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Title: LANL Status Report

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LANL Status Report

P.Talou, T.Kawano, P.G.Young, S.G.Mashnik*

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Outlook

- Coupled-channel OMPs for nucleon-induced reactions up to 150 MeV for selected fissile nuclei
- Prompt fission neutron information for selected actinides using CEM2k calculations up to 150 MeV
- Produce test cases of covariance matrix for level density parameters using the KALMAN code
- "blind" GNASH calculations of (n,f) and (n,2n) cross sections for selected actinides, using Goriely's fission barrier parameters and nuclear level densities at saddle points

Coupled-channels OMPs

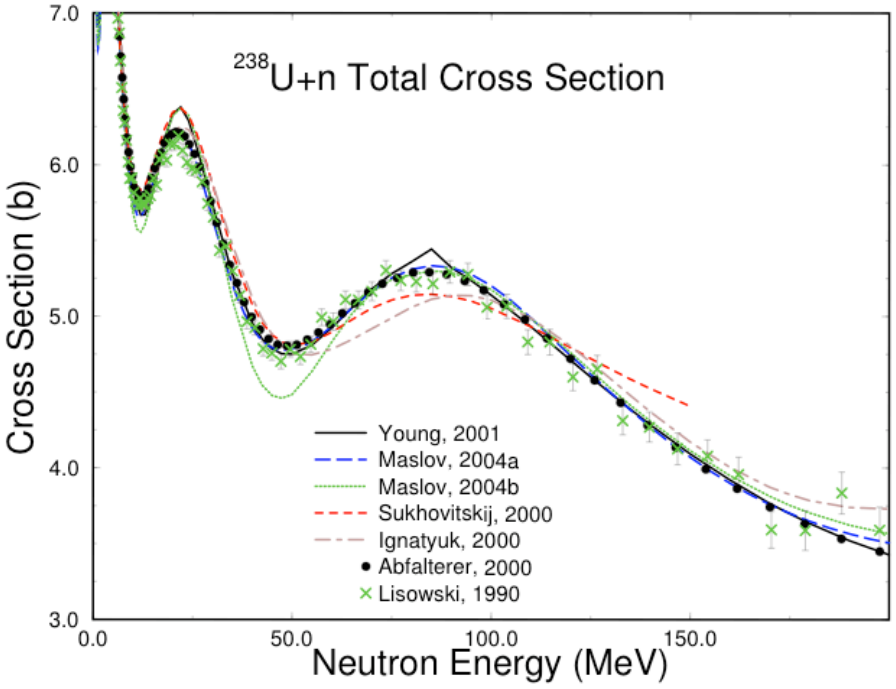
- Coupled-channels OMPs for nucleon-induced reactions up to 150 MeV, used at LANL (P.G.Young)

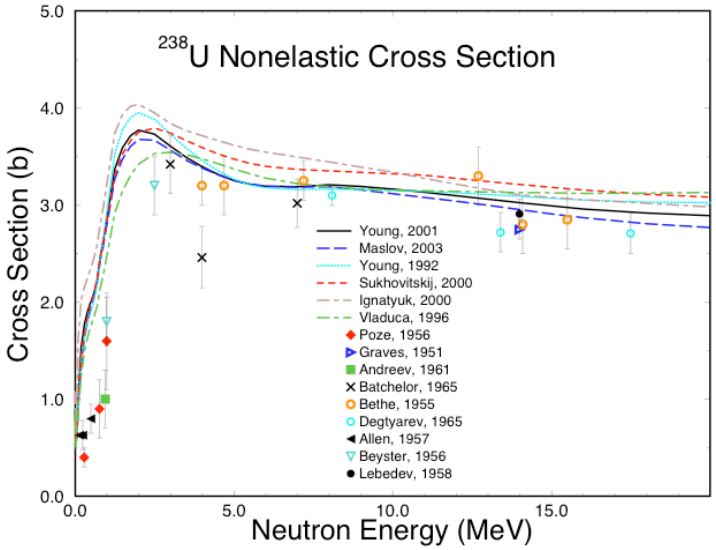
Lib. No.	Inc. Part.	Model Type	Disp. Pot	Rel. Pot.	Z-Range	A-Range	E-Range	Ref. No.	First Author
22	n	rot.-3	no	no	77-77	191-191	0.0-20.0	1	M.B.Chadwick
23	n	rot.-3	no	no	77-77	193-193	0.0-20.0	1	M.B.Chadwick
2008	n	rot.-3	no	no	92-92	232-240	0.0-30.0	2	P.G.Young
2009	n	rot.-3	no	no	92-92	232-240	0.0-200.0	3	P.G.Young
2200	n	rot.-5	no	yes	92-92	238-238	0.0-150.0	4	E.S.Sukhovistkii
2301	n	rot.-3	no	yes	92-92	238-238	0.0-230.0	5	V.P.Lunev
2600	n	rot.-5	no	yes	92-92	238-238	0.0-20.0	6	V.M.Maslov
5301	p	rot.-3	no	yes	92-92	238-238	0.0-230.0	5	V.P.Lunev
9601	^{4}He	sphe.	no	no	39-50	89-124	0.1-32.0	7	M.Avrigeanu

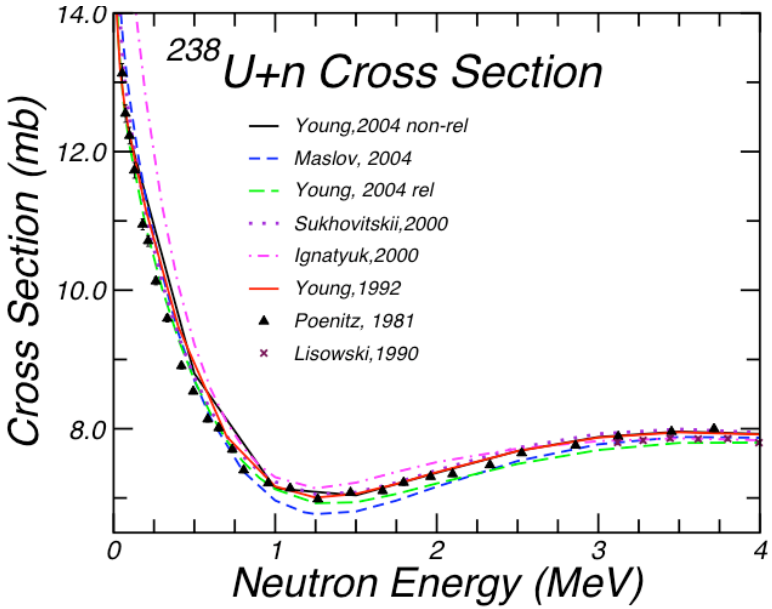
OMPs References

1. M.B.Chadwick and A.C.Hayes (entered in current format by P.Talou), [Ref. R.Macklin and P.G.Young, Nucl. Sci. Eng. 97, 239 (1987)]
2. P.G.Young and E.D.Arthur, LANL Report LA-UR-91-1424,894(1992); IAEA-TECDOC-1034 (1998) p.131
3. P.G.Young, LANL Progress Report LA-11972-PR (1990) p.9
4. E.S.Sukhovitskii,O.Iwamoto,S.Chiba,T.Fukahori, J.Nucl.Sci.& Tech. 37,120 (2000)
5. V.P.Lunev, private communication to M.B.Chadwick, Feb., 2002
6. V.M.Maslov,Yu.V.Porodzinskij,N.A.Tetereva,A.B.Kagalenko,et al., INDC(BLR)-014 (2003)
7. M.Avrigeanu,W.von Oertzen,A.J.Plompen,V.Avrigeanu, Proc.10th Int.Conf. on Nucl.Reaction Mechanisms,Varenna,9-13 June 2003,p.271.

^{238}U+n Cross Sections







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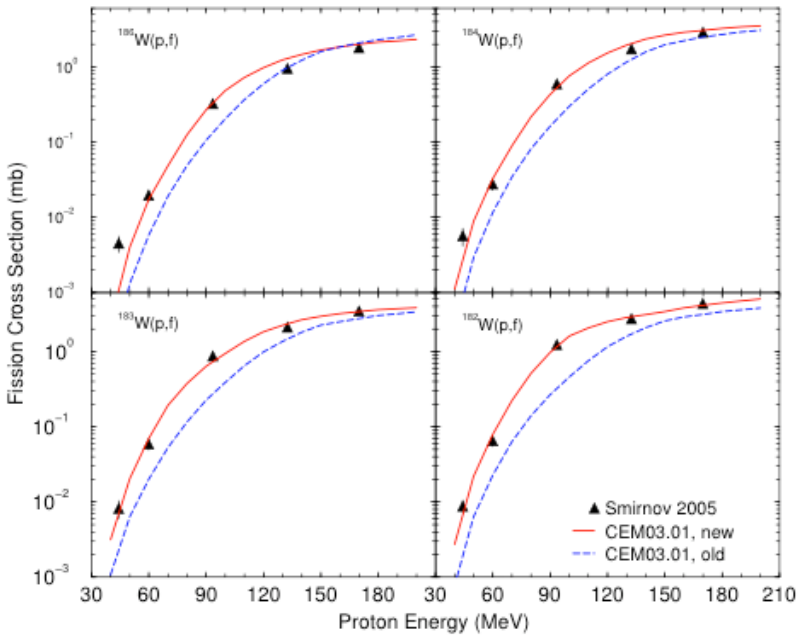
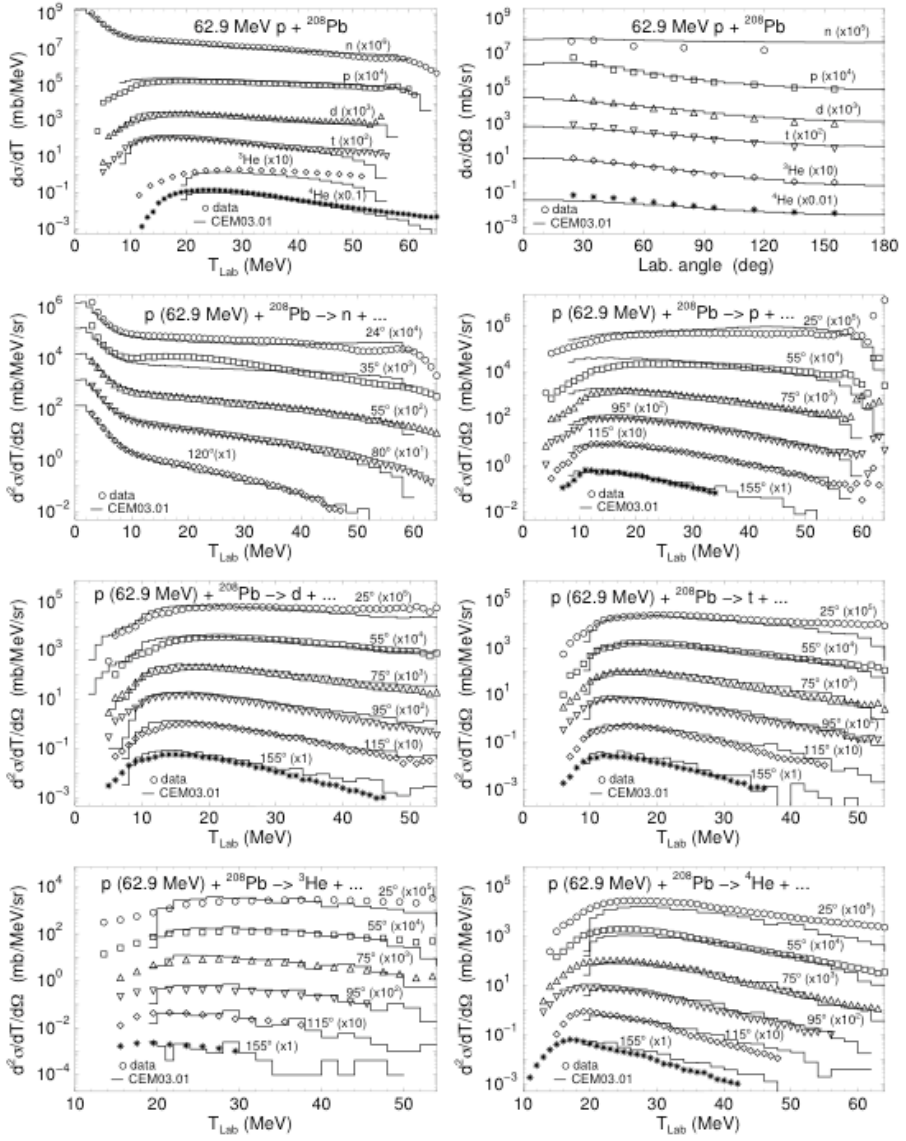
Prompt fission neutron information for selected actinides using CEM2k calculations up to 150 MeV

- S.G.Mashnik, K.K.Gudima, A.J.Sierk, M.I.Baznat, N.V.Mokhov, *"CEM03.01 User Manual"*, **LA-UR-05-7321**
- CEM03.01: new extended and improved version of the earlier code CEM2k+GEM2
- **C**ascade-**E**xciton-**M**odel of nuclear reactions
- Calculates total reaction and fission cross-sections, nuclear fissilities, excitation functions, Y(A,Z) of all produced isotopes, energy and angular spectra, double-differential cross sections, ejectile yields and their mean energies
- Reactions induced by nucleons, pions and photons on medium and heavy targets at incident energies from ~10 MeV up to several GeV.

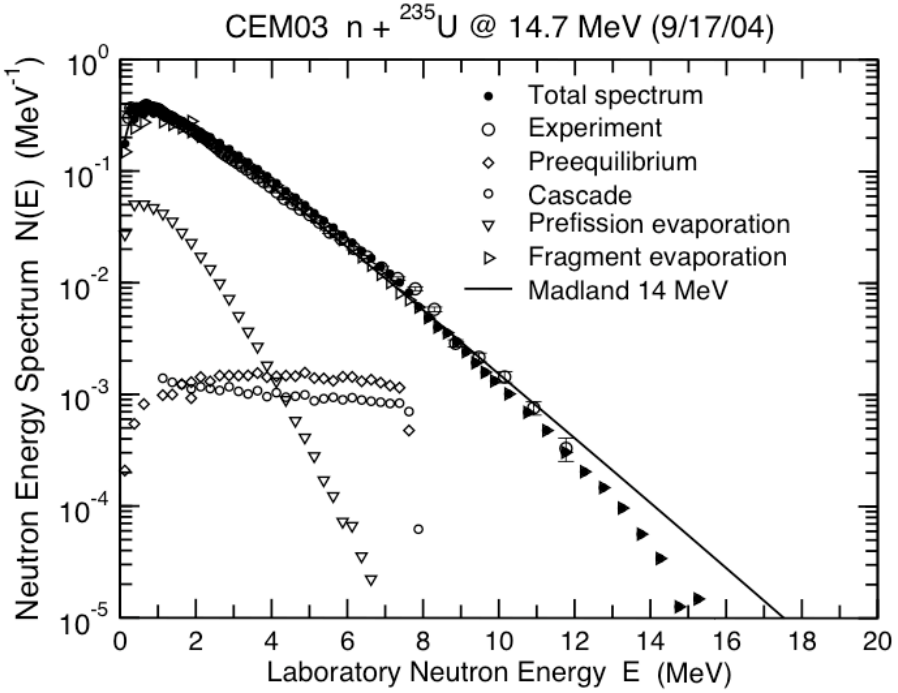
Extensive benchmarking of CEM03.01

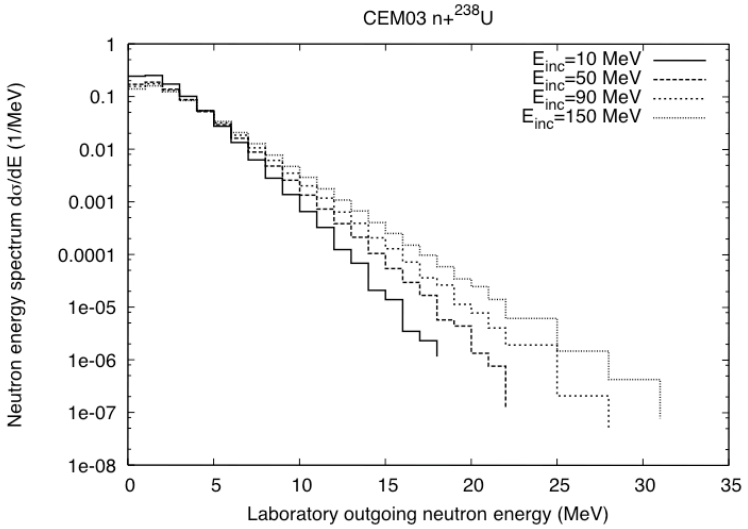
- S.G.Mashnik *et al.*, ND2004 Conference Proceedings CP769, AIP 2005, p. 1188.

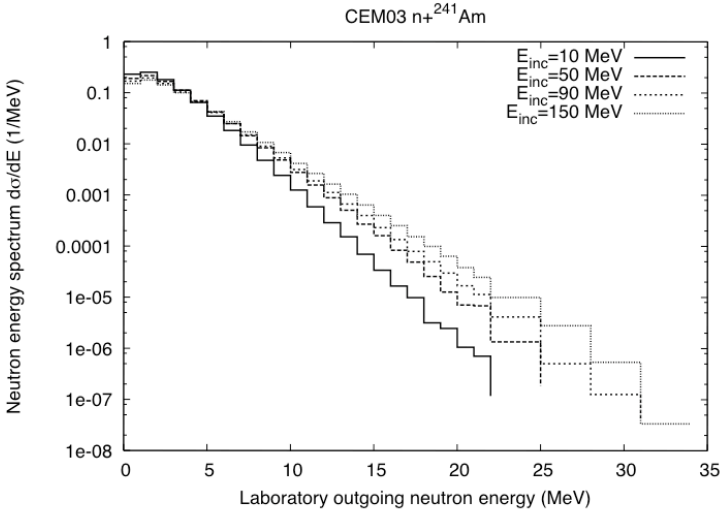




Fission neutrons spectra







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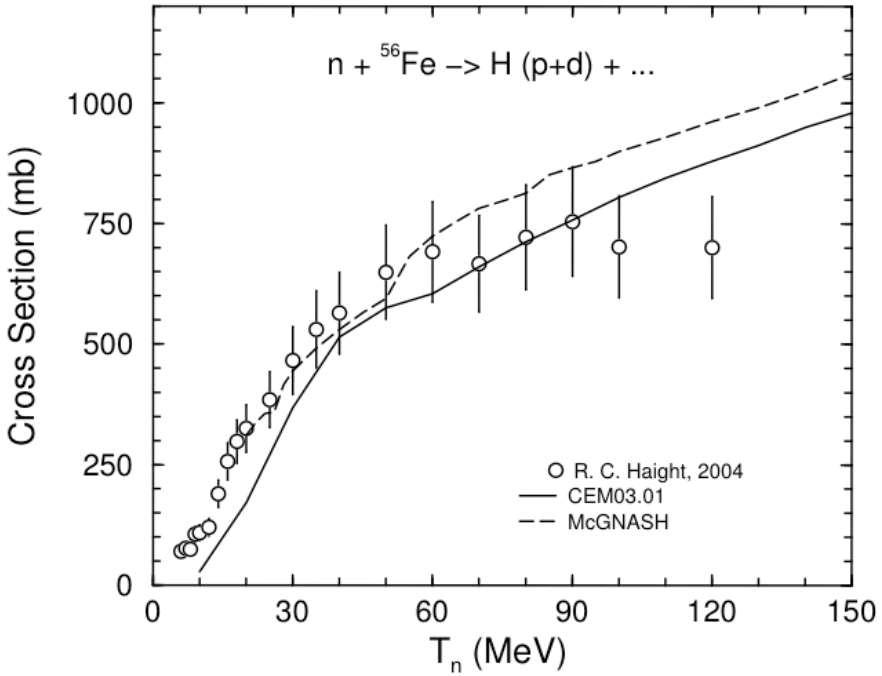
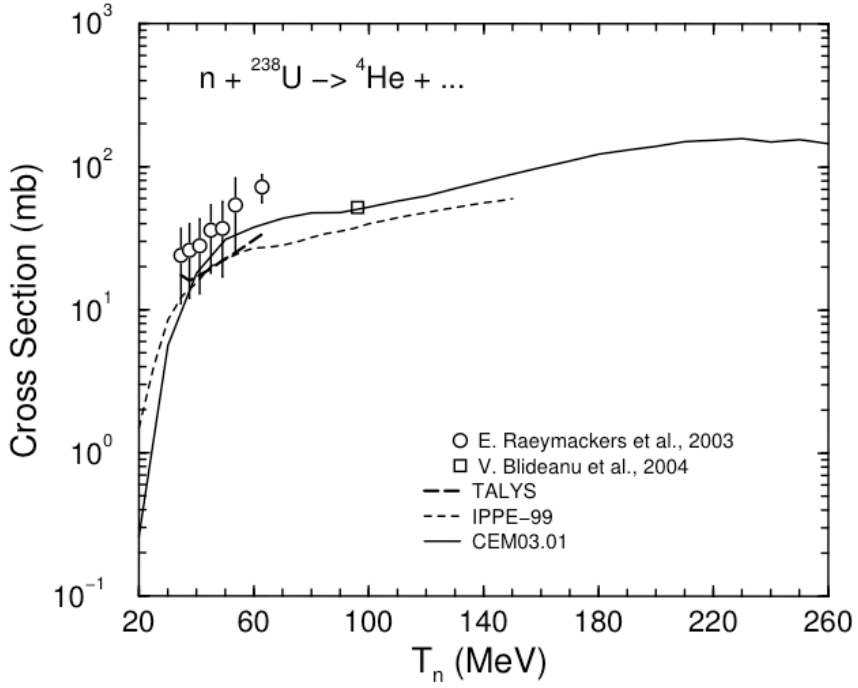
CEM03 for gas-production cross section calculations

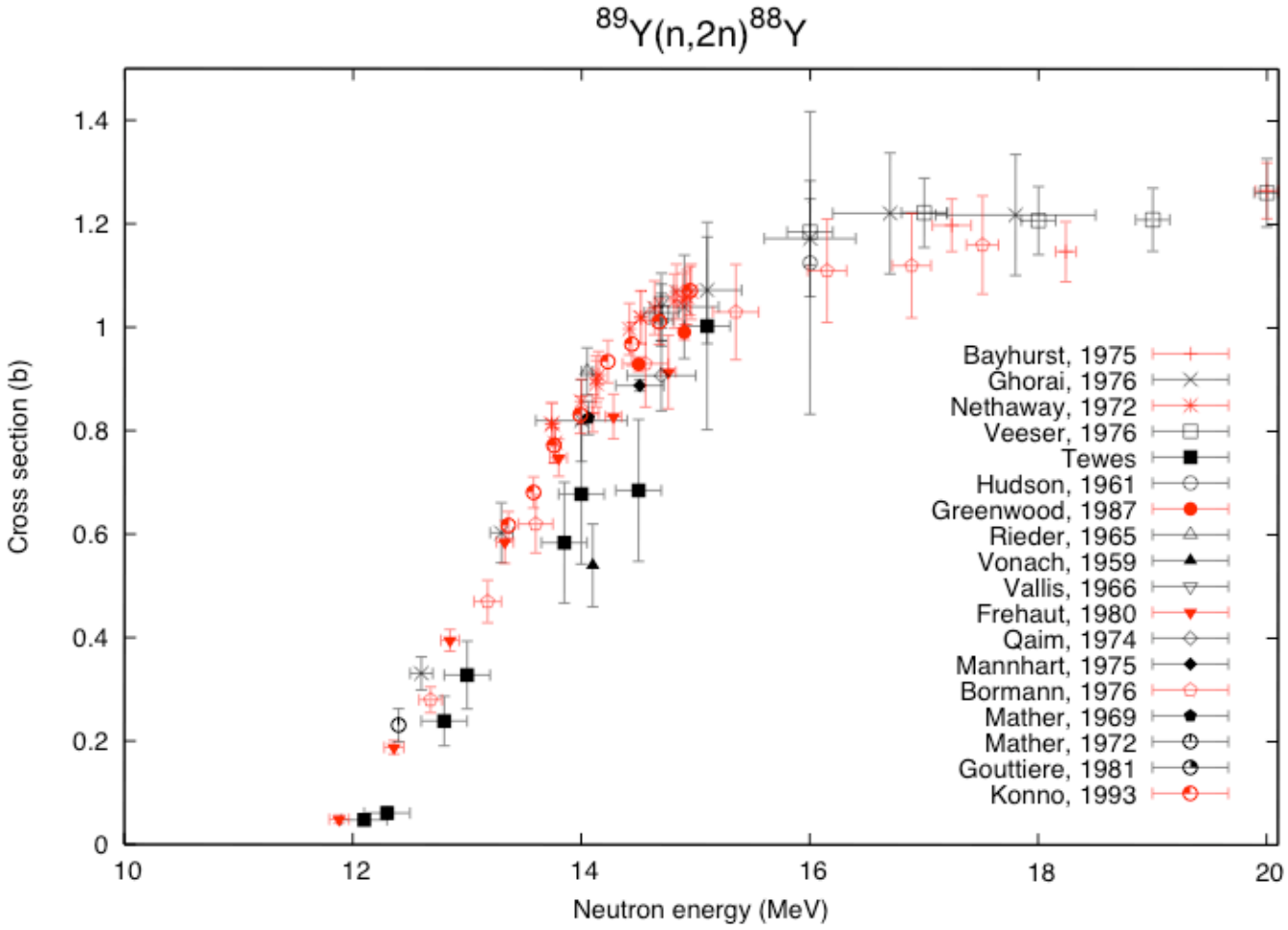




Test case of covariance matrix for level density parameters using the KALMAN code

- Goal: show the impact of including experimental data uncertainties in the evaluation of covariance matrices from model calculations.
- Case of $^{89}Y(n,2n)^{88}Y$ radchem cross-section, studied at LANSCE-GEANIE.
- Use KALMAN code to generate covariance matrix for the (n,2n) channel. Level density parameters for ^{90}Y, ^{89}Y and ^{88}Y with 30% uncertainty.

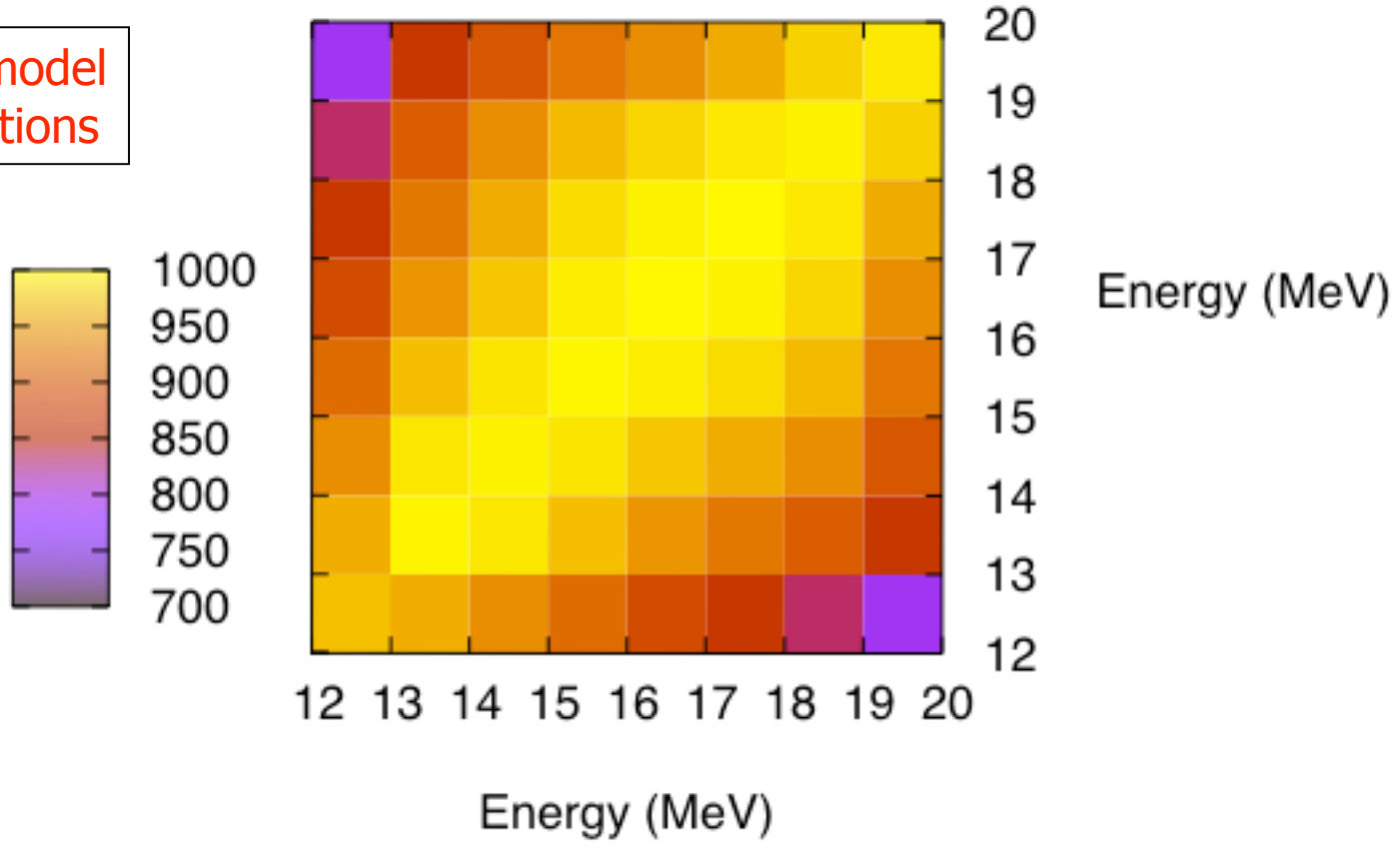
$^{89}Y(n,2n)^{88}Y$ cross-section



$^{89}Y(n,2n)^{88}Y$ evaluated covariance

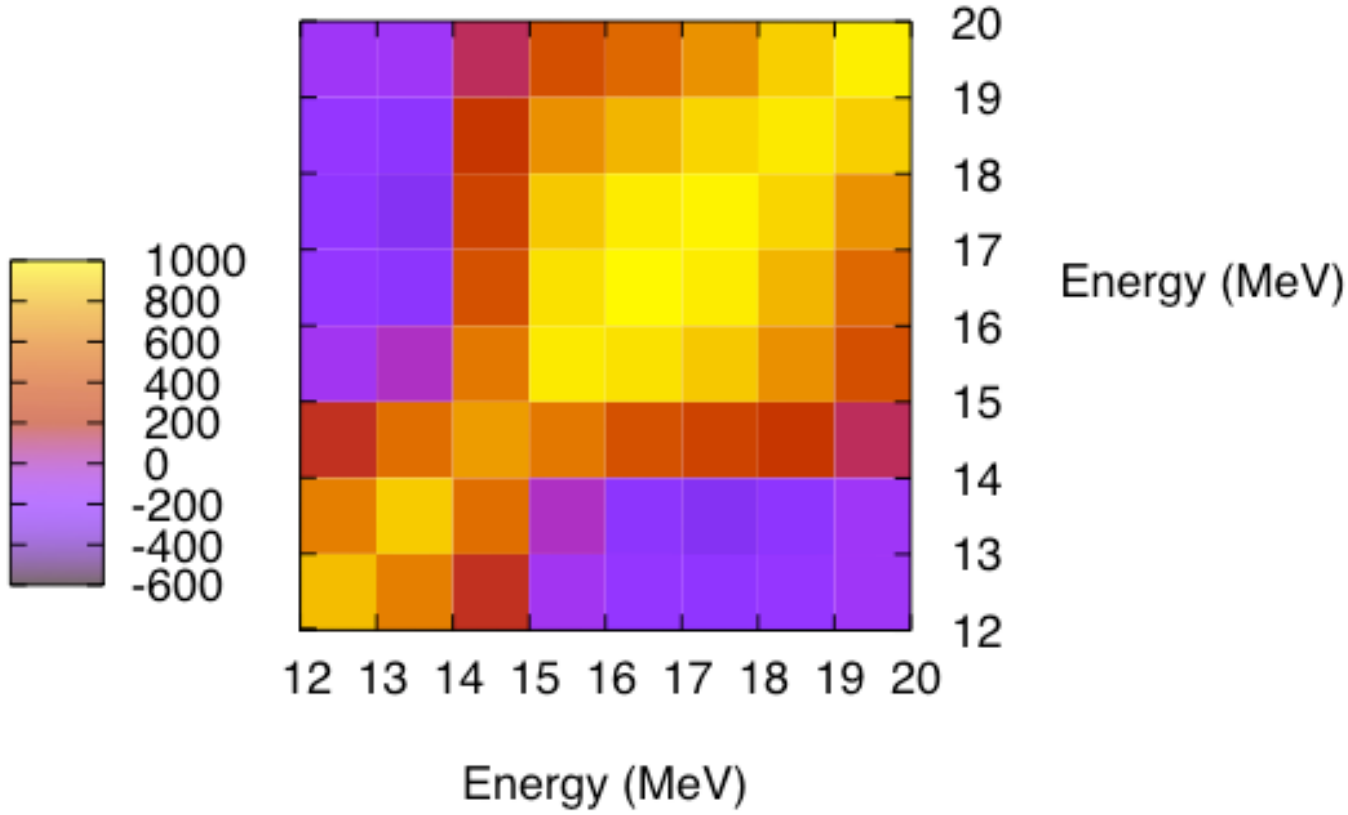
No experimental information ; 30% uncorrelated uncertainties in LD parameters

Large model correlations



$^{89}Y(n,2n)^{88}Y$ evaluated covariance

Experimental covariance added

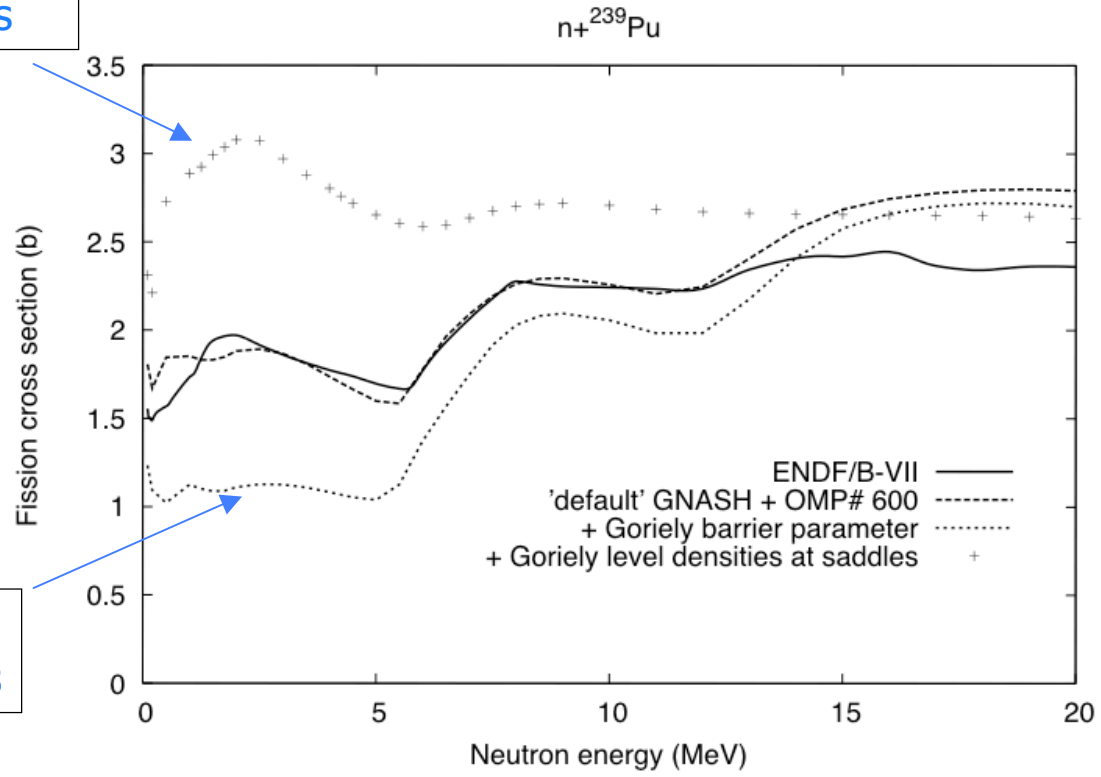


"Blind" GNASH calculations with HFB input (S.Goriely)

- S.Goriely's HFB fission barrier parameters and NLD at inner and outer saddle points
- $0.25 \leq U \leq 150$ MeV ; 30 spins
- Modified GNASH code to directly read in nuclear level densities
- Comparison with "default" input files using rotational band-head information and Gilbert-Cameron level density for the continuum
- Nuclei studied (so far): ^{239}Pu, ^{235}U, ^{238}U

^{239}Pu+n cross-sections calculations

Larger microscopic level densities



ENDF/B-VII taken as reference

Higher HFB barrier heights