	mg/cm ²
1.53722e+7	54923	micron

ATIMA

```

charge of fragment [5.000000] ? 8
mass of fragment [amu] [8.024606] ? 18
energy of fragment [MeV/u] [308.500000] ? 27000
charge of material [13] ?
mass of material [27] ?
material thickness [mg/cm2] [100.000000] ? 1000
<I> read ATIMA splines for Al.
1: Z=13, A=26.981541, w=1.000000, pot=166.000000

particle Z=8 A=18.000000 E=27000.000000 MeV/u
target Z=13 A=27 T=1000.000000
exit energy : 26993.083984 MeV/u
energy straggling : 2.656865 MeV/u (SD)
range : 4154606.915041 mg/cm2 -> 4153606.753428 mg/cm2
    
```

M.P.'s request

Example

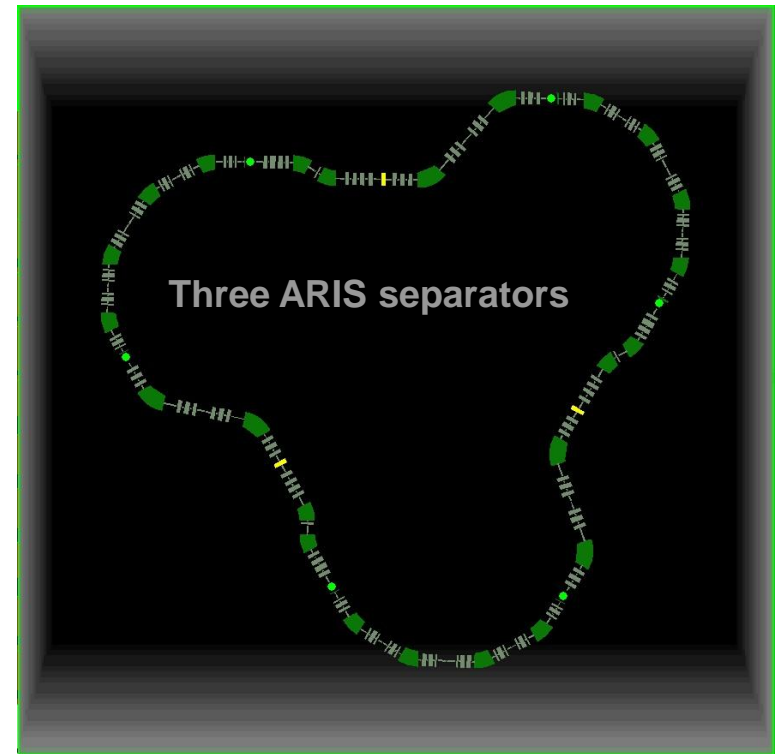
Spectrometer designing

Block	Given Name	Z-Q	Length,m	Enable
Target	Target			+
Stripper	Stripper			+
Dipole	dummy	0	0	+
Rotate	Make_Vert		0	+
Drift	LS1a1		0.102	+
Drift	LS1a2		0.4	+
Drift	LS1a3		0.032	+
Drift	LS1a3		0.093	+
Drift	LS1a3		0.348	+
Drift	FSQ1		0.65	+
Drift	LS1b		0.3	+
Drift	FSQ2		0.9	+
Drift	LS1c		0.25	+
Drift	FSQ3		0.8	+
Drift	LS1d		0.275	+
Drift	FSS1		0.6	+
Drift	LS1e		0.65	+
Dipole	FSD1_MSS_1	0	2.094	+
Drift	InDmn1Fn		0.182	+

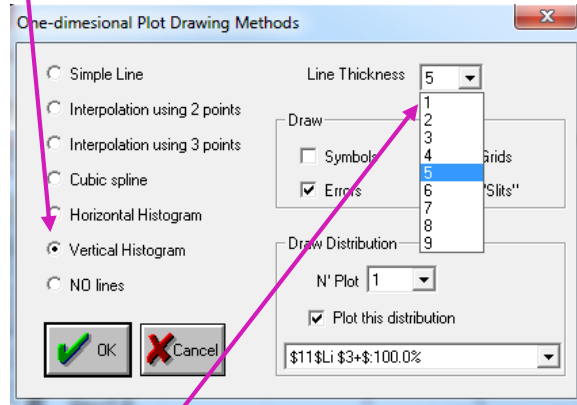
Selected block: Dispersive (M-dipole)

Block Length [m]: 0
Length after this block [m]: 0
Sequence number: 3

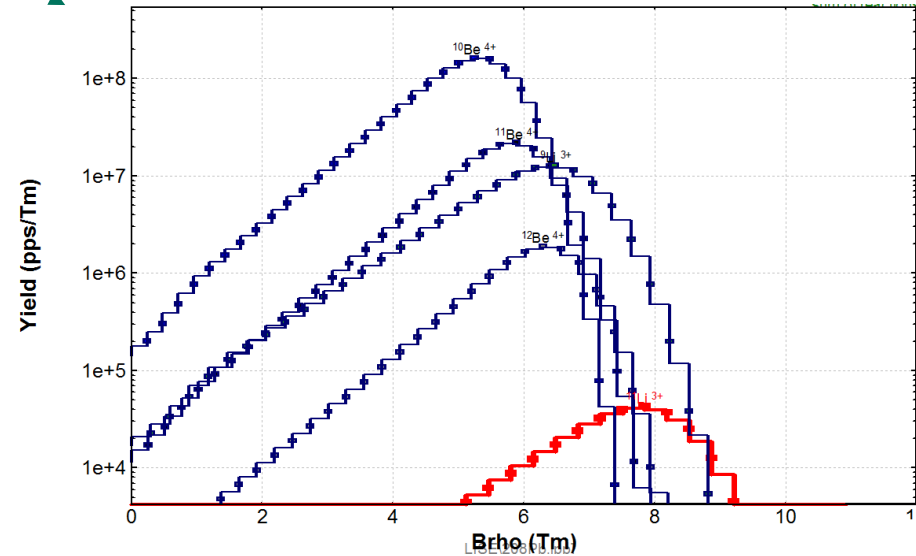
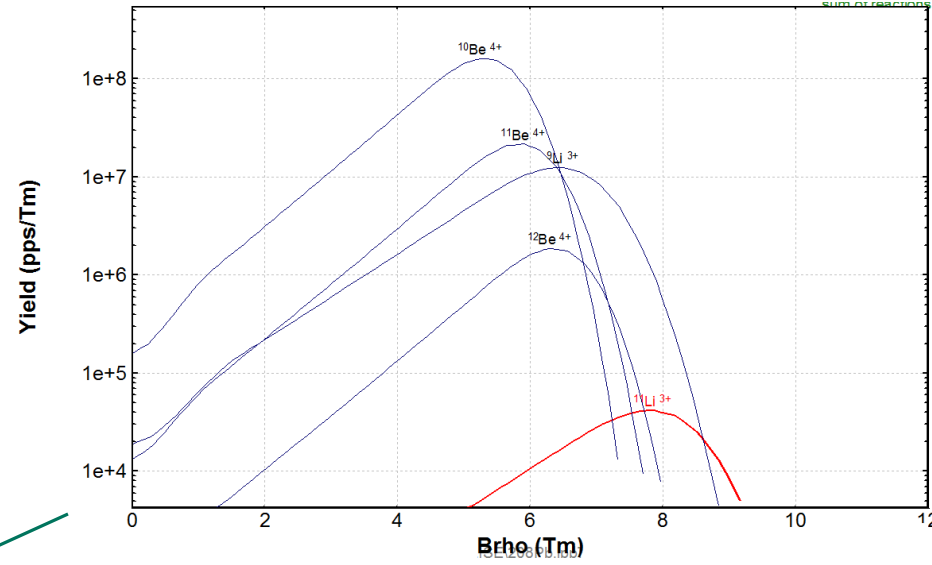
Total Number of Blocks: 443
Length [m]: 259.636



V-Histogram

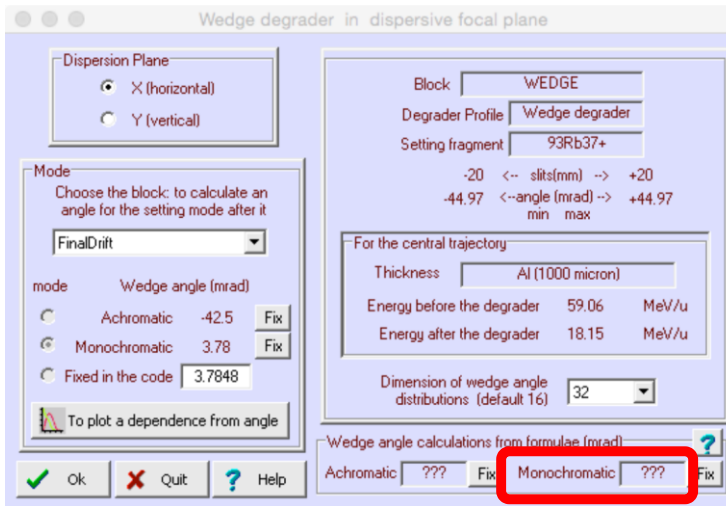


User line thickness

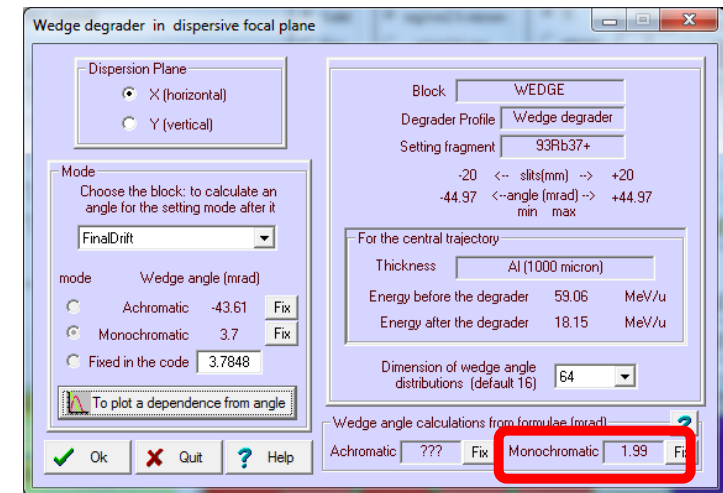


Local Dispersion between wedge and Final drift blocks is equal to 0.
No solution in achromatic case, but for monochromatic case should be

LISE v.9.9



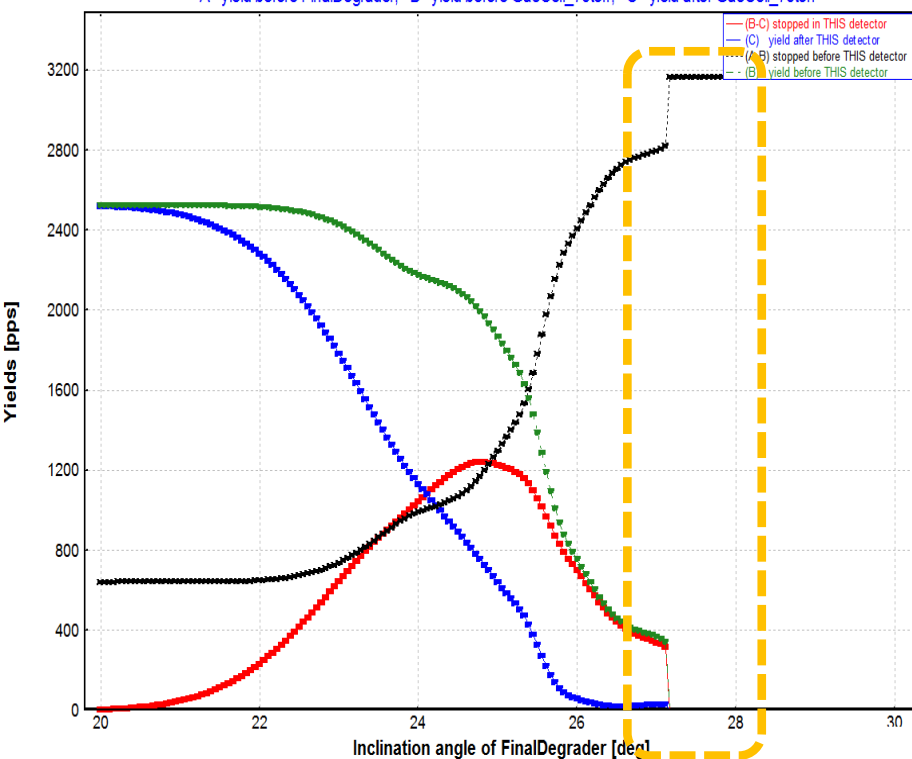
LISE v.9.10



LISE v.9.9

Range 1D-Optimizer: Number of particles stopped in GasCell_75torr

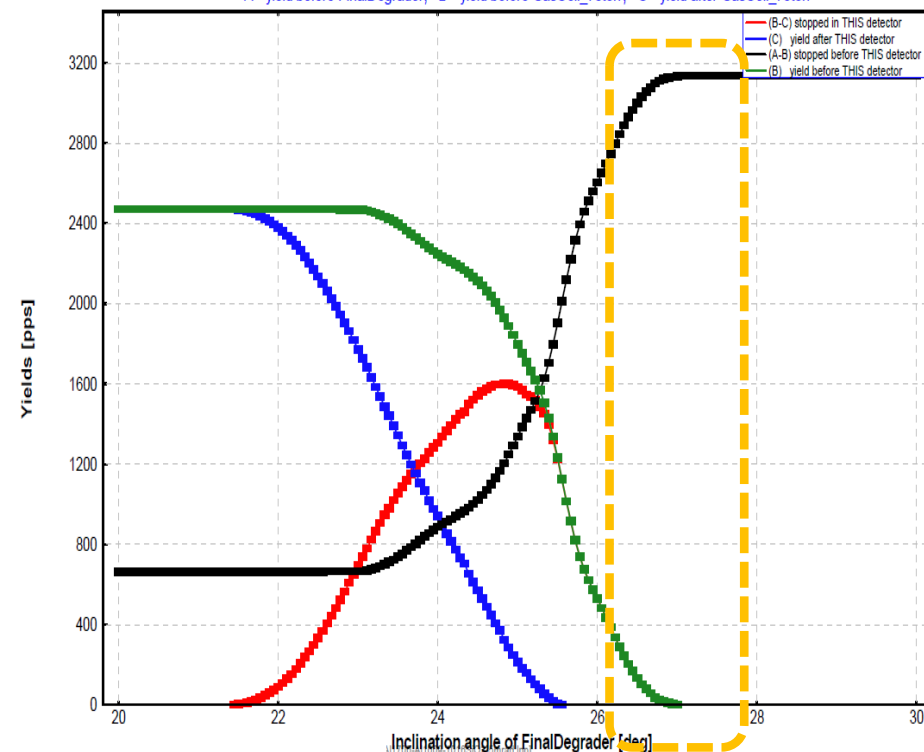
^{36}Ar (150.1 MeV/u) + Be (1269 mg/cm²); Settings on ^{26}Si ; Config: DDSWDDSDDDMDMDMWSMMM
 dp/p=1.00% ; Wedges: Al (240 mg/cm²), O2Si (1016 μm); Brho(Tm): 2.6319, 2.6319, 2.4570, 2.4570, 2.4570....
 A - yield before FinalDegrader; B - yield before GasCell_75torr; C - yield after GasCell_75torr



LISE v.9.10

Range 1D-Optimizer: Number of particles stopped in GasCell_75torr

^{36}Ar (150.1 MeV/u) + Be (1269 mg/cm²); Settings on ^{26}Si ; Config: DDSWDDSDDDMDMDMWSMMM
 dp/p=1.00% ; Wedges: Al (240 mg/cm²), O2Si (1016 μm); Brho(Tm): 2.6319, 2.6319, 2.4570, 2.4570, 2.4570....
 A - yield before FinalDegrader; B - yield before GasCell_75torr; C - yield after GasCell_75torr



Angular Momentum in the Plots of the "Excitation energy of prefragments" dialog

Excitation Energy of prefragment

Prefragment

A	Element	Z
26	Si	14

Reaction: 36Ar + Be

Excitation Energy in the code = 133.00 MeV

Models

- A. J.W.Wilson et al., NIM B18 (1987) 225-231
- B. J.-J.Gaimard and K.-H.Schmidt, NPA531 (1991) 709
- C. Parametrized Gaussian distribution
- D. Exponential excitation-energy distribution

Use LISE++ corrections for Geometrical A-A model

Apply thermalization for Excitat. energy according to J.-J.Gaimard & K.-H.Schmidt, NPA531 (1991) 709; see Equation 3.4

Plot Make default

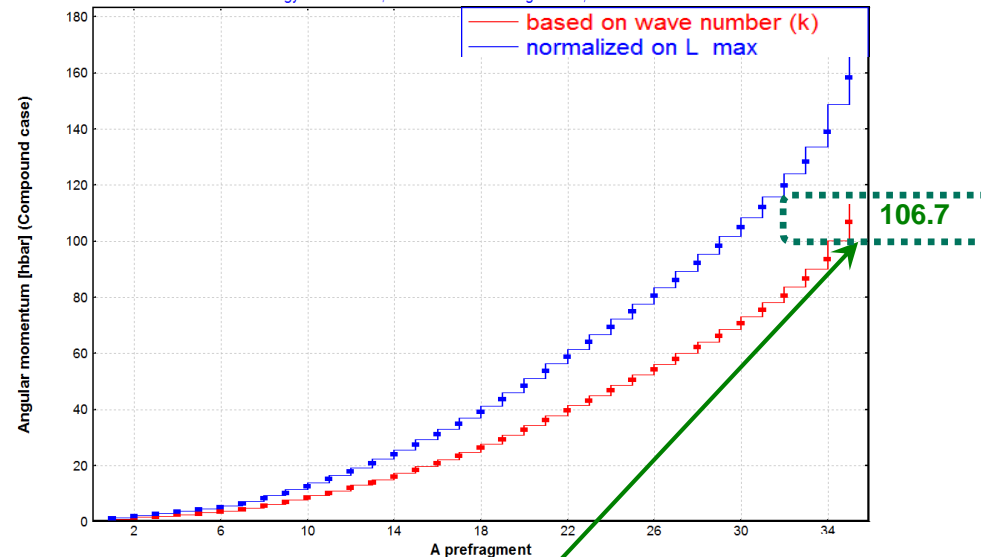
OK Cancel Help

Excitation energy for 36Ar + Be -> 26Si: Angular momentum

Excit.Energy Method:< 0 >; g=0.95; Sigma=9.6; c1,2=(1.5,2.5) Friction:"Off"

Excit.Energy Method:< 1 >; Hole Depth: 40.0 MeV

Excit.Energy Method:< 2 >; <E">;13.3'dA MeV Sigma.9.60; No Intrinsic Thermalization



Purpose : obtain L_direct from the Geometrical Abrasion-Ablation model assuming one nucleon stripping

Fusion -> Residues

Evaporation settings: 36Ar(150.1 MeV/u) + 9Be -> 49Ti [Ex=1101.9 MeV]

Fusion barrier

Fusion properties

Transmission probability for a one-dimensional potential barrier

Classical Quantum-mechanical

η_ω , omega - Curvature parameter of the parabolic potential describing the barrier (default value 3 MeV)

5 MeV

Probability for compound nucleus formation P_{c(N)}

Take into account the Probability for compound nucleus formation P_{c(N)} according to V.Zagrebaev & W.Greiner, PRC78, 034610 (2008)

Fission barrier vanishing

Take into account the Fission barrier vanishing with

0 - "Barrif" - A.J.Sierk, PRC33(1986)2039

1 - "FisRot" - S.Cohen et al.An.P 82(1974)

Nuclear potential

Bas formalism Wood-Saxon

V0 = 105 MeV
R0 = 1.12 fm
a = 0.75 fm

Fusion L-diffuseness 1 MeV

Calculation

L (Bfis=0) = 40
L critical = 38

L direct (@ Rint) = 105
L max (grazing) = 171.8
L max (LISE) = 171.8

Show Details & CS

Partial Cross Sections Potentials V1 = f(R) T,PCN,dEx chan as f(L) Barrier properties as f(L) Bas Fusion CS & Barrier 2D: Barrier V1f(R,L) & dVdR

Partner site

Fusion Evaporation

OK Cancel Help

Fusion Details

L (Bfis=0)	40	
L critical	38	(E crit=75.1 MeV)
L direct (AA)	106.7	
L direct @ Rint	105	used in calculations
L max (grazing)	171.8	used in calculations
L max (LISE)	171.8	

Cross sections (mb)

Partial (LISE++)

Interaction 2.501e+03

1. Atomic number of target in the "Show Setup" frame
2. "Dummy" blocks modifications for the Scheme
3. Physical Calculator modifications for Range and degrader values
4. Plot1 legend size
5. Energy loss : MaxZtargetHubert=92, NumberTabELOSS = 100
6. Momentum "L" is new parameter of the "S_Element" class for Abrasion-Ablation
7. New class "TListShowWindow" :
 - TShowMCtrans based on TListShowWindow*
 - W_ShowCalc based on TListShowWindow*
 - Correction for overall transmission in the ShowCalc window*
 - ShowCalc -- modification for charge state numbers (%-3d format)*
 - Bug correction in the WShow subroutine*
 - Upgrade The ShowValues window class in the Fusion dialog*
8. Reaction characteristics from Energy : corrections
9. "Custom shape degrader" dialog: option to skip energy/position calculations in polynomial mode

http://lise.nsci.msu.edu/9_10/9_10_279_Qoptim.pdf

Q_{optimal} value in Two-body mode of the Kinematics Calculator

Q optional and Total Excitation energy are calculated in this mode

To get this document @ LISE++ site

Share this Total excitation energy between the fragment and residue

Participant	ME [MeV]	Excitation Energy
A: Beam	47.31	0
B: Target	0	0
C*: Fragment	50.13	0
D*: Residual	12.61	0

Q_value = -15.43 MeV
Q_opt = -22.2 & Ex = +6.8 MeV

Participant	ME [MeV]	Excitation Energy	Total Excitation Energy
C* Fragment	240Pu	50.13	6.492
D* Residual	10Be	12.61	0.270

Target thickness = 1e-1 micron
Q_value = -22.19 MeV
Q_opt = -22.2 & Ex = +0.0 MeV