Zr data:
New capabilities and future needs

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Zirconium problem

- ❑ **Zr evaluations in ENDF/B-VIIb2**
  - ▪ **^{90}Zr (51%)**: BROND-2 + bound resonance => SG23 => ENDF/B-VIIb2
  - ▪ **Other Zr's**: Atlas+JENDL-3.3 or JENDL-3.3
- ❑ **Problem**: thermal reactor reactivity reduced compared to ENDF/B-VI.8
- ❑ **C. Lubitz**, mini-CSWEG on ENDF/B-VIIb2 validation, BNL, June 2006: "KAPL opinion is that in thermal reactors, some adjustments to SG23 zirconium cross section would be beneficial".
  - ▪ **RR**: no room for improvement
 - ▪ **Sensitivity studies at KAPL**: Increase in elastic cross section provides increase in reactivity!

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^{90}Zr elastic x-section comparison

ENDF/B-VI.8

ENDF/B-VIIb2
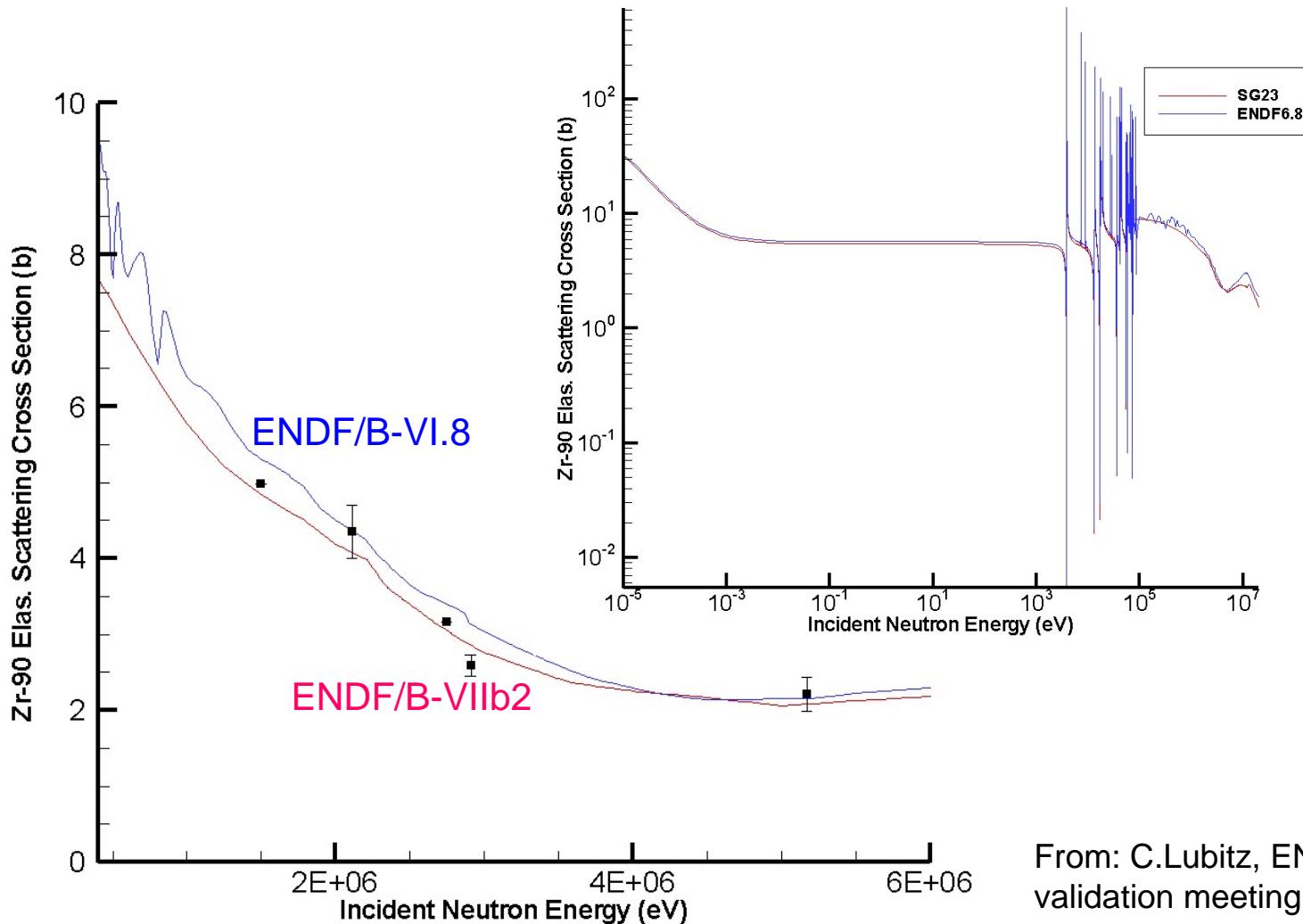
From: C.Lubitz, ENDF/B-VIb2
validation meeting, BNL, June 2006

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BNL evaluation capacity

Resonance Region
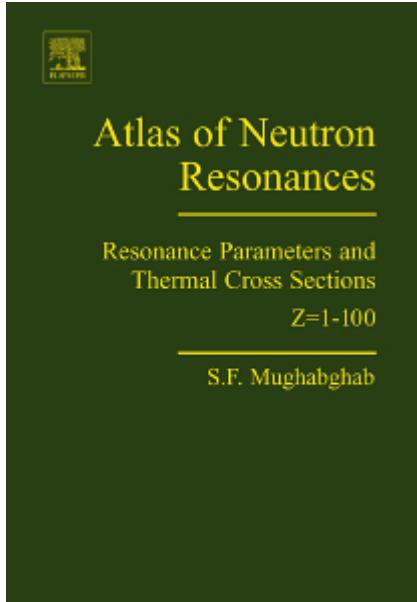
Atlas of Neutron Resonances

Resonance Parameters and
Thermal Cross Sections
Z=1-100

S.F. Mughabghab

Fast Neutron Region

EMPIRE

Nuclear Reaction Model Code

Version 2.19 (Lodi)

^{90}Zr

- Resolved Resonance region: beta2 = Atlas

- Fast neutron range: re-evaluate with EMPIRE-code

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AFC Workshop, Bethesda
August 10-12, 2006

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Preliminary results (elastic)

90-Zr(n,elastic)

Legend:
- Yamamura
- beta2
- Capote-CC
- Igarasi65
- Wilmore-Hodgson
- Igarasi66
- Smith
- 1977 Mc Daniel
- 1976 Stooksberry
- 1974 Mcdaniel
- 1973 Wilson

Y-axis: Cross Section (barns)
X-axis: Incident Neutron Energy (MeV)

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Preliminary results (elastic)

90-Zr(n,γ)
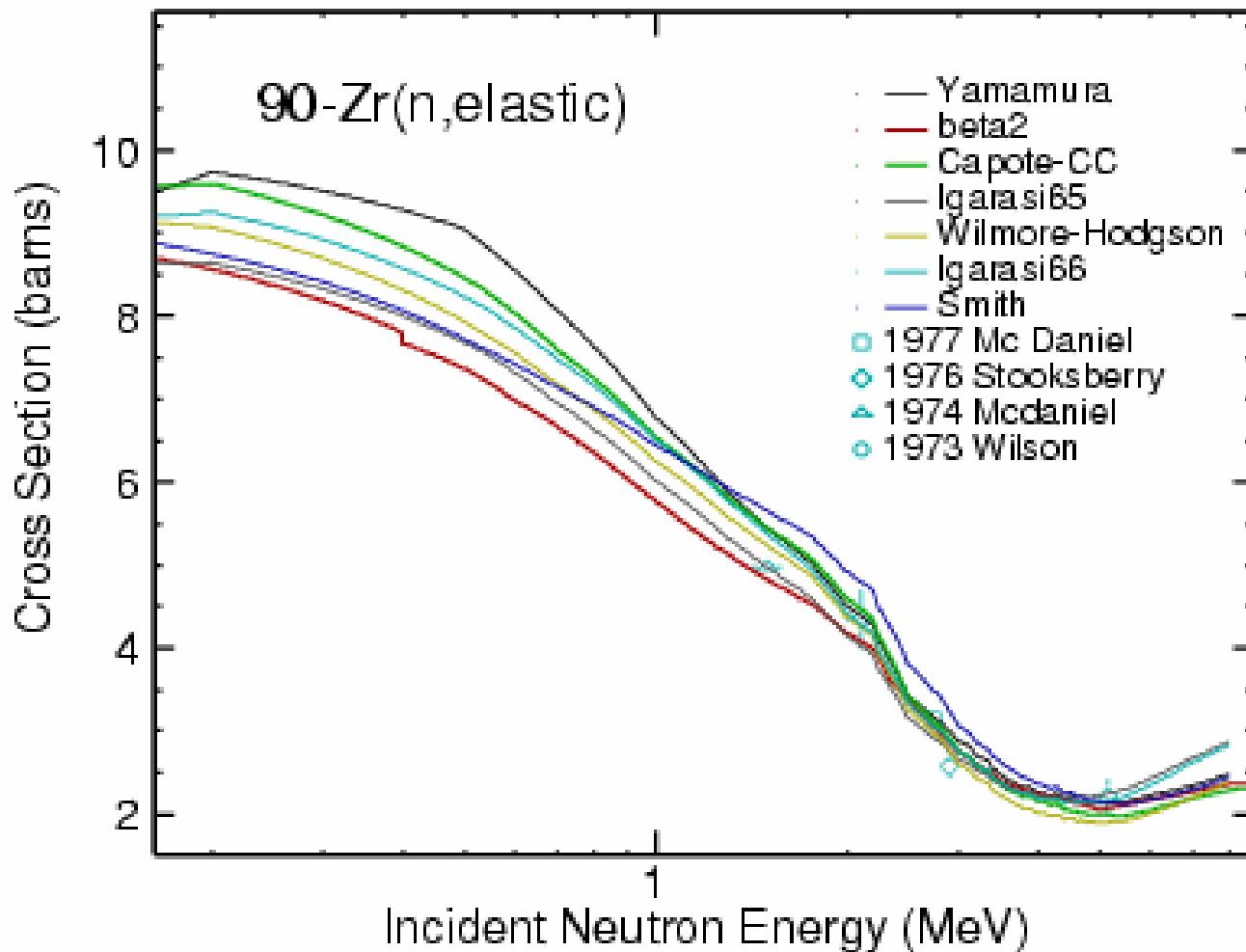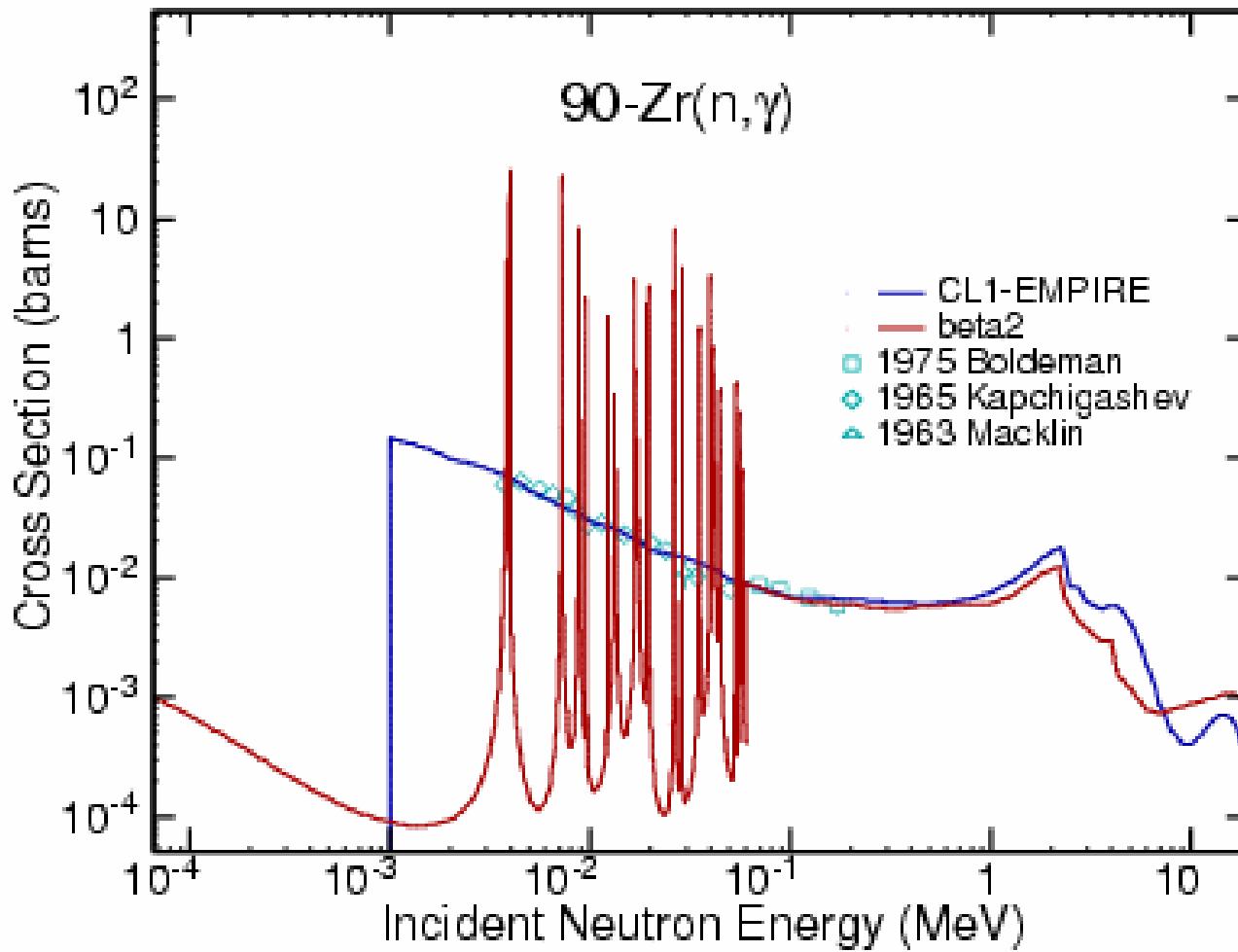
Conclusions

❑ New capabilities:

- Integrated system, providing comprehensive nuclear reaction modeling, allows prompt response to users needs
- Cross section covariance capabilities

❑ Future needs:

- Selection and adjustment of model parameters is the most time consuming part of the evaluation process. Input parameter libraries need continues maintenance, validation and improvement. The basic physics would also benefit from such an effort.
- QA is needed for experimental data library (CSISRS/EXFOR)

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Cross Section Perturbation Study, II (continued)

The Reactivity Effect of Perturbations to ^{90}Zr for Three Benchmark Models
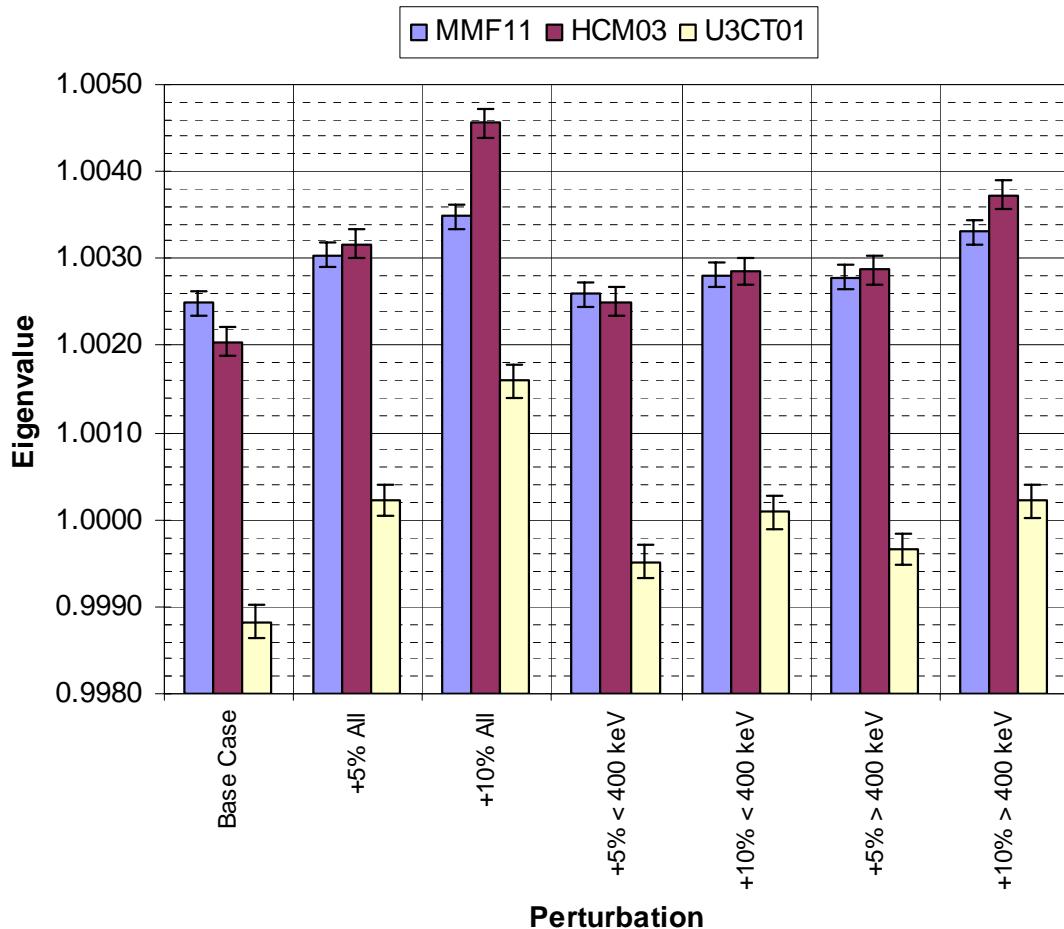
| | Increase in Reactivity for Model | | |
Perturbation	MMF11	HCM03	U3CT01
+5% All	0.00055	0.00112	0.00140
+10% All	0.00100	0.00252	0.00278
+5% < 400 keV	0.00010	0.00046	0.00070
+10% < 400 keV	0.00033	0.00081	0.00127
+5% > 400 keV	0.00030	0.00083	0.00084
+10% > 400 keV	0.00082	0.00168	0.00139

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