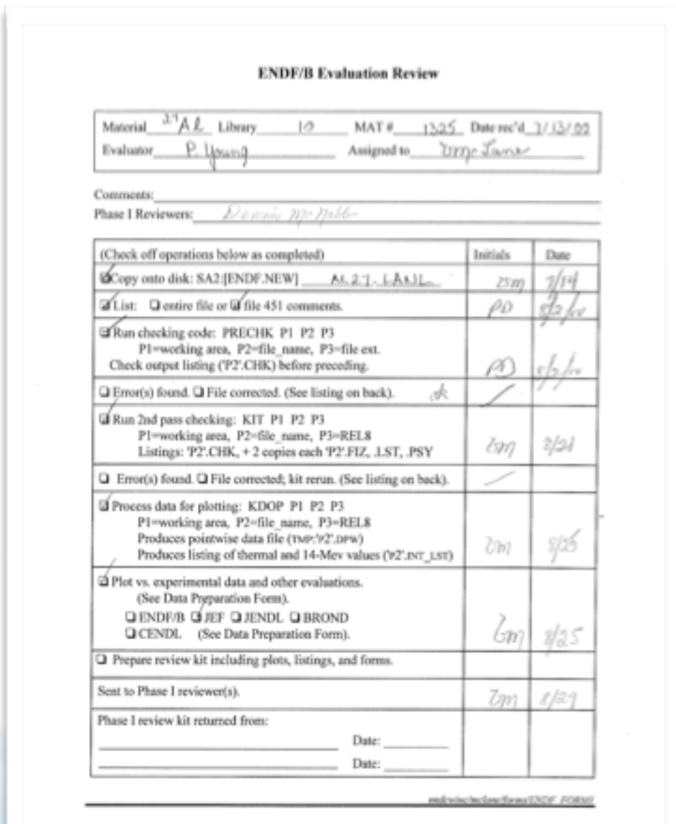
Library deficiencies

D. Brown, National Nuclear Data Center, BNL

ENDF/B Quality Assurance

Pen-n-paper "Days of yore" (pre-2011)



ENDF/B Evaluation Review

Material ²⁷Al Library 10 MAT # 1325 Date rec'd 7/13/00
Evaluator P. Young Assigned to

Comments:
Phase I Reviewers:

(Check off operations below as completed)	Initials	Date
Copy onto disk: SA2:[ENDF.NEW]		
List: entire file or file 451 comments.		
Run checking code: PRECHK P1 P2 P3 P1=working area, P2=file_name, P3=file ext. Check output listing ('P2'.CHK) before preceding.		
Error(s) found. File corrected. (See listing on back).		
Run 2nd pass checking: KIT P1 P2 P3 P1=working area, P2=file_name, P3=REL8 Listings: 'P2'.CHK, + 2 copies each 'P2'.FIZ, .LST, .PSY		
Error(s) found. File corrected; kit rerun. (See listing on back).		
Process data for plotting: KDOP P1 P2 P3 P1=working area, P2=file_name, P3=REL8 Produces pointwise data file (TMP:'P2'.DPW) Produces listing of thermal and 14-Mev values ('P2'.INT_LST)		
Plot vs. experimental data and other evaluations. (See Data Preparation Form). ENDF/B JEF JENDL BROND CENDL (See Data Preparation Form).		
Prepare review kit including plots, listings, and forms.		
Sent to Phase I reviewer(s).		
Phase I review kit returned from: Date: Date:		

Sample PHASE I review packet cover page (June 2000)

Automated with ADVANCE (2011-present)

http://www.nndc.bnl.gov/endf/b7.dev/qa/index.html

Where to find the link to ADVANCE

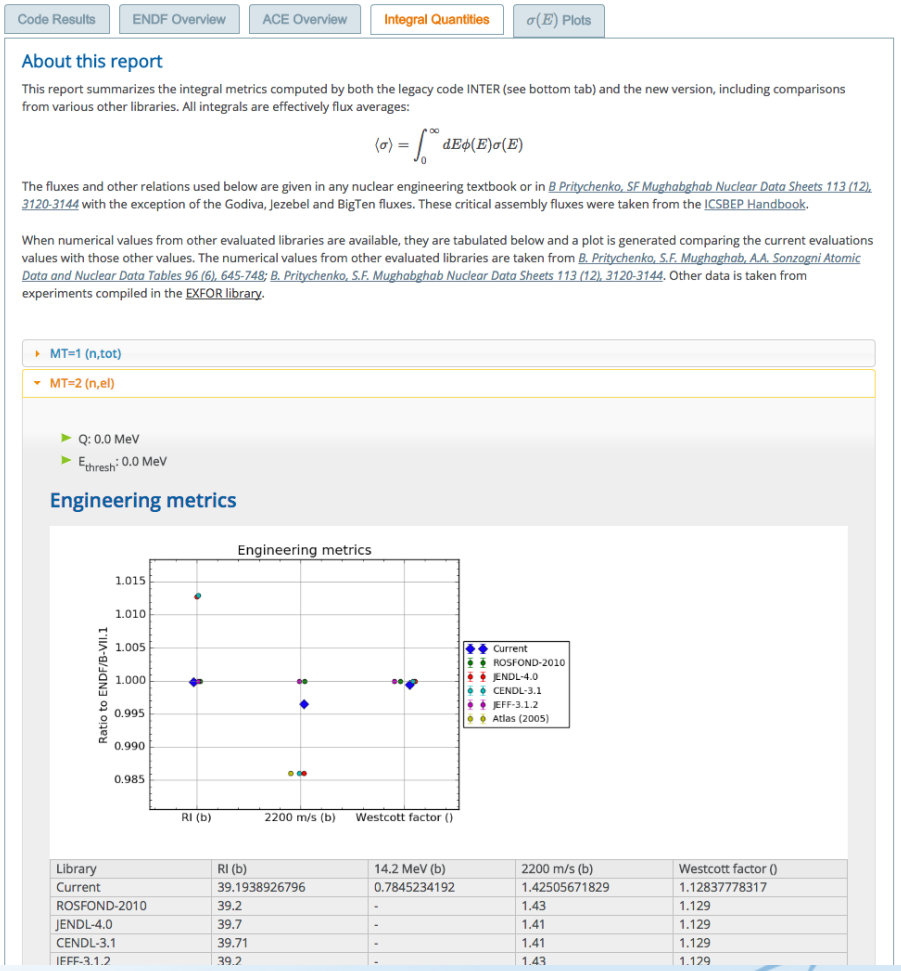
www.nndc.bnl.gov

Reactions tab

The link

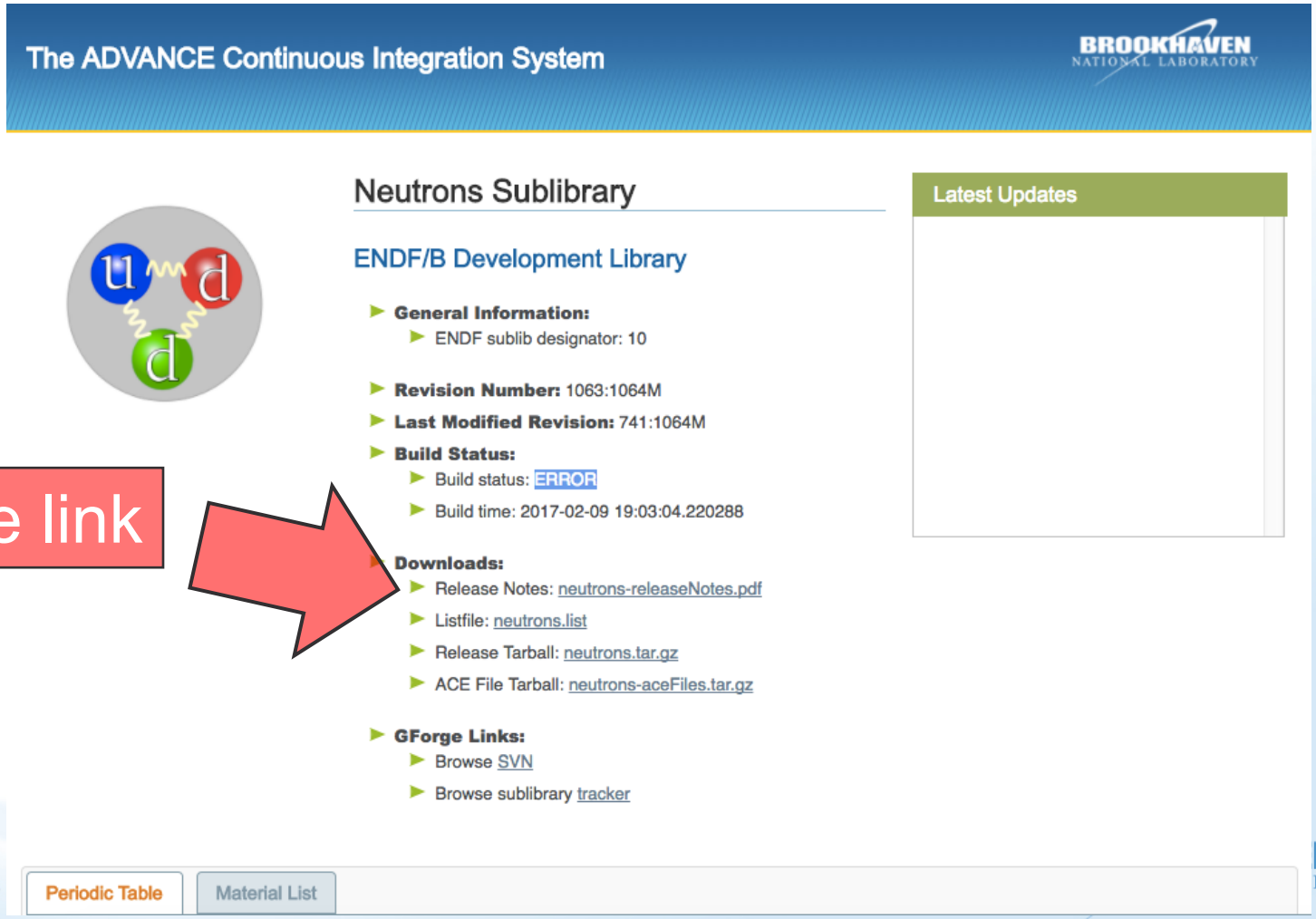
ADVANCE quality assurance system for ENDF

- **On every commit of every evaluation automatically:**
  - Run it through a battery of tests, including customer codes
  - Generate comparison plots
  - Generate HTML report
- **New in FY17:**
  - Update Fudge-4.2.1 add PREPRO/GROUPIE
  - Aesthetic improvements (AJAX & MathJax)
  - Full library ACE file tarballs
  - Per-isotope error reports
  - Covariance and ACE overview
  - Rewrote INTER using FUDGE



Library	RI (b)	14.2 MeV (b)	2200 m/s (b)	Westcott factor ()
Current	39.1938926796	0.7845234192	1.42505671829	1.12837778317
ROSFOND-2010	39.2	-	1.43	1.129
JENDL-4.0	39.7	-	1.41	1.129
CENDL-3.1	39.71	-	1.41	1.129
JEFF-3.1.2	39.2	-	1.43	1.129

To find out detailed lists of problems, go to ADVANCE, find your library's release notes



Many big problems exist that require new evaluations

- See neutron and CSEWG trackers
- Many other cases we can handle...

Common Problems

- ENDF header needs update for ENDF/B-VIII:
  - Mod numbers
  - Dates
  - Directory
  - ...
- This will clean up ~1/2 of all errors reported by processing and checking codes

Atomic Problems

- atomic_relax: LIST records confused, all actinides (FIZCON bug or real issue?)
- photoat: all reactions use two-body kinematics, but not in CM frame (FUDGE bug or real issue?)
- electrons: FUDGE unimplemented something

Charged Particle Problems

- Energy ranges not in sync
- QM, QI problems (electrons included or not?)
- P(μ|E), P(μ,E'|E) not normalized correctly
- Negative probabilities and/or multiplicities

- 1 incorrect MAT assignment (p+9Be)
- 2-body kinematics specified incorrectly (p+d, p+13C)
- Incorrect primary gamma (p+d)
- Discrete levels out of order (d+t)
- d+t uses N-body phase space for MT=51

Decay Problems

- Too many damn isotopes, go look at notes

FPY Problems

- Incorrect MAT assignments
- 241Pu hole in rare earths
- 84mAs doesn’t exist
- IFPY > CFPY for 239Pu

Neutron Problems (1/2)

- Energy ranges not in sync
- QM, QI problems (electrons included or not?)
- P(μ|E), P(μ,E'|E) not normalized correctly
- Negative probabilities and/or multiplicities

- Occasional NaN in PURR tables (NJOY)
- Missing continuum gammas (many instances)
- Stupid punchcard related format errors (58Ni, 60Ni, 16O, 182W)
- Q vs. Ethresh (16O, 93Nb)

Neutron Problems (2/2)

- Outgoing ZA wrong (d, 93Nb, all W)
- Negative RRR width (231Pa)
- Log(0) (124Sn, 122Sn)
- Duplicate E' (many)
- Check fission energy release/fission Q (239Pu, 231Pa, 233Pa, 237U, 239U, 241U)
- Gamma BR (all Hf)
- Sum rules not obeyed (many)
- Elevel in gammas != cross sections (enough to cause heartburn)
- Primary gamma has too much energy (natC, 12C)

Photonuclear Problems

- Energy ranges not in sync
- QM, QI problems (electrons included or not?)
- P(μ|E), P(μ,E'|E) not normalized correctly
- Negative probabilities and/or multiplicities

- Missing nubar and/or LFI incorrect (232Th, 233U, 234U, 236U, 238Pu, 241Pu)
- E' too big (234U, 236U, 238Pu, 241Pu)
- Missing spectra (many)
- Kalbach-Mann parameters off (13C, 14N, 17O, 206Pb, 207Pb)
- 40Ca mass different here
- (g,n) listed as MT=5

TSL Problems

- See next pages

TSL Library Action Item from Nov 2016

- Temperature interpolator for LEAPR module (Python scripts with XML intermediate files drive NJOY/LEAPR); **QUESTION: is it possible to post interpolator on-line? QUESTION: is it possible to release LEAPR inputs for H2O? FIX: Yes, and though BNL in the not to distant future.** NNL need them for licensing
- **ACTION: BNL make system for storing LEAPR inputs associated with ENDF files**

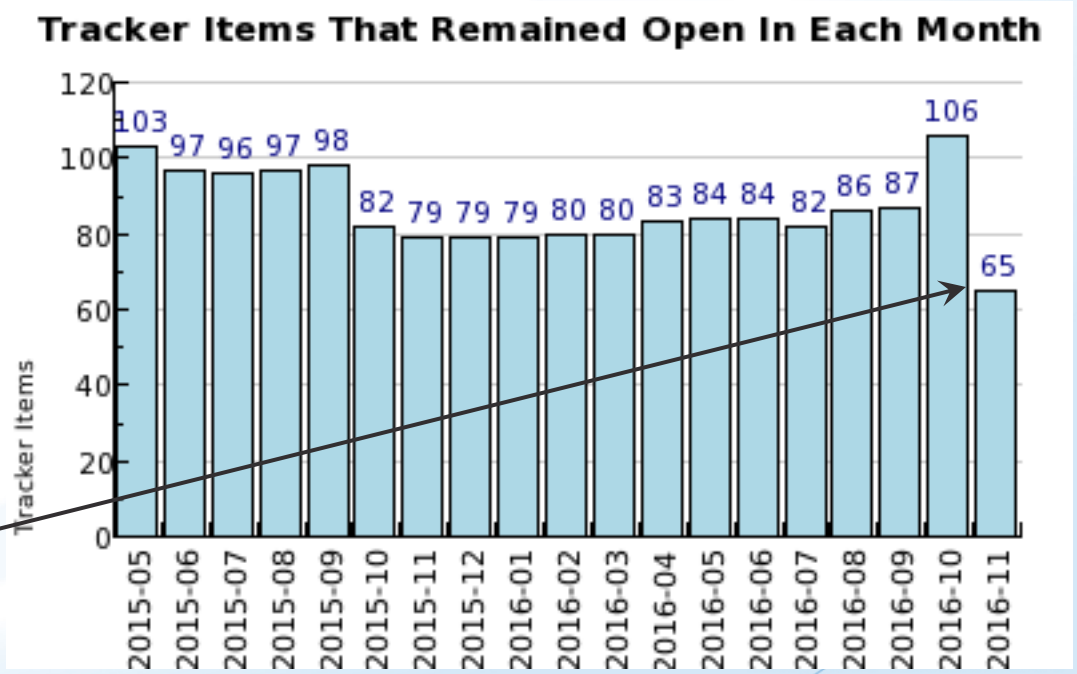
- LEAPR files available for all TSL evaluation except benzene
- Enabled set of checks from I. Marquez-Damien & D. Roubtsov)

TSL checks from (I. Marquez-Damien & D. Roubtsov)

1. Check (if possible, from the documentation and/or LEAPR inputs) if the evaluation is given for a nuclide, element or compound;
2. Compare M0*f0 from MF7/MT4 with the reconstructed value from RECONR/BROADR at 0 K (B(1), B(6) consistency check);
3. Check that MAT corresponds to the new values in ENDF-102, app. C;
4. Check that ZAID follows the new guidelines given in ENDF-102, app. C;
5. Check that the provided LEAPR inputs run in NJOY2016.

ENDF Hackathon© 2016

- **Participants (9/2016):** D. Brown, T. Kawano, S. Mughabghab, G. Nobre, V. Sobes, I. Thompson (remotely)
- **Clean up as many ENDF evaluations as possible using whatever evaluation tools you have**
- **Donuts and coffee provided…**
- **Schedule:**
  - M-Th — kill bugs
  - F — review changes, make sure OK



40% reduction in open trackers

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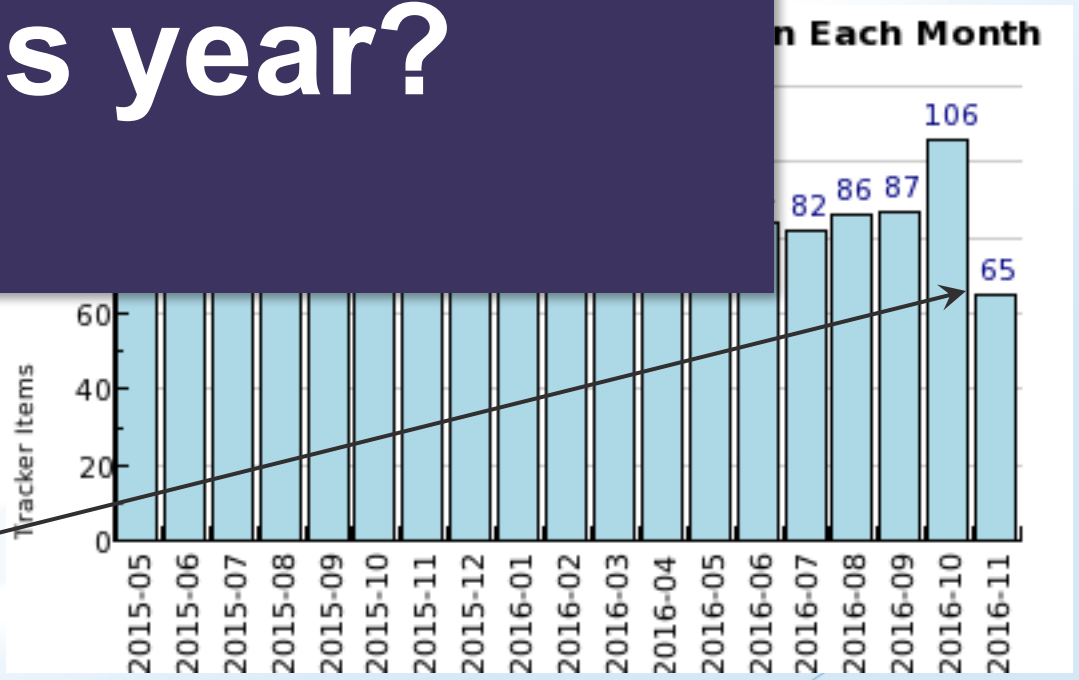
- **Clean** **whate** **le using**
- **Donu** **provi**
- **Sche**
  - M-T
  - F — review changes, make sure OK

Do we need one this year?



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