

VII.1 COVARIANCE REVIEW

NUCLEAR DATA WEEK

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Materials Reviewed

78 Structural Materials

- ^{23}Na
- $^{24,25,26}\text{Mg}$; ^{27}Al ; $^{28,29,30}\text{Si}$
- $^{50,52,53}\text{Cr}$; ^{55}Mn , $^{54,56,57}\text{Fe}$, $^{58,60}\text{Ni}$
- $^{90,91,92,93,94,95,96}\text{Zr}$
- ^{95}Nb ; $^{92,94,95,96,97,98,100}\text{Mo}$
- ^{99}Tc ; $^{101,102,103,104,106}\text{Ru}$, ^{103}Rh
- $^{105,106,107,108}\text{Pd}$; ^{109}Ag ; $^{127,129}\text{I}$
- $^{131,132,134}\text{Xe}$; $^{133,135}\text{Cs}$; ^{139}La ; ^{141}Ce
- ^{141}Pr ; $^{143,145,146,148}\text{Nd}$; ^{147}Pm , $^{149,151,152}\text{Sm}$
- $^{153,155}\text{Eu}$; $^{155,156,157,158,160}\text{Gd}$
- $^{166,167,168,170}\text{Er}$
- $^{204,206,207,208}\text{Pb}$; ^{209}Bi

Materials Reviewed

20 Actinides – nu-bars

^{232}Th , $^{233,234,235,236,238}\text{U}$

$^{238,240}\text{Pu}$

^{239}Pu

^{237}Np

^{241}Pu

^{242}Pu

^{241}Am

$^{242\text{m},243}\text{Am}$

$^{242,243,244,245,246}\text{Cm}$

Quality Assurance

Both covariance plots and integral data (including nubars for the actinides) were checked.

Besides clerical fixes (e.g. missing plots), attention was paid to the feasibility of the cross section uncertainty. The general guidelines set forth by the CSEWG were followed.

In addition, integral data were examined. Normalization was made to VII.0 – Atlas value. Condition was that it needed to fall within 2σ .

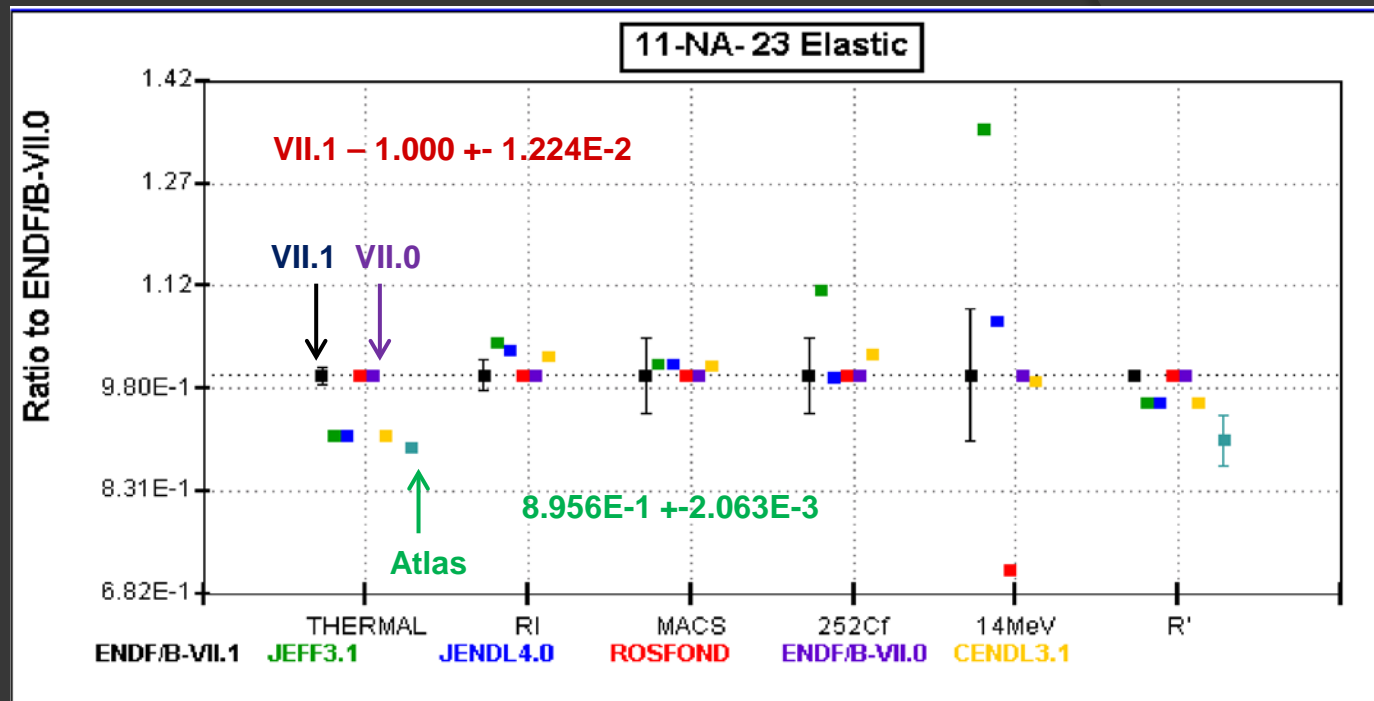


If these conditions weren't met,
then materials were fixed

^{23}Na

Initial Atlas
value $\Delta\sigma > 2\sigma$
from VII.0

Uncertainty
was increased
to fall within 2σ

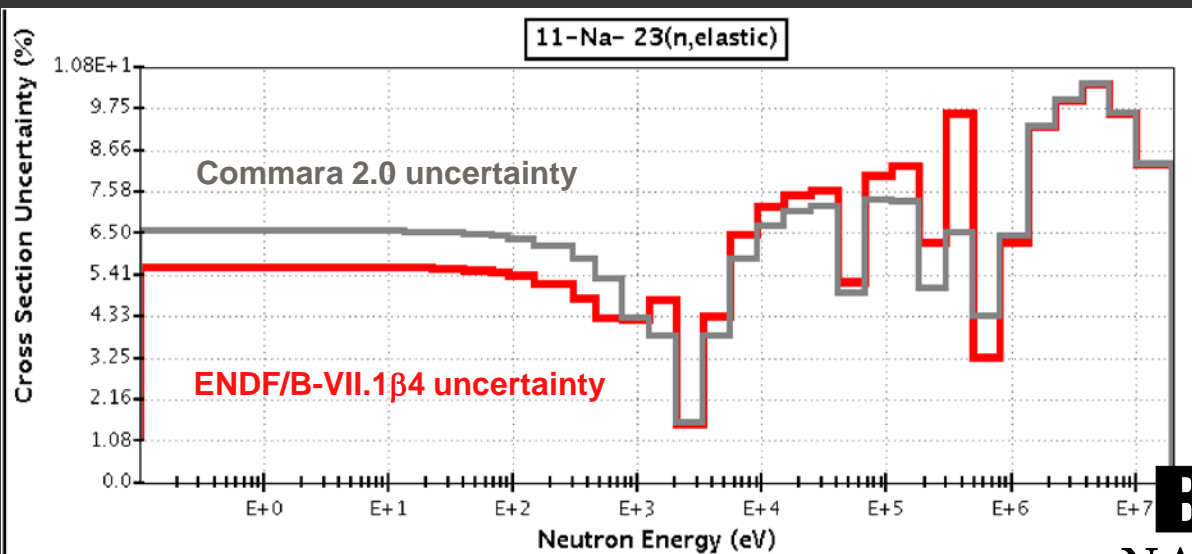
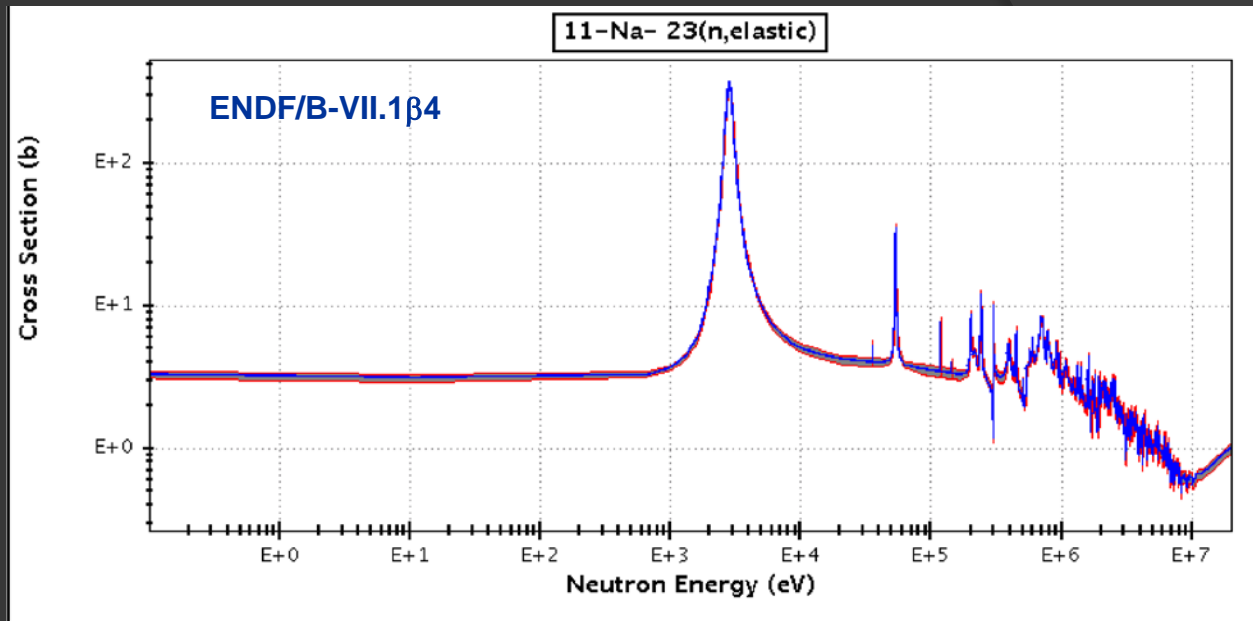


Elastic						
Library	THERMAL	RI 0.5-2E+7 eV	MACS 30 keV	^{252}Cf	14 MeV	R' (fm)
ENDF/B-VII.1	3.392	1.316E+2	5.696	2.605	7.496E-1	5.410
JEFF3.1	3.091	1.377E+2	5.797	2.929	1.019	5.200
JENDL4.0	3.091	1.365E+2	5.797	2.598	8.080E-1	5.200
ROSFOND	3.392	1.315E+2	5.696	2.605	5.382E-1	5.410
ENDF/B-VII.0	3.392	1.316E+2	5.696	2.605	7.496E-1	5.410
CENDL3.1	3.091	1.354E+2	5.769	2.687	7.421E-1	5.200
Atlas	3.038					4.900
Atlas Δ	7.000E-3 2.30E-1%					2.000E-1 4.08%
ENDF/B-VII.1 β_4 Δ	4.154E-2 1.22%	2.934 2.22%	3.166E-1 5.55%	1.436E-1 5.51%	7.207E-2 9.61%	
Recommended Δ	1.867E-1 5.50%					2.676E-1 4.94%

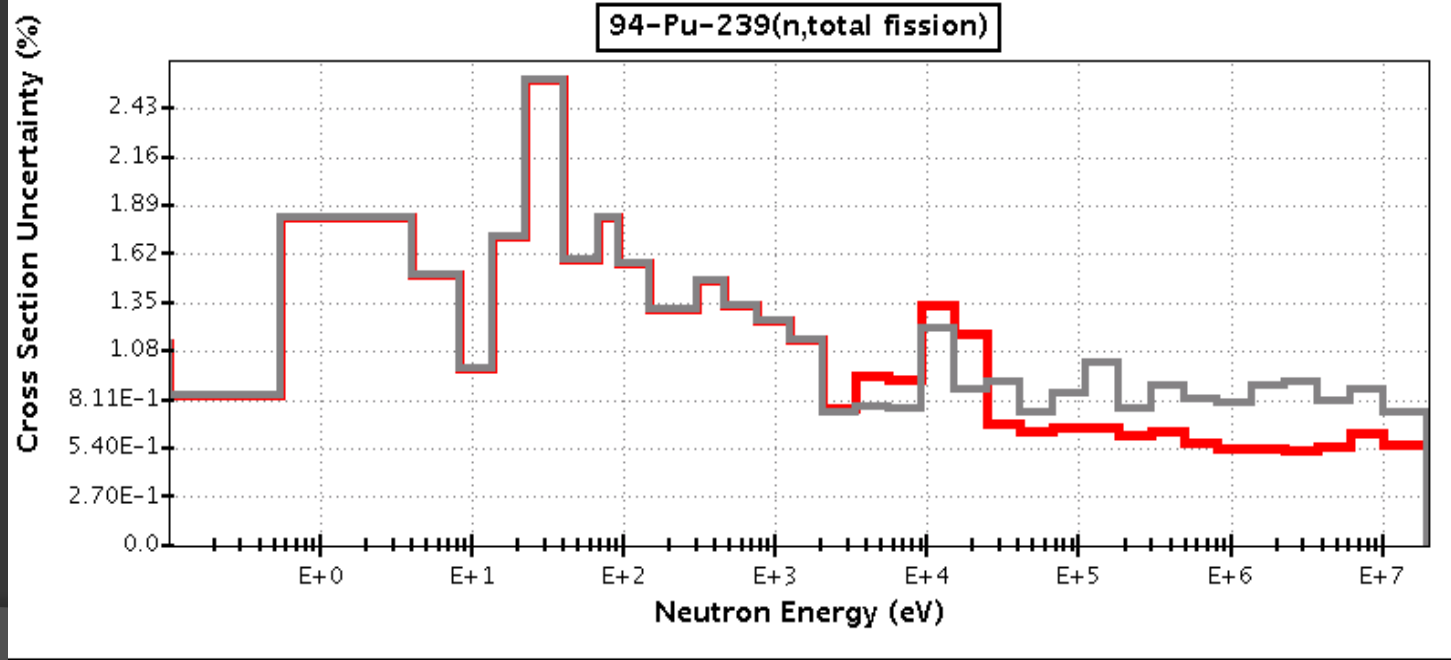
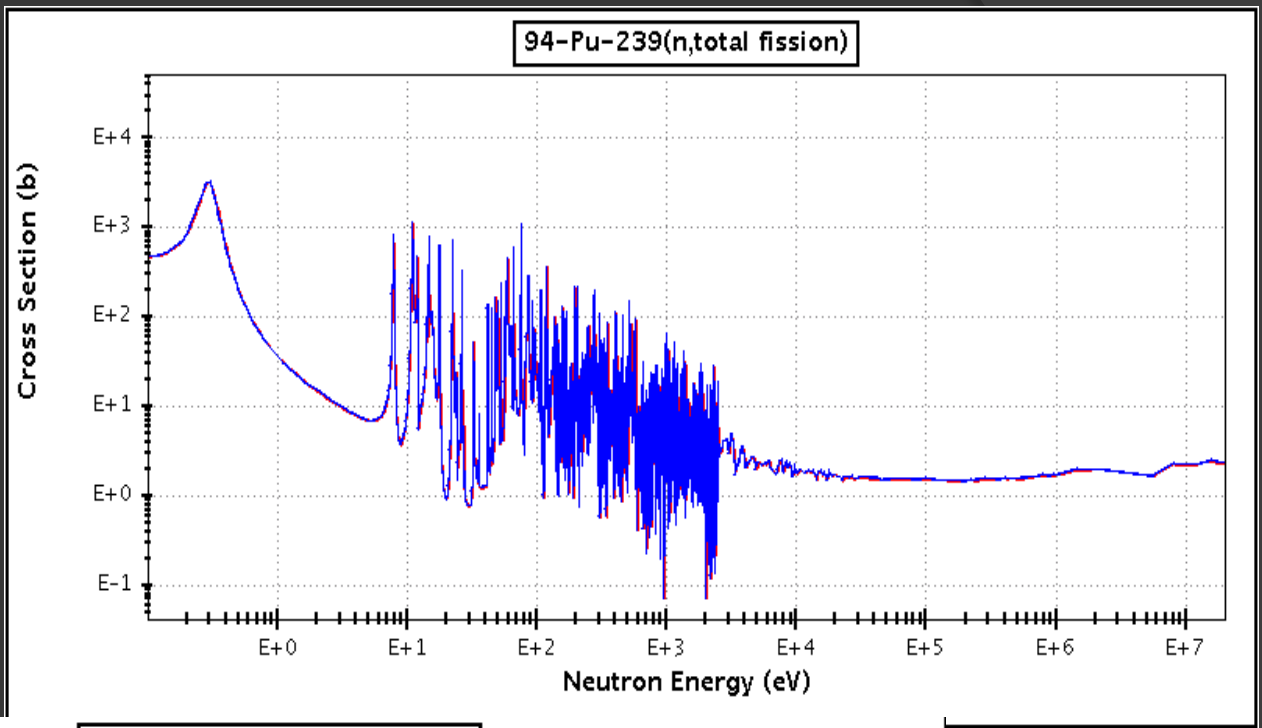
→ 5.5%

^{23}Na

Min. uncertainty ~ 2%



^{239}Pu



Summary Page

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Global changes to the library:

1. replacement of header line 1 with line containing SVN \$Revision and \$Date. Hoblit, BNL
2. for many materials modifying number of gammas in MF14 to agree with MF12. Mattoon, LLNL

- Beta5 vs Beta4

- Beta4 vs VII.0

- Beta4 vs Beta3

- Beta3 vs VII.0

- Beta3 vs Beta2

- Beta2 vs VII.0

- Beta2 vs Beta1

- Beta2 vs Beta0

- Beta3 covariance survey

- To do for VII.2

- Orphaned covariances

<https://ndclx4.bnl.gov/gf/project/endlf/wiki>

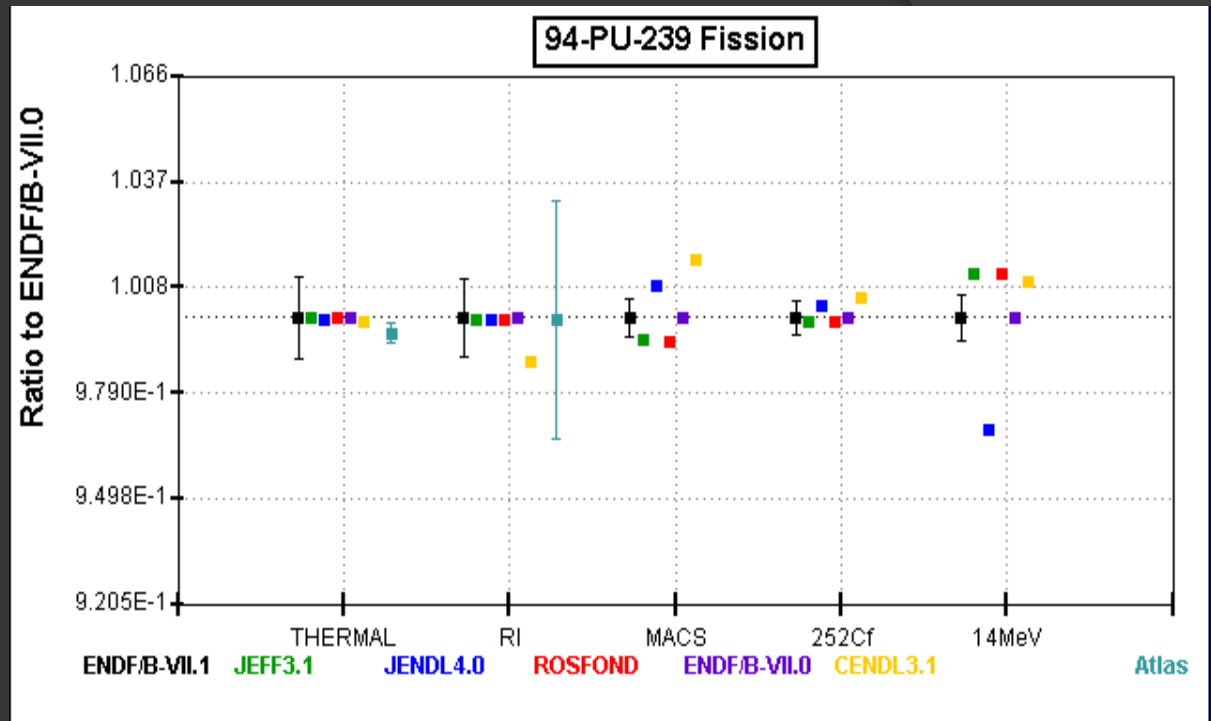
[Beta3 covariance survey](#)



239Pu

Uncertainty too low – 0.5%

Comparison of integral quantities – off-diagonal also included in calculation



Fission					
Library	THERMAL	RI 0.5-2E+7 eV	MACS 30 keV	252Cf	14 MeV
ENDF/B-VII.1	7.513E+2	3.032E+2	1.819	1.797	2.389
JEFF3.1	7.513E+2	3.030E+2	1.808	1.795	2.418
JENDL4.0	7.509E+2	3.031E+2	1.835	1.803	2.315
ROSFOND	7.513E+2	3.030E+2	1.807	1.795	2.418
ENDF/B-VII.0	7.513E+2	3.032E+2	1.819	1.797	2.389
CENDL3.1	7.503E+2	2.995E+2	1.848	1.807	2.413
Atlas	7.481E+2	3.030E+2			
Atlas Δ	2.000 2.67E-1%	1.000E+1 3.30%			
ENDF/B-VII.1β4 Δ	8.444 1.12%	3.284 1.08%	9.223E-3 5.07E-1%	8.236E-3 4.58E-1%	1.500E-2 6.27E-1%
Recommended Δ	2.008 2.67E-1%	1.000E+1 3.30%			

Mannhart value: 1.812 (1.4%)

W. Mannhart, PTB Braunschweig

Summary

- 98 materials were reviewed
- Fixes were made to several isotopes (e.g. ^{23}Na , ^{100}Mo)
- <https://ndclx4.bnl.gov/gf/project/endl/>



neutron evaluations