CSWEG Meeting on ENDF/B-VII Validation,
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Fission Product Evaluations

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WPEC SG21: Review FP Evaluations, 2001-2004

Summary of recommendations for 218 materials (Z = 31 – 68) →

ENDF/B-VI.8 contains 196 FP evaluations, often ~30 years old

Library (Data Source)	Full File	Resonance Region	Fast Region
ENDF/B-VI	1	18	13
PreENDF/B-VII	27	-	2
JEFF-3.0	1	-	-
JENDL-3.3	44	7	66
CENDL-3	10	-	27
BROND-2	1	1	1
New BNL-325	-	109	-
EMPIRE	-	-	25
Total 218 files	84	134	134

WPEC SG23: Creation of FP Library, 2004 - 2006

Membership (5 projects, 14 members)

- **Chairman** Oblozinsky, ENDF project
- **Monitor** Jacqmin, JEFF project
- **ENDF** Dunford, Herman, Mughabghab (BNL), Dunn (ORNL)
- **JEFF** Dean (Winfrith), Trkov (IAEA)
- **JENDL** Nakagawa and Shibata (JAERI)
- **BROND** Ignatyuk and Pronyaev (IPPE)
- **CENDL** Ge Zhigang and Chen Guochang (CNDC)

Goals

- **Create library based on SG21 recommendations for 218 FPs**
- **Perform partial validation of the library**

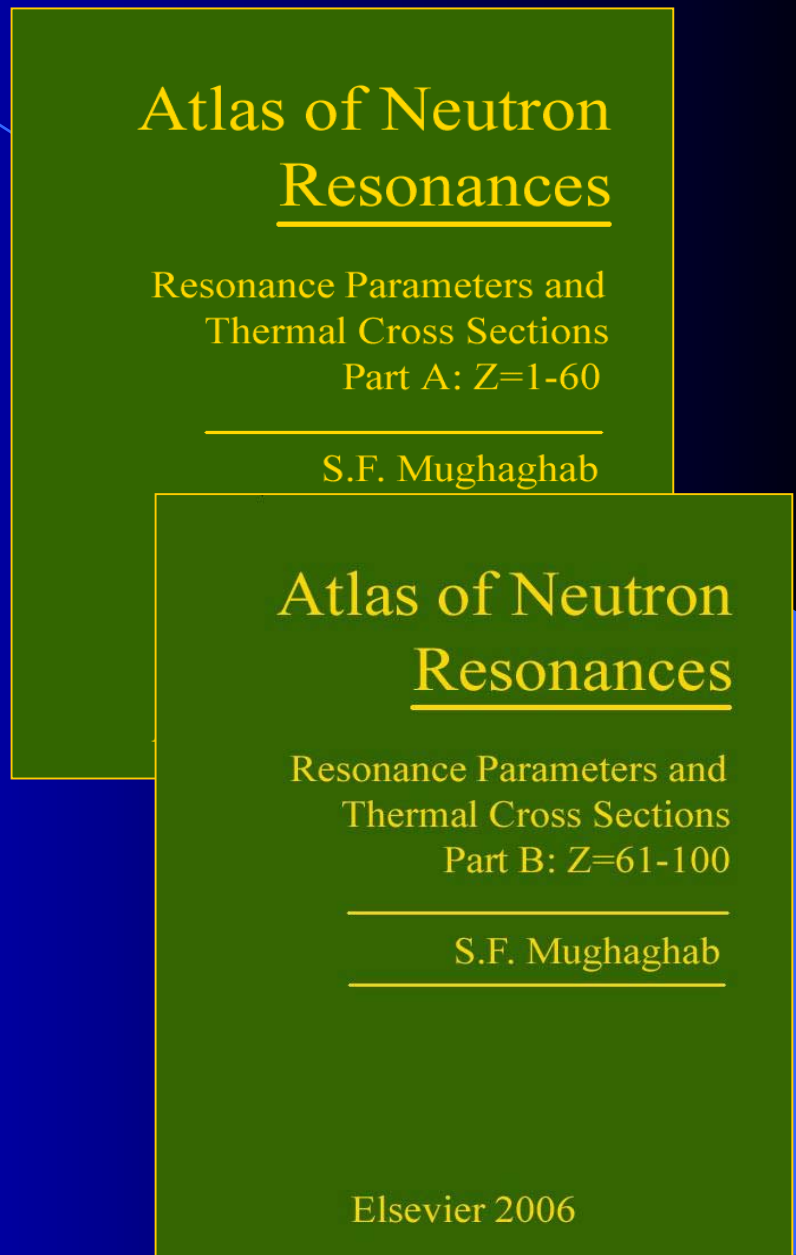
Atlas of Neutron Resonances

5-th issue of BNL-325
Neutron resonance parameters
Thermal cross-sections
Average resonance parameters
Z = 1 – 100

Contract with Elsevier signed
Submit by August 15, 2005
Publish early 2006

FP region: 177 materials ok,
41 materials no resonance data

ENDF-6 files given to SG23 as needed
URR in selected cases only



SG23 Library: Procedures

Convert files recommended for fast region into SG23 style

- Marked as ENDF/B-VII, to be changed once NLIB for SG23 Library will be given
- Standard SG23 text added
- Comments on fixes added

Insert resonance parameters

- None – if full file was recommended
- Take from specific file – if it was recommended
- Take from Atlas of Neutron Resonances – if new BNL-325 was recommended
- URR taken from the file recommended for the fast region

SG23 Library: Procedures

Perform data verification

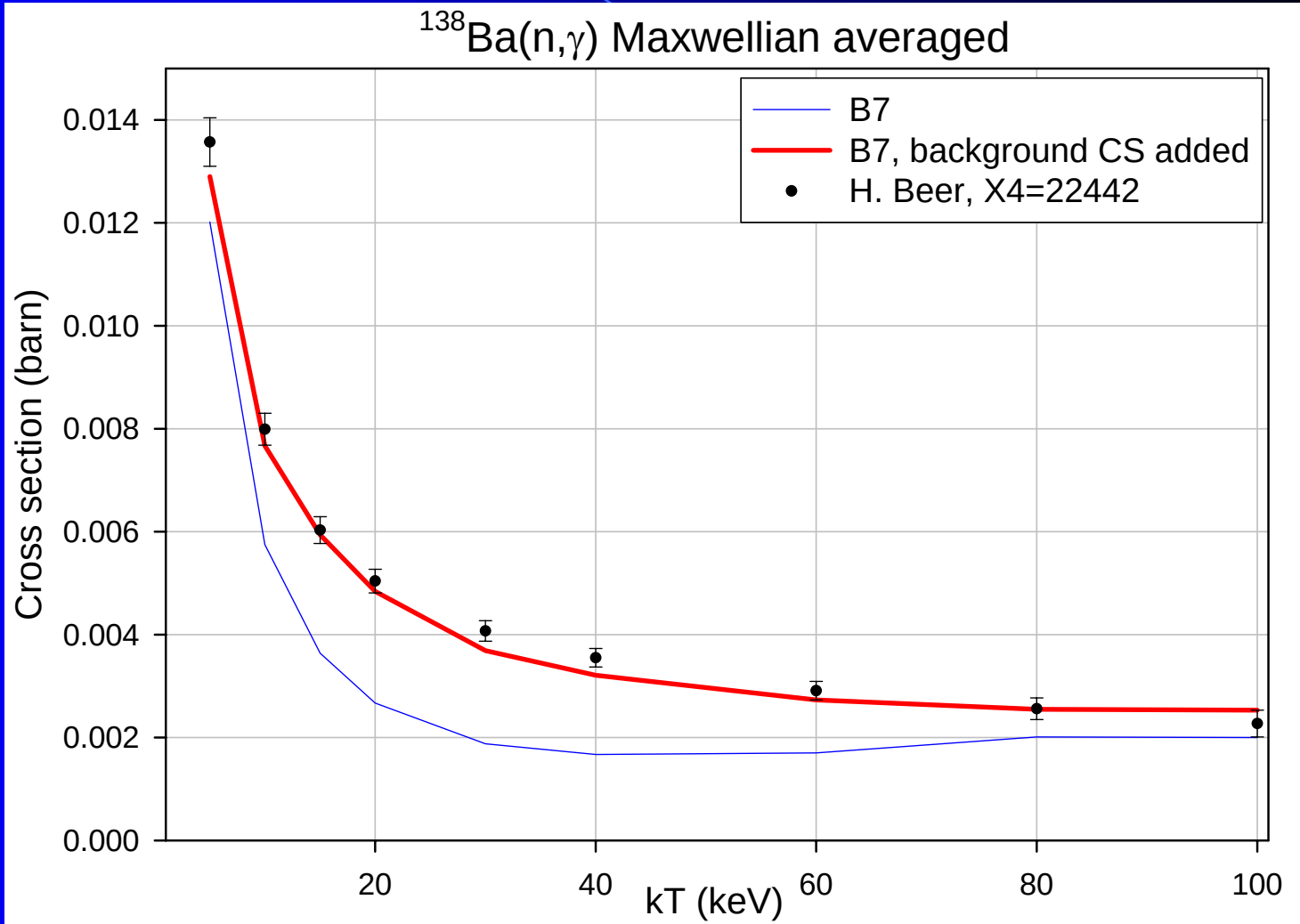
- Correct all errors (CHECKR, FIZCON, PSYCHE) → no format errors, all SG23 files (164 files so far) are clean!
- Run NJOY (ok for 139 materials, problems with remaining files)
- Run simple MCNP test (Godiva, FP as impurity, partly done)

Review files

- Check thermal and resonance data, perform statistical analysis
  - Done for 164 files by V. Pronyaev, June 2005
  - 116 files ok
  - 43 files corrected by Pronyaev & Mughabghab
  - 5 remaining files corrected by Nakagawa, July 2005
- Check cross section plots in fast region
  - No obvious problems

SG23 Library: Procedures

Example of correction done by V. Pronyaev in June 2005



FP Library: Status of 218 files

164 materials labeled as SG23

Merged, checked, reviewed and revised

164 files ok now

NJOY problem for 25 files

29 materials labeled as Pre-ENDF/B-VII

5 isotopes of Ge (BNL-JAERI) revised and ok

5 isotopes of Dy (KAERI) some deficiencies, accept in current form

2 isotopes of Gd (BNL-KAERI) under revision → ^{155,157}Gd covariances

17 materials (BNL-KAERI) under revision

25 materials labeled as Empire

MF2 data available (9 new with RRR, 16 from current files with no RRR)

Preliminary Empire calculations performed

Blue = full files (60 materials) **Black = merged files (104)**
Red = Pre-ENDF/B-VII (29) **Green = Empire (25)**

31-Ga- 69, 71
32-Ge- 70, 72, 73, 74, 76 → New evaluations for MCNP users
33-As- 75
34-Se- 74, 76, 77, 78, 79, 80, 82
35-Br- 79, 81
36-Kr- 78, 80, 82, 83, 84, 85, 86
37-Rb- 85, 86, 87
38-Sr- 84, 86, 87, 88, 89, 90
39-Y - 89, 90, 91
40-Zr- 90, 91, 92, 93, 94, 95, 96 → Could replace files in ENDF/B-VII b0
41-Nb- 93, 94, 95
42-Mo- 92, 94, 95, 96, 97, 98, 99, 100
43-Tc- 99
44-Ru- 96, 98, 99, 100, 101, 102, 103, 104, 105, 106
45-Rh-103, 105
46-Pd-102, 104, 105, 106, 107, 108, 110
47-Ag-107, 109, 110m, 111
48-Cd-106, 108, 110, 111, 112, 113, 114, 115m, 116
49-In-113, 115
50-Sn-112, 113, 114, 115, 116, 117, 118, 119, 120, 122, 123, 124, 125, 126

Blue = full files (60 materials) **Black = merged files (104)**
Red = Pre-ENDF/B-VII (29) **Green = Empire (25)**

51-Sb-121, 123, 124, 125, 126
52-Te-120, 122, 123, 124, 125, 126, 127m, 128, 129m, 130, 132
53-I -127, 129, 130, 131, 135
54-Xe-123, 124, 126, 128, 129, 130, 131, 132, 133, 134, 135, 136
55-Cs-133, 134, 135, 136, 137
56-Ba-130, 132, 133, 134, 135, 136, 137, 138, 140
57-La-138, 139, 140
58-Ce-136, 138, 139, 140, 141, 142, 143, 144
59-Pr-141, 142, 143
60-Nd-142, 143, 144, 145, 146, 147, 148, 150
61-Pm-147, 148, 148m, 149, 151
62-Sm-144, 147, 148, 149, 150, 151, 152, 153, 154
63-Eu-151, 152, 153, 154, 155, 156, 157
64-Gd-152, 153, 154, 155, 156, 157, 158, 160 → Covariance data
65-Tb-159, 160
66-Dy-156, 158, 160, 161, 162, 163, 164
67-Ho-165, 166m
68-Er-162, 164, 166, 167, 168, 170

Conclusions

Goal:
Prepare all 218 FPs for possible inclusion into ENDF/B-VII beta1

To-do-list is formidable:

1. **Revise 19 materials evaluated by BNL-KAERI (partly done)**
2. **Complete 25 materials with Empire**
3. **Look into Gd isotopes (covariances)**
4. **Check thermal capture, RI with Atlas of Neutron Resonances**
5. **Complete documentation (MT=451)**
6. **Run NJOY (patch for JENDL files needed)**
7. **Run MCNP**