BNL AM4 task

- ## AM4 Budget information:

1. Carryover into FY 2023 = $ 3,524
2. Approved FY 2023 Budget = $ 70,000
3. Total FY 2023 Budget w/Carryover: $73,524
4. Actual spending for 1st Quarter FY 2023 = $0
5. Actual spending for 2nd Quarter FY 2023 = $0
6. Actual spending for 3rd Quarter FY 2023 = $0
7. Actual spending for 4th Quarter FY 2023 = $0
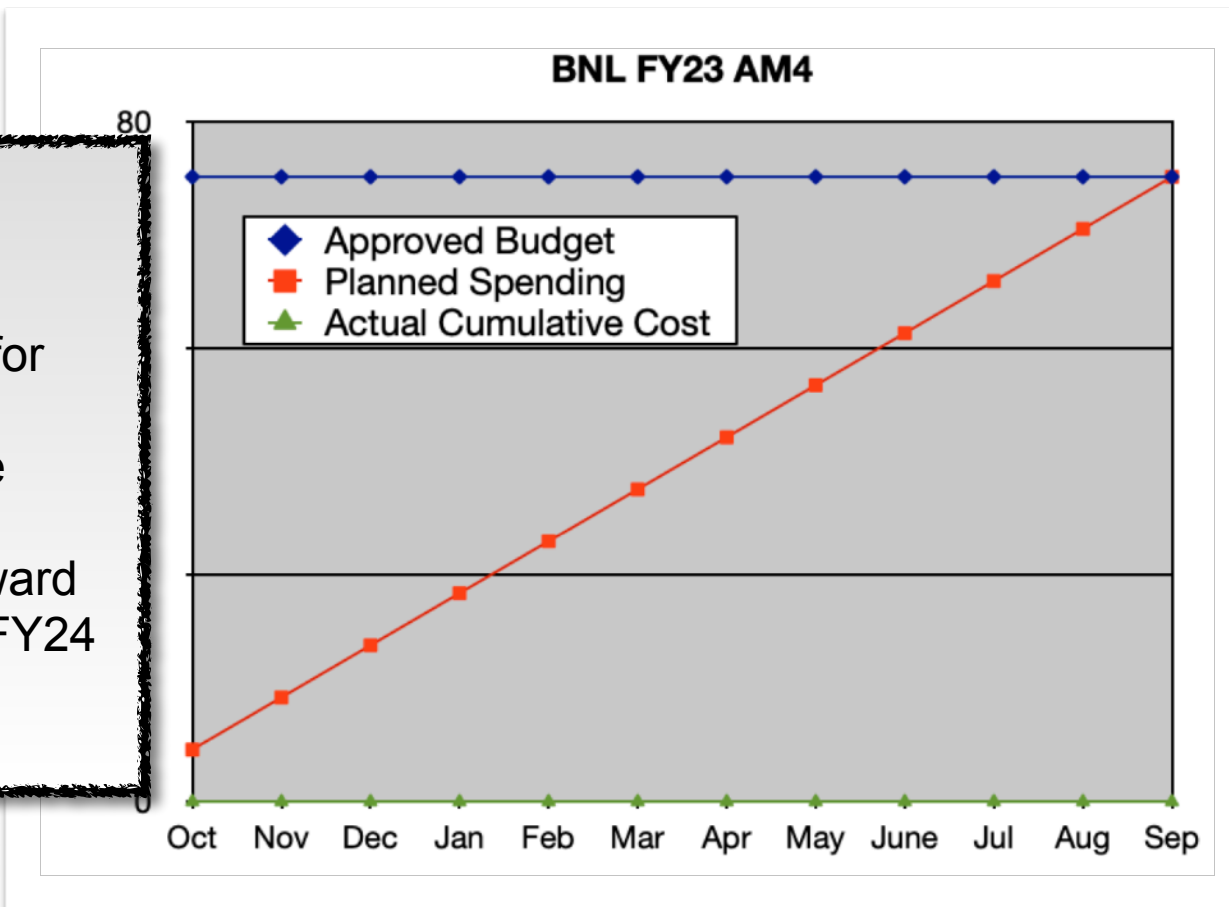8. Projected carryover into FY 2024 = $73,524

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BNL AM4 task

- AM4 Budget information:

1. C
2. A
3. T
4. A
5. A
6. A
7. A
8. P
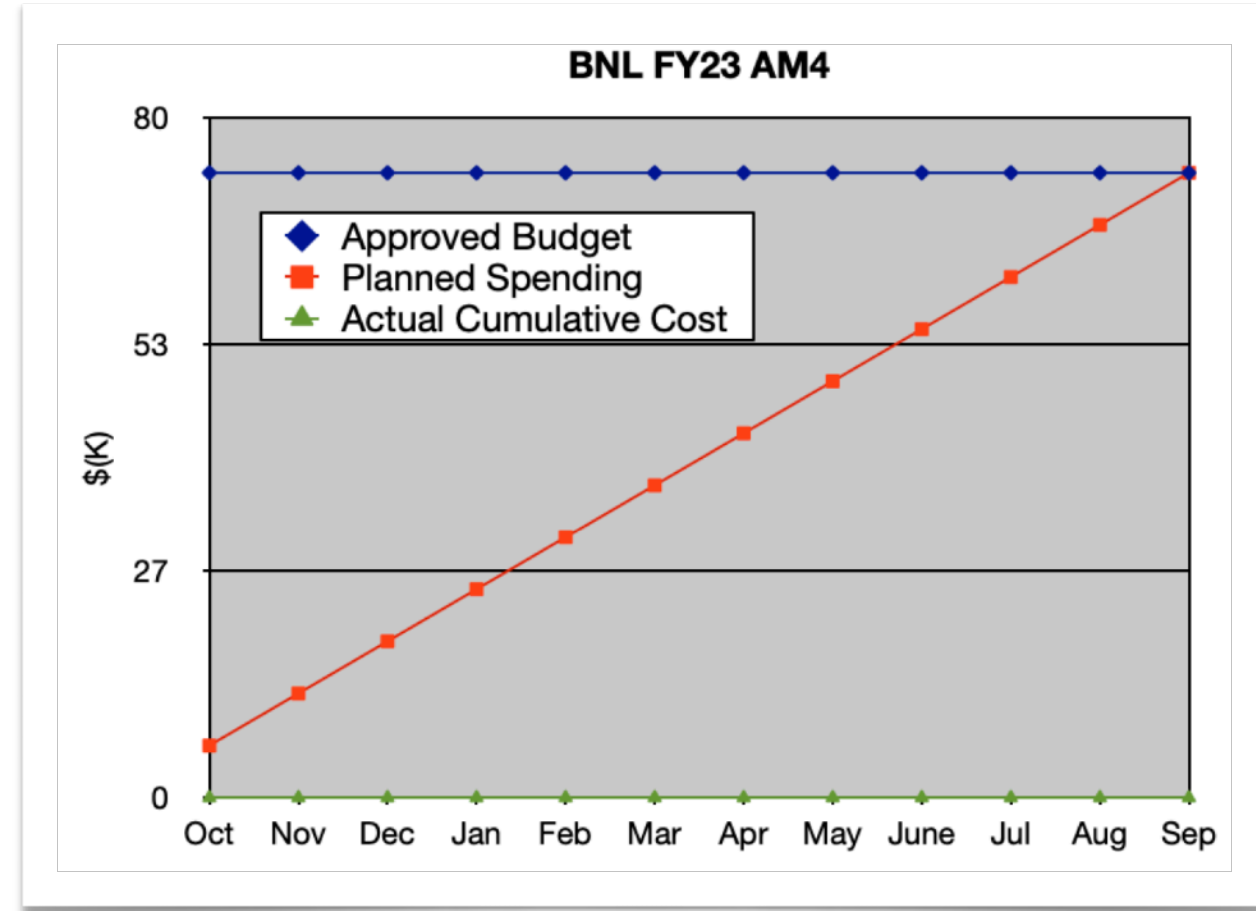
Budget comments on AM4:
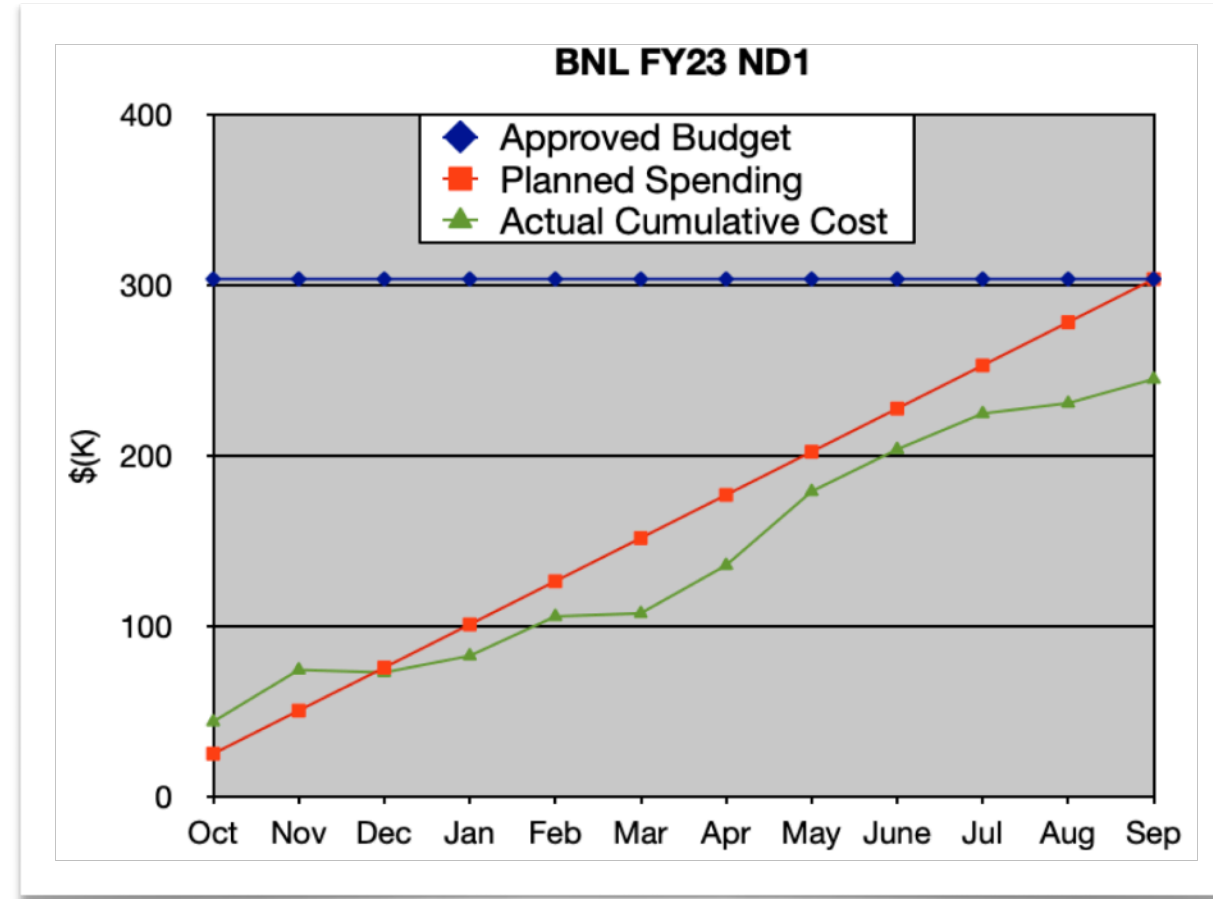
- FY23 funds was unspent:
  - Postdoc left BNL at the beginning of FY23 for staff position in the UK
  - Dave Brown is significantly more expensive
  - It was requested and approved at the 2023 Budget Execution Meeting to carry this forward to FY24 so Dave can work on this task on FY24
  - He has already made progress that he will present at the AM meeting on Friday

BNL FY23 AM4

- Approved Budget
- Planned Spending
- Actual Cumulative Cost

80

Oct Nov Dec Jan Feb Mar Apr May June Jul Aug Sep

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BNL ND1 task

- ND1 Budget information:

1. Carryover into FY 2023 = $ 13,754

2. Approved FY 2023 Budget = $ 290,000

3. Total FY 2023 Budget w/Carryover = $303,754

4. Actual spending for 1st Quarter FY 2023 = $73,063

5. Actual spending for 2nd Quarter FY 2023 = $34,667

6. Actual spending for 3rd Quarter FY 2023 = $96,160

7. Actual spending for 4th Quarter FY 2023 = $41,220

Projected carryover into FY 2024 = $58,644

BNL FY23 ND1

BNL ND1 task

BNL FY23 ND1

- ND1 Budget information:

1. C...

2. Ap...

3. To...

4. Ac...

5. Ac...

6. Ac...

7. Ac...

Proj...

Budget comments on ND1:

- Funded two efforts:
  - Rebecca Coles to work on the CI/CD platform ADVANCE
  - Gustavo Nobre and Dave Brown to coordinate the next ENDF/B release
- Spending pace more or less constant as planned, expect for last couple of months where we needed to be a bit more cautious to be sure we could cover Rebecca.
  - For FY24, Rebecca has a fraction of her time reserved for NCSP, which will make planning easier
- Will show details on Thursday
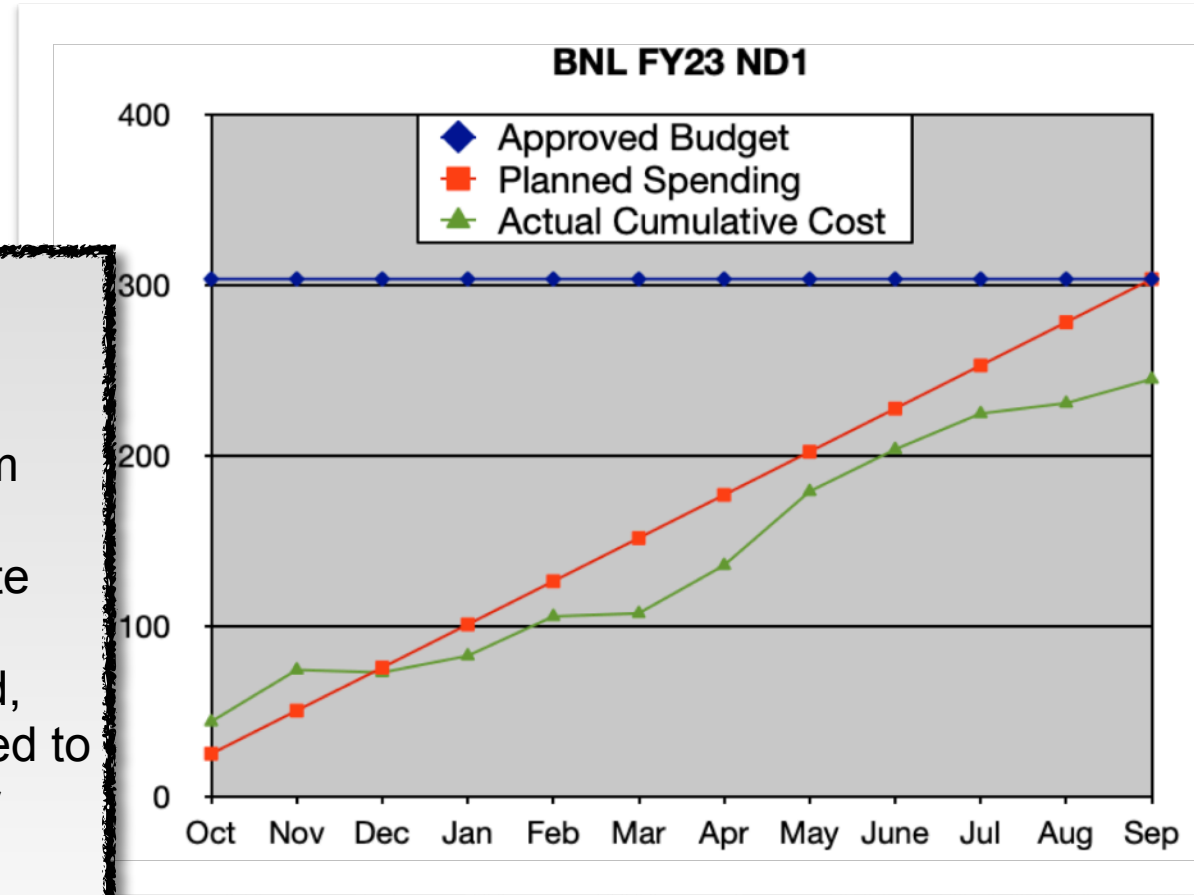
BNL TS6 task

- TS6 Budget information:

1. Carryover into FY 2023 = $ 9,027

2. Approved FY 2023 Budget = $100,000

3. Total FY 2023 Budget w/Carryover = $109,027

4. Actual spending for 1st Quarter FY 2023 = $22,135

5. Actual spending for 2nd Quarter FY 2023 = $13,609

6. Actual spending for 3rd Quarter FY 2023 = $32,189

7. Actual spending for 4th Quarter FY 2023 = $22,101
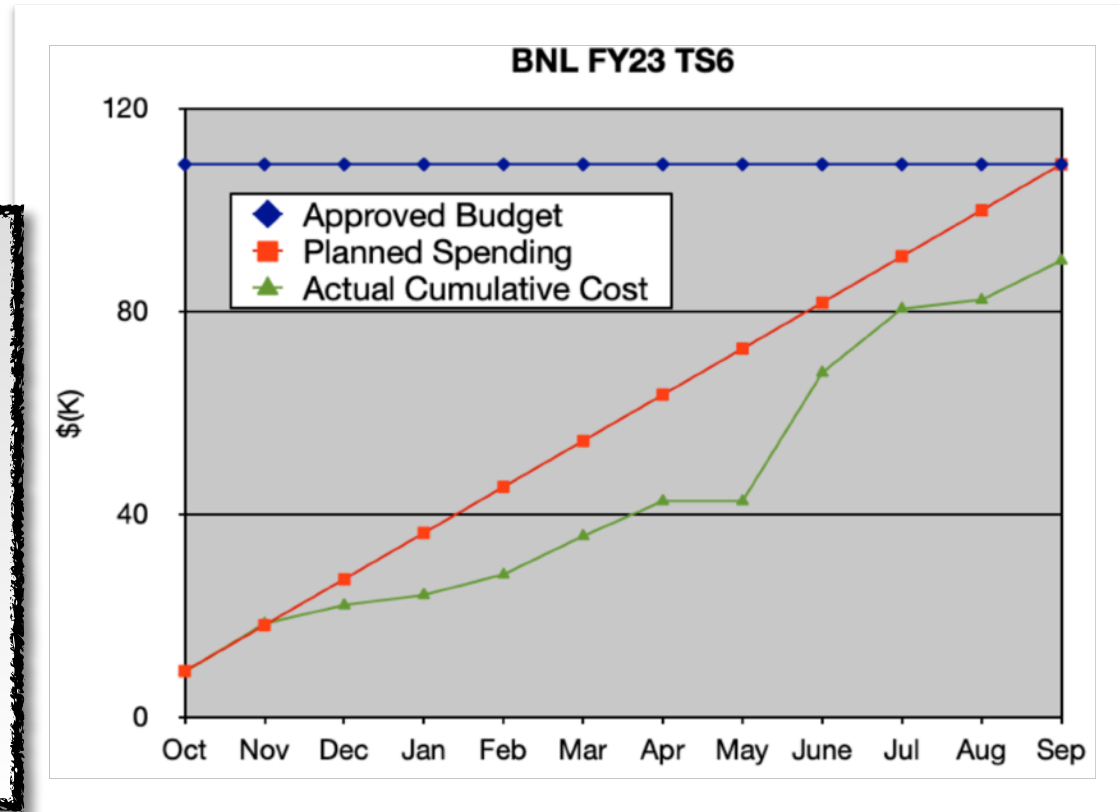
8. Projected carryover into FY 2024 = $18,993

BNL FY23 TS6

Legend:
- Approved Budget
- Planned Spending
- Actual Cumulative Cost

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BNL TS6 task

- TS6 Budget information:

1. C...
2. A...
3. To...
4. Ac...
5. Ac...
6. Ac...
7. Ac...
8. Projected carryover into FY 2024 = $18,993
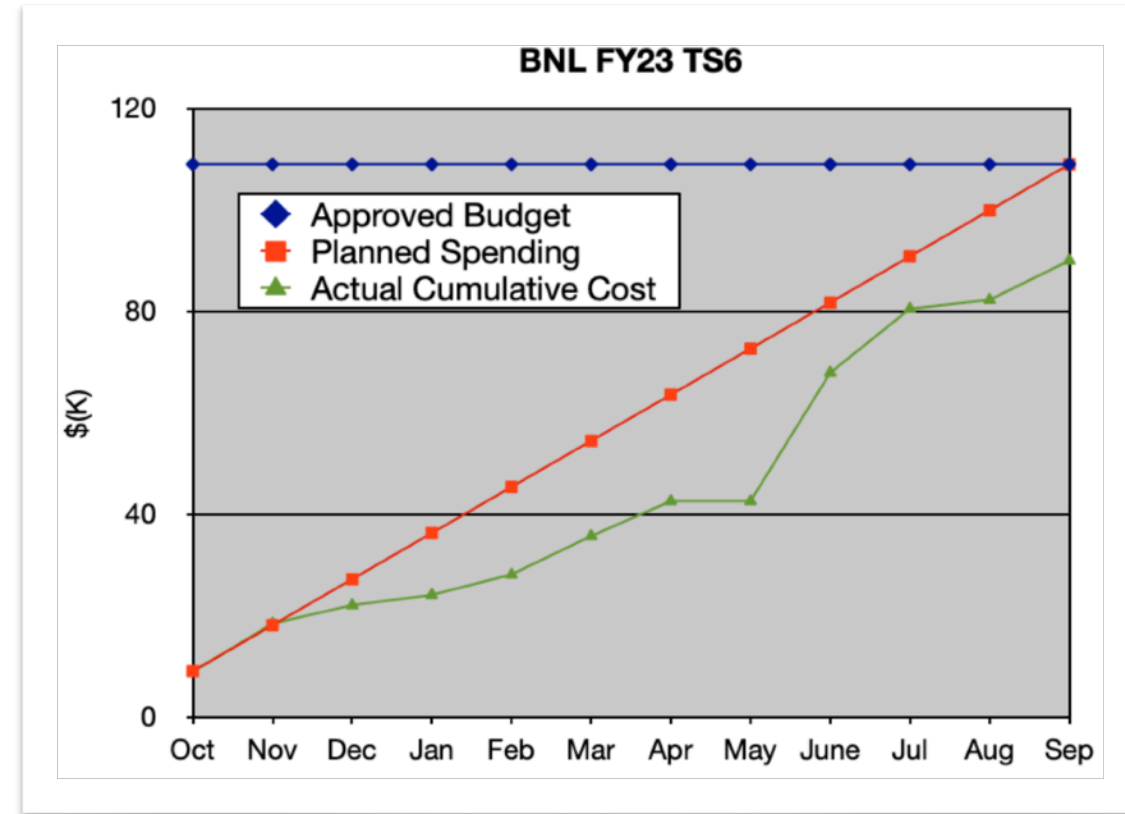
Budget comments on TS6:

- Spending mostly in bumps:
  - Undergraduate interns: specific spending cycles (Spring, Summer, Fall)
  - Pays for both Gustavo and Dave's time to work on mentoring projects as well in some cases directly to the intern stipends and CEU participation.
  - Will show highlights in this talk

BNL FY23 TS6

Legend:
- Approved Budget (blue diamond)
- Planned Spending (red square)
- Actual Cumulative Cost (green triangle)

y-axis: $(K), 0 to 120
x-axis: Oct, Nov, Dec, Jan, Feb, Mar, Apr, May, June, Jul, Aug, Sep

Highlights in FY23

- ENDF/B-VIII.1-Beta releases
  - Multiple "very preliminary" Beta0 in October 2022
  - Beta1 released on 1 March, 2023. Item on the 2023 **<u>Make-It-Happen</u>** list!
  - Beta1.1 released on 18 April, 2023
  - Beta2 released on 4 August, 2023
  - Preparation for Beta3 (released on 11 January 2024 - FY24)
- Co-organized 2023 mini-CSEWG Meeting at LLNL
- Attended and presented invited talk at the TEX2.0 meeting in LLNL
- Co-organized 2023 Hackathon at LANL
- Coordination: VIII.1 release timeline, CSEWG organization
- ADVANCE continuous integration system
- Machine-Learning for neutron resonance classification

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Will talk a little bit about these now

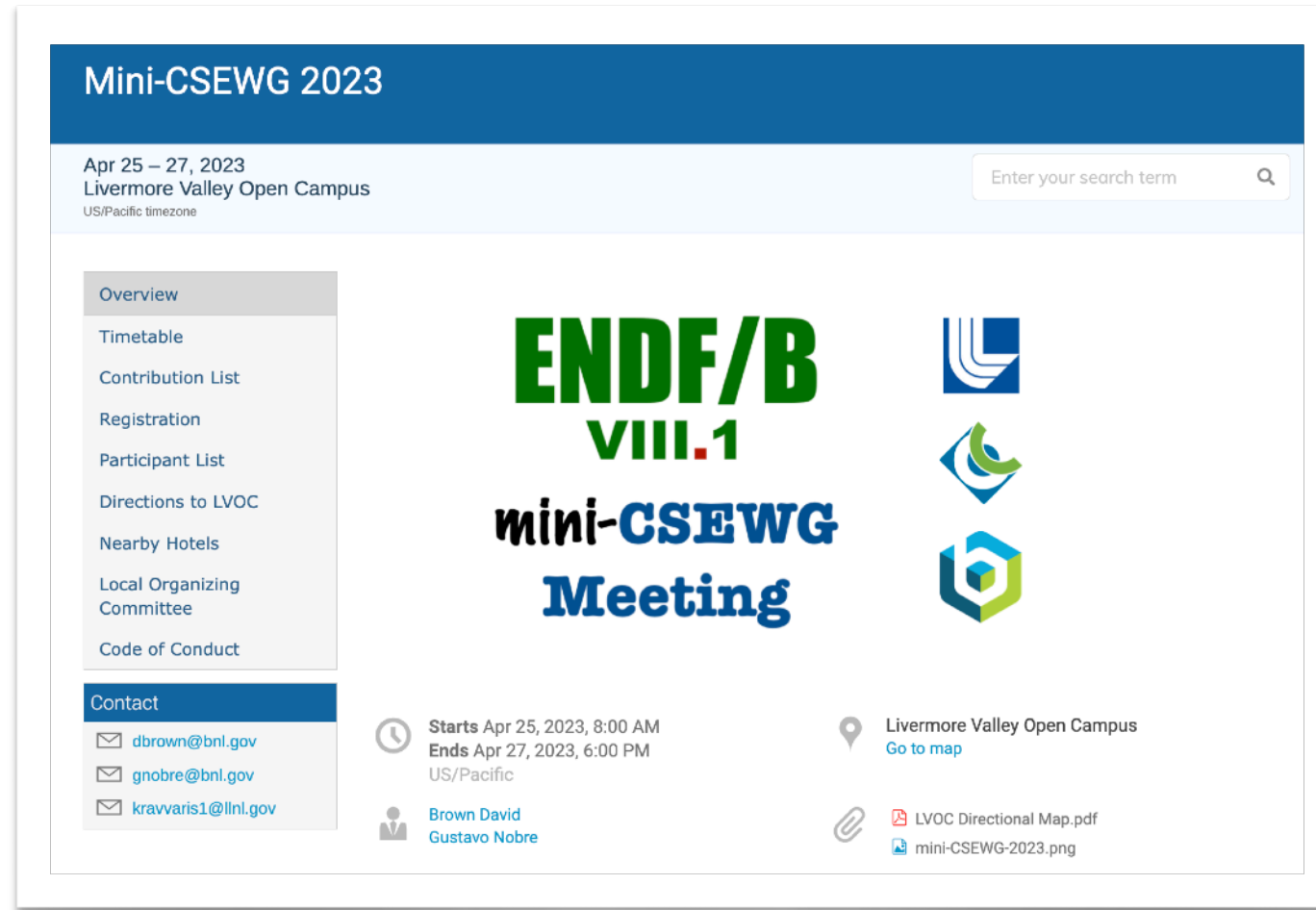**Brookhaven** National Laboratory

Highlights in FY23

Will give more details on Thursday

- ENDF/B-VIII.1-Beta releases
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Will talk a little bit about these now

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2023 mini-CSEWG

- Held between April 25-27, 2023 at LLNL
- Focused on validation results from Beta1/1.1
- Pointed directions for Beta2. E.g.:
  - Showed that ^{239}Pu improved depletion benchmarks but degraded performance in PST
  - Beta2 had updates to ^{240,241}Pu to address that
- Outlined recommendations for many other evaluations and format changes

2023 Hackathon

- Held on August 6-8, 2023 at LANL
- Right after Beta2 release, so fixes would a clear starting point
- About 8-10 participants in person and ~5 remote
- Tracked issues resolved:
  - 6 issues for neutrons, 4 in TSL
- Many processing issues not listed in trackers were fixed
- TSL MAT number overload addressed
  - MAT numbers assigned
  - CSV file created
  - Description implemented in ENDF-102 manual
- More issues were found and logged
- Special shout-outs:
  - Wim Haeck, our dedicated social host
  - Jesse Brown, and his epic journey through airline delays and cancellations to attend the Hackathon
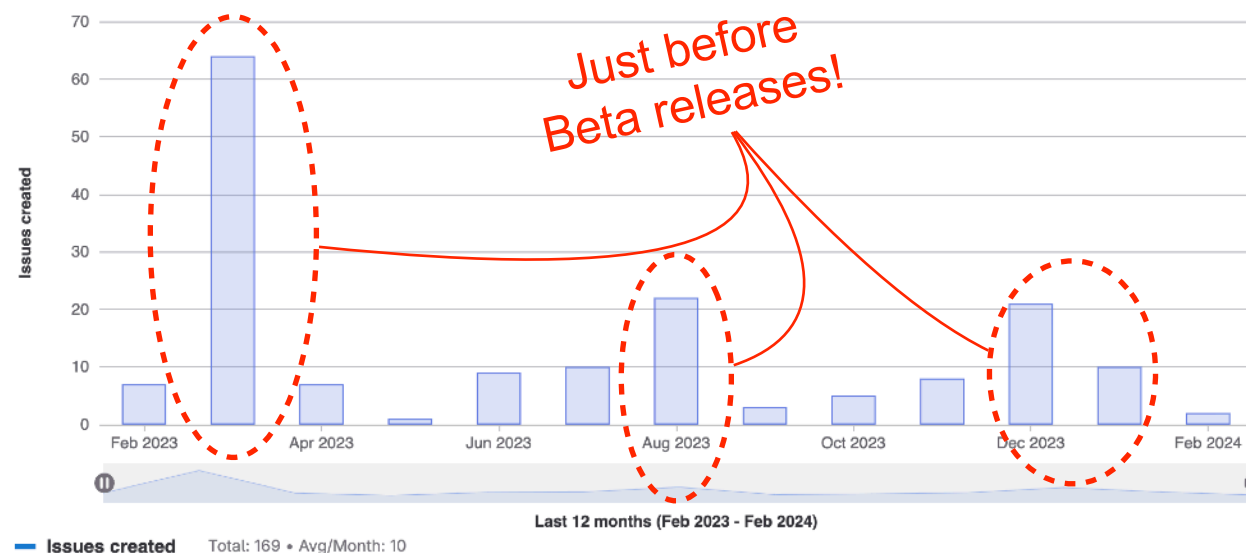
*"Thanks again for your interest and participation in Hackathon. I think we have a good group, with folks from **BNL**, **LLNL**, **NNL**, and **ORNL** visiting us here at **LANL**. And I think we have about the right number of people to be productive and collaborative. There will be a handful online, too, and hopefully that adds to the experience."*

- Nathan Gibson

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Navigating complex technical decisions

- Everyone is passionate about their work, but sometimes discussion steered from purely technical

- We brought everyone together for many, many, many meetings to gather as much information possible to guide a decision

  - Making decisions on **great** parallel evaluations is a complex endeavor, with many different aspects to be considered

  - Effort to establish an **efficient**, **clear**, **transparent**, **community-wide**, **constructive** process

  - We were able to make decisions, which were implemented in Beta2 and Beta3

*We are not interested in making **one group** very happy, but rather **everyone** mildly happy.*

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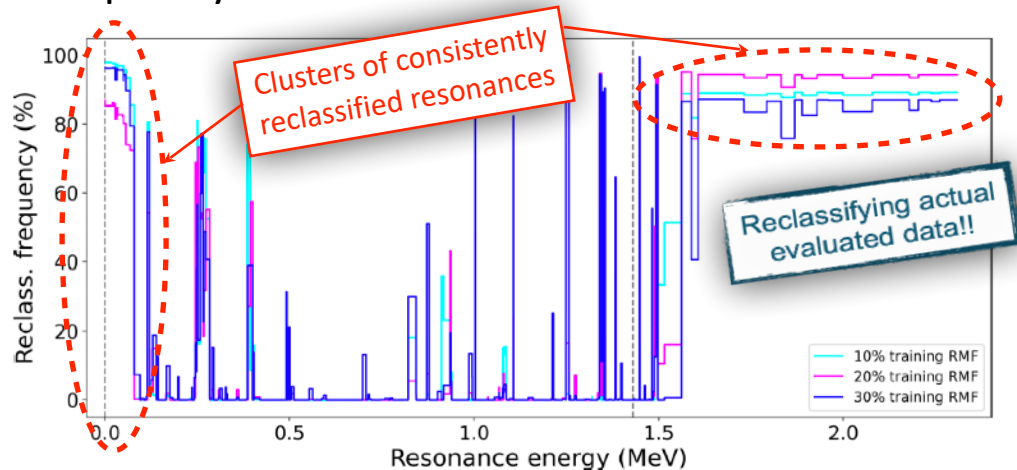
TS6: Bayesian Resonance Reclassifier

- A machine-learning method for resonance spin re-classification

- First article on the method has been published in FY23

- It is shaping up to be a great tool to assist in resonance evaluations
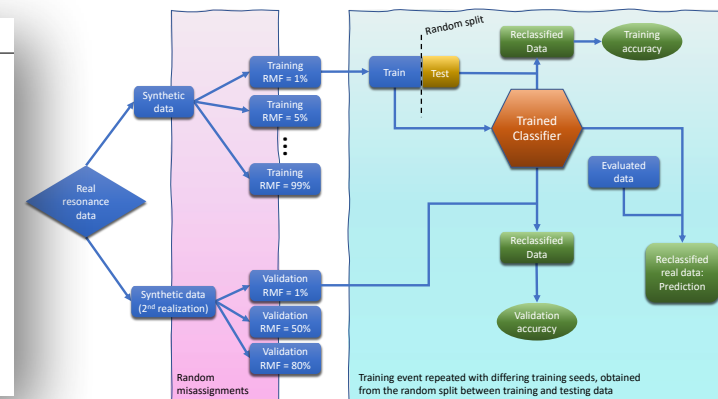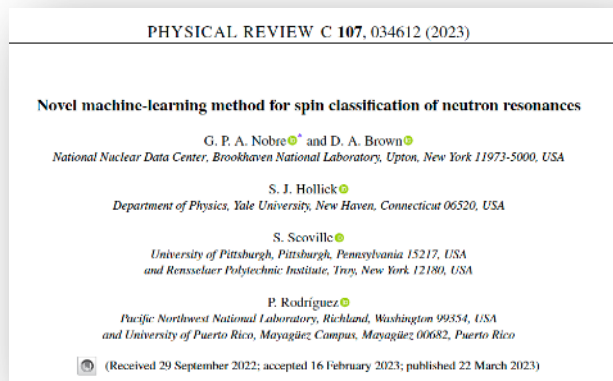
These mis-assignments in resonance evaluations can potentially impact many reactor applications!

PHYSICAL REVIEW C **107**, 034612 (2023)

Novel machine-learning method for spin classification of neutron resonances

G. P. A. Nobre[*] and D. A. Brown
National Nuclear Data Center, Brookhaven National Laboratory, Upton, New York 11973-5000, USA

S. J. Hollick
Department of Physics, Yale University, New Haven, Connecticut 06520, USA

S. Scoville
University of Pittsburgh, Pittsburgh, Pennsylvania 15217, USA
and Rensselaer Polytechnic Institute, Troy, New York 12180, USA

P. Rodríguez
Pacific Northwest National Laboratory, Richland, Washington 99354, USA
and University of Puerto Rico, Mayagüez Campus, Mayagüez 00682, Puerto Rico

- Work done mainly with **undergraduate interns**
- Interns presented CEU posters at 2022/2023 DNP Meetings
- Past interns went on to grad school or staff positions

Frequency of reclassification of resonances in ^{52}Cr

Clusters of consistently reclassified resonances

Reclassifying actual evaluated data!!

10% training RMF
20% training RMF
30% training RMF

Sophia Hollick Sergey Scoville Pedro Rodriguez Mary Fucci Sergio Ruiz Charlie Neufeldt Khadim Mbacke

Marcus McLaurin Nicholas Fritsch Ian Snider Ethan Richards Ayman Abdullah-Smoot Isaac Broussard Kwame Bennett

Exploring an iterative approach

CEU poster by
I. Broussard

Isaac Broussard

Validation Accuracy for 50 RMF
Without Γ_γ; label mode: L

- Iteration 0
- Iteration 1, cutoff =20%
- Iteration 1, cutoff =60%
- Iteration 1, cutoff =90%
- Starting acc. (50% RMF)

Validation Accuracy for 20 RMF
Without Γ_γ; label mode: L

- Iteration 0
- Iteration 1, cutoff =20%
- Iteration 1, cutoff =60%
- Iteration 1, cutoff =90%
- Starting acc. (20% RMF)

Validation Accuracy for 80 RMF
Without Γ_γ; label mode: L

- Iteration 0
- Iteration 1, cutoff =20%
- Iteration 1, cutoff =60%
- Iteration 1, cutoff =90%
- Starting acc. (80% RMF)

- Run classifier many times on validation synthetic sequence, leading to many reclassified resonance sequences
- Count how many times each resonance was reclassified
- Build a new sequence where resonances reclassified more often than a certain cut-off had their spin re-assigned
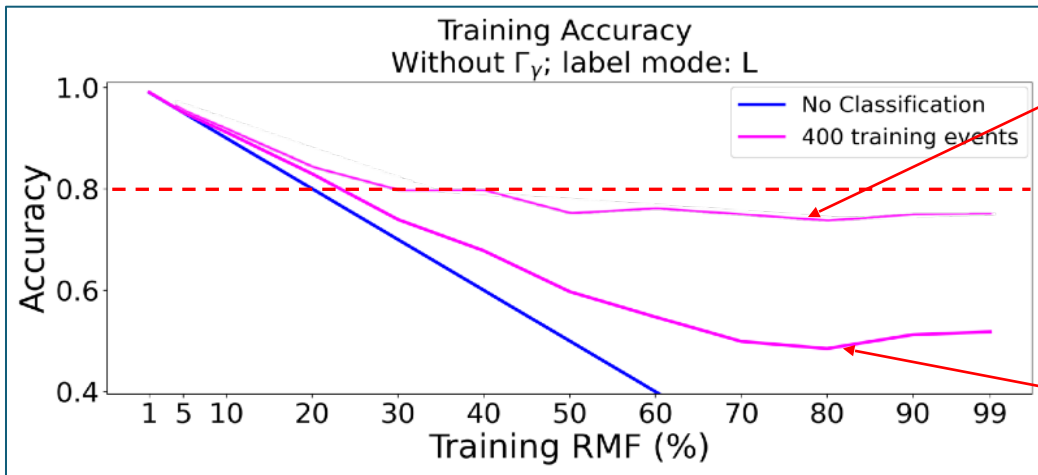- Run classifier many times again and extract new average accuracy

Reclassification Distribution

- Val. RMF = 80%
- Val. RMF = 50%
- Val. RMF = 20%
- Cutoff=20%
- Cutoff=60%
- Cutoff=90%
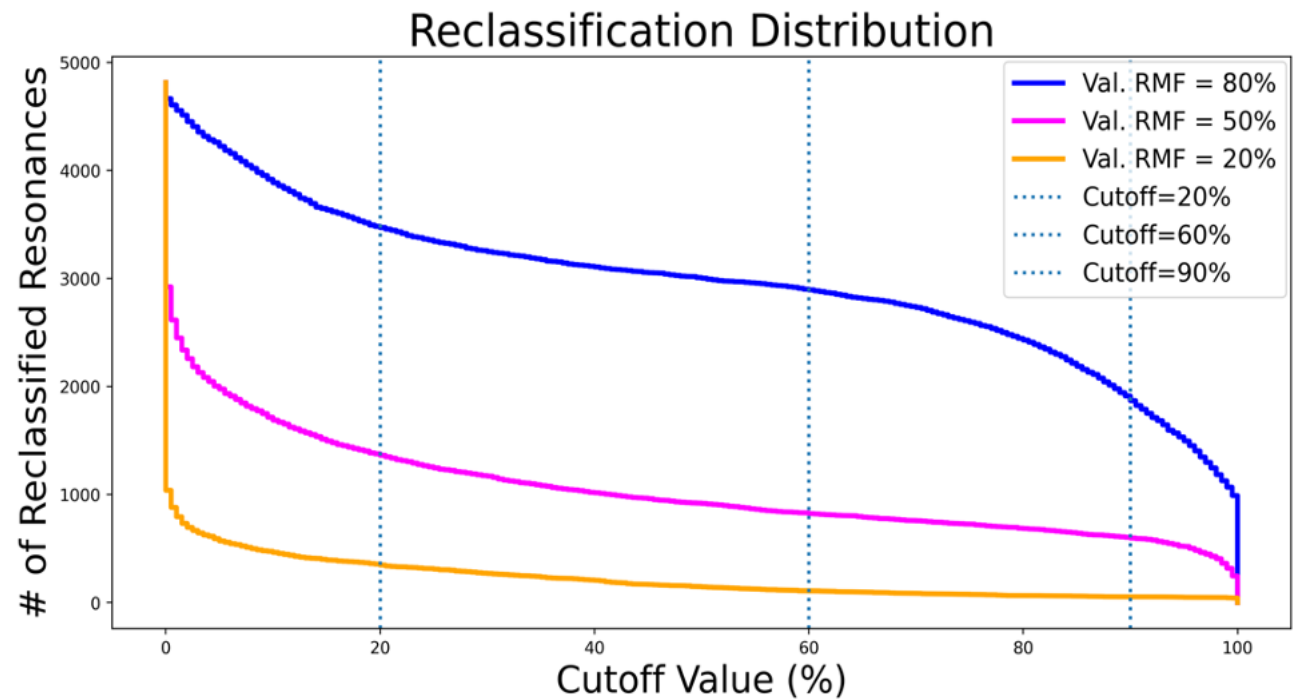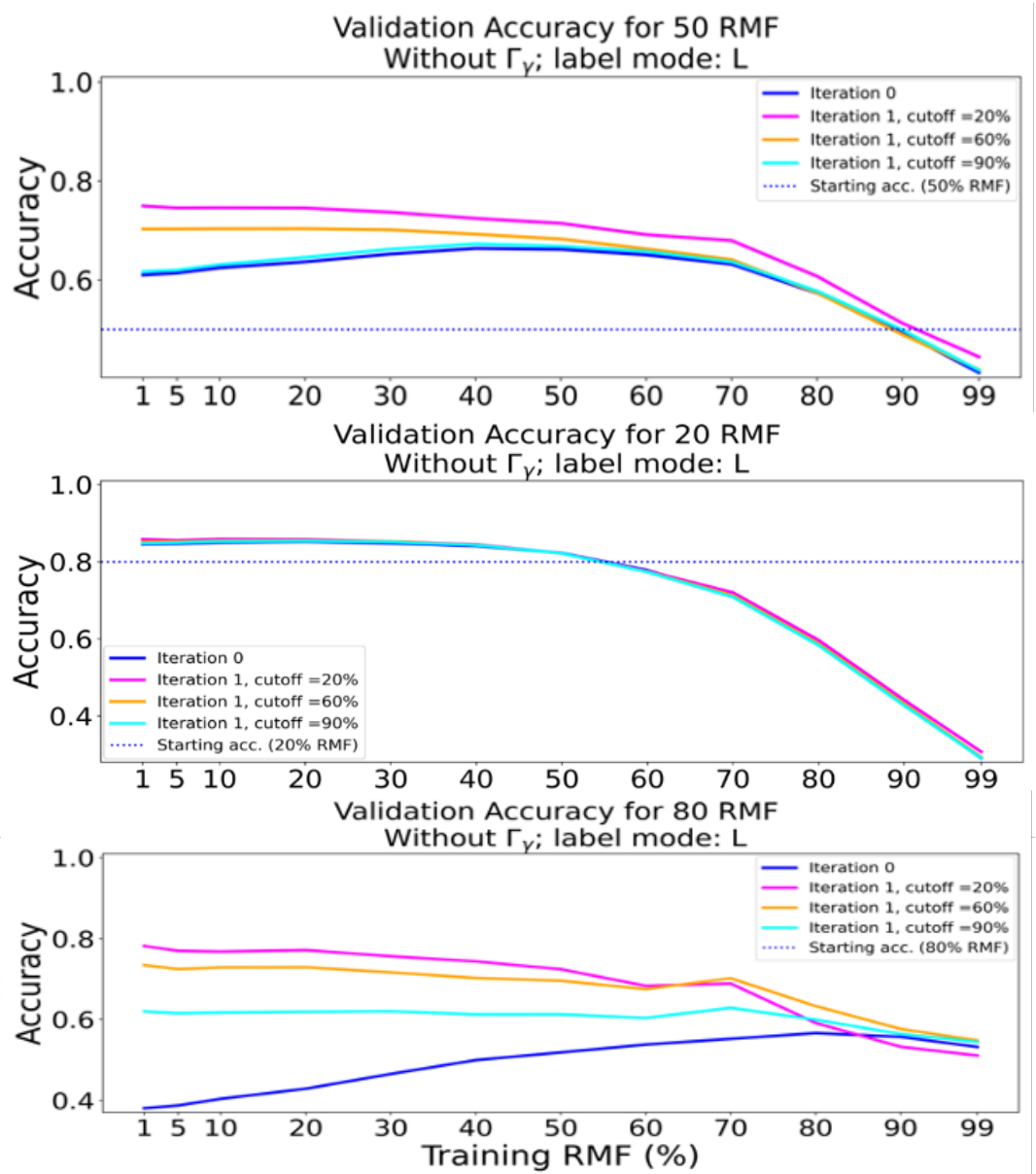
Exploring realistic Γ_γ with ^{206}Pb

CEU poster
by I. Snider

Ian Snider

Training (1st realization)

Validation (2nd realization)

With capture width features

Without capture width features
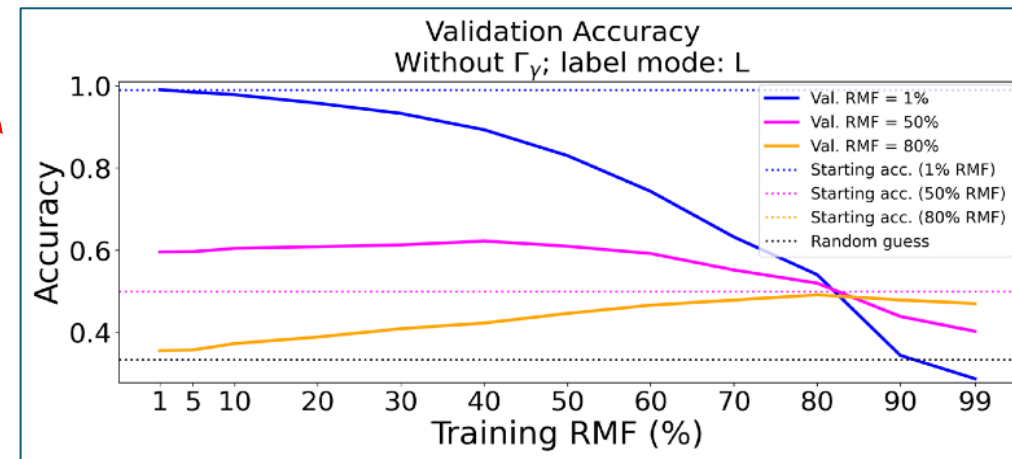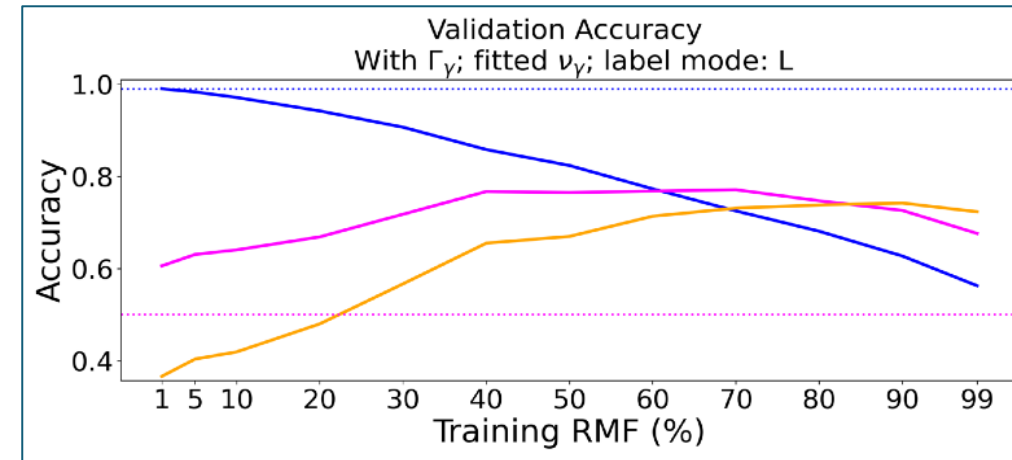
- Investigation of experimental resonance data available for ^{206}Pb indicated that we could trust the measured Γ_γ
- Fitted Γ_γ and ν of survival function of Porter-Thomas distribution of new ^{206}Pb evaluation (ENDF/B-VIII.1-Beta2)
- Compared classifier performance with and without Γ_γ

Testing on Real ²⁰⁶Pb

CEU poster
by I. Snider

Ian Snider

Reclassification Frequency

- Reclassification frequency obtained from 1000 training events

- Shows us which resonances are reclassified most often

- Appropriate training RMF somewhere between 10-30%

With capture width features
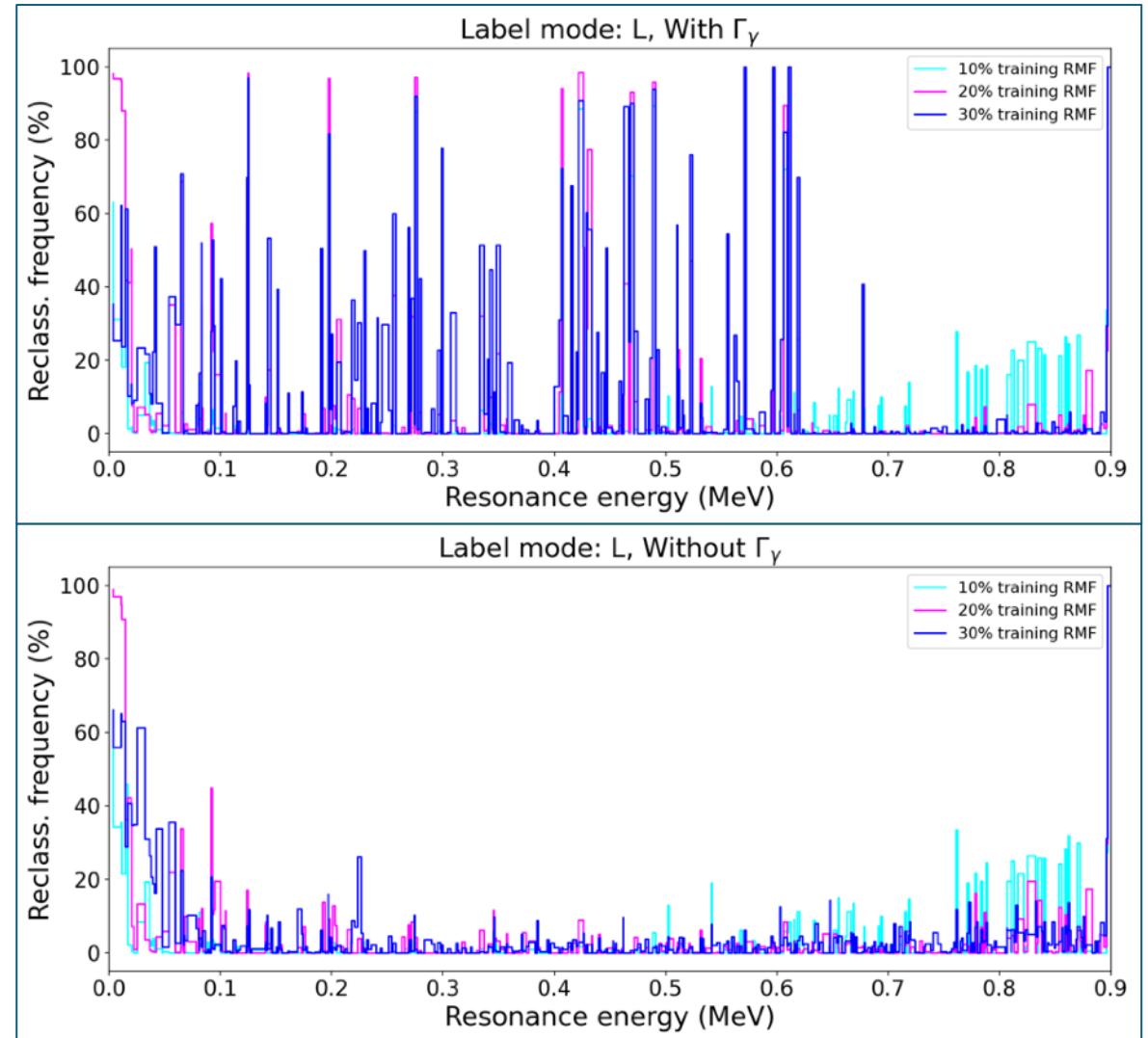
Without capture width features

Interacting with the evaluators to assess the quality of these most-frequent reassignments.

Acknowledgements

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