



The ENDF/B-VIII.1 release and future plans on structural materials

G.P.A. Nobre¹, D.A. Brown¹ et al.

National Nuclear Data Center

¹National Nuclear Data Center, Brookhaven National Laboratory

INDEN Consultants Meeting on Structural Materials IAEA, Vienna, Austria December 18-21, 2023

Outline

- The next release and library infrastructure
- "Big Paper"
- ENDF/B-VIII.1 release status
 - Beta releases
 - What to expect for Beta3
- Updates on INDEN evaluations for structural materials
- Release timeline
- Future plans



The next ENDF/B release



ENDF/B-VIII.1 release

The next release of the ENDF/B library is scheduled for <u>May 2024!</u>

Although technically "minor", it will have **major** impact.

- Why VIII.1 and not IX?
 - There are no planned updates of the standards library for this release
 - Standards are well-stablished cross sections, in specific energy ranges, used in ratios with other measurements
 - However, many, many important and impactful changes are on the way!!
- Next release will be in both legacy ENDF-6 format and GNDS-2.0
- Will have an accompanying "Big Paper"
- Implemented review system: Multiple VIII.1 Beta versions have been released
- Preliminary validation indicate that this will be the best-performing library ever!



ENDF/B VIII.1-β2

What to expect when expecting... ... the ENDF/B-VIII.1 release

Neutrons:

- Many INDEN contributions
- Actinides:
 - ²³⁹Pu: multi-institution effort, with important updates to fission, nubar, PFNS, capture, URR, RRR, (n,2n)
 - ²³⁵U: resonances, nubar, covariances,
 - ²³⁸U: resonance update to improve performance on depletion benchmarks
 - ^{240,241}Pu: work in concert with changes in ²³⁹Pu and ²³⁸U to recover burnup performance
- Stainless steel & other structure materials:
 - 54,56,57 Fe: Corrects leakage deficiency from ENDF/B-VIII.0
 - ^{50,52,53,54}Cr: Thorough re-evaluation, impact in criticality and leakage benchmarks

- ^{206,207,208}**Pb**: complete evaluations (RPI/LANL)
- ^{63,65}Cu: improved performance
- ⁵⁵Mn: Gamma spectra
- 28,29,30 Si: resonance evaluations
- Others:
 - 6Li, 9Be (LANL)
 - 234,236U (LANL)
 - 140,142Ce (ORNL)
 - 103Rh (RPI/IRSN)
 - 86Kr (BNL)
 - 181Ta (RPI/ORNL/LANL)
 - 95Mo (IRSN/LANL)
 - Many, many, many more...



What to expect when expecting... ... the ENDF/B-VIII.1 release

<u> TSL:</u>

- 70+ new updated/files
- Polystyrene, zirconium hydride, UC, UN, UO₂, sapphire, lucite, FLiBe, etc...
- Fuel materials with different enrichments
- So many new evaluations that we had to re-think how to identify them.
- Low-temperature extrapolations to light water

Community-wide review and validation

Fission Yields:

- Many fixes
- ...but no changes to the actual yields

Photo-nuclear:

• 200+ updates coming from IAEA CRP

Charged particles:

• A few improvements and fixes



ENDF versioned repository: GitLab

ENDF/B Library

Epics
 Issues
 Merge requests

CI/CD

Subgroup information

① Security & Compliance

Packages and registries

623

USNDP Collaboration Platform		
National Nuclear Data Center	Username or email	
The U.S. nuclear data community working together to continuously advance the state of nuclear data for science and technology applications.	Password Password	Forgot your password?
NOTICE TO USERS	Si	ign in
This is a Federal computer system (and/or it is directly connected to a BNL local network system) and is the property of the United States Government. It		

- · Constantly updated and maintained
- Keeps track of
 - Any changes
 - Development, <u>review</u> and release branches
 - Issue trackers
 - etc...
- Usage is growing! Currently ~60 active members in ENDF library group (unfortunately there's a seat limit: victims of our own success)
- Integration of library repository in GitLab with a Continuous Integration system: ADVANCE (R. Arcilla, R. Coles, B. Shu, D. Brown)

Group ID:	8 👸 Leave group			
The ENDF library p history is available	project itself. At the time of as an archived project na	of creation of this proj amed "svn-export". Se	ect area, ENDF comprises 15 sublibrari ee the "README" in each project for m	es. The full ENDF/B ore information.
Recent activity Last 30 days	Merge requests created 327	Issues created	Members added	
Subgroups and pro	jects Shared projects	Archived projects	Q Search	Updated ~ ↓
D 😯 neutron ENDF/B	s \oplus neutron sublibrary		★ 2	55 minutes ago
	spontaneous FPY sublibrary		★ 0	4 days ago
1 😽 🕅 ENDF/B	neutron FPY sublibrary		★ 0	4 days ago
1 ENDF/B	s Φ gamma sublibrary		★ 0	2 weeks ago
I Internal ENDF/B	_scatt ⊕ thermal neutron scattering s	ublibrary	*1	2 weeks ago
D melium3	s ⊕ 3He sublibrary		★ 0	2 months ago
I konstanting deutero	ns \mathbb{O} deuteron sublibrary		★ 0	3 months ago
🛈 🔶 decay (ENDF/B	D decay sublibrary		★ 2	4 months ago
D SPROTONS ENDF/B	⊕ proton sublibrary		★ 0	4 months ago
I START	D alphas sublibrary		* 1	4 months ago
C Tritons ENDF/B	D triton sublibrary		★ 0	4 months ago
0 🚰 standar ENDF/B	ds ⊕ nuclear data standards subli	brary	★ 0	5 months ago
C ENDF/B	relax Φ atomic relaxation sublibrary		★ 0	8 months ago

ENDF versioned repository: GitLab

USNDP Collaboration Platform Image: State of a computer system (and/or it is directly connected to a BNL local network system) and is the property of the United States Government. It		 ibirary Subgroup information Epics Issues Issues Merge requests Merge requests Security & Compliance CI/CD Packages and registries Analytics Wiki Settings 	New subgroup New proje New proje New subgroup New proje New proje New subgroup New proje New subgroup New project for more information. Members added O Q Search Updated Adapte of Adapte of Adapte of		
 Constantly updated and ma Keeps track of Any changes Development, <u>review</u> a 	intained nd release branches	CI/CD throug system behi allows for full for mach i appro	★ 0 ★ 0 ★ 1 ★ 0 ★ 0 ★ 0 ★ 2	4 days ago 4 days ago 2 weeks ago 2 weeks ago 2 months ago 3 months ago 4 months ago	
 Issue trackers etc Usage is growing! Currently (unfortunately there's a s 	 ~60 active members in E eat limit: victims of our ow 	ENDF library group /n success)	Image: Construction of the second state of the second	★ 0 ★ 1 ★ 0 ★ 0 ★ 0	4 months ago 4 months ago 4 months ago 5 months ago 8 months ago
 Integration of library reposit system: ADVANCE (<u>R. A</u> 	ory in GitLab with a Conti <u>rcilla, R. Coles, B. Shu, D</u>	nuous Integration <u>Brown</u>)	 □ electrons ① ENDF/B electron sublibrary □ ♥ super 合 Super project for the entire ENDF library. □ ■ photoat ① ENDF/B photo-atomic sublibrary 	★ 1 ★ 0 ★ 0	8 months ago 1 year ago 2 years ago

	+ 🛞	😑 ENDF > 😁 library > 🛞 neutrons > Merge requests > 1932		
D 11 มีมี1	⊡ 33	Copen Draft: Review/n-038_Sr_088 Review/n-038_Sr_088 C into phase2		
Q Search or go t	to	Overview 32 Commits 5 Pipelines 0 Changes 1	8 unresolved threads $~~$	Add a to do
Project		Gustavo Nobre @gnobre · 3 weeks ago	O Assignees None - assign yourself	Edit
☆ Pinned Issues	169	(@pignim, the 8557 file has errors pointed out by CHECKR (see § n-038_5r_088-tog.checkr). Could you please fix this? If you can please work on the current version of the file that has line numbers removed: https://git.nndc.bnl.gov/endf/library/neutrons/-/raw/5af34c9c966d29963217ed24ce4dc043f1232419/n-038_5r_088.exdf2inipa_false	O Reviewers None - assign yourself	Edit
Merge requests	26	 Collapse replies 	Labels None	Edit
Branches Commits Repository		Gustavo Nobre @gnobre · 3 weeks ago Hi @pignimt, it seems that this is not a problem with your 88Sr file, but rather with the checking/processing codes that were not ready to deal with the background in the R-matrix	Milestone None	Edit
ී Manage ඕ Plan	>	region. @dbrown is fixing CHECKR, @mattoon1 is working in FUDGE and @wim with NJOY. As a matter of fact, Wim already did a "quick patch" of NJOY and would be nice if you (@pignimt) could help him test if the NJOY reconstruction is producing the right answer.	Time tracking No estimate or time spent	Q +
Code	>	Wim said:	5 Participants	
BuildSecure	>	I did a quick implementation of the Sammy background rmatrix elements since that's being used in Sr88 but I also laid the groundwork for the other options. The Frohner option is as easy to implement as the Sammy one so I'm not worried about that one (we're already storing it but	V V V V	
Deploy	>	I just need to implement the formula). The arbitrary tabulated complex function is going to be a bit more complicated but conceptually it should not pose an issue here since I know where it		
OperateMonitor	>	goes in the code. You can find the updated version on the following branch of the NJOY2016 repo: feature/kbk		
🔟 Analyze	>	I attached an ∞ input deck that runs reconr by itself and outputs an ∞ ENDF file with the reconstructed cross sections for Sr88 along with the resulting PENDF file. This is a blind		
🕐 Help		implementation for me (no testing at all), so I'd be really happy if we get the right result out of		

Q Search or g	i 0	+ 🌘 😑	ENDF > 🕮 library > 💿 neutrons > Merge requests > 1932	
Project	D'11 \$\$1	⊠ 33	Draft: Review/n-038_Sr_088 Review/n-038_Sr_088 الح دي الح الح	
seutrons	Q Search or go to	o	Overview 32 Commits 5 Pipelines 0 Changes 1 8 unresolved threads ^ <	Add a to d
☆ Pinned	Project		Great Opiopimt thanks! But could you please perhaps just quickly check if the reconstructed OAssignees	Edit
Merge requests	☆ Pinned	~	88Sr generated by Wim is consistent with your own file, just so I can push this file into Beta3? O Reviewers None - assign yourself	Edit
Branches Commits	Issues Merge requests	169 26	Wim Haeck @wim · 3 weeks ago Developer Image: Comparison of the second sec	Edit
Repository 6 Manage	Branches Commits		By the way: are you planning on adding covariance data? I ask because this will have an effect on ERRORR. Milestone None	Edit
한 Plan /> Code	Repository 산 Manage	>	Marco Pigni @pignimt · 3 weeks ago @wim I am attaching the xcs file (energy, eV - Total, b - Elastic, b - Capture, b) reconstructed from SAMMY at 0K. I quickly checked in your file the value at 1e-5 eV and the difference is about 0.25% for the total cross section at that energy. I also checked elastic for the same energy and No estimate or time spent	Ŏ +
/ Build) Secure	Code Build	>	the agreement is much better, basically the same: 8.8432095615 (SAMMY) 8.843210+0 (Tape30). Therefore, the difference is coming from capture which is confirmed to be 0.1823186573 5 Participants (SAMMY) and 2.039473e-1 (Tape30). $\bigcirc \bigoplus \bigoplus \bigoplus \bigoplus \bigoplus$	
 Operate 	⊕ Secure	>	I checked only one energy point and I will let you check the rest. Please assess the situation for the other energy points and let me know if you want to further investigate the differences.	
Monitor	DeployOperate	>	So far, I am not working on the covariance but, yes, it'd nice a comparison.	
Help	🛄 Monitor	>	Edited 3 weeks ago by Marco Pigni	
	ili Analyze ⑦ Help	>	Wim Haeck @wim · 3 weeks ago Well, since elastic is the only channel in the rmatrix for Sr88 I must have done something right :-)	

<u>í</u> (🗋 🕂 🍺 🖮 ENDF > 🖷 library > 💿 ner	utrons > Merge requests > 1932		
D'11 \$\$1				
Q Search or e	📋 🗆 🖛 🛞 🖃	ENDF > 🖷 library > 💿 neutrons > Merge requ	iests > 1932	
Project	D' 11 👫 1 🖂 33 🤇	3		
😵 neutrons	Q Search or go to	• 💧 🗆 + 👂	😑 ENDF > 🕮 library > 🖲 neutrons > Merge requests > 1932	
🖈 Pinned	Project	D' 11 🖁 1 🖂 33	າງ Open Draft: Review/n-038_Sr_088 Review/n-038_Sr_088 ເດິງ into phase2	
Issues	😍 neutrons	Q Search or go to	Overview 32 Commits 5 Pipelines 0 Changes 1 8 u	nresolved threads \land \checkmark : Add a to do
Merge requests	🖈 Pinned 🗸	Project	Marco Pigni @pignimt · 3 weeks ago Developer 🔗 🙂 🕤 🖉 🚦	O Assignees Edit
Branches	Issues 169	Se neutrons	@wim I recalculated the xcs by including the direct capture and the same grid you used. The	None - assign yourself
Commits	Merge requests 26	🖈 Pinned 🗸	and the control of the control in the new Prease see attached.	O Reviewers Edit
Repository	Branches	Issues 169	Edited 3 weeks and by Marco Pinni	None - assign yourself
යී Manage	Commits	Merge requests 26		Labels Edit
🛱 Plan	Repository	Branches	 Collapse replies 	None
> Code	å Manage >	Commits	Wim Haeck @wim · 2 weeks ago	Milestone Edit
🕼 Build	₿ Plan >	Repository	These are the relative differences 1 - njoy/sammy (in %) for elastic and capture:	
⊕ Secure	Code >	🖧 Manage >	ENDF/B-VIII.1 Sr88 at 0 K	Time tracking Ö +
ত Deploy	Build Solution Solution	₿ Plan >	100 elastic	No estimate or time spent
Operate	\oplus Secure >	Code	50 - capture	5 Participants
🖽 Monitor	Deploy >	Build >		🚯 🌑 🤀 🦃 🏶
<u>↓</u> Analyze	Operate >	\square Secure >	8	
🕑 Help	💮 Monitor >	© Deploy →		
	↓ Analyze >	Operate >	³ / _≻ −100 −	
	() [®] Help	H Monitor >		
		<u>↓</u> Analyze >		
		년 https://git.pndc.bnl.gov/endf/library/neutron	-200 - s/uploads/e7ac13058242198d79b907551aba1a24/Figure 17.png	

8

<u> </u>	📋 🕂 👸 🖮 ENDF > 😁 librar	y > 😢 neutrons >	Merge requests > 1932			· M/hala diagua
D 11 \$\$ 1						• whole discuss
Q Search or g		ENDF >	😇 library > 😍 neutrons > N	lerge requests > !	1932	instead of lo
Project	D'11 🕄 1 🗹 3	3 11				
😍 neutrons	Q Search or go to	Ov		+ 🛞 😐	NDF > 👼 library > 😨 neu	• Allowe for
🖈 Pinned	Project		D'11 \$\$1 (I 33	Open Draft: Review/n-	
Issues	😍 neutrons		Q Search or go to	0	verview 32 Commit	
Merge requests	🖈 Pinned	~	Project		Marco Pigni @pign	• pinging/i
Branches	Issues 1	69	😍 neutrons		@wim I recalculate differences should	
Commits	Merge requests	26	🖈 Pinned	~	℅ rec-final.lst.forW	 separate
Repository	Branches		Issues	169	Edited 3 weeks ago by	•
<u>රී</u> Manage	Commits		Merge requests	26		 postina d
🛱 Plan	Repository	_	Branches		 Collapse replies 	P
Code	යි Manage	>	Commits		Wim Haeck @	 unloadin
🕼 Build	🛱 Plan	>	Repository		These are the	upiouum
⊕ Secure	> Code	>	රී Manage	>	100 -	
Deploy	2 Build	>	🗟 Plan	>	100]	- elastic
Operate	⊕ Secure	>	> Code	>	50 -	capture
😐 Monitor	Deploy	>	🕼 Build	>	0 -	
년 Analyze	Operate	>	⊕ Secure	>	[%]	
💮 Help	证 Monitor	>	Deploy	>	WW	
	<u>↓u</u> Analyze	>	Operate	>	³ -100 -	
	(? Help		😐 Monitor	>	ON	
			📖 Analyze	>	1	
			C Heln		-200 -	755406404/51000 47 000
					and a second sec	

- sion is documented, st in some email thread
 - tagging,
 - e threads,
 - of plots,
 - ng of files (pdf, endf, etc.)

5 Participants

ENDF Repo Auto-updating Wikis

A new job is being added to GitLab ENDF repositories to auto-update the repo's wiki with useful information about job and artifact status.

Example: https://git.nndc.bnl.gov/endf/library/neutrons/-/wikis/Neutron-Artifacts

1) update_wikis job runs after verify_endf

Pipeline	Needs	Jobs 3	Tests 0
login			
🕝 re	gistry_logi	in C	
verify			
Ø ve	erify_endf	Q	
update			1
🕝 up	date_wikis		

2) Use Wiki table of contents to find your data

Neutron Artifacts

Atomic Number (Z)	Symbol	Atomic Mass (A)	
000	n	001	
001	н	001, 002, 003	
002	Не	003, 004	
003	Li	006, 007	
004	Be	007, 009	
005	В	010, 011	
006	с	012, 013	
007	Ν	014, 015	
008	0	016, 017, 018	
009	F	019	
010	Ne	020, 021, 022	
011	Na	022 022	

3) Enjoy a record of job and artifact data all in one place

n 000_n_001

Last updated: 2023-11-09 19:06:57.358348

A verify_endf 2023-11-09 19:06:57.358383 Job Status: Job Details	
Artifacts created by this job: https://git.nndc.bnl.gov/api/v4/pro	ojects/27/jobs/10305/artifacts
A verify_endf 2023-11-09 18:30:02.626032	
Job Status: Job Details	
Artifacts created by this job: https://git.nndc.bnl.gov/api/v4/pro	ojects/27/jobs/10299/artifacts
A verify_endf 2023-11-06 14:41:16.202000	
Job Status: Job Details	
Artifacts created by this job: https://git.nndc.bnl.gov/api/v4/pro	ojects/27/jobs/10122/artifacts
👍 verify_endf 2023-11-06 14:54:46.259000	
Job Status: Job Details	
Artifacts created by this job: None	

Status of "Big Paper"



Past ENDF release published accompanying paper in Nuclear Data Sheets



A Journal Devoted to Compilations and Evaluations of Experimental and Theoretical Results in Nuclear Physics E. A. McCutchan, Editor National Nuclear Data Center, Brookhaven National Laboratory, Upton, NY 11973-5000, USA www.indc.Unl.gov

> Special Issue on Nuclear Reaction Data

Special Issue Editor: Pavel Obložinský Special Issue Assistant Editor: Boris Pritychenko

Contents

ENDF/R-VIILd: The 8th Major Release of the Nuclear Reaction Data Library with CIELO-project Cross Sections, New Standards and Thermal Scattering Data. DA, Brown, M.B. Chadwick, R. Capote, A.C. Kahler, A. Trkov, M.W. Herman, A.A. Sonzogai, Y. Danon, A.D. Carlson, M. Daun, D.L. Smith, G.M. Hale, G. Arbanas, R. Arcilla, C.R. Bates, B. Becker, F. Brown, J. Conlin, D.E. Cullen, M.A. Descalle, R. Friestone, K.H. Guber, A.I. Hawari, J. Holmes, T.D. Johason, T. Kawano, B.C. Kiedrowski, A.J. Koning, S. Kopecky, L. Leal, J. Lestone, C. Labitz, J.I. Marquez Damian, C. Mattoon, E.A. McCutchan, S. Maghabah, P. Navratil, D. Neudecker, G.P.A. Nobre, G. Noguere, M. Paris, M.T. Pigri, A. Piompen, B. Pritychenko, V.G. Pronyaev, D. Roubtow, D. Rochman, P. Romano, P. Schillebecck, S. Simakov, M. Sin, I. Simakov, B. Sleaford, V. Sobeş, E.S. Soukhovitskii, I. Steto, P. Talou, I. Thompson, S.C. van der Marka, D. Warda, W. Write, J.L. Wormald, R.Q. Weight, M. Zerdke, G. Zerowik, Y. Zhu

Contents continued on the back cover page



Nuclear Data Sheets 148, 1-142 (2018)

Nuclear Data Sheets Volume 148, February 2018, Pages 1-142



ENDF/B-VIII.0: The 8th Major Release of the Nuclear Reaction Data Library with CIELOproject Cross Sections, New Standards and Thermal Scattering Data

Cited 1,658 times!

This is really, <u>really</u> impactful!

Past ENDF release published accompanying paper in Nuclear Data Sheets Nuclear Data Sheets 112, 2887-2996 (2011) Nuclear Data Sheets



of Experimental and Theoretical Results in Nuclear Physic E.A. McCutchan, Editor National Nuclear Data Center, Brookhaven National Laboratory, Unton, NY 11973-5000, USA www.nndc.bnl.gov

> Special Issue on Nuclear Reaction Data

Special Issue Editor: Pavel Obložinský Special Issue Assistant Editor: Boris Pritychenko

Contents

ENDF/B-VIIL0: The 8th Major Release of the Nuclear Reaction Data Library with CIELO-project Cross Sections, New Standards and Thermal Scattering Data..... D.A. Brown, M.B. Chadwick, R. Capote, A.C. Kahler, A. Trkov, M.W. Herman A.A. Sonzogni, Y. Danon, A.D. Carlson, M. Dunn, D.L. Smith, G.M. Hale, G. Arbanas R. Arcilla, C.R. Bates, B. Beck, B. Becker, F. Brown, J. Conlin, D.E. Cullen, M.-A. Descalle R. Firestone, K.H. Guber, A.I. Hawari, J. Holmes, T.D. Johnson, T. Kawano, B.C. Kiedrowski A.J. Koning, S. Kopecky, L. Leal, J. Lestone, C. Lubitz, J.I. Márquez Damián, C. Mattoon, E.A. McCutchan, S. Mughabghab, P. Navratil, D. Neudecker, G.P.A. Nobre, G. Noguere M. Paris, M.T. Pigni, A. Plompen, B. Pritychenko, V.G. Pronyaev, D. Roubtsov, D. Rochman P. Romano, P. Schillebeeckx, S. Simakov, M. Sin, I. Sirakov, B. Sleaford, V. Sobes, E.S. Soukhovitskii, I. Stetcu, P. Talou, I. Thompson, S.C. van der Marck, D. Wiarda M. White, J.L. Wormald, R.Q. Wright, M. Zerkle, G. Zerovnik, Y. Zhu

Evaluation of the Neutron Data Standards . A.D. Carlson, V.G. Pronyaev, R. Capote, G.M. Hale, Z.-P. Chen, I. Duran, F.-J. Hambsch, S. Kunieda, W. Mannhart, B. Marcinkevicius, R.O. Nelson, D. Neudecker, G. Noguere M. Paris, S. Simakov, P. Schillebeeckx, D.L. Smith, X. Tao, A. Trkov, A. Wallner, W. Wang

Contents continued on the back cover page



Nuclear Data Sheets 148, 1-142 (2018)

and the second se	
1.20	N
E. Silve	Volum
LSEVIER	

uclear Data Sheets ne 148, February 2018, Pages 1-142



ENDF/B-VIII.0: The 8th Major Release of the Nuclear Reaction Data Library with CIELOproject Cross Sections, New Standards and Thermal Scattering Data

D.A. Brown^a, M.B. Chadwick^b and an analysis and a second structure of the A.A. Sonzogni a, Y. Danon d, A.D. Carlson e, M. Dunn f, D.L. Smith 8, G.M. Hale b, G. Arbanas h R. Arcilla^a, C.R. Bates^b, B. Beckⁱ, B. Becker^j, F. Brown^b, R.J. Caspersonⁱ, J. Conlin^b, D.E. Cullenⁱ, M.-A. Descalle¹, R. Firestone^k, T. Gaines¹, K.H. Guber^h, A.I. Hawari^m, J. Holmesⁿ, T.D. Johnson^a, T. Kawano^b, B.C. Kiedrowski^o, A.J. Koning^c, S. Kopecky^P, L. Leal^q, J.P. Lestone^b, C. Lubitz^r, J.I. Márquez Damián[®], C.M. Mattoon¹, E.A. McCutchan[®], S. Mughabghab[®], P. Navratil¹, D. Neudecker^b, G.P.A. Nobre^a, G. Noguere^v, M. Paris^b, M.T. Pigni^h, A.J. Plompen^p, B. Pritychenko a, V.G. Pronyaev v, D. Roubtsov v, D. Rochman v, P. Romano g, P. Schillebeeckx P S. Simakov Y, M. Sin Z, I. Sirakov aa, B. Sleaford I, V. Sobes h, E.S. Soukhovitskii ab, I. Stetcu b, P. Talou^b, I. Thompson¹, S. van der Marck^{ac}, L. Welser-Sherrill^b, D. Wiarda^h, M. White^b, J.L. Wormald ^m, R.Q. Wright ^h, M. Zerkle ⁿ, G. Žerovnik ^p, Y. Zhu ^m



This is really, <u>really</u> impactful!



Volume 112, Issue 12, December 2011, Pages 2887-2996

ENDF/B-VII.1 Nuclear Data for Science and Technology: Cross Sections, Covariances, Fission Product Yields and Decay Data

M.B. Chadwick a 🖂 , M. Herman ^b, P. Obložinský ^b, M.E. Dunn ^c, Y. Danon ^d, A.C. Kahler ^a, D.L. Smith ^e, B. Pritychenko^b, G. Arbanas^c, R. Arcilla^b, R. Brewer^a, D.A. Brown^{b f}, R. Capote^g A.D. Carlson^h, Y.S. Cho^m, H. Derrien^c, K. Guber^c, G.M. Hale^{*}, S. Hoblit^b, S. Holloway^{*}, T.D. Johnson^b, T. Kawano^a, B.C. Kiedrowski^a, H. Kim^m, S. Kunieda^a^o, N.M. Larson^c, L. Leal^c, J.P. Lestone^a, R.C. Little^a, E.A. McCutchan^b, R.E. MacFarlane^a, M. MacInnes^a, C.M. Mattoon R.D. McKnight ^c, S.F. Mughabghab ^b, G.P.A. Nobre ^b, G. Palmiotti ⁿ, A. Palumbo ^b, M.T. Pigni ^c V.G. Pronyaev¹, R.O. Sayer^c, A.A. Sonzogni^b, N.C. Summers^f, P. Talou^a, I.J. Thompson^f, A. Trkov^j, R.L. Vogt ^f, S.C. van der Marck ^k, A. Wallner ¹, M.C. White ^a, D. Wiarda ^c, P.G. Young ^a

Cited 3,138 times!

Nuclear Data Sheets, 107 (2006), p. 2931



Nuclear Data Sheets Volume 107, Issue 12, December 2006, Pages 2931-3060

ENDF/B-VII.0: Next Generation Evaluated Nuclear Data Library for Nuclear Science and Technology



Big Paper updates

- Many contributions have been sent but there are still gaps that will be addressed after CSEWG Meeting
- · Defined preliminary full author list and ordering
- Big Paper is shaping up: huge "stitching" effort
- Aiming to have a complete manuscript soon

Commits to development

10

Excluding merge commits. Limited to 6,000 commits.

FIXME: Full title of ENDF/B-VIII.1 paper

G.P.A. Nobre,^{1,*} R. Capote,² M.T. Pigni,³ A. Trkov,⁴ C.M. Mattoon,⁵ D. Neudecker,⁶ D.A. Brown,¹ M.B. Chadwick,⁶ A.C. Kahler,⁶ N.A. Kleedtke,⁶ M. Zerkle,⁷ A.I. Hawari,⁸ C.W. Chapman,³ N.C. Fleming,⁸ J.L.
Wormald,⁷ K. Ramić,³ Y. Danon,⁹ N.A. Gibson,⁶ P. Brain,⁹ M.W. Paris,⁶ G.M. Hale,⁶ I.J. Thompson,⁵ D.P. Barry,⁷ I. Stetcu,⁶ W. Haeck,⁶ A.E. Lovell,⁶ M.R. Mumpower,⁶ G. Potel Aguilar,⁵ K. Kravvaris,⁵ G. Noguer,¹⁰ A.D. Carlson,¹¹ M. Dunn,¹² T. Kawano,⁶ D. Wiarda,³ G. Arbanas,³ R. Arcilla,¹ B. Beck,⁵ D. Bernard,¹⁰ R. Beyer,¹³ J.M. Brown,³ O. Cabellos,¹⁴ R.J. Casperson,⁵ E.V. Chimanski,¹ R. Coles,¹ M. Cornock,¹⁵ J. Cotchen,⁷ J.P.W. Crozier,⁸ D.E. Cullen,² A. Daskalakis,⁷ M.-A. Descalle,⁵ D.D. DiJulio,¹⁶ P. Dimitriou,² A.C. Dreyfuss,⁵ FIXME: Ignacio Duran,¹⁷ R. Ferrer,¹⁸ T. Gaines,¹⁵ G. Gert,⁵ K.H. Guber,³ J.D. Haverkamp,⁷ M.W. Herman,⁶ J. Holmes,⁷ A.R. Junghans,¹³ K. Kelly,⁶ H.I. Kim,¹⁹ P.E. Koehler,⁶ M. Koštál,²⁰ B.K. Laramee,⁸ A. Lauer-Coles,¹ L. Leal,^{3,21} H.Y. Lee,⁶ A.M. Lewis,⁷ J. Malec,⁴ J.I. Márquez Damián,¹⁶ W.J. Marshall,³ A. Mattera,¹ J.D. McDonnell,³ G. Muhrer,¹⁶ A. Ney,⁷ W.E. Ormand,⁵ D.K. Parsons,⁶ C.M. Percher,⁵ B. Pritychenko,¹ V.G. Pronyaev,²² S. Quaglioni,⁵ M. Rapp,⁷ J.J. Ressler,⁵ P.K. Romano,²³ D. Roubtsov,²⁴ G. Schnabel,² M. Schulc,²⁰ A.A. Sonzogni,¹ P. Talou,⁶ J. Thompson,⁷ T.H. Trumbull,⁷ M. Vorabbi,¹ C. Wemple,¹⁸ K.A. Wendt,⁵ M. White,⁶ and R.Q. Wright²⁵

¹Brookhaven National Laboratory, Upton, NY 11973-5000, USA ²International Atomic Energy Agency, Vienna-A-1400, PO Box 100, Austria ³Oak Ridge National Laboratory, Oak Ridge, TN 37831-6171, USA ⁴ Jožef Stefan Institute, Jamova 39, SI-1000, Ljubljana, Slovenia ⁵Lawrence Livermore National Laboratory, Livermore, CA 94551-0808, USA ⁶Los Alamos National Laboratory, Los Alamos, NM 87545, USA ⁷Naval Nuclear Laboratory, Schenectady, New York 12301-1072, USA ⁸North Carolina State University, Department of Nuclear Engineering, Raleigh, North Carolina 27695 ⁹Rensselaer Polytechnic Institute, Troy, NY 12180, USA ¹⁰CEA, DEN, DER, SPRC, Cadarache, 13108 Saint-Paul-lèz-Durance, France ¹¹National Institute of Standards and Technology, Gaithersburg, MD 20899-8463, USA ¹²Spectra Tech, Inc., Oak Ridge, TN 37830, USA ¹³ Physikalisch-Technische Bundesanstalt, Department 6.4 - Ion and Neutron Radiation, Bundesallee 100, 38116 Braunschweig, Germany ¹⁴Universidad Politécnica de Madrid, José Gutiérrez Abascal, 2 28006, Madrid, Spain ¹⁵AWE.plc Aldermaston, Reading, BERKSHIRE, RG7 4PR. ¹⁶European Spallation Source ERIC, Lund, Sweden ¹⁷ FIXME: Missing Affiliation 2

¹⁸ FIXME: Missing Affiliation ¹⁸ FIXME: Studvisk

 ¹⁹Korea Atomic Energy Research Institute, Daejeon, Republic of Korea ²⁰Research Centre Řež Ltd, Husinec-Řež, Czech Republic
 ²¹Institut de Radioprotection et de Sûreté Nucléaire, 92262 Fontenay aux Roses, Cedex, France ²²International Atomic Energy Agency (consultant), Vienna-A-1400, PO Box 100, Austria ²³Argonne National Laboratory, Argonne, IL 60439-4842 USA ²⁴Canadian Nuclear Laboratories, Chalk River, Ontario, Canada ²⁵FIXME: Missing Affiliation 1



⁻ Commits Avg: 391m · Max: 9

ENDF release status



Progress towards ENDF/B-VIII.1

- **Beta1** was released on March 1st, 2023:
 - Mostly neutrons sublibraries
 - Mostly INDEN
- **Beta1.1** was released on April 18th, 2023:
 - Mostly TSL files
 - Some few specific neutrons fixes
- Mini-CSEWG (LLNL): April 24-28, 2023
- Beta2 was released on August 4, 2023
 - All neutrons contributions incorporated

- New ²³⁹Pu that restores depletion performance, following feedback from mini-CSEWG
- Gaps in exit distributions filled
- Many dosimetry reactions consistently adopted from IRDFF-II
- Many updates on photonuclear library based on IAEA CRP
- Hackathon (LANL): August 6-8, 2023
- CSEWG Meeting: November 15-17, 2023











ENDF/B

VIII.1-*β***2**

- For many nuclides, there were no outgoing distributions for some emitted particles
 - Wherever it was missing, exit spectra was taken from TENDL
 - Cross sections left unchanged
 - Impacted 219 files



ENDF/B

VIII**.**1-*β*2



• For many nuclides, there were no outgoing distributions for some emitted particles

- Wherever it was missing, exit spectra was taken from TENDL
- Cross sections left unchanged
- Impacted 219 files
- The IRDFF-II dosimetry library contains well-measured cross-sections for specific reactions
 - This tends to be more accurate than any full, selfconsistent evaluation
 - 34 files had something replaced by IRDFF
 - Had to reconstruct other reactions to preserve unitarity

Updating of the ENDF/B-VIII.1b2 candidate evaluations with reaction cross sections from IRDFF-II

A. Trkov

Jozef Stefan Institute, Ljubljana, Slovenia

R. Capote

International Atomic Energy Agency, Vienna, Austria

July 2023

Introduction

In addition to the neutron cross section Standards, the dosimetry reaction cross sections are the most rigorously evaluated nuclear data that include covariance information extending to at least 60 meV. The most recent neutron dosimetry library is IRDFF-II, available from the IAEA. It is desirable that evaluated data in the new libraries would be consistent with the dosimetry cross sections so that integral reaction rates could be calculated directly from detailed Monte Carlo calculations.

In the present notes the reaction cross sections in IRDFF-II are compared to the equivalent cross sections in ENDF/B-VIII.1b1. Changes to the candidate evaluations for ENDF/B-VIII.1b2 are proposed.





 For many nuclides, there were no outgoing distributions for some emitted particles

- Wherever it was missing, exit spectra was taken from TENDL
- Cross sections left unchanged
- Impacted 219 files
- The IRDFF-II dosimetry library contains well-measured cross-sections for specific reactions
 - This tends to be more accurate than any full, selfconsistent evaluation
 - 34 files had something replaced by IRDFF
 - Had to reconstruct other reactions to preserve unitarity
- These efforts were done semi-simultaneously, independently, by different groups, often in the same file
 - Logistic challenge to coordinate all this!

Updating of the ENDF/B-VIII.1b2 candidate evaluations with reaction cross sections from IRDFF-II

A. Trkov

Jozef Stefan Institute, Ljubljana, Slovenia

R. Capote

International Atomic Energy Agency, Vienna, Austria

July 2023

Introduction

In addition to the neutron cross section Standards, the dosimetry reaction cross sections are the most rigorously evaluated nuclear data that include covariance information extending to at least 60 meV. The most recent neutron dosimetry library is IRDFF-II, available from the IAEA. It is desirable that evaluated data in the new libraries would be consistent with the dosimetry cross sections so that integral reaction rates could be calculated directly from detailed Monte Carlo calculations.

In the present notes the reaction cross sections in IRDFF-II are compared to the equivalent cross sections in ENDF/B-VIII.1b1. Changes to the candidate evaluations for ENDF/B-VIII.1b2 are proposed.





Previously non-existent exit distributions added by LLNL

• Na22	• V50	• Se82	• Mo97	• Cd112	• Te122	• Cs135	• Pm149	• Er170	• Os189
• Na23	• V51	• Br79	• Mo98	• Cd113	• Te123	• Cs136	• Sm147	• Yb168	• Os190
• Mg24	 Co58m1 	• Br81	• Mo99	• Cd114	• Te124	• Cs137	• Sm149	• Yb170	• Os192
• Mg25	• Zn64	• Kr80	• Mo100	• Cd116	• Te125	• Ba130	• Sm153	• Yb171	• Hg196
• Mg26	• Zn65	• Kr82	• Ru96	• In113	• Te126	• Ba132	• Eu151	• Yb172	• Hg198
• Si28	• Zn66	• Kr83	• Ru98	• In115	• Te127m1	• Ba134	• Eu152	• Yb173	• Hg199
• P31	• Zn67	• Kr84	• Ru99	• Sn112	• Te128	• Ba135	• Eu153	• Yb174	• Hg200
• S32	• Zn68	• Rb85	• Ru100	• Sn114	• Te129m1	• Ba136	• Eu154	• Yb176	• Hg201
• S33	• Zn70	• Rb87	• Ru102	• Sn115	• Te130	• Ba137	• Eu155	• Lu175	• Hg202
• S34	• Ga69	• Sr86	• Ru103	• Sn116	• I129	• Ba138	• Eu156	• Lu176	• Hg204
• S36	• Ga71	• Sr87	• Ru104	• Sn117	• I131	• Ba140	• Gd152	• Hf174	• Bi209
• Ar36	• Ge70	• Sr88	• Ru105	• Sn118	• I135	• La138	• Gd153	• Hf176	• Ra223
• Ar38	• Ge72	• Sr89	• Ru106	• Sn119	• Xe126	• Ce140	• Gd155	• Hf178	• Ra224
• K39	• Ge73	• Sr90	• Rh103	• Sn122	• Xe128	• Ce141	• Gd157	• Hf179	• Ra225
• K40	• Ge74	• Y91	• Rh105	• Sn123	• Xe129	• Ce142	• Tb159	• Hf180	• Ra226
• K41	• Ge76	• Nb93	• Pd107	• Sn124	• Xe130	• Ce144	• Dy154	• Hf181	• U235
• Sc45	• Se74	 Nb94 	• Ag107	• Sn126	• Xe132	• Pr143	• Dy159	• Hf182	• Pu238
• Ti46	• Se76	 Nb95 	 Ag110m1 	• Sb121	• Xe133	• Nd143	• Er162	• Ta182	• Am242
• Ti47	• Se77	• Mo92	• Cd106	• Sb123	• Xe134	• Nd145	• Er164	• Os184	• Am242m1
• Ti48	• Se78	• Mo94	• Cd108	• Sb124	• Xe135	• Pm147	• Er166	• Os186	• Am244
• Ti49	• Se79	• Mo95	• Cd110	• Sb125	• Xe136	• Pm148	• Er167	• Os187	• Am244m1
• Ti50	• Se80	 Mo96 	• Cd111	• Te120	• Cs134	 Pm148m1 	• Er168	• Os188	



IRDFF-II replacements



- 7Li
- 23Na
- 24Mg
- 27AI
- 28Si
- 29Si
- 31P
- 32S
- 46Ti
- 47Ti
- 48Ti
- 51V
- 55Mn
- 54Fe
- 59Co
- 58Ni
- 60Ni

- 64Zn
 - 67Zn
 - 68Zn
 - 75As
 - 89Y
 - 90Zr
 - 92Mo
 - 103Rh
 - 113In
 - 115In
 - 1271
 - 141Pr
 - 169Tm
 - 197Au
 - 199Hg
 - 204Pb
 - 209Bi

Updating of the ENDF/B-VIII.1b2 candidate evaluations with reaction cross sections from IRDFF-II

A. Trkov

Jozef Stefan Institute, Ljubljana, Slovenia

R. Capote

International Atomic Energy Agency, Vienna, Austria

July 2023

Introduction

In addition to the neutron cross section Standards, the dosimetry reaction cross sections are the most rigorously evaluated nuclear data that include covariance information extending to at least 60 meV. The most recent neutron dosimetry library is IRDFF-II, available from the IAEA. It is desirable that evaluated data in the new libraries would be consistent with the dosimetry cross sections so that integral reaction rates could be calculated directly from detailed Monte Carlo calculations.

In the present notes the reaction cross sections in IRDFF-II are compared to the equivalent cross sections in ENDF/B-VIII.1b1. Changes to the candidate evaluations for ENDF/B-VIII.1b2 are proposed.



Results sensitive to stainless steel



Results sensitive to stainless steel



Preliminary validation on Beta2, by Andrej Trkov (JSI)



ENDF/BVIII.1 is on track to be the best-performing library to-date!

<u>**Caveat</u>**: Cumulative χ^2 of benchmarks provide only a global view. Detailed investigation of performance on specific benchmark are also important.</u>

For more details on the ENDF-VIII.1-Beta2 performance, see talks in the Validation session of 2023 CSEWG Meeting!

Chi**2/DoF

- Reactor lattice category ("LCT", LEU-COMP- THERM) shows excellent overall performance
- Changes in 235,238U and 239Pu produce favorable changes in mixed U+Pu benchmarks simulated results
- PST benchmark simulated results are slightly concerning E8.0 "success story" of reducing PST bias
- Discussion: should we compromise PST performance for better performance in depletion metrics, temperature coefficients, etc.?
- Overall, there is a significant reduction in mean absolute bias for 233U benchmarks simulated results from changes in the 233U file; however, C/E values are still very far from unity...



- Reactor lattice category ("LCT", LEU-COMP- THERM) shows excellent overall performance
- Changes in 235,238U and 239Pu produce favorable changes in mixed U+Pu benchmarks simulated results
- PST benchmark simulated results are slightly concerning E8.0 "success story" of reducing PST bias
- Discussion: should we compromise PST performance for better performance in depletion metrics, temperature coefficients, etc.?
- Overall, there is a significant reduction in mean absolute bias for 233U benchmarks simulated results from changes in the 233U file; however, C/E values are still very far from unity...



- Reactor lattice category ("LCT", LEU-COMP- THERM) shows excellent overall performance
- Changes in 235,238U and 239Pu produce favorable changes in mixed U+Pu benchmarks simulated results
- PST benchmark simulated results are slightly concerning E8.0 "success story" of reducing PST bias
- Discussion: should we compromise PST performance for better performance in depletion metrics, temperature coefficients, etc.?
- Overall, there is a significant reduction in mean absolute bias for 233U benchmarks simulated results from changes in the 233U file; however, C/E values are still very far from unity...



- Reactor lattice category ("LCT", LEU-COMP- THERM) shows excellent overall performance
- Changes in 235,238U and 239Pu produce favorable changes in mixed U+Pu benchmarks simulated results
- PST benchmark simulated results are slightly concerning E8.0 "success story" of reducing PST bias
- Discussion: should we compromise PST performance for better performance in depletion metrics, temperature coefficients, etc.?
- Overall, there is a significant reduction in mean absolute bias for 233U benchmarks simulated results from changes in the 233U file; however, C/E values are still very far from unity...



What to expect for Beta3

• <u>TSL:</u>

- New MAT number assignments
- Reviewed and new files
- Extension of light water to low temperatures

• <u>Neutrons:</u>

- Exit distributions form LANL/KAERI
- Many fixes
- Improved ^{239,240,241}Pu set with better criticality/depletion performance

Photonuclear:

- Reverted ^{180,182,183}W to VIII.0
- ²⁴²Pu from JENDL-5.0
- ⁹Be from IAEA CRP

Atomic sublibraries:

- Taken from EPICS-2023
 - Atomic relaxation sublibrary (EADL)
 - Electrons sublibrary (EEDL)
 - Photoatomic sublibrary (EPDL)



TSL MAT numbers

- Many, many new contributions: MAT number overload!
- Approved format change allow direct MAT assignments in the range of 1 to 9999
- New assignments were made, according to new guidelines:

Table C.1: Set of general rules used to assign MAT numbers for new materials in the TSL sublibrary.

MAT range	Description					
1-10	legacy hydrogen (except organics) assignments					
11-20	legacy deuterium assignments					
21 - 25	legacy lithium assignments					
26-29	legacy beryllium assignments					
30-44	legacy carbon (including organics) assignments					
45-50	legacy oxygen assignments					
51-70	legacy metal assignments					
71-99	legacy fuel assignments					
100-299	single element					
	(100 + Z for natural element and)					
	200+Z for alternative form whenever possible)					
300-999	graphite/diamond variations					
1000-2999	carbon including organics					
3000-3999	two-element inorganic compounds					
4000-4999	three-element inorganic compounds					
5000-5999	four-element inorganic compounds					
6000-6499	five-element inorganic compounds					
6500-6999	free slots					
7000-7999	fuel compounds with plutonium					
8000-8999	fuel compounds with uranium					
9000-9999	free slots					

	•	THE REAL PROPERTY IN	SL_N	AAT_number	s.csv (~/Ca	alculatio	ns/ENI	DF/thermal_sca	itt) - VIM	I
####	###########	####	#####	############	##########	########	#####	####		
##								##		
##			TS	L MAT numbe	rs			##		
## a	associate	d wi	th th	e ENDF/B-VI	II .1 -BetaX	release		##		
##								##		
## N	lote: emp	tv f	ile f	ield means I	MAT number	is rese	rved.	##		
##		-, -						##		
##								##		
####	***	####	#####	############	****	########	#####	####		
###	*****	" """		******	****			<i></i>		
## ##	MAT numb	er,	ENDF-	6 file name		,	De	scription		
""	1		tsl-H	inH20.endf			н	in H2O (liauid)	
	2		tsl-p	ara-H.endf			pa	ra-Hvdrogen		
	3		tsl-o	rtho-H.endf			or	tho-Hvdrogen		
	5	,	ts1_H	inYH2.endf		,	Ĥ.	in YH2		
	7	,	tc1_H	in7rH endf		,	н	in 7rH		
	10	,	tc1_H	inTceTh end	f	,	н н	in H2O (ice (T	h))	
	11	,	tc1_D	inD20 endf	•	,	п. П	in D20 (liquid)	
	12	,	tol_p	ara_D ondf		,	D .	n Dzo (tiquiu	,	
	12	,	tst-p	rtha D andf		,	pa	the Doutorium		
	14	,	LSL-0	ling-prendi		,				
тсі	MAT numb	ars	CEV			,	υ.		1 1	Ton
IJL_		ers.	tcl_H	in7r⊎2 ondf			Ш.	in 7rH2	1,1	тор
	2002	,	tst-n tcl_7	rinZrHz.enul	f	,	п. 7 г	in ZrHy		
	2000	,	ιςι-2 +c1 μ		1	,				
	2007	,	tst-n +cl C		£	,	п. Со			
	2011	,	ιςι-υ + c1 μ	aincanz.enu	۱ ۶	,				
	2013	,	tst-n tel 4		1 F	,	11	in CaH2		
	2014	,	ιςι-Π +cl ε	iinCiO2 ala	ha ondf	,	п <u>г</u>	in CiO2 alaba		
	2010	,	+-1 0	incio2 alph		,	51	in SiO2-alpha		
	201/	,	LSL-0	insiuz-atph	a.enui	,	0 . C 4			
	2021	,				,	51	in SiO2-Deta		
	3022	,	+ - 1 7		und and f	,		in SIUZ-Dela	a	
	3031	,		L11N/L1H-M1)	xea.enar	,	/	i in /Lin-mixe	a	
	3032	,	tsι-Π + -1 7		a.enar	,	п. 71			
	3034	,			xea.enar	,	/L	i in /LiD-mixe	a	
	2022	,	tst-D	in/LiD-mixe	a.enar	,	U :	in /LiD-mixed		
	303/	,				,	mg	in MgHZ		
	3038	,				,	п	in MgHZ		
	3042	,				,	мg	in MgD2		
	3043	,	+ - 1 F	dallE and 6		,	U :	in MgDZ		
	3047	,	tsl-F	inHF.endt		,	F :			
	3048	,	tst-H	LinhF.endf		,	H			
	3052	,	tsl-A	linAl203.en	a T	,	AL	in Al203		
	3053	,	tsl-0	inAl203.end	Т	,	0	in Al203		
TCI	3060	,				,	Pb	in PDF2	100.04	0.74
151	_MAI_numb	ers.	CSV						128,24	37%
	• "### ## ## ### ### ### ### ###	<pre>####################################</pre>	<pre></pre>	<pre>TSL_N "####################################</pre>	<pre> TSL_MAT_number TSL_MAT_number TSL_MAT_number TSL_MAT_number TSL_MAT_numbe TSL_MAT_number TSL_MAT_number TSL_MAT_number TSL_MAT_number TSL_MAT_number, ENDF-6 file name TSL_MAT_number, ENDF-6 file name TSL_MAT_number, ENDF-6 file name TSL_MAT_number, ENDF-6 file name TSL_MAT_numbers.csv S002 , tsl-HinZrH.endf 10 , tsl-HinZrH.endf 11 , tsl-DinD20.endf 12 , tsl-para-D.endf 13 , tsl-ortho-D.endf 14 , TSL_MAT_numbers.csv S002 , tsl-HinZrH2.endf S006 , tsl-ZrinZrH2.endf S007 , tsl-HinZrH2.endf S006 , tsl-ZrinZrH2.endf S007 , tsl-HinZrH2.endf S007 , tsl-HinZrH2.endf S007 , tsl-HinZrH2.endf S001 , tsl-SiinSi02-alp S011 , tsl-OinSi02-alp S017 , tsl-OinSi02-alp S017 , tsl-DinTLiD-mixe S034 , tsl-TLiin7LiH-mixe S034 , tsl-TLiin7LiH-mixe S034 , tsl-TLiin7LiH-mixe S034 , tsl-TLiin7LiH-mixe S037 , S038 , S042 , S043 , S044 , S043 , S047 , tsl-AlinAl203.end S053 , tsl-OinAl203.end S053 , tsl-OinAl203.end S054 S054</pre>	<pre>TSL_MAT_numbers.csv (~/Ca TSL_MAT_numbers.csv (~/Ca TSL_MAT numbers ## associated with the ENDF/B-VIII.1-BetaX ## Note: empty file field means MAT number ## ## ## MAT number, ENDF-6 file name ## 1 , tsl-HinH20.endf 2 , tsl-para-H.endf 3 , tsl-ortho-H.endf 5 , tsl-HinZrH.endf 10 , tsl-HinZrH.endf 10 , tsl-HinZrH2.endf 11 , tsl-DinD20.endf 12 , tsl-para-D.endf 13 , tsl-ortho-D.endf 13 , tsl-ortho-D.endf 14 , TSL_MAT_numbers.csv 3002 , tsl-HinZrH2.endf 3006 , tsl-ZrinZrHx.endf 3011 , tsl-CainCaH2.endf 3013 , tsl-HinZrH2.endf 3014 , tsl-HinZrH2.endf 3015 , tsl-HinZrH2.endf 3016 , tsl-ZinZrH2.endf 3017 , tsl-OinSi02-alpha.endf 3018 , tsl-SiinSi02-alpha.endf 3021 , 3022 , 3031 , tsl-TLiin7LiH-mixed.endf 3034 , tsl-TLiin7LiH-mixed.endf 3035 , tsl-Din7LiD-mixed.endf 3036 , tsl-Ziin7LiD-mixed.endf 3037 , 3038 , 3042 , 3043 , 3047 , tsl-FinHF.endf 3048 , tsl-HinHF.endf 3053 , tsl-OinAl203.endf 3053 , tsl-OinAl203.endf 3053 , tsl-OinAl203.endf 3054 , tsl-AlinAl203.endf 3055 , tsl-OinAl203.endf 3055 , tsl-OinAl203.endf 3055 , tsl-OinAl203.endf 3056 , tsl-OinAl203.endf 3056 , tsl-OinAl203.endf 3056 , 3056 ,</pre>	<pre>TSL_MAT_numbers.csv (-/Calculation "####################################</pre>	<pre>TSL_MAT_numbers.csv (~/Calculations/ENU TSL_MAT numbers TSL_MAT numbers TSL_MAT numbers TSL_MAT numbers TSL_MAT numbers TSL_MAT numbers TSL_MAT number is reserved. TSL_MAT number, ENDF-6 file name TSL_MAT_number, ENDF-6 file name TSL_NAT_number, ENDF, ENDF-6 file name TSL_NAT_NUMBer, ENDF-6</pre>	<pre>TSL_MAT_numbers.csv (-/Calculations/ENDF/thermal_sca TH####################################</pre>	<pre>TSL_MAT_numbers.csv (~/Calculations/ENDF/thermal_scatt) - VIM TTSL_MAT_numbers.csv (~/Calculations/ENDF/thermal_scatt) - VIM TTSL_MAT_numbers.csv # TSL_MAT_numbers # TSL_MAT_numbers ## TSL_MAT_numbers ## TSL_MAT_numbers ## TSL_MAT_numbers ## TSL_MAT_number is reserved. ## TSL_MAT_number, ENDF-6 file name , Description ## T1 , tsl-HinH20.endf , H in H20 (liquid) 2 , tsl-para-H.endf , para-Hydrogen 3 , tsl-ortho-H.endf , H in TCH1 10 , tsl-HinZrH2.endf , H in TCH1 10 , tsl-HinZrH2.endf , H in ZrH2 3002 , tsl-HinZrH2.endf , H in ZrH2 3002 , tsl-HinZrH2.endf , D in D20 (liquid) 11 , tsl-OinD20.endf , D in D20 (liquid) 12 , tsl-para-D.endf , D in D20 (liquid) 13 , tsl-ortho-D.endf , D in TCH2 3006 , tsl-ZrinZrH2.endf , H in ZrH2 3007 , tsl-HinZrH2.endf , H in TCH2 3011 , tsl-OinD20.endf , D in TCH2 3013 , tsl-HinCH2.endf , H in TCH2 3014 , tsl-HinZrH2.endf , Ca in CaH2 3013 , tsl-HinCH2.endf , H in SCH2 3014 , tsl-HinZrH2.endf , Si in Si02-alpha 3021 , sl-HinZrH2.endf , H in TCH2 3014 , tsl-HinZH2.endf , H in SCH2 3015 , tsl-HinZrH2.endf , H in TCH2 3016 , tsl-SiINSI02-alpha.endf , Si in Si02-alpha 3021 , tsl-HinZlH2.endf , H in TCH2 3031 , tsl-HinZH2.endf , H in TCH2 3031 , tsl-HinZH2.endf , H in TCH2 3031 , tsl-HinZH2.endf , H in SCH2 3031 , tsl-HinZH2.endf , H in TCH2 3031 , tsl-HinZH2.endf , H in TCH2 3031 , tsl-HinZH2.endf , H in SCH2 3031 , tsl-HinZH2.endf , H in TCH2 3031 , tsl-HinZH2.endf , H in M IN 202 3031 , tsl-HinZH2.endf , H in M20 3032 , tsl-HinZH4.endf , H in M20 3033 , tsl-DinZLD-alpha.endf , D in M202 3044 , tsl-FinHF.endf , H in M4 3035 , tsl-OinAl203.endf , A tl in Al203 3060 , tsl-AlinAl203.endf , D in M203 3060 , Pb in PbF2 3060 , TSL-AlinAl203.endf , D in M203 3060 , Pb in PbF2 3060 , TSL-AlinAl203.endf , D in M203 3060 , Pb in PbF2 3060 , TSL-AlinAl203.endf , D in M203 3060 , Pb in PbF2 3060 , TSL-AlinAl203.endf , D in M203 3060 , Pb in PbF2 3060 , Pb in PbF2 3060 , TSL-AlinAl203.endf</pre>

TSL updates since Beta2 (in addition to new MAT assignments)

- tsl-Be-metal+Sd
- tsl-Be-metal
- tsl-BeinBeO
- tsl-CainCaH2
- tsl-CinC5O2H8.endf (fixes)
- tsl-CinC8H8 (minor fix)
- tsl-CinCF2.endf (minor fix)
- tsl-CinSiC
- tsl-CinUC-100P (new file)
- tsl-CinUC-10P
- tsl-CinUC-5P
- tsl-CinUC-HALEU (new file)
- tsl-CinUC-HEU
- tsl-CinUC
- tsl-DinD2O (minor fix)
- tsl-FinCF2 (minor fix)
- tsl-H1inCaH2
- tsl-H2inCaH2
- tsl-HinC5O2H8.endf (ORNL)
- tsl-HinH2O.endf (ESS)
- tsl-HinC8H8.endf (minor fix)

- tsl-Hinlcelh.endf (minor fix)
- tsl-HinParaffinicOil (minor fix)
- tsl-HinYH2 (minor fix)
- tsl-HinZrH2 (minor fix)
- tsl-HinZrHx (minor fix)
- tsl-NinUN-100P
- tsl-NinUN-10P
- tsl-NinUN-5P
- tsl-NinUN-HALEU
- tsl-NinUN-HEU
- tsl-NinUN
- tsl-OinBeO
- tsl-OinC5O2H8.endf (fixes)
- tsl-OinD2O
- Oinlcelh
- tsl-OinPuO2
- tsl-OinSiO2-alpha
- tsl-OinUO2-100P
- tsl-OinUO2-10P
- tsl-OinUO2-5P
- OinUO2-HALEU

- tsl-OinUO2-HEU
- tsl-OinUO2
 - tsl-PuinPuO2
- tsl-SiinSiC
- tsl-SiinSiO2-alpha
- tsl-U-metal-10P
- tsl-U-metal-5P
- tsl-U-metal-HEU
- tsl-U-metal
- tsl-UinUC-100P
- tsl-UinUC-10P
- tsl-UinUC-5P
- tsl-UinUC-HALEU
- tsl-UinUC-HEU
- tsl-UinUC
- tsl-UinUN-100P
- tsl-UinUN-10P
- tsl-UinUN-5P
- tsl-UinUN-HALEU
- tsl-UinUN-HEU
- tsl-UinUN

- tsl-UinUO2-100P
- tsl-UinUO2-10P
- tsl-UinUO2-5P
- tsl-UinUO2-HALEU
- tsl-UinUO2-HEU
- tsl-UinUO2
- tsl-YinYH2
- tsl-ZrinZrH2 (minor fix)
- tsl-ZrinZrHx (minor fix)
- tsl-graphiteSd
- tsl-reactor-graphite-10P
- tsl-reactor-graphite-20P
- tsl-reactor-graphite-30P
- tsl-s-CH4
- tsl-CinZrC
- tsl-ZrinZrC
- tsl-ortho-D
- tsl-para-D
- tsl-ortho-H
- tsl-para-H



KAERI/LANL exit distributions

• al27

• MF=6 MT= 600-619, 650-669, 700-710, 800-819 were updated.

• si28

- MF=12/14 MT= 601-613, 801-815 were deleted.
- MF=6 MT= 104 were deleted.
- MF=3 MT= 650-659, 699 were added.
- MF=6 MT= 650-659, 699 were added.
- MF=6 MT= 600-613, 800-815 were updated.

• si29

- MF=12/14 MT= 601-615, 801-819 were deleted.
- MF=6 MT= 600-615, 800-819 were updated.

• si30

- MF=12/14 MT= 601-605, 801-811 were deleted.
- MF=6 MT= 600-605, 800-811 were updated.

• si31

- MF=4 MT= 600, 800-814 were deleted.
- MF=12/14 MT= 801-814 were deleted.
- MF=6 MT= 600, 800-814 were added.

• si32

- MF=4 MT= 600, 800 were deleted.
- MF=6 MT= 600, 800 were added.
- cl35
 - MF=6 MT= 600-629, 650-680, 700-730, 800-820 were updated.
- cl36
 - MF=4 MT= 600-615, 800-831 were deleted.
 - MF=12/14 MT= 601-615, 801-831 were deleted.

Brookhaven National Laboratory

• MF=6 MT= 600-615, 800-831 were added.

• cl37

- MF=3 MT= 600-609, 649 were added.
- MF=6 MT= 600-609 were added.
- MF=6 MT= 649, 650-661, 700-715, 800-805 were updated.

• k39

- MF=15 MT= 103, 107 were deleted.
- MF=12/14 MT= 601-609, 801-809 were deleted.
- MF=3 MT= 600-609, 649, 800-809, 849 were added.
- MF=6 MT= 600-609, 649, 800-809, 849 were added.
- k40
 - MF=15 MT= 103, 107 were deleted.
 - MF=12/14 MT= 601-609, 801-809 were deleted.
 - MF=3 MT= 600-609, 649, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 800-809, 849 were added.
- k41
 - MF=15 MT= 103, 107 were deleted.
 - MF=12/14 MT= 601-609, 801-809 were deleted.
 - MF=3 MT= 600-609, 649, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 800-809, 849 were added.
- ti46
 - MF=6 MT= 104, 105, 106 were deleted.

- MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- ti47
 - MF=6 MT= 104, 105, 106 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- ti48
 - MF=6 MT= 104, 105, 106 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- ti49
 - MF=6 MT= 104, 105, 106 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
• ti50

- MF=6 MT= 104, 105, 106 were deleted.
- MF=3 MT= 600-608, 649, 650-659, 699, 700-709, 749, 750, 800-809, 849 were added.
- MF=6 MT= 600-608, 649, 650-659, 699, 700-709, 749, 750, 800-809, 849 were added.
- v49
 - MF=4 MT= 600-639, 800-839 were deleted.
 - MF=12/14 MT= 601-639, 801-839 were deleted.
 - MF=6 MT= 600-639, 800-839 were added.

• v50

- MF=6 MT= 104, 105, 106 were deleted.
- MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- v51
 - MF=6 MT= 104, 105, 106 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- cr50
 - MF=12/14 MT= 601-639, 801-839 were deleted.
 - MF=6 MT= 104, 105, 106 were deleted.

- MF=3 MT= 650-659, 699, 701-709, 749, 750-759, 799 were added.
- MF=6 MT= 650-659, 699, 701-709, 749, 750-759, 799 were added.

• MF=6 MT= 600-639, 800-839 were updated.

- cr51
 - MF=4 MT= 600-639, 800-839 were deleted.
 - MF=12/14 MT= 601-639, 801-839 were deleted. co58
 - MF=6 MT= 104, 105, 106 were deleted.
 - MF=3 MT= 650-659, 699, 700-709, 749, 750-759, 799 were added.
 - MF=6 MT= 600-639, 650-659, 699, 700-709, 749, 750-759, 799, 800-839 were added.
- cr52
 - MF=12/14 MT= 601-631, 801-839 were deleted.
 - MF=6 MT= 104, 105, 106 were deleted.
 - MF=3 MT= 650-659, 699, 701-709, 749, 750-759, 799 were added.
 - MF=6 MT= 650-659, 699, 701-709, 749, 750-759, 799 were added.
 - MF=6 MT= 600-631, 800-839 were updated.
- cr53

• cr54

- MF=12/14 MT= 601-610, 801-839 were deleted.
- MF=6 MT= 104, 105, 106 were deleted.
- MF=3 MT= 650-659, 699, 701-709, 749, 750-759, 799 were added.
- MF=6 MT= 650-659, 699, 701-709, 749. 750-759, 799 were added.
- MF=6 MT= 600-610, 800-839 were updated.

- MF=12/14 MT= 601-616, 801-834 were deleted.
- MF=6 MT= 104, 105, 106 were deleted.
- MF=3 MT= 650-659, 699, 701-709, 749, 750-759, 799 were added.
- MF=6 MT= 650-659, 699, 701-709, 749, 750-759, 799 were added.
- MF=6 MT= 600-616, 800-834 were updated.

- MF=4 MT= 600-639, 800-839 were deleted.
- MF=12/14 MT= 601-639, 801-839 were deleted.
- MF=6 MT= 104, 105 were deleted.
- MF=3 MT= 650-659, 699, 700-709, 749 were added.
- MF=6 MT= 600-639, 650-659, 699, 700-709, 749, 800-839 were added.
- co59
 - MF=6 MT= 103, 104, 105, 106, 107 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- ni58
 - MF=6 MT= 103, 104, 105, 107 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.

28



• ni59

- MF=6 MT= 103, 104, 105, 106, 107 were deleted.
- MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- ni60
 - MF=6 MT= 103, 104, 105, 107 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.
- ni61
 - MF=6 MT= 103, 104, 105, 107 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.
- ni62
 - MF=6 MT= 103, 104, 105, 107 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.
- ni63
 - MF=4 MT= 600-625, 800-827 were deleted.

- MF=12/14 MT= 601-625, 801-827 were deleted.
- MF=6 MT= 600-625, 800-827 were added.
- ni64
 - MF=6 MT= 103, 104, 105, 107 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800, 849 were added.
- cu63
 - MF=6 MT= 103, 104, 105, 107 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.
- cu64
 - MF=4 MT= 600-639, 800-839 were deleted.
 - MF=12/14 MT= 601-639, 801-839 were deleted.
 - MF=6 MT= 600-639, 800-839 were added.
- cu65
 - MF=6 MT= 103, 104, 105, 107 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.
- zn64
 - MF=6 MT= 104, 105, 106 were deleted.

- MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- zn65
 - MF=6 MT= 104, 105, 106 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- zn66
 - MF=6 MT= 104, 105, 106 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- zn67
 - MF=6 MT= 103, 104, 105, 106, 107 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.

• zn68

- MF=6 MT= 104, 105, 106 were deleted.
- MF=3 MT= 600-607, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- MF=6 MT= 600-607, 649, 650-659, 699, 700-709, 749, 750-759, 799, 800-809, 849 were added.
- zn69
 - MF=4 MT= 600-616, 800-817 were deleted.
 - MF=12/14 MT= 601-616, 801-817 were deleted.
 - MF=6 MT= 600-616, 800-817 were added.
- zn70
 - MF=6 MT= 104, 105, 106 were deleted.
 - MF=3 MT= 600, 649, 650-659, 699, 700-707, 749, 750-757, 799, 800, 849 were added.
 - MF=6 MT= 600, 649, 650-659, 699, 700-707, 749, 750-757, 799, 800, 849 were added.
- as73
 - MF=6 MT= 103, 107 were deleted.
 - MF=3 MT= 600-609, 649, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 800-809, 849 were added.
- as74
 - MF=6 MT= 103, 107 were deleted.
 - MF=3 MT= 600-609, 649, 800-809, 849 were added.

- MF=6 MT= 600-609, 649, 800-809, 849 were zr93 added.
- zr90
 - MF=4 MT= 600-611, 800-808 were deleted.
 - MF=12/14 MT= 601-611, 801-808 were deleted.
 - MF=6 MT= 104, 105 were deleted.
 - MF=3 MT= 650-659, 699, 700-709, 749 were added.
 - MF=6 MT= 600-611, 650-659, 699, 700-709, 749, 800-808 were added.
- zr91
 - MF=4 MT= 600-605, 800-839 were deleted.
 - MF=12/14 MT= 601-605, 801-839 were deleted.
 - MF=6 MT= 104, 105 were deleted.
 - MF=3 MT= 650-659, 699, 700-709, 749 were added.
 - MF=6 MT= 600-605, 650-659, 699, 700-709, 749, 800-839 were added.
- zr92
 - MF=4 MT= 600, 800-839 were deleted.
 - MF=12/14 MT= 801-839 were deleted.
 - MF=6 MT= 104, 105 were deleted.
 - MF=3 MT= 650-659, 699, 700-709, 749 were added.
 - MF=6 MT= 600, 650-659, 699, 700-709, 749, 800-839 were added.

- MF=4 MT= 600-616. 800-826 were deleted.
- MF=12/14 MT= 601-616, 801-826 were deleted.
- MF=6 MT= 104, 105 were deleted.
- MF=3 MT= 650-658, 699, 700-709, 749 were added.
- MF=6 MT= 600-616, 650-658, 699, 700-709, 749, 800-826 were added.
- zr94
 - MF=4 MT= 600-609, 800-839 were deleted.
 - MF=12/14 MT= 601-609, 801-839 were deleted.
 - MF=6 MT= 104, 105 were deleted.
 - MF=3 MT= 650-659, 699, 700-708, 749 were added.
 - MF=6 MT= 600-609, 650-659, 699, 700-708, 749, 800-839 were added.
- zr95
 - MF=4 MT= 600-615, 800-808 were deleted.
 - MF=12/14 MT= 601-615, 801-808 were deleted.
 - MF=6 MT= 104, 105 were deleted.
 - MF=3 MT= 650-659, 699, 700-709, 749 were added.
 - MF=6 MT= 600-615, 650-659, 699, 700-709, 749, 800-808 were added.



• zr96

- MF=4 MT= 600-602, 800-809 were deleted.
- MF=12/14 MT= 601-602, 801-809 were deleted.
- MF=6 MT= 104, 105 were deleted.
- MF=3 MT= 650-659, 699, 700-709, 749 were added.
- MF=6 MT= 600-602, 650-659, 699, 700-709, 749, 800-809 were added.

• ag107

- MF=15 MT= 103, 107 were deleted.
- MF=12/14 MT= 601-609, 801-809 were deleted.
- MF=3 MT= 600-609, 649, 800-809, 849 were added.

• MF=6 MT= 600-609, 649, 800-809, 849 were added.

• ag109

- MF=4 MT= 600-630, 800-801 were deleted.
- MF=12/14 MT= 601-630, were deleted.
- MF=6 MT= 600-630, 800-801 were added.
- ta180
 - MF=15 MT= 103, 104, 105, 107 were deleted.
 - MF=12/14 MT= 601-609, 651-659, 701-709, 801-809 were deleted.
 - MF=6 MT= 103, 104, 105, 107 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.

- MF=6 MT= 600-609, 649, 650-659, 699, 700-709, 749, 800-809, 849 were added.
- ta181
 - MF=4 MT= 600-635, 800-814 were deleted.
 - MF=12/14 MT= 601-635, 801-814 were deleted.
 - MF=6 MT= 106 were deleted.
 - MF=3 MT= 750-759, 799 were added.
 - MF=6 MT= 600-635, 750-759, 799, 800-814 were added.
- au197
 - MF=3 MT= 600-609, 649, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 800-809, 849 were added.



Additional changes from Beta2

- n-001_H_002 (minor fix)
- n-004_Be_009 (problems above 2.8 MeV)
- n-005_B_011 (fix of wrong gamma flagging)
- n-006_C_012 (minor fix)
- n-006_C_013 (primary gammas & minor fix)
- n-008_O_016 (minor fix plus flagging of primary gammas, branching ratios added)
- n-008_O_018 (fix by removing 21MeV point in capture)
- n-009_F_019 (flagged primary gammas)
- n-014_Si_028 (flagged primary gammas)
- n-016_S_032 (added inelastic gammas)
- n-016_S_033 (added inelastic gammas)
- n-016_S_034 (added inelastic gammas)
- n-024_Cr_050 (added VIII.0 covariances and KAERI exit dist.)
- n-024_Cr_051 (KAERI exit dist.)
- n-024_Cr_052 (added VIII.0 covariances and KAERI exit dist.)
- n-024_Cr_053 (added VIII.0 covariances and KAERI exit dist.)
- n-024_Cr_054 (KAERI exit dist.)
- 029_Cu_063 (fixes and KAERI exit dist.)

- 029_Cu_065 (fixes and KAERI exit dist.)
- n-038_Sr_088 (ORNL evaluation)
- n-045_Rh_103 (minor fixes)
- n-046_Pd_110 (minor fixes)
- n-049_In_113 (MT=3 fix)
- n-049 In_115 (format fixes that were breaking NJOY)
- n-058_Ce_140 (updated covariances, fixes)
- n-058_Ce_142 (updated covariances, fixes)
- n-059_Pr_141 (processing fixes)
- n-066_Dy_161 (minor fixes)
- n-066_Dy_164 (minor fixes)
- n-073_Ta_180m1 (new file based on JENDL-5)
- n-073_Ta_181 (updated URR and doc.)
- n-074_W_182 (minor fix)
- n-074_W_183 (minor fix)
- n-074_W_184 (minor fix)
- n-074_W_186 (minor fix)
- n-082_Pb_206 (fixes by evaluator)
- n-082_Pb_207 (fixes by evaluator)
- n-082_Pb_208 (fixes by evaluator)
- n-092_U_233 (minor fixes)

- n-092_U_234 (uncertainty and other fixes by evaluator)
- n-092_U_235 (Restored MF=6 MT=18 P(nu), fixed typo in 232TH yield)
- n-092_U_238 (Fixed typo in p-wave resonance)
- n-092_U_236 (uncertainty and other fixes by evaluator)
- n-094_Pu_239 (new criticality vs burn-up compromise solution)
- n-094_Pu_242 (covariance fix)
- n-078_Pt_190
- n-078_Pt_191
- n-078_Pt_192
- n-078_Pt_193
- n-078 Pt 194
- n-078 Pt 195
- n-078 Pt 196
- n-078 Pt 197
- n-078_Pt_198
- n-023 V 051
- Prompt nubar of 20 nuclides

Additional changes from Beta2 Prompt nubar from RQW

- Maslov, INDC(BLR) reports:
 - Pa-230
 - Pa-232
 - U-230
 - U-231
 - U-232
 - Am-240
 - Am-244
 - Cm-240
- Madland-Nix calculations:
 - Cf-246
 - Cf-248

- Cf-249
- Cf-250
- Cf-251
- Cf-252
- Cf-253
- Cf-254
- Pu-237
- Input for Cf isotopes was revised relative to the values used for VIII.0 R. Q. Wright evaluations:
 - Np-234 (too similar to VIII.0)
 - Np-235 (too similar to VIII.0)
- Es-254m1 is the same as Es-254



Additional changes from Beta2 - tritons

- t-002_He_003 (fixes)
- t-002_He_004 (LANL evaluation)



Photonuclear sublibrary

- 180,182,183,186W: reverted to VIII.0
- 242Pu: inexistent, taken from JENDL-5.0
- 9Be: NNL evaluation Take from CRP



Recommendation from M.Chadwick @ mini-CSEWG

Need more time to assess and review these files. So, for now, keeping them from VIII.0

- Consider ⁹Be from NNL
- Adopt evaluations from 2019 IAEA CRP for (almost) all nuclei: 200+ files
- Except for 16 select mission-critical materials:

• 2H	• 27 A	• 184W	• ²³⁷ Np
• 12C	• ²⁸ Si	• ²⁰⁶ Pb	• 235U
• ¹⁴ N	• ⁴⁰ Ca	• ²⁰⁷ Pb	• 238U
• 16O	• ⁶³ Cu	• ²⁰⁸ Pb	• ²³⁹ Pu

 For those, for now, keep older LANL evaluations present in ENDF/B-VIII.0 This is what is in Beta2

Photo-nuclear sub library

• g-023 V 051.endf

• g-024 Cr 050.endf

• g-024 Cr 052.endf

• g-024 Cr 053.endf

• q-024 Cr 054.endf

• g-025 Mn 055.endf

• g-026 Fe 054.endf

• g-026_Fe_056.endf

• g-026 Fe 057.endf

• g-026 Fe 058.endf

• g-027 Co 059.endf

• g-028 Ni 058.endf

• g-028 Ni 060.endf

• g-028 Ni 061.endf

• g-028 Ni 062.endf

• g-028 Ni 064.endf

• g-029 Cu_063.endf

• g-029 Cu 065.endf

• g-030 Zn 064.endf

• g-030 Zn 066.endf

• g-030 Zn 067.endf

• g-030 Zn 068.endf

• g-030 Zn 070.endf

• g-032 Ge 070.endf

• g-001 H 002.endf • g-016 S 033.endf • g-002 He 003.endf • g-016 S 034.endf • g-003 Li 006.endf • g-016 S 036.endf • g-003 Li 007.endf • g-017 Cl 035.endf • q-004 Be 009.endf • g-017 Cl 037.endf • g-006 C 012.endf • g-018 Ar 036.endf • g-006 C 013.endf • g-018 Ar 038.endf • g-006 C 014.endf • g-018 Ar 040.endf • g-007 N 014.endf • q-007 N 015.endf • g-008 O 016.endf • q-008 O 017.endf • q-008 O 018.endf • g-009 F 019.endf • g-011 Na 023.endf • g-012 Mg 024.endf • g-012 Mg 025.endf • q-012 Mg 026.endf • g-013 Al 027.endf • a-014 Si 027.endf • g-014 Si 028.endf • g-014 Si 029.endf • g-014 Si 030.endf

• g-016 S 032.endf

• g-019 K 039.endf • g-019 K 040.endf • g-019 K 041.endf • g-020 Ca 040.endf • g-020 Ca 042.endf • g-020 Ca 043.endf • g-020 Ca 044.endf • g-020 Ca 046.endf • g-020 Ca 048.endf • g-021 Sc 045.endf • g-022 Ti 046.endf • g-022 Ti 047.endf • g-022 Ti 048.endf • g-022 Ti 049.endf • g-022 Ti 050.endf • g-023 V 050.endf

• g-032 Ge 072.endf • g-042 Mo 094.endf • g-032 Ge 073.endf • g-032 Ge 074.endf • g-032 Ge 076.endf • q-033 As 075.endf • g-034 Se 076.endf • g-034_Se_078.endf • g-034 Se 080.endf • g-034 Se 082.endf • g-038 Sr 084.endf • g-038 Sr 086.endf • g-038 Sr 087.endf • g-038 Sr 088.endf • g-038 Sr 090.endf • g-039 Y 089.endf • g-040 Zr 090.endf • g-040 Zr 091.endf • g-040 Zr 092.endf • q-040 Zr 093.endf • g-040 Zr 094.endf • g-040 Zr 096.endf • g-041 Nb 093.endf

= Submitted

= Under review

• g-041_Nb_094.endf • g-042 Mo 092.endf • g-042 Mo 095.endf • g-042 Mo 096.endf • g-042 Mo 097.endf • g-042_Mo_098.endf • g-042 Mo 100.endf • q-044 Ru 098.endf g-045_Rh_103.endf • g-046 Pd 102.endf

= Not submitted

= Approved

- g-046 Pd 104.endf
- g-046 Pd 105.endf
- q-046 Pd 106.endf
- g-046 Pd 107.endf • g-046 Pd 108.endf
- g-046 Pd 110.endf
- Typo/dictionary fix Kept from VIII.0 Level index fix on isomeric production Not from CRP NNL new eval.

37

Photo-nuclear sub library

• g-060 Nd 145.endf

• g-060 Nd 146.endf

• g-060 Nd 148.endf

• g-060 Nd 150.endf

• g-062 Sm 144.endf

• g-062 Sm 147.endf

• g-062 Sm 148.endf

• g-062 Sm 149.endf

• g-062 Sm 150.endf

• g-062 Sm 151.endf

• g-062_Sm_152.endf

• g-062 Sm 154.endf

• g-063 Eu 153.endf

• g-064 Gd 156.endf

• g-064 Gd 157.endf

• g-064 Gd 158.endf

• g-064 Gd 160.endf

• q-065 Tb 158.endf

• g-065_Tb_159.endf

• g-066 Dy 162.endf

• g-066 Dy 163.endf

g-067_Ho_165.endf

• g-068 Er 166.endf

• g-047 Ag 107.endf • q-051 Sb 123.endf • g-047 Ag 108.endf • q-052 Te 120.endf • g-052 Te 122.endf • g-047 Ag 109.endf • g-048_Cd_106.endf • g-052 Te 123.endf • g-048 Cd 108.endf • g-052 Te 124.endf • g-048 Cd 110.endf • g-052 Te 125.endf • g-048 Cd 111.endf • g-052 Te 126.endf • g-048 Cd 112.endf • g-052 Te 128.endf • q-048 Cd 113.endf • q-052 Te 130.endf • g-048 Cd 114.endf • q-053 | 127.endf • g-048 Cd 116.endf • g-053 | 129.endf • g-049 In 115.endf • g-054 Xe 132.endf • g-050 Sn 112.endf • g-055 Cs 133.endf • g-050 Sn 114.endf • g-055 Cs 135.endf • g-050 Sn 115.endf • g-055 Cs 137.endf • g-050 Sn 116.endf • g-056 Ba 138.endf • q-057 La 139.endf • g-050 Sn 117.endf • g-050 Sn 118.endf • g-058 Ce 140.endf • g-050_Sn_119.endf • g-058_Ce_142.endf • q-050 Sn 120.endf • g-059 Pr 141.endf • g-050 Sn 122.endf • g-060 Nd 142.endf • g-050 Sn 124.endf • q-060 Nd 143.endf • g-051 Sb 121.endf • q-060 Nd 144.endf

• q-068 Er 170.endf • g-069 Tm 169.endf • g-071 Lu 175.endf • g-072 Hf 174.endf • q-072 Hf 176.endf • g-072 Hf 177.endf • g-072 Hf 178.endf • g-072 Hf 179.endf • a-072 Hf 180.endf • g-073_Ta_181.endf • g-074_W_180.endf • g-074 W 182.endf • g-074 W 183.endf • g-074 W 184.endf • g-074 W 186.endf • g-075 Re 185.endf • g-075 Re 187.endf • g-076 Os 186.endf • g-076_Os_188.endf • g-076 Os 189.endf • g-076 Os 190.endf • q-076 Os 192.endf • g-078 Pt 194.endf



Atomic sub libraries

Red Cullen submitted the 2023 version of EPICS leading to updates to:

- Atomic relaxation sublibrary (EADL)
- Electrons sublibrary (EEDL)
 - This did NOT overwrite ZAP format fix done by Bret Beck for VIII.1-Beta2
- Photoatomic sublibrary (EPDL)



Charged Particles

- Deuterons, tritons, helions, protons
- Submitted files have issues. We're still trying to define the best course of action



Updates to INDEN evaluations of structural materials

Between the evaluations and the ENDF/B-VIII.1-Beta3 release







• Since the last submission submission of an evaluation, many things may have happened with it:





- Since the last submission submission of an evaluation, many things may have happened with it:
 - Line numbers may have been removed





- Since the last submission submission of an evaluation, many things may have happened with it:
 - Line numbers may have been removed
 - Format issues may have been fixed





- Since the last submission submission of an evaluation, many things may have happened with it:
 - Line numbers may have been removed
 - Format issues may have been fixed
 - Processing issues may have been addressed





- Since the last submission submission of an evaluation, many things may have happened with it:
 - Line numbers may have been removed
 - Format issues may have been fixed
 - Processing issues may have been addressed
 - Added exit distributions from LLNL and/or KAERI/LANL





• Since the last submission submission of an evaluation, many things may have happened with it:

- Line numbers may have been removed
- Format issues may have been fixed
- Processing issues may have been addressed
- Added exit distributions from LLNL and/or KAERI/LANL
- Some reaction cross sections may have been replaced by IRDFF-II





- Since the last submission submission of an evaluation, many things may have happened with it:
 - Line numbers may have been removed
 - Format issues may have been fixed
 - Processing issues may have been addressed
 - Added exit distributions from LLNL and/or KAERI/LANL
 - Some reaction cross sections may have been replaced by IRDFF-II
 - Normally, we are not changing any physics without consulting the evaluation authors (issue trackers)





- Since the last submission submission of an evaluation, many things may have happened with it:
 - Line numbers may have been removed
 - Format issues may have been fixed
 - Processing issues may have been addressed
 - Added exit distributions from LLNL and/or KAERI/LANL
 - Some reaction cross sections may have been replaced by IRDFF-II
 - Normally, we are not changing any physics without consulting the evaluation authors (issue trackers)
 - So, don't be alarmed if the released file is not exactly the same as the one submitted





- Since the last submission submission of an evaluation, many things may have happened with it:
 - Line numbers may have been removed
 - Format issues may have been fixed
 - Processing issues may have been addressed
 - Added exit distributions from LLNL and/or KAERI/LANL
 - Some reaction cross sections may have been replaced by IRDFF-II
 - Normally, we are not changing any physics without consulting the evaluation authors (issue trackers)
 - So, don't be alarmed if the released file is not exactly the same as the one submitted
 - I will quickly report on the changes done to INDEN evaluations for structural materials after submitted



• • •

🚞 neutrons — less 🛛 git log -- n-014_Si_028.endf — 89×40

commit 753f15754fa0ca88ebb97ff18cd8de0ff0c9a7ec Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Nov 29 09:34:51 2023 -1000

Update sent by H.I. Kim on Nov. 29, 2023, Correcting merging Energy: $2.000010+7 \Rightarrow 2.000001+7$

commit 7dacbdd541df38423f7729d8b037d6191179687d Author: echimansk <echimansk@bnl.com> Date: Mon Nov 6 16:49:46 2023 -0500

capture primaries flagged

commit 568a098ce15e42a4d069e9ff4e535d9b54f1fc4d Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Sep 14 15:21:15 2023 -0400

Updated n-014_Si_028.endf with exit distributions from KAERI/LANL. Summary of MF/MT c hanges can be found in the file documentation section.

commit 973fe543b9e85c1506868448db3807b6271b925c Author: Ian J. Thompson <thompson97@llnl.gov> Date: Mon Jul 24 14:17:38 2023 -0400

Remove Kalbach-Mann parameters too high in energy n-014_Si_028.endf

commit 91f5d1bd960273ec205ad60293e0928d809d284c Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Jul 20 09:14:18 2023 -0700

Inclusion of dosimetry production reactions from IRDFF-II sent by A. Trkov.

commit bf775d3e6bbba7076d5553465056691d6f495f74 Author: Caleb M. Mattoon <mattoon1@llnl.gov> Date: Wed Apr 26 11:06:51 2023 -0700

Fix two issues with prior commit: NLIB was set to -1 (unknown library), and covarianc e energy bounds (and values in the case of MF35) were accidentally converted to MeV

📄 meutrons — less 🛛 git log -- n-014_Si_028.endf — 89×40

commit 30a149b6a4a8afd40a8737801d1b042de3086a1d Author: Ian J. Thompson <thompson97@llnl.gov> Date: Sat Apr 22 08:30:23 2023 -0400

. . .

Adding exit charged-particle and gamma distributions where previously missing. The CHANGELOG lists the added exit distributions

commit b6357d7975561a313545fb8e5c8967f997c25cb3 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Apr 17 10:02:54 2023 -0400

Updated file for 28Si sent by A. Trkov on April 16. He stated that "there was an erro r in uploading the silicon files to the INDEN web page, which eventually went into ENDF/B -VIII.1[-Beta1]. The files [were] missing the direct capture component, which destroys co mpletely the performance in criticality benchmarks (e.g. "hmm005"). [The new files] shoul d be correct."

commit c6e5f5608eb71a4db132a5c4e816fbcdecd461bf Author: Nathan Gibson <ngibson@lanl.gov> Date: Tue Sep 20 09:27:43 2022 -0600

Updated directory for n-014_Si_028.endf; previously, directory items had incorrect NC values.

commit 0dc3637214a8d06c5f6b413a2a28ef4572fa5b38 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Tue Sep 6 14:55:59 2022 -0400

Removed line numbers from 28,29,30Si files, which came from INDEN.

commit ba37846287ae7c7b021158be6e20510baebd49e9
Author: Nobre <gnobre@130-199-210-147.dhcp.bnl.gov>
Date: Mon Nov 23 17:06:08 2020 -0500

New INDEN files for 28,29,30Si. Description of files can be found in the technical re port "Evaluation and Validation of 28,29,30SI Cross Sections in the Resolved Resonance Re gion", M.T. Pigni et al., ORNL/LTR-2018/1044 (https://doi.org/10.2172/1489565)

28Si neutrons - less • git log n-014_Si_028.endf - 89×40 commit 753f15754fa0ca88ebb97ff18cd8de0ff0c9a7ec Author: Gustavo Nobre <gnobre@bn1.gov></gnobre@bn1.gov>	 Directory and other minor fixes Covariance fixes IRDFF cross sections Exit distributions from LLNL and KAERI Capture gammas flagged 		
Date: Wed Nov 29 09:34:51 2023 -1000	Author: Ian J. Thompson <thompson97@llnl.gov> Date: Sat Apr 22 08:30:23 2023 -0400</thompson97@llnl.gov>		
000001+7	Adding exit charged-particle and gamma distributions where previously missing.		
commit 7dacbdd541df38423f7729d8b037d6191179687d Author: echimansk <echimansk@bnl.com> Date: Mon Nov 6 16:49:46 2023 -0500</echimansk@bnl.com>	commit b6357d7975561a313545fb8e5c8967f997c25cb3 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Apr 17 10:02:54 2023 -0400</gnobre@bnl.gov>		
capture primaries flagged commit 568a098ce15e42a4d069e9ff4e535d9b54f1fc4d Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Sep 14 15:21:15 2023 -0400</gnobre@bnl.gov>	Updated file for 28Si sent by A. Trkov on April 16. He stated that "there was an err r in uploading the silicon files to the INDEN web page, which eventually went into ENDF/ -VIII.1[-Beta1]. The files [were] missing the direct capture component, which destroys of mpletely the performance in criticality benchmarks (e.g. "hmm005"). [The new files] show d be correct."		
hanges can be found in the file documentation section.	commit c6e5f5608eb71a4db132a5c4e816fbcdecd461bf Author: Nathan Gibson <ngibson@lanl.gov> Date: Tue Sep 20 09:27:43 2022 -0600</ngibson@lanl.gov>		
Author: Ian J. Thompson <thompson97@llnl.gov> Date: Mon Jul 24 14:17:38 2023 -0400</thompson97@llnl.gov>	Updated directory for n-014_Si_028.endf; previously, directory items had incorrect N values.		
Remove Kalbach-Mann parameters too high in energy n-014_Si_028.endf commit 91f5d1bd960273ec205ad60293e0928d809d284c Author: Gustavo Nobre <gnobre@bnl.gov></gnobre@bnl.gov>	commit 0dc3637214a8d06c5f6b413a2a28ef4572fa5b38 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Tue Sep 6 14:55:59 2022 -0400</gnobre@bnl.gov>		
Date: Thu Jul 20 09:14:18 2023 -0700	Removed line numbers from 28,29,30Si files, which came from INDEN.		
commit bf775d3e6bbba7076d5553465056691d6f495f74 Author: Caleb M. Mattoon <mattoon1@llnl.gov></mattoon1@llnl.gov>	commit ba37846287ae7c7b021158be6e20510baebd49e9 Author: Nobre <gnobre@130-199-210-147.dhcp.bnl.gov> Date: Mon Nov 23 17:06:08 2020 -0500</gnobre@130-199-210-147.dhcp.bnl.gov>		
Date: Wed Apr 26 11:06:51 2023 -0700 Fix two issues with prior commit: NLIB was set to -1 (unknown library), and covariar e energy bounds (and values in the case of MF35) were accidentally converted to MeV	New INDEN files for 28,29,30Si. Description of files can be found in the technical r port "Evaluation and Validation of 28,29,30SI Cross Sections in the Resolved Resonance R gion", M.T. Pigni et al., ORNL/LTR-2018/1044 (https://doi.org/10.2172/1489565)		

National Laboratory

neutrons — less < git log -- n-014_Si_029.endf — 89×40</p>

commit bbaa4f7e2097aa2a2f966c40905605bee3f9f703
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Thu Sep 14 15:27:24 2023 -0400

Updated n-014_Si_029.endf with exit distributions from KAERI/LANL. Summary of MF/MT c hanges can be found in the file documentation section.

commit 66ad4b20ace1491083aefd240ecc31a653162187
Author: David Brown <dbrown@bnl.gov>
Date: Thu Aug 3 18:42:41 2023 -0400

fixed upper energy of MF10 MT5

(cherry picked from commit 5747e09d654ee186ba6e270f884c6a95c59ad3b0)

commit 6aaec71747ab8384dd2c3ade038bb9314e46f599
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Thu Jul 20 09:19:08 2023 -0700

Inclusion of dosimetry production reactions from IRDFF-II sent by A. Trkov.

commit 2939e04003815be3254fc6a0aa2467aa134a61b8 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Apr 17 10:03:17 2023 -0400

Updated file for 29Si sent by A. Trkov on April 16. He stated that "there was an erro r in uploading the silicon files to the INDEN web page, which eventually went into ENDF/B -VIII.1[-Beta1]. The files [were] missing the direct capture component, which destroys co mpletely the performance in criticality benchmarks (e.g. "hmm005"). [The new files] shoul d be correct."

commit 33a3d6b49af5f9554ac3c34d5f0280a3bbb6df26 Author: Nathan Gibson <ngibson@lanl.gov> Date: Tue Sep 20 09:27:44 2022 -0600

Updated directory for n-014_Si_029.endf; previously, directory items had incorrect NC values.

• • • neutrons — less • git log -- n-014_Si_029.endf — 89×40 Inclusion of dosimetry production reactions from IRDFF-II sent by A. Trkov. commit 2939e04003815be3254fc6a0aa2467aa134a61b8 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Apr 17 10:03:17 2023 -0400 Updated file for 29Si sent by A. Trkov on April 16. He stated that "there was an erro in uploading the silicon files to the INDEN web page, which eventually went into ENDF/B -VIII.1[-Beta1]. The files [were] missing the direct capture component, which destroys co mpletely the performance in criticality benchmarks (e.g. "hmm005"). [The new files] shoul d be correct." commit 33a3d6b49af5f9554ac3c34d5f0280a3bbb6df26 Author: Nathan Gibson <ngibson@lanl.gov> Date: Tue Sep 20 09:27:44 2022 -0600 Updated directory for n-014 Si 029.endf; previously, directory items had incorrect NC values. commit 0dc3637214a8d06c5f6b413a2a28ef4572fa5b38 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Tue Sep 6 14:55:59 2022 -0400 Removed line numbers from 28,29,30Si files, which came from INDEN. commit ba37846287ae7c7b021158be6e20510baebd49e9 Author: Nobre <gnobre@130-199-210-147.dhcp.bnl.gov> Date: Mon Nov 23 17:06:08 2020 -0500 New INDEN files for 28,29,30Si. Description of files can be found in the technical re

New INDEN files for 28,29,30S1. Description of files can be found in the technical re port "Evaluation and Validation of 28,29,30SI Cross Sections in the Resolved Resonance Re gion", M.T. Pigni et al., ORNL/LTR-2018/1044 (https://doi.org/10.2172/1489565)

commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42 Author: David Alan Brown <dbrown@bnl.gov> Date: Sat Nov 23 11:43:03 2019 -0500

initial commit from project export (END)

Directory and other minor fixes

- IRDFF cross sections
- Fixed energy range of MF=10, MT=5
- Exit distributions from KAERI

• • • neutrons — less < git log -- n-014_Si_029.endf — 89×40</p> neutrons — less < git log -- n-014_Si_029.endf — 89×40</p> commit bbaa4f7e2097aa2a2f966c40905605bee3f9f703 Inclusion of dosimetry production reactions from IRDFF-II sent by A. Trkov. Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Sep 14 15:27:24 2023 -0400 commit 2939e04003815be3254fc6a0aa2467aa134a61b8 Author: Gustavo Nobre <gnobre@bnl.gov> Updated n-014 Si 029.endf with exit distributions from KAERI/LANL. Summary of MF/MT c Date: Mon Apr 17 10:03:17 2023 -0400 hanges can be found in the file documentation section. Updated file for 29Si sent by A. Trkov on April 16. He stated that "there was an erro commit 66ad4b20ace1491083aefd240ecc31a653162187 in uploading the silicon files to the INDEN web page, which eventually went into ENDF/E Author: David Brown <dbrown@bnl.gov> -VIII.1[-Beta1]. The files [were] missing the direct capture component, which destroys co Date: Thu Aug 3 18:42:41 2023 -0400 mpletely the performance in criticality benchmarks (e.g. "hmm005"). [The new files] shoul d be correct." fixed upper energy of MF10 MT5 commit 33a3d6b49af5f9554ac3c34d5f0280a3bbb6df26 Author: Nathan Gibson <ngibson@lanl.gov> (cherry picked from commit 5747e09d654ee186ba6e270f884c6a95c59ad3b0) Date: Tue Sep 20 09:27:44 2022 -0600 commit 6aaec71747ab8384dd2c3ade038bb9314e46f599 Updated directory for n-014_Si_029.endf; previously, directory items had incorrect NC Author: Gustavo Nobre <gnobre@bnl.gov> values. Date: Thu Jul 20 09:19:08 2023 -0700 commit 0dc3637214a8d06c5f6b413a2a28ef4572fa5b38 Inclusion of dosimetry production reactions from IRDFF-II sent by A. Trkov. Author: Gustavo Nobre <gnobre@bnl.gov> Date: Tue Sep 6 14:55:59 2022 -0400 commit 2939e04003815be3254fc6a0aa2467aa134a61b8 Author: Gustavo Nobre <gnobre@bnl.gov> Removed line numbers from 28,29,30Si files, which came from INDEN. Date: Mon Apr 17 10:03:17 2023 -0400 commit ba37846287ae7c7b021158be6e20510baebd49e9 Updated file for 29Si sent by A. Trkov on April 16. He stated that "there was an erro Author: Nobre <gnobre@130-199-210-147.dhcp.bnl.gov> in uploading the silicon files to the INDEN web page, which eventually went into ENDF/B Date: Mon Nov 23 17:06:08 2020 -0500 ·VIII.1[-Beta1]. The files [were] missing the direct capture component, which destroys co mpletely the performance in criticality benchmarks (e.g. "hmm005"). [The new files] shoul New INDEN files for 28,29,30Si. Description of files can be found in the technical re d be correct." port "Evaluation and Validation of 28,29,30SI Cross Sections in the Resolved Resonance Re gion", M.T. Pigni et al., ORNL/LTR-2018/1044 (https://doi.org/10.2172/1489565) commit 33a3d6b49af5f9554ac3c34d5f0280a3bbb6df26 Author: Nathan Gibson <ngibson@lanl.gov> commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42 Date: Tue Sep 20 09:27:44 2022 -0600 Author: David Alan Brown <dbrown@bnl.gov> Date: Sat Nov 23 11:43:03 2019 -0500 Updated directory for n-014_Si_029.endf; previously, directory items had incorrect NC values. initial commit from project export

(END)

● ● ●		
<pre>commit e095c9c9c5b691dd4f2df6510898713bc3797347 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Sep 14 15:32:33 2023 -0400</gnobre@bnl.gov></pre>	Fix energy range of MF=6, MT=800	
Updated n-014_Si_030.endf with exit distributions from KAERI/LANL. Summary of MF/MT c hanges can be found in the file documentation section.	commit e8522bdd6730ea5f0de9135d99fbc23026d2b285 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Apr 17 10:03:36 2023 -0400</gnobre@bnl.gov>	
<pre>commit 6df8781d3bd2c08b9ede9d2304025ce911e3432d Author: David Brown <dbrown@bnl.gov> Date: Fri Jul 28 15:07:07 2023 -0400 Fix energy range of MF=6, MT=800</dbrown@bnl.gov></pre>	Updated file for 30Si sent by A. Trkov on April 16. He stated that "there was an r in uploading the silicon files to the INDEN web page, which eventually went into E -VIII.1[-Beta1]. The files [were] missing the direct capture component, which destro mpletely the performance in criticality benchmarks (e.g. "hmm005"). [The new files] d be correct."	
commit e8522bdd6730ea5f0de9135d99fbc23026d2b285 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Apr 17 10:03:36 2023 -0400</gnobre@bnl.gov>	commit f205cde6a64e9aa823d813fecb922a0cb50570db Author: Nathan Gibson <ngibson@lanl.gov> Date: Tue Sep 20 09:27:44 2022 -0600</ngibson@lanl.gov>	
Updated file for 30Si sent by A. Trkov on April 16. He stated that "there was an erro r in uploading the silicon files to the INDEN web page, which eventually went into ENDF/B -VIII.1[-Beta1]. The files [were] missing the direct capture component, which destroys co mpletely the performance in criticality benchmarks (e.g. "hmm005"). [The new files] shoul d be correct."	Updated directory for n-014_Si_030.endf; previously, directory items had incorre values. commit 0dc3637214a8d06c5f6b413a2a28ef4572fa5b38 Author: Gustavo Nobre <gnobre@bnl.gov></gnobre@bnl.gov>	
<pre>commit f205cde6a64e9aa823d813fecb922a0cb50570db Author: Nathan Gibson <ngibson@lanl.gov> Date: Tue Sep 20 09:27:44 2022 -0600 Updated directory for n-014_Si_030.endf; previously, directory items had incorrect NC</ngibson@lanl.gov></pre>	Date: Tue Sep 6 14:55:59 2022 -0400 Removed line numbers from 28,29,30Si files, which came from INDEN. commit ba37846287ae7c7b021158be6e20510baebd49e9 Author: Nobre <gnobre@130-199-210-147.dhcp.bnl.gov></gnobre@130-199-210-147.dhcp.bnl.gov>	
values. commit 0dc3637214a8d06c5f6b413a2a28ef4572fa5b38 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Tue Sep 6 14:55:59 2022 -0400</gnobre@bnl.gov>	Date: Mon Nov 23 17:06:08 2020 -0500 New INDEN files for 28,29,30Si. Description of files can be found in the technic port "Evaluation and Validation of 28,29,30SI Cross Sections in the Resolved Resonan gion", M.T. Pigni et al., ORNL/LTR-2018/1044 (https://doi.org/10.2172/1489565)	
Removed line numbers from 28,29,30Si files, which came from INDEN.	commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42 Author: David Alan Brown <dbrown@bnl.gov> Date: Sat Nov 23 11:43:03 2019 -0500</dbrown@bnl.gov>	
Author: Nobre <gnobre@130-199-210-14 .dhcp.bnl.gov=""> Date: Mon Nov 23 17:06:08 2020 -0500 :</gnobre@130-199-210-14>	initial commit from project export (END)	

erro IDF/B /s co shoul

NC

re Re

Mon Nov 23 17:06:08 2020 -0500

Date:

- Directory and other minor fixes
- Fixed energy range of MF=6, MT=800
- Exit distributions from KAERI

● ● ●		neutrons — less < git log n-014 Si 030.endf — 89x40	
commit e095c9c9c5b691dd4f2df6510898713bc3797347 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Sep 14 15:32:33 2023 -0400</gnobre@bnl.gov>	Fix energy range of MF=6, MT=800		
Updated n-014_Si_030.endf with exit distributions from KAERI/LANL. Summary of MF/MT c hanges can be found in the file documentation section.	commit e8522bdd6730ea5f0de9135d99fbc23026d2b285 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Apr 17 10:03:36 2023 -0400</gnobre@bnl.gov>		
commit 6df8781d3bd2c08b9ede9d2304025ce911e3432d Author: David Brown <dbrown@bnl.gov> Date: Fri Jul 28 15:07:07 2023 -0400</dbrown@bnl.gov>	Updated file for 30Si sent by A. Trkov on April 16. He stated that "there was an error in uploading the silicon files to the INDEN web page, which eventually went into ENDF/E-VIII.1[-Betal]. The files [were] missing the direct capture component, which destroys components is interview.		
Fix energy range of MF=6, MT=800	d be correct."		
commit e8522bdd6730ea5f0de9135d99fbc23026d2b285 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Apr 17 10:03:36 2023 -0400</gnobre@bnl.gov>	commit f205cde0 Author: Nathan Date: Tue Sep	commit f205cde6a64e9aa823d813fecb922a0cb50570db Author: Nathan Gibson <ngibson@lanl.gov> Date: Tue Sep 20 09:27:44 2022 -0600</ngibson@lanl.gov>	
Updated file for 30Si sent by A. Trkov on April 16. He stated that "there was an erro r in uploading the silicon files to the INDEN web page, which eventually went into ENDF/B	Updated dir values.	<pre>rectory for n-014_Si_030.endf; previously, directory items had incorrect NC</pre>	
mpletely the performance in criticality benchmarks (e.g. "hmm005"). [The new files] shoul d be correct."	commit 0dc36372 Author: Gustavo Date: Tue Sec	214a8d06c5f6b413a2a28ef4572fa5b38 > Nobre <gnobre@bnl.gov> > 6 14:55:59 2022 - 0400</gnobre@bnl.gov>	
commit f205cde6a64e9aa823d813fecb922a0cb50570db Author: Nathan Gibson <ngibson@lanl.gov> Date: Tue Sep 20 09:27:44 2022 -0600</ngibson@lanl.gov>	Removed line numbers from 28,29,305i files, which came from INDEN. commit ba37846287ae7c7b021158be6e20510baebd49e9 Author: Nobre <gnobre@130-199-210-147.dhcp.bnl.gov> Date: Mon Nov 23 17:06:08 2020 -0500</gnobre@130-199-210-147.dhcp.bnl.gov>		
Updated directory for n-014_Si_030.endf; previously, directory items had incorrect NC values.			
commit 0dc3637214a8d06c5f6b413a2a28ef4572fa5b38 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Tue Sep 6 14:55:59 2022 -0400</gnobre@bnl.gov>	New INDEN 1 port "Evaluatio gion", M.T. Pig	files for 28,29,30Si. Description of files can be found in the technical re on and Validation of 28,29,30SI Cross Sections in the Resolved Resonance Re gni et al., ORNL/LTR-2018/1044 (https://doi.org/10.2172/1489565)	
Removed line numbers from 28.29.30Si files, which came from INDEN.	commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42 Author: David Alan Brown <dbrown@bnl.gov> Date: Sat Nov 23 11:43:03 2019 -0500</dbrown@bnl.gov>		
commit ba37846287ae7c7b021158be6e20510baebd49e9 Author: Nobre <pre>spobre@130-199-210-147.dbcp.bnl.gov></pre>			

(END)

54Fe

🚞 neutrons — -zsh — 108×36

```
lgustavonobre@LNE-170746 neutrons % git log -- n-026_Fe_054.endf
commit 489ebaf40de5abee26ed0272ff6ecc7ac8783bed
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Tue Jul 18 17:25:47 2023 -0400
```

Inclusion of dosimetry production reactions from IRDFF-II sent by A. Trkov.

commit 36423e5f0ecf82be80c052e725c3905d6a251187
Author: Nathan Gibson <ngibson@lanl.gov>
Date: Thu Sep 22 13:41:16 2022 -0600

Added lump definitions for MT851.

commit 5b2efe09627df818ef17b8a3094e36a8eea91a6c Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Sep 7 15:35:46 2022 -0400

Previous NLIB value ('8') was invalid (see ENDF-6 manual). Changed to '0' (ENDF/B).

commit 66422c1047b9c583371cb3f6e8e0b0d3df269a37
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Fri Apr 29 16:12:48 2022 -0400

Updated IAEA/INDEN evaluated file for 54Fe corresponding to IAEA-labeled version "fe54e80p", obtained fr om the following link: https://www-nds.iaea.org/INDEN/data/fe54e80p_ENDF.zip. IAEA group indicates this file is ready to be reviewed. Ran STANEF on it to remove line numbers. Note: Covariances for alpha emission are missing when compared to VIII.0. Authors should check if this was intentional.

```
commit cf9eld276c9ceb751cd895f06eae91c3705e7e42
Author: David Alan Brown <dbrown@bnl.gov>
Date: Sat Nov 23 11:43:03 2019 -0500
```



initial commit from project export gustavonobre@LNE-170746 neutrons %

Minor fixes

- Corrected definition for MT=851
- IRDFF cross sections

54Fe

lgustavonobre@LNE-170746 neutrons % git log -- n-026_Fe_054.endf commit 489ebaf40de5abee26ed0272ff6ecc7ac8783bed Author: Gustavo Nobre <gnobre@bnl.gov> Date: Tue Jul 18 17:25:47 2023 -0400

Inclusion of dosimetry production reactions from IRDFF-II sent by A. Trkov.

commit 36423e5f0ecf82be80c052e725c3905d6a251187
Author: Nathan Gibson <ngibson@lanl.gov>
Date: Thu Sep 22 13:41:16 2022 -0600

Added lump definitions for MT851.

commit 5b2efe09627df818ef17b8a3094e36a8eea91a6c Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Sep 7 15:35:46 2022 -0400

Previous NLIB value ('8') was invalid (see ENDF-6 manual). Changed to '0' (ENDF/B).

commit 66422c1047b9c583371cb3f6e8e0b0d3df269a37
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Fri Apr 29 16:12:48 2022 -0400

Updated IAEA/INDEN evaluated file for 54Fe corresponding to IAEA-labeled version "fe54e80p", obtained fr om the following link: https://www-nds.iaea.org/INDEN/data/fe54e80p_ENDF.zip. IAEA group indicates this file is ready to be reviewed. Ran STANEF on it to remove line numbers. Note: Covariances for alpha emission are missing when compared to VIII.0. Authors should check if this was intentional.

commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42
Author: David Alan Brown <dbrown@bnl.gov>
Date: Sat Nov 23 11:43:03 2019 -0500



initial commit from project export
gustavonobre@LNE-170746 neutrons %

56Fe

eutrons — less < git log -- n-026_Fe_056.endf — 121×39

commit 8aa103427c61b7bae7e5681639204b8f9e31c9e7
Author: Nathan Gibson <ngibson@lanl.gov>
Date: Tue Nov 1 08:17:52 2022 -0600

Updated directory for n-026_Fe_056.endf; previous update had bug with MF1 sections.

commit e7b26eeb287bf457a9c73853ebcdc7944f0e1fc4
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Tue Oct 25 13:34:36 2022 -0400

Updated 56Fe to INDEN version fe56e80X29r61, described as "CIELO RR evaluation (including Perey RRR angular distribut ions below 850keV) was restored for Fe-56. ENDF/B-VIII.0 1/v background reduced more than 50% to reproduce hmi006 (ZPR-9/ 34) - the iron benchmark. Kinney fit changed to tune11. The added (smaller) background is in excellent agreement with the direct capture cross section estimated by Japanese colleagues and included into the JENDL-5 evaluation."

commit fcbdf9dc108afc1da2dca833aa4a3985c8177dd1
Author: ian <thompson97@llnl.gov>
Date: Tue Sep 20 07:00:21 2022 -0700

Fixed n-026_Fe_056.endf to Eval-Aug18

commit 901aaec673768806af9de86bfd1e2854bd62bd28
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Fri Apr 29 14:50:37 2022 -0400

Updated IAEA/INDEN evaluated file for 56Fe corresponding to IAEA-labeled version "fe56e80X29r50", obtained from the f ollowing link: https://www-nds.iaea.org/INDEN/data/fe56e80X29r50_ENDF.zip. IAEA group indicates this file is ready to be reviewed and should supercede earlier versions. Ran STANEF on it to remove line numbers.

commit aa09fa0940dd541cff7b5c1f8140741498e1e0a7 Author: Nobre <gnobre@130-199-210-147.dhcp.bnl.gov> Date: Mon Nov 23 16:50:34 2020 -0500

INDEN file for Fe-56. The INDEN page presents two versions, fe56e80X29r34 and fe56e80X29r39. This file corresponds to fe56e80X29r39.endf.



Minor fixes

56Fe





57Fe

•••

🚞 neutrons — -zsh — 116×39

[gustavonobre@LNE-170746 neutrons % git log -- n-026_Fe_057.endf commit 9ecf88356cc4e36f9dc168a5c9a13436d0afb02f Author: Gustavo Nobre <gnobre@bnl.gov> Date: Fri Apr 29 16:33:53 2022 -0400

Updated IAEA/INDEN evaluated file for 57Fe corresponding to IAEA-labeled version "fe57e80o", obtained from the f ollowing link: https://www-nds.iaea.org/INDEN/data/fe57e80o_ENDF.zip. IAEA group indicates this file is ready to be reviewed and that it should supersede earlier versions. Ran STANEF on it to remove line numbers.

commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42
Author: David Alan Brown <dbrown@bnl.gov>
Date: Sat Nov 23 11:43:03 2019 -0500

initial commit from project export gustavonobre@LNE-170746 neutrons %



No additional fixes

where the provide sector is the first and the provide sector is the first sector to be the sector of the provide the provident of the providen

57Fe




55Mn

neutrons — less < git log -- n-025_Mn_055.endf — 114×40

commit d82a109f9e589a488108d4e4628faf4dc253e2b1
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Tue Jul 18 16:42:59 2023 -0400

Inclusion of dosimetry production reactions from IRDFF-II sent by A. Trkov.

commit 6751c5f3bcfa203dba558a610c1f85bef5f83516
Author: Caleb Mattoon <mattoon1@llnl.gov>
Date: Tue Feb 14 14:15:52 2023 -0800

Minor tweaks to masses to fix up some FUDGE Q-value warnings

(cherry picked from commit 69fad675d146f8e3b56bded1b67cbc444cdbd7d1)

commit 180265ba28cb076f7f8dac090acd04b1c42043eb Author: David Brown <dbrown@bnl.gov> Date: Thu Jul 15 21:00:44 2021 -0400

Remove line numbers and resolve formatting problem STAN was concerned with

commit 70bfecf8af46d0cc532c8bbc9558423c7a3c15dd Author: Nobre <gnobre@130-199-210-147.dhcp.bnl.gov> Date: Mon Nov 23 16:43:20 2020 -0500

INDEN evaluated file for Mn-55. This corresponds to the IAEA-labeled file mn55e80p.endf.

The description of the file from the INDEN page is as follows:

See IAEA report INDC(NDS)-0810 on "Evaluation of thermal capture gamma spectra".

Mn-55 from ENDF/B-VIII.0, updated thermal capture gamma spectra

Reference mentioned above:



- https://www-nds.iaea.org/publications/indc/indc-nds-0810/

55	M	n
		(

• Minor fixes

• Tweaks to masses to fix Q-value warnings

IRDFF cross sections

📄 neutrons — less 🛛 git 🕅

commit d82a109f9e589a488108d4e4628faf4dc253e2b1
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Tue Jul 18 16:42:59 2023 -0400

Inclusion of dosimetry production reactions from IRDFF-II sent by A. Trkov.

commit 6751c5f3bcfa203dba558a610c1f85bef5f83516
Author: Caleb Mattoon <mattoon1@llnl.gov>
Date: Tue Feb 14 14:15:52 2023 -0800

Minor tweaks to masses to fix up some FUDGE Q-value warnings

(cherry picked from commit 69fad675d146f8e3b56bded1b67cbc444cdbd7d1)

commit 180265ba28cb076f7f8dac090acd04b1c42043eb
Author: David Brown <dbrown@bnl.gov>
Date: Thu Jul 15 21:00:44 2021 -0400

Remove line numbers and resolve formatting problem STAN was concerned with

commit 70bfecf8af46d0cc532c8bbc9558423c7a3c15dd Author: Nobre <gnobre@130-199-210-147.dhcp.bnl.gov> Date: Mon Nov 23 16:43:20 2020 -0500

INDEN evaluated file for Mn-55. This corresponds to the IAEA-labeled file mn55e80p.endf.

The description of the file from the INDEN page is as follows:

See IAEA report INDC(NDS)-0810 on "Evaluation of thermal capture gamma spectra".

Mn-55 from ENDF/B-VIII.0, updated thermal capture gamma spectra

Reference mentioned above:



- https://www-nds.iaea.org/publications/indc/indc-nds-0810/

• • •

i neutrons — less < git log -- n-024_Cr_050.endf — 74×39

commit 1a951edbd6b7ee8c27a9e82499e59eb682d586c9 Author: Caleb Mattoon <mattoon1@llnl.gov> Date: Wed Oct 11 15:58:10 2023 -0700

Fix Cr50 MF=32, preserving relative uncertainties and correlations fro m ENDF-VIII.0

commit b99dcfd4d5800cc96cf4a7e9a45d8a02c2584240 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Oct 4 14:22:26 2023 -0400

Fixed resonance widths in file 32 for 50Cr, following Caleb's comment https://git.nndc.bnl.gov/endf/library/neutrons/-/merge_requests/889#note_1 5957

commit alabfc3f2ec5703lfeeec7653268a9f3bf22c50c Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Sep 25 16:13:16 2023 -0400

Brought VIII.0 covariances to 50Cr file.

commit 39ba0745b3786e3a613138acdcfdda0bdecdc9b3
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Mon Sep 18 11:13:10 2023 -0400

Updated n-024_Cr_050.endf with exit distributions from KAERI/LANL. Sum mary of MF/MT changes can be found in the file documentation section.

commit aa653dea41880f142157a154365095c56357c547 Author: Caleb M. Mattoon <mattoon1@llnl.gov> Date: Wed Mar 1 13:22:54 2023 -0800

Remove extra line before first EDATE in documentation section for seve ral Cr evaluations

commit f2ff62a3ca484d06b42ace574b92bae4cf677c6f Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Jan 11 17:00:53 2023 -0500

neutrons — less < git log -- n-024_Cr_050.endf — 74×39</p>

commit aa653dea41880f142157a154365095c56357c547 Author: Caleb M. Mattoon <mattoon1@llnl.gov> Date: Wed Mar 1 13:22:54 2023 -0800

Remove extra line before first EDATE in documentation section for seve ral Cr evaluations

commit f2ff62a3ca484d06b42ace574b92bae4cf677c6f Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Jan 11 17:00:53 2023 -0500

Updated library name for 50Cr.

• • •

(cherry picked from commit 0175d515dee2cb50404b90d60999d800c0bcb60d)

commit 7ae95ab17636b53bb3a13abd52c6fdc8c4d791d4
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Fri May 27 10:01:34 2022 -0400

Updated 50Cr file to BNL/IAEA version v2.3.2=v2.3.1, which has extende d energy range up to 65MeV for FENDL.

(cherry picked from commit 0035eadef52ba4287f56513edc625986ab848b40)

commit 3f8d3773a4ffd9fb9b331028304bdb44bde1e9c1
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Thu May 26 16:36:51 2022 -0400

"Preparing n-024_Cr_050.endf for review"

commit cf9eld276c9ceb751cd895f06eae91c3705e7e42
Author: David Alan Brown <dbrown@bnl.gov>
Date: Sat Nov 23 11:43:03 2019 -0500

initial commit from project export

• • •

i neutrons — less < git log -- n-024_Cr_050.endf — 74×39

commit 1a951edbd6b7ee8c27a9e82499e59eb682d586c9 Author: Caleb Mattoon <mattoon1@llnl.gov> Date: Wed Oct 11 15:58:10 2023 -0700

Fix Cr50 MF=32, preserving relative uncertainties and correlations fro m ENDF-VIII.0

commit b99dcfd4d5800cc96cf4a7e9a45d8a02c2584240 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Oct 4 14:22:26 2023 -0400

Fixed resonance widths in file 32 for 50Cr, following Caleb's comment https://git.nndc.bnl.gov/endf/library/neutrons/-/merge_requests/889#note_1 5957

commit alabfc3f2ec5703lfeeec7653268a9f3bf22c50c Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Sep 25 16:13:16 2023 -0400

Brought VIII.0 covariances to 50Cr file.

commit 39ba0745b3786e3a613138acdcfdda0bdecdc9b3
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Mon Sep 18 11:13:10 2023 -0400

Updated n-024_Cr_050.endf with exit distributions from KAERI/LANL. Sum mary of MF/MT changes can be found in the file documentation section.

commit aa653dea41880f142157a154365095c56357c547
Author: Caleb M. Mattoon <mattoon1@llnl.gov>
Date: Wed Mar 1 13:22:54 2023 -0800

Remove extra line before first EDATE in documentation section for seve ral Cr evaluations

commit f2ff62a3ca484d06b42ace574b92bae4cf677c6f Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Jan 11 17:00:53 2023 -0500

• Minor fixes

- Exit distributions from KAERI
- Added covariances from VIII.0
- Fixed resonance width in MF=32
- Other fixes to MF=32

Author: Caleb M. Mattoon <mattoon1@llnl.gov> Date: Wed Mar 1 13:22:54 2023 -0800

Remove extra line before first EDATE in documentation section for seve ral Cr evaluations

commit f2ff62a3ca484d06b42ace574b92bae4cf677c6f Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Jan 11 17:00:53 2023 -0500

Updated library name for 50Cr.

(cherry picked from commit 0175d515dee2cb50404b90d60999d800c0bcb60d)

commit 7ae95ab17636b53bb3a13abd52c6fdc8c4d791d4
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Fri May 27 10:01:34 2022 -0400

Updated 50Cr file to BNL/IAEA version v2.3.2=v2.3.1, which has extende d energy range up to 65MeV for FENDL.

(cherry picked from commit 0035eadef52ba4287f56513edc625986ab848b40)

commit 3f8d3773a4ffd9fb9b331028304bdb44bde1e9c1
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Thu May 26 16:36:51 2022 -0400

"Preparing n-024_Cr_050.endf for review"

commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42
Author: David Alan Brown <dbrown@bnl.gov>
Date: Sat Nov 23 11:43:03 2019 -0500

initial commit from project export

neutrons — -zsh — 74×39

gustavonobre@LNE-170746 neutrons % git log -- n-024_Cr_051.endf commit 4e10604637fc13198a6a26b9aed1ada7042ace37 Author: Hyeong Il Kim <hikim@kaeri.re.kr> Date: Sat Dec 9 21:25:55 2023 +0000

Replace n-024_Cr_051.endf

commit a6e6fb76c0a332e4fd2d0f92730f82b7c87d9692
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Thu Dec 7 10:28:35 2023 -0500

INDEN evaluation for 51Cr, calculated consistently with the INDEN eval uations for the other Cr isotopes. This file corresponds to BNL/INDEN labe l cr51-v2.2.0.

commit 85d6943ce21531a7183882588b8369dc1a0f5d9e
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Mon Sep 18 11:26:19 2023 -0400

Updated n-024_Cr_051.endf with exit distributions from KAERI/LANL. Sum mary of MF/MT changes can be found in the file documentation section.

commit 058c43ac3871d1a139bd0b91b86357e0c121927e Author: Nathan Gibson <ngibson@lanl.gov> Date: Tue Sep 20 09:27:51 2022 -0600

Updated directory for n-024_Cr_051.endf; previously, directory items h ad incorrect NC values.

commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42 Author: David Alan Brown <dbrown@bnl.gov> Date: Sat Nov 23 11:43:03 2019 -0500

initial commit from project export
gustavonobre@LNE-170746 neutrons %

📄 neutrons — -zsh — 74×39

igustavonobre@LNE-170746 neutrons % git log -- n-024_Cr_051.endf commit 4e10604637fc13198a6a26b9aed1ada7042ace37 Author: Hyeong Il Kim <hikim@kaeri.re.kr> Date: Sat Dec 9 21:25:55 2023 +0000

Replace n-024_Cr_051.endf

commit a6e6fb76c0a332e4fd2d0f92730f82b7c87d9692 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Dec 7 10:28:35 2023 -0500

INDEN evaluation for 51Cr, calculated consistently with the INDEN eval uations for the other Cr isotopes. This file corresponds to BNL/INDEN labe l cr51-v2.2.0.

commit 85d6943ce21531a7183882588b8369dc1a0f5d9e
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Mon Sep 18 11:26:19 2023 -0400

Updated n-024_Cr_051.endf with exit distributions from KAERI/LANL. Sum mary of MF/MT changes can be found in the file documentation section.

commit 058c43ac3871d1a139bd0b91b86357e0c121927e
Author: Nathan Gibson <ngibson@lanl.gov>
Date: Tue Sep 20 09:27:51 2022 -0600

Updated directory for n-024_Cr_051.endf; previously, directory items h ad incorrect NC values.

commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42 Author: David Alan Brown <dbrown@bnl.gov> Date: Sat Nov 23 11:43:03 2019 -0500

initial commit from project export
gustavonobre@LNE-170746 neutrons %

Minor fixesExit distributions from KAERI

📄 neutrons — less < git log -- n-024_Cr_052.endf — 74×39

commit 4e7813555a0d0b02bc2e3c2428dd71ab21c6c488 Author: Ian J. Thompson <thompson97@llnl.gov> Date: Mon Dec 11 20:39:10 2023 -0500

Change MT=51 exit distribution from 1461944 eV to 1461960 eV as for MF =3

commit 22dc7f7f0f58664335a91f485cd67d7b48ed793f
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Mon Sep 25 16:17:14 2023 -0400

Brought VIII.0 covariances to 52Cr file.

commit 1b1058be03ca72aec9393c437fed1c023c862b8a
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Mon Sep 18 12:03:06 2023 -0400

Updated n-024_Cr_052.endf with exit distributions from KAERI/LANL. Sum mary of MF/MT changes can be found in the file documentation section.

commit aa653dea41880f142157a154365095c56357c547
Author: Caleb M. Mattoon <mattoon1@llnl.gov>
Date: Wed Mar 1 13:22:54 2023 -0800

Remove extra line before first EDATE in documentation section for seve ral Cr evaluations

commit 8202f147081067fc532d545e0f186ee5fc6c97d4
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Tue Feb 7 16:06:24 2023 -0300

Reverted 52Cr to the version before IAEA tweaks, returning to the version of the reference paper Nuclear Data Sheets 173 (2021) 1-41, wi

the extension to 65MeV and two added points around 12.25 MeV. Also fix

the evaluation name in documentation. This should be used for Beta1.

📄 neutrons — less 4 git log -- n-024_Cr_052.endf — 74×39

Brought VIII.0 covariances to 52Cr file.

commit 1b1058be03ca72aec9393c437fed1c023c862b8a Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Sep 18 12:03:06 2023 -0400

Updated n-024_Cr_052.endf with exit distributions from KAERI/LANL. Sum mary of MF/MT changes can be found in the file documentation section.

commit aa653dea41880f142157a154365095c56357c547
Author: Caleb M. Mattoon <mattoon1@llnl.gov>
Date: Wed Mar 1 13:22:54 2023 -0800

Remove extra line before first EDATE in documentation section for seve ral Cr evaluations

commit 8202f147081067fc532d545e0f186ee5fc6c97d4
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Tue Feb 7 16:06:24 2023 -0300

Reverted 52Cr to the version before IAEA tweaks, returning to the version of the reference paper Nuclear Data Sheets 173 (2021) 1-41, wi h

the extension to 65 MeV and two added points around 12.25 MeV. Also fix ed

the evaluation name in documentation. This should be used for Beta1.

commit 47059204ff849f334bf245072b8af0742d55fe75
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Thu May 26 16:37:45 2022 -0400

"Preparing n-024_Cr_052.endf for review"

commit cf9eld276c9ceb751cd895f06eae91c3705e7e42 Author: David Alan Brown <dbrown@bnl.gov> Date: Sat Nov 23 11:43:03 2019 -0500

initial commit from project export

• 522Cr • • • • • • • • • • • • • • • • • • •	 Minor fixes Reverted to publication version, before resonance tweaks Exit distributions from KAERI Added covariances from VIII.0 Fixed minor issue with MT=51 exit distribution 	
Change MT=51 exit distribution from 1461944 eV to 1461960 eV as for here as $1461960 = 1461960$	bace. Hôn sep 10 12.03.00 2023 - 0400	
commit 22dc7f7f0f58664335a91f485cd67d7b48ed793f	Updated n-024_Cr_052.endf with exit distributions from KAERI/LANL. Sum mary of MF/MT changes can be found in the file documentation section.	
Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Sep 25 16:17:14 2023 -0400</gnobre@bnl.gov>	commit aa653dea41880f142157a154365095c56357c547	
Brought VIII.0 covariances to 52Cr file.	Author: Caleb M. Mattoon <mattoon1@llnl.gov> Date: Wed Mar 1 13:22:54 2023 -0800</mattoon1@llnl.gov>	
<pre>commit 1b1058be03ca72aec9393c437fed1c023c862b8a Author: Gustavo Nobre <gnobre@bnl.gov> Dete: Mag. Sec. 10, 12:02:06, 2022, 0100</gnobre@bnl.gov></pre>	Remove extra line before first EDATE in documentation section for seve ral Cr evaluations	
Updated n-024_Cr_052.endf with exit distributions from KAERI/LANL. Sum mary of MF/MT changes can be found in the file documentation section.	<pre>commit 8202f147081067fc532d545e0f186ee5fc6c97d4 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Tue Feb 7 16:06:24 2023 -0300</gnobre@bnl.gov></pre>	
<pre>commit aa653dea41880f142157a154365095c56357c547 Author: Caleb M. Mattoon <mattoon1@llnl.gov> Date: Wed Mar 1 13:22:54 2023 -0800</mattoon1@llnl.gov></pre>	Reverted 52Cr to the version before IAEA tweaks, returning to the version of the reference paper Nuclear Data Sheets 173 (2021) 1-41, wi th	
Remove extra line before first EDATE in documentation section for seve ral Cr evaluations	the extension to 65MeV and two added points around 12.25 MeV. Also fix ed the evaluation name in documentation. This should be used for Beta1.	
<pre>commit 8202f147081067fc532d545e0f186ee5fc6c97d4 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Tue Feb 7 16:06:24 2023 -0300</gnobre@bnl.gov></pre>	commit 47059204ff849f334bf245072b8af0742d55fe75 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu May 26 16:37:45 2022 -0400</gnobre@bnl.gov>	
Reverted 52Cr to the version before IAEA tweaks, returning to the version of the reference paper Nuclear Data Sheets 173 (2021) 1-41, wi	"Preparing n-024_Cr_052.endf for review"	
th the extension to 65MeV and two added points around 12.25 MeV. Also fix	<pre>commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42 Author: David Alan Brown <dbrown@bnl.gov></dbrown@bnl.gov></pre>	
ed the evaluation name in documentation. This should be used for Beta1.	Date: Sat Nov 23 11:43:03 2019 -0500 initial commit from project export	

• • •

neutrons — less < git log -- n-024_Cr_053.endf — 74×39

commit 88fb0e7bad123a175b1d89e324f9dd99277a2987 Author: Caleb Mattoon <mattoon1@llnl.gov> Date: Fri Oct 13 16:33:19 2023 -0700

Fix Cr53 covariance issues: remove MF33 MT61-63 since no MF=3 is provided, tweak threshold for MF=33 MT=91, and update MF=32 to reflect changes in MF=2 resonance parameters

commit 9941691a8966e4c740fc68d3d0a424ee72c07485
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Mon Sep 25 16:23:47 2023 -0400

Brought VIII.0 covariances to 53Cr file.

commit 73e78044ef694e3440ee2de8ca862f6189899b04
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Mon Sep 18 12:11:51 2023 -0400

Updated n-024_Cr_053.endf with exit distributions from KAERI/LANL. Sum mary of MF/MT changes can be found in the file documentation section.

commit aa653dea41880f142157a154365095c56357c547 Author: Caleb M. Mattoon <mattoon1@llnl.gov> Date: Wed Mar 1 13:22:54 2023 -0800

Remove extra line before first EDATE in documentation section for seve ral Cr evaluations

commit fefb73ed94b93c26c80f0de4074677b4f2900587
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Wed Jan 25 16:53:39 2023 -0500

Improved comment section of 53Cr.

commit a3f0e0d828b464625f5708414a3a8b9032df33c3
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Fri May 27 09:42:20 2022 -0400

) 😑 😑 📄 neutrons — less < git log -- n-024_Cr_053.endf — 74×39

Updated n-024_Cr_053.endf with exit distributions from KAERI/LANL. Sum mary of MF/MT changes can be found in the file documentation section.

commit aa653dea41880f142157a154365095c56357c547
Author: Caleb M. Mattoon <mattoon1@llnl.gov>
Date: Wed Mar 1 13:22:54 2023 -0800

Remove extra line before first EDATE in documentation section for seve ral Cr evaluations

commit fefb73ed94b93c26c80f0de4074677b4f2900587
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Wed Jan 25 16:53:39 2023 -0500

Improved comment section of 53Cr.

commit a3f0e0d828b464625f5708414a3a8b9032df33c3
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Fri May 27 09:42:20 2022 -0400

Updated 53Cr file to BNL/IAEA version v2.3.2=v2.3.1, which has extende d energy range up to 65MeV for FENDL.

(cherry picked from commit b763d49c2ef2519824f177c312841f521507047a)

commit fc3add957573b5c028663c910ea8536dc2cc0d09
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Thu May 26 16:39:12 2022 -0400

"Preparing n-024_Cr_053.endf for review"

commit cf9eld276c9ceb751cd895f06eae91c3705e7e42
Author: David Alan Brown <dbrown@bnl.gov>
Date: Sat Nov 23 11:43:03 2019 -0500

initial commit from project export

53Cr • • • • • • • • • • • • • • • • • • •	 Minor fixes Exit distributions from KAERI Added covariances from VIII.0 Fixes to MF=32/33 	
<pre>commit 88fb0e7bad123a175b1d89e324f9dd99277a2987 Author: Caleb Mattoon <mattoon1@llnl.gov> Date: Fri Oct 13 16:33:19 2023 -0700</mattoon1@llnl.gov></pre>	Updated n-024_Cr_053.endf with exit distributions from KAERI/LANL. Sum mary of MF/MT changes can be found in the file documentation section.	
Fix Cr53 covariance issues: remove MF33 MT61-63 since no MF=3 is proded, tweak threshold for MF=33 MT=91, and update MF=32 to reflect change in MF=2 resonance parameters	vi s Author: Caleb M. Mattoon <mattoon1@llnl.gov> Date: Wed Mar 1 13:22:54 2023 -0800</mattoon1@llnl.gov>	
commit 9941691a8966e4c740fc68d3d0a424ee72c07485 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Sep 25 16:23:47 2023 -0400</gnobre@bnl.gov>	Remove extra line before first EDATE in documentation section for seve ral Cr evaluations	
Brought VIII.0 covariances to 53Cr file.	<pre>commit fefb73ed94b93c26c80f0de4074677b4f2900587 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Jan 25 16:53:39 2023 -0500</gnobre@bnl.gov></pre>	
<pre>commit 73e78044ef694e3440ee2de8ca862f6189899b04 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Sep 18 12:11:51 2023 -0400</gnobre@bnl.gov></pre>	Improved comment section of 53Cr.	
Updated n-024_Cr_053.endf with exit distributions from KAERI/LANL. S mary of MF/MT changes can be found in the file documentation section.	commit a3f0e0d828b464625f5708414a3a8b9032df33c3 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Fri May 27 09:42:20 2022 -0400</gnobre@bnl.gov>	
commit aa653dea41880f142157a154365095c56357c547 Author: Caleb M. Mattoon <mattoon1@llnl.gov> Date: Wed Mar 1 13:22:54 2023 -0800</mattoon1@llnl.gov>	Updated 53Cr file to BNL/IAEA version v2.3.2=v2.3.1, which has extende d energy range up to 65MeV for FENDL.	
Remove extra line before first EDATE in documentation section for se ral Cr evaluations	ve (cherry picked from commit b763d49c2ef2519824f177c312841f521507047a)	
commit fefb73ed94b93c26c80f0de4074677b4f2900587 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Jan 25 16:53:39 2023 -0500</gnobre@bnl.gov>	commit fc3add957573b5c028663c910ea8536dc2cc0d09 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu May 26 16:39:12 2022 -0400</gnobre@bnl.gov>	
Improved comment section of 53Cr.	"Preparing n-024_Cr_053.endf for review"	
commit a3f0e0d828b464625f5708414a3a8b9032df33c3 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Fri May 27 09:42:20 2022 -0400</gnobre@bnl.gov>	commit cf9eld276c9ceb751cd895f06eae91c3705e7e42 Author: David Alan Brown <dbrown@bnl.gov> Date: Sat Nov 23 11:43:03 2019 -0500 initial commit from project export</dbrown@bnl.gov>	

• • •

neutrons — less < git log -- n-024_Cr_054.endf — 74×39

commit 8643d47caf055e7df26adb0159cb92dac495ad34
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Mon Sep 18 12:17:48 2023 -0400

Updated n-024_Cr_054.endf with exit distributions from KAERI/LANL. Sum mary of MF/MT changes can be found in the file documentation section.

commit 4fa5d88a2bcc31be9576ab4e48ba603bae016c4c Author: Gustavo Nobre <gnobre@bnl.gov> Date: Tue Apr 11 10:30:50 2023 -0400

Replaced 54Cr by BNL's cr54-v2.5.1. This was reassembled using new version of FUDGE (6.1.0). The previous version had a bug that changed the LRF flag for MF=32 from LRF=3 to LRF=7 making it inconsistent with MF=2 and c ausing some modules of NJOY to crash (see https://git.nndc.bnl.gov/endf/library/neutrons/-/issues/471). The new FUDGE fixed that.

commit aa653dea41880f142157a154365095c56357c547
Author: Caleb M. Mattoon <mattoon1@llnl.gov>
Date: Wed Mar 1 13:22:54 2023 -0800

Remove extra line before first EDATE in documentation section for seve ral \mbox{Cr} evaluations

commit 44b16a58a98cc6c256aa43818b997427e4b625b7
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Thu Nov 10 09:40:21 2022 -0500

Minor update in Cr54, updating the name of the library in the document ation.

commit 62d534df4a5c1b636c0dc1681bb250c491b1dc57
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Wed Oct 19 11:02:27 2022 -0400

Updated 54Cr file to contain resonance covariances from VIII.0 (See ht tps://git.nndc.bnl.gov/endf/evaluations/chromium-evaluation/-/commit/31ae8 b5559350f3749b7157e47fb5e82f1053830).

📄 neutrons — less < git log -- n-024_Cr_054.endf — 74×39

Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Nov 10 09:40:21 2022 -0500

• • •

Minor update in Cr54, updating the name of the library in the document ation.

commit 62d534df4a5c1b636c0dc1681bb250c491b1dc57
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Wed Oct 19 11:02:27 2022 -0400

Updated 54Cr file to contain resonance covariances from VIII.0 (See ht tps://git.nndc.bnl.gov/endf/evaluations/chromium-evaluation/-/commit/31ae8 b5559350f3749b7157e47fb5e82f1053830).

(cherry picked from commit 11c94265e9570b04e086de7f27baa034006fe44d)

commit 9780310353fc9ba2fdf170a2185d164f4039a83d Author: Gustavo Nobre <gnobre@bnl.gov> Date: Fri May 27 10:12:48 2022 -0400

Updated 54Cr file to BNL/IAEA version v2.3.2=v2.3.1, which has extende d energy range up to 65MeV for FENDL.

(cherry picked from commit de3d5012f1198bf08196852f4d1d7a68f746c2b7)

commit 510e83de0abba1443a0ad865ef14f9751b124601
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Thu May 26 16:39:54 2022 -0400

"Preparing n-024_Cr_054.endf for review"

commit cf9eld276c9ceb751cd895f06eae91c3705e7e42 Author: David Alan Brown <dbrown@bnl.gov> Date: Sat Nov 23 11:43:03 2019 -0500

initial commit from project export
(END)

54Cr • • • • neutrons – less • git log n-024_Cr_054.endf – 74×39		 Minor fixes Added resonance covariances from VIII.0, after a FUDGE update Exit distributions from KAERI 		
	commit 8643d47caf055e7df26adb0159cb92dac495ad34 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Mon Sep 18 12:17:48 2023 -0400</gnobre@bnl.gov>		Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Nov 10 09:40:21 2022 -0500</gnobre@bnl.gov>	
	Updated n-024_Cr_054.endf with exit distributions from KAERI/LANL. Sur	n	Minor update in Cr54, updating the name of the library in the documen ation.	ŧ
	commit 4fa5d88a2bcc31be9576ab4e48ba603bae016c4c Author: Gustavo Nobre <gnobre@bnl.gov> Date: Tue Apr 11 10:30:50 2023 -0400</gnobre@bnl.gov>		commit 62d534df4a5c1b636c0dc1681bb250c491b1dc57 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Oct 19 11:02:27 2022 -0400</gnobre@bnl.gov>	
	Replaced 54Cr by BNL's cr54-v2.5.1. This was reassembled using new ver sion of FUDGE (6.1.0). The previous version had a bug that changed the LRF flag for MF=32 from LRF=3 to LRF=7 making it inconsistent with MF=2 and c ausing some modules of NJOY to crash (see https://git.nndc.bnl.gov/endf/l brary/neutrons/-/issues/471). The new FUDGE fixed that.	r = i	Updated 54Cr file to contain resonance covariances from VIII.0 (See h tps://git.nndc.bnl.gov/endf/evaluations/chromium-evaluation/-/commit/31ae b5559350f3749b7157e47fb5e82f1053830). (cherry picked from commit 11c94265e9570b04e086de7f27baa034006fe44d)	C B
	commit aa653dea41880f142157a154365095c56357c547 Author: Caleb M. Mattoon <mattoon1@llnl.gov> Date: Wed Mar 1 13:22:54 2023 -0800</mattoon1@llnl.gov>		commit 9780310353fc9ba2fdf170a2185d164f4039a83d Author: Gustavo Nobre <gnobre@bnl.gov> Date: Fri May 27 10:12:48 2022 -0400</gnobre@bnl.gov>	
	Remove extra line before first EDATE in documentation section for several Cr evaluations		Updated 54Cr file to BNL/IAEA version v2.3.2=v2.3.1, which has extend d energy range up to 65MeV for FENDL.	e
	commit 44b16a58a98cc6c256aa43818b997427e4b625b7 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Nov 10 09:40:21 2022 -0500</gnobre@bnl.gov>		(cherry picked from commit de3d5012f1198bf08196852f4d1d7a68f746c2b7)	
	Minor update in Cr54, updating the name of the library in the document ation.		commit 510e83de0abba1443a0ad865ef14f9751b124601 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu May 26 16:39:54 2022 -0400</gnobre@bnl.gov>	
	commit 62d534df4a5c1b636c0dc1681bb250c491b1dc57 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Oct 19 11:02:27 2022 -0400</gnobre@bnl.gov>		<pre>"Preparing n-024_Cr_054.endf for review" commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42</pre>	
L	Updated 54Cr file to contain resonance covariances from VIII.0 (See https://git.nndc.bnl.gov/endf/evaluations/chromium-evaluation/-/commit/31ae&b5559350f3749b7157e47fb5e82f1053830).	5	Author: David Alan Brown <dbrown@bnl.gov> Date: Sat Nov 23 11:43:03 2019 -0500 initial commit from project export</dbrown@bnl.gov>	54

END

🖲 😑 🔵 🚞 neutrons — less 🛛 git log -- n-029_Cu_063.endf — 52×40

commit 3b460b5f7eb799eab706573ca99fef5fcff1037b Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Nov 29 09:50:09 2023 -1000

Update to 63Cu to include exit distributions fro m KAERI/LANL. File sent

by H.I. Kim on November 28, 2023.

commit f63bb09a6e20e6750b1565de73512dbc3140f14e
Author: Caleb Mattoon <mattoon1@llnl.gov>
Date: Fri Oct 27 17:09:32 2023 -0700

Fix some FUDGE checker warnings: recompute MF=3 cross section from summands, move the MF=16 photon d istribution threshold to match cross section, add un itbase interpolation to a bunch of MT=5 MF=6 product s

commit 1cc82ced773866db405056146e1c52b8ff9e3ca0
Author: Jason Thompson <jason.thompson@unnpp.gov>
Date: Thu Oct 26 14:18:18 2023 +0000

Fixing poorly normalized PDFs in MT=2 at 9 MeV t hrough 15 MeV. (FIZCON complained about 9-12MeV, but the next few had similar issues to a small degree.)

(cherry picked from commit a006aaac204687144d517 d0bd593fb5290b3d5d1)

commit 595f8aaf215fe61cd64f8379a565d83d4434de86
Author: McDonnell, Jordan <mcdonnelljd@ornl.gov>
Date: Mon Aug 14 15:16:50 2023 +0000

Resolve "Large negative eigenvalue in 63Cu MF=32

commit 511bd64a21358c73f90a00049aa9cc0731d4d4bb
Author: JayT <jason.thompson@unnpp.gov>
Date: Tue Aug 8 12:10:37 2023 -0600

🖲 😑 💼 neutrons — less 🛛 git log -- n-029_Cu_063.endf — 52×40

added 7MeV tabulated distrubution to Cu63 ESAD

commit b950438a81584ec868bd80dbf3c5b3873b2cf117
Author: JayT <jason.thompson@unnpp.gov>
Date: Tue Aug 8 05:57:11 2023 -0600

Changed break point between Legendre and tabualt ed data in ESAD and zeroed the negative PDFs

commit 0fd5321f074648eca915c9c066dc45e74d45d66d
Author: Wim Haeck <whaeck@gmail.com>
Date: Mon Aug 7 13:58:02 2023 -0600

Fixed MF32 MT151

commit ca001bb04dcd74e863db423f1fd0904089e7da2c Author: Wim Haeck <whaeck@gmail.com> Date: Mon Aug 7 13:05:36 2023 -0600

Correcting index in MF1 MT451

commit 6a65aa9ae3c529723b8c2c1d9d124d87e5cfadef Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Jun 15 17:20:40 2023 -0400

Fixed (n,2n) threshold energy.

commit fe55025b67d3b50ac8f7961a92a37141082245ad Author: Caleb Mattoon <mattoon1@llnl.gov> Date: Tue Jun 6 16:56:37 2023 -0700

Fix some FUDGE warnings for Cu63: remove extra z ero-probability outgoing energies from distributions , fix some masses to better match Q-values.

commit 5bebe0f1aef24c26c1dffc98767b35f4d78fff7f
Author: Nathan Gibson <ngibson@lanl.gov>
Date: Tue Nov 1 08:17:52 2022 -0600

🖲 😑 📄 neutrons — less 🛛 git log -- n-029_Cu_063.endf — 52×40

Author: Nathan Gibson <ngibson@lanl.gov> Date: Tue Nov 1 08:17:52 2022 -0600

Updated directory for n-029_Cu_063.endf; previou s update had bug with MF1 sections.

commit 2f077d9b11d32a73b3b4aae10977d56e29503054 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Oct 5 09:34:37 2022 -0400

Ran dos2unix on version cu63ane6k09aRR

commit 4db079090b2fce1af25f97eb4d64004cf766f8b6
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Wed Oct 5 09:32:07 2022 -0400

New recommended version from INDEN (cu63ane6k09a RR). Description: Cu-63(n,a) from iRDFF-II adopted. New evaluation of Cu-63 (IAEA/JSI/ORNL) validated in criticality and leakage benchmarks.

commit a39d7325b737364b7048fb2e6d86680651f2c095 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Apr 28 10:56:36 2022 -0400

INDEN evaluation of 63Cu (file labeled as cu63an e6k09RR in INDEN website). Ran STANEF on it to remov e line numbers. Also, FIZCON complained about the th reshold value of (n,2n), so I changed it slightly to 1.103790+7 (line 4189). More details can be found i n issue tracker #424 of the neutron sublibrary repos itory (https://git.nndc.bnl.gov/endf/library/neutron s/-/issues/424).

commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42 Author: David Alan Brown <dbrown@bnl.gov> Date: Sat Nov 23 11:43:03 2019 -0500

initial commit from project export (END)

🧕 😑 🔵 🚞 neutrons — less < git log -- n-029_Cu_063.endf — 52×40

commit 3b460b5f7eb799eab706573ca99fef5fcff1037b Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Nov 29 09:50:09 2023 -1000

Update to 63Cu to include exit distributions fro m KAERI/LANL. File sent

by H.I. Kim on November 28, 2023.

commit f63bb09a6e20e6750b1565de73512dbc3140f14e
Author: Caleb Mattoon <mattoon1@llnl.gov>
Date: Fri Oct 27 17:09:32 2023 -0700

Fix some FUDGE checker warnings: recompute MF=3 cross section from summands, move the MF=16 photon d istribution threshold to match cross section, add un itbase interpolation to a bunch of MT=5 MF=6 product s

commit 1cc82ced773866db405056146e1c52b8ff9e3ca0
Author: Jason Thompson <jason.thompson@unnpp.gov>
Date: Thu Oct 26 14:18:18 2023 +0000

Fixing poorly normalized PDFs in MT=2 at 9 MeV t hrough 15 MeV. (FIZCON complained about 9-12MeV, but the next few had similar issues to a small degree.)

(cherry picked from commit a006aaac204687144d517 d0bd593fb5290b3d5d1)

commit 595f8aaf215fe61cd64f8379a565d83d4434de86
Author: McDonnell, Jordan <mcdonnelljd@ornl.gov>
Date: Mon Aug 14 15:16:50 2023 +0000

Resolve "Large negative eigenvalue in 63Cu MF=32

commit 511bd64a21358c73f90a00049aa9cc0731d4d4bb Author: JayT <jason.thompson@unnpp.gov> Date: Tue Aug 8 12:10:37 2023 -0600

spurious outgoing energies in some exit distributions 😑 🔵 📄 neutrons — less 🔹 Masses fixes to match Q-values added 7MeV tabul Fixed (n,2n) threshold energy commit b950438a81584 • Fix to elastic angular distribution to address negative Author: JayT <jason. Date: Tue Aug 8 05 **PDFs** Changed break po ed data in ESAD and Fixed negative eigenvalue in MF=32 More FUDGE fixes commit 0fd5321f07464 Author: Wim Haeck <w Date: Mon Aug 7 13 Exit distributions from KAERI

Directory and other minor fixes

• Fixed FUDGE warnings:

commit ca001bb04dcd74e863db423f1fd0904089e7da2c
Author: Wim Haeck <whaeck@gmail.com>
Date: Mon Aug 7 13:05:36 2023 -0600

Correcting index in MF1 MT451

Fixed MF32 MT151

commit 6a65aa9ae3c529723b8c2c1d9d124d87e5cfadef Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Jun 15 17:20:40 2023 -0400

Fixed (n,2n) threshold energy.

commit fe55025b67d3b50ac8f7961a92a37141082245ad Author: Caleb Mattoon <mattoon1@llnl.gov> Date: Tue Jun 6 16:56:37 2023 -0700

Fix some FUDGE warnings for Cu63: remove extra z ero-probability outgoing energies from distributions , fix some masses to better match Q-values.

commit 5bebe0f1aef24c26c1dffc98767b35f4d78fff7f Author: Nathan Gibson <ngibson@lanl.gov> Date: Tue Nov 1 08:17:52 2022 -0600 New recommended version from INDEN (cu63ane6k09a

RR). Description: Cu-63(n,a) from iRDFF-II adopted. New evaluation of Cu-63 (IAEA/JSI/ORNL) validated in criticality and leakage benchmarks.

commit a39d7325b737364b7048fb2e6d86680651f2c095 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Thu Apr 28 10:56:36 2022 -0400

INDEN evaluation of 63Cu (file labeled as cu63an e6k09RR in INDEN website). Ran STANEF on it to remov e line numbers. Also, FIZCON complained about the th reshold value of (n,2n), so I changed it slightly to 1.103790+7 (line 4189). More details can be found i n issue tracker #424 of the neutron sublibrary repos itory (https://git.nndc.bnl.gov/endf/library/neutron s/-/issues/424).

commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42
Author: David Alan Brown <dbrown@bnl.gov>
Date: Sat Nov 23 11:43:03 2019 -0500

initial commit from project export END)

● ● ● 📄 neutrons — less < git log -- n-029_Cu_065.endf — 52×40

commit e02cbd6a2fe2fb38f365ec0afb74c176b1c8d850
Author: Caleb Mattoon <mattoon1@llnl.gov>
Date: Wed Nov 29 13:51:49 2023 -0800

Minor fix to improve energy balance in MT=749 ph otons for Cu-65

commit 3550d4bc78c4c7b096584ed8a318ef0d7a75f882
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Wed Nov 29 10:02:41 2023 -1000

Update to 65Cu to include exit distributions fro m KAERI/LANL. He also mentioned fixing some interpolation flags in MF/ MT=6/51-88 that were causing CHECKR to crash. File sent by H.I. Kim on November 28, 2023.

commit 644c89f286126f722347b6fee70d8f7f6d15aedc Author: Caleb Mattoon <mattoon1@llnl.gov> Date: Thu Nov 2 12:05:08 2023 -0700

Additional fixes to Cu65 to fix FUDGE warnings: add unitbase interpolation to MT=5 outgoing product distributions, update masses to better match tabulat ed Q-values, minor fix to MT=107 alpha distribution to improve energy balance

commit b3cd0edd6550ddc5601d12ce494b7ae46e50d31b Author: Caleb Mattoon <mattoon1@llnl.gov> Date: Wed Nov 1 17:05:01 2023 -0700

Renormalize discrete gammas for MTs 16, 22 and 9 1. Fixes FIZCON warning

commit 6d8d837e3f0f1611b5083a03ec2b1f49557b1557
Author: McDonnell, Jordan <mcdonnelljd@ornl.gov>
Date: Mon Aug 14 15:17:29 2023 +0000

● ● ● 📄 neutrons — less < git log -- n-029_Cu_065.endf — 52×40

commit 6d8d837e3f0f1611b5083a03ec2b1f49557b1557
Author: McDonnell, Jordan <mcdonnelljd@ornl.gov>
Date: Mon Aug 14 15:17:29 2023 +0000

Resolve "Negative Cross Section in 65Cu"

commit 08a98368ad253d85d9b3cde73d74d42c3eaa7c5a
Author: Wim Haeck <whaeck@gmail.com>
Date: Mon Aug 7 13:58:09 2023 -0600

Fixed MF32 MT151

commit a32e056f8e484b0cdd1aa87c7c605457322a8097
Author: Caleb Mattoon <mattoon1@llnl.gov>
Date: Tue Jun 6 17:06:19 2023 -0700

Fix some FUDGE warnings for Cu65: remove extra z ero-probability outgoing energies from distributions , fix (n,2n) threshold.

commit 9155cd6b6d62fa406486ae0f34b789bf04348369 Author: Nathan Gibson <ngibson@lanl.gov> Date: Tue Sep 20 09:27:54 2022 -0600

Updated directory for n-029_Cu_065.endf; previou sly, directory items had incorrect NC values.

commit 27971dcf0123dc80b397591fef681b6bd20ffc26 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Sep 7 10:45:56 2022 -0400

Ran dos2unix and removed line numbers from 65Cu file.

commit 74cb841b4228a7f2b3f7d85f01974c28a67ffc62
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Wed Sep 7 10:37:31 2022 -0400

New version of the INDEN 65Cu file, correspondin

🖲 😑 🚞 neutrons — less < git log -- n-029_Cu_065.endf — 52×40

Updated directory for n-029_Cu_065.endf; previou sly, directory items had incorrect NC values.

commit 27971dcf0123dc80b397591fef681b6bd20ffc26
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Wed Sep 7 10:45:56 2022 -0400

Ran dos2unix and removed line numbers from 65Cu file.

commit 74cb841b4228a7f2b3f7d85f01974c28a67ffc62
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Wed Sep 7 10:37:31 2022 -0400

New version of the INDEN 65Cu file, correspondin g to cu65ane5k05 in IAEA labeling, published in thei r website on 09-May-2022. Their log reads "(recommen ded) New evaluation of Cu-65 (IAEA/JSI/ORNL) validat ed in criticality and leakage benchmarks"

commit cdb3b342880e3650f52b376eac76de26b2befa89
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Fri Apr 29 11:34:13 2022 -0400

INDEN evaluation of 65Cu (file labeled as cu65an e5k02 in INDEN website). Ran STANEF on it to remove line numbers. Also, FIZCON points out errors in the (n,2n) channel in MF=6 (SECTION DOES NOT SPAN THE SA ME ENERGY RANGE AS FILE 3, MT= 16). This still ne eds to be fixed. More details can be found in issue tracker #424 of the neutron sublibrary repository (h ttps://git.nndc.bnl.gov/endf/library/neutrons/-/issu es/424).

commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42 Author: David Alan Brown <dbrown@bnl.gov> Date: Sat Nov 23 11:43:03 2019 -0500

initial commit from project export
(END)

Minor fix to improve energy balance in MT=749 ph otons for $\mbox{Cu-}65$

commit 3550d4bc78c4c7b096584ed8a318ef0d7a75f882
Author: Gustavo Nobre <gnobre@bnl.gov>
Date: Wed Nov 29 10:02:41 2023 -1000

Update to 65Cu to include exit distributions fro m KAERI/LANL. He also mentioned fixing some interpolation flags in MF/ MT=6/51-88 that were causing CHECKR to crash. File sent by H.I. Kim on November 28, 2023.

commit 644c89f286126f722347b6fee70d8f7f6d15aedc Author: Caleb Mattoon <mattoon1@llnl.gov> Date: Thu Nov 2 12:05:08 2023 -0700

Additional fixes to Cu65 to fix FUDGE warnings: add unitbase interpolation to MT=5 outgoing product distributions, update masses to better match tabulat ed Q-values, minor fix to MT=107 alpha distribution to improve energy balance

commit b3cd0edd6550ddc5601d12ce494b7ae46e50d31b Author: Caleb Mattoon <mattoon1@llnl.gov> Date: Wed Nov 1 17:05:01 2023 -0700

Renormalize discrete gammas for MTs 16, 22 and 9 1. Fixes FIZCON warning

commit 6d8d837e3f0f1611b5083a03ec2b1f49557b1557
Author: McDonnell, Jordan <mcdonnelljd@ornl.gov>
Date: Mon Aug 14 15:17:29 2023 +0000

 Directory and other n Fixed FUDGE warnin spurious outgoing distributions Masses fixes to n Fixed (n,2n) threshol Fix to elastic angular PDFs Fixed MF32 MT15: Fixed MF32 MT15: Fixed MF32 MT15: More FUDGE fixes Exit distributions from Fix to photon energy 	 Directory and other minor fixes Fixed FUDGE warnings: spurious outgoing energies in some exit distributions Masses fixes to match Q-values Fixed (n,2n) threshold energy Fix to elastic angular distribution to address negative PDFs Fixed negative eigenvalue in MF=32 Renormalized discrete gammas for MT=16, 22, 91 More FUDGE fixes Exit distributions from KAERI Fix to photon energy balances in MT=749 		
commit 9155cd6b6d62fa406486ae0f34b789bf04348369 Author: Nathan Gibson <ngibson@lanl.gov> Date: Tue Sep 20 09:27:54 2022 -0600</ngibson@lanl.gov>	commit cdb3b342880e3650f52b376eac76de26b2befa89 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Fri Apr 29 11:34:13 2022 -0400</gnobre@bnl.gov>		
Updated directory for n-029_Cu_065.endf; previou sly, directory items had incorrect NC values. commit 27971dcf0123dc80b397591fef681b6bd20ffc26 suthor: Gustavo Nobre <gnobre@bnl.gov> bate: Wed Sep 7 10:45:56 2022 -0400 Ran dos2unix and removed line numbers from 65Cu file.</gnobre@bnl.gov>	INDEN evaluation of 65Cu (file labeled as cu65an e5k02 in INDEN website). Ran STANEF on it to remove line numbers. Also, FIZCON points out errors in the (n,2n) channel in MF=6 (SECTION DOES NOT SPAN THE SA ME ENERGY RANGE AS FILE 3, MT= 16). This still ne eds to be fixed. More details can be found in issue tracker #424 of the neutron sublibrary repository (h ttps://git.nndc.bnl.gov/endf/library/neutrons/-/issu es/424).		
commit 74cb841b4228a7f2b3f7d85f01974c28a67ffc62 Author: Gustavo Nobre <gnobre@bnl.gov> Date: Wed Sep 7 10:37:31 2022 -0400 New version of the INDEN 65Cu file, correspondin</gnobre@bnl.gov>	<pre>commit cf9e1d276c9ceb751cd895f06eae91c3705e7e42 Author: David Alan Brown <dbrown@bnl.gov> Date: Sat Nov 23 11:43:03 2019 -0500 initial commit from project export</dbrown@bnl.gov></pre>		
	(END)		

Release Timeline











• Beta3:



- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks



- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ²³³U is the only thing that may need more time, we were promised to get it within a month's time



- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ²³³U is the only thing that may need more time, we were promised to get it within a month's time
 - Once Beta3 is released, file list and mean values shall be frozen



- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ²³³U is the only thing that may need more time, we were promised to get it within a month's time
 - Once Beta3 is released, file list and mean values shall be frozen
- Validation will take 2-3 months



- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ²³³U is the only thing that may need more time, we were promised to get it within a month's time
 - Once Beta3 is released, file list and mean values shall be frozen
- Validation will take 2-3 months
- Do While 3 < Beta < 4:



- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ²³³U is the only thing that may need more time, we were promised to get it within a month's time
 - Once Beta3 is released, file list and mean values shall be frozen
- Validation will take 2-3 months
- Do While 3 < Beta < 4:
 - Fix covariances, documentation, format, processing issues



- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ²³³U is the only thing that may need more time, we were promised to get it within a month's time
 - Once Beta3 is released, file list and mean values shall be frozen
- Validation will take 2-3 months
- Do While 3 < Beta < 4:
 - Fix covariances, documentation, format, processing issues
 - If there are no validation surprises:



- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ²³³U is the only thing that may need more time, we were promised to get it within a month's time
 - Once Beta3 is released, file list and mean values shall be frozen
- Validation will take 2-3 months
- Do While 3 < Beta < 4:
 - Fix covariances, documentation, format, processing issues
 - If there are no validation surprises:
 - Beta4 = release candidate



- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ²³³U is the only thing that may need more time, we were promised to get it within a month's time
 - Once Beta3 is released, file list and mean values shall be frozen
- Validation will take 2-3 months
- Do While 3 < Beta < 4:
 - Fix covariances, documentation, format, processing issues
 - If there are no validation surprises:
 - Beta4 = release candidate
 - Else:



- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ²³³U is the only thing that may need more time, we were promised to get it within a month's time
 - Once Beta3 is released, file list and mean values shall be frozen
- Validation will take 2-3 months
- Do While 3 < Beta < 4:
 - Fix covariances, documentation, format, processing issues
 - If there are no validation surprises:
 - Beta4 = release candidate
 - Else:
 - Unfreeze what must be unfrozen



- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ²³³U is the only thing that may need more time, we were promised to get it within a month's time
 - Once Beta3 is released, file list and mean values shall be frozen
- Validation will take 2-3 months
- Do While 3 < Beta < 4:
 - Fix covariances, documentation, format, processing issues
 - If there are no validation surprises:
 - Beta4 = release candidate
 - Else:
 - Unfreeze what must be unfrozen
 - · Go to "Adjust timeline as needed"



- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ²³³U is the only thing that may need more time, we were promised to get it within a month's time
 - Once Beta3 is released, file list and mean values shall be frozen
- Validation will take 2-3 months
- Do While 3 < Beta < 4:
 - Fix covariances, documentation, format, processing issues
 - If there are no validation surprises:
 - Beta4 = release candidate
 - Else:
 - Unfreeze what must be unfrozen
 - · Go to "Adjust timeline as needed"
 - Endif



- Beta3:
 - · Collect all updates/fixes, review and push forward in the next few weeks
 - ²³³U is the only thing that may need more time, we were promised to get it within a month's time
 - Once Beta3 is released, file list and mean values shall be frozen
- Validation will take 2-3 months
- Do While 3 < Beta < 4:
 - Fix covariances, documentation, format, processing issues
 - If there are no validation surprises:
 - Beta4 = release candidate
 - Else:
 - Unfreeze what must be unfrozen
 - · Go to "Adjust timeline as needed"
 - Endif
- End do



- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ²³³U is the only thing that may need more time, we were promised to get it within a month's time
 - Once Beta3 is released, file list and mean values shall be frozen
- Validation will take 2-3 months
- Do While 3 < Beta < 4:
 - Fix covariances, documentation, format, processing issues
 - If there are no validation surprises:
 - Beta4 = release candidate
 - Else:
 - Unfreeze what must be unfrozen
 - · Go to "Adjust timeline as needed"
 - Endif
- End do




Future plans

... or, There must be life after VIII.1!



Next evaluations planned at BNL

- After CIELO Fe evaluation, we did a study of which isotopes had measured data that were more recent than the last evaluation (at that time)
- Focusing on structural materials, we came up with a list of potential priorities for re-evaluations: Cr, Al, Zr, Ni, Ti, V, Co...
- Those conclusions remain more or less valid
- After finishing Cr, the natural next one would be Zr:
 - Improvement in benchmarks
 - Leveraging collaboration and experience gained with Fe, Cr



Introduction



- Other structural materials have been recently re-evaluated:
 - Fe (IAEA, JSI, BNL)
 - Cr (BNL, ORNL, IAEA, JSI)
 - Cu (LANL,ORNL)
- Applications:
 - Cladding
 - Zircaloy
 - Zirconium-Niobium alloy
 - Zirconium is used in fuel rods cladding due to its corrosion-resistance and low thermal neutron absorption cross-section. It is also considered in advanced reactor design studies as a moderator (in the form of zirconium hydride) and as inert matrix fuel material. The ENDF/B-VI.8 files evaluated in the 1970's relied heavily on experimental data and lacked quantities such as double-differential cross sections and gamma production.







Critical benchmarks sensitive to Zr

Searched DICE, critical/subcritical benchmarks sensitive to Zircalloy and Zirconium-Niobium Alloy

- LCT-015-001 LCT-015-165
- LCT-020-001 LCT-020-007
- LCT-021-001 LCT-021-006
- LCT-026-001 LCT-026-006
- LCT-030-001 LCT-030-012
- LCT-031-001 LCT-031-006
- LCT-036-001 LCT-036-069
- LCT-053-001 LCT-053-014
- LCT-060-001 LCT-060-026
- LCT-061-001 LCT-061-010
- LCT-064-001 LCT-061-007
- LCT-070-001 LCT-070-012

- LCT-071-001 LCT-071-004
- LCT-072-001 LCT-072-009
- LCT-073-001 LCT-073-014
- LCT-075-001 LCT-075-006
- LCT-079-001 LCT-079-010
- LCT-081-001
- LCT-085-001 LCT-085-013
- LCT-087-001 LCT-087-025
- LCT-094-001 LCT-094-011
- LMT-001-001 LMT-001-005
- LMT-002-001 LMT-002-006
- LMT-003-001 LMT-003-015

- LMT-005-001 LMT-005-012
- LMT-006-001 LMT-006-010
- LMT-007-001 LMT-007-012
- UCT-001-002 UCT-001-004
- UCT-004-001
- MCT-002-001 MCT-002-006
- MCT-004-001 MCT-004-011
- MCT-006-001 MCT-006-050
- MCT-007-001 MCT-007-027
- MCT-008-001 MCT-008-028



Critical benchmarks sensitive to Zr



Critical benchmarks sensitive to Zr



65

History lesson

- All isotopes have more or less the same history:
 - VI.8: Eval. by Drake et al. (1976) relied heavily on exp. data and lacked quantities such as doubledifferential cross sections and gamma production
 - VII.0: Basically EMPIRE based with some other contributions (~2006,1999)
 - VII.1: H.I. Kim's evaluation (2011)
- Kim's evaluation was a long and winding road....
 - Resonances from S. Mughabghab
 - EMPIRE-based, with soft-rotor OMP (for ⁹⁰Zr, not clear about the other isotopes)
 - Tuning of total x.s. to fit fluctuations
 - Kim had to leave and Dave inherited it just a few months before library release
 - Dave replaced EMPIRE ang. dist. by JENDL ones.
 - Roberto tweaked LDs



Library Date Comments ENDF/B-VII.1 Dec 2011 EMFIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.0 Dec 2006 EMFIRE based, w/ BROND-2 RR, by Herman, Rochman, Oblozinsky ENDF/B-VI.8 Apr 1976 By M.Drake, D.Sargis, T.Maung, P.Rose 5 Revision History <u>5 Revision History</u> <u>92Zr</u> Library Date Comments ENDF/B-VII.1 Dec 2011 EMFIRE based, by H.I.Kim, S. Capote, A.Trkov, R. Arcilla ENDF/B-VII.1 Dec 2011 EMFIRE based, by H.I.Kim, S. Capote, A.Trkov, R. Arcilla ENDF/B-VII.6 Apr 1976 By M.Drake, D.Sargis, T.Mau <u>5 Revision History</u> <u>93Zr</u> <u>1 Dec 2011 EMFIRE based, by H.I.Kim, S. Rughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.6 Apr 1976 By M.Drake, D.Sargis, T.Mau <u>1 Dec 2011 EMFIRE based, by H.I.Kim, S. Rughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.6 Apr 1976 By M.Drake, D.Sargis, T.Mau <u>1 Dec 2011 EMFIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.1 Dec 2011 EMFIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla <u>1 Dec 2011 EMFIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.0 Dec 1011 EMFIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla <u>1 Dec 2011 EMFIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla <u>1 Dec 2011 EMFIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla <u>1 Dec 2011 EMFIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla <u>1 Dec 2011 EMFIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla <u>1 Dec 2011 EMFIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla <u>1 Dec 2011 EMFIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla <u>1 Dec 2011 EMFIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla <u>1 Dec 2011 EMFIRE based, by H.I.Kim</u>, S. Mughabghab, M.W. Herman</u></u></u></u></u></u></u></u></u></u></u>	5 Revisio	on History	⁹⁰ Zr			⁹¹ Ζr	
ENDF/B-VII.1 Dec 2011 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.0 Dec 2006 EMPIRE based, w/ BROND-2 RR, by Herman, Rochman, Oblozinsky ENDF/B-VI.8 Apr 1976 By M.Drake, D.Sargis, T.Maung, P.Rose 5 Revision History 	Library	Date Com	ments		Date	Comments	
5 Revision History 92Zr Library Date Comments Library Date Comments ENDF/B-VII.1 Dec 2011 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.0 Mar 2005 ENDF/B-VII.0 Dec 1999 JNDC FPN UK.C. part of WPEC-23 5 Revision History 96Z Library Date Comments ENDF/B-VII.1 Dec 2011 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.0 Mar 2005 Sargis, T.Maug, I S Revision History 93Zr Sargis, T.Mau 96Z Library Date Comments B-VII.1 Dec 2011 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.1 Dec 2011 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla B-VII.1 Dec 2011 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.1 Dec 2011 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla B-VII.0 Dec 1999 OMDC FPND W.G., Mughabghab, part of WPEC-23 ENDF/B-VII.1 Dec 2011 EMPIRE based, by H.I.Kim, S. Aughabab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla Sarevision History 95Zr	ENDF/B-VI	TII.1 Dec 2011 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla TI.0 Dec 2006 EMPIRE based, w/ BROND-2 RR, by Herman, Rochman, Oblozinsky TI.8 Apr 1976 By M.Drake, D.Sargis, T.Maung, P.Rose		Rose	.1 Dec 2011 .0 Feb 2005	EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla EMPIRE based, part of WPEC-23, by JNDC FPND W.G., Mughabghab	a ,
Library Date Comments ENDF/B-VII.1 Dec 2011 EMPIRE based, by H.I.Kim, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.0 Dec 1999 JNDC FP Nuclear Data W.G., part of WPEC-23 5 Revision History ENDF/B-VI.8 Apr 1976 By M.Drake, D.Sargis, T.Mau ENDF/B-VI.8 Apr 1976 By M.Drake, D.Sargis, T.Mau ENDF/B-VI.0 Dec 1999 JNDC FPND W.G., Mughabghab, ENDF/B-VII.1 Dec 2011 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.0 Mar 2005 JNDC FPND W.G., Mughabghab ENDF/B-VII.0 Mar 2005 JNDC FPND W.G., Mughabghab	5 ===]	Revision History	⁹² Zr		Library ENDF/B-VII.1 D	Date Comments ec 2011 EMPIRE based, by H.I.Kim, S.Muchabehab, M.W. Harman	
Library Date Comments B-VII.1 Dec 2011 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.0 Mar 2005 JNDC FPND W.G., Mughabghab ENDF/B-VII.0 Mar 2005 JNDC FPND W.G., Mughabghab ENDF/B-VII.0 Mar 2005 JNDC FPND W.G., Mughabghab	Li EN EN	Library Date Comments R. Capote, A.TrKov, R. Ar ENDF/B-VII.1 Dec 2011 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.TrKov, R. Arcilla ENDF/B-VII.0 Dec 1999 JNDC FP Nuclear Data W.G., part of WPEC-23 5 Revision History ENDF/B-VI.8 Apr 1976 By M.Drake, D.Sargis, T.Mat ====================================				R. Capote, A.Trkov, R. Arcilla lar 2005 JNDC FPND W.G., Mughabghab part of WPC-23 pr 1976 By M.Drake, D.Sargis, T.Maung, P.Rose 96Zr	3
S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla ENDF/B-VII.0 Mar 2005 JNDC FPND W.G., Mughabghab	5 - -	Revision History	93Zr Comments	Libra	ry Date B-VII.1 Dec 201 B-VII.0 Dec 199	Comments 11 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla 9 JNDC FPND W.G., Mughabghab, part of WPEC-23	
part of WPEC-23 ENDF/B-VI.8 Apr 1976 By M.Drake, D.Sargis, T.Maung, P.Rose ENDF/B-VI.1 Dec 2011 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Tkov, R. Arcilla	-	ENDF/B-VII.0 Mar 200	S. Mughabghab, M.W. Herman, R. Capote, A.TrKov, R. Arcilla 55 JNDC PPND W.G., Mughabghab part of WPEC-23 76 By M.Drake, D.Sargis, T.Maung, P.R	lose -	6 Revision Histor Library Da ENDF/B-VII.1 Dec	y 95Zr te Comments 2011 EMPIRE based, by H.I.Kim, S. Mughabghab, M.W. Herman, R. Capote, A.Trkov, R. Arcilla	

- Devicing History

91**7**r

NDF/B-VI.8 Apr 1976 By M.Drake, D.Sargis, T.Maung, P.Rose

Rose

907r

- Dave worked further on Zr in 2012 but had to • stop when he became library manager
- Gustavo started working on Zr again a couple of ۲ years ago but had to stop, again library manager

Current status of Zr

- The original plan: Measurements at GEEL, resonance evaluations by RPI
- Challenge: All GEEL activity for new measurements is suspended.
- Current status of experimental isotopic measurements and evaluation in the resonance region (see Yaron Danon's talk):
- 90Zr:
 - Measurements
 - Evaluation
- 91Zr:
 - Measurements
 - Evaluation
- 92Zr:
 - Measurements



- 94Zr:
 - Measurements
 - Evaluation
- 96Zr:
 - Measurements
 - Evaluation



Current status of Zr

- The original plan: Measurements at GEEL, resonance evaluations by RPI
- Challenge: All GEEL activity for new measurements is suspended.
- Current status of experimental isotopic measurements and evaluation in the resonance region (see Yaron Danon's talk) :
- 90Zr:
 - Measurements
 - Evaluation (preliminary)
- 91Zr:
 - Measurements 💊
 - Evaluation (Will be done early next year)
- 92Zr:
 - Measurements

- Evaluation
- 94Zr:
 - Measurements
 - Evaluation
- 96Zr:
 - Measurements
 - Evaluation



Current status of Zr

- The original plan: Measurements at GEEL, resonance evaluations by RPI
- Challenge: All GEEL activity for new measurements is suspended.
- Current status of experimental isotopic measurements and evaluation in the resonance region (see Yaron Danon's talk):
- 90Zr:
 - Measurements
 - Evaluation (preliminary)
- 91Zr:
 - Measurements 💊
 - Evaluation (Will be done early next year)
- 92Zr:
 - Measurements



- 94Zr:
 - Measurements
 - Evaluation
- 96Zr:
 - Measurements
 - Evaluation





• RPI PhD student Greg Siemers has been working on data analysis and resonance evaluation

• ⁹⁰Zr is done and ⁹¹Zr should be done in a couple of months (Yaron's talk)

- ⁹⁰Zr is done and ⁹¹Zr should be done in a couple of months (Yaron's talk)
- Instead of just sitting and waiting for GEEL to come back to life, Greg is motivated to work on producing complete evaluations for ⁹⁰Zr and ⁹¹Zr: RRR + URR + Fast (EMPIRE + fluctuations)

- ⁹⁰Zr is done and ⁹¹Zr should be done in a couple of months (Yaron's talk)
- Instead of just sitting and waiting for GEEL to come back to life, Greg is motivated to work on producing complete evaluations for ⁹⁰Zr and ⁹¹Zr: RRR + URR + Fast (EMPIRE + fluctuations)
- Collaboration and meetings will begin to ramp up: RPI, BNL, NNL, ORNL, IAEA, JSI,...? WPEC-SG?

- ⁹⁰Zr is done and ⁹¹Zr should be done in a couple of months (Yaron's talk)
- Instead of just sitting and waiting for GEEL to come back to life, Greg is motivated to work on producing complete evaluations for ⁹⁰Zr and ⁹¹Zr: RRR + URR + Fast (EMPIRE + fluctuations)
- Collaboration and meetings will begin to ramp up: RPI, BNL, NNL, ORNL, IAEA, JSI,...? WPEC-SG?
- Greg will visit BNL to work with Gustavo on EMPIRE calculations

- ⁹⁰Zr is done and ⁹¹Zr should be done in a couple of months (Yaron's talk)
- Instead of just sitting and waiting for GEEL to come back to life, Greg is motivated to work on producing complete evaluations for ⁹⁰Zr and ⁹¹Zr: RRR + URR + Fast (EMPIRE + fluctuations)
- Collaboration and meetings will begin to ramp up: RPI, BNL, NNL, ORNL, IAEA, JSI,...? WPEC-SG?
- Greg will visit BNL to work with Gustavo on EMPIRE calculations
- Although this effort won't lead to final answer to "all-things-zirconium", it will be already very impactful:

- ⁹⁰Zr is done and ⁹¹Zr should be done in a couple of months (Yaron's talk)
- Instead of just sitting and waiting for GEEL to come back to life, Greg is motivated to work on producing complete evaluations for ⁹⁰Zr and ⁹¹Zr: RRR + URR + Fast (EMPIRE + fluctuations)
- Collaboration and meetings will begin to ramp up: RPI, BNL, NNL, ORNL, IAEA, JSI,...? WPEC-SG?
- Greg will visit BNL to work with Gustavo on EMPIRE calculations
- Although this effort won't lead to final answer to "all-things-zirconium", it will be already very impactful:
 - Capture in critical systems is driven by ⁹¹Zr resonances

- RPI PhD student Greg Siemers has been working on data analysis and resonance evaluation
 - ⁹⁰Zr is done and ⁹¹Zr should be done in a couple of months (Yaron's talk)
 - Instead of just sitting and waiting for GEEL to come back to life, Greg is motivated to work on producing complete evaluations for ⁹⁰Zr and ⁹¹Zr: RRR + URR + Fast (EMPIRE + fluctuations)
 - Collaboration and meetings will begin to ramp up: RPI, BNL, NNL, ORNL, IAEA, JSI,...? WPEC-SG?
 - Greg will visit BNL to work with Gustavo on EMPIRE calculations
 - Although this effort won't lead to final answer to "all-things-zirconium", it will be already very impactful:
 - Capture in critical systems is driven by ⁹¹Zr resonances
 - With ^{90,91}Zr, we cover 62% of natural abundance for fast region, which also has significant impact in some benchmarks. Potentially, with evaluated EMPIRE inputs for ⁹⁰Zr (even) and ⁹¹Zr (odd), we could even straightforwardly generalize to fast-region evaluations for ^{92, 94, 96}Zr and ^{93, 95}Zr (but we're not worried about this now)

- RPI PhD student Greg Siemers has been working on data analysis and resonance evaluation
 - ⁹⁰Zr is done and ⁹¹Zr should be done in a couple of months (Yaron's talk)
 - Instead of just sitting and waiting for GEEL to come back to life, Greg is motivated to work on producing complete evaluations for ⁹⁰Zr and ⁹¹Zr: RRR + URR + Fast (EMPIRE + fluctuations)
 - Collaboration and meetings will begin to ramp up: RPI, BNL, NNL, ORNL, IAEA, JSI,...? WPEC-SG?
 - Greg will visit BNL to work with Gustavo on EMPIRE calculations
 - Although this effort won't lead to final answer to "all-things-zirconium", it will be already very impactful:
 - Capture in critical systems is driven by ⁹¹Zr resonances
 - With ^{90,91}Zr, we cover 62% of natural abundance for fast region, which also has significant impact in some benchmarks. Potentially, with evaluated EMPIRE inputs for ⁹⁰Zr (even) and ⁹¹Zr (odd), we could even straightforwardly generalize to fast-region evaluations for ^{92, 94, 96}Zr and ^{93, 95}Zr (but we're not worried about this now)
 - Leveraging a few timing opportunities:

- RPI PhD student Greg Siemers has been working on data analysis and resonance evaluation
 - ⁹⁰Zr is done and ⁹¹Zr should be done in a couple of months (Yaron's talk)
 - Instead of just sitting and waiting for GEEL to come back to life, Greg is motivated to work on producing complete evaluations for ⁹⁰Zr and ⁹¹Zr: RRR + URR + Fast (EMPIRE + fluctuations)
 - Collaboration and meetings will begin to ramp up: RPI, BNL, NNL, ORNL, IAEA, JSI,...? WPEC-SG?
 - Greg will visit BNL to work with Gustavo on EMPIRE calculations
 - Although this effort won't lead to final answer to "all-things-zirconium", it will be already very impactful:
 - Capture in critical systems is driven by ⁹¹Zr resonances
 - With ^{90,91}Zr, we cover 62% of natural abundance for fast region, which also has significant impact in some benchmarks. Potentially, with evaluated EMPIRE inputs for ⁹⁰Zr (even) and ⁹¹Zr (odd), we could even straightforwardly generalize to fast-region evaluations for ^{92, 94, 96}Zr and ^{93, 95}Zr (but we're not worried about this now)
 - Leveraging a few timing opportunities:
 - "Imminent" release of ENDF/B-VIII.1 frees a bit of my time to work with Greg

- RPI PhD student Greg Siemers has been working on data analysis and resonance evaluation
 - ⁹⁰Zr is done and ⁹¹Zr should be done in a couple of months (Yaron's talk)
 - Instead of just sitting and waiting for GEEL to come back to life, Greg is motivated to work on producing complete evaluations for ⁹⁰Zr and ⁹¹Zr: RRR + URR + Fast (EMPIRE + fluctuations)
 - Collaboration and meetings will begin to ramp up: RPI, BNL, NNL, ORNL, IAEA, JSI,...? WPEC-SG?
 - Greg will visit BNL to work with Gustavo on EMPIRE calculations
 - Although this effort won't lead to final answer to "all-things-zirconium", it will be already very impactful:
 - Capture in critical systems is driven by ⁹¹Zr resonances
 - With ^{90,91}Zr, we cover 62% of natural abundance for fast region, which also has significant impact in some benchmarks. Potentially, with evaluated EMPIRE inputs for ⁹⁰Zr (even) and ⁹¹Zr (odd), we could even straightforwardly generalize to fast-region evaluations for ^{92, 94, 96}Zr and ^{93, 95}Zr (but we're not worried about this now)
 - Leveraging a few timing opportunities:
 - "Imminent" release of ENDF/B-VIII.1 frees a bit of my time to work with Greg
 - Suspension of GEEL forcefully frees Greg's time

- RPI PhD student Greg Siemers has been working on data analysis and resonance evaluation
 - ⁹⁰Zr is done and ⁹¹Zr should be done in a couple of months (Yaron's talk)
 - Instead of just sitting and waiting for GEEL to come back to life, Greg is motivated to work on producing complete evaluations for ⁹⁰Zr and ⁹¹Zr: RRR + URR + Fast (EMPIRE + fluctuations)
 - Collaboration and meetings will begin to ramp up: RPI, BNL, NNL, ORNL, IAEA, JSI,...? WPEC-SG?
 - Greg will visit BNL to work with Gustavo on EMPIRE calculations
 - Although this effort won't lead to final answer to "all-things-zirconium", it will be already very impactful:
 - Capture in critical systems is driven by ⁹¹Zr resonances
 - With ^{90,91}Zr, we cover 62% of natural abundance for fast region, which also has significant impact in some benchmarks. Potentially, with evaluated EMPIRE inputs for ⁹⁰Zr (even) and ⁹¹Zr (odd), we could even straightforwardly generalize to fast-region evaluations for ^{92, 94, 96}Zr and ^{93, 95}Zr (but we're not worried about this now)
 - Leveraging a few timing opportunities:
 - "Imminent" release of ENDF/B-VIII.1 frees a bit of my time to work with Greg
 - Suspension of GEEL forcefully frees Greg's time
 - In-between ENDF releases: aim for a IX-Beta1 release, having a much improved Zr performance than VIII.1

- RPI PhD student Greg Siemers has been working on data analysis and resonance evaluation
 - ⁹⁰Zr is done and ⁹¹Zr should be done in a couple of months (Yaron's talk)
 - Instead of just sitting and waiting for GEEL to come back to life, Greg is motivated to work on producing complete evaluations for ⁹⁰Zr and ⁹¹Zr: RRR + URR + Fast (EMPIRE + fluctuations)
 - Collaboration and meetings will begin to ramp up: RPI, BNL, NNL, ORNL, IAEA, JSI,...? WPEC-SG?
 - Greg will visit BNL to work with Gustavo on EMPIRE calculations
 - Although this effort won't lead to final answer to "all-things-zirconium", it will be already very impactful:
 - Capture in critical systems is driven by ⁹¹Zr resonances
 - With ^{90,91}Zr, we cover 62% of natural abundance for fast region, which also has significant impact in some benchmarks. Potentially, with evaluated EMPIRE inputs for ⁹⁰Zr (even) and ⁹¹Zr (odd), we could even straightforwardly generalize to fast-region evaluations for ^{92, 94, 96}Zr and ^{93, 95}Zr (but we're not worried about this now)
 - Leveraging a few timing opportunities:
 - "Imminent" release of ENDF/B-VIII.1 frees a bit of my time to work with Greg
 - Suspension of GEEL forcefully frees Greg's time
 - In-between ENDF releases: aim for a IX-Beta1 release, having a much improved Zr performance than VIII.1
 - New release of EMPIRE coming soon: which should make the life of a beginner a bit easier...

The plan - Fast region

- Good starting point from previous EMPIRE input files but not perfect:
 - Definition of NLD parameters have changed since 2011 so they will have to be refitted -I already began this
 - There are some new data since then
 - Need to assess which measurements to consider from older data sets
 - OMP is good, but need to check if previous fine tuning was appropriate
 - "Recent" inelastic gamma data
- First step is to have Greg compiling EMPIRE and reproducing our preliminary results





The plan - Fast region

- Good starting point from previous EMPIRE input files but not perfect:
 - Definition of NLD parameters have changed since 2011 so they will have to be refitted -I already began this
 - There are some new data since then
 - Need to assess which measurements to consider from older data sets
 - OMP is good, but need to check if previous fine tuning was appropriate
 - "Recent" inelastic gamma data
- First step is to have Greg compiling EMPIRE and reproducing our preliminary results



Note: We will also combine efforts from Devin Barry, Dave Brown, and possibly ORNL to work on **URR**





70



71





73












Some plots...



Some plots...



Some plots...



Conclusions



Conclusion

- Infrastructure development
 - Set up evaluation review process
 - Tracking issues
 - ADVANCE CI/CD system is live
- Process for the next ENDF/B release is moving along
 - Multiple Beta versions released
 - Most recent (Beta2) released in august, being broadly tested
 - Finishing the next one (Beta3): release is imminent!!

- Validation feedback from Beta1.1/Beta2 is generally positive with specific improvement needs (that are already being addressed)
- Expect to have addressed main issues with Beta2, and additional issues in upcoming Beta3
- Beta3 should be very close to final release
- Collaborative effort on evaluation, review and issue fixing have been very successful
- Updated timeline to ensure the optimal quality of the final ENDF/B-VIII.1 release



Conclusion

- Zirconium is an important structural material present in fuel rod cladding, et al.
- It impacts many criticality benchmarks
- Existing files are old and poor
- We have now a realistic plan to deliver ^{90,91}Zr evaluations: Greg Siemers
- We have a good starting point: Kim's evaluation, improved by Dave, Roberto and Andrej
- Plan:
 - "Modernize" old EMPIRE inputs
 - Leverage the experience we have acquired with other structural materials, especially concerning critical impact of minor isotopes, high-energy fluctuations
 - Review resonances: Resolved and Unresolved
 - Incorporate new data
- We hope to have more results for the next meeting!



Acknowledgements

This work was supported by the Nuclear Criticality Safety Program, funded and managed by the National Nuclear Security Administration for the U.S. Department of Energy. Additionally, work at Brookhaven National Laboratory was sponsored by the Office of Nuclear Physics, Office of Science of the U.S. Department of Energy under Contract No. DE-SC0012704 with Brookhaven Science Associates, LLC.

