



State of EMPIRE

Mike Herman
National Nuclear Data Center
Brookhaven National Laboratory

mwherman@bnl.gov

Recent development

- Six ejectiles (n, p, alpha, g, d, t, ^3He) + arbitrary light ion; includes ENDF-6 formatting (Capote, Trkov)
- Inclusion of RIPL-3 combinatorial level densities with parity dependence
- Further extension of the resonance module
 - adjustment of capture, elastic and fission uncertainties to reproduce thermal uncertainties using anticorrelations
 - inclusion of arbitrary correlations among gamma-widths and among neutron-widths
- Upgrade of ZVView package - 2-D and 3-D plotting of covariance matrices (Zerkin)
- Working towards EMPIRE-3.0 release

Resonance module (scat. radius uncertainty)

(Young-Sik Cho)

File Input Outputs Help

Input Execute

ZA: 25055 MAT: 2525 Reload Scattering radius

s-wave p-wave d-wave Level density parameter

SF: 4.20e-04 3.10e-05 0.00e+00 Strength function for s-wave

Gg: 750.00 400.00 0.00 Strength function for p-wave

D : 2420.00 spin cut-off : 2.83 Strength function for d-wave

Resolved region

E_{max} : 207700. R' : 4.50 0.40

G_{n0}_cut: Gn1_cut:

Unresolved region

a l.d.p. : 6.88 gPower : 2.5

E_{max} : 225948.992 energies: 30

☐ Energy dependent D and neutron width for s-wave

☐ Energy dependent D and gamma width for p-wave

☐ Energy dependent D and gamma width for d-wave

s-wave average capture width

p-wave average capture width

Atlas of Neutron Resonances

Edit resonance parameters

Resonance module (parameter correlations)

(Young-Sik Cho)

File Input Outputs Help

Input Execute

Evaluation

☐ All codes

☐ PTANAL

☐ WRIURR

☐ RECENT/
SIGMA

Run codes

Analysis

Cumulative plot

Porter-Thomas analysis

ENDF

Comparison

☐ ENDF/B-VII ☐ JENDL-3.3 ☐ JEFF-3.1

Total Scattering Capture

Uncertainty calc.

No. of resonances to be varied: 10 ☐ All codes Run codes

No. of additional resonances held fixed: 5 ☐ Sensitivity

No. of resonances to write out: 3 ☐ KALMAN Parameter unc.

Reaction to be considered in KALMAN: ☐ None ☐ 1 ☐ 2 ☐ 18 ☐ 102 ☒ All

Correlations of GnGn: 0.0 GgGg: 0.0 No. of res.: 9999 Save cov.

Working towards EMPIRE-3.0 release (C. Mattoon)

- Scripts modified to allow running EMPIRE in an arbitrary directory - step towards parallelization
- Simplified installation (modernized Makefile)
- More user friendly GUI
- several Bash scripts ported to Python (error checking)
- Python modules for manipulation of ENDF files
 - functions for reading/writing ENDF sections (search & replace)
 - classes for dealing with MF=31, 32, 33, and 35
 - classes for working with multi-group cross sections and covariances from NJOY and PUFF

$^{55}\text{Mn}(n,\text{inl})$

In theory we trust!

Cross sections

