

Release and Distribution of ENDF/B-VIII.0-Based ACE Files



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ENDF/B-VIII.0

- Released by National Nuclear Data Center (February 2, 2018)
- Many years of work
- International collaboration
- 557 incident neutron materials
- 34 thermal scattering ($S(\alpha, \beta)$) materials

<https://www.nndc.bnl.gov/endl/b8.0/>

D.A. Brown et al. “ENDF/B-VIII.0: The 8th Major Release of the Nuclear Reaction Data Library with CIELO-project Cross Sections, New Standards and Thermal Scattering Data”. In: *Nuclear Data Sheets* 148 (2018). Special Issue on Nuclear Reaction Data, pp. 1–142. ISSN: 0090-3752

Format Changes in ENDF

- Tabulated fission energy release (MF=1, MT=458)
- $P(\nu|E)$ for fission neutrons (MF=6)
- Provision for sub-actinide fission (MF=8, MF=10)

Updates to NJOY2016 for ENDF/B-VIII.0

- Updates to handle format changes

<https://github.com/njoy/NJOY2016/issues>

- HEATR to include data from tabulated fission energy release
- ACER for plot generation and thermal scattering data formatting
- ERRORR for covariance processing
- LEAPR for generating thermal scattering data
- PURR for unresolved resonance probability tables
- THERMR for thermal scattering data

ENDF/B-VIII.0-Based ACE Data Libraries

Lib80x—continuous-energy incident neutron

- 556 different materials (MCNP can't do neutron-neutron calculations)
- 7 different temperatures
 - 293.6 K, 600 K, 900 K, 1200 K, 2500 K, 0.1 K, 250 K

ENDF80SaB—thermal scattering, continuous representation

- 33 different materials
- All temperatures on evaluation file

Processed with NJOY2016.35

<https://www.njoy21.io/NJOY2016>

Temperatures and extensions for ZAIDs and SZAIDs in Lib80x

Temperature (K)	ZAID Extension	SZAID Extension
293.6	.00c	.800c
600	.01c	.801c
900	.02c	.802c
1200	.03c	.803c
2500	.04c	.804c
0.1	.05c	.805c
250	.06c	.806c

Materials in the thermal scattering ACE library, ENDF80SaB

- blue = new data
 - red = renamed ZAID
 - 293.6 K (if exists) has .80t extension
- | | | |
|----------|----------|----------|
| • al-27 | • h-ice | • orthoH |
| • be-beo | • h-luci | • o-uo2 |
| • be-met | • h-poly | • paraD |
| • benz | • h-yh2 | • paraH |
| • c-sic | • h-zrh | • sio2 |
| • d-d2o | • lmeth | • si-sic |
| • fe-56 | • n-un | • smeth |
| • grph10 | • o-beo | • u-un |
| • grph30 | • o-d2o | • u-uo2 |
| • grph | • o-ice | • y-yh2 |
| • h-h2o | • orthoD | • zr-zrh |

Verification and Validation of ACE Data Libraries

`checkace`—suite of programs used to perform simple checks on ACE files

- Many problems reported by `checkace` were fixed prior to ENDF/B-VIII.0 final
- Several evaluations with negative KERMA/heating values:

– ^{94}Mo

– ^{96}Mo

– ^{97}Mo

– ^{98}Mo

– $^{119m1}\text{Ag}$

– $^{131m1}\text{Te}$

– $^{132m1}\text{I}$

– $^{137m1}\text{Cs}$

– ^{168}Yb

– ^{170}Yb

– ^{171}Yb

– ^{172}Yb

– ^{173}Yb

– ^{174}Yb

– ^{176}Yb

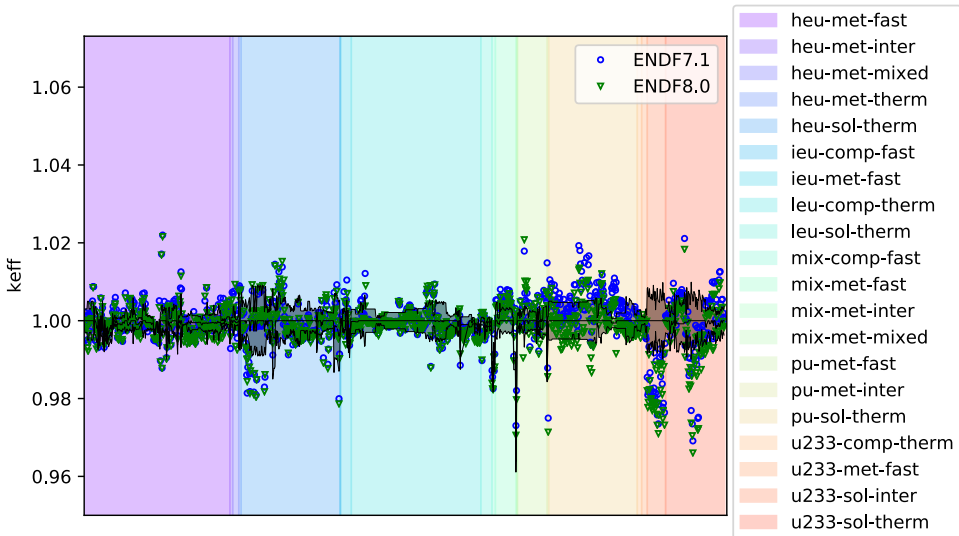
– $^{194m1}\text{Ir}$

– $^{197m1}\text{Hg}$

– ^{208}Po

- NJOY21016.35 (update to PURR) fixed millions of issues with probability tables

keff Benchmark Results



Distribution of ACE Data Libraries

Download

<https://nucleardata.lanl.gov>

1. `Lib80x.tgz` or `Lib80x.zip`
 - 1.1 Verify checksum
2. Decompress tarball
`tar -xzvf Lib80x.tgz`
3. Copy data to `$DATAPATH`
`mv Lib80x/Lib80x $DATAPATH`
4. Add entries to `xmdir_MCNP6.2`

File structure:

```
Lib80x/  
  Lib80x/  
  docs/  
  xmdir  
  xmdir_2.0
```

<https://nucleardata.lanl.gov/ACE/install.html>

Known Issues with ENDF_{SaB}—Thermal Scattering ACE Library

- Inelastic cross section is too small by factor of 6 in SiO₂
 - Used wrong value of NMIX when processing
- 10 % and 30 % got mixed up in final preparation
- Issues have been resolved
- Preparing updated release of thermal scattering ACE files

Conclusion

- ENDF/B-VIII.0 released by NNDC, February 2, 2018
- NJOY updated to:
 - Handle new data formats
 - Fix bugs and inconsistencies
- Neutron and Thermal Scattering sublibraries processed by NJOY2016.35
- Lib80x and ENDF80SaB ACE Libraries
- ACE libraries available to download *today*¹ from:
<https://nucleardata.lanl.gov>

¹Fix for thermal scattering coming soon.