



ENDF/B Status

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Principle Upgrades Planned for ENDF/B-VII.1

M. Chadwick

- Covariances
- Light nuclei based on R matrix work (${}^6\text{Li}(n,t)$, ${}^9\text{Be}$, ${}^{16}\text{O}$...)
- Structural materials (ORNL lead) – supported by criticality safety
- Fission products (Pu FPYs & delayed neutron, gamma data)
- Actinides – minor actinide improvements to fission, capture, n_2n including much usage of feedback from critical assembly reaction rate data, and data from LANSCE, CERN etc
 - And much use of new JENDL data for MA
- Actinides – major (for future release):
 - Big issues in fission neutron spectra will take longer to resolve
 - ${}^{239}\text{Pu}$ resonance evaluation (ORNL + Cadarache/CEA)
 - We're interested in WPEC/Iwamoto conclusions re. ${}^{235}\text{U}$ capture.
 - **Need to fix DN problems reported**

ENDF/B-VII.1beta0 release Oct. 22, 2010 4:37p.m.

Neutron sublibrary

Total number of materials	411
New or revised materials	125
Totally or partially new materials	37
- LANL	8
- LANL/ORNL	7
- ORNL	9
- ORNL/IAEA	6
- BNL	1
- LLNL	6
Bob Little's fixes	7
Other fixes	16
Adopted:	65
- Actinoid file	58
- JENDL-3.3 (R.Q. Wright corr.)	2
- JENDL-4.0	1
- JEFF-3.3 (R.Q. Wright corr.)	4

New evaluations

(see also full list in the booklet)

LANL

R-matrix

4-He

6-Li

16-O

BNL

no covar.

90-Zr

LANL

9-Be MT2, no covar.

46-Ti

238-Pu

241-Pu MF33 MT18

241-Am

LLNL

no covar.

78-Kr

123-Xe

124-Xe

185-Re

187-Re

239-U

New evaluations (cont.)

LANL/ORNL

47-Ti

49-Ti

50-Ti

58-Ni MF2, a-prod.

235-U MF31,33

238-U MF31,33

239-Pu MF31,33

240-Pu

ORNL

19-F MF2/32

35-Cl MF2/32 RM Ltd

37-Cl MF2/32

39-K MF2/32

41-K MF2/32

52-Cr MF2/32 fast FZK MF33

53-Cr MF2/32

60-Ni MF2

IAEA/ ORNL

55-Mn

180-W

182-W

183-W

184-W

186-W

Narrowly missed VII.1beta0

	Commit #	Author	Comment
180-Ta	135	N.Summer	New LLNL evaluation
181-Ta	135	N.Summer	New LLNL evaluation
66-Zn	134	N.Summer	Replaced Zn-0 elemental with JENDL-4
67-Zn	134	N.Summer	Replaced Zn-0 elemental with JENDL-4
65-Zn	134	N.Summer	Replaced Zn-0 elemental with JENDL-4
68-Zn	134	N.Summer	Replaced Zn-0 elemental with JENDL-4
70-Zn	134	N.Summer	Replaced Zn-0 elemental with JENDL-4
64-Zn	134	N.Summer	Replaced Zn-0 elemental with JENDL-4
58-Ni	133	S.Holloway	Corrected MT=3 MF=22
54-Cr	132	D.Wiarda	New ORNL/FZK evaluation
52-Cr	131	D.Wiarda	Correction to cross-reaction covariances

ENDF/B-VII.1beta0 release notes

- 37 new (partially new) files, mostly:
 - light nuclei
 - structural materials
 - actinides
- ~50% of the 125 new materials were adopted from JENDLActinide (1 from JEFF-3.3).
- Considerable effort directed to:
 - fission spectra
 - new resonance parameters
 - covariances
- BNL covariances were advanced through the AFCI project but have not yet been incorporated
- Systematic cleaning done by A.Trkov in June/July
- Still, ENDF/B-VII.1beta0 is **not clean!**

ENDF/B under GForge

ENDF/B-VII

Home » Projects » ENDF/B-VII » Home

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- >> Lists
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ENDF/B-VII

US Library of Evaluated Nuclear Reaction Data

ENDF/B-VII.1beta0 | ENDF/B-VII.1beta0.tgz

[Neutron evaluations \(ex ENDF/A\)](#) | [Full library](#) | [CSEWG actions](#) | [Issues](#) | [Discussion list](#) | [Documents](#)

Recent News

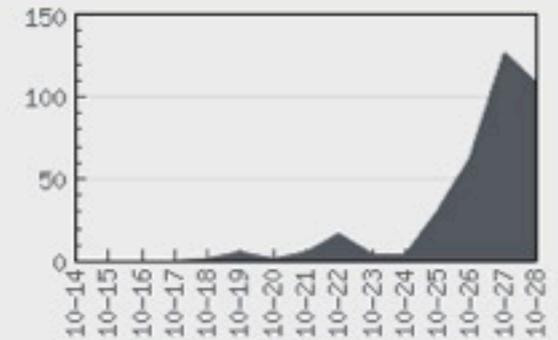
ENDF/B-VII.1beta0 released

Mike Herman
2010-10-22

The beta0 version of the ENDF/B-VII.1 library (neutron sub-library only) has been released for testing on Oct. 22, 2010. The library contains 411 files. **WARNING; beta0 is work in progress intended for the developers. It is neither guaranteed to be useful nor recommended for practical applications.**

Time	Activity Type	By
2010-Oct-29		
13:23:02	Commit: Added LLNL evalautions for Ta-180 and Ta-181	Neil Summers
2010-Oct-28		
21:19:36	Tracker item "10B(n,g)11B : sharp drop-off in (n,g) cross section above 0.5 MeV" opened	Neil Summers
20:14:30	Tracker item "Zn-72,73: ACTION LLNL, finalize the evaluations" changed status to Closed	Neil Summers
20:12:29	Commit: Replaced Zn-0 elemental evaluation with JENDL-4 evaluations for Zn-64,65,66,67,68,70.	Neil Summers
2010-Oct-27		
18:19:03	Commit: Corrected MT=3 MF=22	Shannon Holloway
2010-Oct-25		
12:17:59	Commit: Cr54 is a completely new evaluations in collaboration with ORNL and FZK. High energy part and scattering matrices: Authors: P.Pereslavtsev, A. Konobeyev, L.Leal, U. Fischer This evaluated data file is based on the nuclear model code Talys 1.0 and on e...	Dorothea Wiarda
11:37:23	Commit: The cross reaction matrices in File 33 were given in subsections that explicitly gave the material and the reaction. However, the ENDF-102 manual states that a value of MMAT1=0 shall be used to mean MAT1=MAT in the CONT record which begins the subsect...	Dorothea Wiarda
2010-Oct-22		

Activity



Request to join project

Description

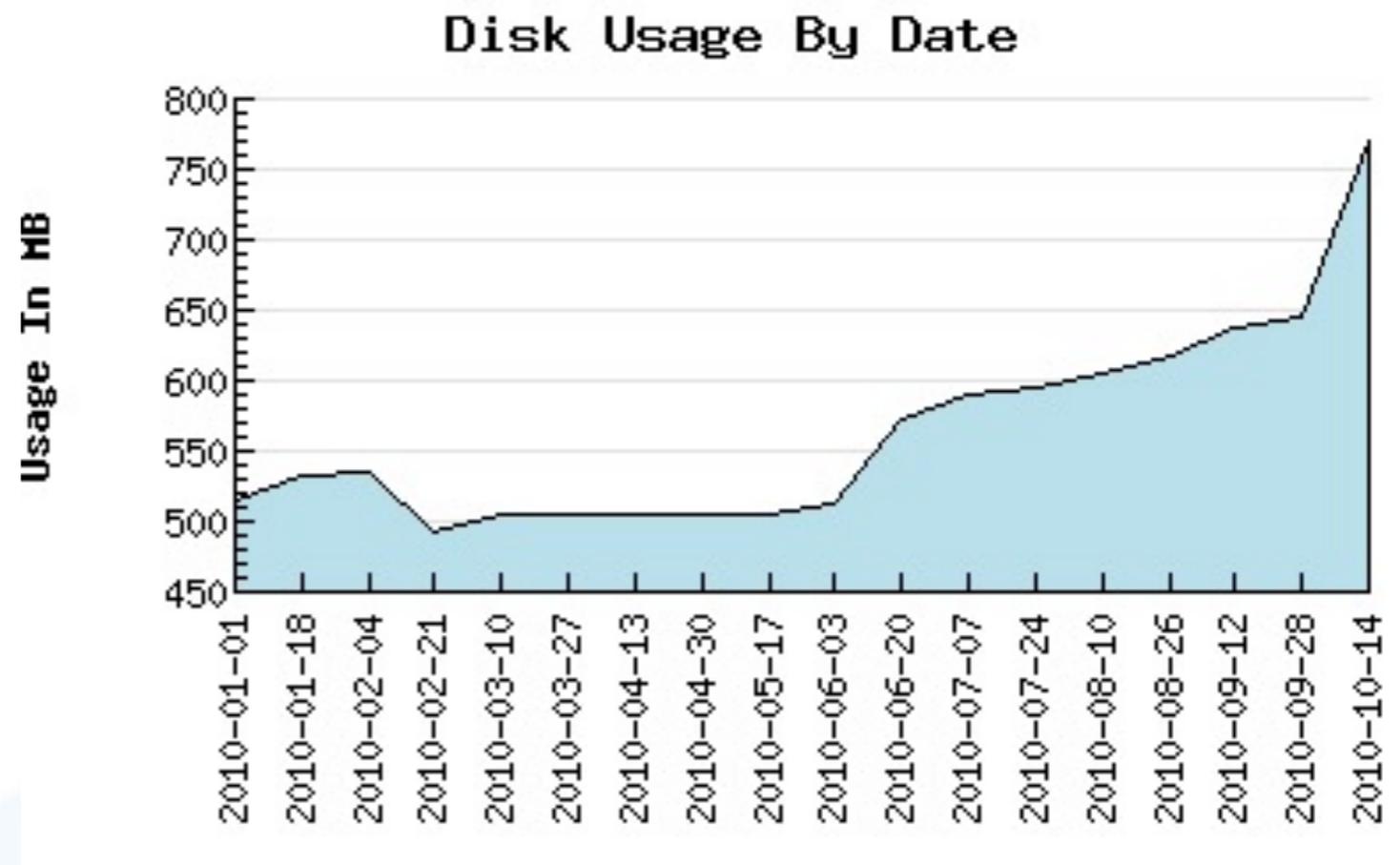
ENDF is the collaboration environment for the CSEWG members who are involved in the development of the Evaluated Nuclear Data File ENDF/B.

Developer Info

- [Caleb Mattoon](#)
- [Mike Herman](#)
- [Ramon Arcilla](#)
- [Michael Dunn](#)
- [Marco Pigni](#)
- [Skip Kahler](#)
- [Toshihiko Kawano](#)
- [Dorothea Wiarda](#)
- [David Brown](#)
- [Neil Summers](#)
- [Andrej Trkov](#)
- [Roberto Capote](#)
- [Young-Sik Cho](#)
- [Boris Pritychenko](#)
- [Patrick Talou](#)
- [Pavel Oblozinsky](#)
- [Mark Chadwick](#)
- [Brett Carlson](#)
- [Luz Leal](#)
- [Samuel Hoblit](#)
- [Donald Smith](#)
- [Yaron Danon](#)
- [Said Mughabghab](#)
- [Richard McKnight](#)
- [Morgan White](#)
- [Shannon Holloway](#)
- [Alan Carlson](#)
- [Patrick Griffin](#)
- [Robert Haight](#)
- [Dennis McNabb](#)

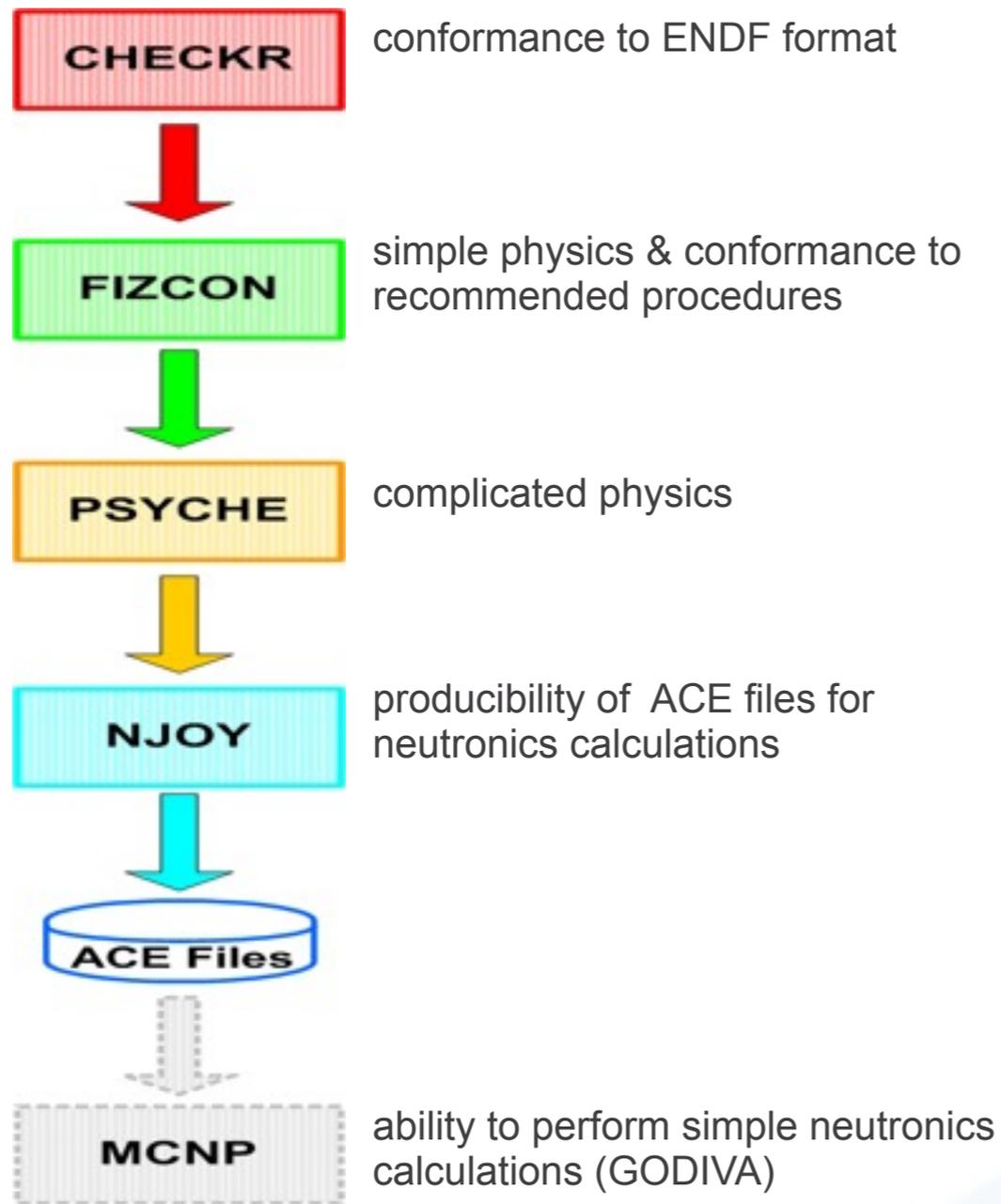
ENDF/B under GForge

- Version control: Subversion
- Deficiency tracking
- To do list tracking
- Release system
 - Tags & Files
- Documents
- Mailing list
- (Forum)
- (Wiki)



Processing Flow

R. Arcilla



NNDC Linux Cluster



CHECKR, FIZCON, PSYCHE can be downloaded from <http://www.nndc.bnl.gov/nndcscr/endl/endl-util/index.html>

CHECKR Results

R. Arcilla

- Total No. of Errors: **129** (22 materials)
- Typical Errors
 - Out of sequence at ...
 - Section cannot be checked from sequence number ??? to ???????
 - Section ?/??? not in directory (Missing section)
 - AWR should be set to ...
 - ZAI should be set to ...
 - SEND card missing
 - MPAR = ? out of range ...
 - NK = 1 must equal 3129 as in File 12 or 13
(Pu-239, MF=14, MT=460)

FIZCON Results

R. Arcilla

- Total No. of Errors: **166** (30 materials)
- Typical Errors:
 - Discrete 2-body law not permitted for MT=102
 - Correlation coefficient incorrect
 - For LF=1 EPMAX found to be ?.??? should be ?.????
 - Self-covariances for MTI missing
 - List out of order near N = ?
 - MAT=????, MF=33, MT=34 Energy incorrect, expect ?.????E +??, find ?.????E+??
 - Sum of transition probabilities = [*# not equal to 1 here*] for MT=??

LANL Submissions for VII.1beta0

(This does not include all the covariance work)

M. Chadwick

- Little's ACE library – based fixes
- Hale: $n+4\text{He}$, 6Li , 9Be , 16O
- Kawano: 48Ti (+other Ti isotopes)
- Holloway: 58Ni , using LANSCE alpha-production - with a tweak coming
- 89Y – fix by Little; more fixes by Kawano
- 233U DN fix?
- Talou: $233,5\text{U}$ and 239Pu VII.0 fiss neutron spectra on finer grid
- Talou: 239Pu VI.0 resonance info put back in
- Kawano/Chadwick 236U improved capture;
- Holloway/Chadwick: 237Np ($n,2n$), thermal, .. improvements (from Maslov)
- Talou, Young: 238Pu and 240Pu
- Kawano/Chadwick: 241Am capture, fission

New R-Matrix Evaluation Work for Light Elements

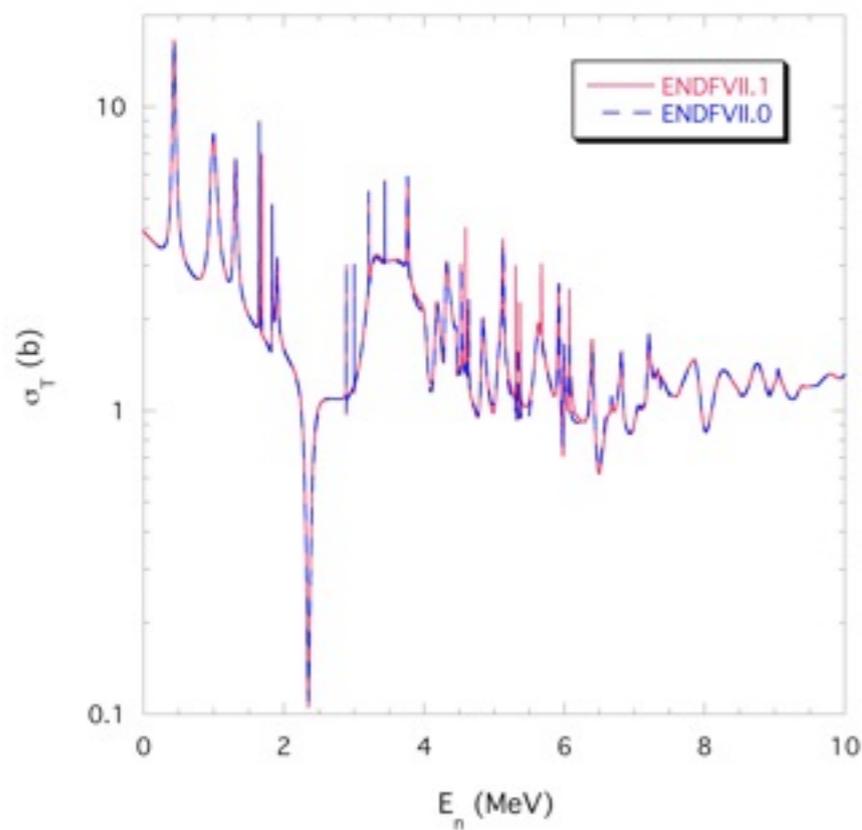
G. Hale

- Covariances for n-p scattering
 - New evaluation, covariances for n- α scattering
- New evaluation, covariances for n+ ^6Li reactions
 - New evaluation, covariances for n+ ^{16}O reactions
 - New evaluation for n+ ^9Be total cross section

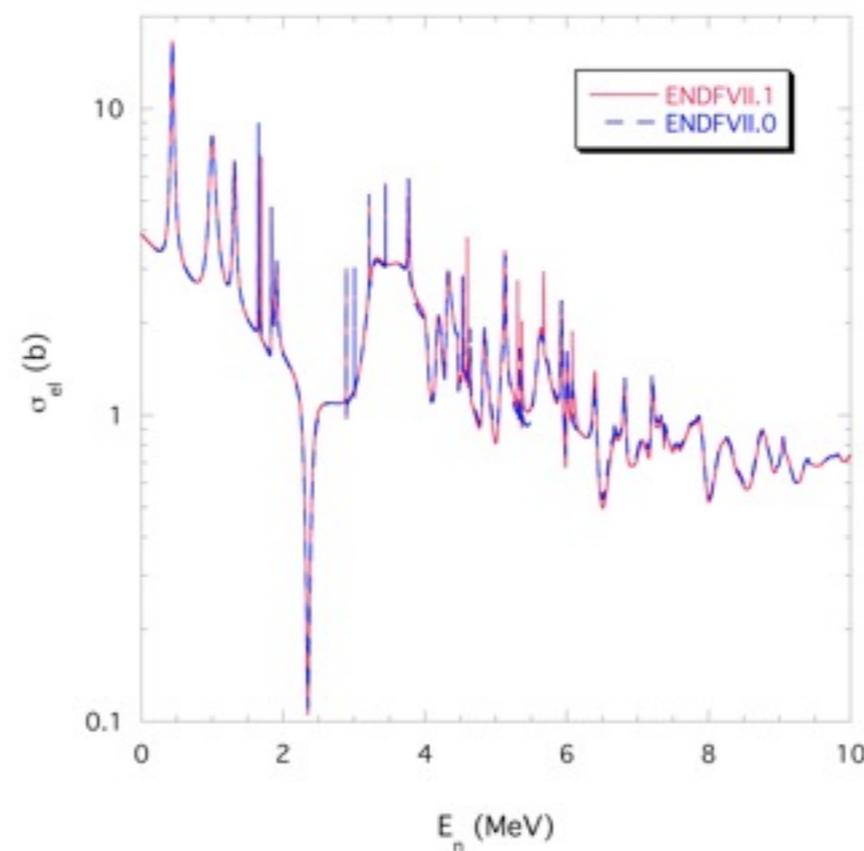
16O - comparisons with ENDF/B VII.0

G. Hale

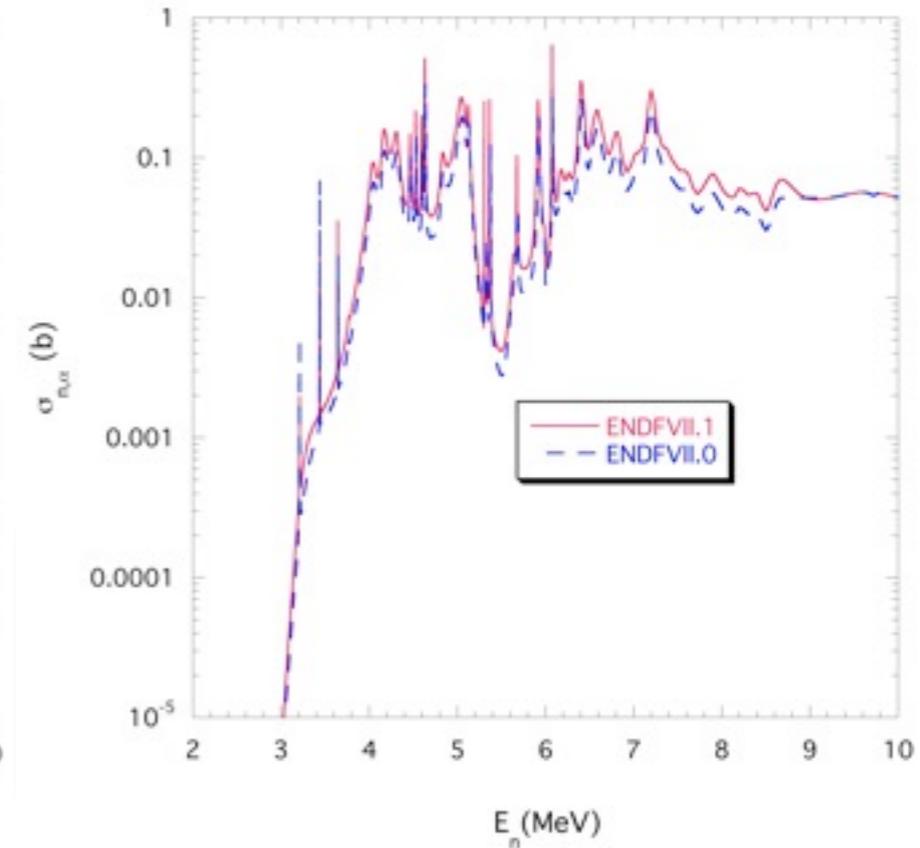
$n+^{16}\text{O}$ Total Cross Section



$^{16}\text{O}(n,n)^{16}\text{O}$ Cross Section



$^{16}\text{O}(n,\alpha)^{13}\text{C}$ Cross Section



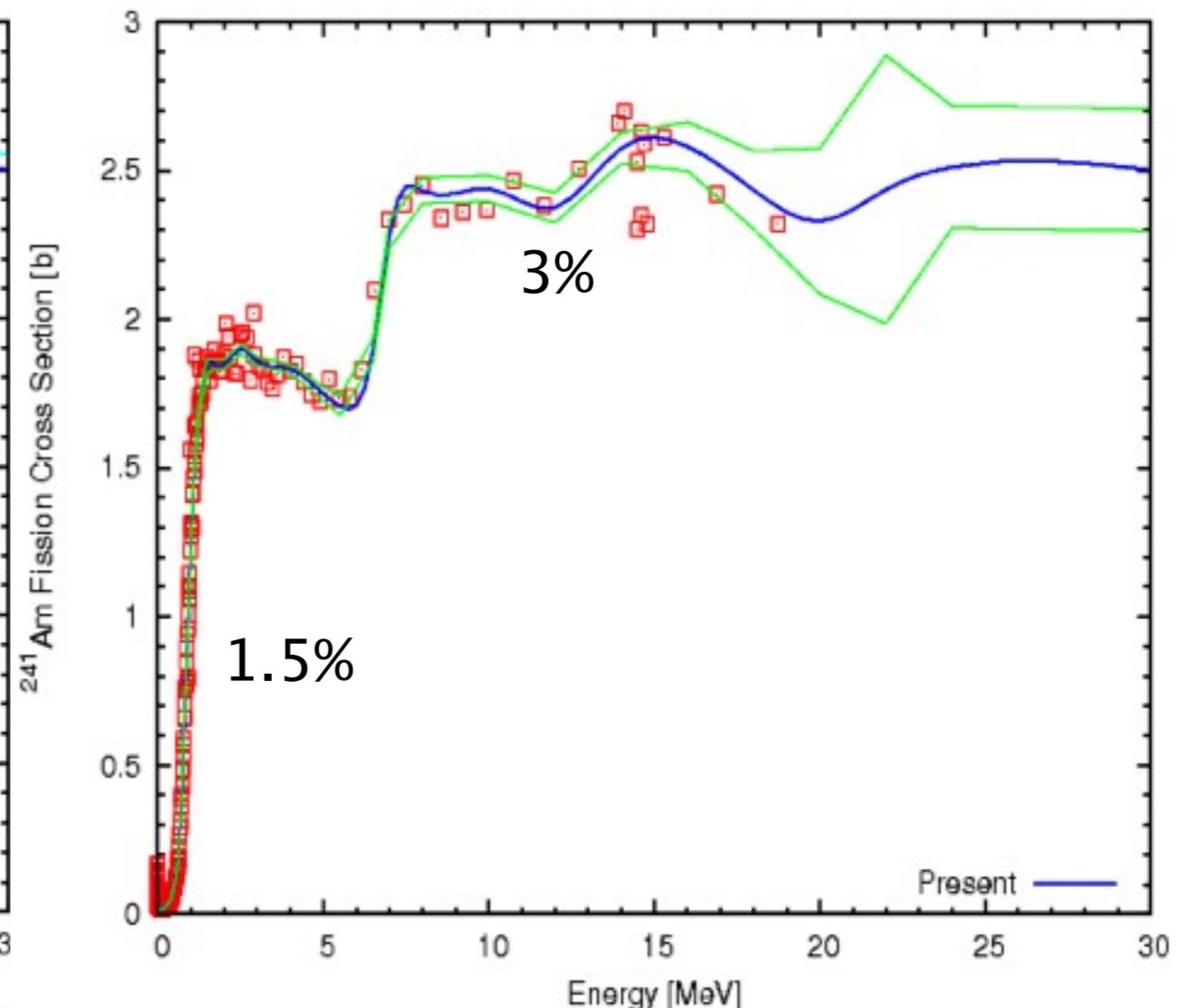
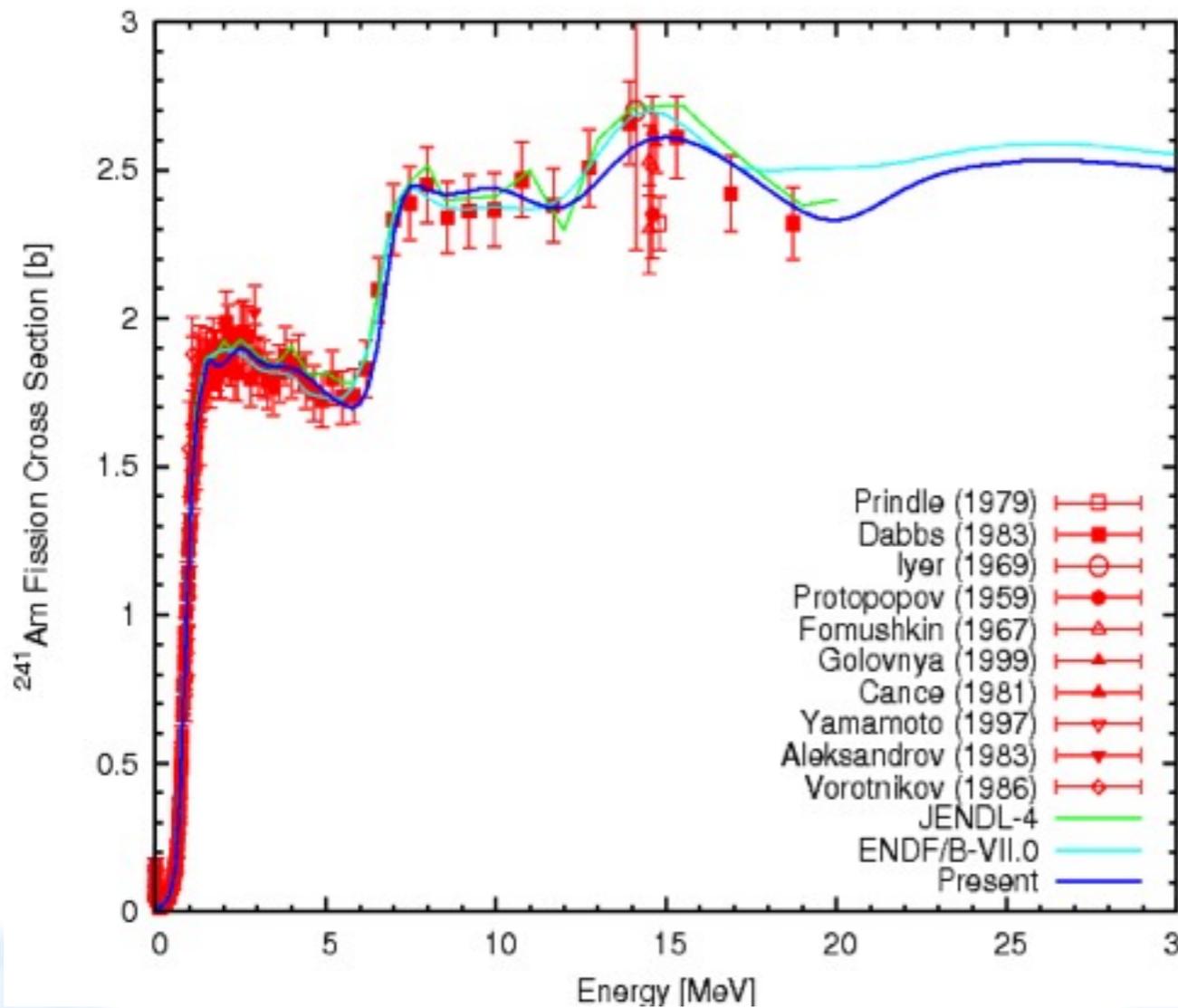
Status of VII.1 for ^{16}O

G. Hale

- Small changes in σ_{eI} and σ_{tot} at energies below 7.5 MeV.
- Scale of $\sigma_{n\alpha}$ cross section increased about 35% below 9 MeV, putting it back about where it was before the previous change.
- All cross sections unchanged above 9 MeV.
- Preliminary testing in aqueous solutions gives little change in the crits; “broomstick”, especially sensitive to the cross sections in the 2.35-MeV window, is yet to be completed.
- Detailed covariances are given for the major cross sections, and for the first Legendre coefficient ($\mu\text{-bar}$).

Covariance Evaluation for Am241 Fission

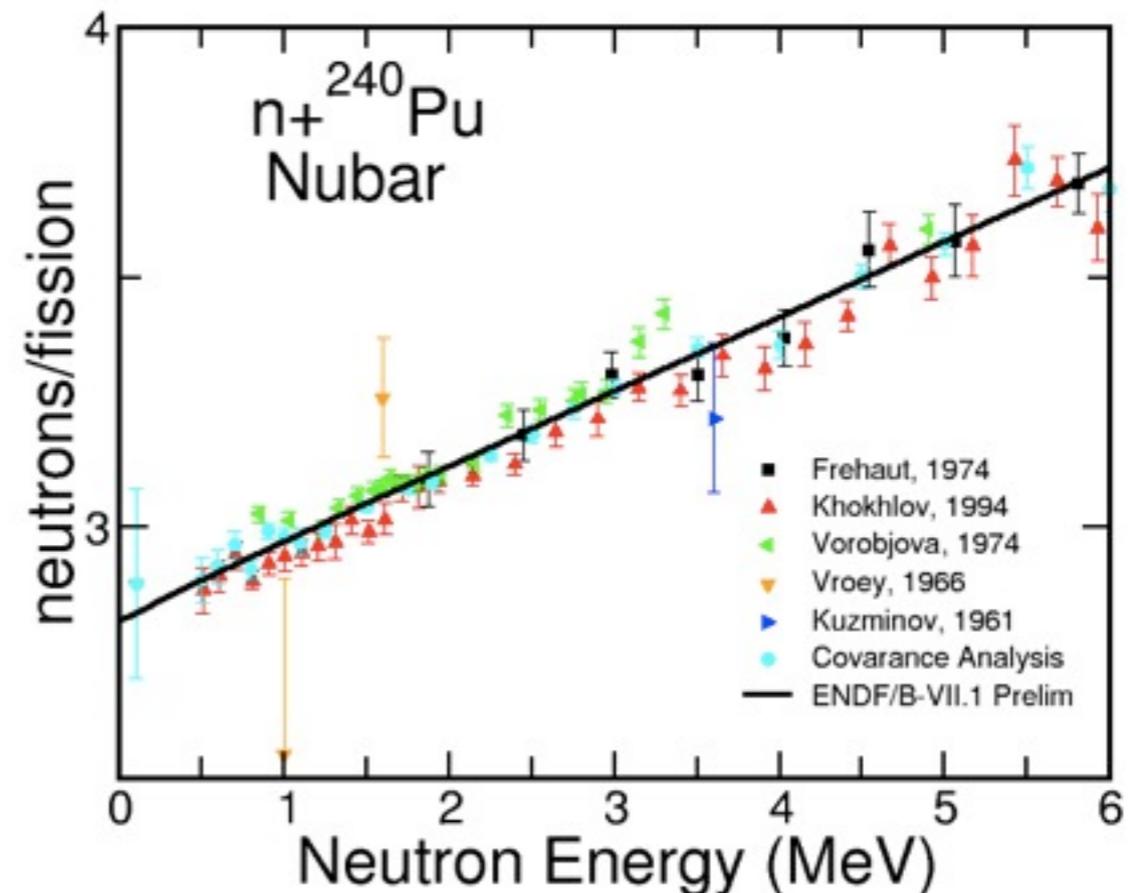
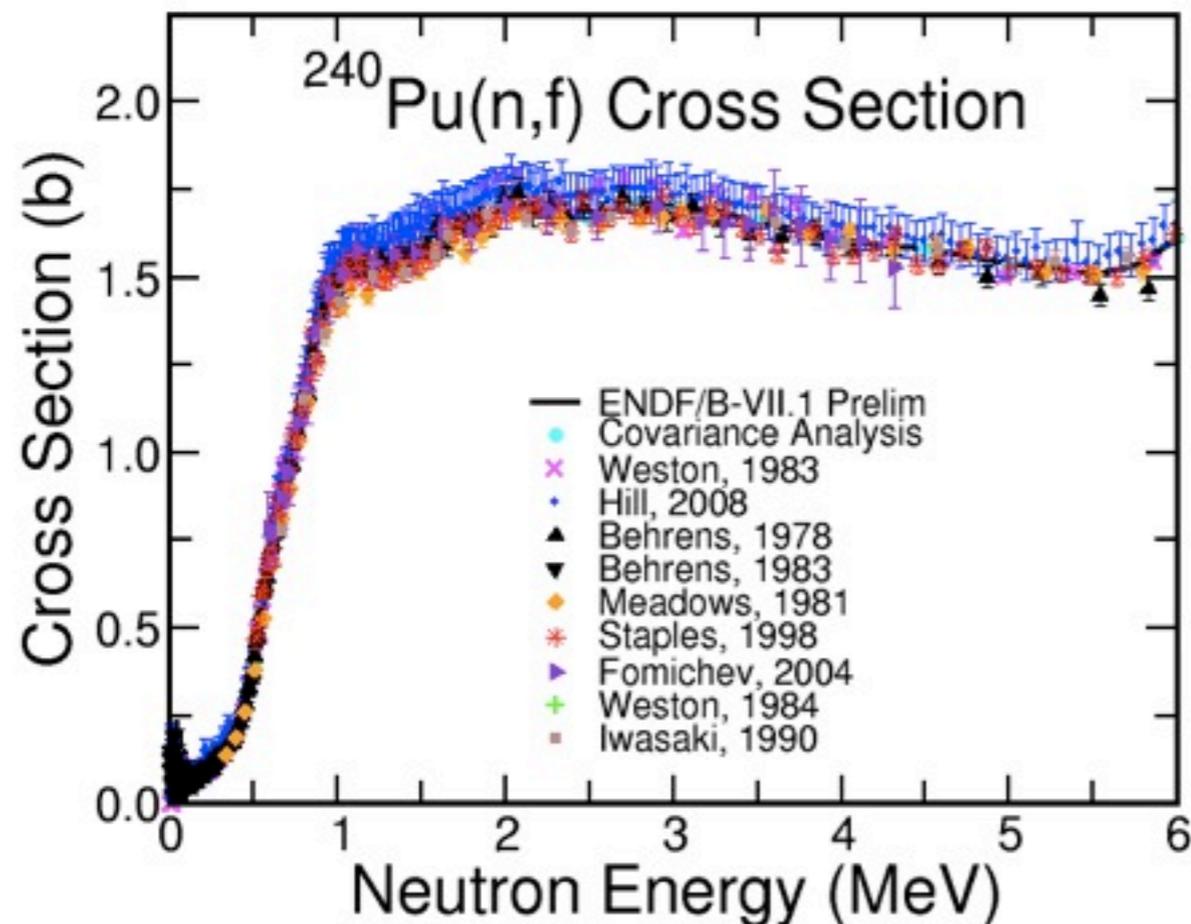
M. Chadwick



Pu-240 LANL Evaluation, Fission

M. Chadwick

When we model Pu crits with high ^{240}Pu content, we now believe we get the right answer for the right reason!



Covariance data are also provided

ORNL evaluations in ENDF/B-VII.1beta0

M. Dunn

- ▶ ^{50}Cr , ^{52}Cr , ^{53}Cr , and ^{54}Cr
- ▶ ^{58}Ni and ^{60}Ni
- ▶ ^{46}Ti , ^{47}Ti , ^{48}Ti , ^{49}Ti , and ^{50}Ti
- ▶ ^{239}Pu
- ▶ ^{240}Pu
- ▶ ^{55}Mn , ^{35}Cl , ^{37}Cl , ^{39}K , ^{41}K , ^{19}F , ^{180}W , ^{182}W , ^{183}W , ^{184}W , ^{186}W
- ▶ ^{233}U , ^{235}U , ^{238}U
- ▶ Hf-isotope evaluations (RQ Wright)
- ▶ SiO_2 thermal evaluation NCSU-ORNL—presentation by Jesse Holmes (NCSU)

Cr isotope evaluation at ORNL

M. Dunn

- Transmission and capture cross section measurements done at ORELA for ^{53}Cr and natural Cr for energy below 500 keV (Guber);
- Early high resolution transmission measurements done by Harvey at ORELA above 100 keV for all Cr isotopes;
- Evaluation performed with SAMMY;
- Resolved resonance parameters determined for all Cr isotopes;

Resonance Parameter and Covariance Evaluation for ^{48}Ti

M. Dunn

- ◆ Capture (40-meter) and transmission (80-meter) measurements for enriched ^{48}Ti and natural titanium done at ORELA from 10 eV to 500 KeV;
- ◆ Evaluation performed with SAMMY;
- ◆ Resolved resonance parameters determined from 10^{-5} eV to 400 keV;
- ◆ Evaluated Resonance parameter covariance;
- ◆ Thermal cross section and resonance integral and uncertainties well reproduced;

^{240}Pu Assessment

M. Dunn

- Most recent resonance evaluation is by Derrien and Bouland—adopted in JEFF 3.1 and JENDL-3.3 up to 40 keV
- ENDF/B-VII.0 resonance evaluation is not latest evaluation—no covariance data in ENDF evaluation
- SAMMY re-analysis of measured data performed with “new” ORELA data—provide improved resonance analysis with covariance data to complement high-energy LANL high-energy evaluation
- Experimental data to support re-evaluation effort
 - “New” data include ORELA neutron transmission measurements by Harvey and Gwin (1988)—recently discovered in ORELA archives—sample thickness: 0.0723 at/b
 - Transmission data by Kolar et al for two different sample thicknesses: 0.00166 at/b and 0.00466 at/b

^{55}Mn & W isotopes - IAEA coordinated evaluations

R. Capote & A. Trkov

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- Radiative strength function - Modified Lorentzian (RIPL)

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- Level densities - Enhanced Generalized Superfluid Model (RIPL-3 EGSM)

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- Level densities - Enhanced Generalized Superfluid Model (RIPL-3 EGSM)
- Covariances: EMPIRE Monte Carlo + GANDR

W-isotopes status

R. Capote & A. Trkov

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- Validation results – big improvement compared to ENDF/B-VI.8, but criticality is overpredicted; possible cross-interference effects in benchmarks are being investigated by I. Kodeli and A. Trkov

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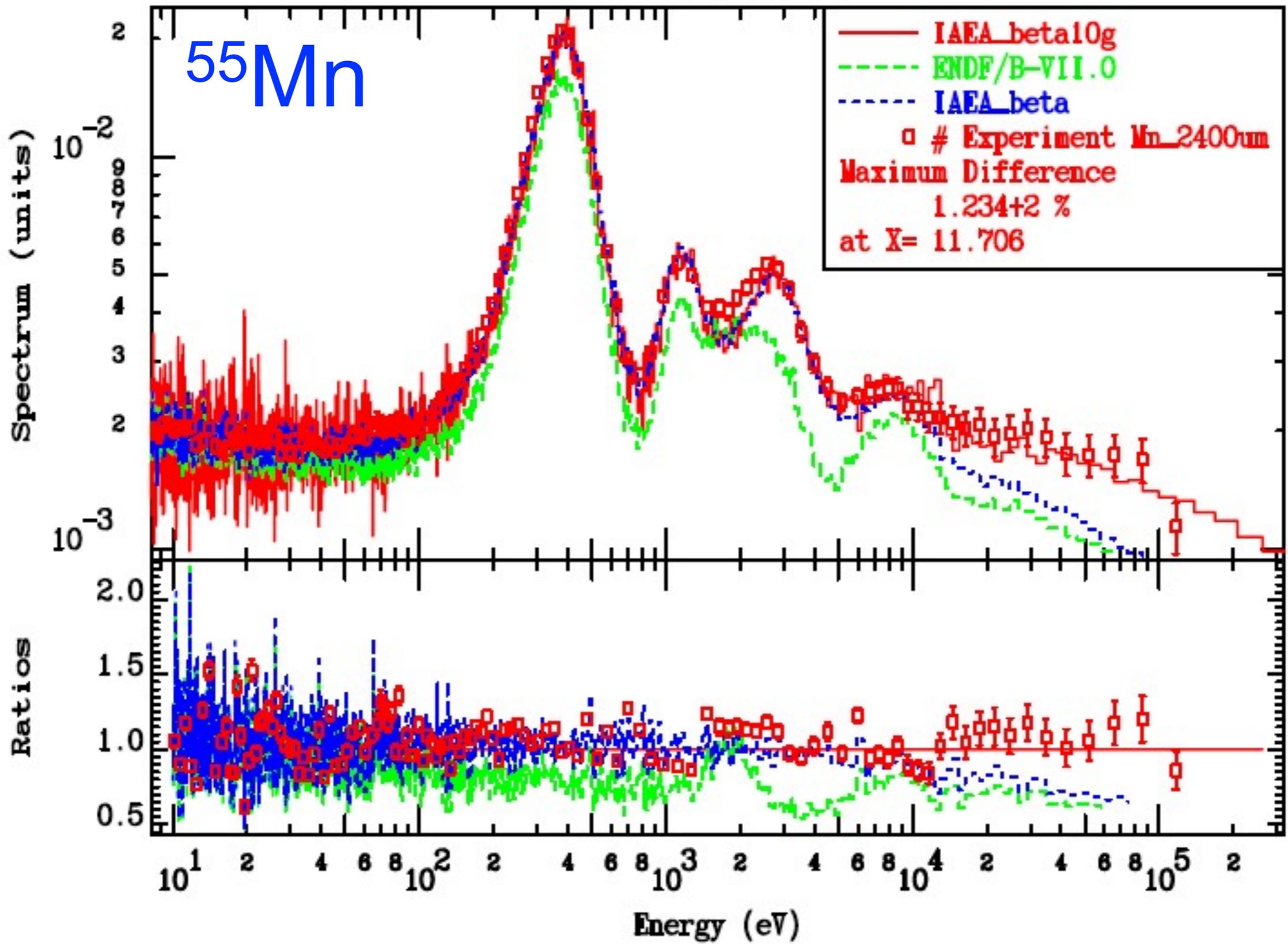
Fast neutron region – validation in progress

- “low” tendency in Cf-252 spectrum averaged cross section
- FNG-W Mn-55 activation 60% high → problem with measurement?
- Inelastic cross section to be resolved

^{55}Mn

Grenoble Lead Slowing-down Spectrometer
Mn 2400 um sample

^{55}Mn



Next steps

- ENDF/B-VII.1beta1 middle of December 2010
 - accommodate missed evaluations
 - fix trivial problems
 - address recommendations of this meeting
- Next major beta in May before mini-CSEWG in June (will include most of the covariances from AFCI-2.0)
- Final beta version in October
- Nucl. Data Sheets publications in December 2011