

Where are we now? Paper and release status update

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Outline

- ENDF/B library and infrastructure
- “Big Paper”
- ENDF/B-VIII.1 release status
 - Beta releases
 - What to expect for Beta3
- Release timeline

ENDF/B
VIII.1

ENDF/B-VIII.1 release

The next release of the ENDF/B library is scheduled for **February* 2024!**

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-established 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)
 - **^{234,236}U** (LANL)
 - **^{140,142}Ce** (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

TSL:

- 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

Photo-nuclear:



- **200+** updates coming from IAEA CRP

Charged particles:

- A few improvements and fixes

ENDF versioned repository: GitLab

USNDP Collaboration Platform

 **National Nuclear Data Center**


The U.S. nuclear data community working together to continuously advance the state of nuclear data for science and technology applications.

NOTICE TO USERS

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

Username or email

Password

☐ Remember me [Forgot your password?](#)

[Sign in](#)

ENDF/B library

Subgroup information

- Epics 0
- Issues 176
- Merge requests 623
- Security & Compliance
- CI/CD
- Packages and registries
- Analytics
- Wiki
- Settings

ENDF/B library

Group ID: 8 [Leave group](#)

The ENDF library project itself. At the time of creation of this project area, ENDF comprises 15 sublibraries. The full ENDF/B history is available as an archived project named "svn-export". See the "README" in each project for more information.

Recent activity Last 30 days

Merge requests created **327**

Issues created **12**

Members added **0**

Subgroups and projects Shared projects Archived projects

Search

Updated

neutrons	ENDF/B neutron sublibrary	★ 2	55 minutes ago
sly		★ 0	4 days ago
		★ 0	4 days ago
		★ 0	2 weeks ago
		★ 1	2 weeks ago
		★ 0	2 months ago
		★ 0	3 months ago
		★ 2	4 months ago
protons	ENDF/B proton sublibrary	★ 0	4 months ago
alphas	ENDF/B alphas sublibrary	★ 1	4 months ago
tritons	ENDF/B triton sublibrary	★ 0	4 months ago
standards	ENDF/B nuclear data standards sublibrary	★ 0	5 months ago
atomic_relax	ENDF/B atomic relaxation sublibrary	★ 0	8 months ago
electrons	ENDF/B electron sublibrary	★ 1	8 months ago
super	Super project for the entire ENDF library.	★ 0	1 year ago
photoat	ENDF/B photo-atomic sublibrary	★ 0	2 years ago

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

CI/CD through Kubernetes system behind BNL firewall allows for full **automation** and for **machine-learning** approaches!

Showcase example: ^{88}Sr review

ENDF > library > neutrons > Merge requests > 1932

Open Draft: Review/n-038_Sr_088 Review/n-038_Sr_088 into phase2

Overview 32 Commits 5 Pipelines 0 Changes 1 8 unresolved threads Add a to do

Gustavo Nobre @gnobre · 3 weeks ago Author Owner

@pignimt, the 88Sr file has errors pointed out by CHECKR (see [n-038_Sr_088-log.checkr](https://git.nndc.bnl.gov/endl/library/neutrons/-/raw/5af34c9c966d29963217ed24ce4dc043f1232419/n-038_Sr_088.endf?inline=false)). 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/endl/library/neutrons/-/raw/5af34c9c966d29963217ed24ce4dc043f1232419/n-038_Sr_088.endf?inline=false

Gustavo Nobre @gnobre · 3 weeks ago Author Owner

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 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.

Wim said:

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 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 goes in the code.

You can find the updated version on the following branch of the NJOY2016 repo: feature/kbk

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 implementation for me (no testing at all), so I'd be really happy if we get the right result out of

0 Assignees Edit
None - assign yourself

0 Reviewers Edit
None - assign yourself

Labels Edit
None

Milestone Edit
None

Time tracking +
No estimate or time spent

5 Participants

Showcase example: ^{88}Sr review

The screenshot displays a software review interface for a merge request. The interface is divided into several sections:

- Header:** Shows the breadcrumb navigation: `ENDF > library > neutrons > Merge requests > 1932`. Below this, there are buttons for `Open`, `Draft: Review/n-038_Sr_088`, `Review/n-038_Sr_088`, and `into phase2`. A summary bar indicates `Overview 32`, `Commits 5`, `Pipelines 0`, and `Changes 1`. On the right, it shows `8 unresolved threads` and an `Add a to do` button.
- Left Sidebar:** Contains a search bar and a list of project items: `neutrons`, `Pinned`, `Issues`, `Merge requests` (highlighted), `Branches`, `Commits`, and `Repository`. Below this is a `Manage` section with icons for `Code`, `Build`, `Secure`, `Deploy`, `Operate`, `Monitor`, and `Analyze`.
- Project Section:** A sub-menu on the left lists `neutrons`, `Pinned`, `Issues` (169), `Merge requests` (26), `Branches`, `Commits`, and `Repository`. The main area shows a list of merge requests with details for each.
- Discussion Thread:** The main content area displays a discussion thread with three messages:
 - Gustavo Nobre @gnobre** (3 weeks ago): "Great, @pignimt, thanks! But could you please perhaps just quickly check if the reconstructed ^{88}Sr generated by Wim is consistent with your own file, just so I can push this file into Beta3?"
 - Wim Haeck @wim** (3 weeks ago): "@pignimt Here's the reconstructed data (RECONR only so 0 K): [referenceTape30](#)
By the way: are you planning on adding covariance data? I ask because this will have an effect on ERRORR."
 - 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 OK. 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 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 (SAMMY) and 2.039473e-1 (Tape30).
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.
[rec-final.lst](#)
So far, I am not working on the covariance but, yes, it'd nice a comparison.
Edited 3 weeks ago by Marco Pigni"
- Right Sidebar:** Contains metadata for the merge request:
 - Assignees:** 0 Assignees (None - assign yourself)
 - Reviewers:** 0 Reviewers (None - assign yourself)
 - Labels:** None
 - Milestone:** None
 - Time tracking:** No estimate or time spent
 - Participants:** 5 Participants (represented by icons)

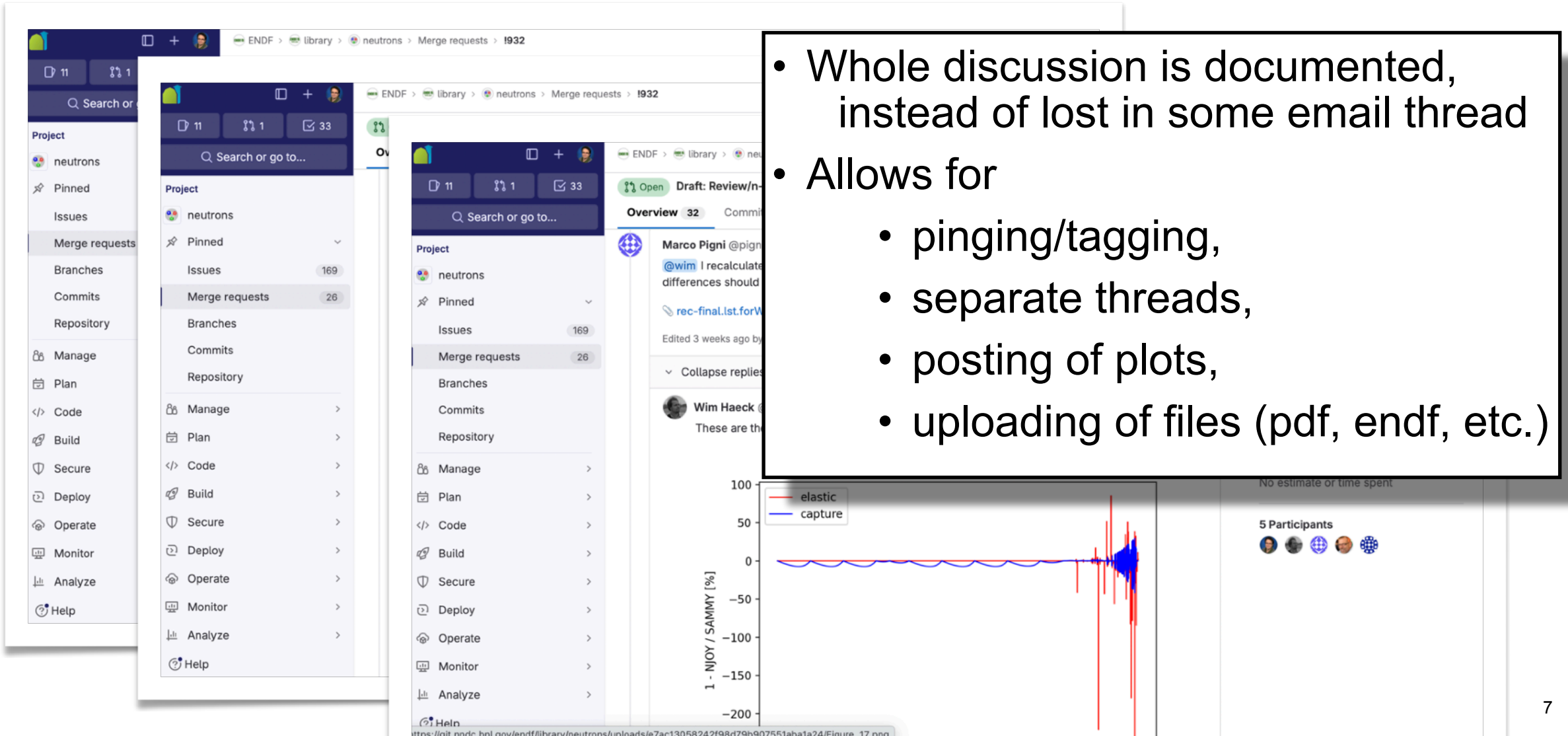
Showcase example: ^{88}Sr review

The screenshot displays a GitHub pull request interface for a merge request titled "Draft: Review/n-038_Sr_088". The interface is divided into several sections:

- Header:** Shows the repository path "ENDF > library > neutrons > Merge requests > 1932". It includes a search bar and a "Search or go to..." dropdown.
- Project:** A sidebar on the left lists project items: neutrons, Pinned, Issues (169), Merge requests (26), Branches, Commits, and Repository.
- Overview:** The main content area shows the pull request details. It includes a "Draft: Review/n-038_Sr_088" link, a "Review/n-038_Sr_088" link, and a "into phase2" button. It also displays statistics: Overview 32, Commits 5, Pipelines 0, and Changes 1. A yellow banner indicates "8 unresolved threads".
- Comments:** Two comments are visible:
 - Marco Pigni @pignimt** (Developer, 3 weeks ago): "@wim I recalculated the xcs by including the direct capture and the same grid you used. The differences should be really minimal now. Please see attached." Attached file: [rec-final.lst.forWim](#). Edited 3 weeks ago by Marco Pigni.
 - Wim Haeck @wim** (Developer, 2 weeks ago): "These are the relative differences 1 - njoy/sammy (in %) for elastic and capture:"
- Figure:** A line graph titled "ENDF/B-VIII.1 Sr88 at 0 K". The y-axis is labeled "1 - NJOY / SAMMY [%]" and ranges from -200 to 100. The x-axis represents energy. Two data series are plotted: "elastic" (red line) and "capture" (blue line). The elastic series shows significant fluctuations, particularly a large peak around 100% difference. The capture series shows smaller fluctuations, mostly within the -50% to 50% range.
- Metadata:** On the right side, there are sections for "0 Assignees", "0 Reviewers", "Labels", "Milestone", "Time tracking", and "5 Participants".

Showcase example: ^{88}Sr review

- Whole discussion is documented, instead of lost in some email thread
- Allows for
 - pinging/tagging,
 - separate threads,
 - posting of plots,
 - uploading of files (pdf, endf, etc.)

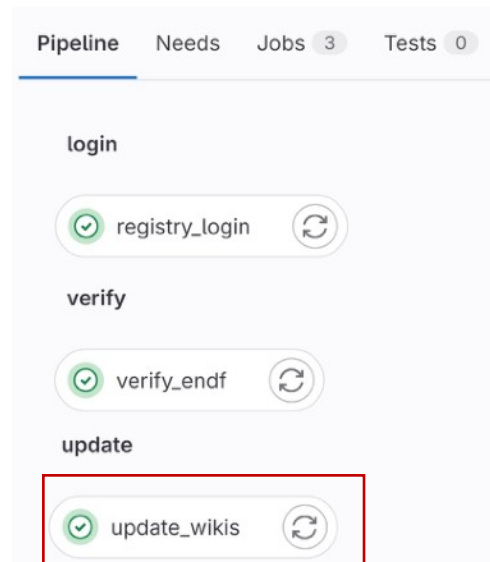


ENDF Repo Auto-updating Wikis

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



2) Use Wiki table of contents to find your data

Neutron Artifacts

Atomic Number (Z)	Symbol	Atomic Mass (A)
000	n	001
001	H	001, 002, 003
002	He	003, 004
003	Li	006, 007
004	Be	007, 009
005	B	010, 011
006	C	012, 013
007	N	014, 015
008	O	016, 017, 018
009	F	019
010	Ne	020, 021, 022
011	Na	023, 024

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

Legend: success = 🟢, failed = 🛑, warning = ⚠️, canceled = ✖️, pending = ⏳, running = 🔄, emoji for unknown status

🟢 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/projects/27/jobs/10305/artifacts>

🟢 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/projects/27/jobs/10299/artifacts>

🟢 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/projects/27/jobs/10122/artifacts>

🟢 verify_endf 2023-11-06 14:54:46.259000
Job Status: [Job Details](#)
Artifacts created by this job: None

🟢 verify_endf 2023-11-06 16:21:16.366000
Job Status: [Job Details](#)
Artifacts created by this job: None

Status of Big Paper

*“I don’t want to make someone very happy at the expense of somebody else’s frustration. My goal is to make everyone **mildly** happy!”*

Author list

*“I don’t want to make someone very happy at the expense of somebody else’s frustration. My goal is to make everyone **mildly** happy!”*

Author list

- Pro-actively worked to converge to a fair consensus
- Iterated with CSEWG Executive Committee and points of contact in all collaborating institutions
 - Author name
 - Short, “one-sentence” contribution
- Divided in tiers:
 - Tier 0: library manager
 - Tier 1: Primary contributors (ordered by number/size/impact of contributions)
 - Tier 2: CSEWG Executive Committee not directly involved in other activities (alphabetically)
 - Tier 3: General contributors (alphabetically)
- Collected feedback from Executive Committee and fine-tuned
- We have a first version of the list. If there are any strong feelings, please contact me!

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

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¹⁷ **FIXME: Missing Affiliation 2**

¹⁸ **FIXME: Studvisk**

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²⁵ **FIXME: Missing Affiliation 1**

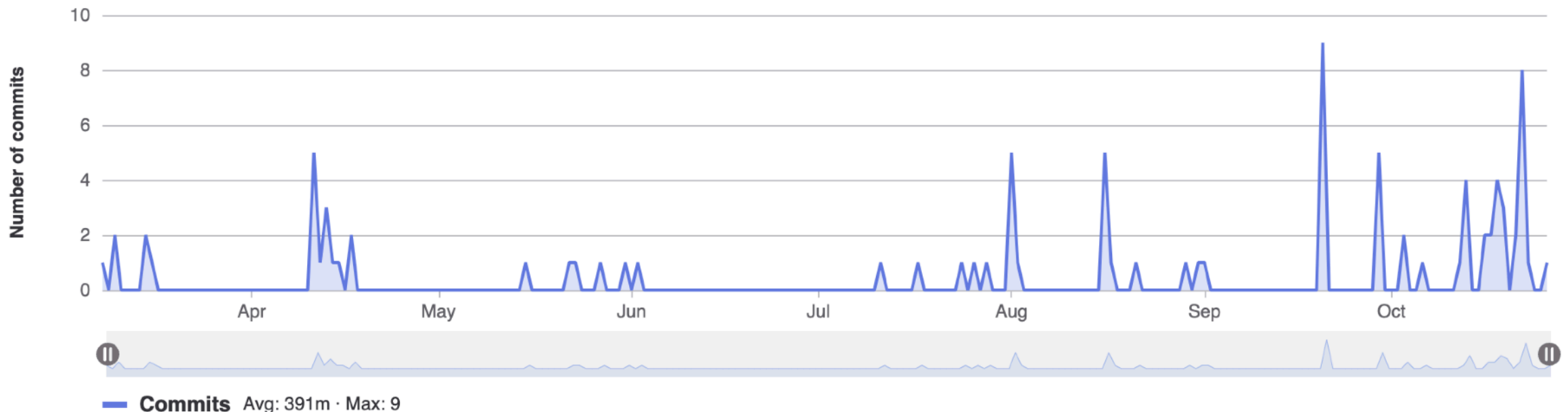
(Dated: November 15, 2023; Received xx Month 2023; revised received xx Month 2023; accepted xx Month 2024)

Big Paper updates

- Many contributions have been sent but there are still gaps that will be addressed after CSEWG Meeting
- Circulated author tiering draft and collected feedback
- Defined preliminary full list and ordering
- Aiming to have a complete manuscript soon

Commits to development

Excluding merge commits. Limited to 6,000 commits.

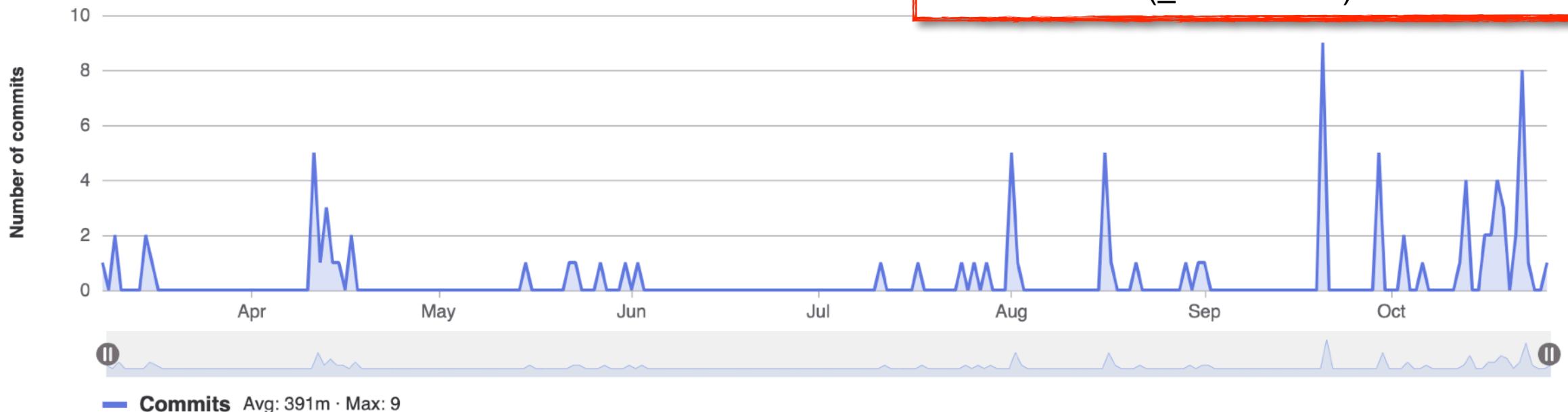


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Request to authors:

- **Review** current version of draft
 - GitLab
 - Ask Gustavo (gnobre@bnl.gov)
- If you contributed something to VIII.1 and it's not there, it means you're **overdue!**
 - Please commit or send your text over
 - Please don't make me hunt you down

Note: sections may shift around as the manuscript takes a complete form. Don't worry about it, I'll find a spot for your contribution. (*If* I receive it.)

Automated pipeline to build paper


Sep 29, 2023

 Added template files for the text on exit distribution work.
Gustavo Nobre authored just now

 7d6f080a  

Once pipeline is complete, click here!

Sep 29, 2023

 Added template files for the text on exit distribution work.
Gustavo Nobre authored 3 minutes ago

 7d6f080a  

Commit 7d6f080a authored 6 minutes ago by  Gustavo Nobre

Browse files Options

Added template files for the text on exit distribution work.

parent 024c758f

Branches development

No related merge requests found

Pipeline #5248 passed with stage in 1 minute and 47 seconds

Changes 4 Pipelines 1

Status	Pipeline	Created by	Stages
 passed 00:01:47 4 minutes ago	Added template files for the text on ex... #5248 development 7d6f080a latest		

Then, click here to download full pdf!

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

Author One,^{1,*} Author Two,² and Author Three^{3,4}

¹Institution 1
²Institution 2
³Institution 3
⁴Institution 4

(Dated: September 29, 2023; Received xx Month 2023; revised received xx Month 2023; accepted xx Month 2024)

FIXME: This is the abstract! Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut parum ell, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices lobortis. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec variis orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

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* Corresponding author: corresponding.author@cnl.gov

If it fails...

Click here!

Sep 29, 2023



Add `\input` command for work on fission products URR.

Gustavo Nobre authored 1 minute ago



f6ecf104



ENDF > publications > ENDF-VIII.1 > Commits

Commit f6ecf104 authored 8 minutes ago by Gustavo Nobre

Browse files

Options

Add `\input` command for work on fission products URR.

parent 7d6f080a

Branches development

No related merge requests found

Pipeline #5251 failed with stage

Then, here!

Changes 1 Pipelines 1

Status	Pipeline	Created by	Stages
failed	Add <code>\input</code> command for work on fission products URR... #5251 development f6ecf104 00:00:34 7 minutes ago	Gustavo Nobre	Stage: test build

ENDF > publications > ENDF-VIII.1 > Jobs > #9510

Search job log

```
2325 Package hyperref Warning: Token not allowed in a PDF string (PDFDocEncoding):
2326 (hyperref) removing 'superscript' on input line 478.
2327 Package hyperref Warning: Token not allowed in a PDF string (PDFDocEncoding):
2328 (hyperref) removing 'math shift' on input line 478.
2329 (./neutrons/pt-192.tex)
2330 Package hyperref Warning: Token not allowed in a PDF string (PDFDocEncoding):
2331 (hyperref) removing 'math shift' on input line 487.
2332 Package hyperref Warning: Token not allowed in a PDF string (PDFDocEncoding):
2333 (hyperref) removing 'superscript' on input line 487.
2334 Package hyperref Warning: Token not allowed in a PDF string (PDFDocEncoding):
2335 (hyperref) removing 'math shift' on input line 487.
2336 (./neutrons/pu-240.tex) (./neutrons/exit-dist.tex)
2337 (./neutrons/exit-dist-LLNL.tex) (./neutrons/exit-dist-LANL-KAERI.tex [17])
2338 Underfull \hbox (badness 1152) in paragraph at lines 524--525
2339 ! LaTeX Error: File 'neutrons/fission_prod.tex' not found.
2340 ! Type X to quit or <RETURN> to proceed, or enter new name. (Default extension: tex)
2341 or enter new name. (Default extension: tex)
2342 Enter file name:
2343 ! Emergency stop.
2344 <read *>
2345
2346
2347 1.526 \input{neutrons/fission_prod.tex}
2348
2349 ! ==> Fatal error occurred, no output PDF file produced!
2350 Transcript written on endf-VIII-1.log.
2351 Latexmk: Missing input file: 'neutrons/fission_prod.tex' from line
2352 '!' LaTeX Error: File 'neutrons/fission_prod.tex' not found.'
2353 Latexmk: List of undefined refs and citations:
2354 Citation 'ATLAS2018' on page 12 undefined on input line 6
2355 Citation 'BARRY2023Rh103URR' on page 11 undefined on input line 3
2356 Citation 'Carlson:2018' on page 4 undefined on input line 145
2357 Citation 'Carlson:2018' on page 4 undefined on input line 151
2358 Citation 'EXFOR_IAEA' on page 12 undefined on input line 8
```

build

Duration: 34 seconds
Finished: 6 minutes ago
Queued: 10 seconds
Timeout: 1h (from project)
Job ID: #9510
Runner: #398 (Zy6gdB4Aw)
gitlab-runner-2-69c778d698-d5jqg

Commit f6ecf104
Add `\input` command for work on fission products URR.

Pipeline #5251 failed for development

test

Related jobs
→ build

Scroll log to find error message!

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 ^{239}Pu that restores depletion performance, following feedback from mini-CSEWG
 - Many updates on photonuclear library based on IAEA CRP
- Hackathon (LANL): August 6-8, 2023

ENDF/B
VIII.1- β 1

ENDF/B
VIII.1- β 1.1

ENDF/B
VIII.1- β 2

Additional overall updates in neutrons sub library

ENDF/B
VIII.1- β 2

Additional overall updates in neutrons sub library

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

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- The IRDFF-II dosimetry library contains well-measured cross-sections for specific reactions
 - This tends to be more accurate than any full, self-consistent 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.

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VIII.1- β 2

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 - 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, self-consistent 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
 - Multiple panic attacks for the library manager trying to coordinate this!

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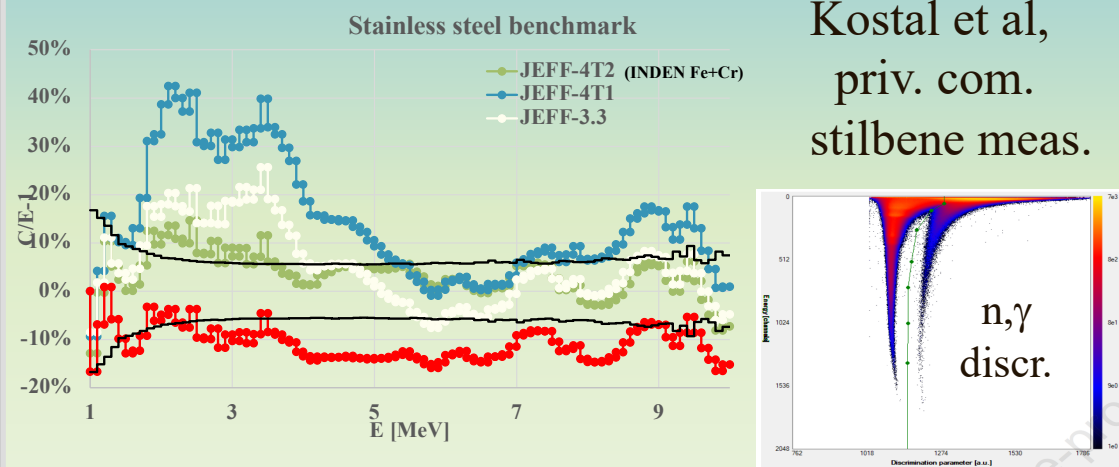
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Results sensitive to stainless steel

INDEN updated “structural” evaluations:

see nds.iaea.org/INDEN/ - Validation

- ✓ Fe isotopes (IAEA/JSI), fe54e80o, fe56e80X29r41, fe54e80o
- ✓ Cr isotopes, BNL/ORNL/IAEA/JSI/CEA, v2.3.2



Stainless steel, neutron leakage (Rez, CZ, 11/2021)

4 Mini-CSWEG meeting (presented by video link)
April 2023, Livermore Valley Open Campus, CA

Roberto Capote, IAEA Nuclear Data Section
e-mail: R.CapoteNoy@iaea.org
Web: <http://www-nds.iaea.org>



The Pool Critical Assembly (PCA) Pressure Vessel Simulator experiment was performed in the early 1980s as part of the NRC’s LWR Pressure Vessel Surveillance Dosimetry Improvement Program (LWR-PV-SDIP)

Benchmark was recently re-analyzed with exact geometry by Dr. Kulesza (LANL/X-5), and MCNP inputs were published and available for use:
– NUCLEAR TECHNOLOGY · VOLUME 197 · 284–295 · MARCH 2017
– Paper: <https://doi.org/10.1080/00295450.2016.1273711>
– MCNP Inputs: <https://doi.org/10.2172/1601379>

Pool Critical Assembly Benchmarking

- C/E Results (ENDF/B-VIII.1b1):
 - MC uncertainty $\sim 1\%$

Depends on U-235, water & SS

	al27a	ni48p	rh103n	in115n	u238f	np237f	avg	std dev
	0.97	0.96	1.04	1.00			0.99	3.9%
	1.02	0.98	1.08	1.01			1.02	4.3%
	1.05	1.01	1.07	1.06			1.05	2.5%
	1.03	0.96	1.00	1.01	0.98	1.03	1.00	2.7%
	1.03	0.96	0.95	1.00	0.98	1.05	0.99	4.0%
	1.04	1.02	0.93	1.03	0.98	1.03	1.00	4.1%
			0.96	0.99	0.99	1.13	1.02	7.6%
avg	1.02	0.98	1.01	1.01	0.98	1.06	1.01	
std dev	2.8%	2.9%	6.4%	2.1%	0.1%	1.0%		4.2%

Presented by Greg Fischer, Westinghouse @ miniCSWEG April 2023

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Slides taken from Roberto Capotes’s talk at 2023 mini-CSEWG

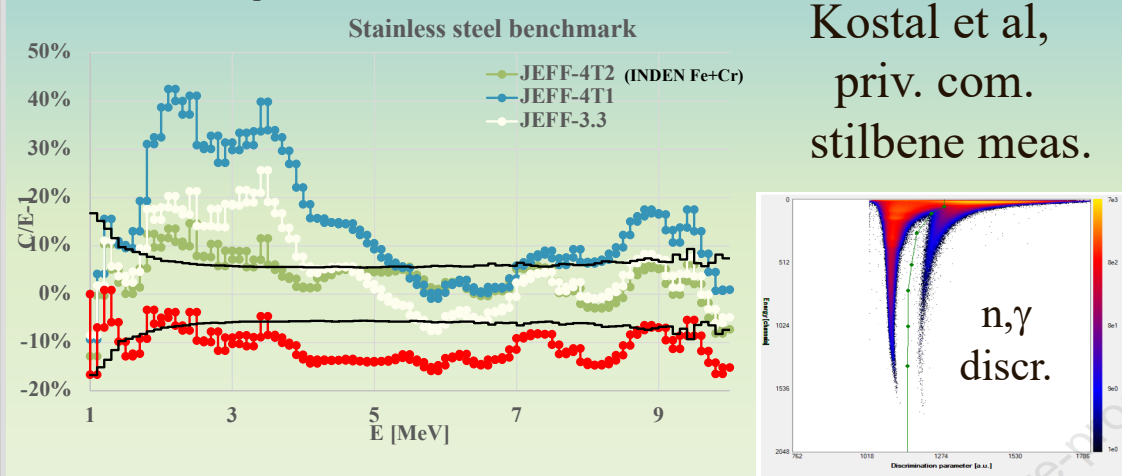
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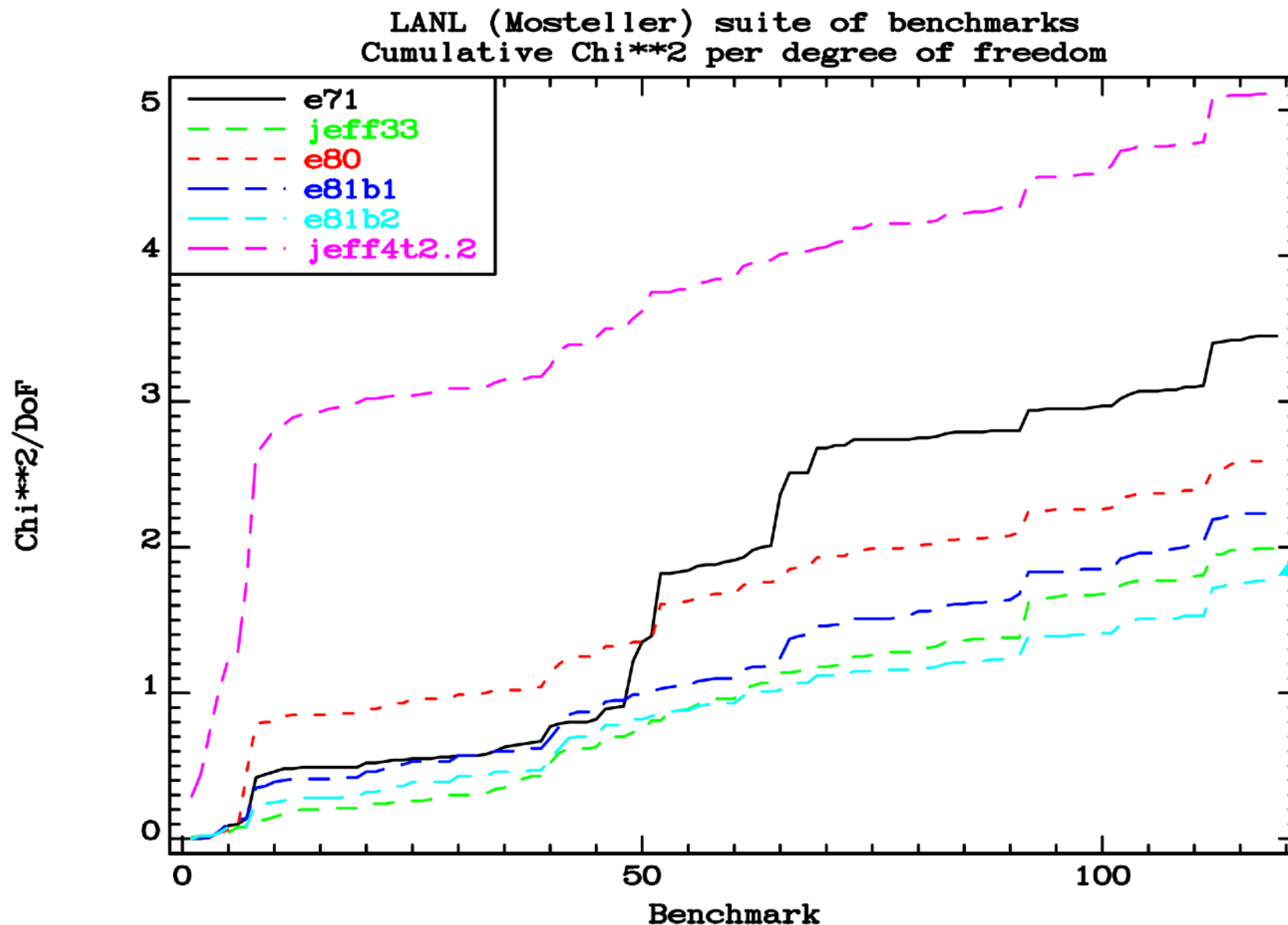
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	1.05	1.01	1.07	1.06			1.05	2.5%
	1.03	0.96	1.00	1.01	0.98	1.03	1.00	2.7%
	1.03	0.96	0.95	1.00	0.98	1.05	0.99	4.0%
	1.04	1.02	0.93	1.03	0.98	1.03	1.00	4.1%
			0.96	0.99	0.99	1.13	1.02	7.6%
avg	1.02	0.98	1.01	1.01	0.98	1.06	1.01	
std dev	2.8%	2.9%	6.4%	2.1%	0.1%	1.0%		4.2%

Presented by Greg Fischer, Westinghouse @ miniCSWEG April 2023

Slides taken from Roberto Capotes’s talk at 2023 mini-CSEWG

- Significant performance improvements in SS (Fe and Cr)
- Users are happy with new files!

Preliminary validation on Beta2, by Andrej Trkov (JSI)



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

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

What to expect for Beta3

- **TSL:**

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

- **Neutrons:**

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

- **Photonuclear:**

- Reverted $^{180,182,183}\text{W}$ to VIII.0
- ^{242}Pu 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

TSL_MAT_numbers.csv (~/Calculations/ENDF/thermal_scatt) - VIM

```
#####
##
##          TSL MAT numbers
## associated with the ENDF/B-VIII.1-BetaX release
##
## Note: empty file field means MAT number is reserved.
##
#####
##
## MAT number, ENDF-6 file name , Description
##
1 , tsl-HinH20.endf , H in H20 (liquid)
2 , tsl-para-H.endf , para-Hydrogen
3 , tsl-ortho-H.endf , ortho-Hydrogen
5 , tsl-HinYH2.endf , H in YH2
7 , tsl-HinZrH.endf , H in ZrH
10 , tsl-HinIceIh.endf , H in H20 (ice (Ih))
11 , tsl-DinD20.endf , D in D20 (liquid)
12 , tsl-para-D.endf , para-Deuterium
13 , tsl-ortho-D.endf , ortho-Deuterium
14 , , D in D20 (ice)
TSL_MAT_numbers.csv 1,1 Top
3002 , tsl-HinZrH2.endf , H in ZrH2
3006 , tsl-ZrinZrHx.endf , Zr in ZrHx
3007 , tsl-HinZrHx.endf , H in ZrHx
3011 , tsl-CainCaH2.endf , Ca in CaH2
3013 , tsl-H1inCaH2.endf , H1 in CaH2
3014 , tsl-H2inCaH2.endf , H2 in CaH2
3016 , tsl-SiinSiO2-alpha.endf , Si in SiO2-alpha
3017 , tsl-OinSiO2-alpha.endf , O in SiO2-alpha
3021 , , Si in SiO2-beta
3022 , , O in SiO2-beta
3031 , tsl-7Liin7LiH-mixed.endf , 7Li in 7LiH-mixed
3032 , tsl-Hin7LiH-mixed.endf , H in 7LiH-mixed
3034 , tsl-7Liin7LiD-mixed.endf , 7Li in 7LiD-mixed
3035 , tsl-Din7LiD-mixed.endf , D in 7LiD-mixed
3037 , , Mg in MgH2
3038 , , H in MgH2
3042 , , Mg in MgD2
3043 , , D in MgD2
3047 , tsl-FinHF.endf , F in HF
3048 , tsl-HinHF.endf , H in HF
3052 , tsl-AlinAl203.endf , Al in Al203
3053 , tsl-OinAl203.endf , O in Al203
3060 , , Pb in PbF2
TSL_MAT_numbers.csv 128,24 37%
```

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

- tsl-Be-metal+Sd
- tsl-Be-metal
- tsl-BeinBeO
- tsl-CainCaH2
- 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 (NCSU)
- tsl-HinC5O2H8.endf (ORNL)
- tsl-HinH2O.endf (ESS)
- tsl-HinC8H8.endf (minor fix)
- tsl-HinIcelh.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
- tsl-OinBeO
- tsl-OinD2O
- OinIcelh
- 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-UinUO2-10P
- 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

- Reviews are coming in, I need to process many of them
- We **MUST** make a decision on lucite and polyethylene

Contributions to low-temperature H and D. Send them to SNS for review, as they seem to be the only potential users.

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

- tsl-Be-metal+Sd
- tsl-Be-metal
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- tsl-FinCF2 (minor fix)
- tsl-H1inCaH2
- tsl-H2inCaH2
- tsl-HinC5O2H8.endf (NCSU)
- tsl-HinC5O2H8.endf (ORNL)
- tsl-HinH2O.endf (ESS)



Yesterday, based on small performance differences, the CSEWG Executive Committee decided to:

- Adopt the *NCSU polyethylene* evaluation from VIII.0
- Adopt the *ORNL lucite* evaluation

- tsl-UinUN
- 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

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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.
- 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.

KAERI/LANL exit distributions

- 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=6 MT= 103, 104, 105, 106, 107 were deleted.
 - MF=3 MT= 600-609, 649, 650-659, 699, 701-709, 749, 750-759, 799, 800-809, 849 were added.
 - MF=6 MT= 600-609, 649, 650-659, 699, 701-709, 749, 750-759, 799, 800-809, 849 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
 - 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.
 - cr54
 - 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.
 - co58
 - 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.

KAERI/LANL exit distributions

- 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.

KAERI/LANL exit distributions

- 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 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.
- zr93
 - 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.

KAERI/LANL exit distributions

- 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-006_C_012 (minor fix)
- n-008_O_016 (minor fix plus flagging of primary gammas)
- n-008_O_018 (fix by removing 21MeV point in capture)
- 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) Errors in CHECKR!
- 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)
- n-058_Ce_140 (updated covariances)
- n-058_Ce_142 (updated covariances)
- 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-074_W_182 (minor fix) Errors in CHECKR!
- n-074_W_183 (minor fix) Errors in CHECKR!
- n-074_W_184 (minor fix) Errors in CHECKR!
- n-074_W_186 (minor fix) Errors in CHECKR!
- 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))
- n-092_U_236 (uncertainty and other fixes by evaluator)
- n-094_Pu_239 (reduced nubar: new criticality vs burn-up compromise solution)
- n-094_Pu_242 (covariance fix)
- Pt
- Prompt nubar of 20 nuclides

Additional changes from Beta2

- n-001_H_002 (minor fix)
- n-004_Be_009 (problems above 2.8 MeV)
- n-006_C_012 (minor fix)
- n-008_O_016 (minor fix plus flagging of primary gammas)
- n-008_O_018 (fix by removing 21MeV point in capture)
- n-016_S_032 (fix)
- n-016_S_033 (fix)
- n-016_S_034 (fix)
- n-024_Cr_050 (fix)
- n-024_Cr_051 (fix)
- n-024_Cr_052 (fix)
- n-024_Cr_053 (fix)
- n-024_Cr_054 (fix)
- 029_Cu_063 (fix)
- 029_Cu_065 (fix)
- n-038_Sr_088 (fix)
- n-045_Rh_103 (fix)
- n-046_Pd_110 (fix)
- n-049_In_113 (fix)
- n-049_In_115 (fix)
- n-058_Ce_140 (fix)

Prompt-nubar Evaluations R. Q. Wright

Prompt-nubar evaluations were done for 20 nuclides.

Data sources were as follows:

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, Np-235

Es-254m is the same as Es-254

- n-058_Ce_142 (updated covariances)
- 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-074_W_182 (minor fix) Errors in CHECKR!
- n-074_W_183 (minor fix) Errors in CHECKR!
- n-074_W_184 (minor fix) Errors in CHECKR!
- n-074_W_186 (minor fix) Errors in CHECKR!
- 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))
- n-092_U_236 (uncertainty and other fixes by evaluator)
- n-094_Pu_239 (reduced nubar: new criticality vs burn-up compromise solution)
- n-094_Pu_242 (covariance fix)
- Pt
- Prompt nubar of 20 nuclides

Photonuclear 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}Al	• ^{184}W	• ^{237}Np
• ^{12}C	• ^{28}Si	• ^{206}Pb	• ^{235}U
• ^{14}N	• ^{40}Ca	• ^{207}Pb	• ^{238}U
• ^{16}O	• ^{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

Photonuclear sublibrary

- $^{180,182,183,186}\text{W}$: reverted to VIII.0
- ^{242}Pu : inexistent, taken from JENDL-5.0
- ^9Be : ~~NNL evaluation~~ Take from CRP

Atomic sub libraries

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

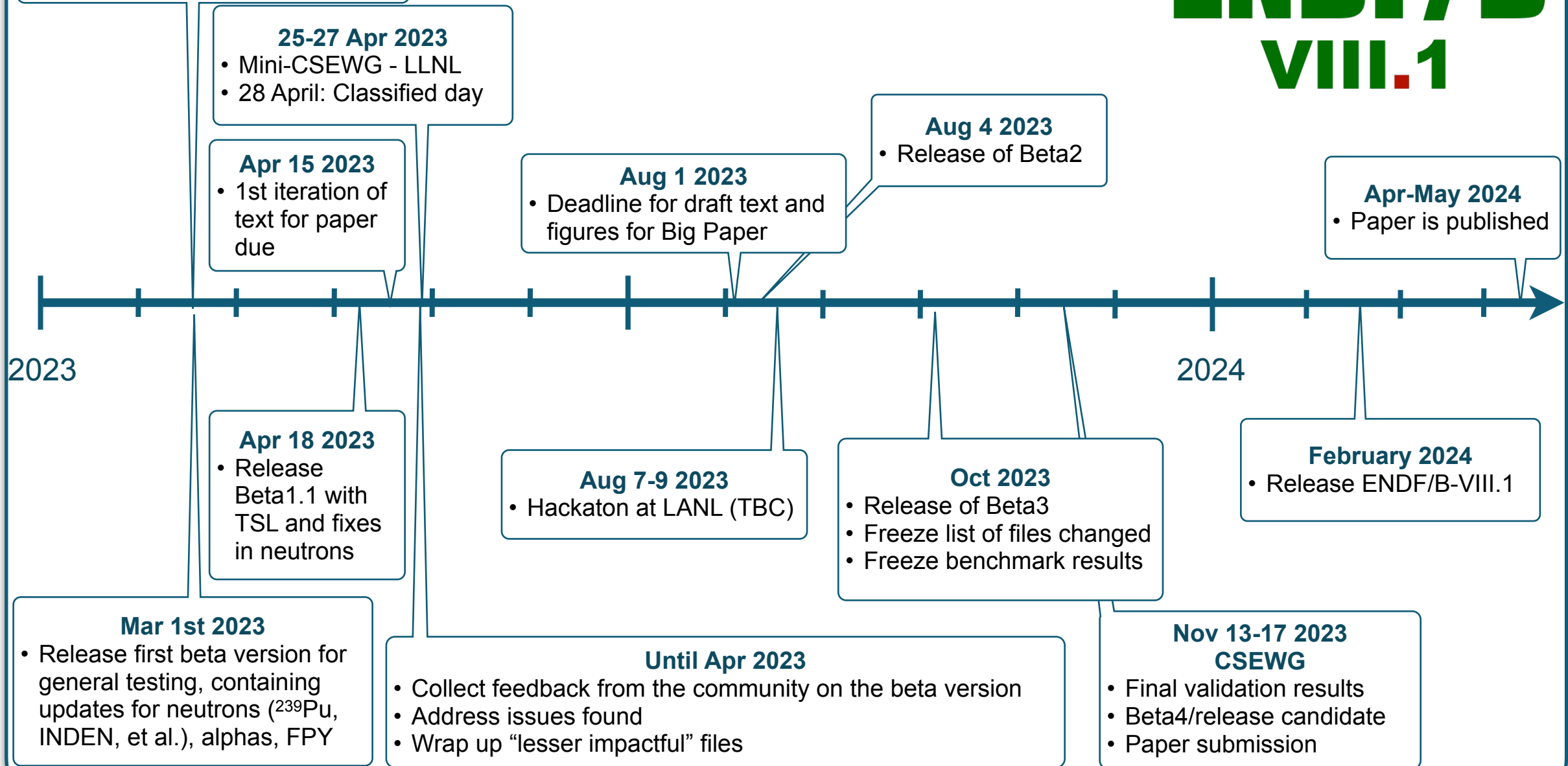
- Atomic relaxation sublibrary (EADL)
- Electrons sublibrary (EEDL)
 - This did NOT overwrite ZAP format fix done by Bret Beck for VIII.1-Beta2
- Photoatomic sublibrary (EPDL)

Release Timeline

... or, the elephant in the room

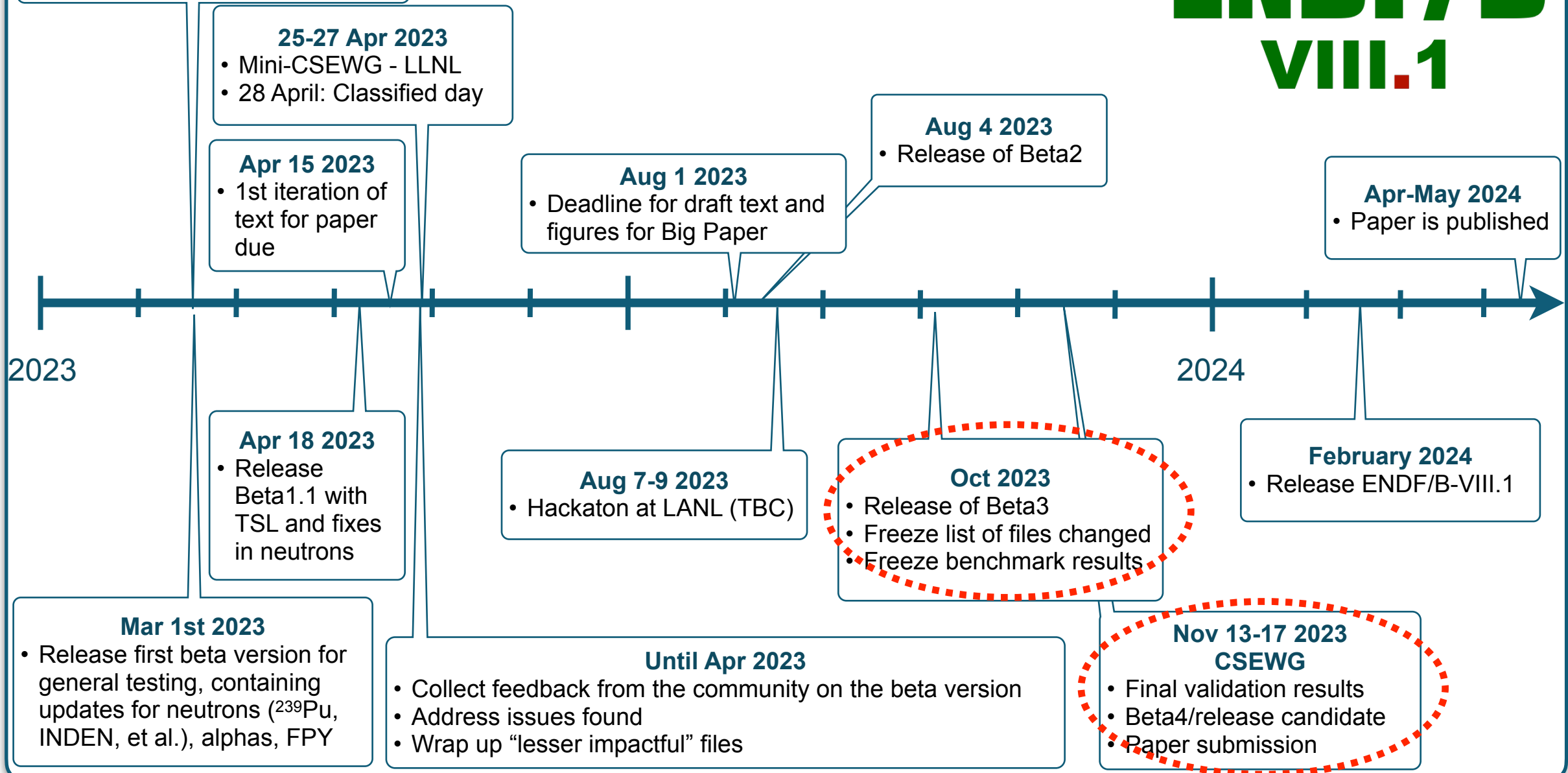
ENDF/B VIII.1

Release timeline



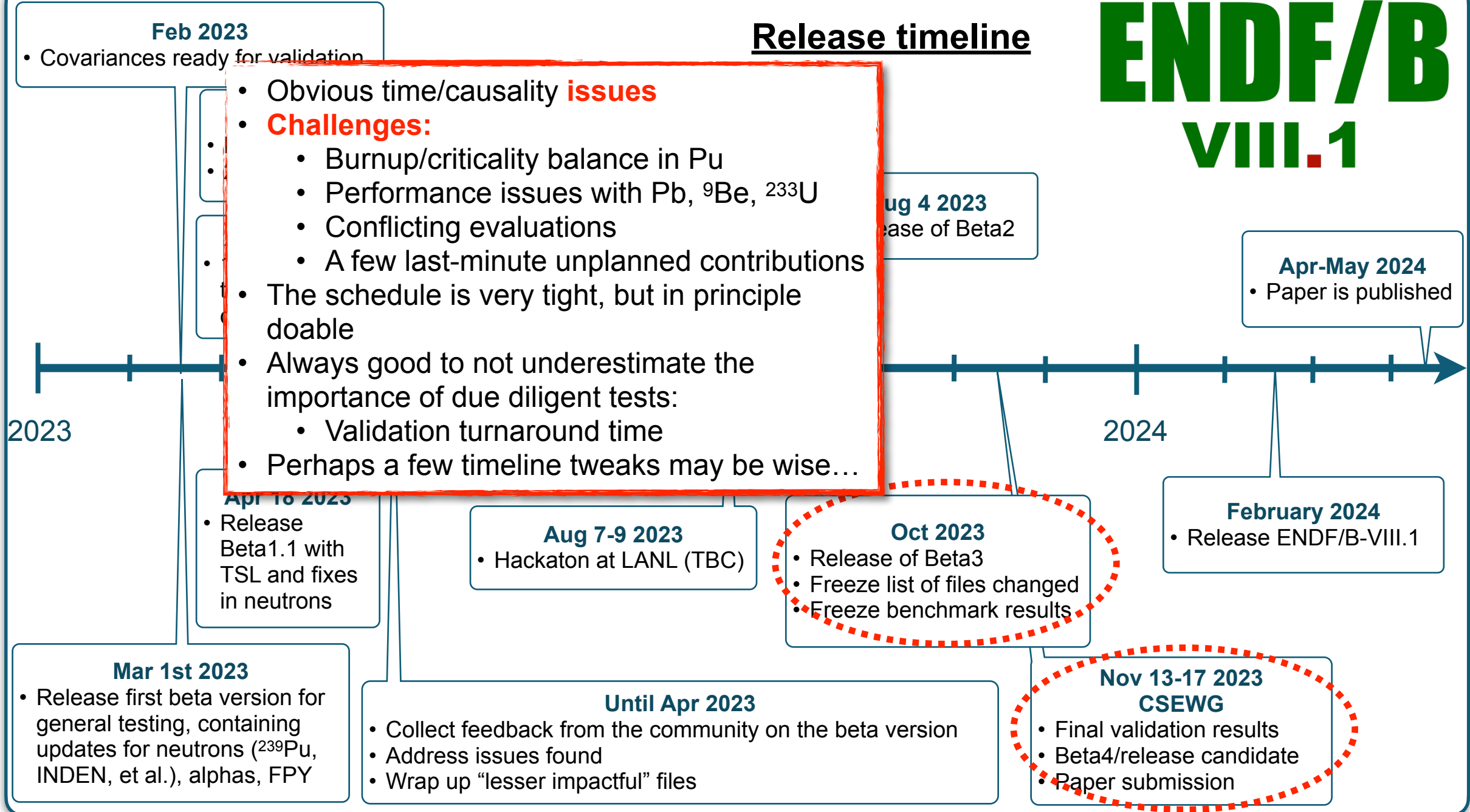
ENDF/B VIII.1

Release timeline



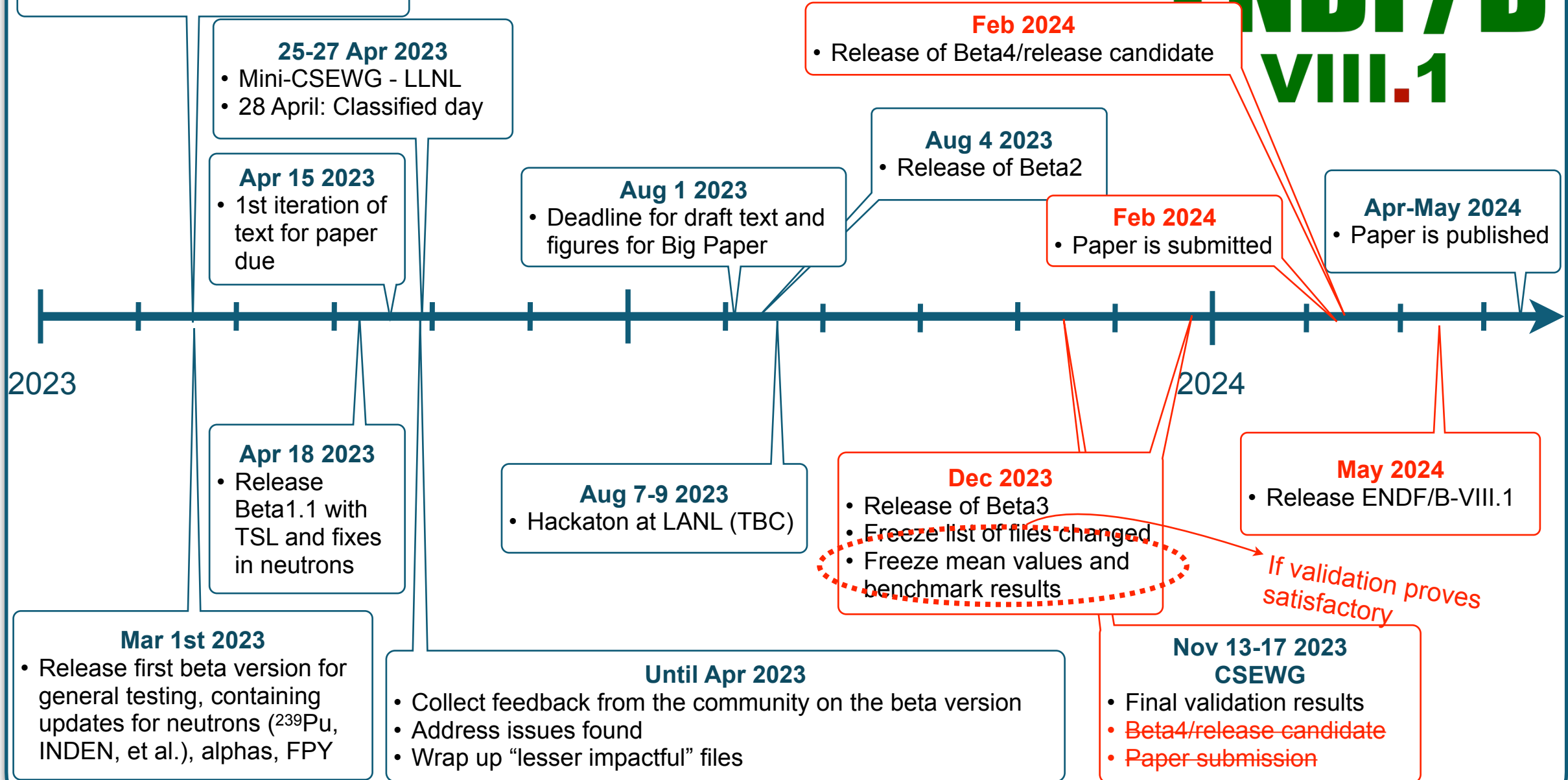
ENDF/B VIII.1

Release timeline



ENDF/B VIII.1

Release timeline



Timeline

Timeline

- Beta3:

Timeline

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

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 - ^{233}U is the only thing that may need more time, we were promised to get it within a month's time

Timeline

- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
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 - Once Beta3 is released, file list and mean values shall be frozen

Timeline

- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ^{233}U 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

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- Do While $3 < \text{Beta} < 4$:

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 - If there are no validation surprises:

Timeline

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 - Fix covariances, documentation, format, processing issues
 - If there are no validation surprises:
 - Beta4 = release candidate

Timeline

- Beta3:
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- Do While $3 < \text{Beta} < 4$:
 - Fix covariances, documentation, format, processing issues
 - If there are no validation surprises:
 - Beta4 = release candidate
 - Else:

Timeline

- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ^{233}U 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 $3 < \text{Beta} < 4$:
 - Fix covariances, documentation, format, processing issues
 - If there are no validation surprises:
 - Beta4 = release candidate
 - Else:
 - Unfreeze what must be unfrozen

Timeline

- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
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 - Fix covariances, documentation, format, processing issues
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 - Beta4 = release candidate
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 - Unfreeze what must be unfrozen
 - Go to "Adjust timeline as needed"

Timeline

- Beta3:
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- Validation will take 2-3 months
- Do While $3 < \text{Beta} < 4$:
 - 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

Timeline

- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ^{233}U is the only thing that may need more time, we were promised to get it within a month's time
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- Do While $3 < \text{Beta} < 4$:
 - 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"
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- End do

Timeline

- Beta3:
 - Collect all updates/fixes, review and push forward in the next few weeks
 - ^{233}U 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 $3 < \text{Beta} < 4$:
 - 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

Mini-CSEWG

- Spring
- Virtual
- Review validation results
- Bless release

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)
- 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

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