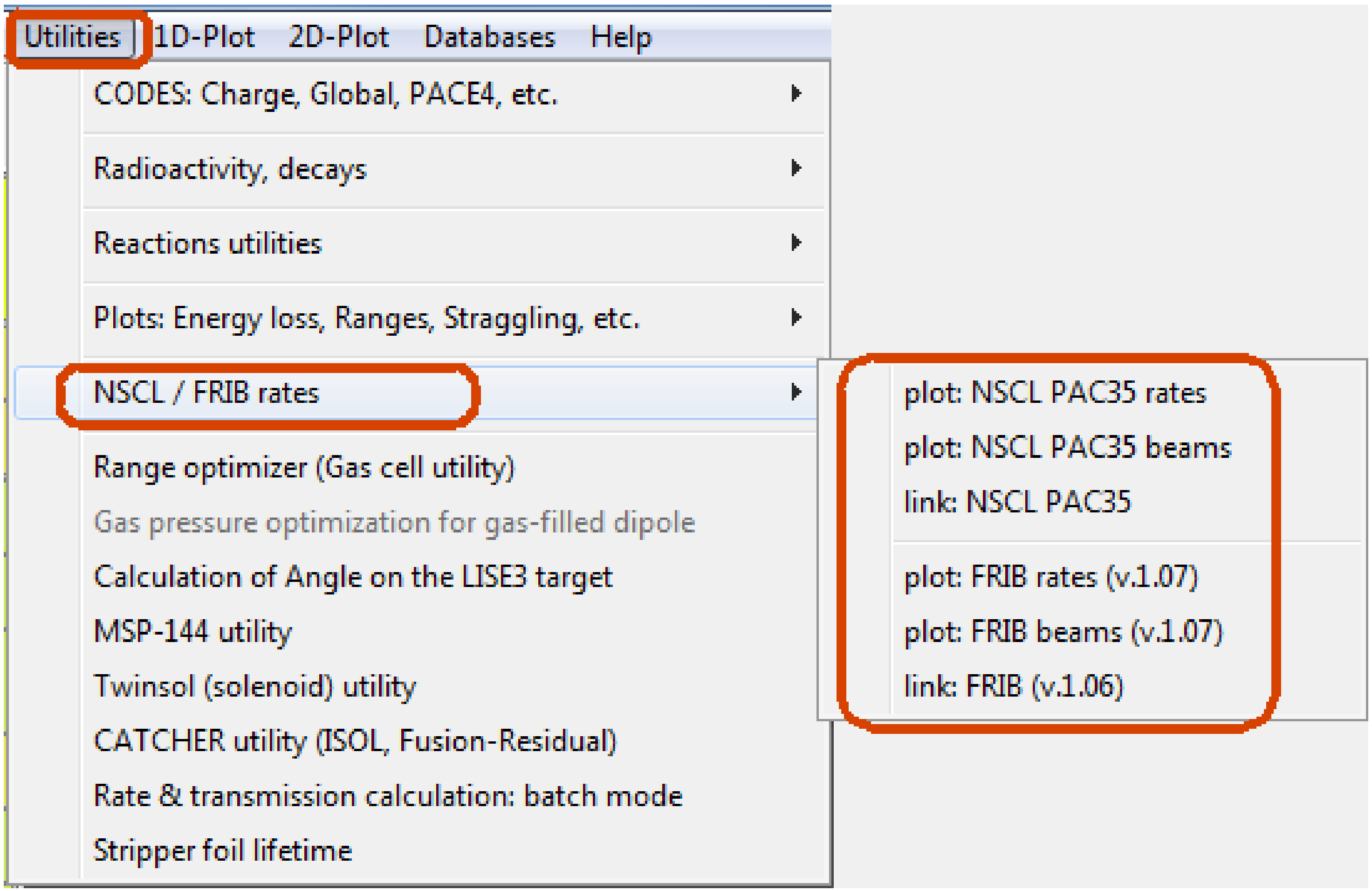
LISE^{++} : NSCL and FRIB rate plots

From 27.08.2012

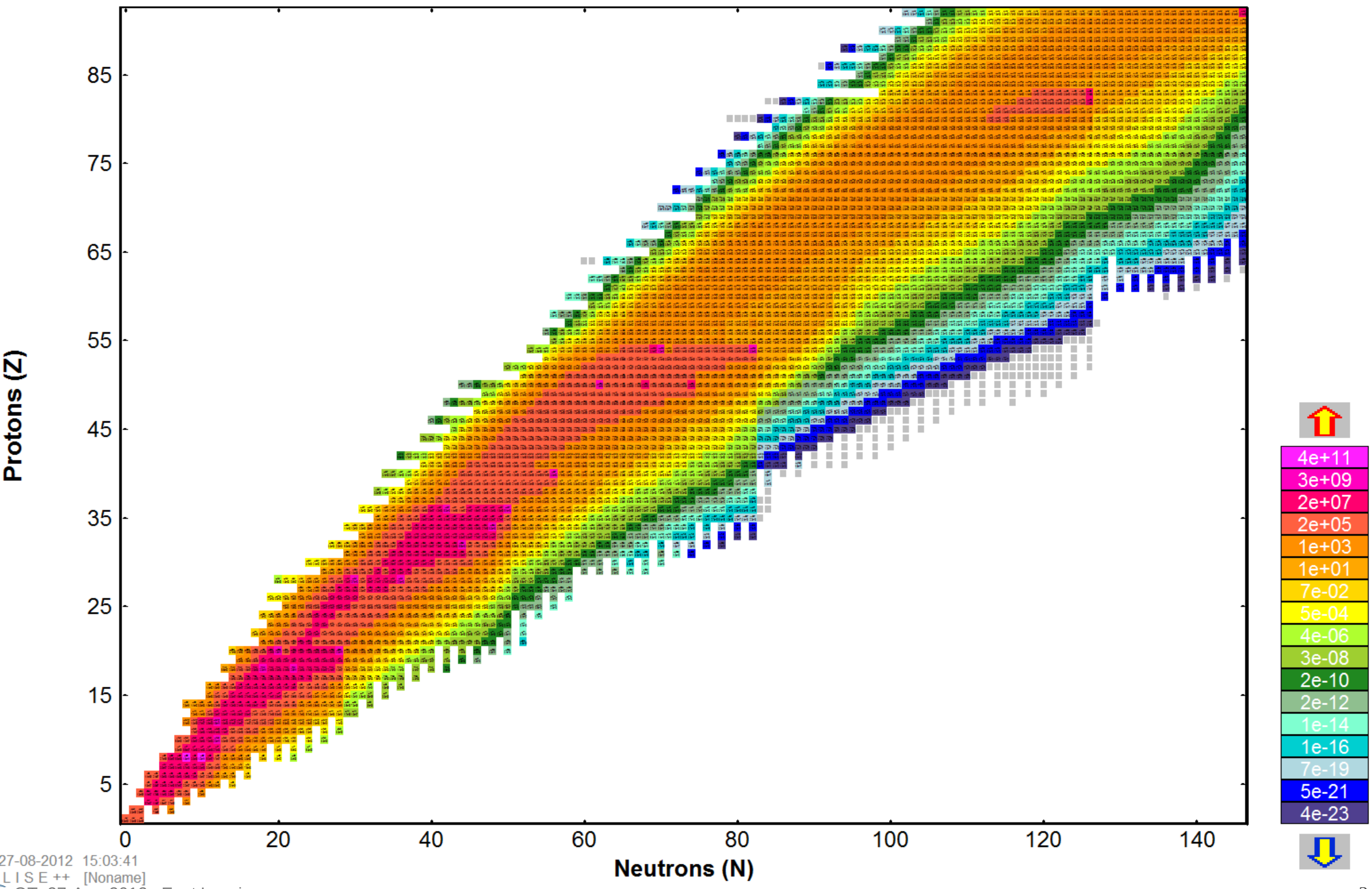
LISE^{++} version 9.4.34



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://lise.nscl.msu.edu

NSCL PAC35 rates (v.1.03)

https://groups.nscl.msu.edu/frib/rates/nscl_pac35_rates.html The rates are estimated based on the EPAX 2.15 cross section parameterization for fragmentation and the LISE++ 3EER model for in-flight fission. Primary beam intensities and energies have been used from the PAC35 beam list



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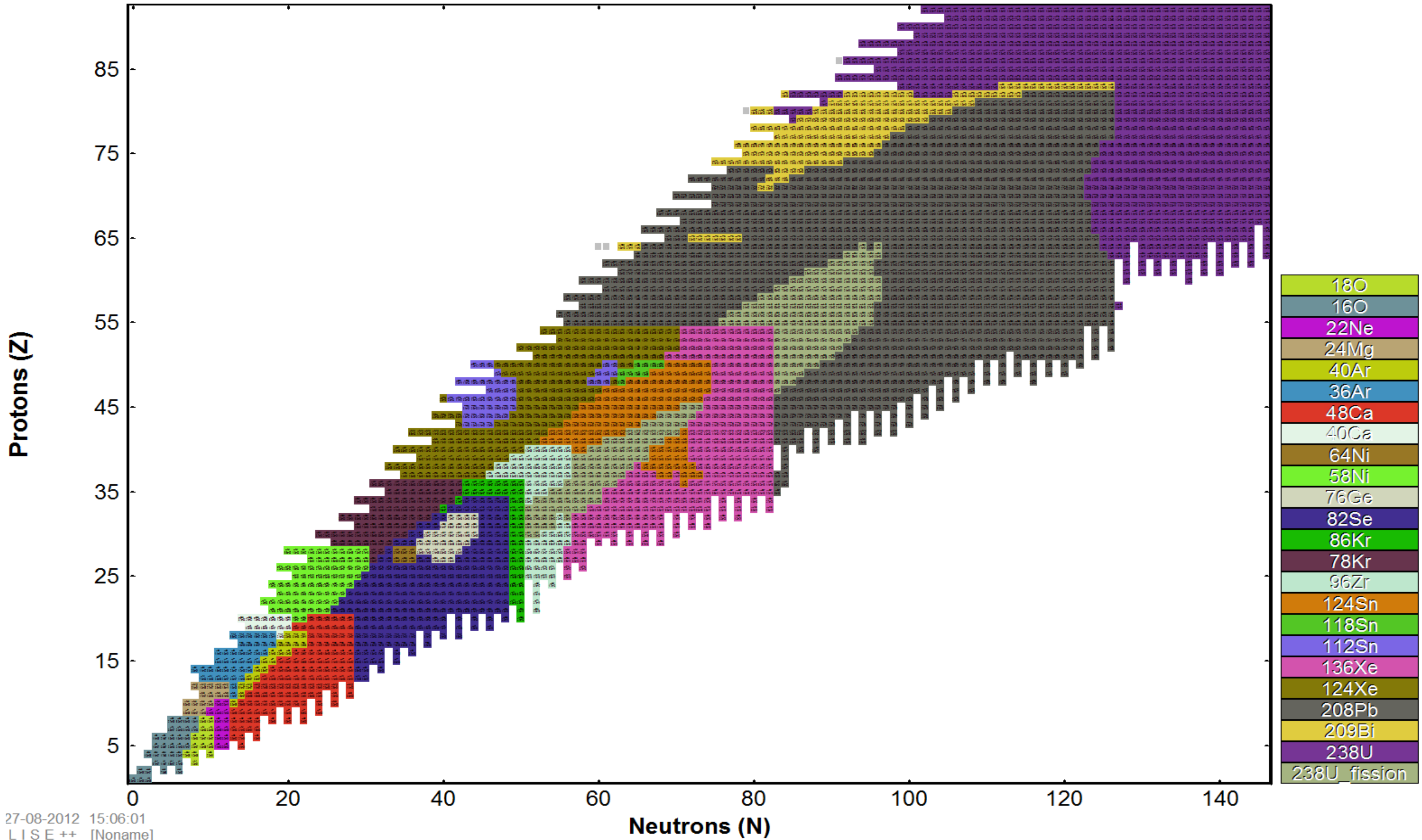
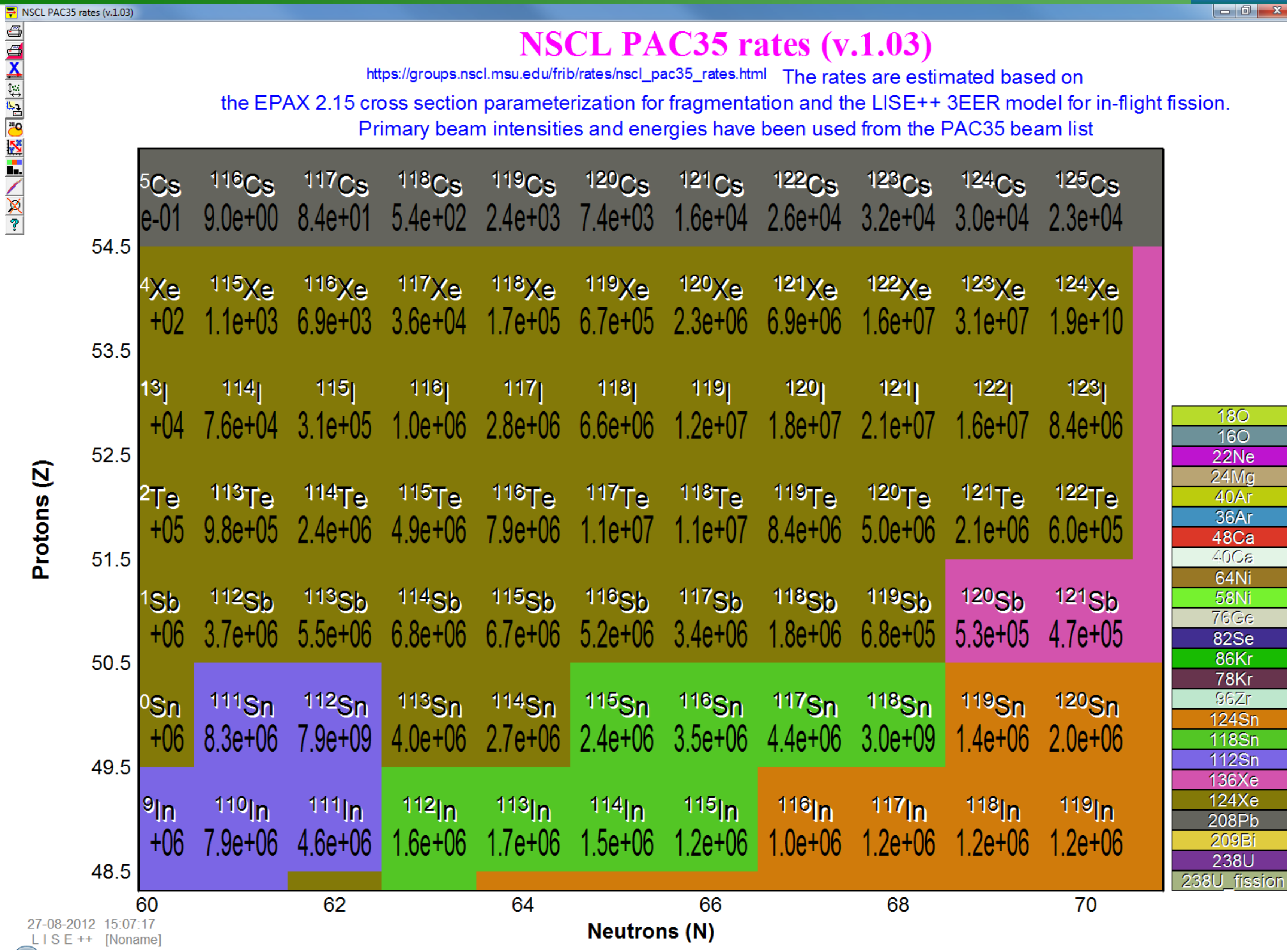
LISE++

NSCL PAC35 rates (v.1.03)

https://groups.nscl.msu.edu/frib/rates/nscl_pac35_rates.html The rates are estimated based on the EPAX 2.15 cross section parameterization for fragmentation and the LISE++ 3EER model for in-flight fission. Primary beam intensities and energies have been used from the PAC35 beam list

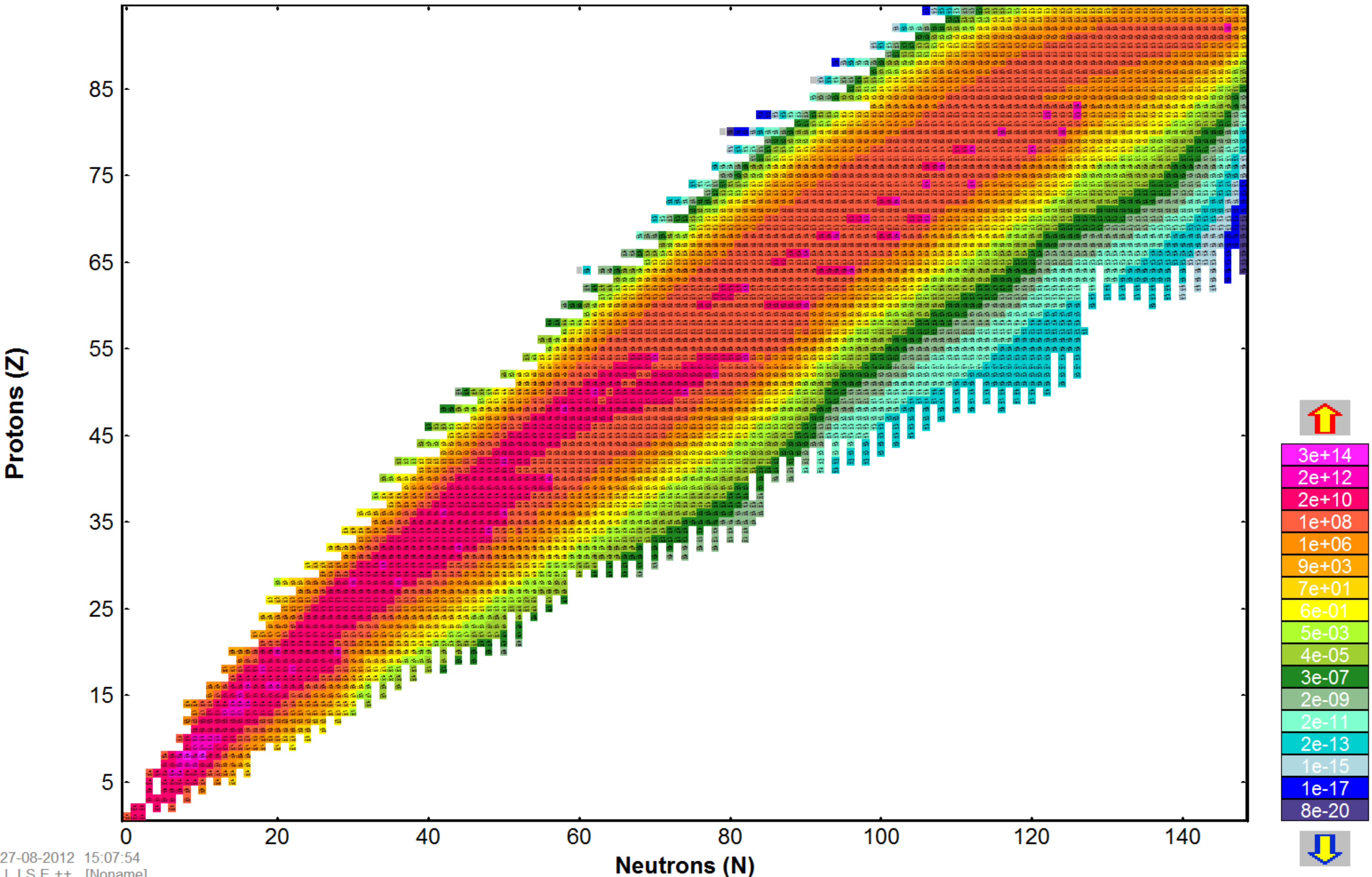


NSCL PAC 35 beams (zoom)



FRIB rates (v.1.07)

https://groups.nscl.msu.edu/frib/rates/fribrates.html The rates are estimated based on the EPAX 3.1 cross section parameterization for fragmentation and the LISE++ 3EER model for in-flight fission. Primary beam intensities and energies based on 400 kW and 200 MeV/u for ^{238}U



FRIB rates v.1.07 (zoom)

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FRIB rates (v.1.07)

FRIB rates (v.1.07)

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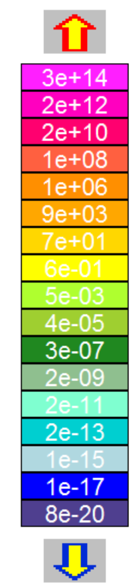
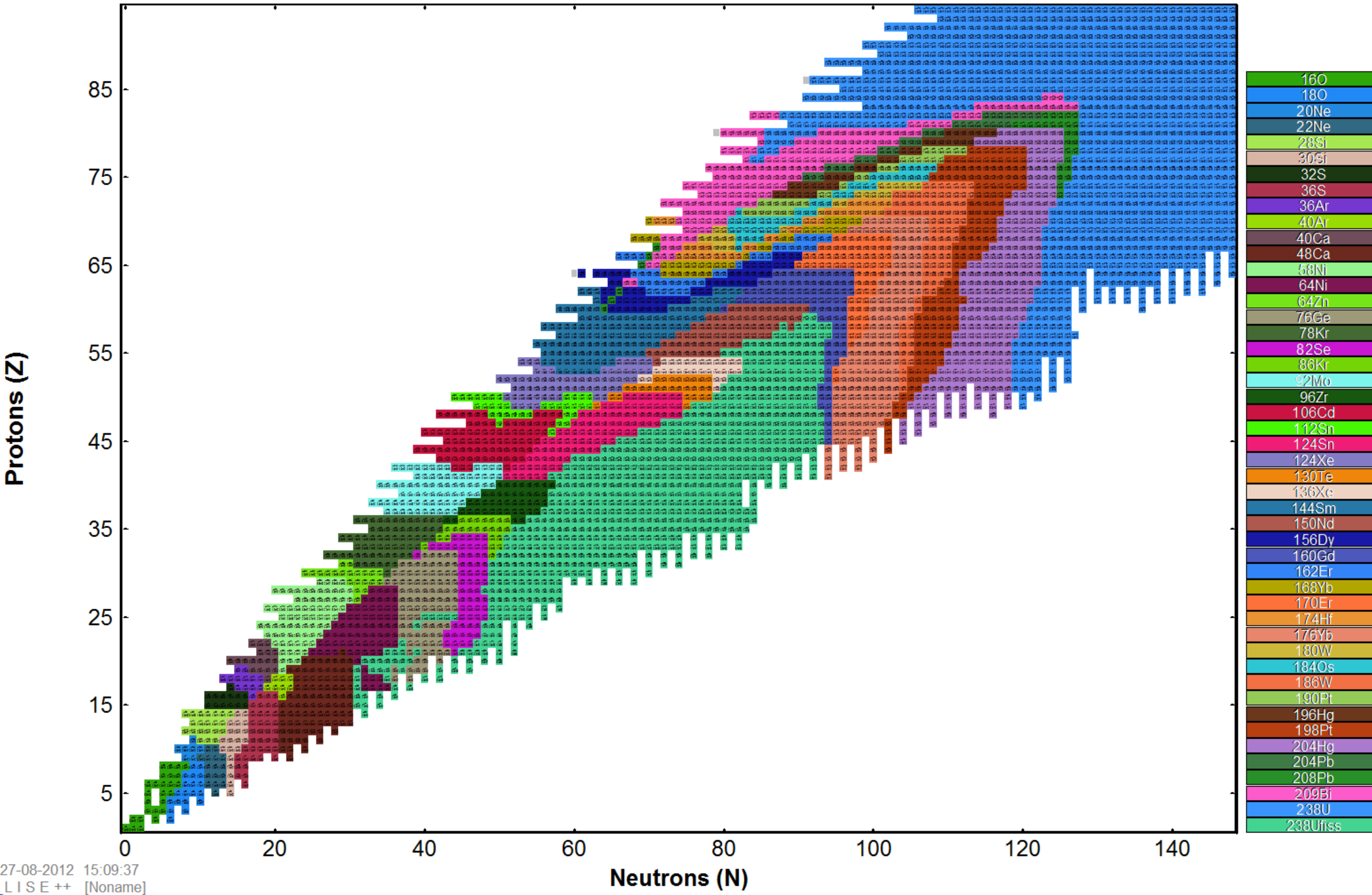
Protons (Z) \ Neutrons (N)	75		77		79		81		83		85		87		89		91
64	^{139}Gd 4.1e+07	^{140}Gd 1.9e+08	^{141}Gd 6.2e+08	^{142}Gd 1.6e+09	^{143}Gd 3.1e+09	^{144}Gd 5.1e+09	^{145}Gd 8.0e+09	^{146}Gd 1.2e+10	^{147}Gd 1.4e+10	^{148}Gd 1.4e+10	^{149}Gd 1.2e+10	^{150}Gd 8.6e+09	^{151}Gd 5.9e+09	^{152}Gd 8.0e+09	^{153}Gd 1.1e+10	^{154}Gd 1.3e+10	^{155}Gd 1.6e+10
	^{138}Eu 3.7e+08	^{139}Eu 1.1e+09	^{140}Eu 2.5e+09	^{141}Eu 4.4e+09	^{142}Eu 7.3e+09	^{143}Eu 1.0e+10	^{144}Eu 1.2e+10	^{145}Eu 1.1e+10	^{146}Eu 8.7e+09	^{147}Eu 6.1e+09	^{148}Eu 7.7e+09	^{149}Eu 9.4e+09	^{150}Eu 1.1e+10	^{151}Eu 1.2e+10	^{152}Eu 1.2e+10	^{153}Eu 1.2e+10	^{154}Eu 1.1e+10
62	^{137}Sm 1.8e+09	^{138}Sm 3.8e+09	^{139}Sm 6.3e+09	^{140}Sm 8.5e+09	^{141}Sm 1.8e+10	^{142}Sm 3.3e+10	^{143}Sm 4.4e+10	^{144}Sm 1.9e+13	^{145}Sm 7.6e+09	^{146}Sm 8.4e+09	^{147}Sm 8.7e+09	^{148}Sm 8.3e+09	^{149}Sm 7.5e+09	^{150}Sm 6.5e+09	^{151}Sm 5.4e+09	^{152}Sm 4.1e+09	^{153}Sm 3.0e+09
	^{136}Pm 5.2e+09	^{137}Pm 9.5e+09	^{138}Pm 1.7e+10	^{139}Pm 2.5e+10	^{140}Pm 2.9e+10	^{141}Pm 2.3e+10	^{142}Pm 1.2e+10	^{143}Pm 6.9e+09	^{144}Pm 6.5e+09	^{145}Pm 5.7e+09	^{146}Pm 4.8e+09	^{147}Pm 3.8e+09	^{148}Pm 3.0e+09	^{149}Pm 2.2e+09	^{150}Pm 1.5e+09	^{151}Pm 9.4e+08	^{152}Pm 5.5e+08
60	^{135}Nd 1.4e+10	^{136}Nd 1.9e+10	^{137}Nd 2.0e+10	^{138}Nd 1.6e+10	^{139}Nd 9.8e+09	^{140}Nd 5.7e+09	^{141}Nd 6.6e+09	^{142}Nd 9.2e+09	^{143}Nd 1.2e+10	^{144}Nd 1.6e+10	^{145}Nd 1.9e+10	^{146}Nd 2.3e+10	^{147}Nd 2.6e+10	^{148}Nd 2.8e+10	^{149}Nd 2.8e+10	^{150}Nd 1.8e+13	^{151}Nd 2.8e+08
	^{134}Pr 1.5e+10	^{135}Pr 1.2e+10	^{136}Pr 7.9e+09	^{137}Pr 6.4e+09	^{138}Pr 8.6e+09	^{139}Pr 1.1e+10	^{140}Pr 1.3e+10	^{141}Pr 1.4e+10	^{142}Pr 1.5e+10	^{143}Pr 1.4e+10	^{144}Pr 1.3e+10	^{145}Pr 1.1e+10	^{146}Pr 9.2e+09	^{147}Pr 6.8e+09	^{148}Pr 4.6e+09	^{149}Pr 2.7e+09	^{150}Pr 2.7e+07
58	^{133}Ce 6.7e+09	^{134}Ce 6.8e+09	^{135}Ce 8.4e+09	^{136}Ce 9.6e+09	^{137}Ce 1.0e+10	^{138}Ce 9.8e+09	^{139}Ce 8.9e+09	^{140}Ce 7.8e+09	^{141}Ce 6.4e+09	^{142}Ce 5.0e+09	^{143}Ce 3.6e+09	^{144}Ce 2.4e+09	^{145}Ce 1.5e+09	^{146}Ce 1.8e+09	^{147}Ce 3.6e+08	^{148}Ce 4.1e+08	^{149}Ce 4.4e+07
	^{132}La 7.6e+09	^{133}La 8.0e+09	^{134}La 7.6e+09	^{135}La 6.8e+09	^{136}La 5.7e+09	^{137}La 4.6e+09	^{138}La 3.5e+09	^{139}La 2.6e+09	^{140}La 1.8e+09	^{141}La 1.6e+09	^{142}La 9.4e+08	^{143}La 5.0e+08	^{144}La 4.1e+08	^{145}La 3.9e+08	^{146}La 9.4e+07	^{147}La 1.6e+08	^{148}La 3.6e+06
56	^{131}Ba 8.6e+09	^{132}Ba 7.2e+09	^{133}Ba 5.8e+09	^{134}Ba 4.4e+09	^{135}Ba 3.2e+09	^{136}Ba 2.2e+09	^{137}Ba 1.5e+09	^{138}Ba 9.3e+08	^{139}Ba 5.8e+08	^{140}Ba 4.4e+08	^{141}Ba 4.8e+08	^{142}Ba 7.5e+08	^{143}Ba 3.1e+08	^{144}Ba 8.2e+08	^{145}Ba 3.2e+07	^{146}Ba 3.0e+07	^{147}Ba 3.5e+06
	^{130}Cs 4.7e+09	^{131}Cs 3.4e+09	^{132}Cs 2.3e+09	^{133}Cs 1.5e+09	^{134}Cs 9.8e+08	^{135}Cs 6.6e+08	^{136}Cs 4.3e+08	^{137}Cs 5.7e+08	^{138}Cs 4.7e+08	^{139}Cs 8.2e+08	^{140}Cs 5.6e+08	^{141}Cs 5.3e+08	^{142}Cs 2.0e+08	^{143}Cs 7.7e+06	^{144}Cs 3.4e+07	^{145}Cs 2.8e+05	^{146}Cs 6.6e+04
54	^{129}Xe 1.6e+10	^{130}Xe 2.1e+10	^{131}Xe 2.5e+10	^{132}Xe 3.0e+10	^{133}Xe 3.4e+10	^{134}Xe 3.6e+10	^{135}Xe 3.6e+10	^{136}Xe 2.2e+13	^{137}Xe 3.8e+08	^{138}Xe 9.7e+07	^{139}Xe 8.0e+08	^{140}Xe 2.1e+07	^{141}Xe 1.3e+08	^{142}Xe 1.6e+07	^{143}Xe 7.9e+05	^{144}Xe 3.6e+03	^{145}Xe 6.2e+03
	^{128}I 2.6e+10	^{129}I 2.6e+10	^{130}I 2.4e+10	^{131}I 2.1e+10	^{132}I 1.7e+10	^{133}I 1.3e+10	^{134}I 8.6e+09	^{135}I 5.1e+09	^{136}I 2.2e+08	^{137}I 1.7e+08	^{138}I 1.3e+08	^{139}I 2.4e+06	^{140}I 9.8e+06	^{141}I 5.0e+04	^{142}I 4.8e+04	^{143}I 1.2e+02	^{144}I 4.1e+01
52	^{127}Te	^{128}Te	^{129}Te	^{130}Te	^{131}Te	^{132}Te	^{133}Te	^{134}Te	^{135}Te	^{136}Te	^{137}Te	^{138}Te	^{139}Te	^{140}Te	^{141}Te	^{142}Te	^{143}Te



27-08-2012 15:08:56
LISE++ [Noname]

FRIB rates (v.1.07)

https://groups.nscl.msu.edu/frib/rates/fribrates.html The rates are estimated based on the EPAX 3.1 cross section parameterization for fragmentation and the LISE++ 3EER model for in-flight fission. Primary beam intensities and energies based on 400 kW and 200 MeV/u for ^{238}U



FRIB rates (v.1.07)

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Protons (Z) \ Neutrons (N)	43		45		47		49		51		53		55		57		59		61
43	.1e+04	6.4e+05	2.1e+07	3.6e+08	3.2e+09	1.5e+10	3.9e+10	6.2e+10	6.0e+10	3.8e+10	1.8e+10	2.1e+10	1.9e+10	1.4e+10	9.2e+09	5.4e+09	3.0e+09	1.7e+09	1.3e+09
	^{5}Mo .6e+06	^{86}Mo 3.4e+07	^{87}Mo 5.5e+08	^{88}Mo 4.4e+09	^{89}Mo 2.5e+10	^{90}Mo 1.1e+11	^{91}Mo 2.8e+11	^{92}Mo 6.5e+13	^{93}Mo 2.7e+10	^{94}Mo 2.0e+10	^{95}Mo 2.0e+10	^{96}Mo 1.6e+10	^{97}Mo 1.0e+10	^{98}Mo 6.2e+09	^{99}Mo 3.3e+09	^{100}Mo 1.6e+09	^{101}Mo 8.9e+08	^{102}Mo 1.1e+09	^{103}Mo 3.7e+08
41	^{84}Nb .5e+08	^{85}Nb 1.7e+09	^{86}Nb 1.2e+10	^{87}Nb 5.1e+10	^{88}Nb 1.4e+11	^{89}Nb 2.4e+11	^{90}Nb 1.9e+11	^{91}Nb 6.6e+10	^{92}Nb 2.0e+10	^{93}Nb 1.7e+10	^{94}Nb 1.2e+10	^{95}Nb 7.4e+09	^{96}Nb 4.1e+09	^{97}Nb 2.0e+09	^{98}Nb 1.1e+09	^{99}Nb 1.4e+09	^{100}Nb 1.0e+09	^{101}Nb 9.5e+08	^{102}Nb 4.0e+08
	^{83}Zr .0e+09	^{84}Zr 2.2e+10	^{85}Zr 7.2e+10	^{86}Zr 1.5e+11	^{87}Zr 1.8e+11	^{88}Zr 1.2e+11	^{89}Zr 4.6e+10	^{90}Zr 4.7e+10	^{91}Zr 8.2e+10	^{92}Zr 1.3e+11	^{93}Zr 1.8e+11	^{94}Zr 2.3e+11	^{95}Zr 2.7e+11	^{96}Zr 7.0e+13	^{97}Zr 2.6e+09	^{98}Zr 6.0e+08	^{99}Zr 6.4e+08	^{100}Zr 8.4e+08	^{101}Zr 2.0e+08
39	^{82}Y .2e+10	^{83}Y 8.5e+10	^{84}Y 1.4e+11	^{85}Y 1.3e+11	^{86}Y 8.0e+10	^{87}Y 5.8e+10	^{88}Y 9.1e+10	^{89}Y 1.2e+11	^{90}Y 1.5e+11	^{91}Y 1.5e+11	^{92}Y 1.3e+11	^{93}Y 9.7e+10	^{94}Y 6.3e+10	^{95}Y 3.3e+10	^{96}Y 5.9e+08	^{97}Y 5.3e+08	^{98}Y 5.7e+08	^{99}Y 3.4e+08	^{100}Y 8.2e+07
	^{81}Sr .1e+10	^{82}Sr 1.2e+11	^{83}Sr 9.8e+10	^{84}Sr 5.3e+10	^{85}Sr 8.2e+10	^{86}Sr 1.0e+11	^{87}Sr 1.1e+11	^{88}Sr 9.4e+10	^{89}Sr 7.2e+10	^{90}Sr 5.0e+10	^{91}Sr 3.0e+10	^{92}Sr 1.6e+10	^{93}Sr 6.7e+09	^{94}Sr 2.1e+09	^{95}Sr 2.5e+08	^{96}Sr 3.4e+08	^{97}Sr 1.2e+08	^{98}Sr 8.3e+07	^{99}Sr 4.1e+06
37	^{80}Rb .0e+11	^{81}Rb 7.1e+10	^{82}Rb 6.9e+10	^{83}Rb 8.6e+10	^{84}Rb 8.5e+10	^{85}Rb 7.0e+10	^{86}Rb 5.1e+10	^{87}Rb 3.2e+10	^{88}Rb 1.9e+10	^{89}Rb 1.0e+10	^{90}Rb 4.6e+09	^{91}Rb 1.7e+09	^{92}Rb 5.2e+08	^{93}Rb 2.2e+08	^{94}Rb 1.1e+08	^{95}Rb 8.6e+07	^{96}Rb 2.0e+07	^{97}Rb 6.3e+06	^{98}Rb 4.0e+05
	^{79}Kr .4e+10	^{80}Kr 7.3e+10	^{81}Kr 9.3e+10	^{82}Kr 1.6e+11	^{83}Kr 2.4e+11	^{84}Kr 3.2e+11	^{85}Kr 3.8e+11	^{86}Kr 9.1e+13	^{87}Kr 3.8e+09	^{88}Kr 1.4e+09	^{89}Kr 4.9e+08	^{90}Kr 3.8e+08	^{91}Kr 1.3e+08	^{92}Kr 5.6e+07	^{93}Kr 1.8e+07	^{94}Kr 8.0e+06	^{95}Kr 2.1e+06	^{96}Kr 1.9e+05	^{97}Kr 1.3e+04
35	^{78}Br .0e+11	^{79}Br 1.6e+11	^{80}Br 2.0e+11	^{81}Br 2.2e+11	^{82}Br 1.9e+11	^{83}Br 1.5e+11	^{84}Br 9.7e+10	^{85}Br 5.0e+10	^{86}Br 5.0e+08	^{87}Br 3.5e+08	^{88}Br 2.3e+08	^{89}Br 1.5e+08	^{90}Br 3.1e+07	^{91}Br 1.1e+07	^{92}Br 1.4e+06	^{93}Br 3.9e+05	^{94}Br 5.6e+04	^{95}Br 2.6e+03	^{96}Br 2.0e+02
	^{77}Se .6e+11	^{78}Se 2.0e+11	^{79}Se 2.9e+11	^{80}Se 3.8e+11	^{81}Se 4.6e+11	^{82}Se 9.6e+13	^{83}Se 1.1e+10	^{84}Se 3.2e+09	^{85}Se 8.4e+07	^{86}Se 1.5e+08	^{87}Se 4.3e+07	^{88}Se 1.9e+07	^{89}Se 2.5e+06	^{90}Se 4.3e+05	^{91}Se 4.2e+04	^{92}Se 4.6e+03	^{93}Se 6.1e+02	^{94}Se 6.0e+01	^{95}Se 9.2e+00
33	^{76}As .4e+11	^{77}As 2.5e+11	^{78}As 2.2e+11	^{79}As 1.7e+11	^{80}As 1.1e+11	^{81}As 5.7e+10	^{82}As 8.2e+08	^{83}As 1.7e+08	^{84}As 2.4e+07	^{85}As 2.9e+07	^{86}As 5.4e+06	^{87}As 1.6e+06	^{88}As 1.1e+05	^{89}As 1.0e+04	^{90}As 7.6e+02	^{91}As 1.1e+02	^{92}As 2.0e+01	^{93}As 4.0e+00	^{94}As 8.9e-01
	^{75}Ge .7e+11	^{76}Ge 1.1e+14	^{77}Ge 5.4e+10	^{78}Ge 2.8e+10	^{79}Ge 1.1e+10	^{80}Ge 3.4e+09	^{81}Ge 5.1e+07	^{82}Ge 2.0e+07	^{83}Ge 3.8e+06	^{84}Ge 2.4e+06	^{85}Ge 2.0e+05	^{86}Ge 4.2e+04	^{87}Ge 2.3e+03	^{88}Ge 1.9e+02	^{89}Ge 2.5e+01	^{90}Ge 8.2e+00	^{91}Ge 1.8e+00	^{92}Ge 4.7e-01	^{93}Ge 5.0e-02
31	^{74}Ga .6e+11	^{75}Ga 7.7e+10	^{76}Ga 7.6e+09	^{77}Ga 2.8e+09	^{78}Ga 8.1e+08	^{79}Ga 1.6e+08	^{80}Ga 4.2e+06	^{81}Ga 2.8e+06	^{82}Ga 3.1e+05	^{83}Ga 1.2e+05	^{84}Ga 1.4e+04	^{85}Ga 8.1e+02	^{86}Ga 1.4e+02	^{87}Ga 9.9e+00	^{88}Ga 2.7e+00	^{89}Ga 8.9e-01	^{90}Ga 1.2e-01	^{91}Ga 2.5e-02	^{92}Ga 5.8e-03

- 16O
- 18O
- 20Ne
- 22Ne
- 28Si
- 30Si
- 32S
- 36S
- 36Ar
- 40Ar
- 40Ca
- 48Ca
- 58Ni
- 64Ni
- 64Zn
- 76Ge
- 78Kr
- 82Se
- 86Kr
- 92Mo
- 96Zr
- 106Cd
- 112Sn
- 124Sn
- 124Xe
- 130Te
- 136Xe
- 144Sm
- 150Nd
- 156Dy
- 160Gd
- 162Er
- 168Yb
- 170Er
- 174Hf
- 176Yb
- 180W
- 184Os
- 186W
- 190Pt
- 196Hg
- 198Pt
- 204Hg
- 204Pb
- 208Pb
- 209Bi
- 238U
- 238Ufiss

Links for NSCL PAC35 and FRIB

https://groups.nscl.msu.edu/frib/rates/nscl_pac35_rates.html

Enter values for A and Z

A	120	
Z	50	
N	70	
	Sn	
$T_{1/2}$	3.403e+38	sec
	Calculate Yield	

Beam

AZ	124Sn	
Energy	120	MeV/u

Fragment

Yield	1.99e+6	pps
Energy	85.2	MeV/u
B_ρ (Q=Z)	3.262	Tm
PAC35 rates at GS	1.59e+6	pps
Stopped-beam rate	6.75e+5	pps
Reaccelerated-beam rate	1.51e+5	pps

NSCL

NSCL Rates Version 1.03

PAC35

by G.Bollen, B.M.Sherrill, O.B.Tarasov

A). The rates are estimated based on the EPAX 2.15[1] cross section parameterization for fragmentation and the LISE++ 3EER model[2,3] for in-flight fission.
B). Reaccelerated and stopped beam rates above 1E+6 are very uncertain. The use of solid catchers may yield higher rates in some cases.
C). Estimated rates may change as the various assumptions are tested and refined.
D). Primary beam intensities and energies have been used from the PAC35 beam list

[1] - K. Sümmerer and B. Blank, Phys. Rev. C 61 (2000) 034607.
[2] - O.B.Tarasov and D.Bazin, NIM B 266 (2008) 4657-466.
[3] - O.B. Tarasov, "LISE++ development: Abrasion-Fission", Tech.Rep. MSUCL1300, NSCL, Michigan State University 2005.
[4] - H. Koura, T. Tachibana, M. Uno, and M. Yamada, Prog.Theo. Phys. 113, 305 (2005).

For further information regarding these calculations, please refer to the NSCL-PAC35 readme file (PDF - 205 kB).

Applet created by Dennis Wey.

Links for NSCL PAC35 and FRIB

https://groups.nscl.msu.edu/frib/rates/fribrates.html

Enter values for A and Z

A	120	
Z	50	
N	70	
	Sn	
$T_{1/2}$	1.000e+20	sec
	Calculate Yield	

Beam

AZ	124Sn	
Energy	221.7	MeV/u

Fragment

Energy	175.6	MeV/u
B_{ρ} (Q=Z)	4.790	Tm
Fast beam rate	4.42e+10	pps
Stopped beam rate	3.53e+8	pps
Reaccelerated beam rate	9.89e+7	pps

FRIB

FRIB Estimated Rates Version 1.06

02/07/2011

A). The rates are estimated based on the EPAX 2.15[1] cross section parameterization for fragmentation and the LISE++ 3EER model[2,3] for in-flight fission.
B). Reaccelerated and stopped beam rates above 1E+9 are very uncertain. The use of solid catchers may yield higher rates in some cases.
C). Estimated rates may change as the various assumptions are tested and refined.

[1] - K. Sümmerer and B. Blank, Phys. Rev. C 61 (2000) 034607.
[2] - O.B.Tarasov and D.Bazin, NIM B 266 (2008) 4657-466.
[3] - O.B. Tarasov, "LISE++ development: Abrasion-Fission", Tech.Rep. MSUCL1300, NSCL, Michigan State University 2005.

For further information regarding these calculations, please refer to the readme file (PDF - 420 kB).