CSEWG Meeting, 8-10 November 2005

^{232}Th Evaluation for the IAEA Nuclear Data Library (INDL)

IAEA Co-ordinated Research Project on the Evaluated Nuclear Data Files for the Th-U Fuel Cycle

A. Trkov, R.Capote

OVERVIEW

- Optical model (total, inelastic to low-lying collective levels, angular distributions, elastic and non-elastic XS calculations)
- Capture (Hauser-Feshbach + HRTW)
- Neutron emission spectra (1-15 MeV)

(DWBA + exciton model + Hauser-Feshbach)

- Total Inelastic, (n,2n) and (n,3n)
- Fission and fission neutrons
- Resonance parameters
- Benchmarking

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Optical model

Dispersive coupled-channel treatment

RIPL 608: Soukhovitskii *et al*, Phys. Rev. **C72** (2005)

- Isospin dependent (N-Z)/A
- Dispersive link between imaginary and real potential

  (constrain OMP parameters)
- Energy-independent geometry
- Smooth energy dependence from 0.001 to 200 MeV

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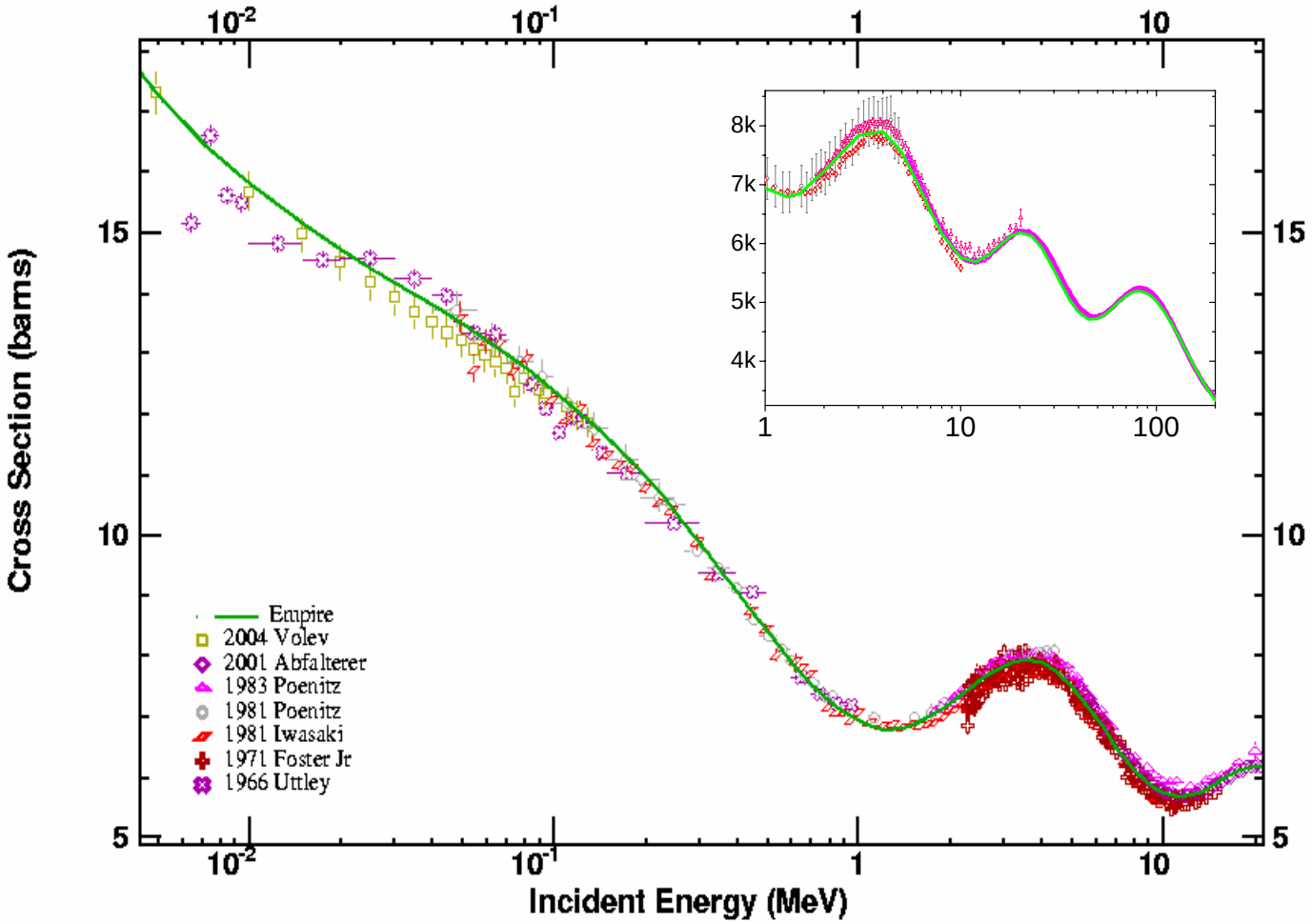
Strength functions and total XS

S_0=0.85
S_0=0.87 (.07) **RIPL-2**
S_0=0.84 (.08) **nTOF**
S_1=1.72
S_1=1.6 (.6) **nTOF**
R'= 9.68
R'= 9.65 (.3) **nTOF**



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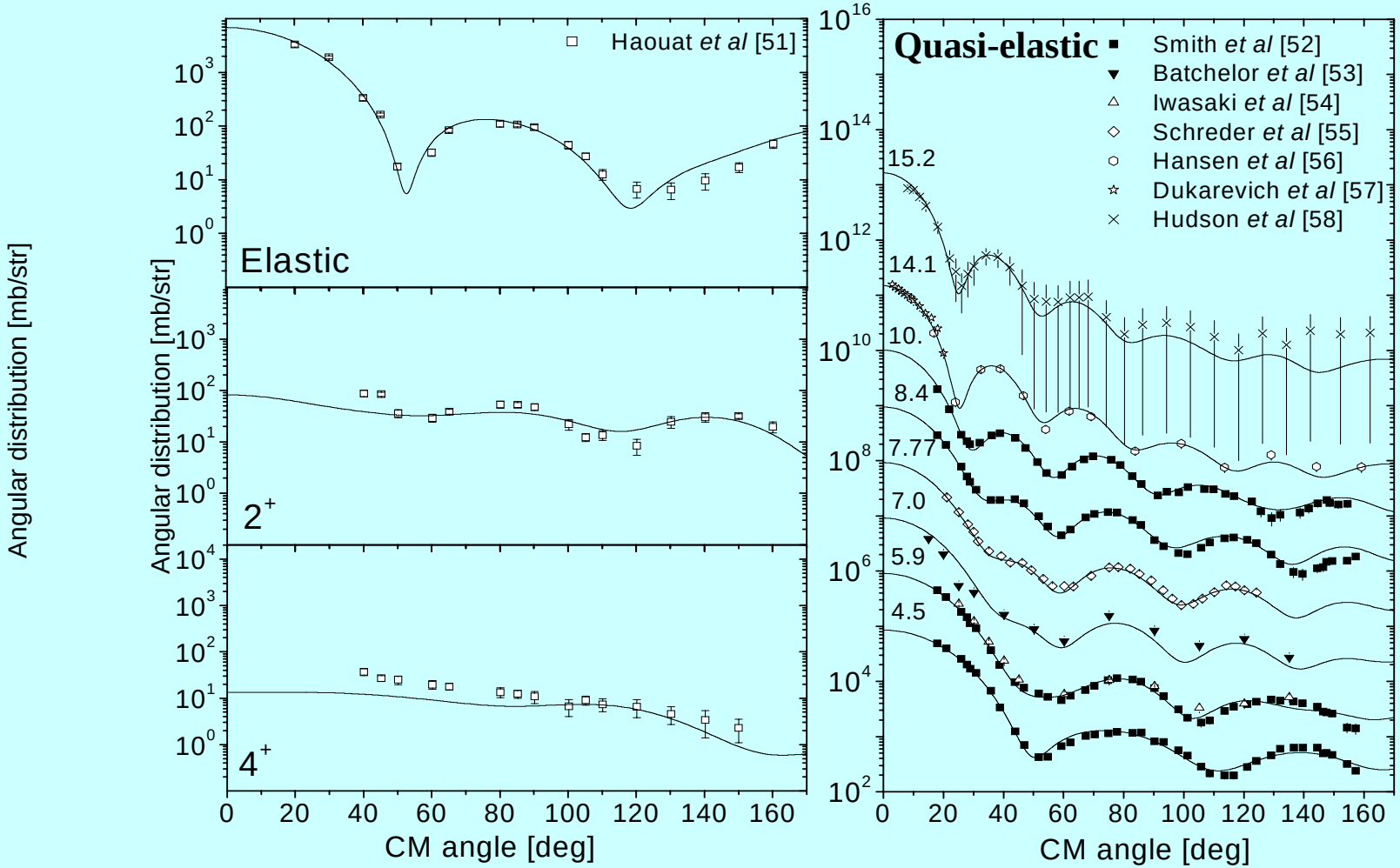
Neutron angular distributions



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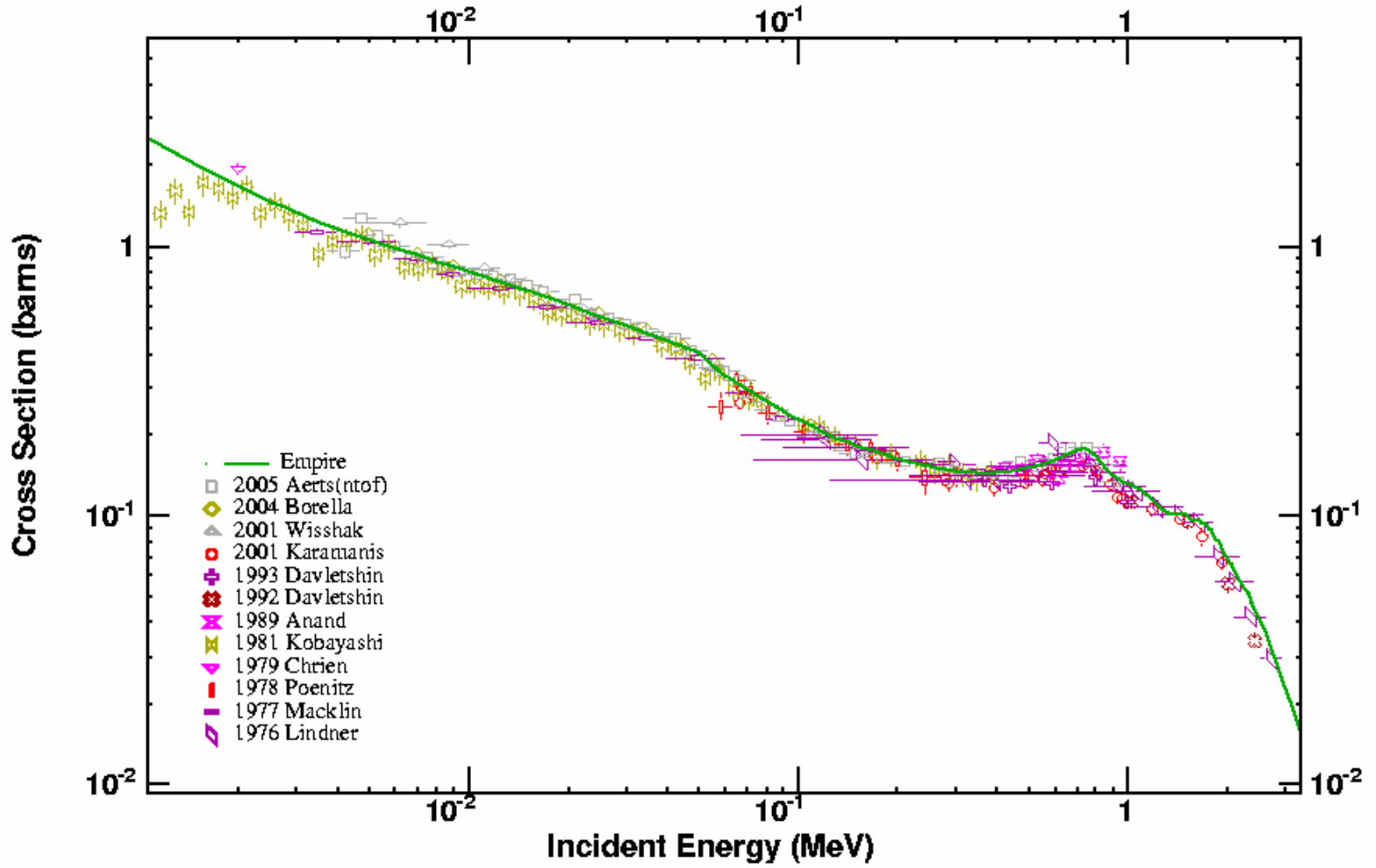
Neutron Capture



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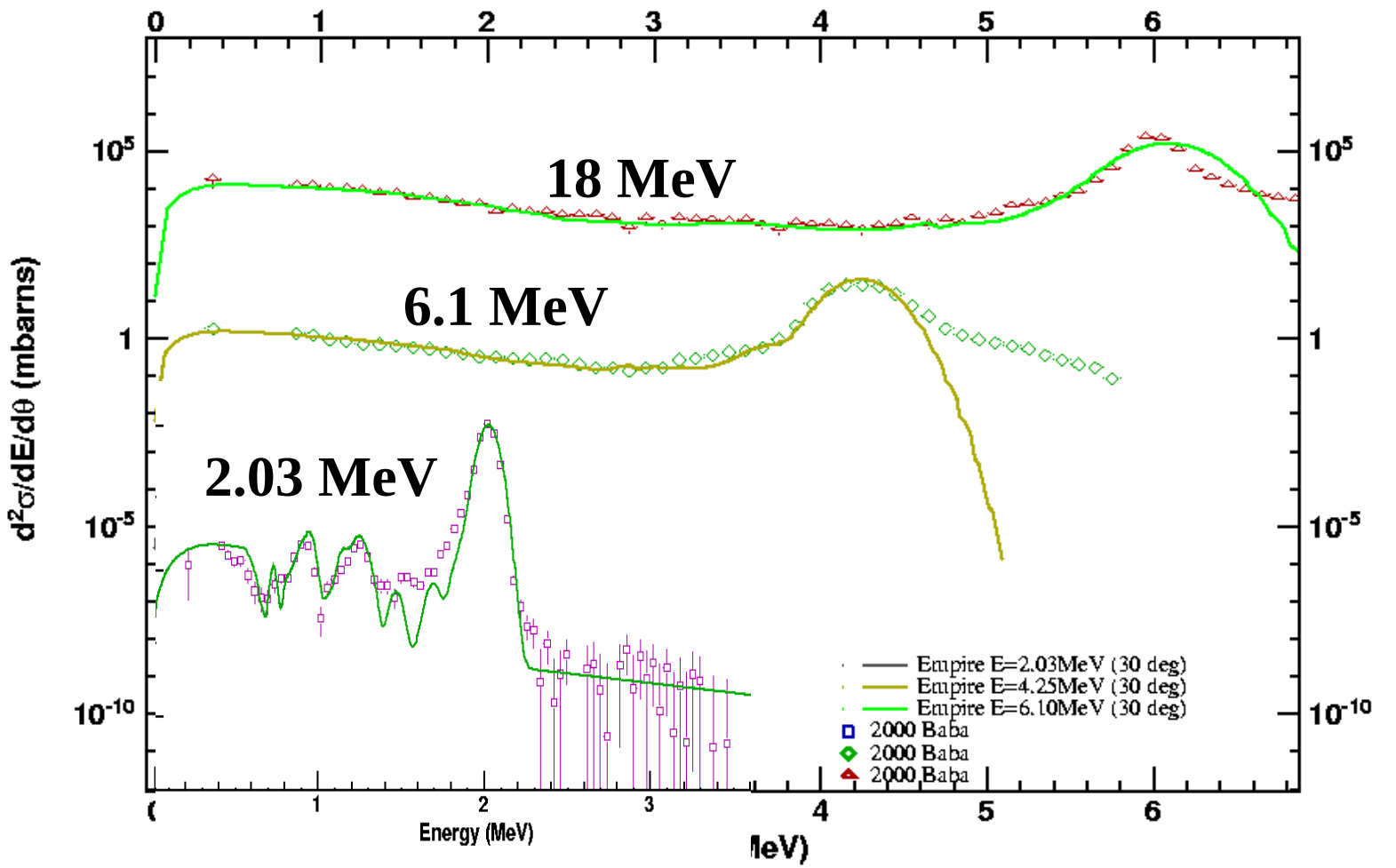
DDXS at 2.03, 6.1 and 18 MeV



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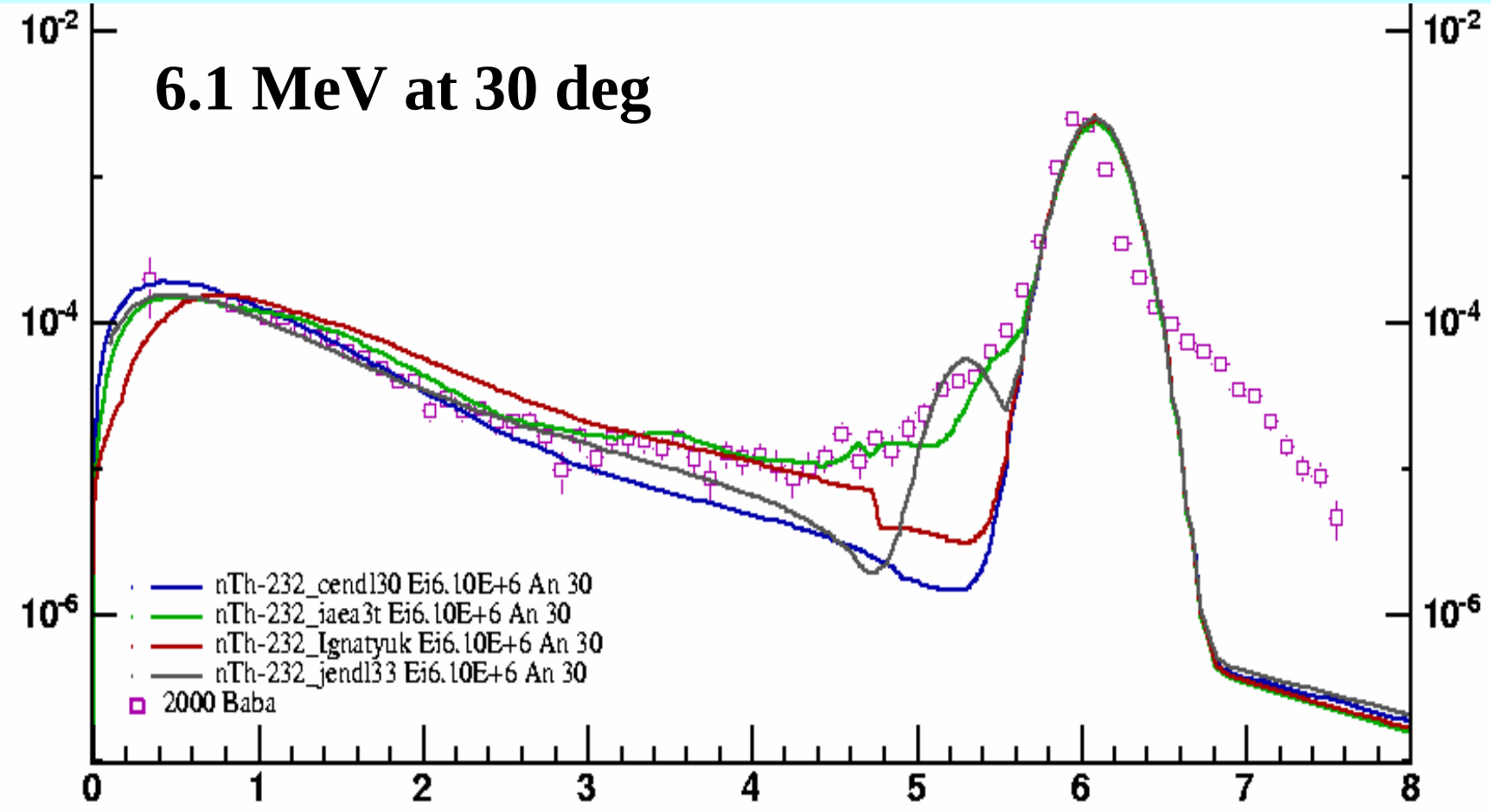
Recent evaluations (DDXS)



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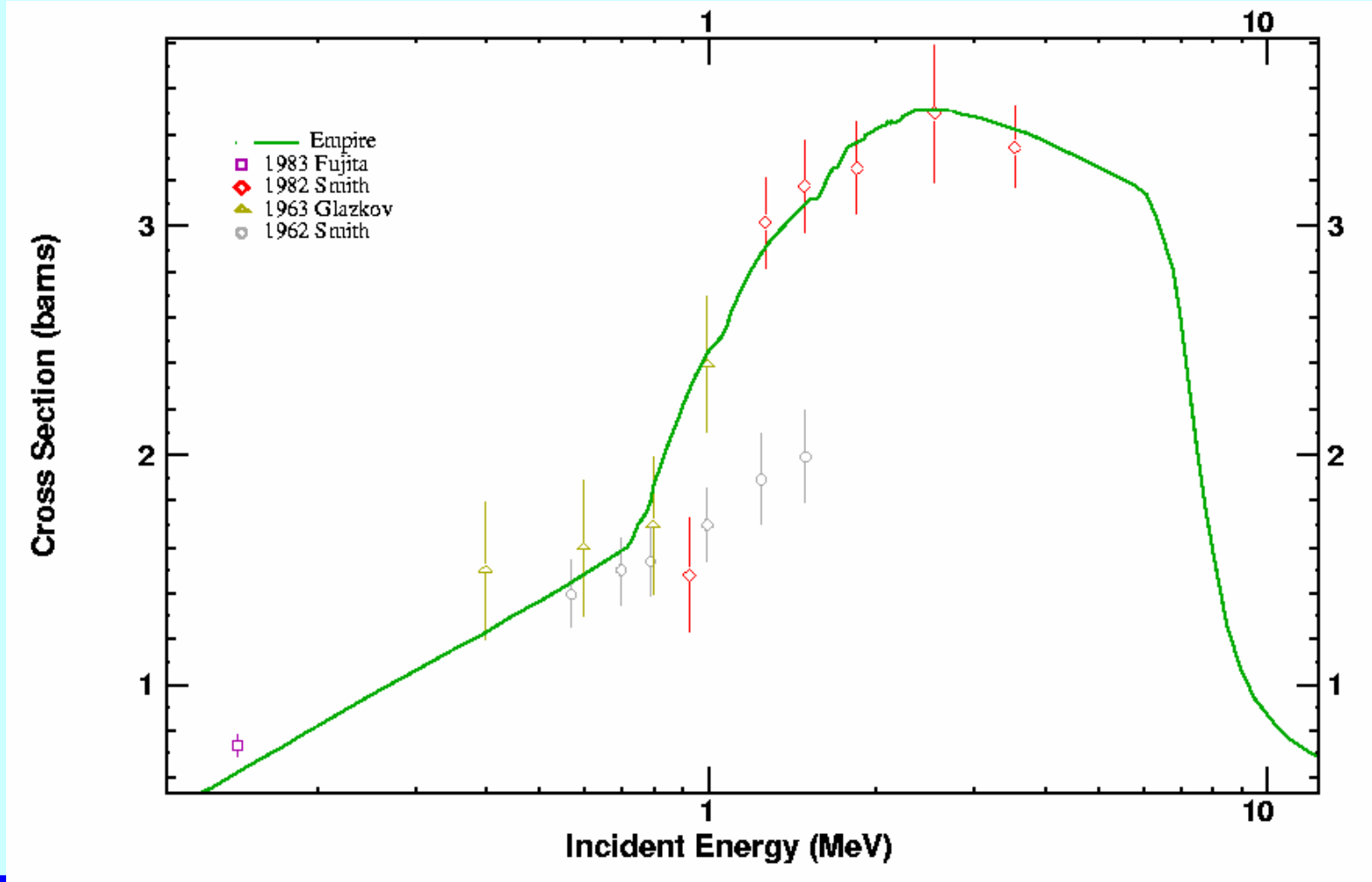
(n,INL)



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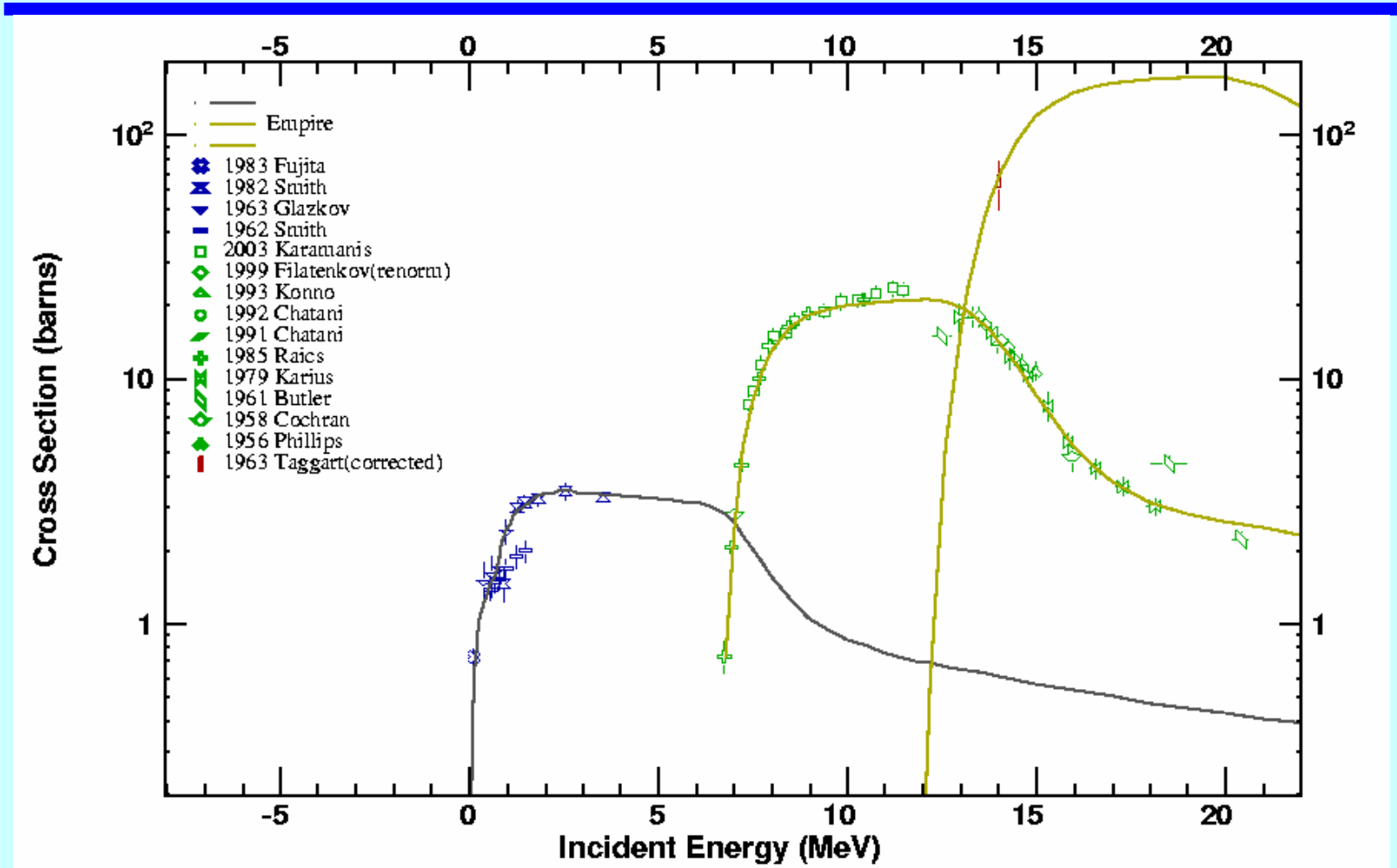
(n,INL), (n,2n), (n,3n)



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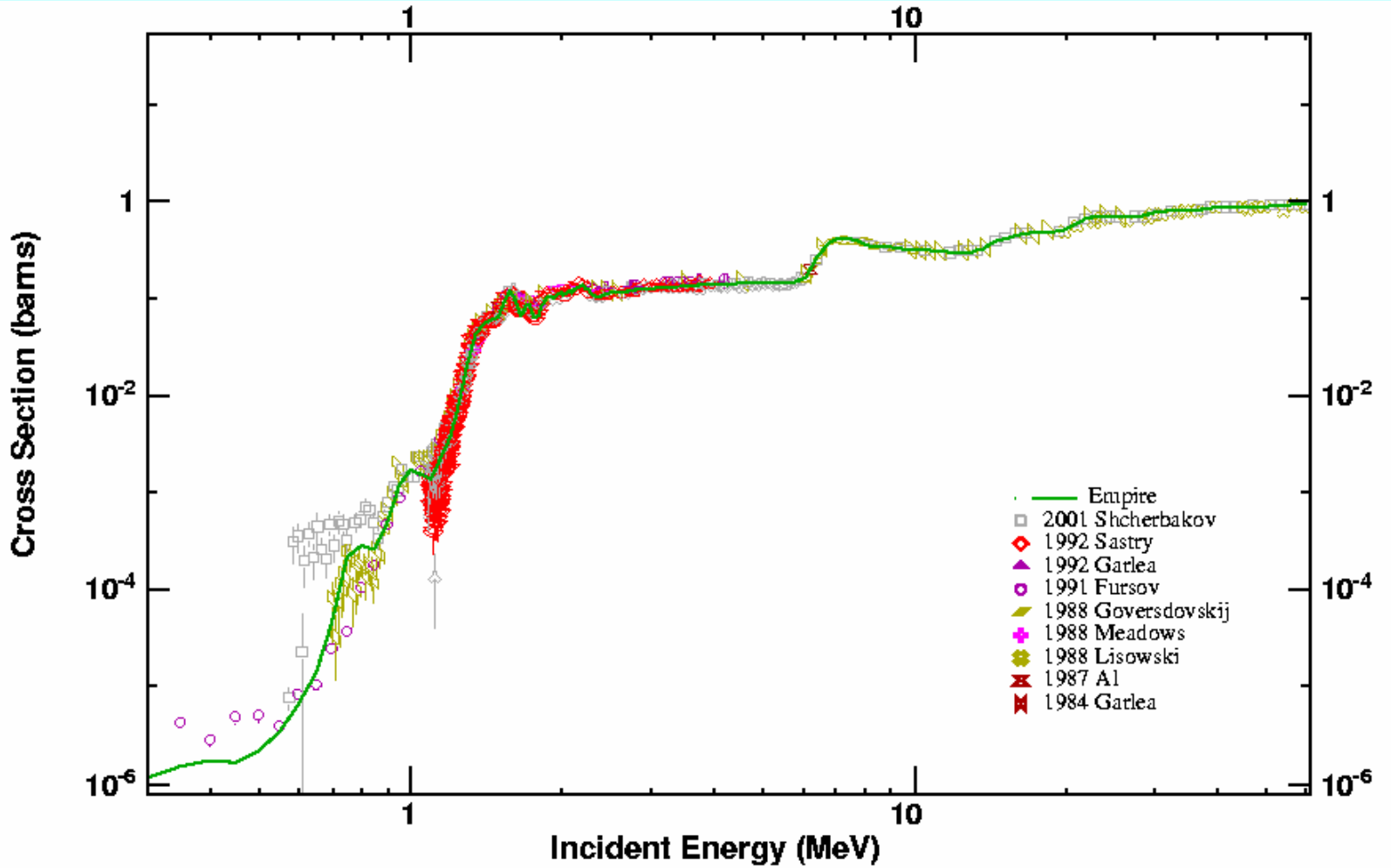
Fission cross section



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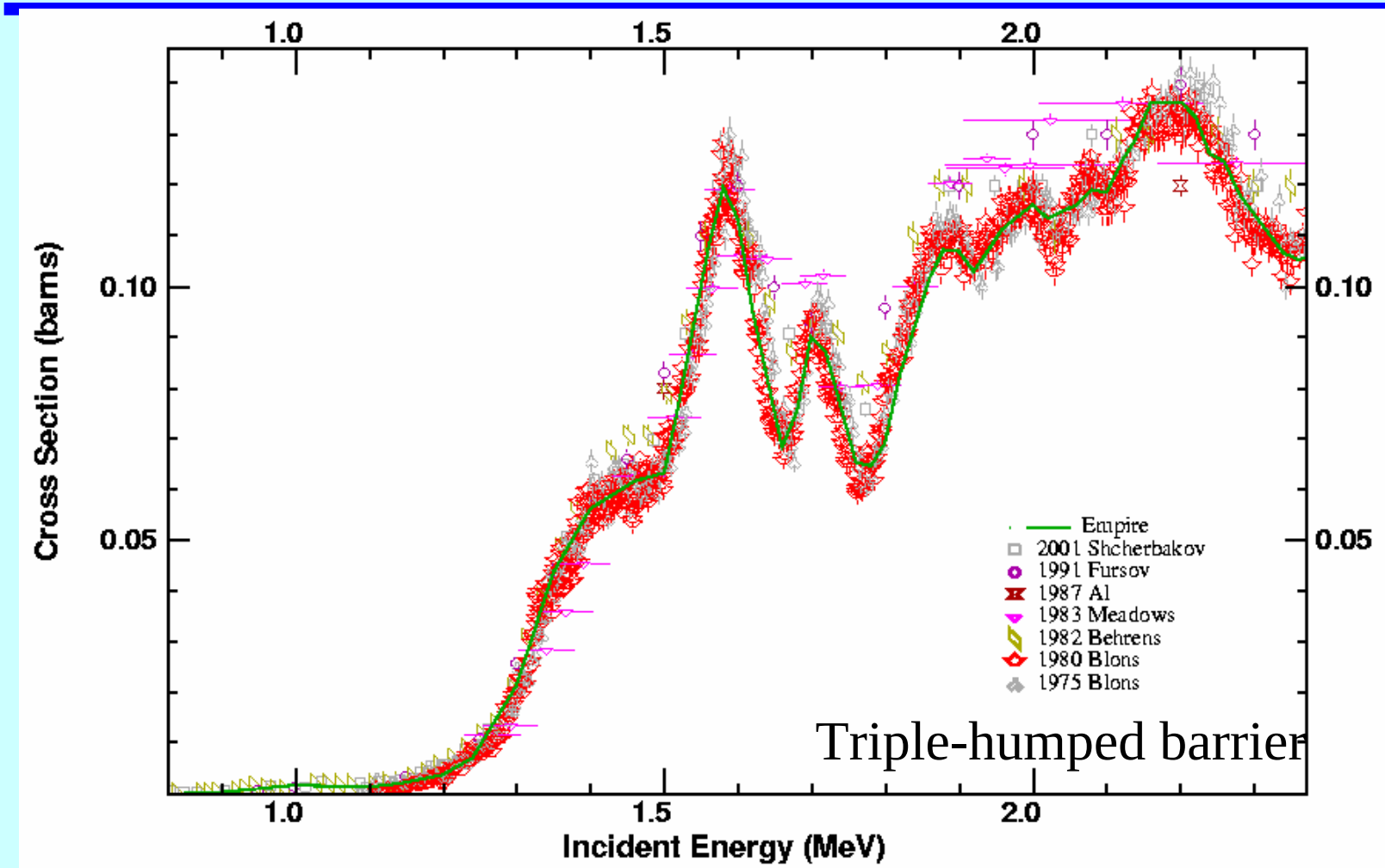
Near-barrier fission structure



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Fission Spectra and nu-bar

Adopted from BROND (A. Ignatyuk):

- Prompt fission neutron spectrum
- Number of prompt neutrons per fission
- Delayed fission neutron spectrum
- Delayed neutron fraction

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Resonance Parameters

- New resonance evaluation
  - Resolved range - Oak Ridge
  - Unresolved range – Geel
- Experimental data analysed with SAMMY
  - n-TOF data
  - Geel data
  - All other available data

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Benchmarking

Ident	Cases					
HEU-MET-FAST-068	1	KBR22	KBR22 (U/Th metal, polyethylene)			
HEU-MET-INTER-008	1	KBR23	KBR23 (U/Th metal, polyethylene)			
IEU-COMP-FAST-002	1	KBR18	KBR18 (90%235UO2+Th metal+36%235UO2)			
IEU-COMP-INTER-001	1	KBR19	KBR19 (90%235UO2+Th metal+36%235UO2, polyethyl			
	1	KBR20	KBR20 (90%235UO2+Th metal, polyethylene)			
IEU-COMP-THERM-005	1	KBR21	KBR21 (36%235UO2+Th metal, polyethylene)			
PU-MET-FAST-008	1	THOR	THOR Pu sphere/Th-reflector			
HEU-COMP-THERM-015	1	LWBR SB-1	LWBR SB-1 (93%235UO2+ZrO2, ThO2 blanket)			
	1	LWBR SB-5	LWBR SB-5 (93%235UO2+ZrO2, ThO2 blanket)			
U233-COMP-THERM-001	1	LWBR SB-2	LWBR SB-2 (97%233UO2+ZrO2, ThO2 blanket)			
	1	LWBR SB-3	LWBR SB-3 (97%233UO2+ZrO2, UO2+ThO2 blanket)			
	1	LWBR SB-4	LWBR SB-4 (97%233UO2+ZrO2, UO2+ThO2 blanket)			
	1	LWBR SB-6	LWBR SB-6 (97%233UO2+ZrO2, ThO2 blanket)			
	1	LWBR SB-7	LWBR SB-7 (97%233UO2+ZrO2, UO2+ThO2 blanket)			

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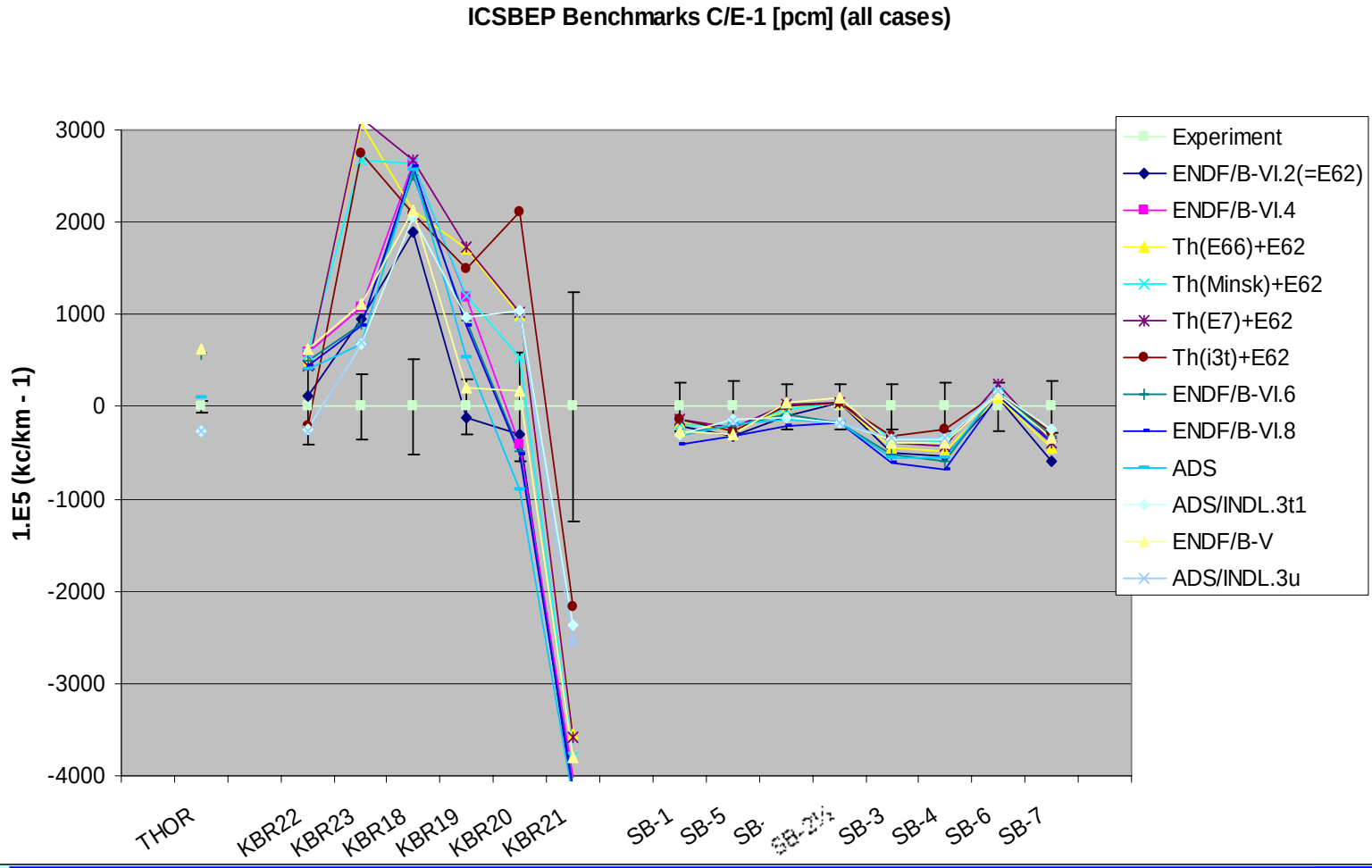
All Benchmarks



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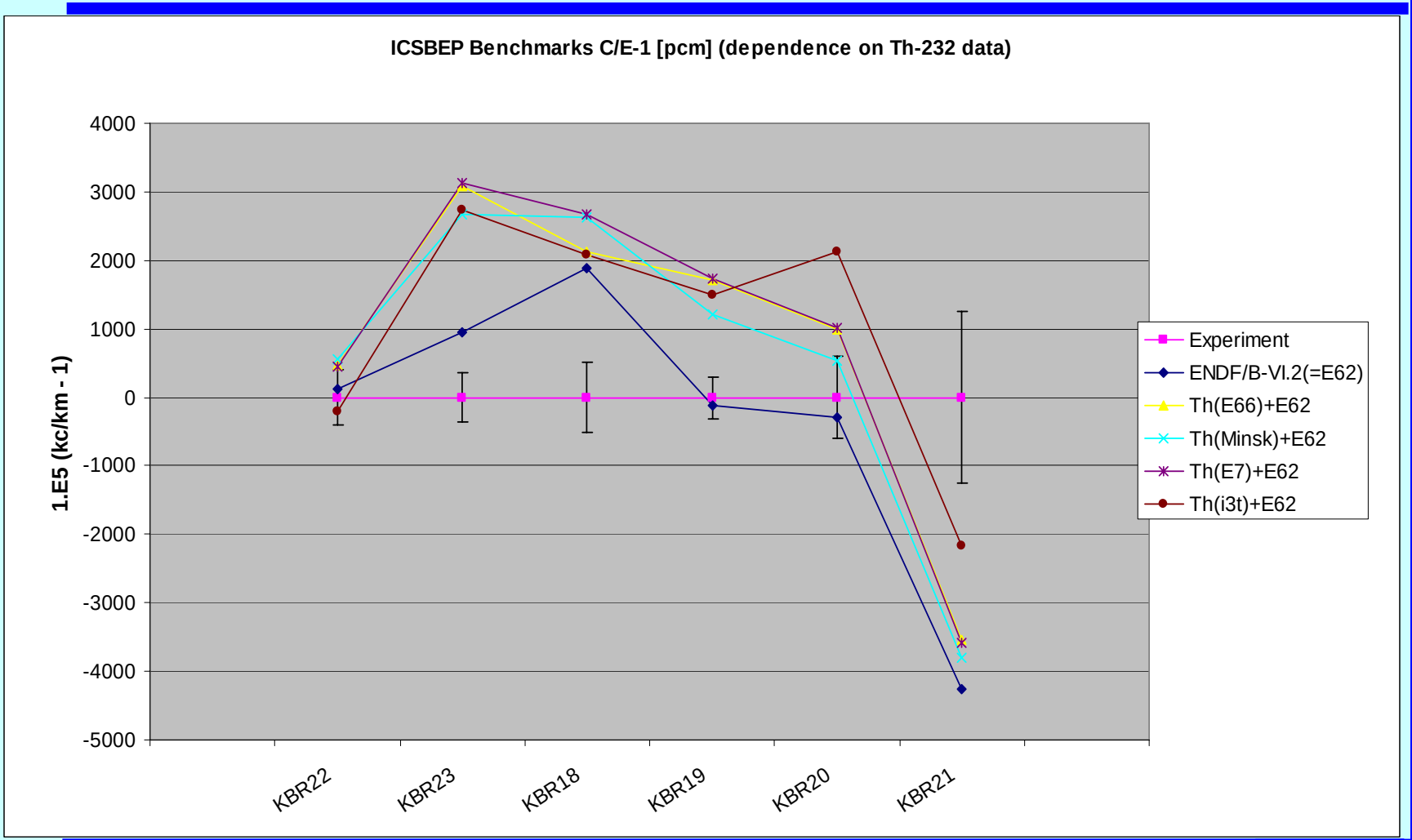
KBR Benchmarks



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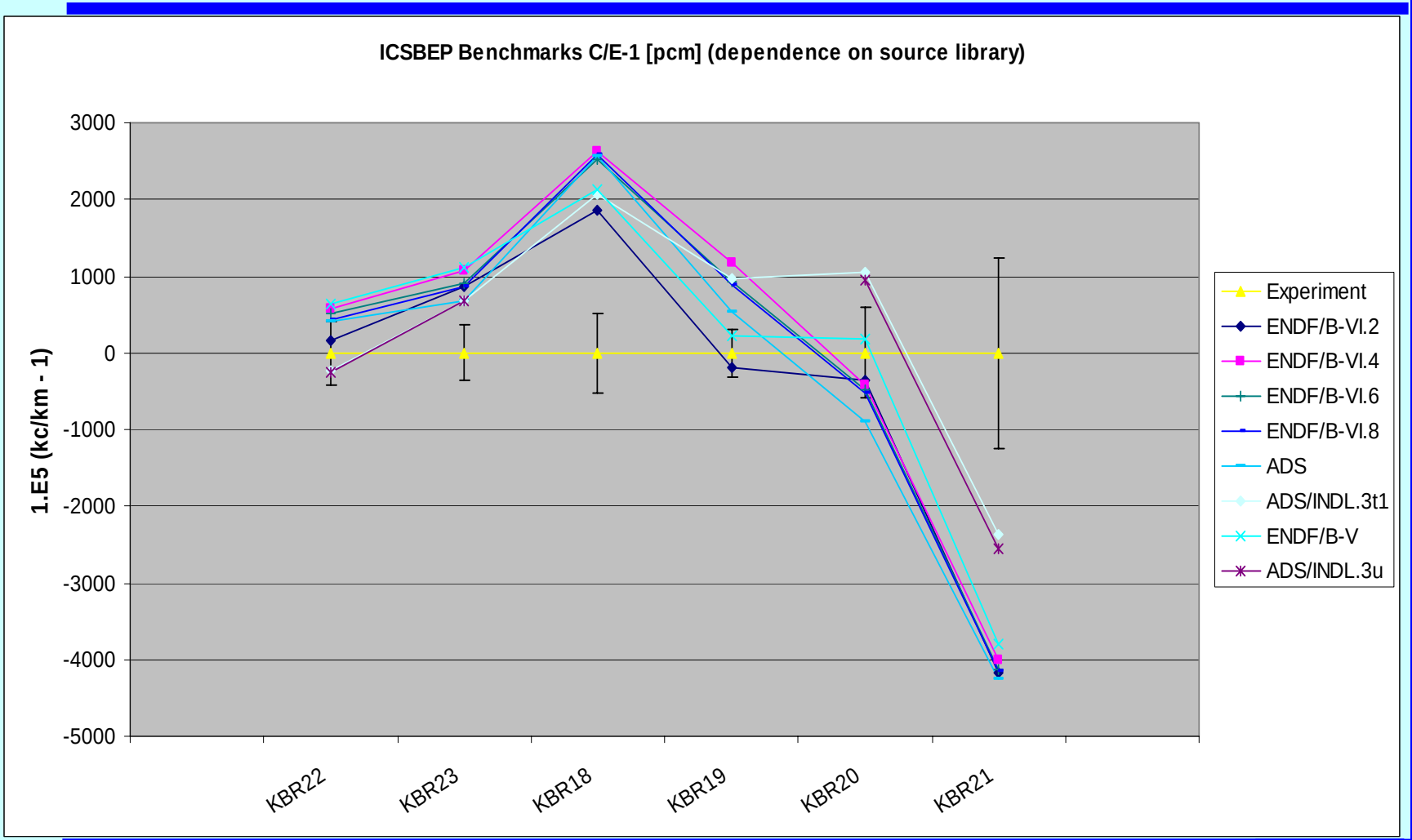
KBR Benchmarks



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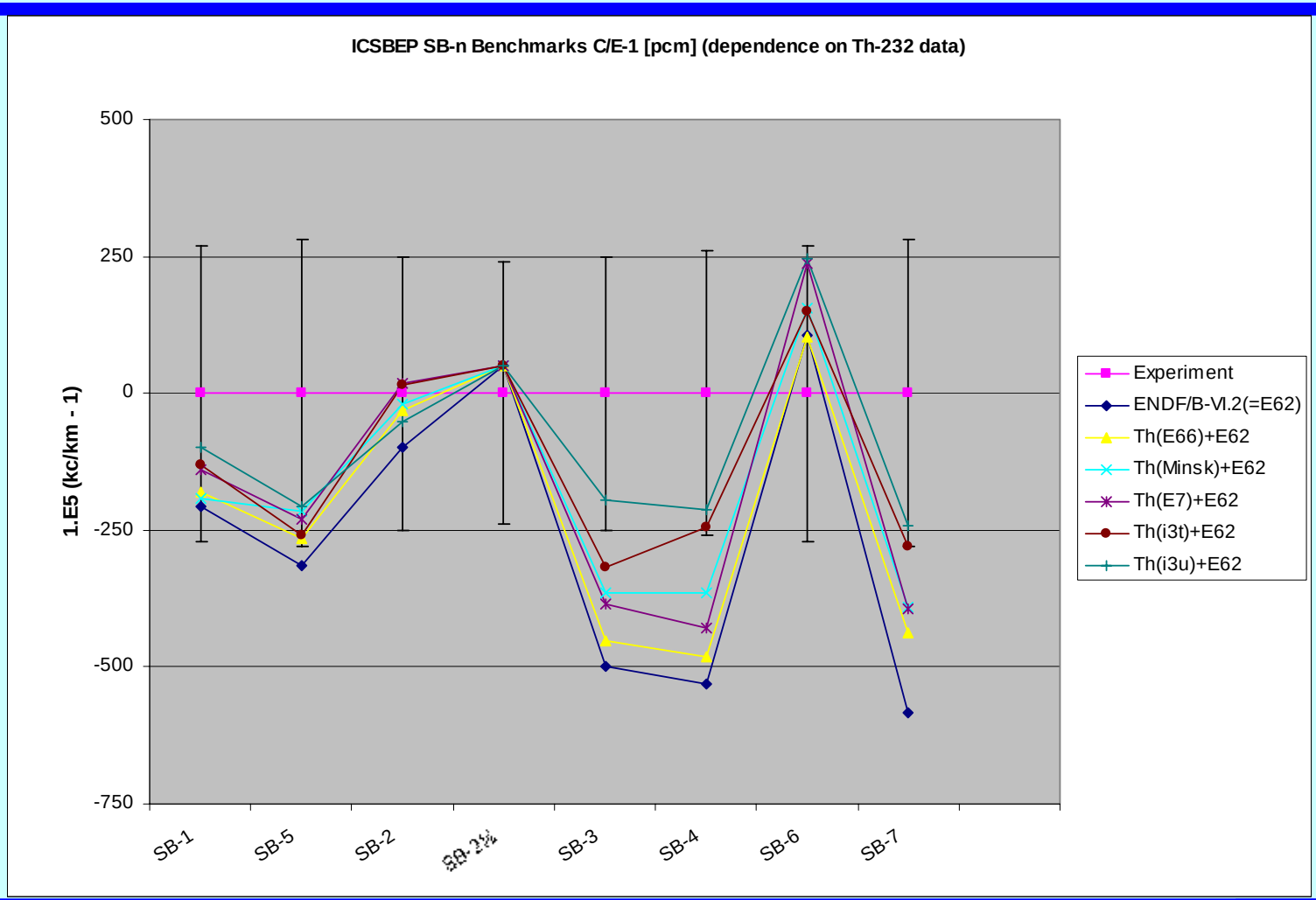
SB-n Benchmarks



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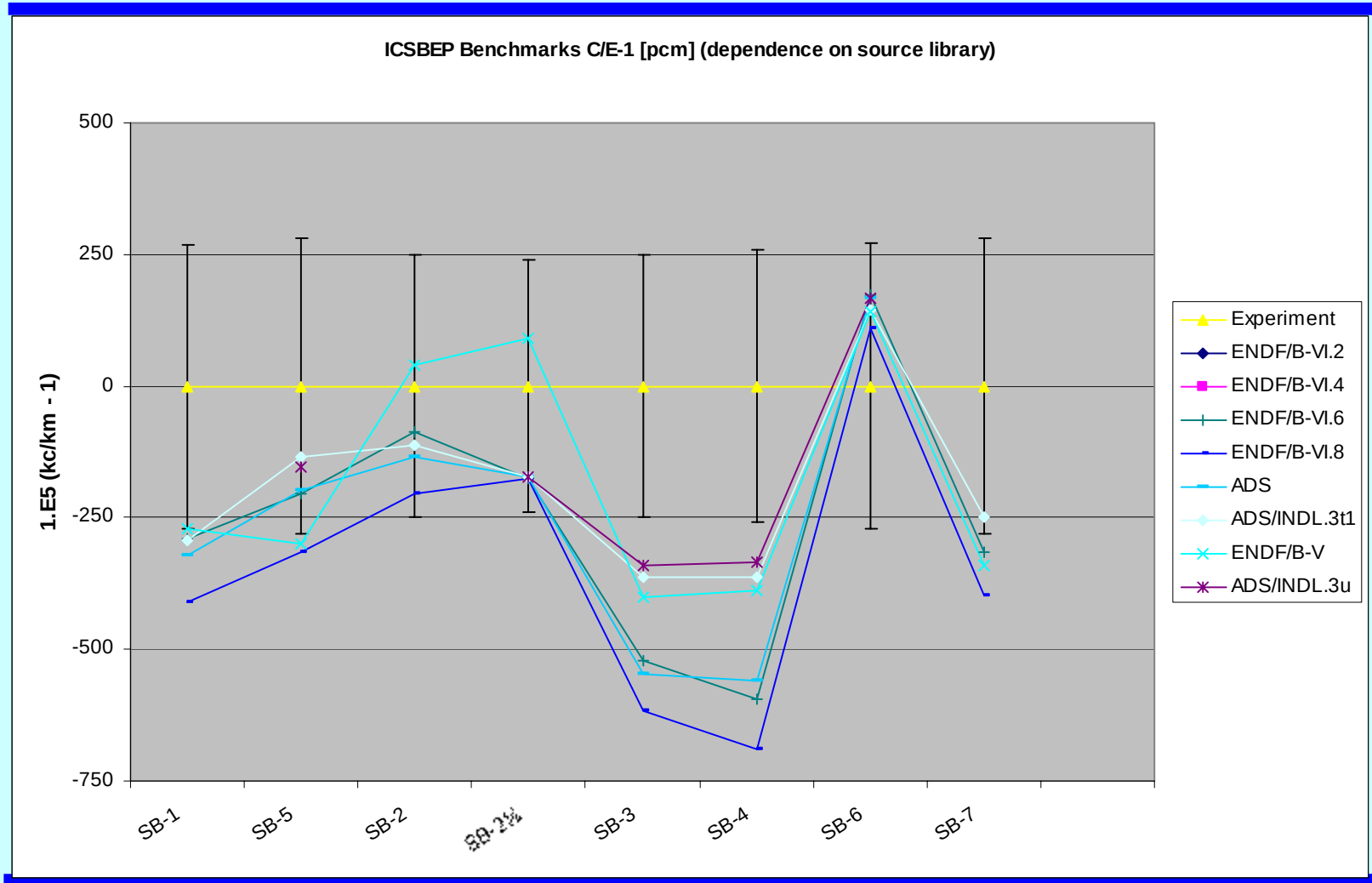
SB-n Benchmarks



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Conclusions

- Evaluated up to 60 MeV
- Best available nuclear models
- Resonance analysis includes most recent data
- Good agreement with differential data
- Benchmark calculations show improved agreement with integral measurements

➔ New ^{232}Th file seems acceptable

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