

Scattering radius uncertainty in MF32: Problem and a solution

D. Rochman

*Nuclear Research and Consultancy Group,
NRG, Petten, The Netherlands*

Port Jefferson, June 23, 2009

① Problem:

⇒ *Not considered in the ENDF-6 format*

② Example:

⇒ *Impact on (n,tot) and (n,el)*

③ A solution

⇒ *One number more*

④ Examples:

⇒ *on ^{234}U*

⑤ Conclusions

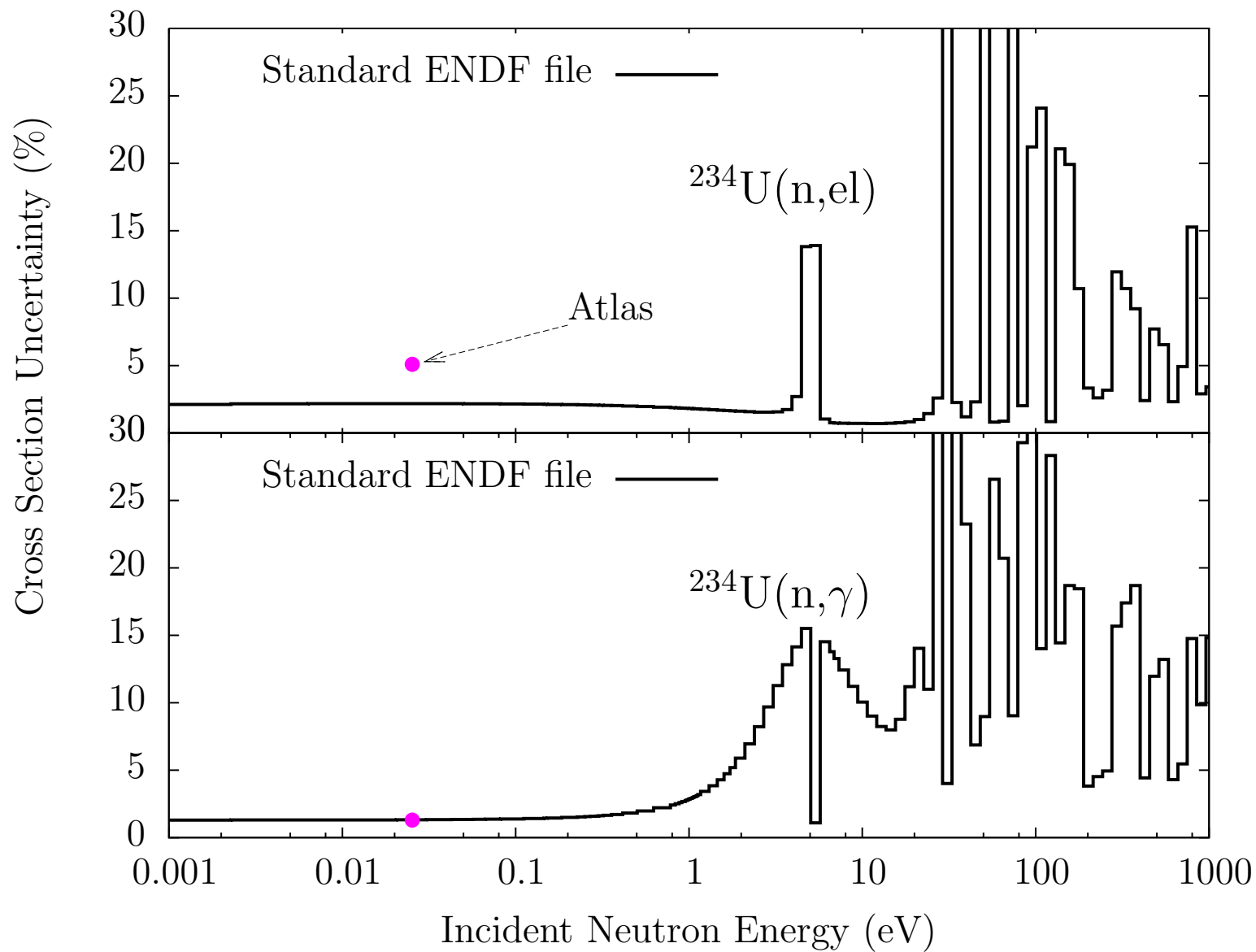
Problem: $\Delta R'$ not in ENDF files



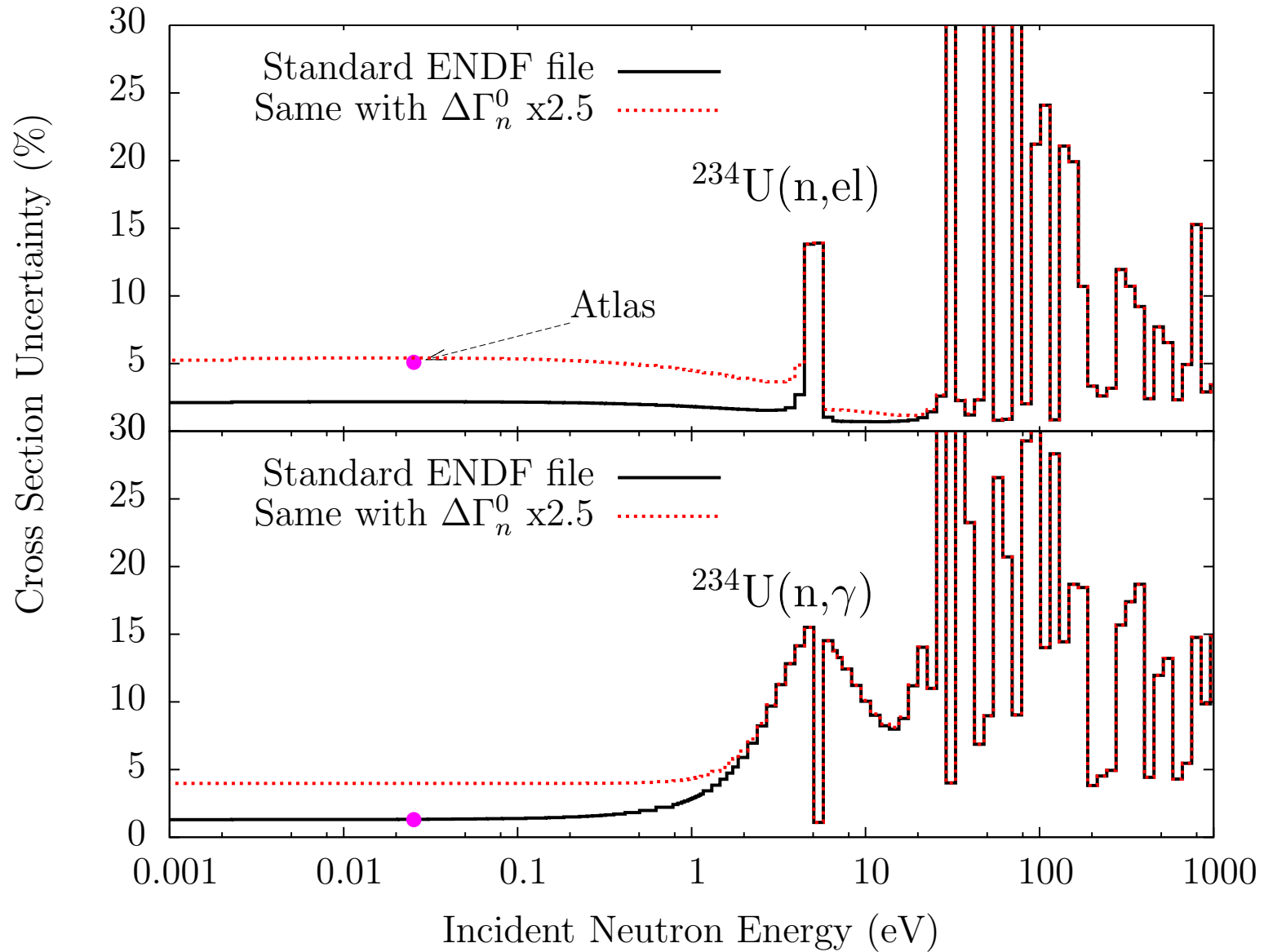
As $\Delta R'$ is not included in evaluation files,

- ☞ Underestimation of (n,el) and (n,tot) cross section uncertainties in the thermal range
- ☞ Underestimation of (n,el) and (n,tot) cross section uncertainties between resonances
- ☞ Unsatisfactory solution:
 - ☹ Increase $\Delta\Gamma_n$ of the bound resonance
⇒ consequences on (n,f) and (n, γ)
 - ☹ Extend MF33 with a "background uncertainty" in the resonance range
⇒ eliminates resonance correlations

Example with ^{234}U : No scattering radius uncertainty



Example with ^{234}U : No scattering radius uncertainty



A solution: with scattering radius uncertainty



```
7.400000+6 4.597681-1 7.600000+6 4.554431-1 7.800000+6 4.561228-19225 9102 50
8.000000+6 4.524165-1 8.500000+6 4.475220-1 9.000000+6 4.417075-19225 9102 51
9.500000+6 4.356091-1 1.000000+7 4.278909-1 1.050000+7 4.198184-19225 9102 52
1.100000+7 4.103454-1 1.150000+7 4.010591-1 1.200000+7 3.939833-19225 9102 53
1.250000+7 3.857292-1 1.300000+7 3.780921-1 1.350000+7 3.719292-19225 9102 54
1.400000+7 3.673125-1 1.450000+7 3.613111-1 1.500000+7 3.581626-19225 9102 55
1.600000+7 3.550122-1 1.700000+7 3.530830-1 1.800000+7 3.514939-19225 9102 56
1.900000+7 3.519404-1 2.000000+7 3.527481-1 9225 9102 57
0.000000+0 0.000000+0 0 0 0 09225 9 099999
0.000000+0 0.000000+0 0 0 0 09225 0 0 0
9.223400+4 2.320304+2 0 0 1 0922532151 1
9.223400+4 1.000000+0 0 1 1 0922532151 2
1.000000-5 1.493000+3 1 3 0 1922532151 3
0.000000+0 8.303910-1 0 2 4 0922532151 4
2.320304+2 3.000000-2 0 0 1428 119922532151 5
-2.210000+0 5.000000-1 8.464740-3 1.956000-2 5.160000-5 0.000000+0922532151 6
1.105000-3 0.000000+0 2.000000-4 3.780000-4 5.000000-6 0.000000+0922532151 7
5.160000+0 5.000000-1 3.920000-3 2.460000-2 1.251000-5 0.000000+0922532151 8
1.000000-2 0.000000+0 2.000000-5 3.800000-3 1.320000-6 0.000000+0922532151 9
2.274000+1 5.000000-1 1.800000-5 2.460000-2 7.820000-6 0.000000+0922532151 10
2.000000-2 0.000000+0 2.000000-6 1.230000-2 2.500000-6 0.000000+0922532151 11
2.342000+1 5.000000-1 1.600000-4 2.460000-2 2.070000-6 0.000000+0922532151 12
2.000000-2 0.000000+0 2.000000-5 1.230000-2 5.600000-7 0.000000+0922532151 13
3.113000+1 5.000000-1 7.200000-3 2.460000-2 5.870000-6 0.000000+0922532151 14
3.000000-2 0.000000+0 8.000000-4 1.230000-2 7.500000-7 0.000000+0922532151 15
```



Snapshot of an ENDF file for ^{234}U

A solution: with scattering radius uncertainty



7.400000+6	4.597681-1	7.600000+6	4.554431-1	7.800000+6	4.561228-19225	9102	50
8.000000+6	4.524165-1	8.500000+6	4.475220-1	9.000000+6	4.417075-19225	9102	51
9.500000+6	4.356091-1	1.000000+7	4.278909-1	1.050000+7	4.198184-19225	9102	52
1.100000+7	4.103454-1	1.150000+7	4.010591-1	1.200000+7	3.939833-19225	9102	53
1.250000+7	3.857292-1	1.300000+7	3.780921-1	1.350000+7	3.719292-19225	9102	54
1.400000+7	3.673125-1	1.450000+7	3.613111-1	1.500000+7	3.581626-19225	9102	55
1.600000+7	3.550122-1	1.700000+7	3.530830-1	1.800000+7	3.514939-19225	9102	56
1.900000+7	3.519404-1	2.000000+7	3.527481-1		9225	9102	57
0.000000+0	0.000000+0	0	0	0	09225	9	099999
0.000000+0	0.000000+0	0	0	0	09225	0	0
9.223400+4	2.320304+2	0	0	1	0922532151		1
9.223400+4	1.000000+0	0	1	1	0922532151		2
1.000000-5	1.493000+3	1	3	0	1922532151		3
0.000000-9	8.303910-1	0	2	4	0922532151		4
2.320304+2	3.000000-2	0	0	1428	119922532151		5
-2.210000-0	5.000000-1	8.464740-3	1.956000-2	5.160000-5	0.000000+0922532151		6
1.105000-3	0.000000+0	2.000000-4	3.780000-4	5.000000-6	0.000000+0922532151		7
5.160000+0	5.000000-1	3.920000-3	2.460000-2	1.251000-5	0.000000+0922532151		8
1.000000-2	0.000000+0	2.000000-5	3.800000-3	1.320000-6	0.000000+0922532151		9
2.274000+1	5.000000-1	1.800000-5	2.460000-2	7.820000-6	0.000000+0922532151		10
2.000000-2	0.000000+0	2.000000-6	1.230000-2	2.500000-6	0.000000+0922532151		11
2.342000+1	5.000000-1	1.600000-4	2.460000-2	2.070000-6	0.000000+0922532151		12
2.000000-2	0.000000+0	2.000000-5	1.230000-2	5.600000-7	0.000000+0922532151		13
3.113000+1	5.000000-1	7.200000-3	2.460000-2	5.870000-6	0.000000+0922532151		14
3.000000-2	0.000000+0	8.000000-4	1.230000-2	7.500000-7	0.000000+0922532151		15

R'

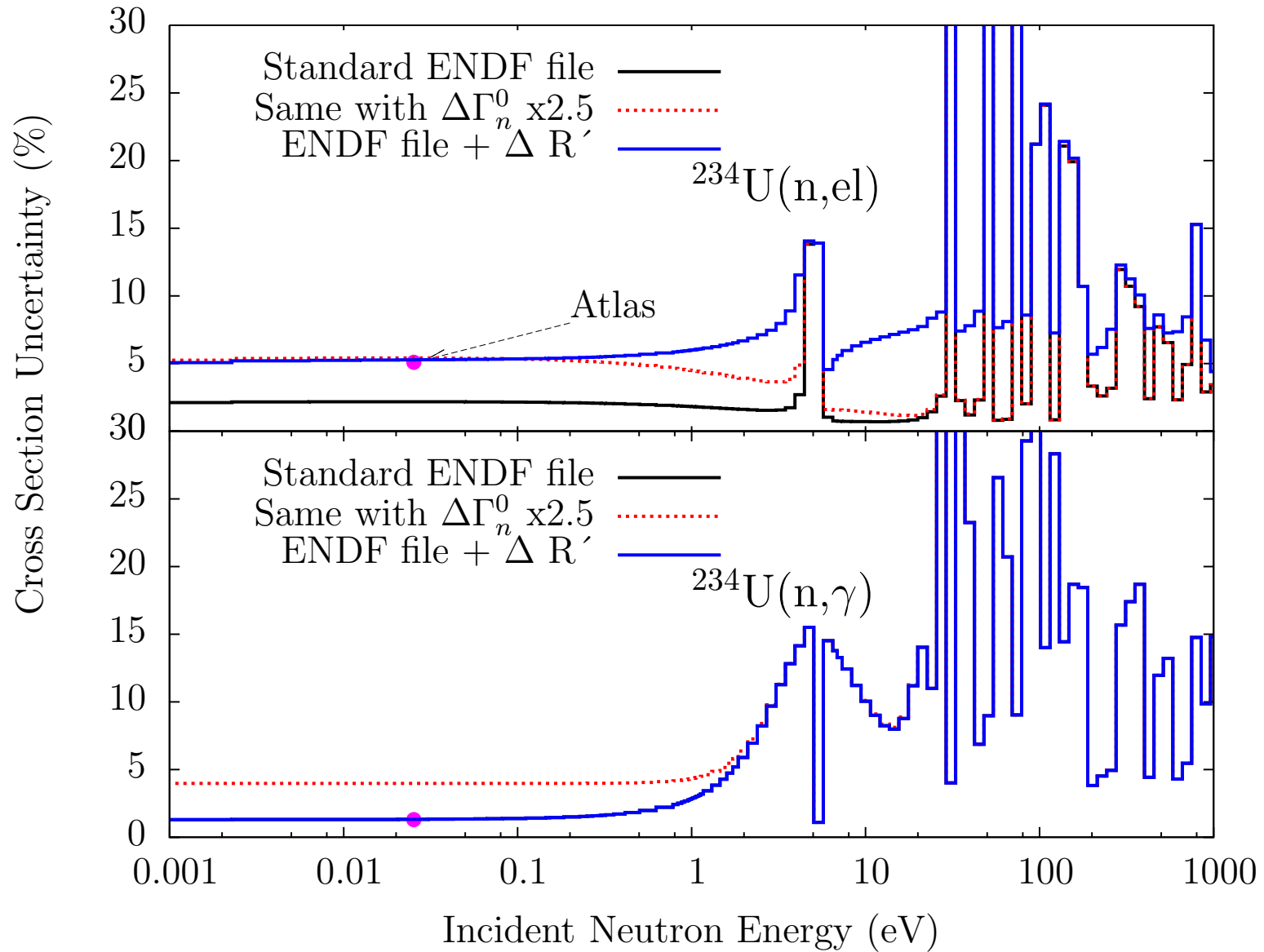
$\Delta R'$

MF32 with $\Delta R'$

Snapshot of an ENDF file for ^{234}U

$\Delta R'$ at line 5, column 2 for MLBW and RM

A solution: with scattering radius uncertainty for ^{234}U



Unofficial update for NJOY at www.nea.fr/html/dbprog/njoy-links.html



[Home](#) [About Us](#) [Work Areas](#) [Data Bank](#) [Publications](#) [Press Room](#) [Search](#)

Home > Data Bank > Computer program services

Links to NJOY Web pages and Sites

NJOY: Data Processing System of Evaluated Nuclear Data Files in ENDF format.

Recent Unofficial Updates at the NEA Data Bank

- [upnea049_up296 recommended updates to NJOY99.296](#) (2 May 2009)

Official Updates (LANL)

- [official up296 patch for NJOY99](#) (1 May 2009)

Archived Unofficial Updates and comments at the NEA Data Bank

Through interaction with Dimitri Rochman and Go Chiba, the following patches have been added:

- upnea047 (Go Chiba) fix processing of fission width uncertainties in Reich-Moore compact format representation and uncertainties in MLBW compact format representation.
- upnea048 (Go Chiba) include the contribution from the uncertainty of the scattering radius. Note: this is a trial patch because the format for storing the scattering radius uncertainty has not yet been officially approved.
- upnea049 (A. Trkov) trivial corrections to keep the compilers happy.

Conclusions



- ☒ Solution to include $\Delta R'$ in MF32
- ☒ NJOY99.296 update available (upnea049) from A. Trkov on the NEA website
- ☒ Mass production tested
(TENDL-2008 and TENDL-2009 libraries with $\Delta R'$) from ^{19}F to $Z = 110$
(all **actinides** included with MF32, MF33 and MF34 in TENDL-2009)

☺ Many thanks to Go Chiba and Andrej Trkov ☺