

Worths of Thermal Reactor Fission Products

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- NEA Burnup Credit Benchmark
Phase 1B Case A

NEA/NSC/DOC(96)-06

ORNL-6901

3.1% U5 PWR PINCELL

WIMS7 burnup to 27.35 GWD/te

Produces number densities A_N

- WIMS7 -CLEAN 14×14 CLUSTER
(Calvert Cliffs)-XMAS 172 Group
Library

$$\phi_g, \quad \phi_g^*$$

Worths of Thermal Reactor Fission Products

- XMAS Library has 82 Fission Products giving 99% Absorption
in PWR (to 60Gwd/te)
+AGR(28Gwd/te)
with UO_2 +MOX fuel -N
- XMAS library has JEF2.2 data but not JENDL3.2

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JEFPCV2 prototype has 172 group data for JEF2.2 + JENDL3.2

$$\sigma_g^N$$

- EXCEL spread sheet to form Nuclide Worths for JEF2.2 and JENDL3.2

$$W_N = A_N \sum_{g=1}^{172} \sigma_g^N \phi_g \phi_g^*$$

- Sum Worths

$$W(\text{library}) = \sum_{\text{Nuclides}} W_N(\text{library})$$

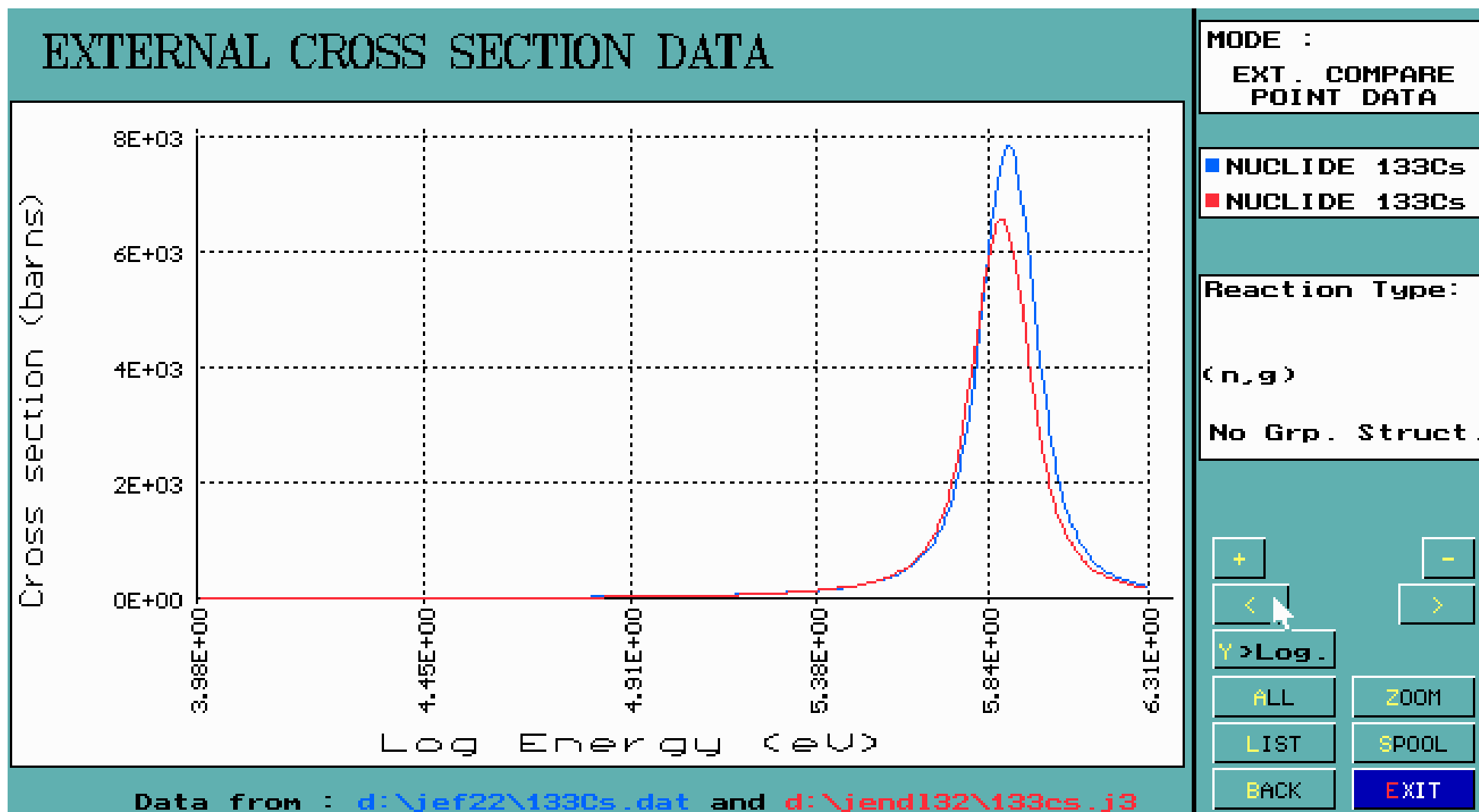
JEF/DOC-730

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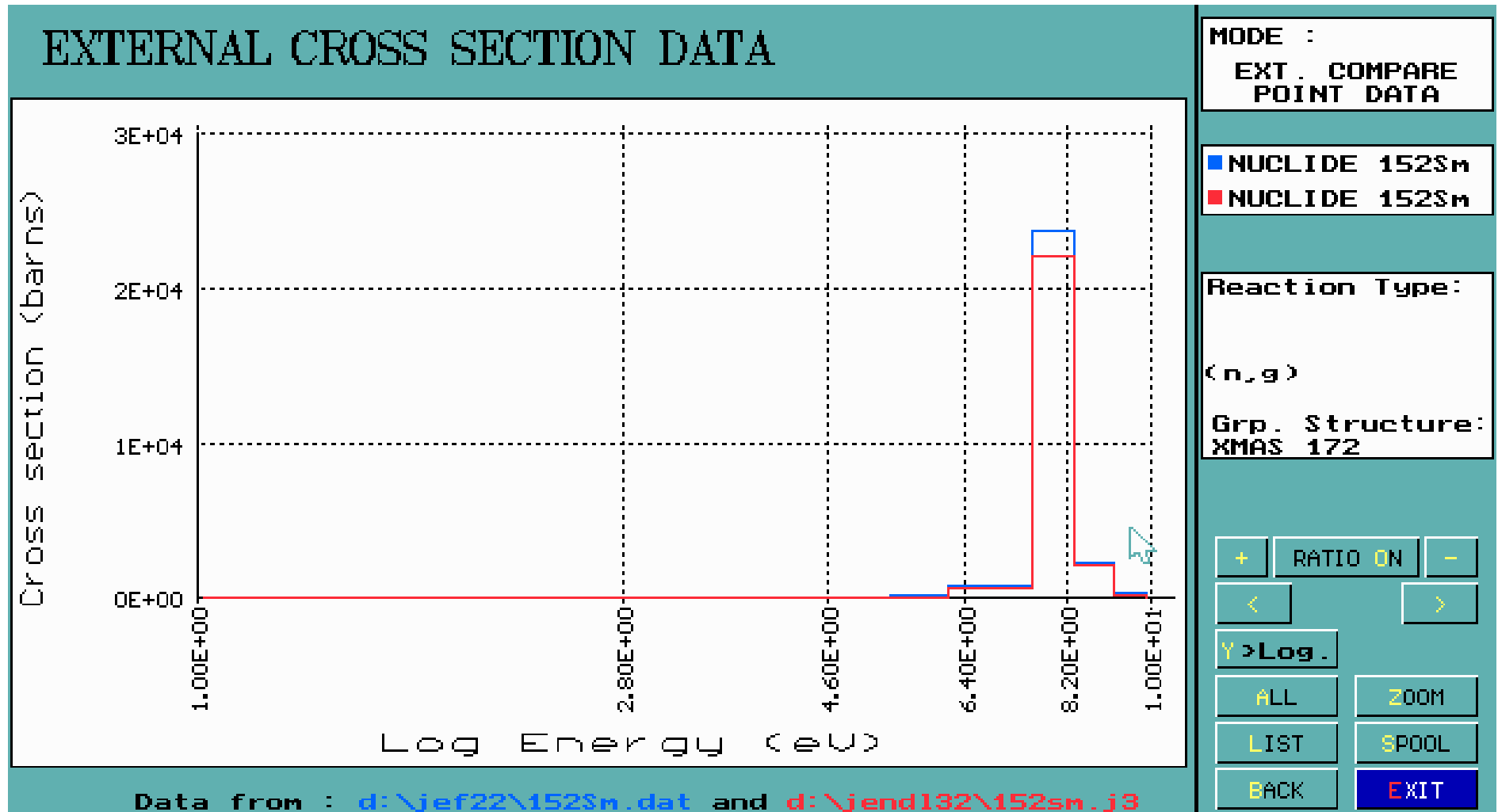
Nuclide	JEF2.2		JENDL3.2		$\Delta\%$
Rh103fp	5.362E-06	14.14%	5.396E-06	14.13%	-0.63
Nd143fp	4.775E-06	12.60%	4.790E-06	12.55%	-0.31
Sm149fp	3.639E-06	9.60%	3.546E-06	9.29%	2.55
Cs133fp	2.880E-06	7.60%	2.651E-06	6.94%	7.95
Xe131fp	2.784E-06	7.34%	2.807E-06	7.35%	-0.83
Sm152fp	1.879E-06	4.96%	1.775E-06	4.65%	5.55
Tc99fp	1.841E-06	4.86%	1.871E-06	4.90%	-1.66
Sm151fp	1.823E-06	4.81%	1.816E-06	4.76%	0.40
Gd155fp	1.609E-06	4.24%	1.609E-06	4.21%	0.01
Nd145fp	1.196E-06	3.15%	1.139E-06	2.98%	4.72
Sm147fp	1.194E-06	3.15%	1.170E-06	3.06%	2.01
Eu153fp	1.156E-06	3.05%	1.207E-06	3.16%	-4.38
Mo95fp	9.273E-07	2.45%	9.764E-07	2.56%	-5.29
Ag109fp	7.341E-07	1.94%	7.325E-07	1.92%	0.21
Sm150fp	6.937E-07	1.83%	6.871E-07	1.80%	0.95
Ru101fp	6.841E-07	1.80%	6.136E-07	1.61%	10.31
Sub-Total	3.318E-05	87.51%	3.279E-05	85.88%	1.18

Total	3.791E-05	-	3.818E-05	-	-0.70
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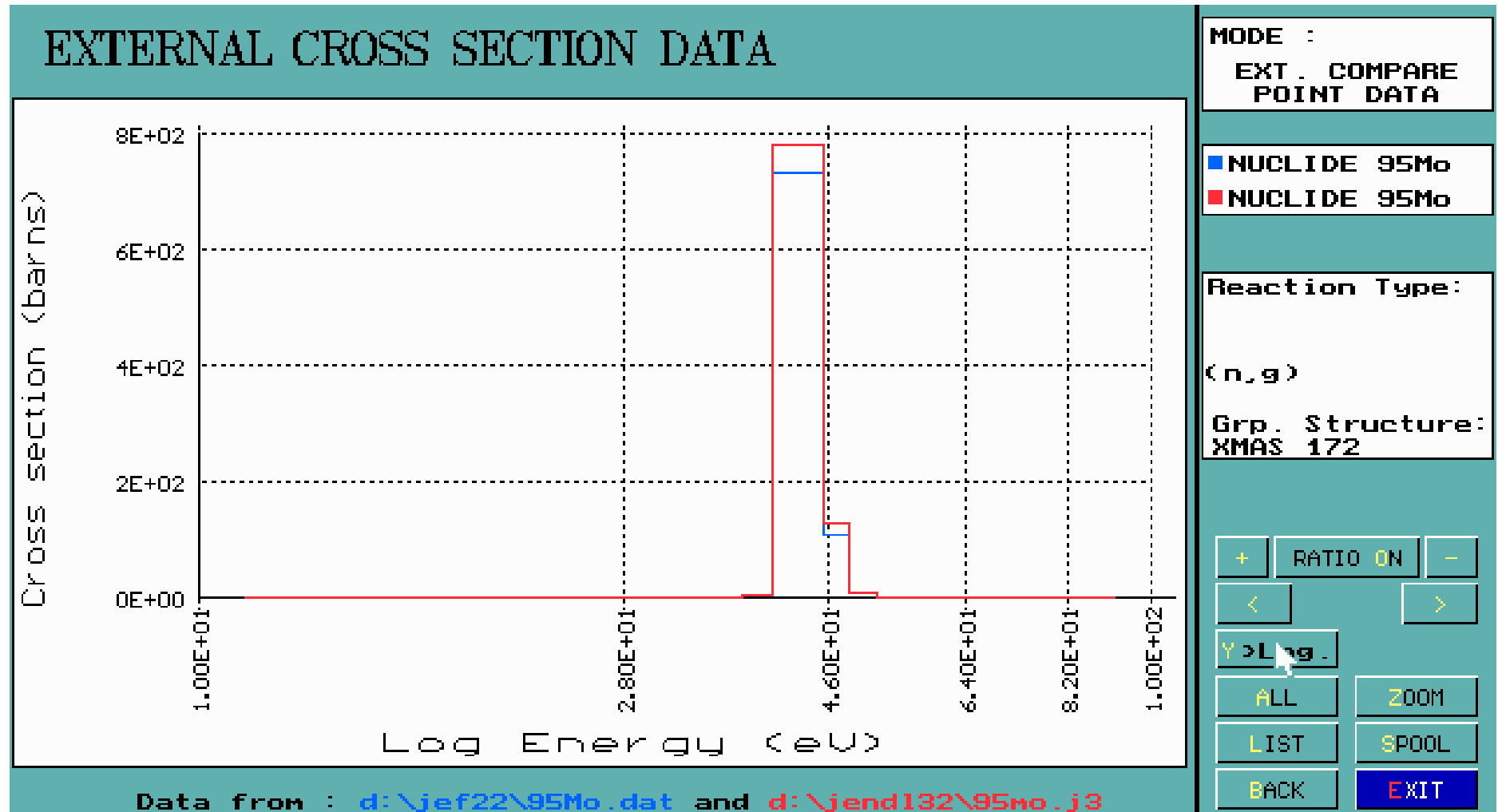
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Conclusions

- The difference in thermal fission product worth between JEF2.2 and JENDL3.2 is less than 1% of total fission product worth.
- Among the 12 fission products studied in CERES, 3 have differences in worth of more than 5% between JEF2.2 and JENDL3.2.
- Changes in the most thermal resonance seem to be responsible.
- Cs133 fission product data should be taken from JENDL3.2
- Sm152 fission product data should be taken from JEF2.2
- Mo95 fission product data should be taken from JEF2.2
- The difference in Eu153 data needs study in view of its use as a neutron absorber.