



BNL report on cross section evaluations for ENDF/B-VII.1

(mini-CSEWG-2010, Port Jeff, June, 2010)

M. Herman
National Nuclear Data Center,
Brookhaven National Laboratory
mwherman@bnl.gov

Major BNL effort : covariances in ENDF/B-VII.1

List of nuclei in AFCI (priority materials in **bold**)

¹ H	²⁸ Si	⁹² Mo	¹⁰⁹ Ag	¹⁴⁹ Sm	²³² Th
² H	²⁹ Si	⁹⁴ Mo	¹²⁷ I	¹⁵¹ Sm	²³³ U
⁴ He	³⁰ Si	⁹⁵ Mo	¹²⁹ I	¹⁵² Sm	²³⁴ U
⁶ Li	⁵⁰ Cr	⁹⁶ Mo	¹³¹ Xe	¹⁵³ Eu	²³⁵ U
⁷ Li	⁵² Cr	⁹⁷ Mo	¹³² Xe	¹⁵⁵ Eu	²³⁶ U
⁹ Be	⁵³ Cr	⁹⁸ Mo	¹³⁴ Xe	¹⁵⁵ Gd	²³⁸ U
¹⁰ B	⁵⁵ Mn	¹⁰⁰ Mo	¹³³ Cs	¹⁵⁶ Gd	²³⁷ Np
¹¹ B	⁵⁴ Fe	⁹⁹ Tc	¹³⁵ Cs	¹⁵⁷ Gd	²³⁸ Pu
¹² C	⁵⁶ Fe	¹⁰¹ Ru	¹³⁹ La	¹⁵⁸ Gd	²³⁹ Pu
¹⁵ N	⁵⁷ Fe	¹⁰² Ru	¹⁴¹ Ce	¹⁶⁰ Gd	²⁴⁰ Pu
¹⁶ O	⁵⁸ Ni	¹⁰³ Ru	¹⁴¹ Pr	¹⁶⁶ Er	²⁴¹ Pu
¹⁹ F	⁶⁰ Ni	¹⁰⁴ Ru	¹⁴³ Nd	¹⁶⁷ Er	²⁴² Pu
²³ Na	⁹⁰ Zr	¹⁰⁶ Ru	¹⁴⁵ Nd	¹⁶⁸ Er	²⁴¹ Am
²⁴ Mg	⁹¹ Zr	¹⁰³ Rh	¹⁴⁶ Nd	¹⁷⁰ Er	^{242m} Am
²⁵ Mg	⁹² Zr	¹⁰⁵ Pd	¹⁴⁸ Nd	²⁰⁴ Pb	²⁴³ Am
²⁶ Mg	⁹³ Zr	¹⁰⁶ Pd	¹⁴⁷ Pm	²⁰⁶ Pb	²⁴² Cm
²⁷ Al	⁹⁴ Zr	¹⁰⁷ Pd		²⁰⁷ Pb	²⁴³ Cm
	⁹⁵ Zr	¹⁰⁸ Pd		²⁰⁸ Pb	²⁴⁴ Cm
	⁹⁶ Zr			²⁰⁹ Bi	²⁴⁵ Cm
	⁹⁵ Nb				²⁴⁶ Cm

AFCI/GNEP project (BNL & LANL): 110 covariances, which will serve as a reference for constructing ENDF-6 formatted covariance files for ENDF/B-VII.1. AFCI-2.0 library, August 2010

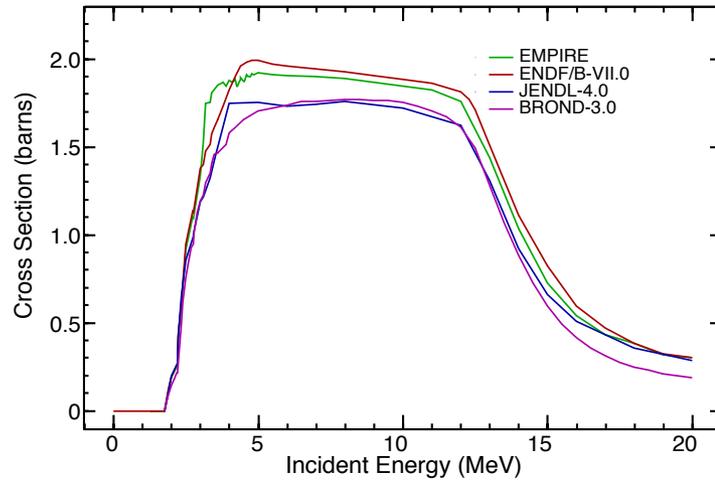
Assimilation (Consistent Adjustment) project (BNL & INL): ²³Na, ⁵⁶Fe, ²³⁸U, ...  **²³Na**

Cross section evaluations only if needed, e.g., ²³Na, ^{93,95,96}Zr, ²³⁷Np, ²⁴²Pu

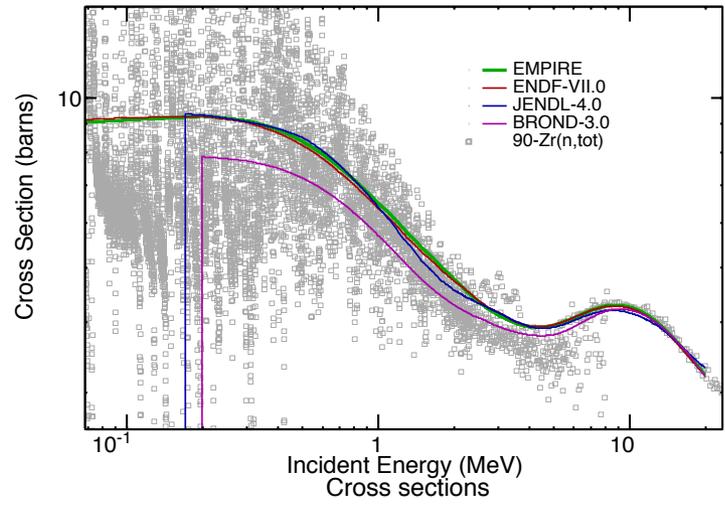
^{90}Zr

Keep ENDF/B-VII.0

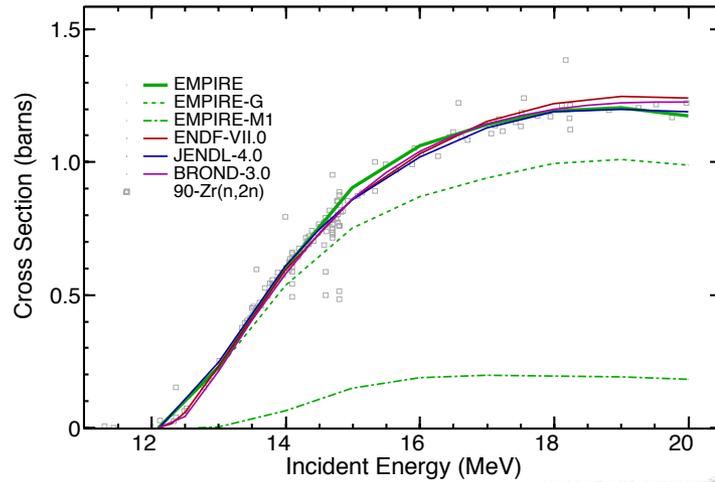
$^{90}\text{Zr}(n,n\text{el})$
Cross sections



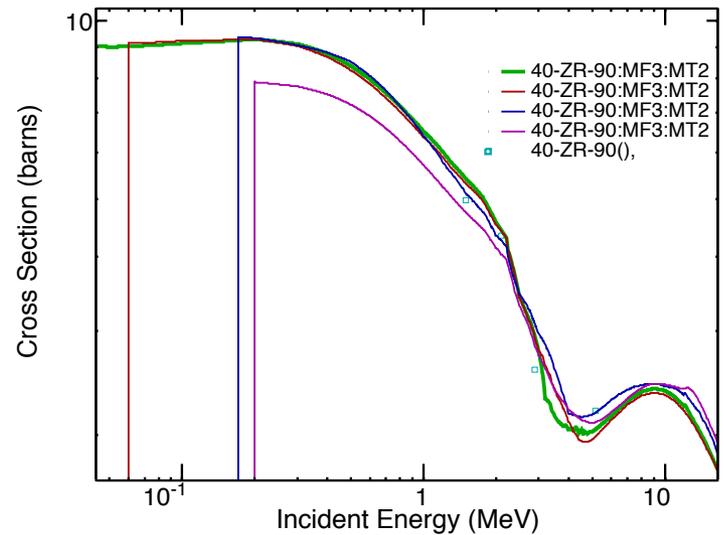
Cross sections



Cross sections



Cross sections

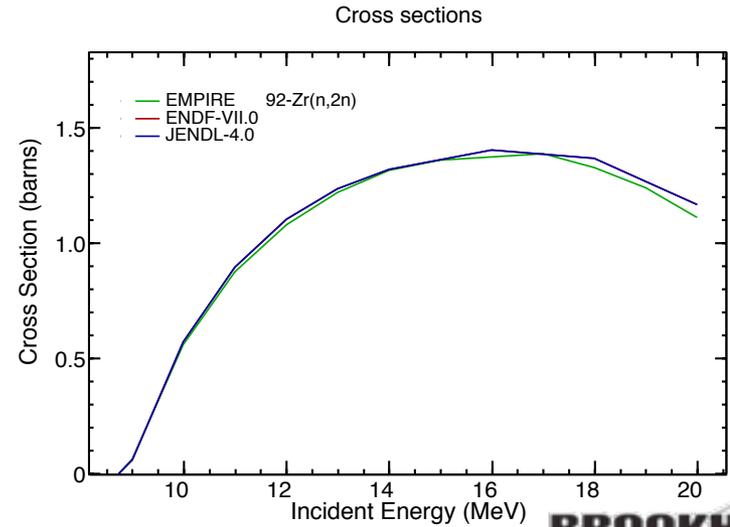
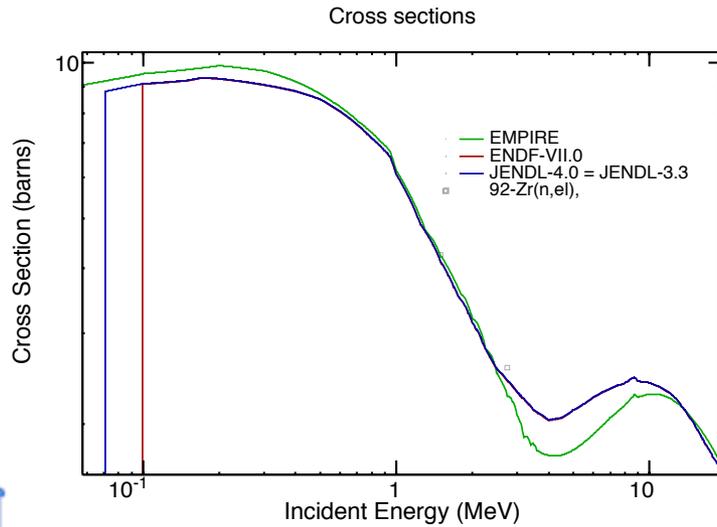
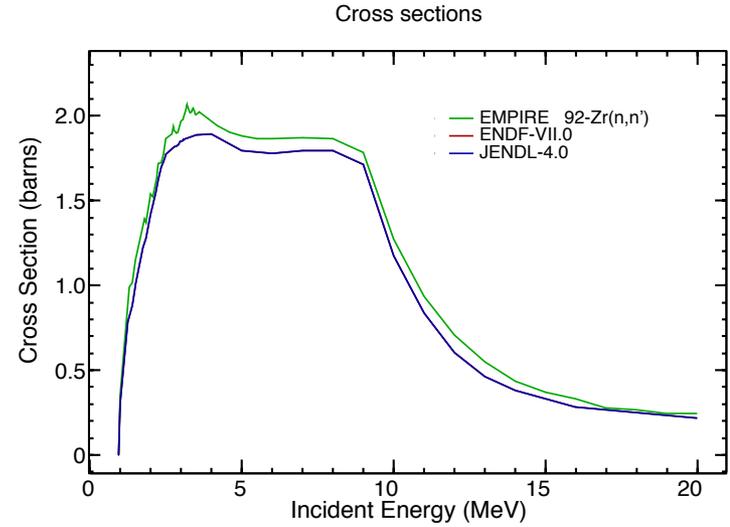
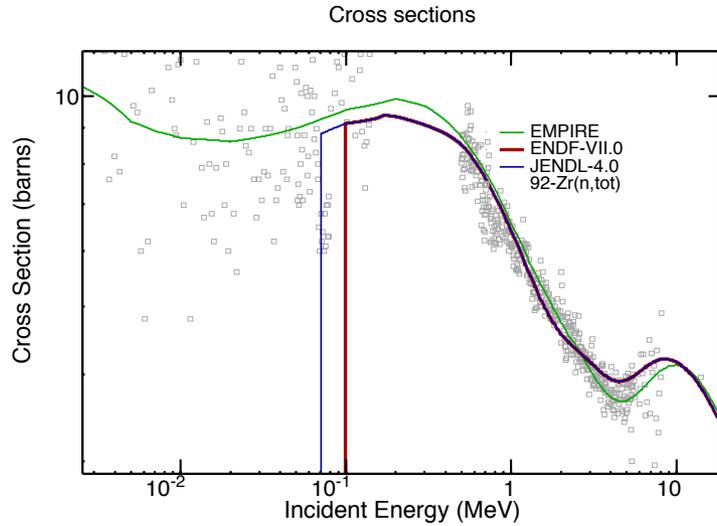


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^{92}Zr



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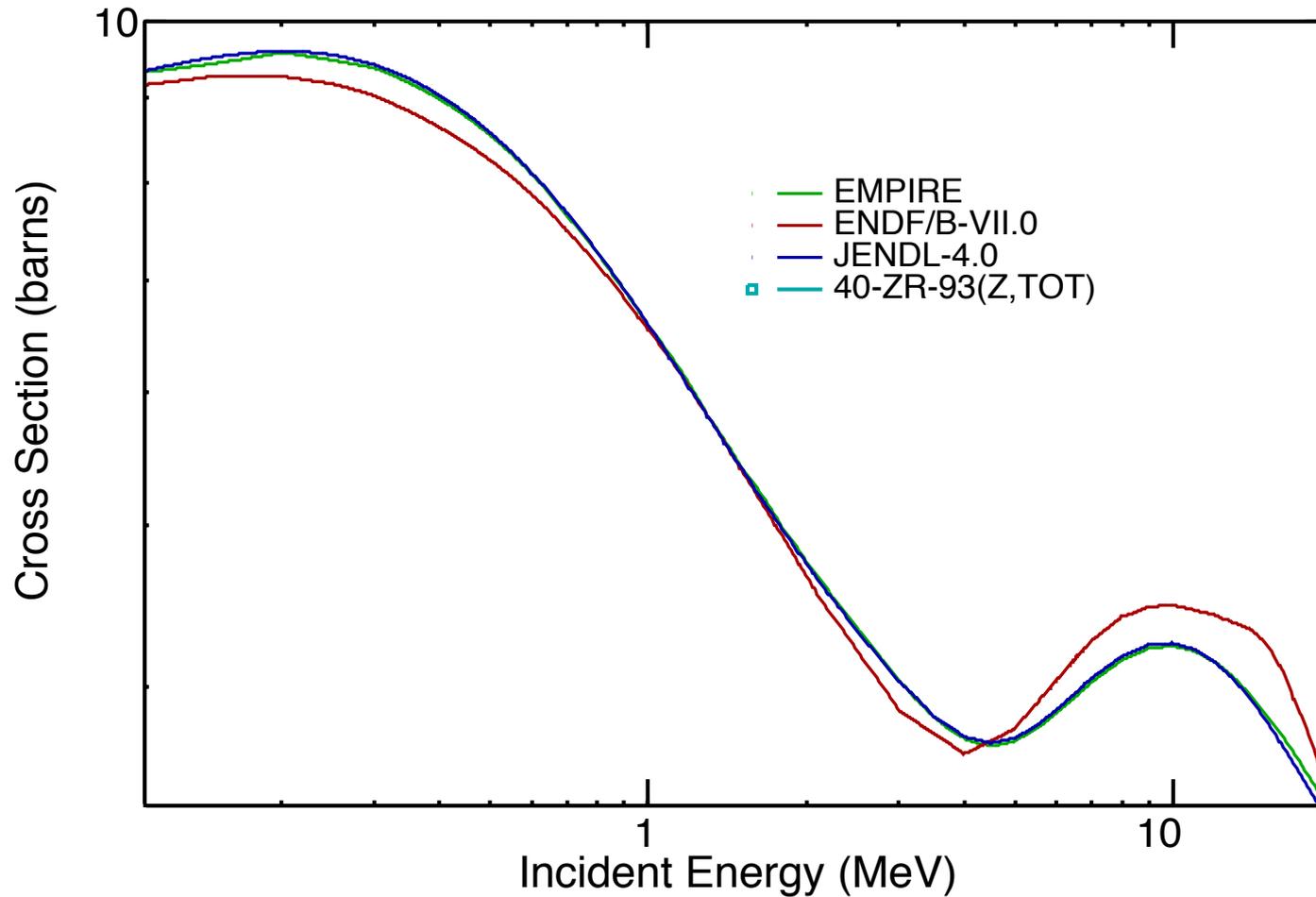
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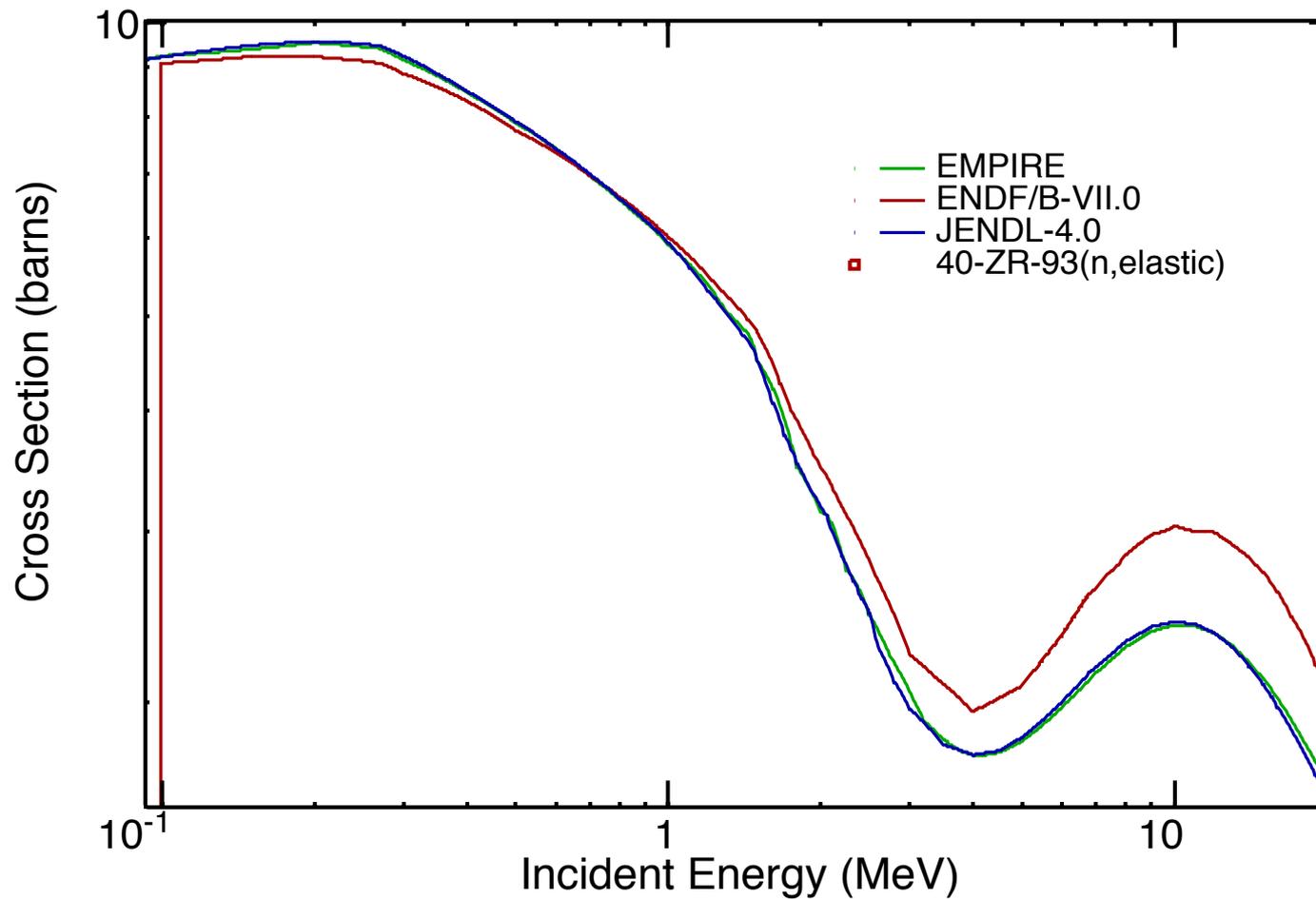
$^{93}\text{Zr}(n,\text{tot})$

Cross sections



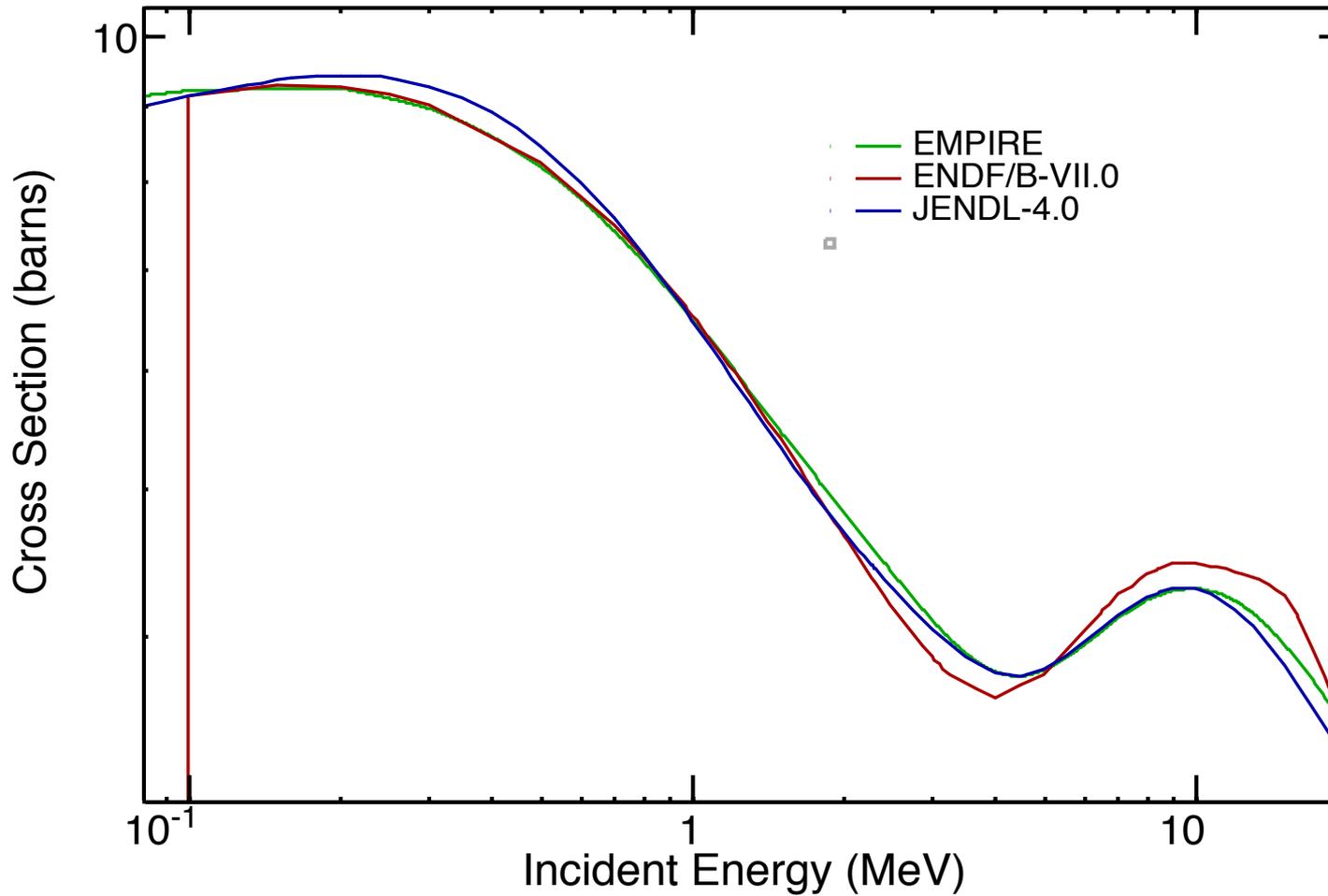
$^{93}\text{Zr}(n,\text{elastic})$

Cross sections



$^{95}\text{Zr}(n,\text{tot})$

Cross sections

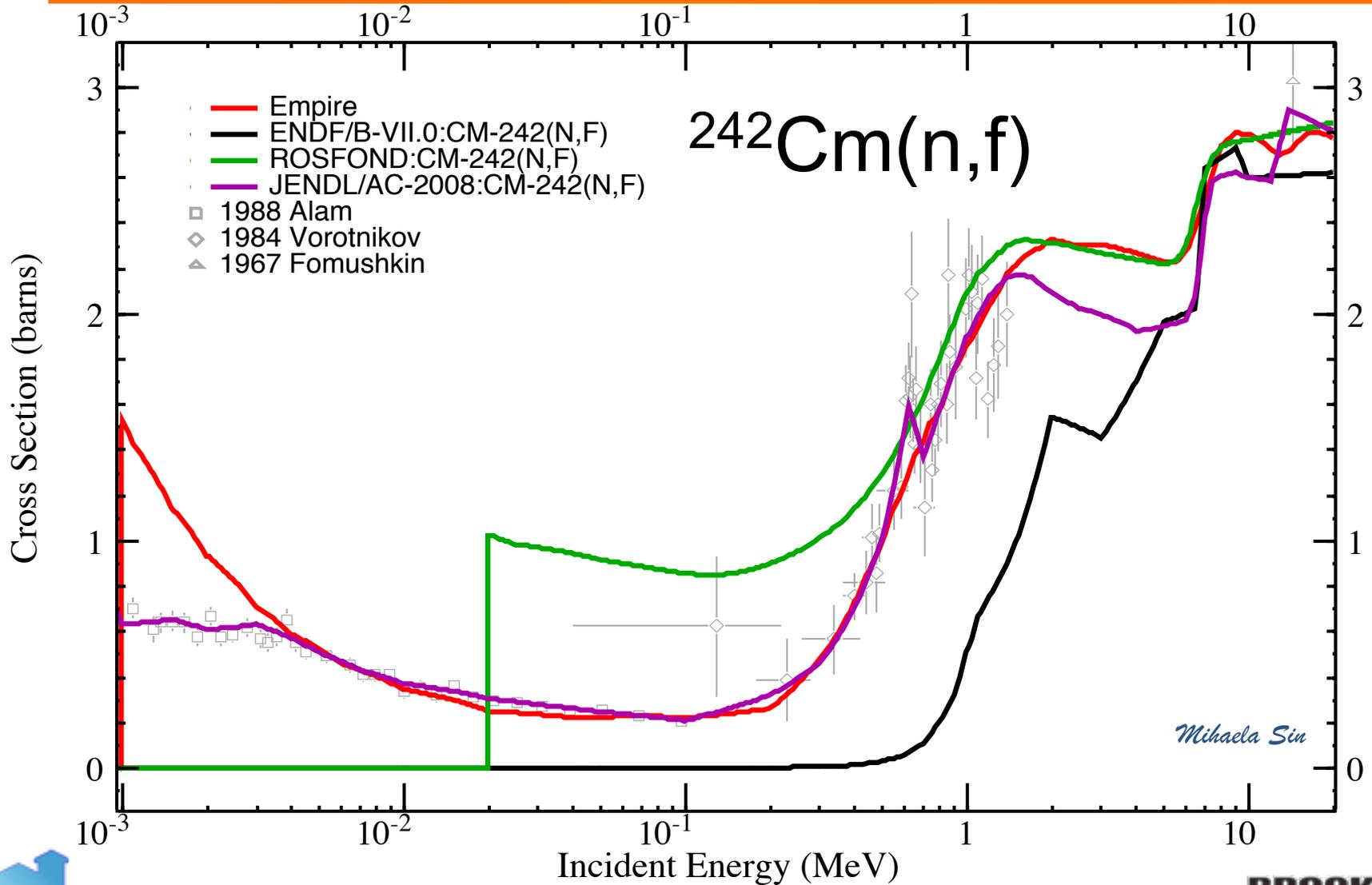


Zr recommendations

- Keep VII.0 for 90-Zr and possibly for 92-Zr
- Replace VII.0 evaluations for 93, 95-Zr with new evaluations based on EMPIRE calculations (close to JENDL-4.0).
- Analyze the remaining isotopes (91,94,96)
- Use JENDL-4.0 resonance parameters for all isotopes

New fission parametrization in EMPIRE

Mihaela Sin



M. Herman

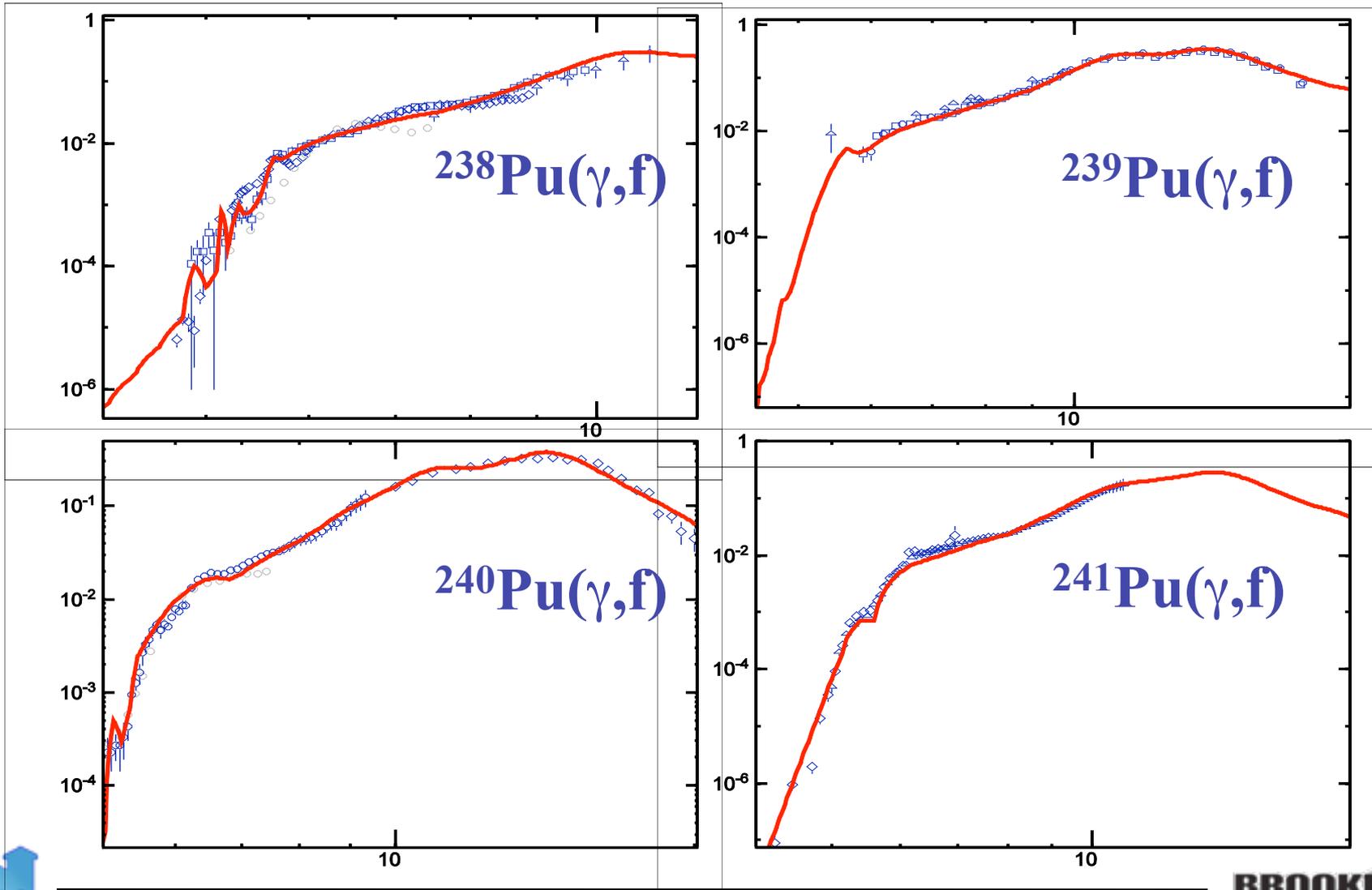
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New fission parametrization in EMPIRE

Use of (g,f) for constraining fission barriers *Mihaela Sin*



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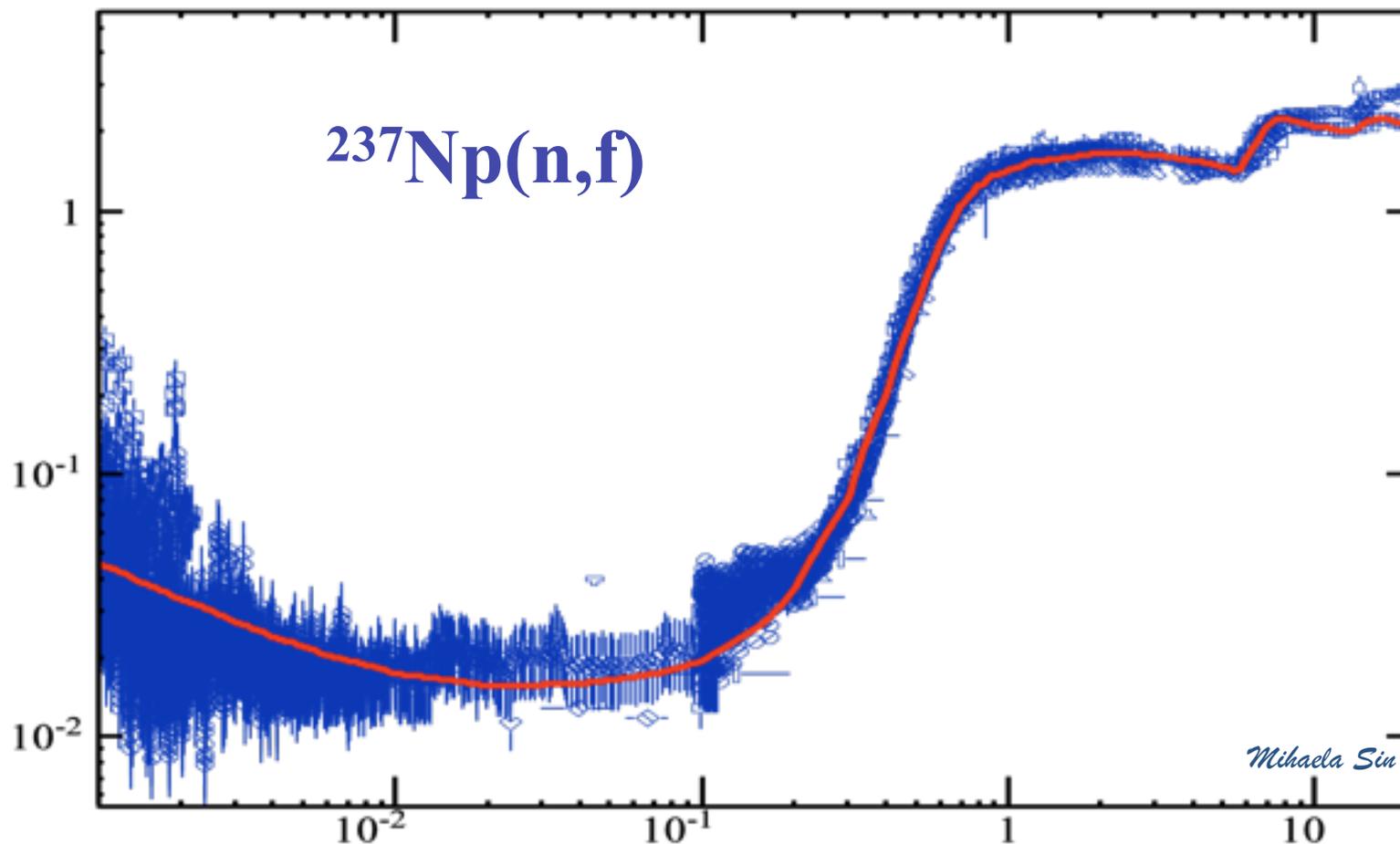
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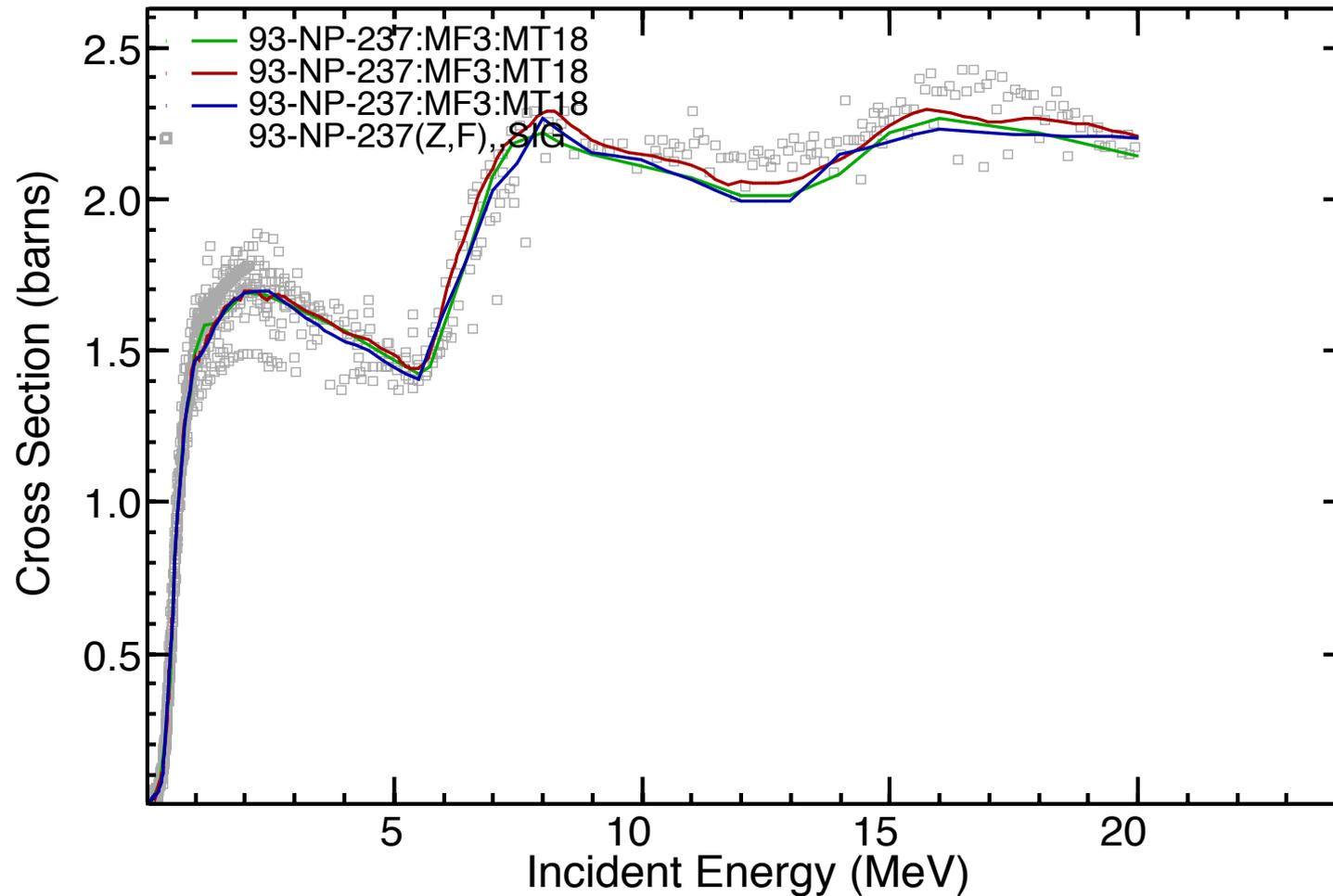
Case of ^{237}Np

M. Pigni & M. Sin



$^{237}\text{Np}(n,f)$

Cross sections



93-NP-237:MF3:MT18
93-NP-237:MF3:MT18
93-NP-237:MF3:MT18
93-NP-237(Z,F), SIG

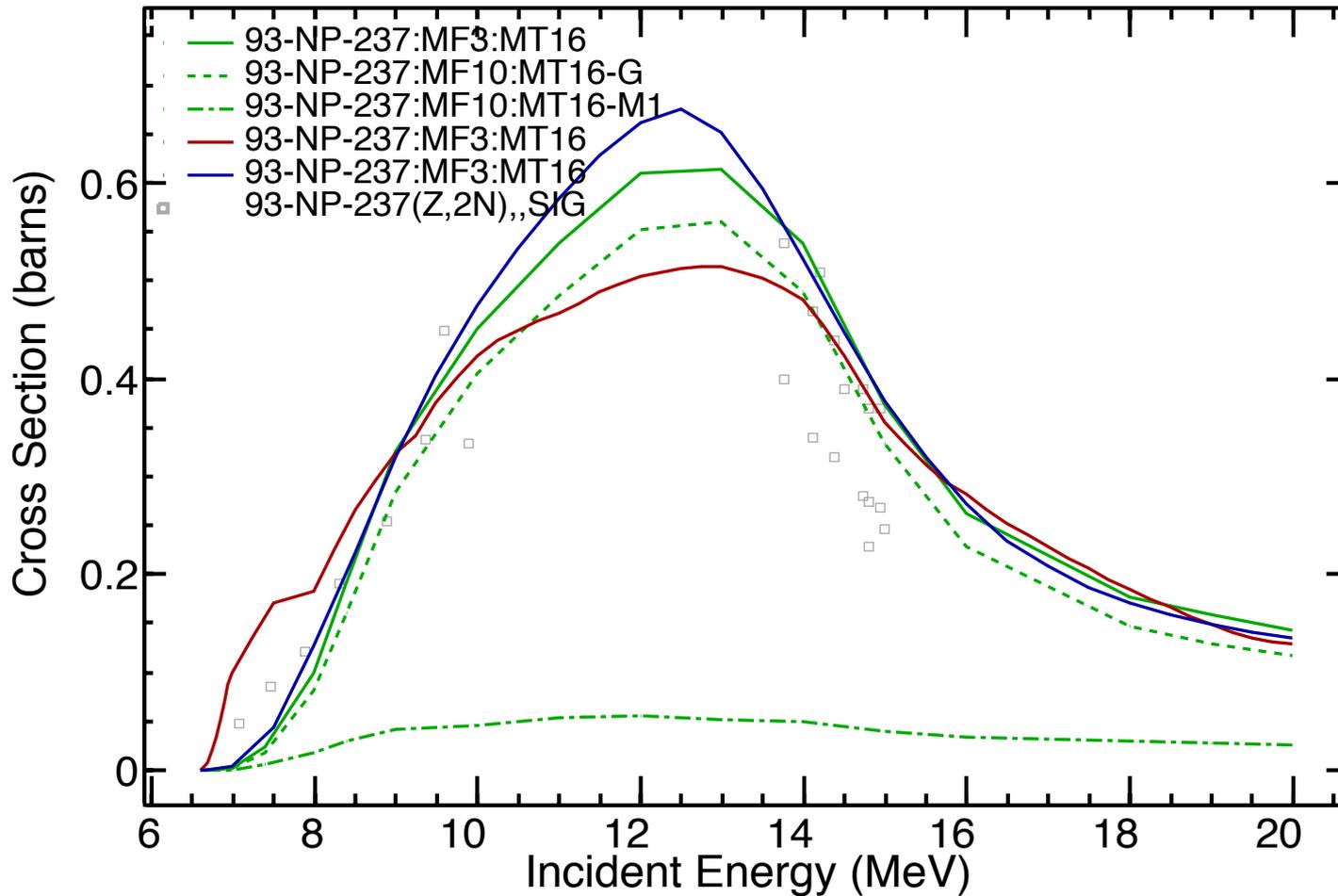
Cross Section (barns)

Incident Energy (MeV)

$^{237}\text{Np}(n,2n)$

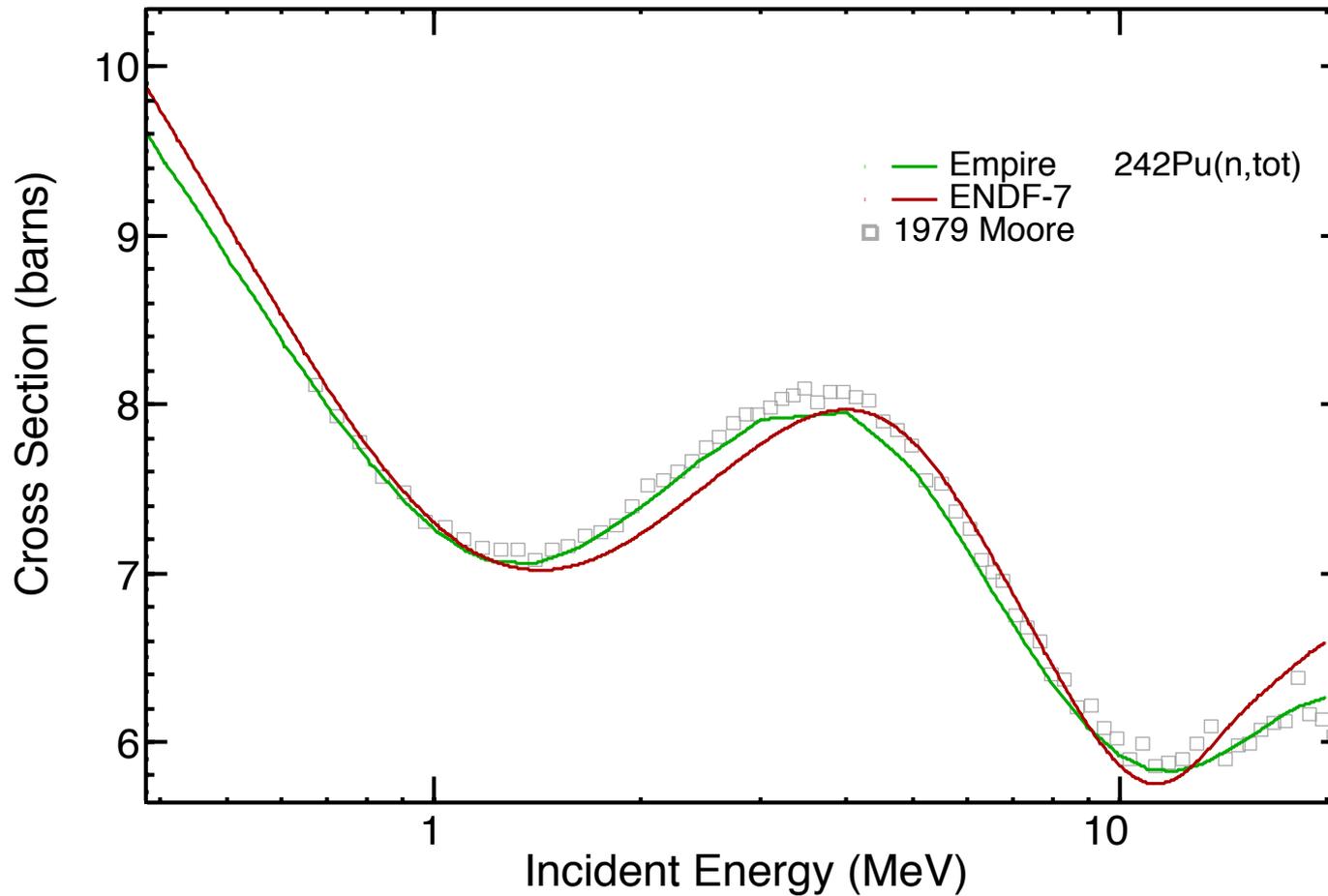
Compare with LANL results

Cross sections



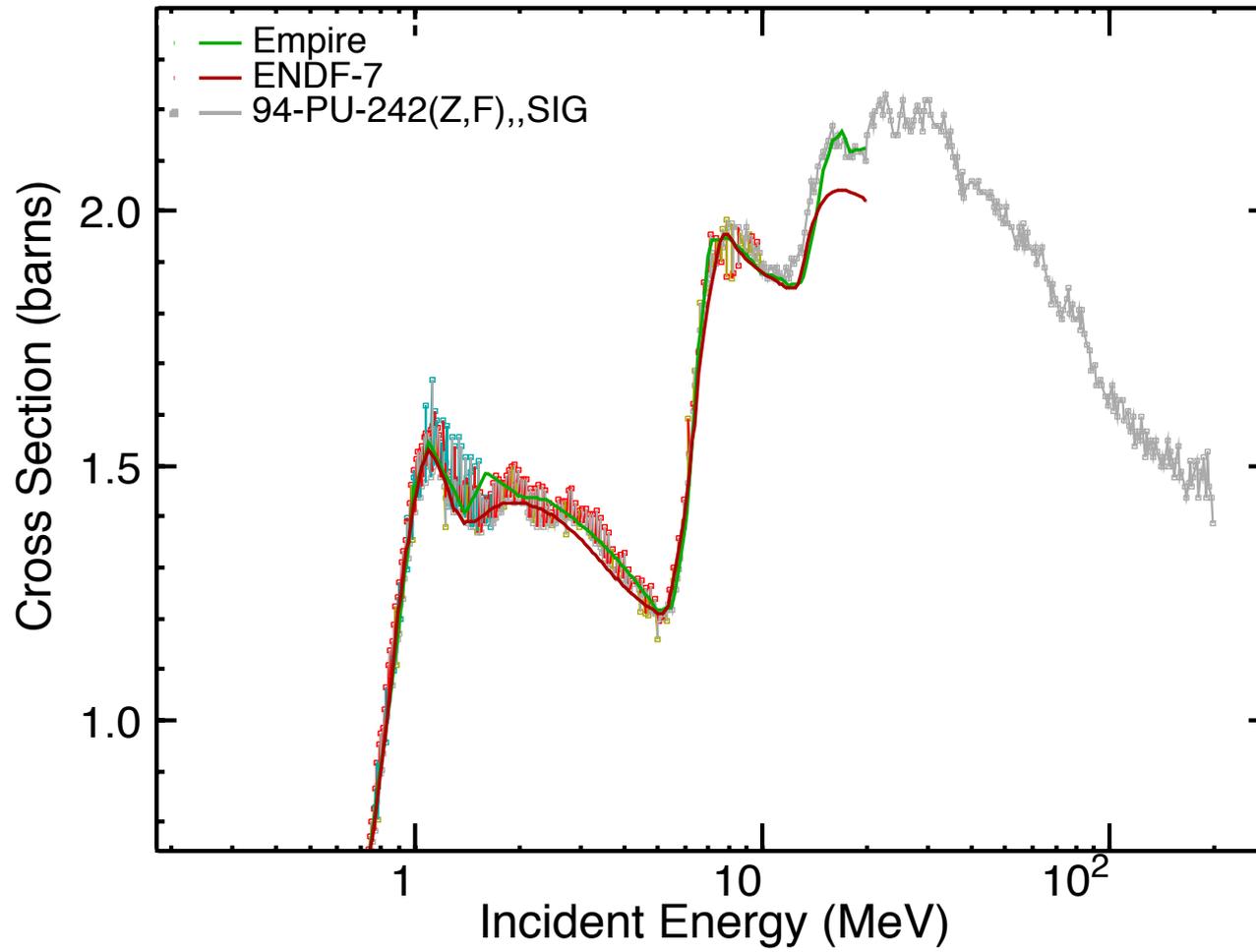
$^{242}\text{Pu}(n,\text{tot})$

Cross sections



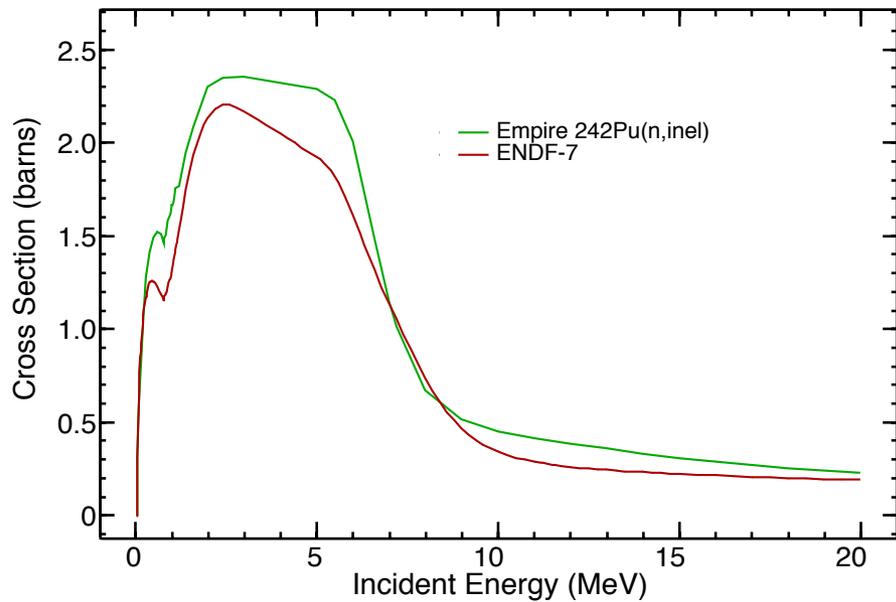
$^{242}\text{Pu}(n,f)$

Cross sections

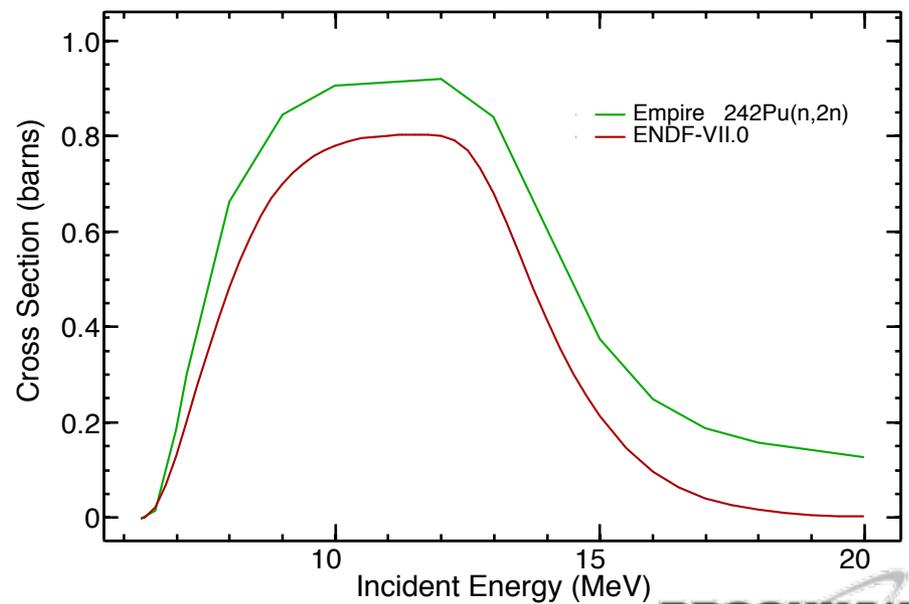


^{242}Pu

Cross sections



Cross sections



BNL plans

- Submit cross section evaluations (including covariances) for:
 - ^{23}Na
 - $^{93,95}\text{Zr}$ (eventually others)
 - ^{237}Np
 - ^{242}Pu