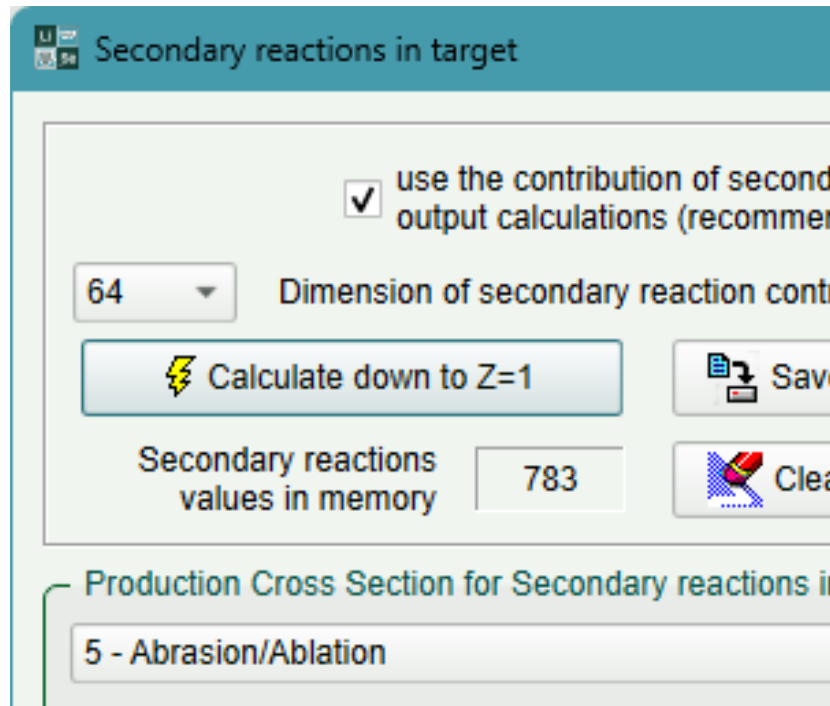


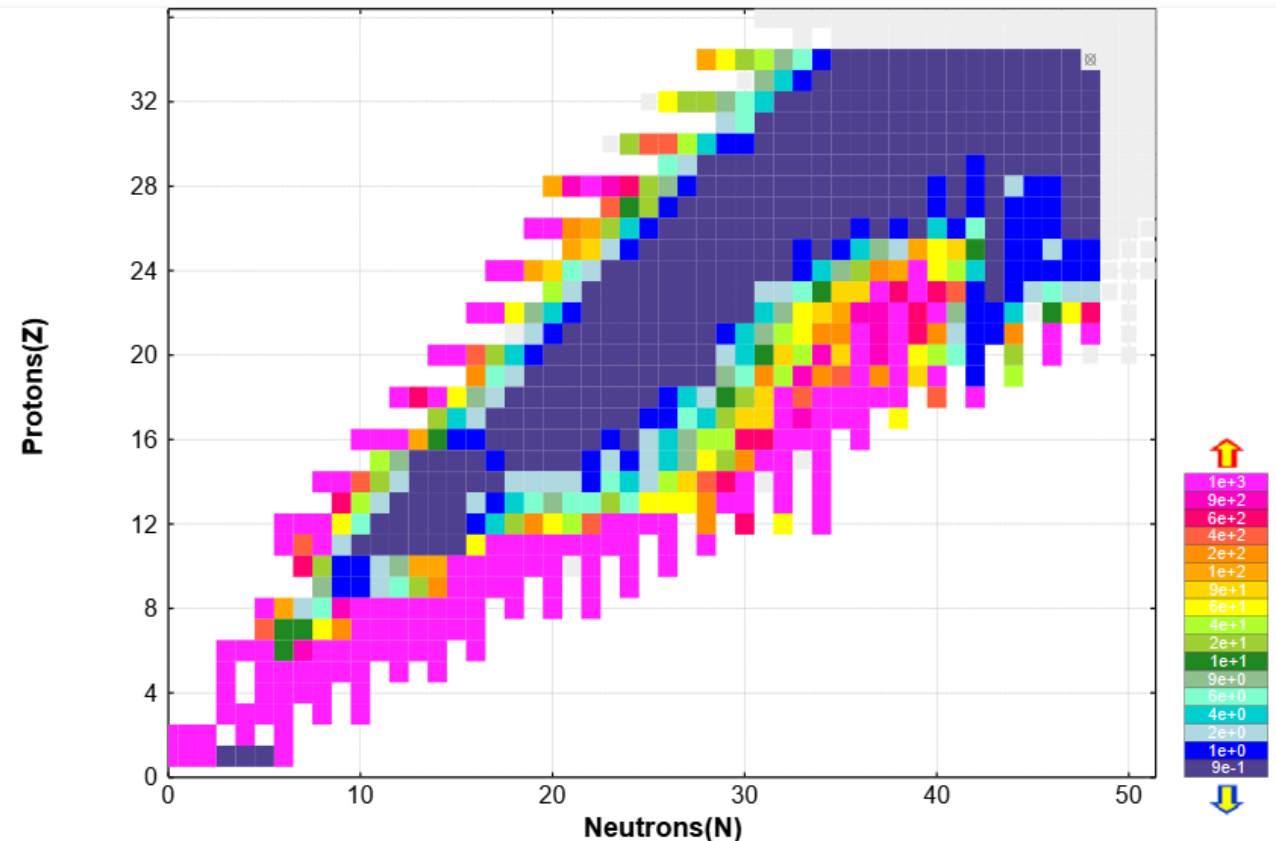
v.17.3  
03/12/24

- Adding Abrasion-Ablation to Secondary reactions
- Optimization of Secondary Reaction calculations
- 4 "fast" AA calculation modes
- Fitting the  $^{82}\text{Se}$  MSU cross-sections with AA
- Changing distribution names in plots
- Plot distribution copy-paste
- Slopes  $X_{\text{dest}}/X_{\text{wedge}}$  and  $E_{\text{dest}}/X_{\text{wedge}}$  in wedge position shift plots



- Fast AA mode is used in Secondary Reactions
- Secondary Reactions mechanism has been updated to use AA calculations
- Still time-consuming. Parallelization?
- Important to apply AA parameters correctly associated to region under investigation

**Secondary reactions coefficients for transmission calculations**  
 $^{82}\text{Se}$  (230 MeV/u) + C (8 mm)  $\rightarrow$   $^{62}\text{Sc}$  (NPsec=64); Coefficients for fragments with NONZERO primary production cross section  
 1<sup>st</sup> reaction: Projectile Fragmentation (AA); 2<sup>nd</sup> reaction: AA  
 Total number of SR coefficients = 784; Number with nonzero primary cross sections = 722



- Interesting results, which could be used for explanation of the “evaporation corridor” in the case of U-beams with thick targets
- The  $^{82}\text{Se}$  MSU cross-sections have been refitted with AA to produce these calculations. See text further.

F1 → F2

Cross section of production F2 from F1 is calculated only once, and kept in memory using QMap

This optimization is also sufficient with using EPAX models in Secondary reactions

```
typedef QMap<int, double> mapCS;
mapCS* vmpCS = new mapCS[Nglobal];

double CStemp;
int index_iff = calc_index(indexZ[iff],indexN[iff]);
bool exist = vmpCS[ib].contains(index_iff);

if(exist) CStemp = vmpCS[ib].value(index_iff);
else
{
    CStemp = epax.yield(indexZ[iff],indexZ[iff]+indexN[iff],EPAX_option,false);
    vmpCS[ib].insert(index_iff, CStemp);
    lev3a++;
}
```

Additionally internal modifications

- TGauge was optimized for AA use
- LastZ value was revised for AA use in Secondary Reactions
- Additional fast AA modes have been created

# 4 "fast" AA calculation modes

Projectile fragmentation

$^{48}\text{Ca} (140.0 \text{ MeV/u}) + \text{Be} \rightarrow ^{42}\text{S}$

Fragment velocity | Momentum distribution | Cross section, Excitation energy and etc.

Prefragment and Evaporation options | Excitation energy for Abrasion-Ablation model

Cross Sections

0 - Abrasion/Ablation v.6.5.1

Use O.T.'s manual corrections for light charge particles (H, He, Li) production cross sections

Fast mode

"FAST" mode for Abrasion-Ablation calculations\*      \* use this mode only for heavy projectiles as Uranium, and for AA in Secondary Reactions

0. NPevap=8; velocity: fast       2. NPevap=16; velocity: fast

1. NPevap=8; velocity: qualitative       3. NPevap=16; velocity: qualitative

34 different AA settings have been used to fitting  $^{82}\text{Se}$  MSU cross-sections

## Last results

### 3<sup>rd</sup> day fits: new left bound, A>1 pair corrections, no2n

1. NP=64 down to Z=21 N=48 WS4\_RBF 4.89
2. NP=64 down to Z=21 N=48 WS4\_RBF MeanT 224
3. NP=64 down to Z=21 N=48 WS4\_RBF LogNorm 2180
4. NP=64 down to Z=21 N=48 WS4\_RBF with 2n 11.92
5. NP=64 down to Z=21 Z=22 WS4\_RBF 10.75
6. NP=64 down to Z=21 N=48 WS4\_RBF Thermo 5.21
7. NP=64 down to Z=21 N=48 HFB22 4.49
8. NP=64 down to Z=18 N=48 WS4\_RBF 4.798
9. NP=64 down to Z=21 N=48 WS4\_RBF fast 8.94
10. NP=64 down to Z=18 N=48 WS4\_RBF A>70 pair corrections 14.1
- 7a. Like 7 but Z=18 4.64

## 7a mode: best results down to Z=18

```
82Se (230.0 MeV/u) + C; **** Local line N = 48; Last Z=18
NP=64; SE: "DB1+Ca12"; Den: "auto"; GeomCor: "On";
Tunlg: "auto"; FisBar= #1; BarFac= 1.00; Modes=1010 1000 010
No Intrin.Thermalztn; LimitTemp: No; DB1="hfb22"; ParticleDistribution=Quality
```

N => Local: init=8 final=8; Total: init=233, final=233

TARGET VALUES: Initial 572.368 and Final 4.63657 LISE++ reduced values

Parameters :	LeftBound	<	Initial	<	RightBound	Final
1. Energy #a1	+9.0e+00	<	+1.5902e+01	<	+3.0e+01	+1.5841e+01
2. Energy #a2	-2.0e+00	<	+1.9400e-02	<	+2.0e+00	+1.5763e-02
3. Sigma #a1	+3.0e+00	<	+9.4273e+00	<	+2.0e+01	+9.4954e+00
4. Sigma #a2	-2.0e+00	<	-7.0620e-01	<	+2.0e+00	-7.6994e-01
5. AA CS-factor	+5.0e-02	<	+6.5210e-01	<	+1.5e+00	+6.8603e-01

Evaporation options dialog box showing various settings for the simulation, including evaporation distributions, decay modes, fission barrier, and state density models.

Settings of AUTO mode dialog box showing parameters for the effective Coulomb barrier, unbound nuclei, and state density.

# Changing distribution names in plots

One-dimensional Plot Drawing Methods

Line Thickness: 3

Draw

- Symbols
- Grids
- Errors
- "Slits"
- Block Labels

Draw Distribution

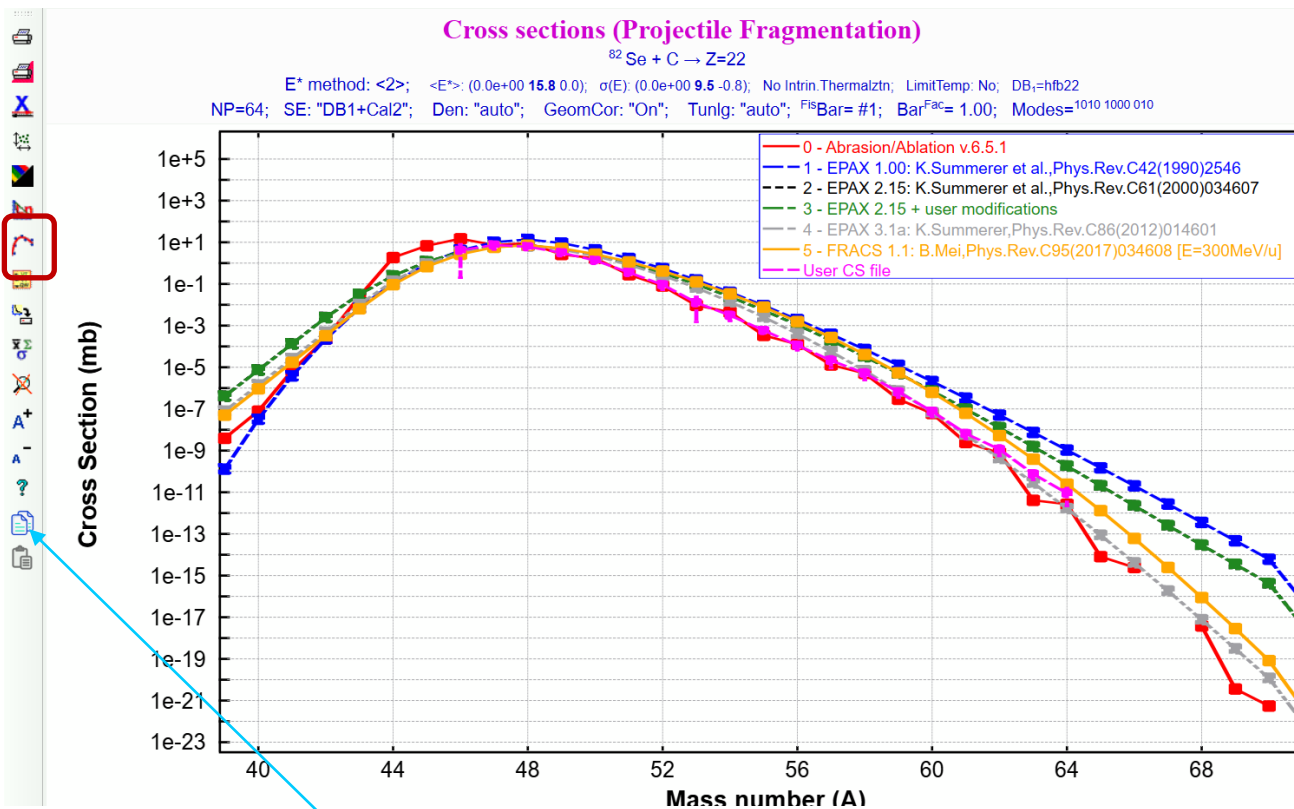
N' Plot: 1

Plot this distribution

6 Z22 User

- 0 - AZ22 AA
- 1 - Z22 EPAX1
- 2 - Z22 EPAX2
- 3 - Z22 EPAX 2.15 + user modifications
- 4 - EPAX 3.1a: K.Sum...Rev.C86(2012)014601
- 5 - Z22 FRACS
- 6 Z22 User

OK Cancel



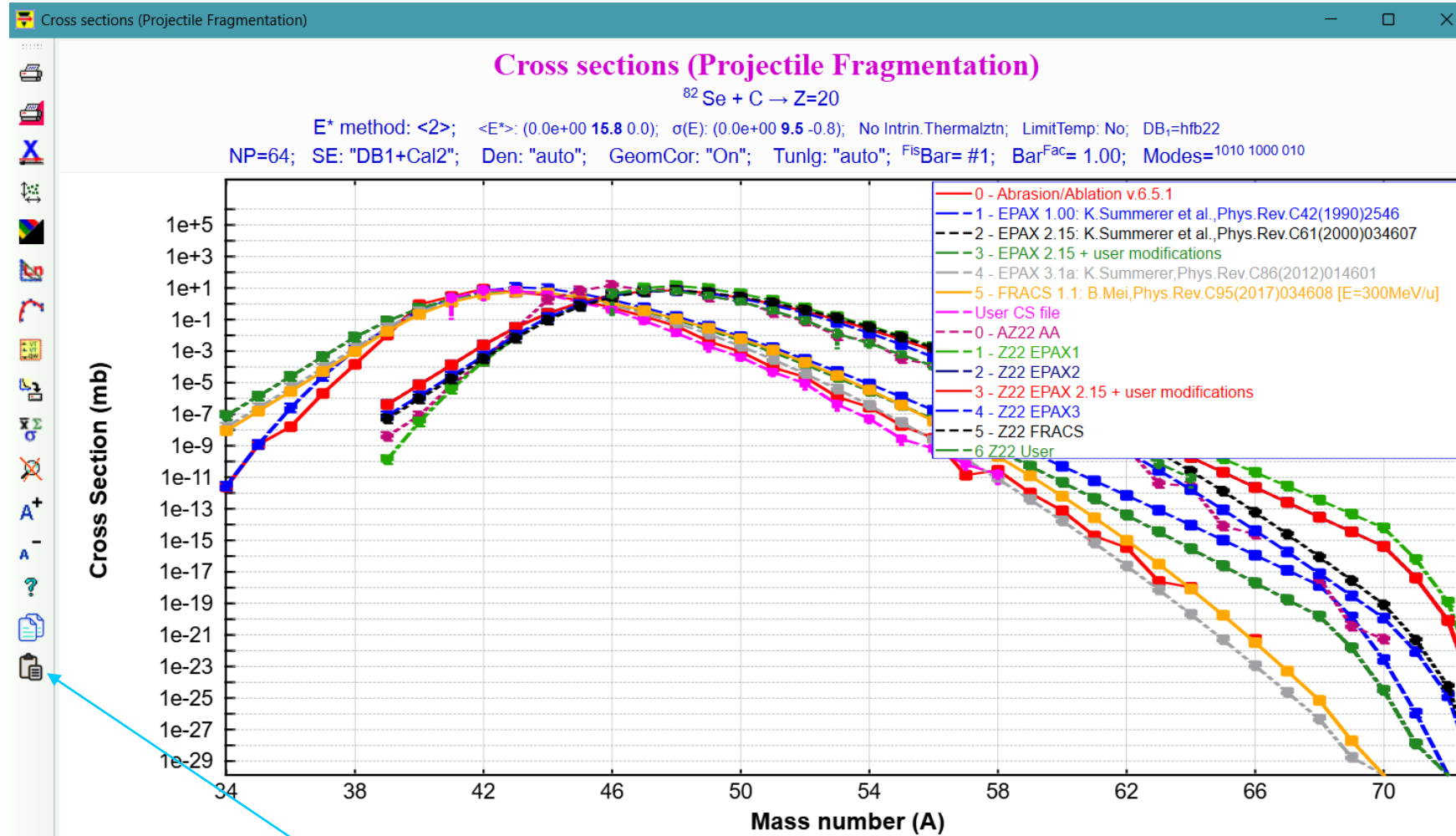
- 0 - AZ22 AA
- 1 - Z22 EPAX1
- 2 - Z22 EPAX2
- 3 - Z22 EPAX 2.15 + user modifications
- 4 - Z22 EPAX3
- 5 - Z22 FRACS
- 6 Z22 User

Copy these distributions to buffer



# Plot distribution copy-paste

Let's copy distributions from previous Z=22 plot to Z=20 plot



Paste distributions to buffer to the current plot. Z22 distributions were copied to Z20 plot.

## Wedge (PS\_wdg) position shift plot for BTS03 [<sup>32</sup>Al]

<sup>48</sup>Ca (197.8 MeV/u) + C (8 mm); Settings on <sup>32</sup>Al; Config: oD<sup>ds</sup>|<sup>d</sup>D|<sub>w</sub>DD|o<sup>b</sup>D|<sub>w</sub>D|<sub>w</sub>DD<sub>m</sub>|<sub>mmm</sub>

dp/p=2.87%; Wedge(s): Al<sub>939</sub>Zn<sub>25</sub>Mg<sub>29</sub> (1.49 mm), Al<sub>939</sub>Zn<sub>25</sub>Mg<sub>29</sub> (1.5 g/cm<sup>2</sup>), 0; Bp (Tm): 4.3645, 4.3645, 4.1960, 4.1960, 4.1960....

minimums after BTS03:  $\sigma(X) = 3.99$  mm ( $\langle X \rangle = +1.5$ ) at  $X_{wedge} = -0.3$  mm,  $\sigma(E) = 2.14$  MeV/u ( $\langle E \rangle = +0.5$ ) at  $X_{wedge} = -0.7$  mm

