



Evaluation work at BNL : Resonance and fast neutron regions

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Evaluation at BNL: Resonance Region

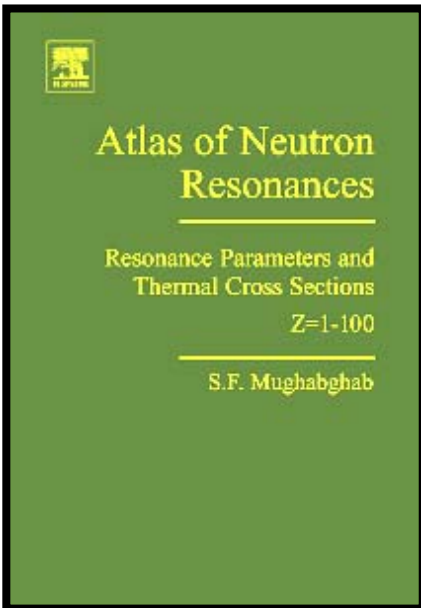
Atlas of Neutron Resonances

S.F. Mughabghab

National Nuclear Data Center, Brookhaven National Laboratory

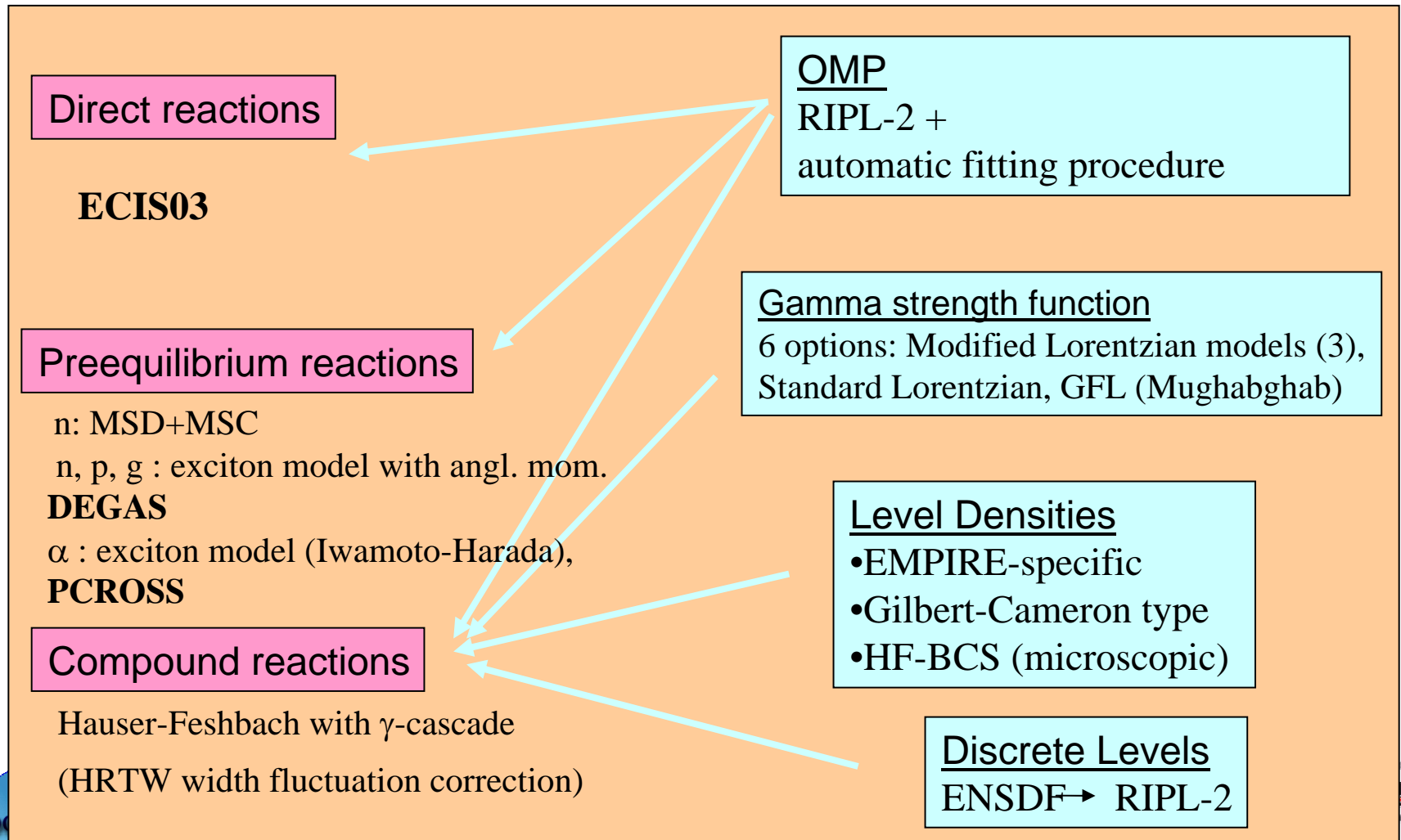
**All BNL evaluations for the
resonance
region were derived from the new
BNL-325**

- 98 elements
- 476 isotopes
- Thermal cross sections
- Resonance parameters in MLBW and RM



Evaluation at BNL: Fast Neutron Region

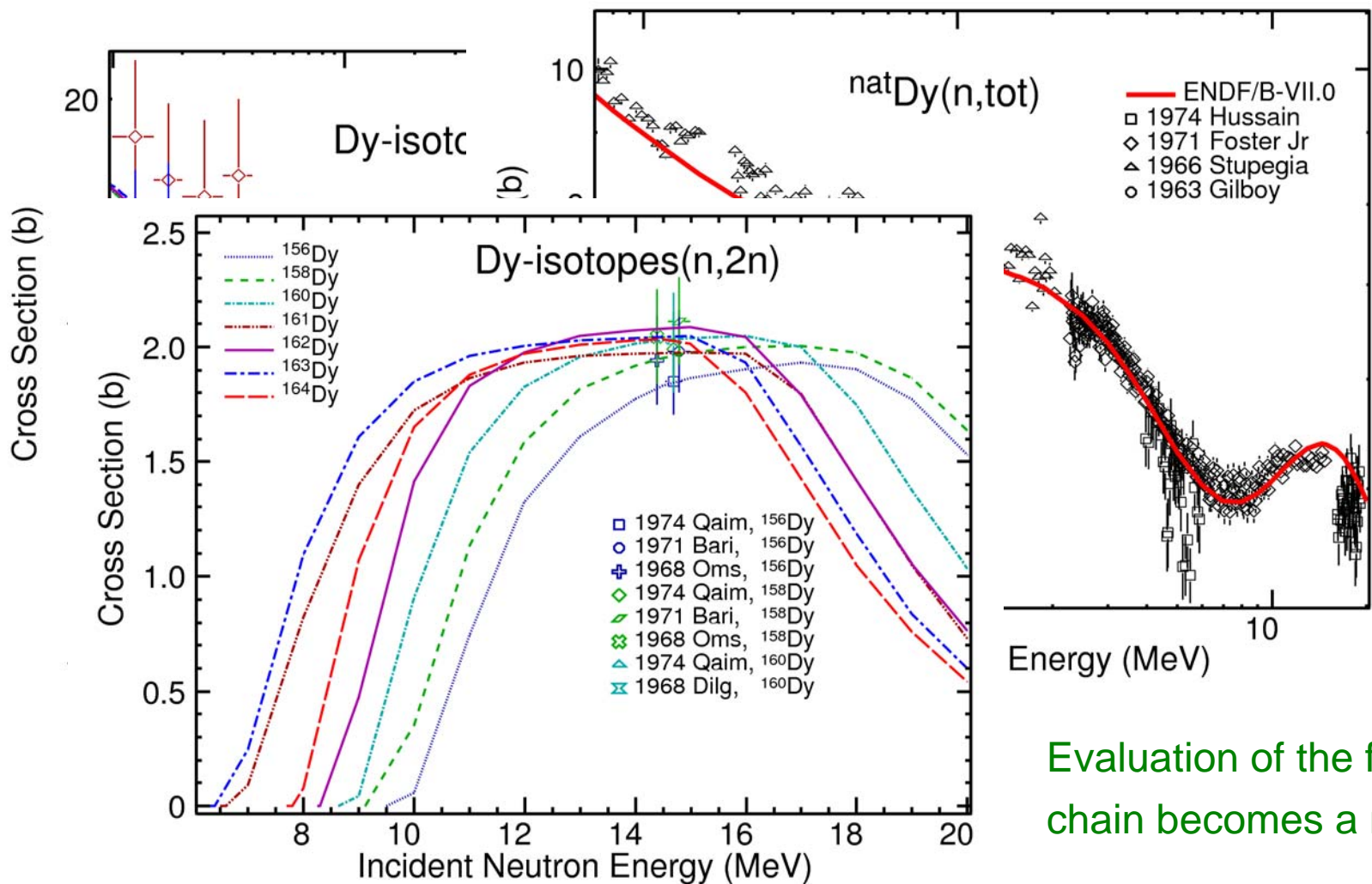
All BNL evaluations above the resonance region are based on the nuclear reaction code **EMPIRE-2.19**



Neutron Evaluations by BNL

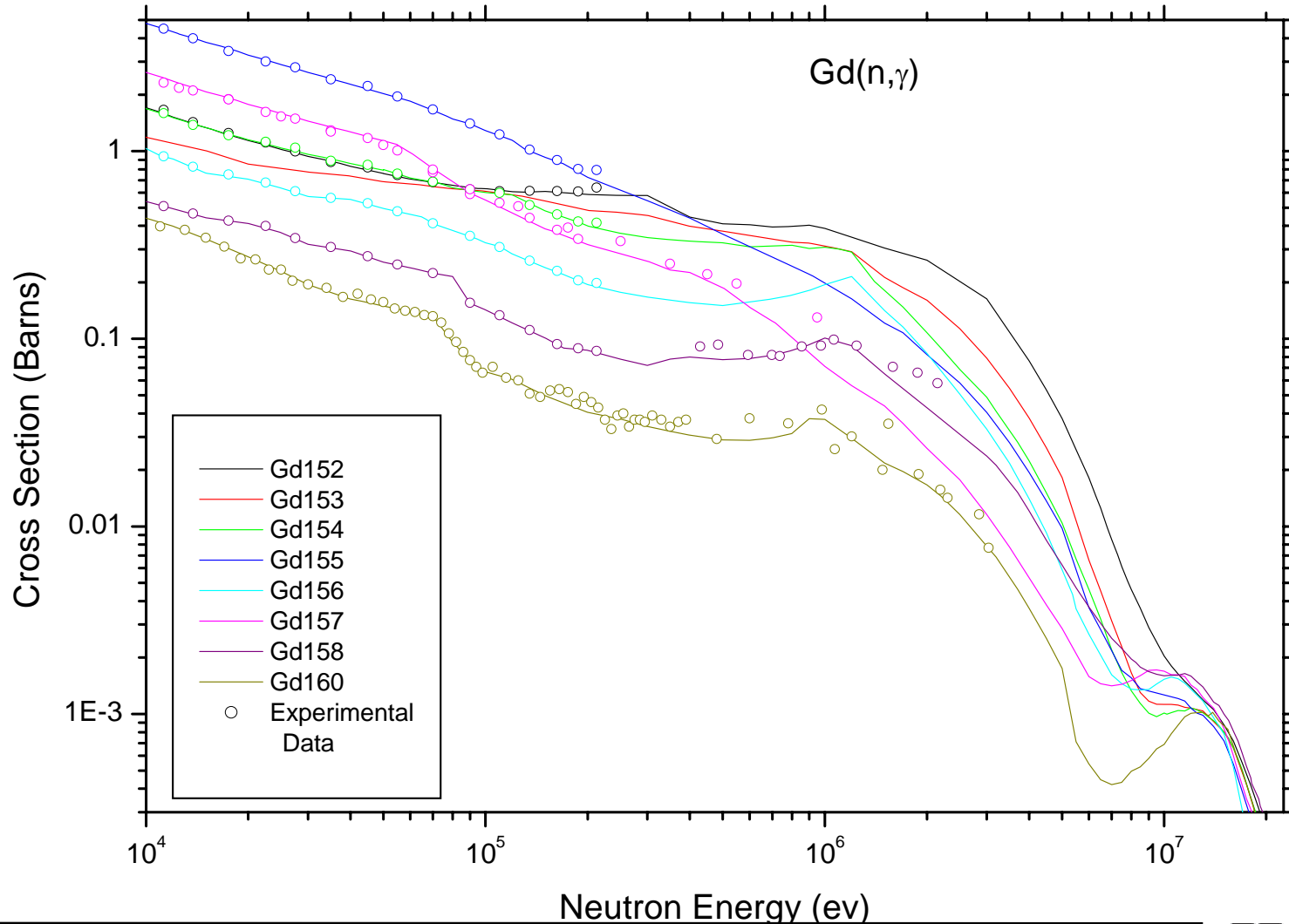
- 3-4 evaluators (together with KAERI)
- Complete evaluations: **73** (from ^{70}Ge to ^{193}Ir) out of 393 neutron evaluations
- Covariance evaluations: **12** out of 12 new cross section covariances ($^{152-160}\text{Gd}$, ^{99}Tc , $^{191,193}\text{Ir}$ and ^{89}Y)
- Resonance evaluations: **160** isotopes (from ^{69}Ga to ^{170}Er)

Full chain of Dy isotopes

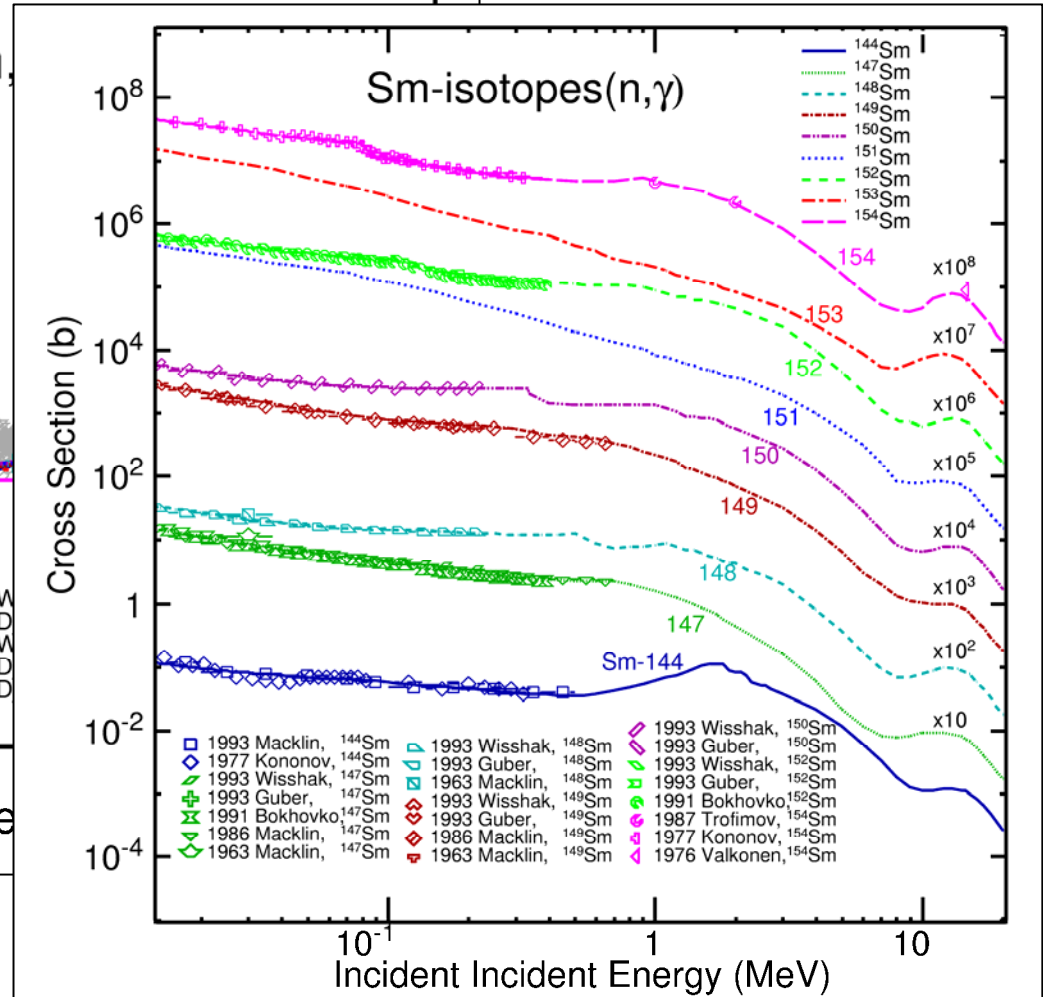
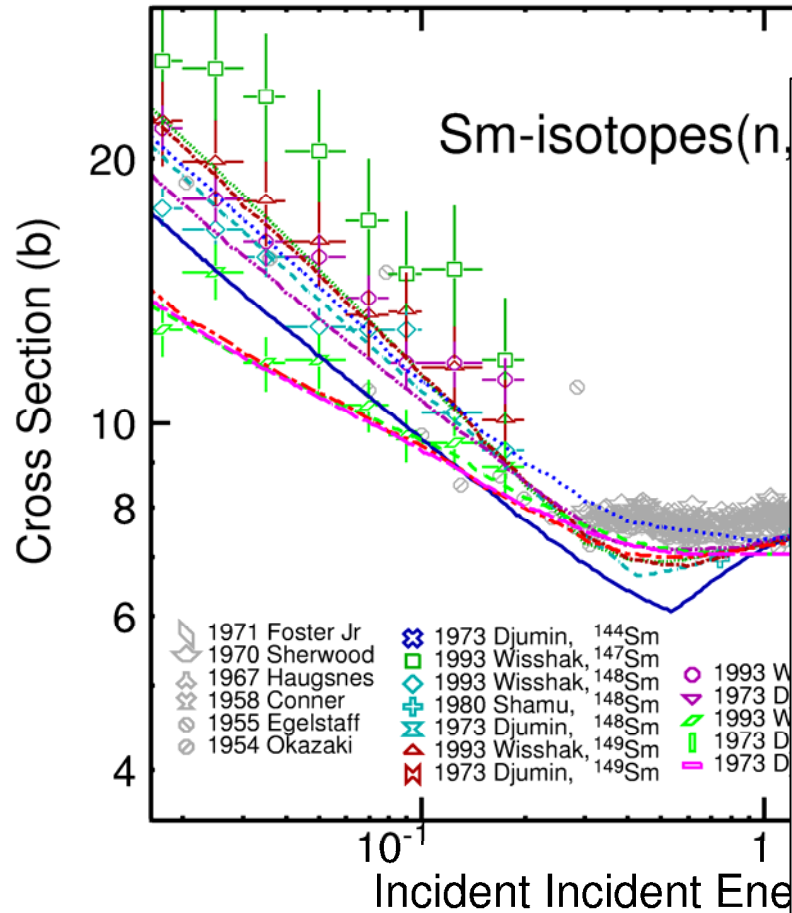


Evaluation of the full chain becomes a norm

Gadolinium isotopes: (n, γ) Cross Sections

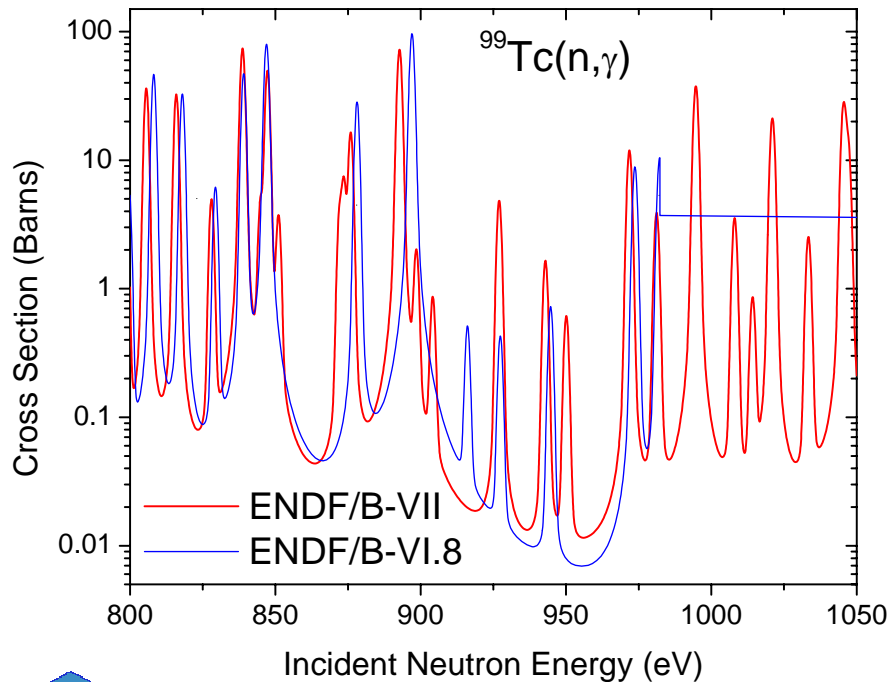


Samarium isotopes: (n,tot) and (n, γ)

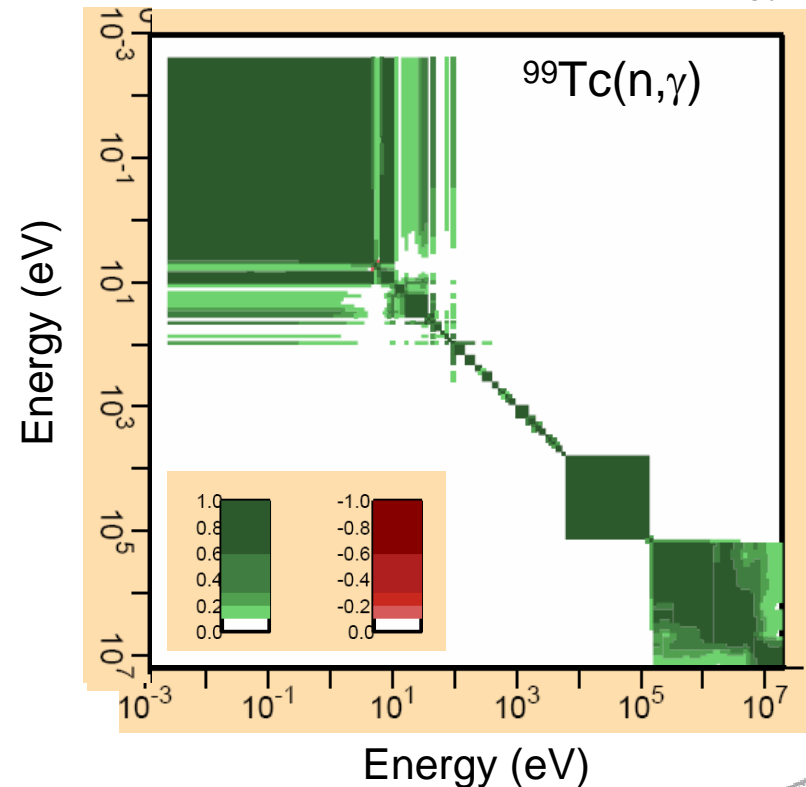


Technetium-99

- Thermal capture cross section from the new Atlas
 - 22.8 ± 1.3 b. in ENDF/B-VII
 - 20.1 ± 1 b. in ENDF/B-VI.8
- Resolved resonance parameters based on F. Gunsing data (2000) from GELINA measurements
- 540 resonances (97 previously)
- up to 6 keV (1 keV previously)

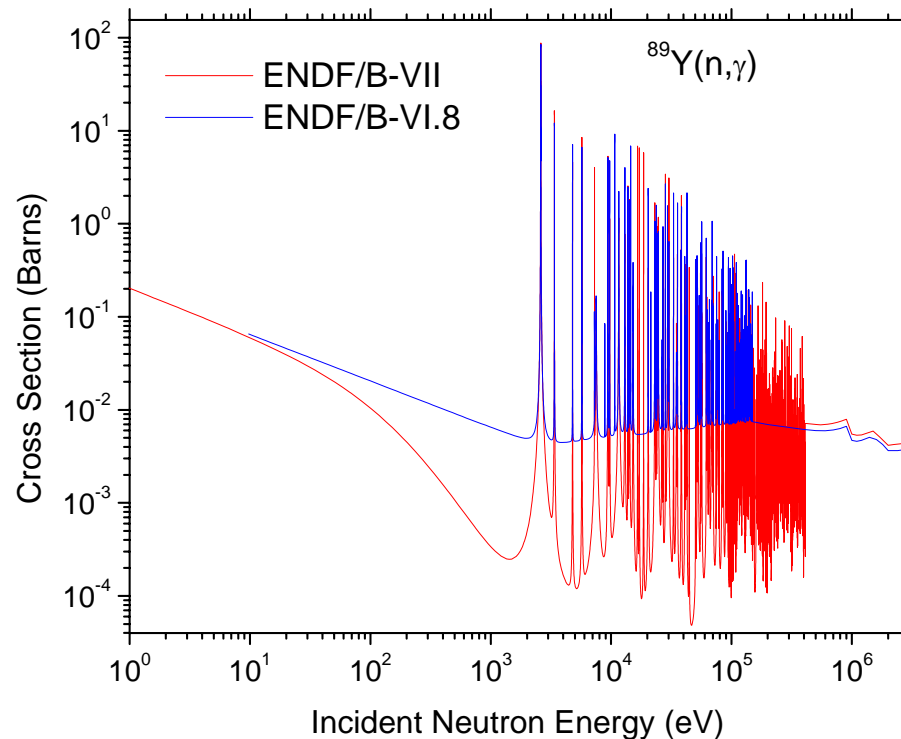


- New evaluation with **EMPIRE 2.19**
- New cross sections for (n,tot), (n,el), (n,inl), (n,2n), (n, γ), (n,p), (n, α)
- New covariances (MF-33) from thermal energy to 20 MeV for (n,tot), (n,el), (n,inl), (n,2n), (n, γ), (n,p) based on the Atlas-BNL-LANL methodology

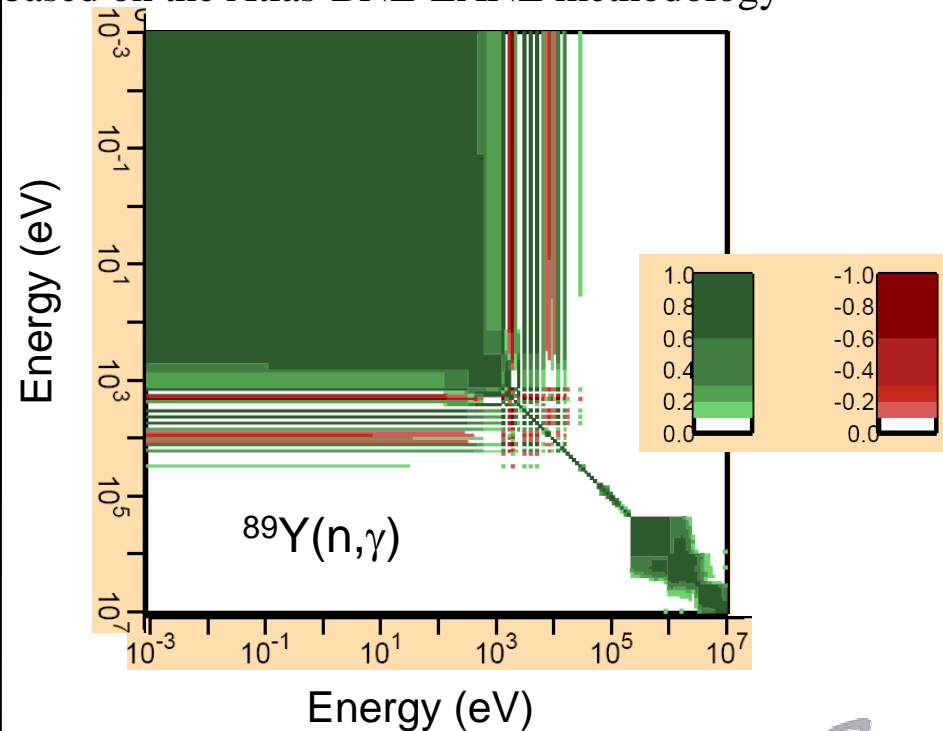


Yttrium-89

- New resonance parameters from the Atlas of Neutron Resonances (S. F. Mughabghab)
- 401 resonances (119 previously)
- up to 400 eV (150 eV previously)

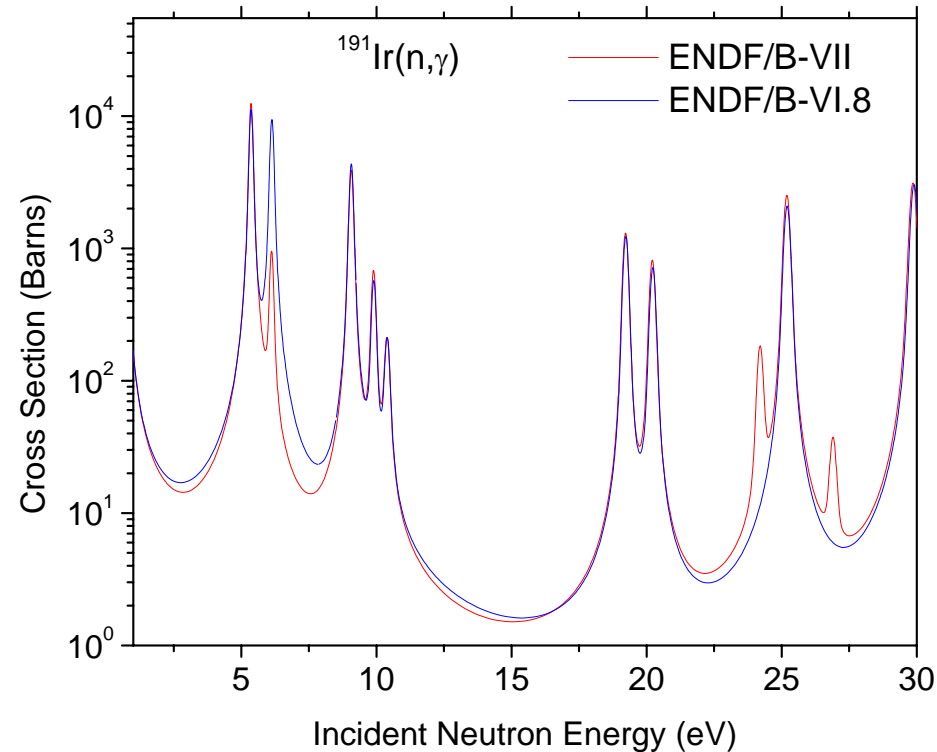


- New evaluation with **EMPIRE 2.19** for (n,tot), (n,el), (n, γ), (n,p), (n, α)
- New cross sections from **LANL** for (n,2n), (n,2n) m_1 , (n,2n) m_2 , (n,inl)g, and (n,inl) m_1
- New covariances (MF-33) from thermal energy to 20 MeV for (n,tot), (n,el), (n,inl), (n,2n), (n, γ), (n,p) based on the Atlas-BNL-LANL methodology

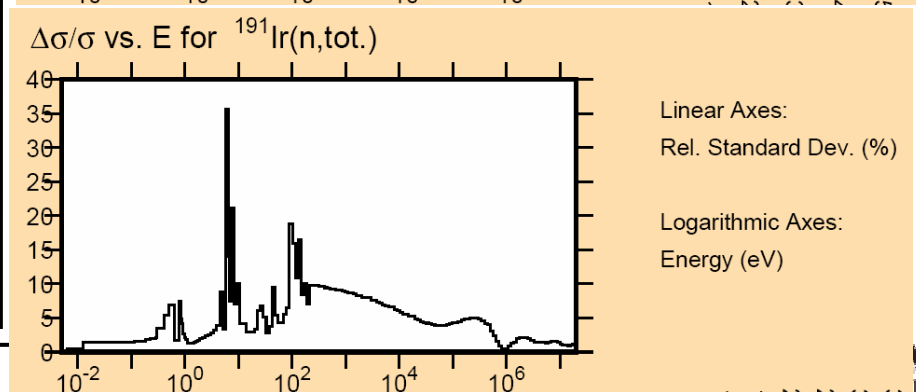
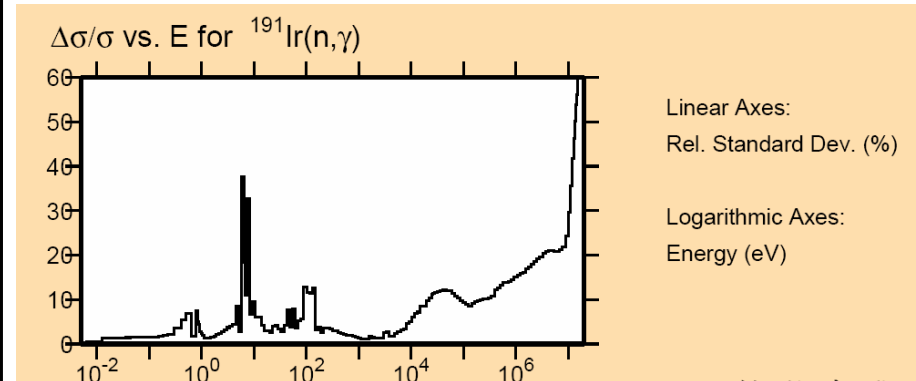


Iridium-191

- New resonance parameters from the Atlas of Neutron Resonances (S. F. Mughabghab)
- 46 resonances (50 previously)
- up to 152 eV (152 eV previously)
- New URR up to 10 keV (none previously)



- New evaluation with **EMPIRE 2.19** for (n,tot), (n,el), (n,inl), (n,p), (n, α)
- New cross sections from **LANL** for (n,2n)g, (n,2n)m₁, (n,2n)m₂, (n,2n)m₃, (n,3n) and (n, γ)
- New covariances (MF-33) from thermal energy to 20 MeV for (n,tot), (n,el), (n,inl), (n,2n), (n, γ), (n,p) based on the Atlas-BNL-LANL methodology

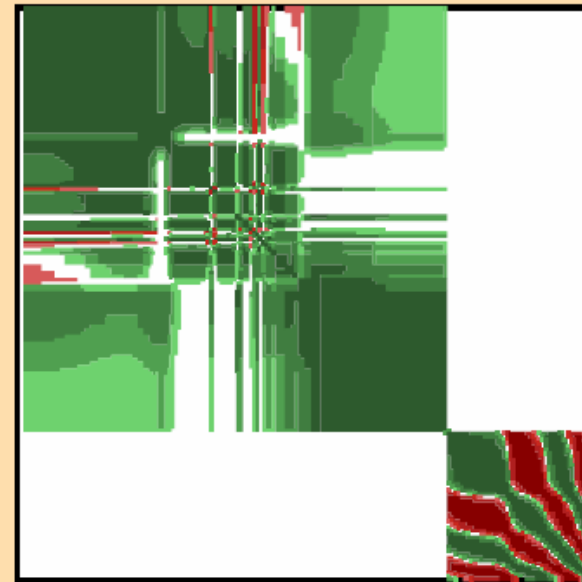
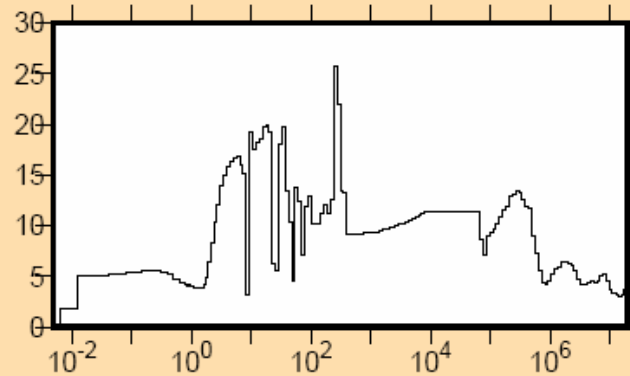


Iridium-193

- New resonance parameters from the Atlas of Neutron Resonances (S. F. Mughabghab)
- 40 resonances (45 previously)
- up to 309 eV (330 eV previously)
- New URR up to 73 keV (10 keV previously)

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- New evaluation with **EMPIRE 2.19** for (n,tot), (n,el), (n, γ), (n,p), (n, α)
 - New cross sections from **LANL** for (n,2n)g, (n,2n)m₁, (n,2n)m₂, (n, 3n)g, (n,3n)m₁ and (n,inl)
 - New covariances (MF-33) from thermal energy to 20 MeV for (n,tot), (n,el), (n,inl), (n,2n), (n, γ), (n,p) based on the Atlas-BNL-LANL methodology

$\Delta\sigma/\sigma$ vs. E for $^{193}\text{Ir}(n,\text{tot.})$



Correlation Matrix