

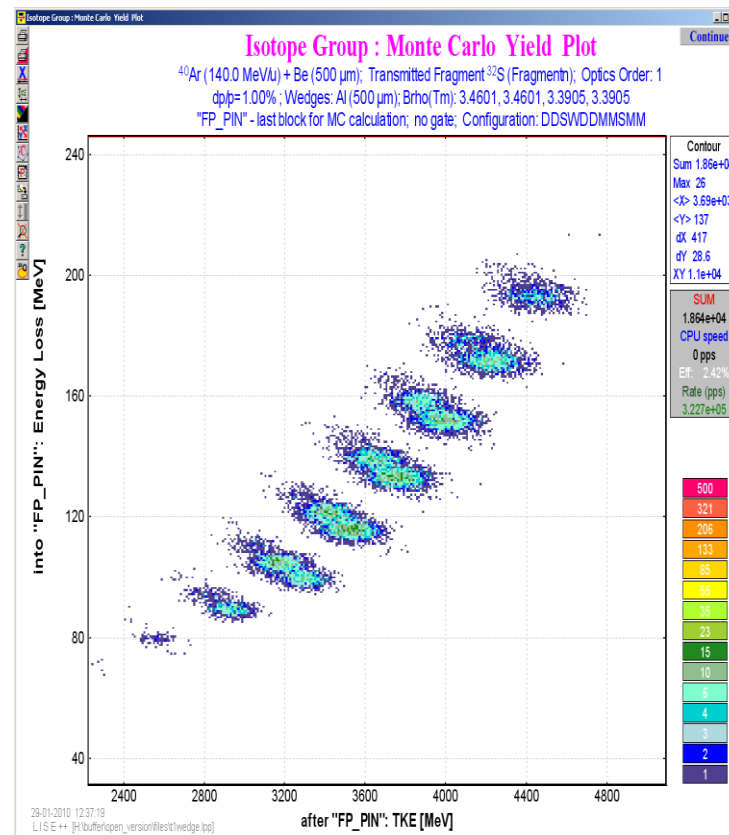
The code operates under MS Windows environment and provides a highly user-friendly interface.  
It can be freely downloaded from the following internet addresses:

<http://www.nsl.msu.edu/lise>

## version 8.5.34

### Contents:

- *LISE++ models to calculate, to plot*
- *MC dialog modifications*
- *Isotope group options*
- *“Yield” and “Transmission” modes*
- *Isotope identification for Isotope group*
- *Isotope group vs. MC writing to file*
- *Energy deposition mode : example*
- *Plans for MC development*



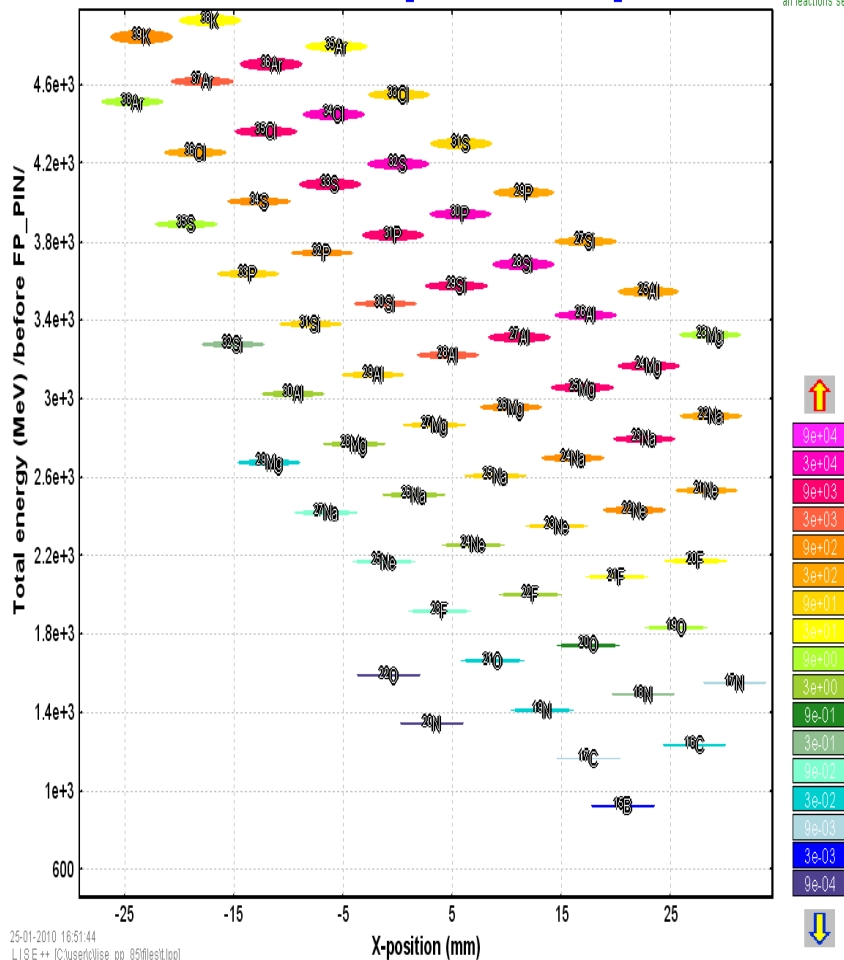
## Ellipse plot

TKE-X

<sup>40</sup>Ar (140.0 MeV/u) + Be (500 μm); Settings on <sup>32</sup>S; Config: DDSWDDMMSSM  
 dp/p=1.00%; Wedges: Al (350 μm); Brho(Tm): 3.4601, 3.4601, 3.4117, 3.4117  
 X-detector: FP\_PPACO\*\* 1st TKE detector: FP\_PIN

Monte Carlo

without charge state  
all reactions sepa



25-01-2010 16:51:44  
 LISE++ [C:\user\olise\_op\_85\filest\lpp]

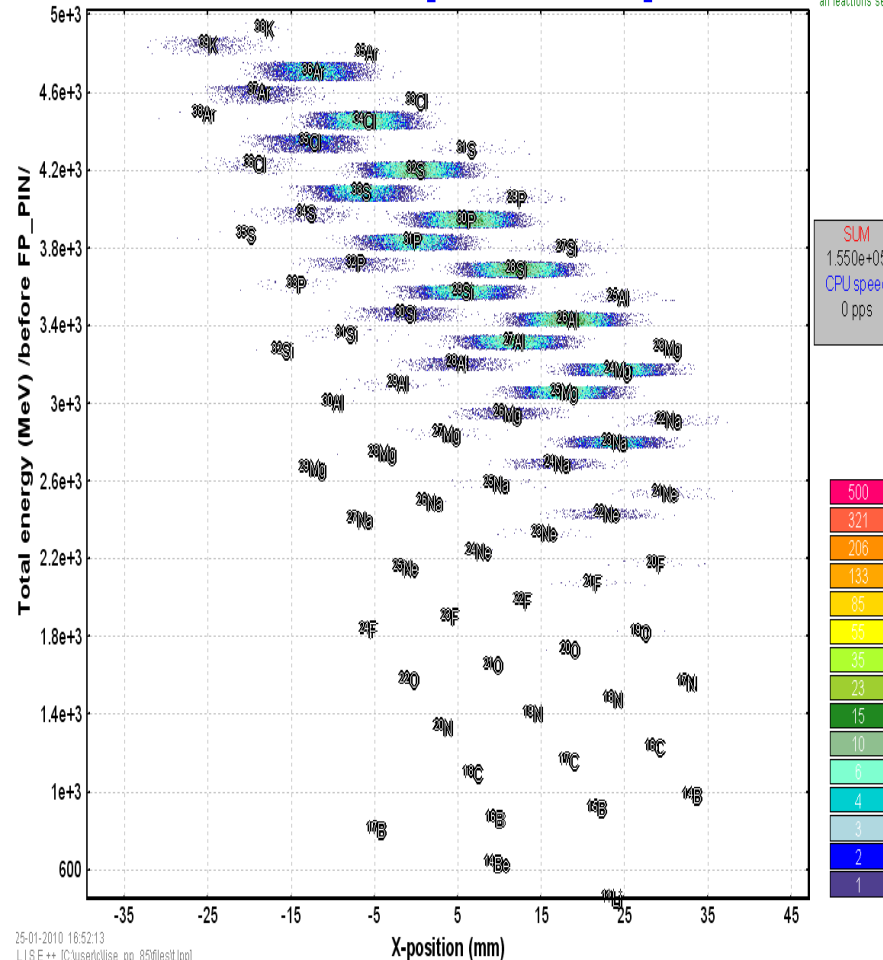
## Pseudo MC plot

TKE-X

<sup>40</sup>Ar (140.0 MeV/u) + Be (500 μm); Settings on <sup>32</sup>S; Config: DDSWDDMMSSM  
 dp/p=1.00%; Wedges: Al (350 μm); Brho(Tm): 3.4601, 3.4601, 3.4117, 3.4117  
 X-detector: FP\_PPACO\*\* 1st TKE detector: FP\_PIN

Continue

without charge states  
all reactions sepa.



25-01-2010 16:52:13  
 LISE++ [C:\user\olise\_op\_85\filest\lpp]

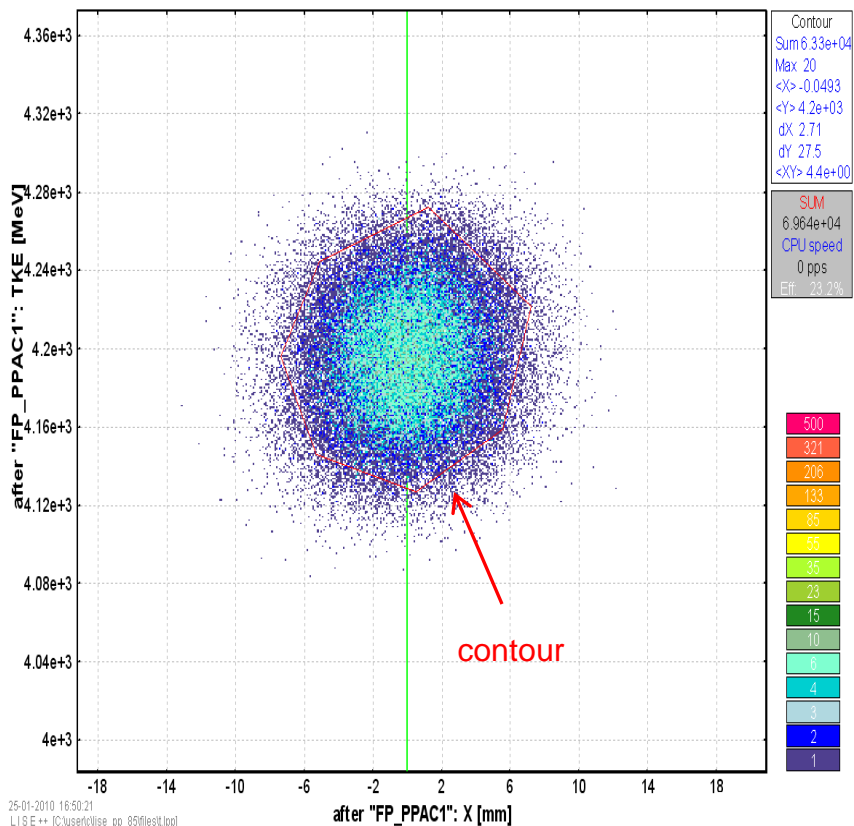
Only one isotope to simulate

Version 8.4

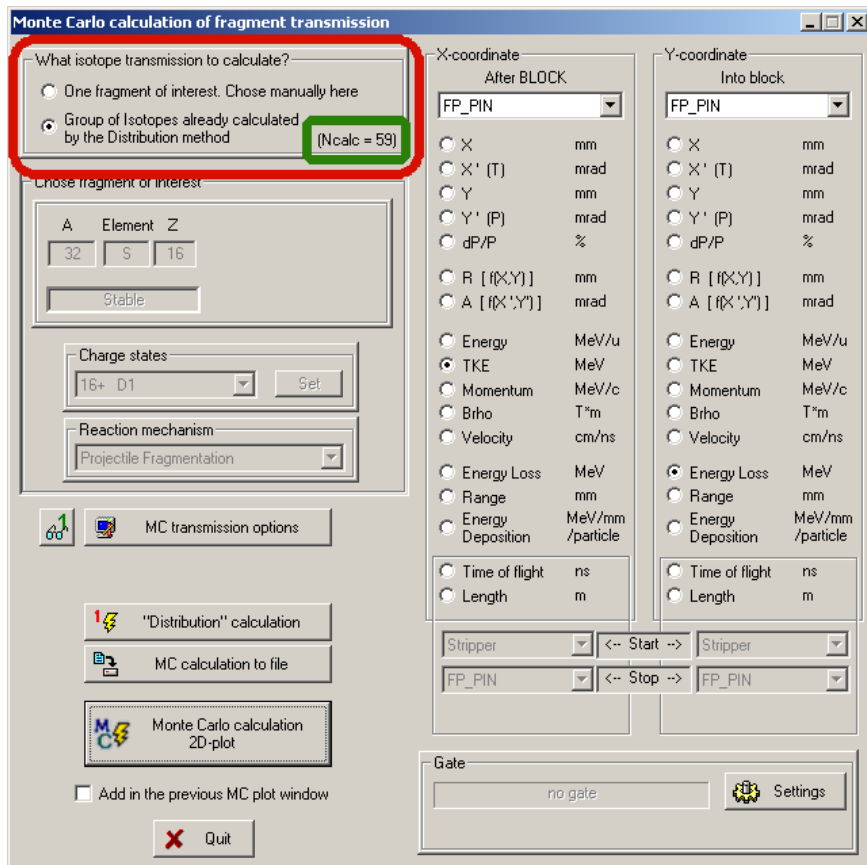
## <sup>32</sup>S : Monte Carlo Transmission Plot

Continue

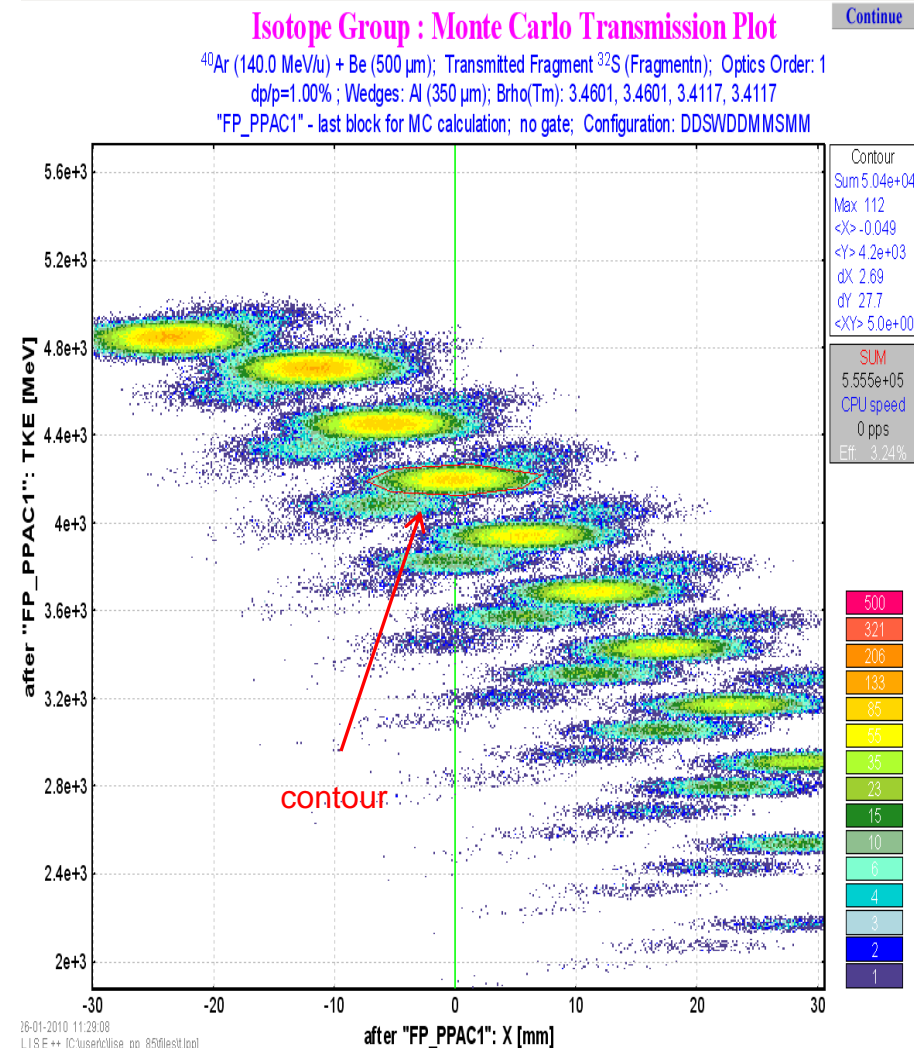
<sup>40</sup>Ar (140.0 MeV/u) + Be (500 μm); Transmitted Fragment <sup>32</sup>S (Fragmentn); Optics Order: 1  
dp/p=1.00%; Wedges: Al (350 μm); Brho(Tm): 3.4601, 3.4601, 3.4117, 3.4117



Option to add in the old plot



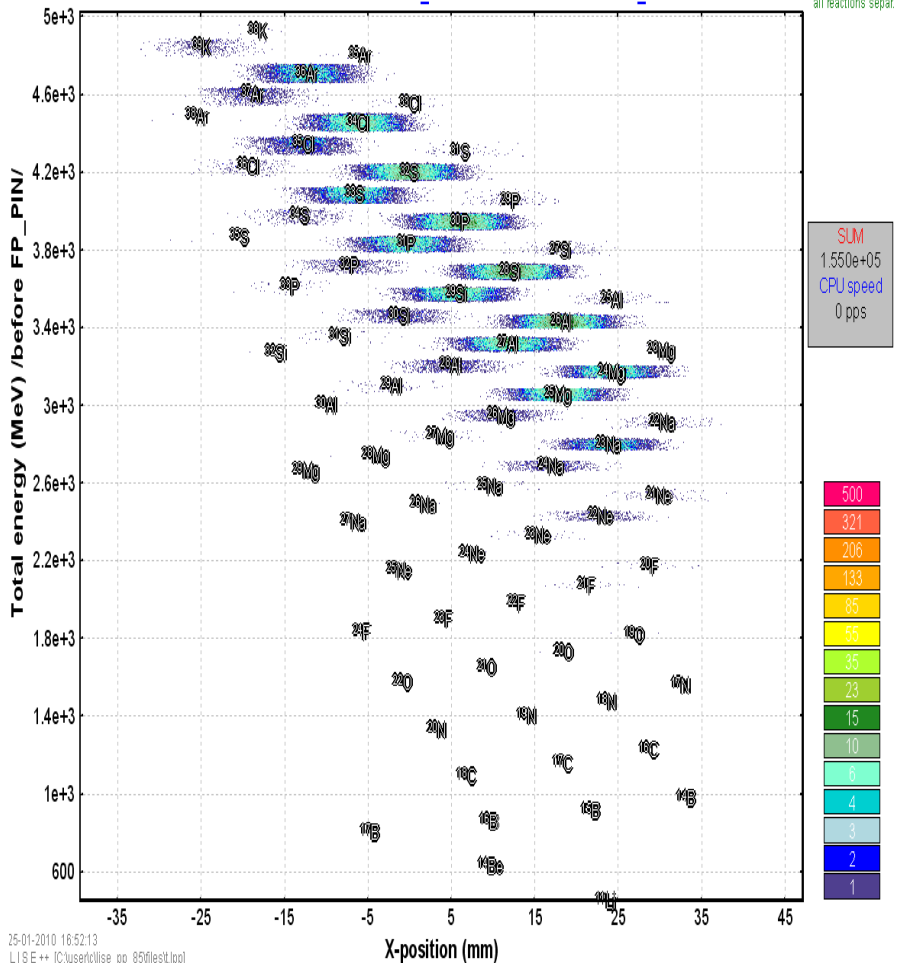
Works for all reactions (temporally except secondary targets).  
 Takes into account secondary reactions in target,  
 charge state calculations,  
 losses due to reactions in materials and so on



## Pseudo MC plot Time!

TKE-X

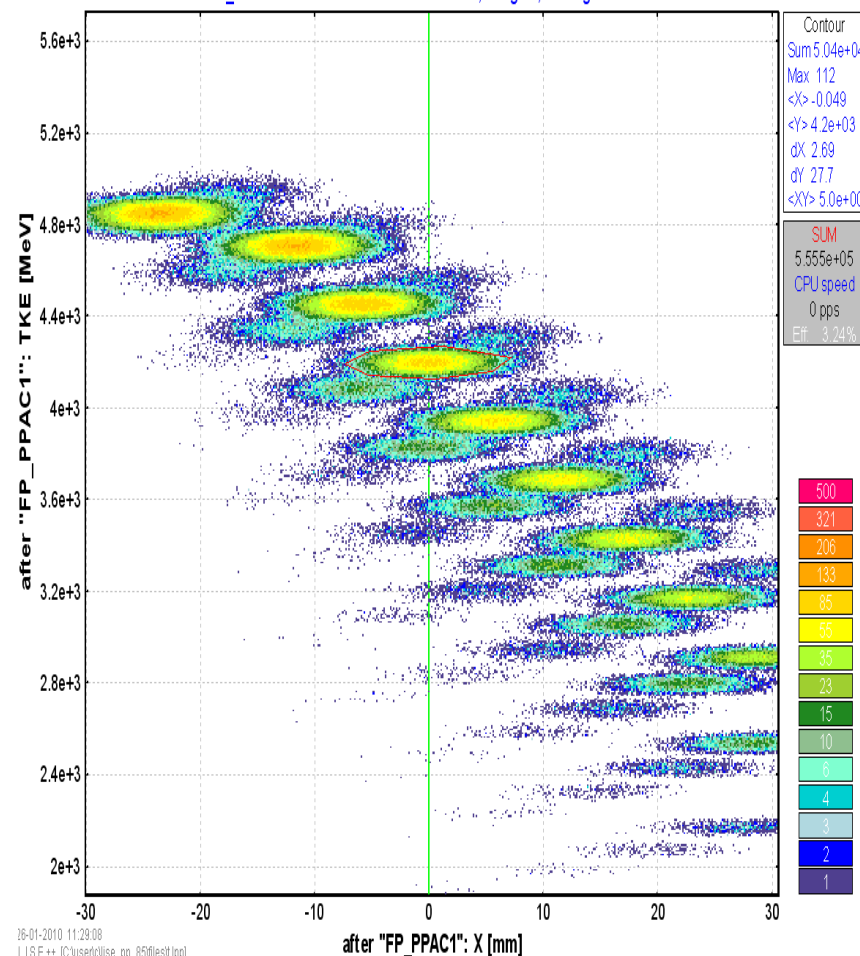
$^{40}\text{Ar}$  (140.0 MeV/u) + Be (500  $\mu\text{m}$ ); Settings on  $^{32}\text{S}$ ; Config: DDSWDDMMSSM  
 dp/p=1.00% ; Wedges: Al (350  $\mu\text{m}$ ); Brho(Tm): 3.4601, 3.4601, 3.4117, 3.4117  
 X-detector: FP\_PPACO \*\* 1st TKE detector: FP\_PIN



## MC transmission plot Quality!

Isotope Group : Monte Carlo Transmission Plot

$^{40}\text{Ar}$  (140.0 MeV/u) + Be (500  $\mu\text{m}$ ); Transmitted Fragment  $^{32}\text{S}$  (Fragmentn); Optics Order: 1  
 dp/p=1.00% ; Wedges: Al (350  $\mu\text{m}$ ); Brho(Tm): 3.4601, 3.4601, 3.4117, 3.4117  
 "FP\_PPAC1" - last block for MC calculation; no gate; Configuration: DDSWDDMMSSM



**MC transmission options**

High Order Optics Calculations

Use in calculations :  through 3rd order      Highest Order in this configuration:

only 1-st order       through 4th order

through 2nd order       through 5th order

Straggling in material

Angular

Energy

Lateral \*\*

Detector resolution

Use energy and time resolution of detectors for TOF, Energy loss, and TKE values      ^ No resolution will be taken into account if the selected block is optical or wedge

Use spatial resolution of detectors for X and Y values      ^ Only energy resolution of first detector after the selected block will be taken into account for TKE value

Take into account thickness defect of materials

Take into account losses due to reactions in materials

Include charge state calculations in the total transmission

for the Isotope group case only:

X-sections independent calculations (all cross sections equal)

Assume the reaction takes place at the middle of target

for Angular distributions      \* these two distributions are correlated for fusion and fission reactions

for Momentum distributions

\*\* time consumed options

Make default

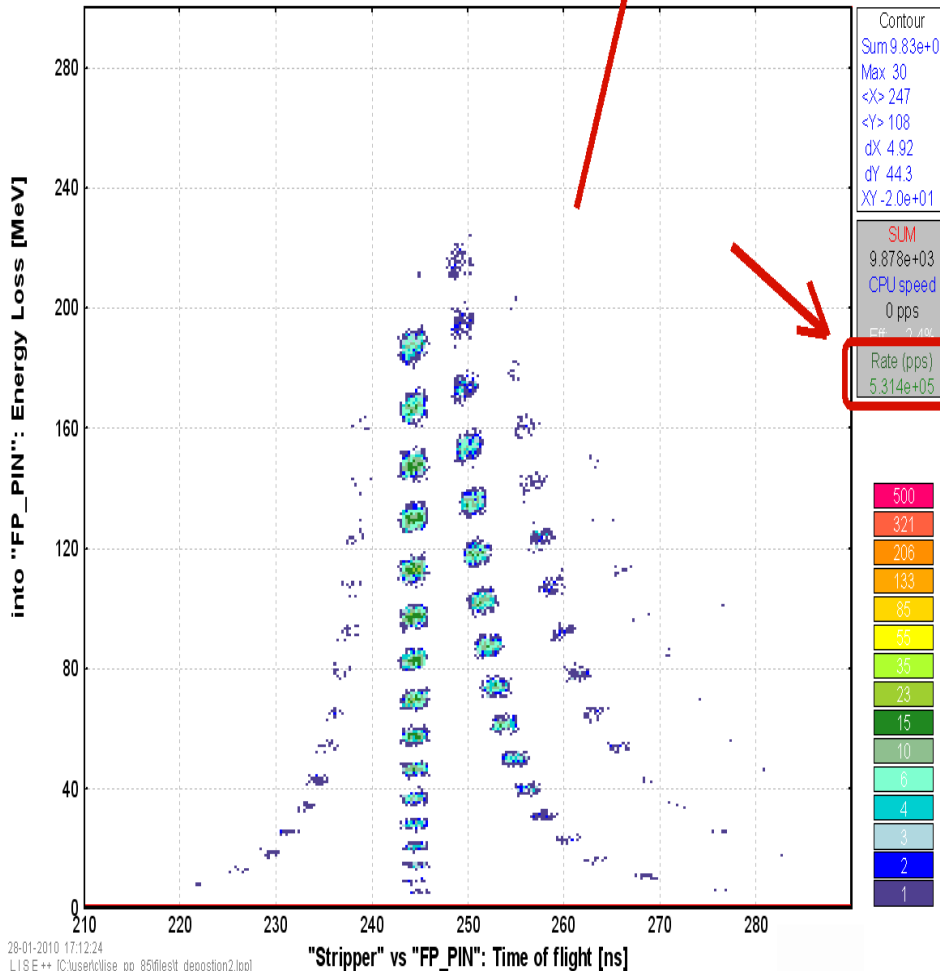
Only for Isotope group:  
Switch between  
"Yield" and "Transmission"  
modes

These options are disabled to change,  
And they will be set according to options  
used for Distribution method calculations

## Isotope Group : Monte Carlo **Yield** Plot

Continue

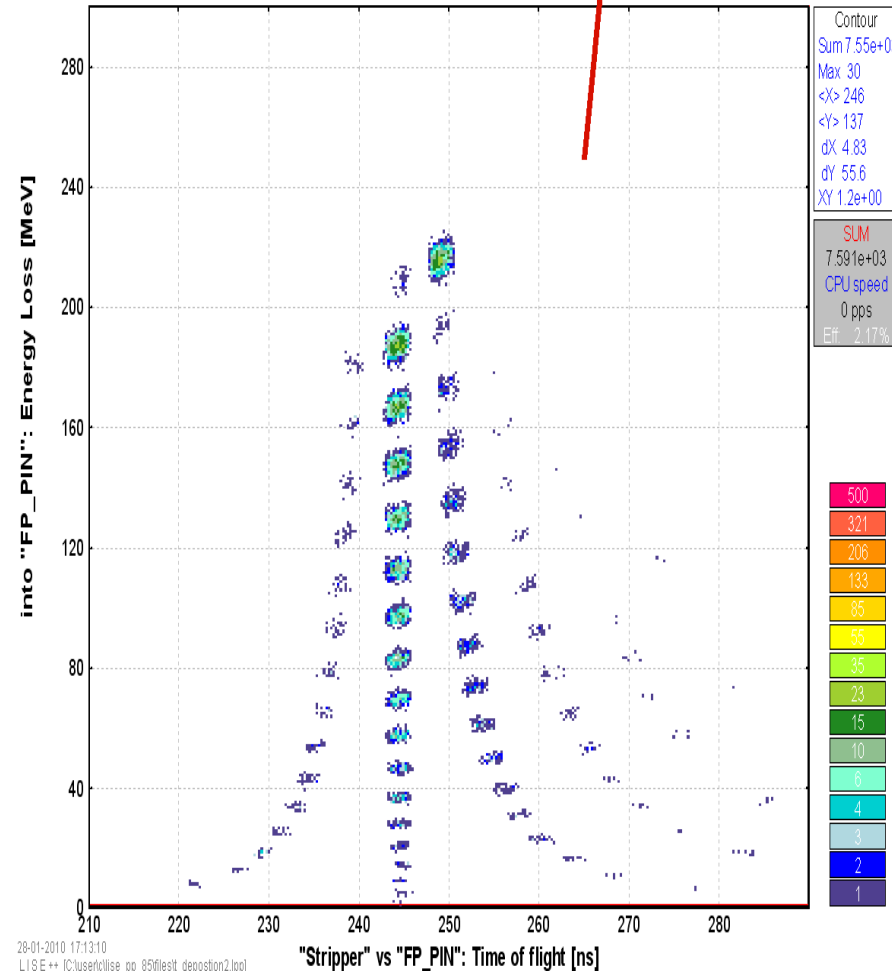
<sup>40</sup>Ar (140.0 MeV/u) + Be (500 μm); Transmitted Fragment <sup>32</sup>S (Fragmentn); Optics Order: 1  
 dp/p=1.00%; Wedges: 0; Brho(Tm): 3.4601, 3.4601, 3.4601, 3.4601  
 "FP\_PIN" - last block for MC calculation; no gate; Configuration: DDSWDDMMSSMM



## Isotope Group : Monte Carlo **Transmission** Plot

Continue

<sup>40</sup>Ar (140.0 MeV/u) + Be (500 μm); Transmitted Fragment <sup>32</sup>S (Fragmentn); Optics Order: 1  
 dp/p=1.00%; Wedges: 0; Brho(Tm): 3.4601, 3.4601, 3.4601, 3.4601  
 "FP\_PIN" - last block for MC calculation; no gate; Configuration: DDSWDDMMSSMM

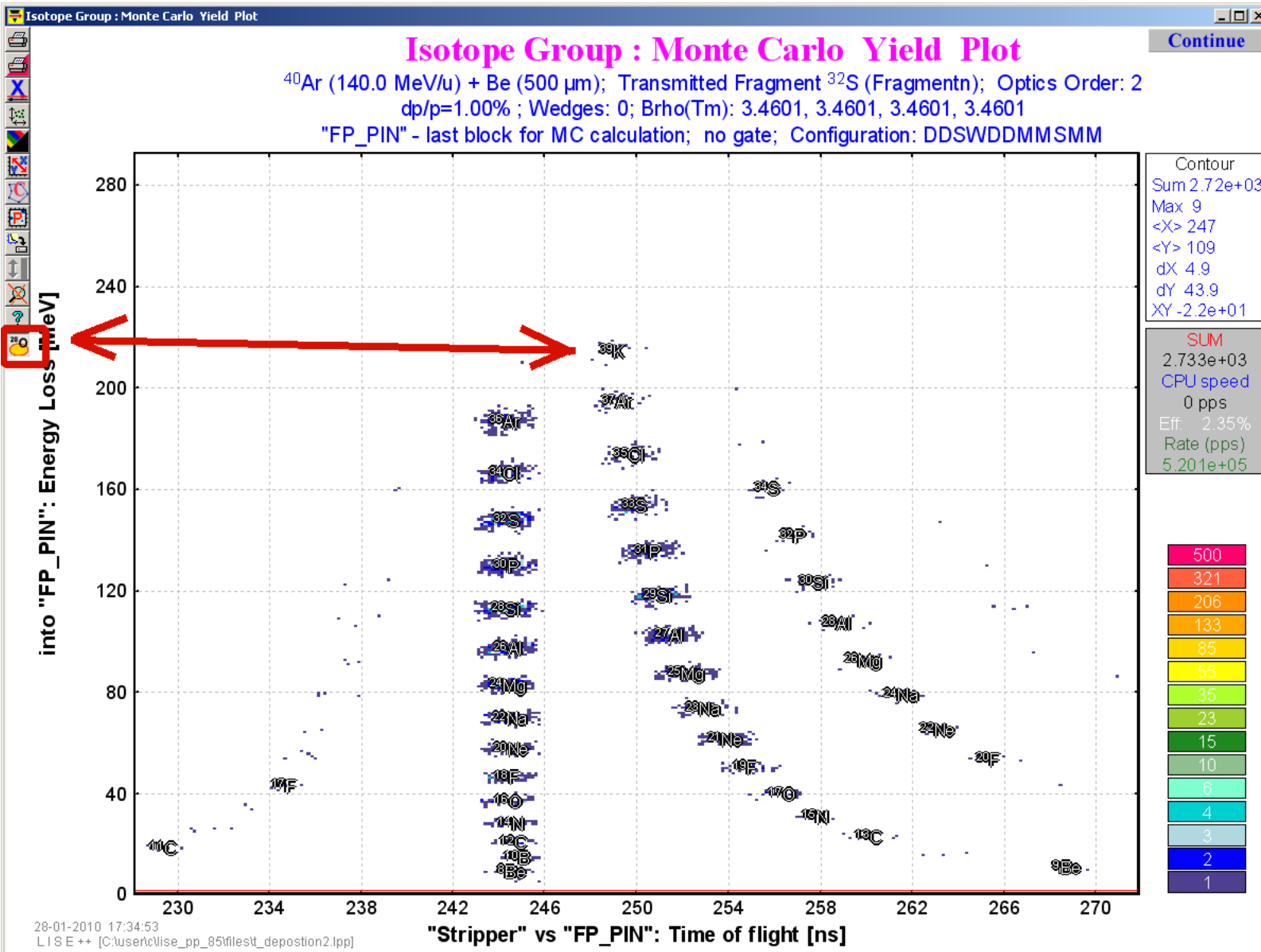


$K = MC\_transWeight \rightarrow inter2(\dots)$

Weight: Yield after target(stripper)

$K = total \% Get\_N\_MCtrans();$

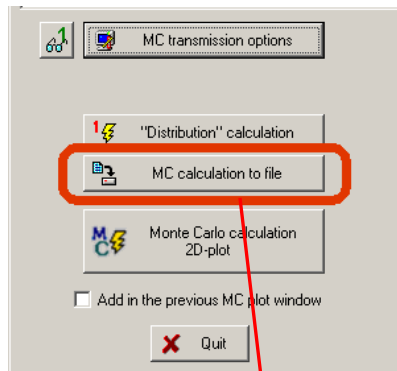
Simple cycle 1...N



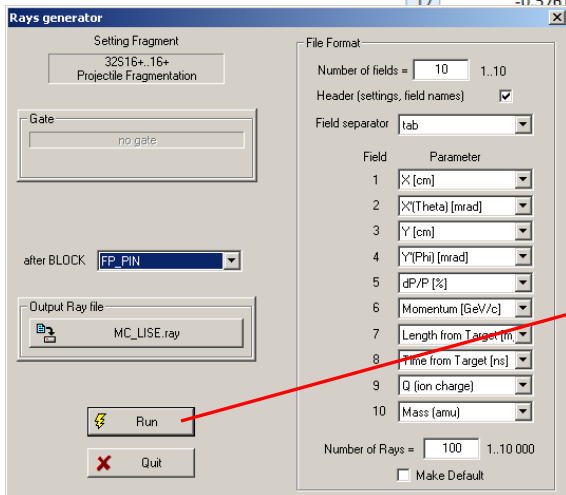
"Off" by default.

A fragment will be identified If its yield > 5 event





	A	B	C	D	E	F	G	H	I	J	K
1	! after block "D4", setting fragment: 36Cl17+..17+ (Projectile Fragmentation); N_fields=10; N_Rays=1000										
2	!X [cm]	X(Theta) [mrad]	Y [cm]	Y(Phi) [mrad]	dP/P [%]	Momentum [GeV]	Length from Targ	Time from Target	Mass (amu)	Z (atomic number)	
3	0.3141	16.48	-0.19515	-6.4145	-0.093076	6.218	35.646	244.7	12	6	
4	-0.066887	4.9316	-0.25801	-5.2656	0.21868	13.514	35.637	243.86	25.987	13	
5	-0.10045	-11.581	0.37771	6.9876	-0.2587	16.554	35.651	244.82	31.972	16	
6	0.30984	-9.9289	-0.21728	4.9878	-0.097064	16.581	35.646	244.55	31.972	16	
7	-0.30863	-3.3237	0.084716	3.1919	-0.14441	13.465	35.648	244.62	25.987	13	
8	0.24019	6.4896	-0.092595	2.0442	-0.16736	13.462	35.649	244.69	25.987	13	
9	-0.13223	-12.92	0.46971	18.211	0.22304	13.515	35.637	243.99	25.987	13	
10	0.39374	-10.248	0.0076804	2.549	-0.1058	6.2172	35.647	244.65	12	6	
11	-0.014752	6.3074	-0.36791	-6.9184	0.42216	16.667	35.631	243.38	31.972	16	
12	0.13938	-1.95	0.33926	11.217	-0.30987	16.545	35.653	244.91	31.972	16	
13	-0.19179	2.1879	0.43102	3.9551	0.25944	13.52	35.636	243.8	25.987	13	
14	-0.27829	-5.1811	0.19101	1.6669	-0.14901	13.465	35.648	244.63	25.987	13	
15	0.22569	-0.23462	-0.19355	-7.5828	0.23919	16.557	35.651	244.75	31.972	16	
16	0.04417	10.471	0.068924	2.7359	-0.16561	17.605	35.649	255.68	35.968	17	
17	-0.5761	6.096	-0.12868	8.9126	0.20913	16.632	35.637	243.94	31.972	16	
		5.2983	-0.0087915	-0.52082	0.0082951	16.598	35.643	244.23	31.972	16	
		-0.75389	-0.14323	5.5027	-0.13704	13.466	35.648	244.66	25.987	13	
		-7.78	0.15151	1.7803	0.29637	16.646	35.635	243.64	31.972	16	
		1.5281	0.022763	6.0434	-0.31607	16.544	35.653	244.93	31.972	16	
		0.9889	-0.45096	-20.268	0.079666	16.61	35.641	244.22	31.972	16	
		0.92954	-0.15519	-9.2503	0.15162	13.505	35.639	244.04	25.987	13	
		-6.6547	-0.052923	-4.7648	0.39323	9.3724	35.632	253.97	18.998	9	
		-7.7549	0.33702	4.5916	0.2849	13.523	35.635	243.74	25.987	13	
		9.5151	-0.40334	-8.9676	0.47006	13.548	35.629	243.37	25.987	13	
		-4.081	0.15333	-11.107	-0.40133	16.53	35.656	245.28	31.972	16	
		9.2426	-0.20594	-7.0844	0.0051961	16.598	35.643	244.26	31.972	16	
		5.238	0.24532	4.415	0.17984	16.627	35.638	243.88	31.972	16	
		-6.8808	-0.31154	2.7543	-0.33824	16.541	35.654	245.03	31.972	16	
		11.867	0.2553	16.337	-0.14953	13.465	35.648	244.8	25.987	13	
		-1.6486	-0.1072	-9.8393	-0.27027	13.448	35.652	244.93	25.987	13	
		-4.3841	0.20712	13.39	-0.31033	6.2045	35.653	245.14	12	6	
		-1.2504	0.02053	1.9638	-0.073993	16.585	35.646	244.39	31.972	16	
		3.1386	-0.30699	-11.312	-0.23742	16.557	35.651	244.77	31.972	16	
		-1.9692	0.052723	-0.3653	-0.12176	16.577	35.647	244.5	31.972	16	
37	-0.35691	-0.60786	-0.26909	-8.5289	0.051949	13.492	35.642	244.22	25.987	13	
38	-0.39463	13.747	0.10566	1.5342	0.26468	9.3604	35.636	254.28	18.998	9	
39	0.36655	12.5	0.20583	2.4739	-0.27162	16.552	35.652	244.86	31.972	16	
40	0.29806	-9.2795	-0.25572	5.0998	0.072273	13.495	35.641	244.28	25.987	13	

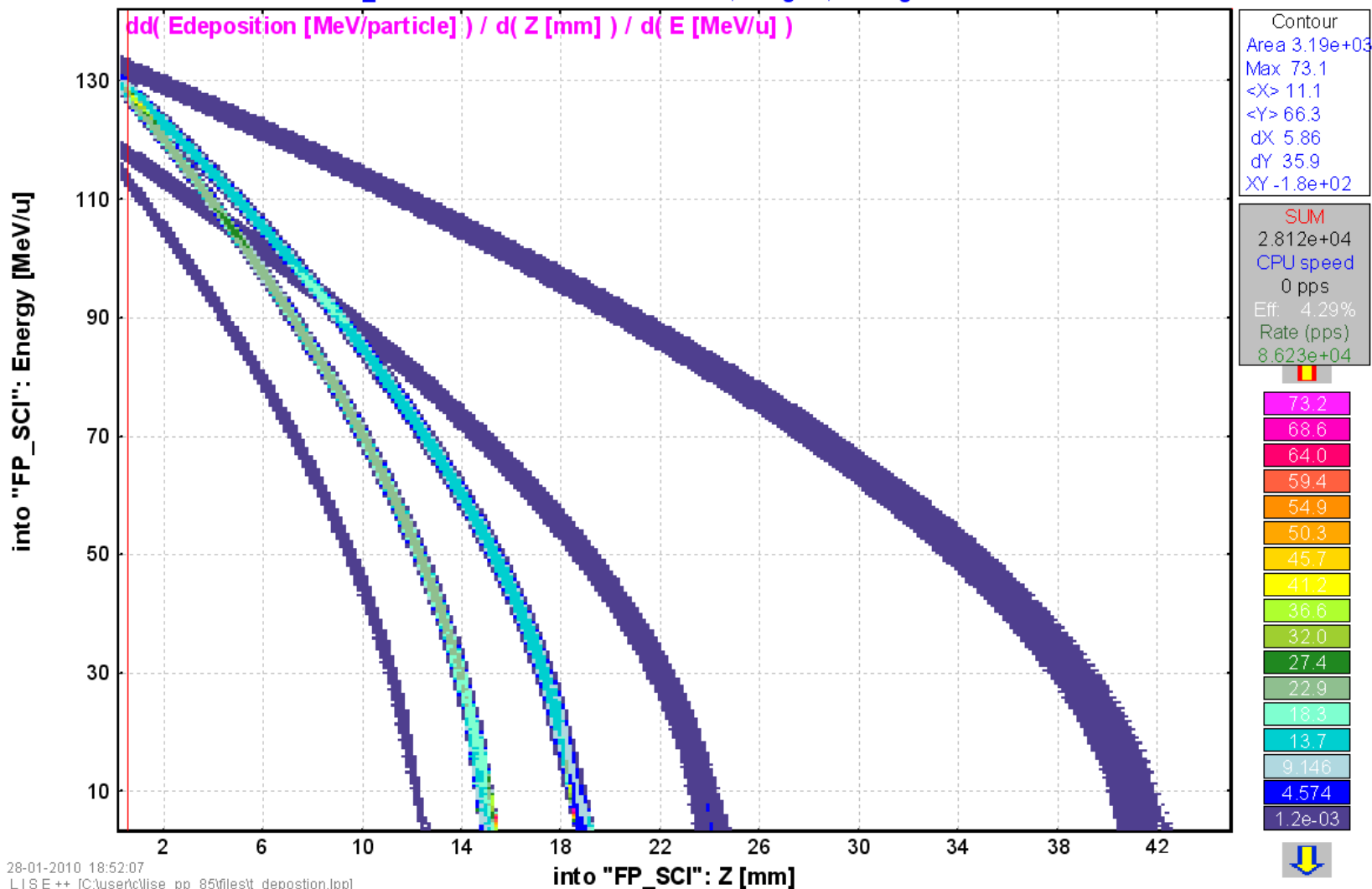


## Isotope Group : MC Yield Plot - Energy Deposition

Continue

$^{40}\text{Ar}$  (140.0 MeV/u) + Be (500  $\mu\text{m}$ ); Transmitted Fragment  $^{32}\text{S}$  (Fragmentn); Optics Order: 1  
 $dp/p=1.00\%$  ; Wedges: 0; Brho(Tm): 3.4601, 3.4601, 3.4601, 3.4601

"FP\_SCI" - last block for MC calculation; no gate; Configuration: DDSWDDMMSSMM



28-01-2010 18:52:07  
 LIS E++ [C:\user\clise\_pp\_85\filest\_deposition.lpp]

## Plans for MC development:

- *Secondary target for the Isotope group mode*
- *Envelope*
- *Excitation function*
- *Transmission losses as a function of length*
- *$B\rho$  method to measure  $T_{1/2}$  (possibility of decay in flight)*
- *Simulation reactions In Si-telescope*

Thanks to  
Dr. D.Bazin,  
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(NSCL/MSU)  
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