The Evaluation of the Neutron Cross Section Standards

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Presented at the

CSEWG Meeting
Brookhaven National Laboratory
November 5, 2003

STANDARDS TO BE EVALUATED

Reaction	Energy Range
H(n,n)	1 keV to 200 MeV
^{3}He(n,p)	thermal to 50 keV
^{6}Li(n,t)	thermal to 1 MeV
^{10}B(n,α)	thermal to 1 MeV
^{10}B(n,$\alpha_1\gamma$)	thermal to 1 MeV
^{197}Au(n,γ)	thermal, 0.2 to 2.5 MeV
^{235}U(n,f)	thermal, 0.15 to 200 MeV
^{238}U(n,f)	threshold to 200 MeV

The International Neutron Cross Section Standards Evaluation

- WPEC and CSEWG
  - Encourage /motivate new measurements where necessary
  - Investigate experimental work to get better information on corrections and uncertainties
  - Mainly interested in the final product, the standards evaluation
- IAEA Coordinated Research Project
  - Refines/improves the evaluation process
  - Seeks to improve the understanding of the uncertainties
  - The focus is on the evaluation process

IAEA CRP
on
Improvement of the Standard Cross Sections for Light Elements

Objectives

• Improve the methodology for determination of the covariance matrix in R-matrix fits**.** Upgrade computer codes using this methodology.

• Study the reasons for uncertainty reduction in R-matrix fits.

• Evaluate cross sections and covariance matrices for neutron induced standard reactions for the light elements,
[H(n,n), ^{3}He(n,p), ^{6}Li(n,t), ^{10}B(n,α) and ^{10}B(n,$\alpha_1\gamma$)]

• Establish the methodology and computer codes for combining the light element with the heavy element evaluations.

Standards Second RCM Attendees

CRP Work Now Underway

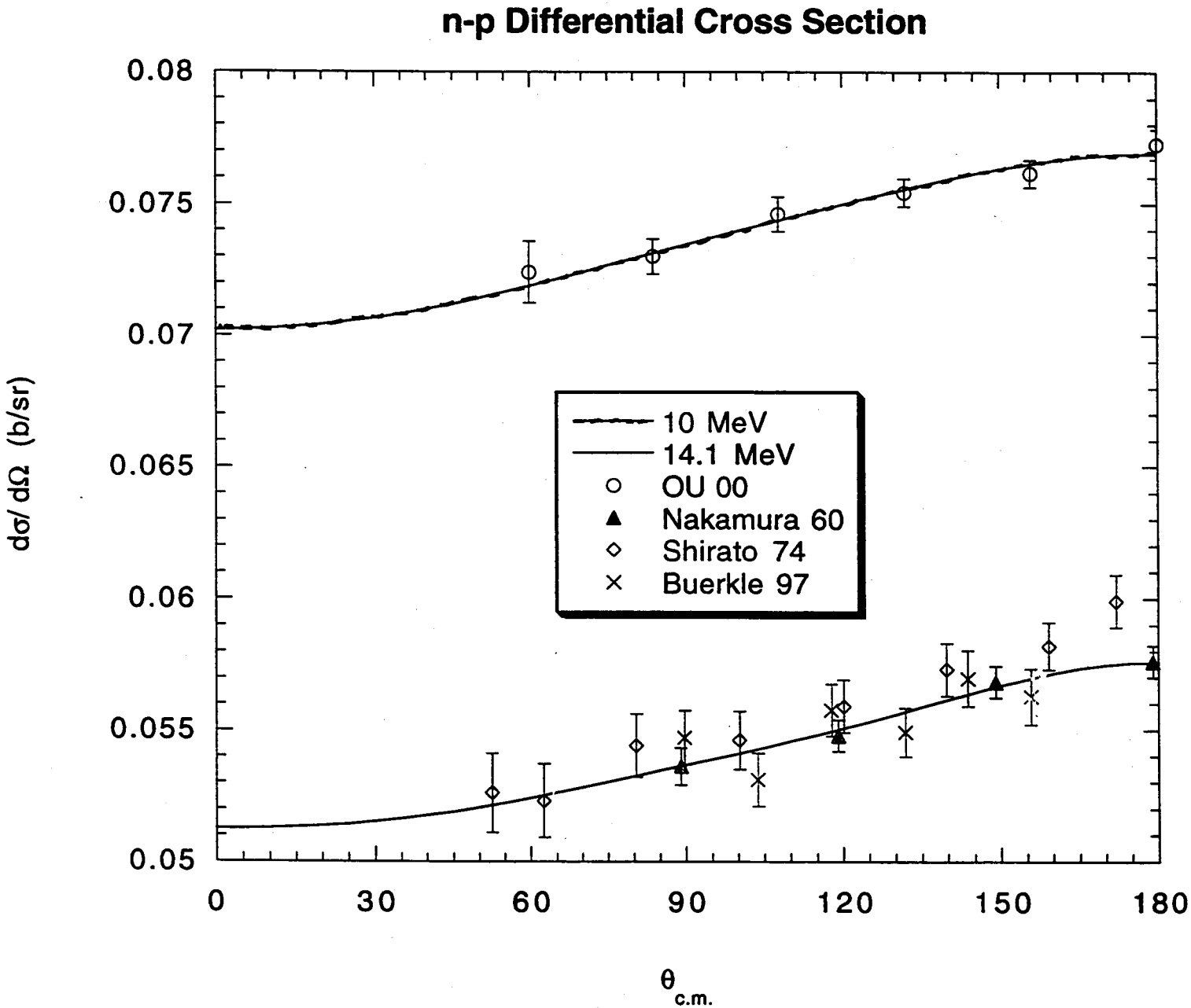
(Two RCMs have been held)

- Improvements to the experimental data in the standards database
  - In addition to the data sets introduced after the ENDF/B-VI evaluation and before the formation of the CRP, more than 30 data sets have been added to the standards database. Many more are expected before the completion of the evaluation.

- R-matrix evaluations
  - Hale has evaluated the hydrogen scattering cross section below 30 MeV neutron energy using the code EDA. Improvement in the angular distribution was observed compared with recent measurements. Unexpected problems at the 1-2% level appear in the total cross section near 10 MeV neutron energy that require further investigation.

  - The ^{6}Li(n,t) cross section has been evaluated by Hale and Zhenpeng. However they used somewhat different databases and procedures

  - The ^{10}B(n,$\alpha_1\gamma$), and ^{10}B(n,α) cross sections were evaluated by Zhenpeng, but the charged-particle database was not complete


n-p Differential Cross Section
0.08
0.075
0.07
0.065
0.06
0.055
0.05
dσ/ dΩ (b/sr)
0
30
60
90
120
150
180
θ c.m.
10 MeV
14.1 MeV
OU 00
Nakamura 60
Shirato 74
Buerkle 97

CRP Work Now Underway

(Two RCMs have been held)

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  - In addition to the data sets introduced after the ENDF/B-VI evaluation and before the formation of the CRP, more than 30 data sets have been added to the standards database. Many more are expected before the completion of the evaluation.

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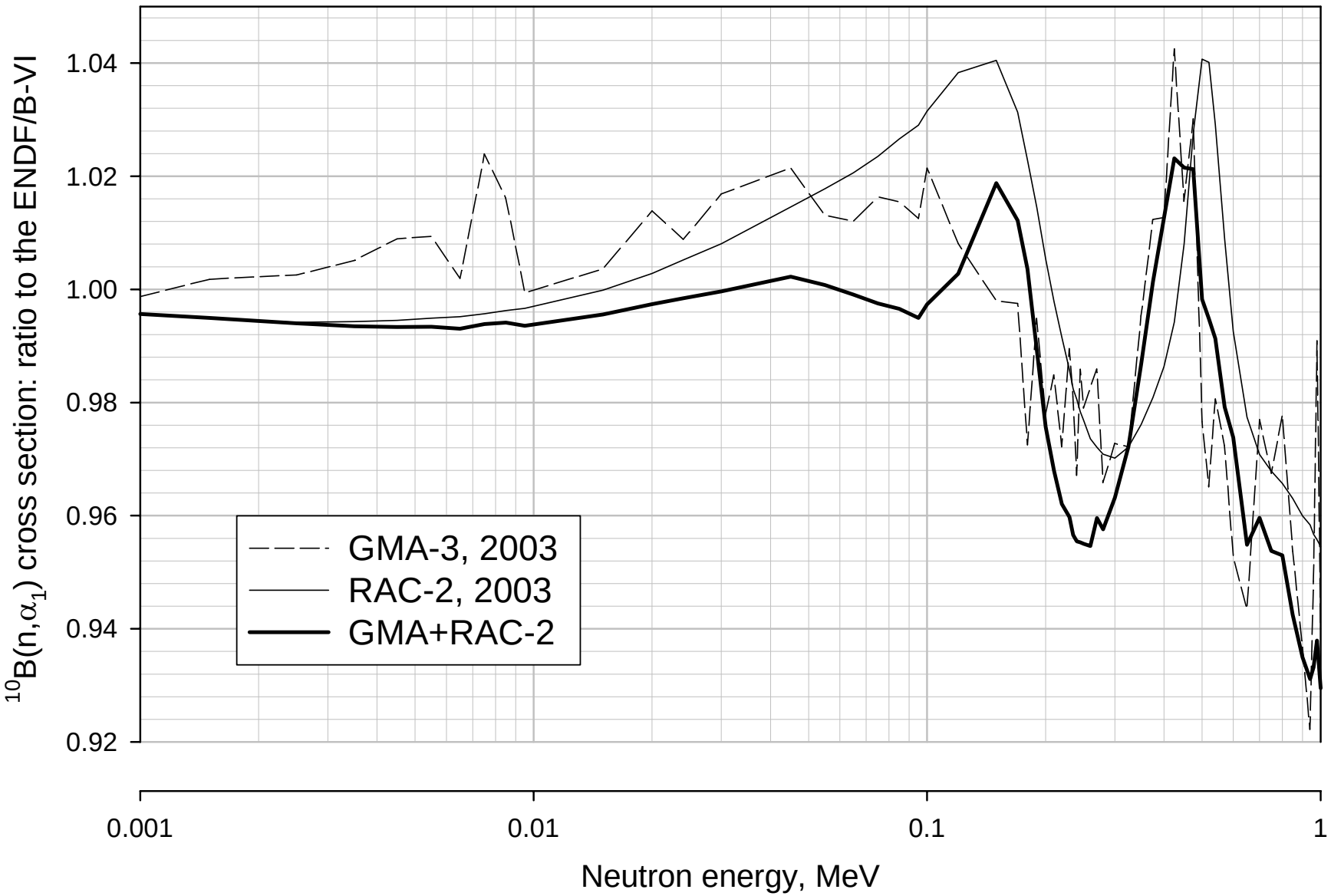
  - The ^{6}Li(n,t) cross section has been evaluated by Hale and Zhenpeng. However they used somewhat different databases and procedures

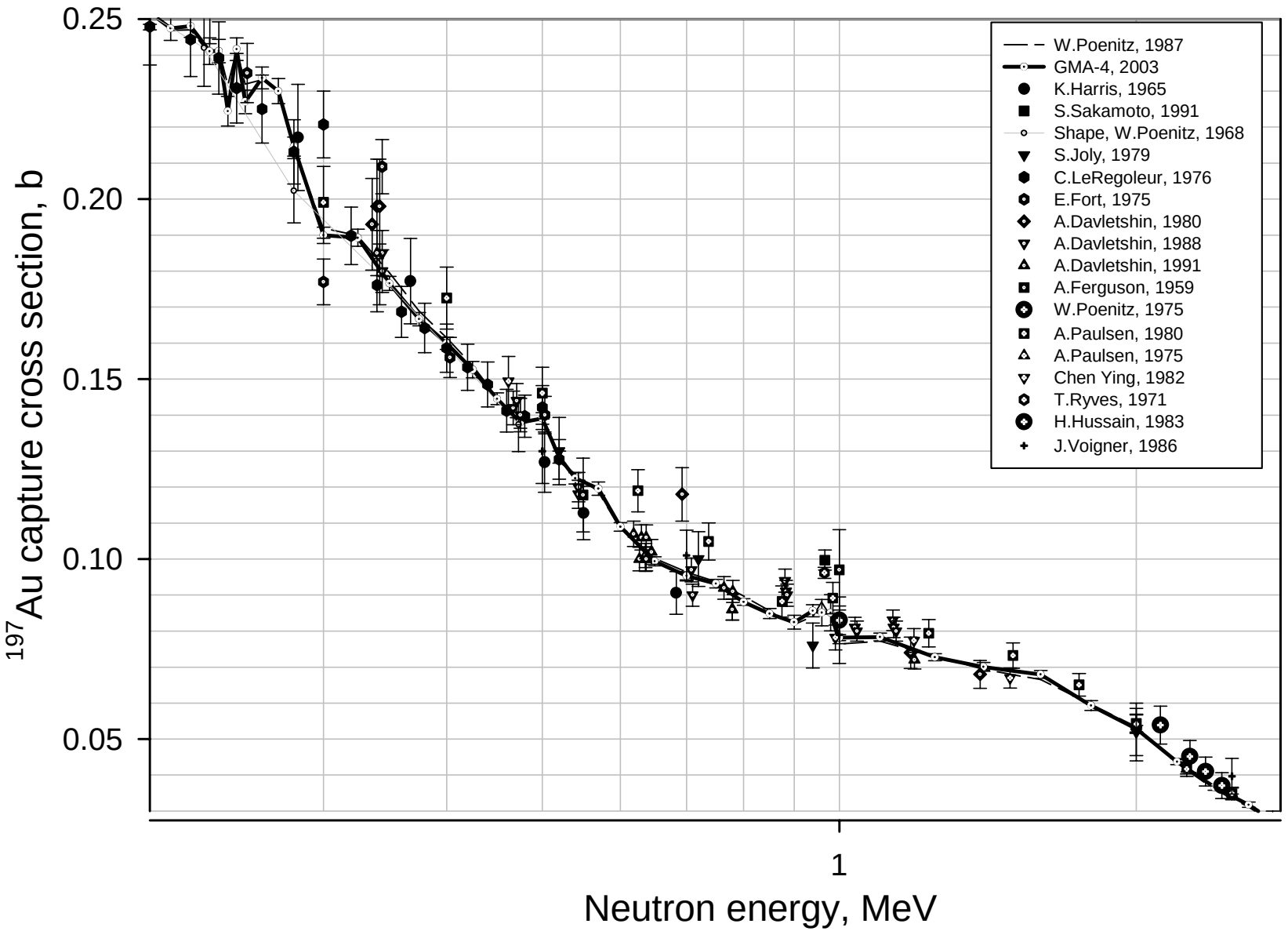
  - The ^{10}B(n,$\alpha_1\gamma$), and ^{10}B(n,α) cross sections were evaluated by Zhenpeng, but the charged-particle database was not complete

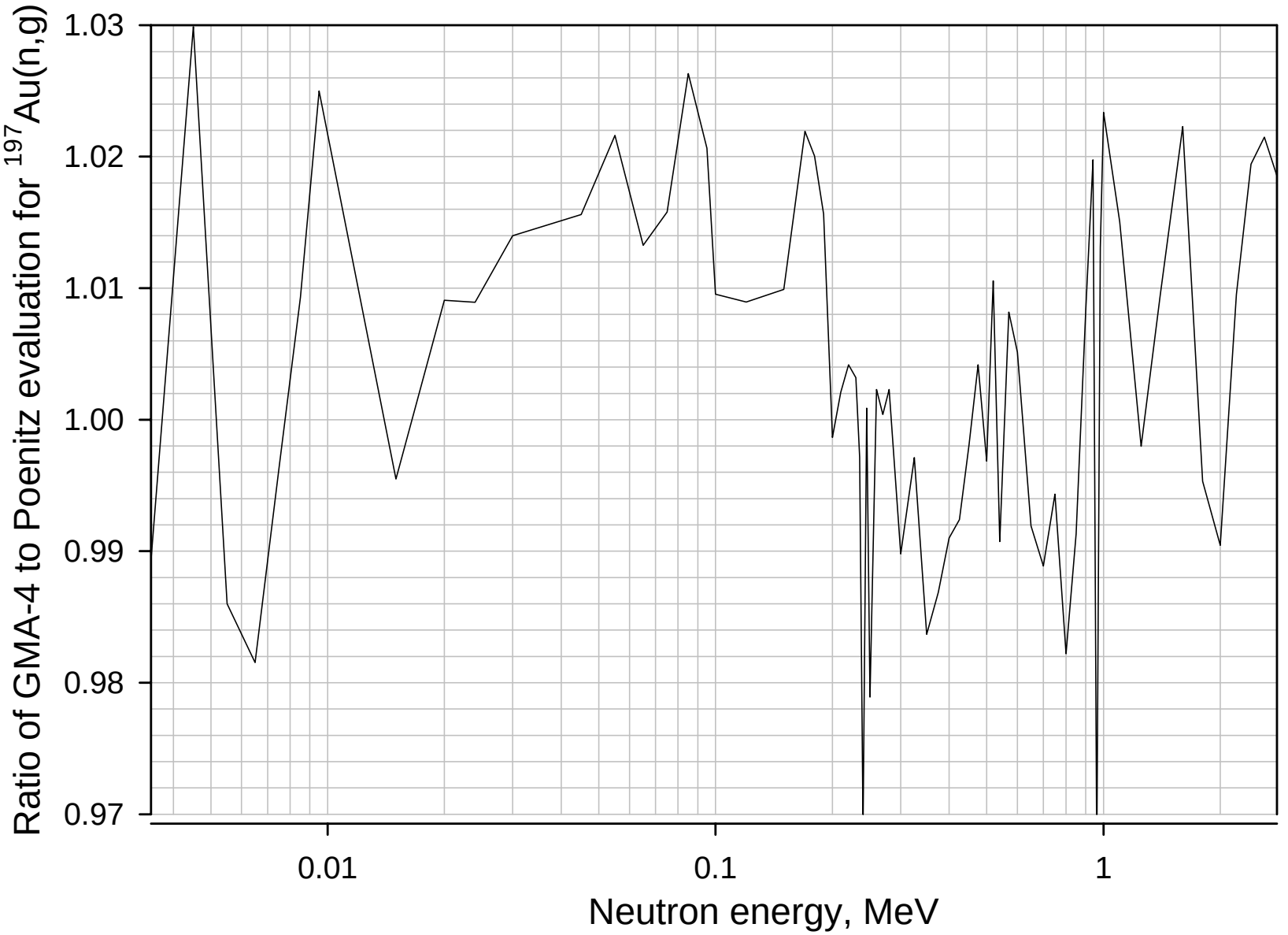
CRP Work Now Underway (cont.)

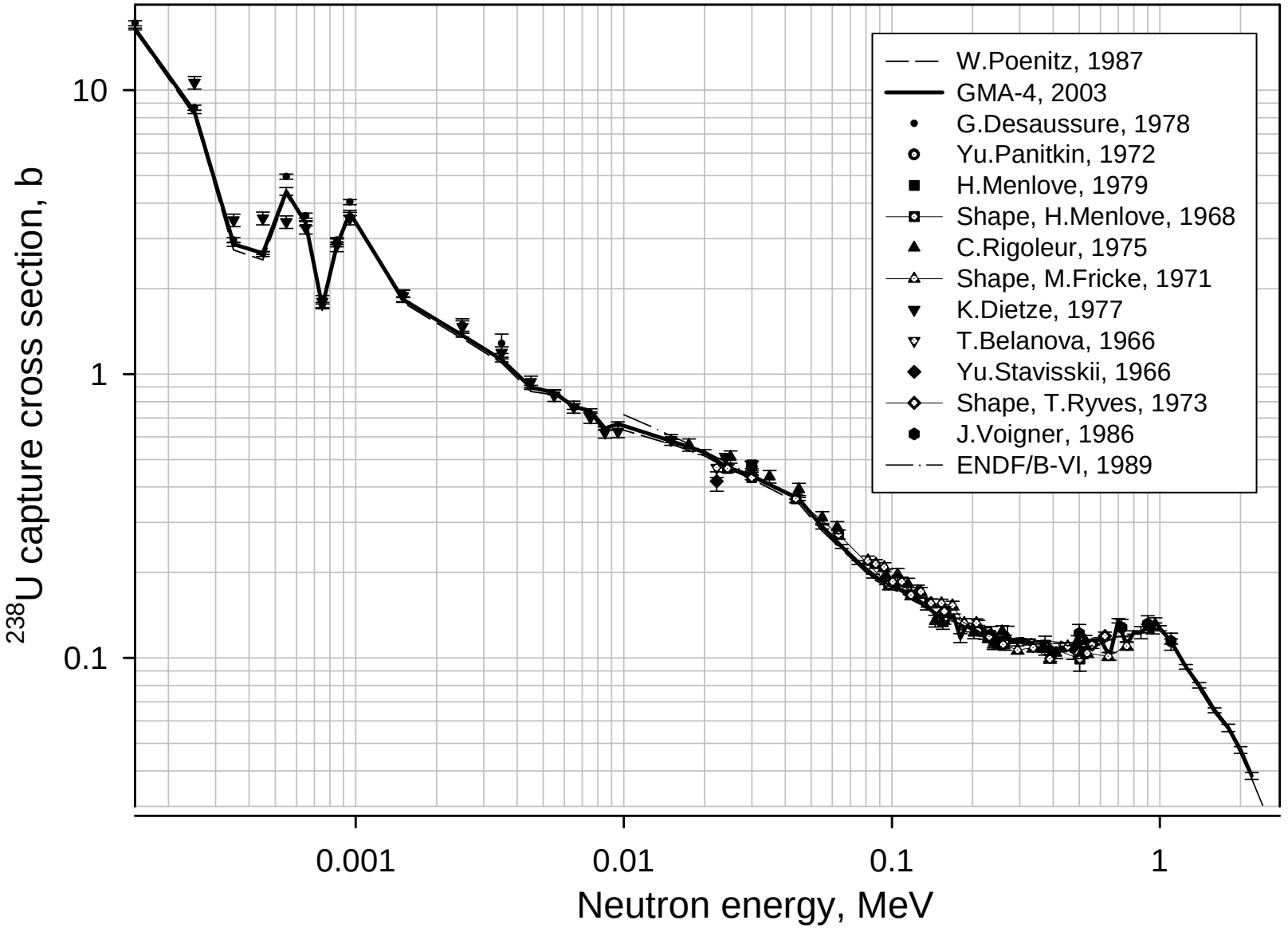
- Microscopic calculations leading to independent determinations of R-matrix poles for light elements nearing final stages
  - Refined Resonating Group Model used for ^{3}He(n,p)
  - Effective NN potentials used for 6Li(n,t)

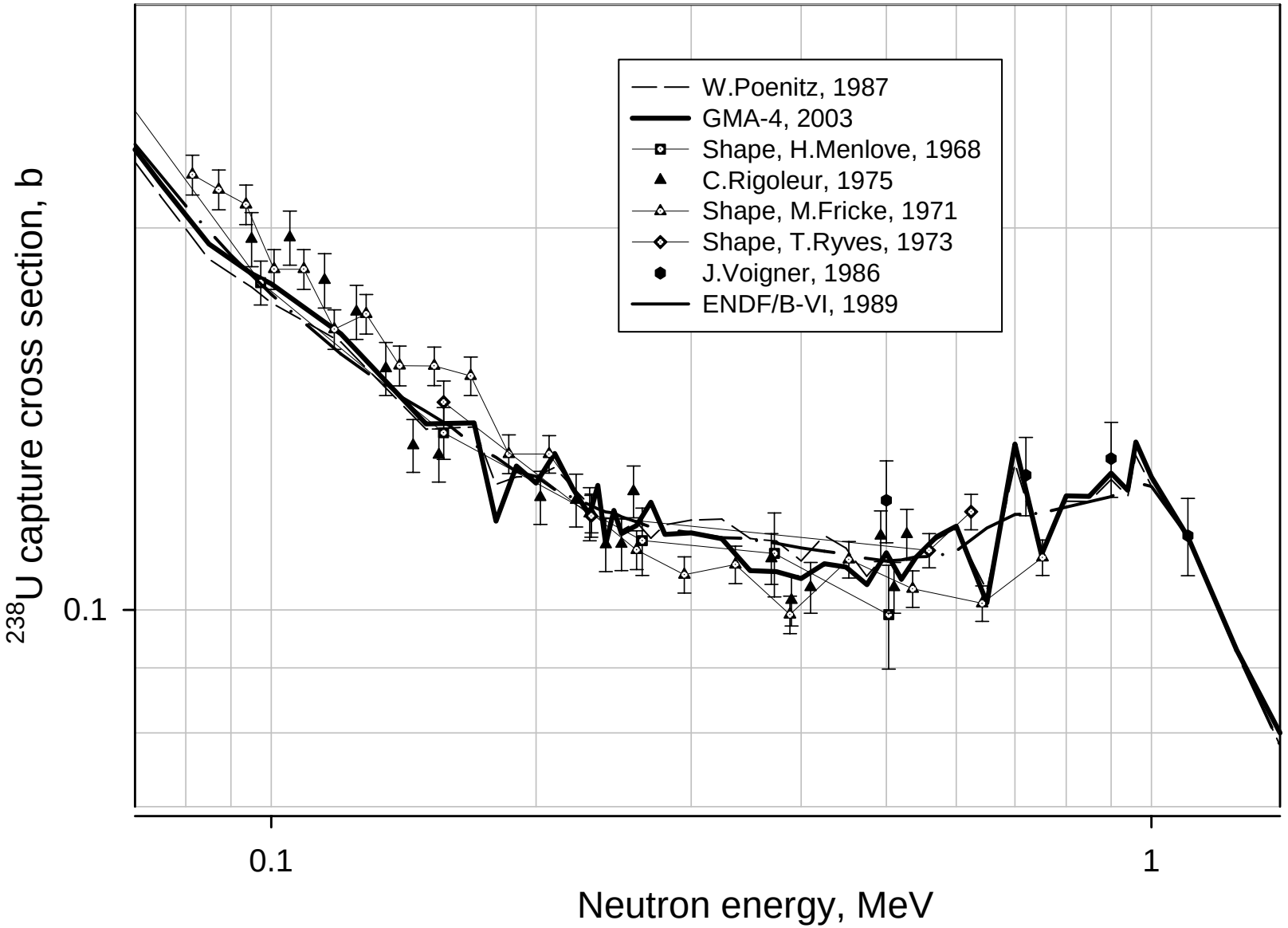
- Generalized least squares evaluations for the ^{6}Li(n,t), ^{10}B(n,α), ^{10}B(n,α$_1$γ), Au(n,γ), ^{235}U(n,f), and ^{238}U(n,f) standard cross sections.
  - GMA Coding improvement by Pronyaev
  - GMA calculations using 419 sets of data

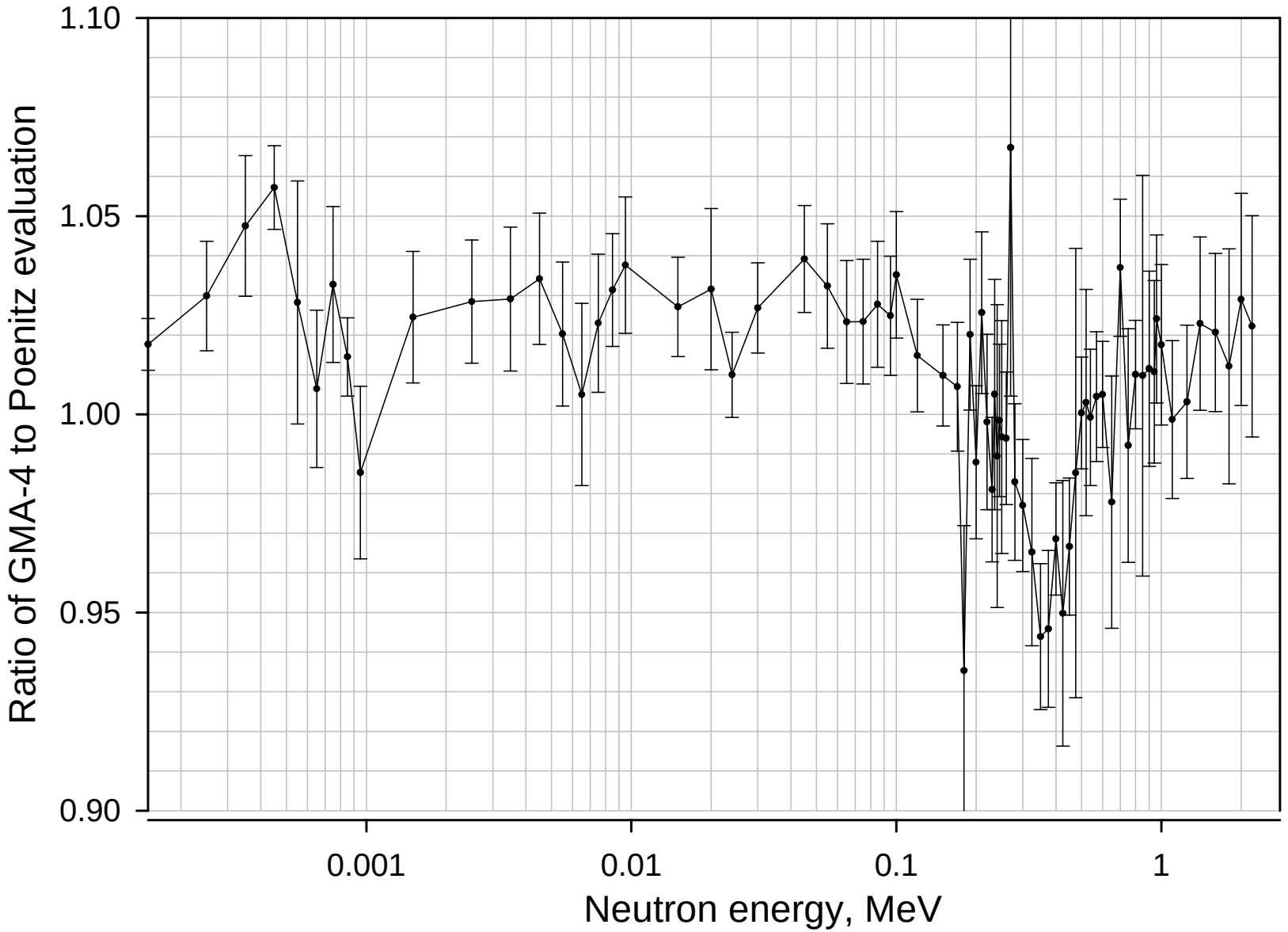

^{10}B(n,α_1) cross section: ratio to the ENDF/B-VI
1.04
1.02
1.00
0.98
0.96
0.94
0.92
GMA-3, 2003
RAC-2, 2003
GMA+RAC-2
0.001
0.01
0.1
1
Neutron energy, MeV

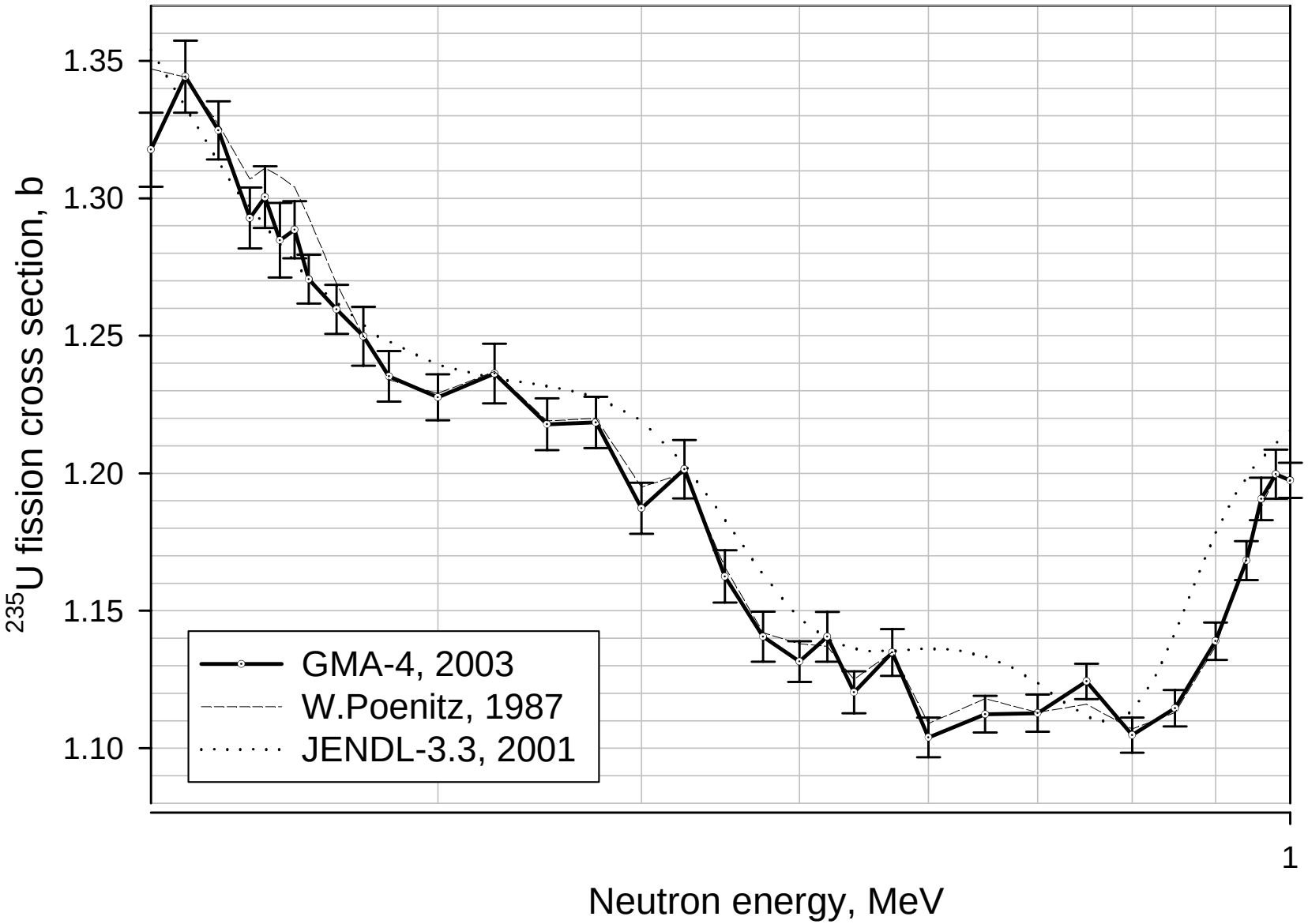

0.25
0.20
0.15
0.10
0.05
197Au capture cross section, b
1
Neutron energy, MeV
W.Poenitz, 1987
GMA-4, 2003
K.Harris, 1965
S.Sakamoto, 1991
Shape, W.Poenitz, 1968
S.Joly, 1979
C.LeRegoleur, 1976
E.Fort, 1975
A.Davletshin, 1980
A.Davletshin, 1988
A.Davletshin, 1991
A.Ferguson, 1959
W.Poenitz, 1975
A.Paulsen, 1980
A.Paulsen, 1975
Chen Ying, 1982
T.Ryves, 1971
H.Hussain, 1983
J.Voigner, 1986

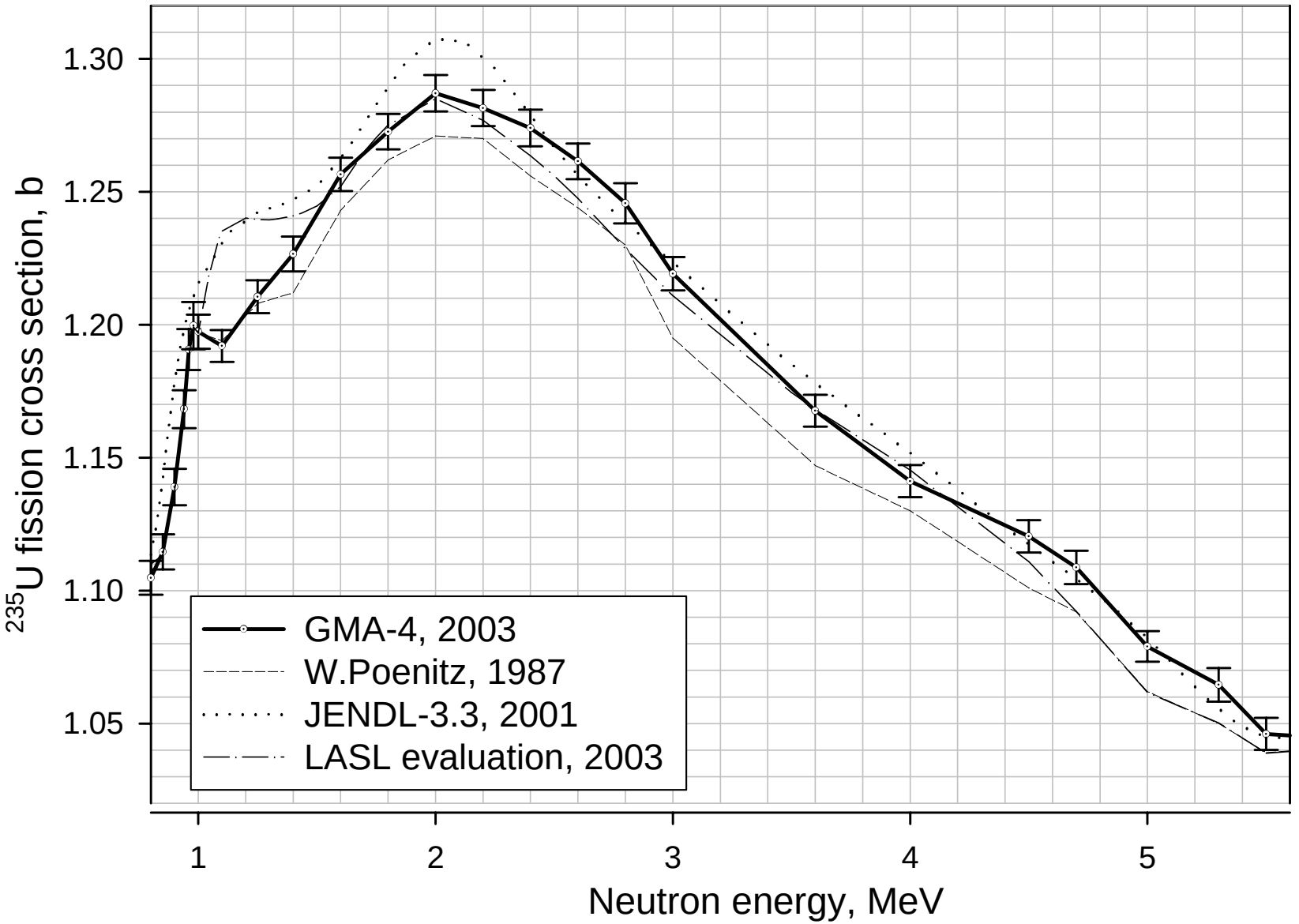

Ratio of GMA-4 to Poenitz evaluation for ^{197}Au(n,g)
1.03
1.02
1.01
1.00
0.99
0.98
0.97
0.01
0.1
1
Neutron energy, MeV

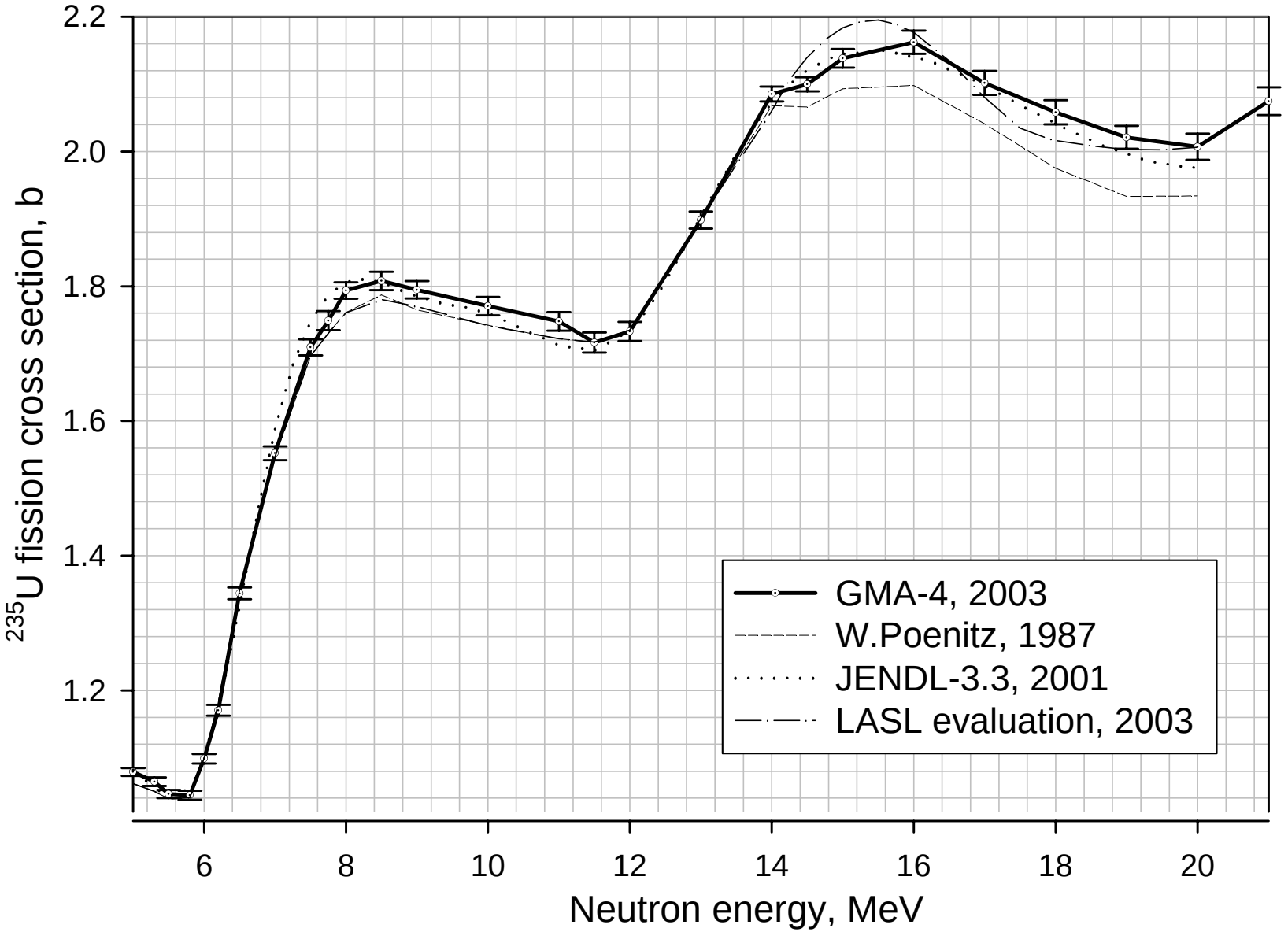

W.Poenitz, 1987
GMA-4, 2003
G.Desaussure, 1978
Yu.Panitkin, 1972
H.Menlove, 1979
Shape, H.Menlove, 1968
C.Rigoleur, 1975
Shape, M.Fricke, 1971
K.Dietze, 1977
T.Belanova, 1966
Yu.Stavisskii, 1966
Shape, T.Ryves, 1973
J.Voigner, 1986
ENDF/B-VI, 1989
10
1
0.1
0.001
0.01
0.1
1
238U capture cross section, b
Neutron energy, MeV

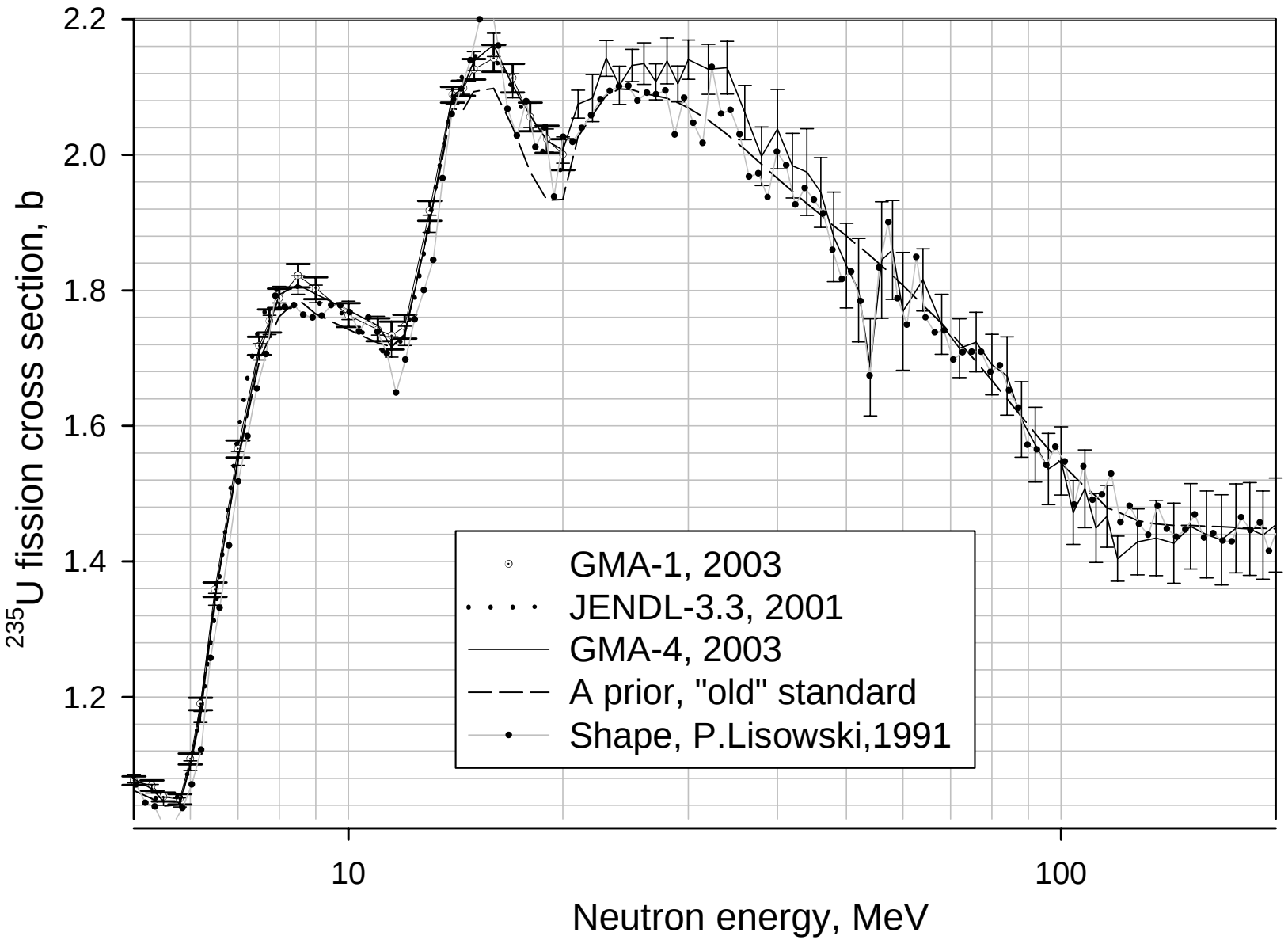

W.Poenitz, 1987
GMA-4, 2003
Shape, H.Menlove, 1968
C.Rigoleur, 1975
Shape, M.Fricke, 1971
Shape, T.Ryves, 1973
J.Voigner, 1986
ENDF/B-VI, 1989
238U capture cross section, b
0.1
0.1
1
Neutron energy, MeV

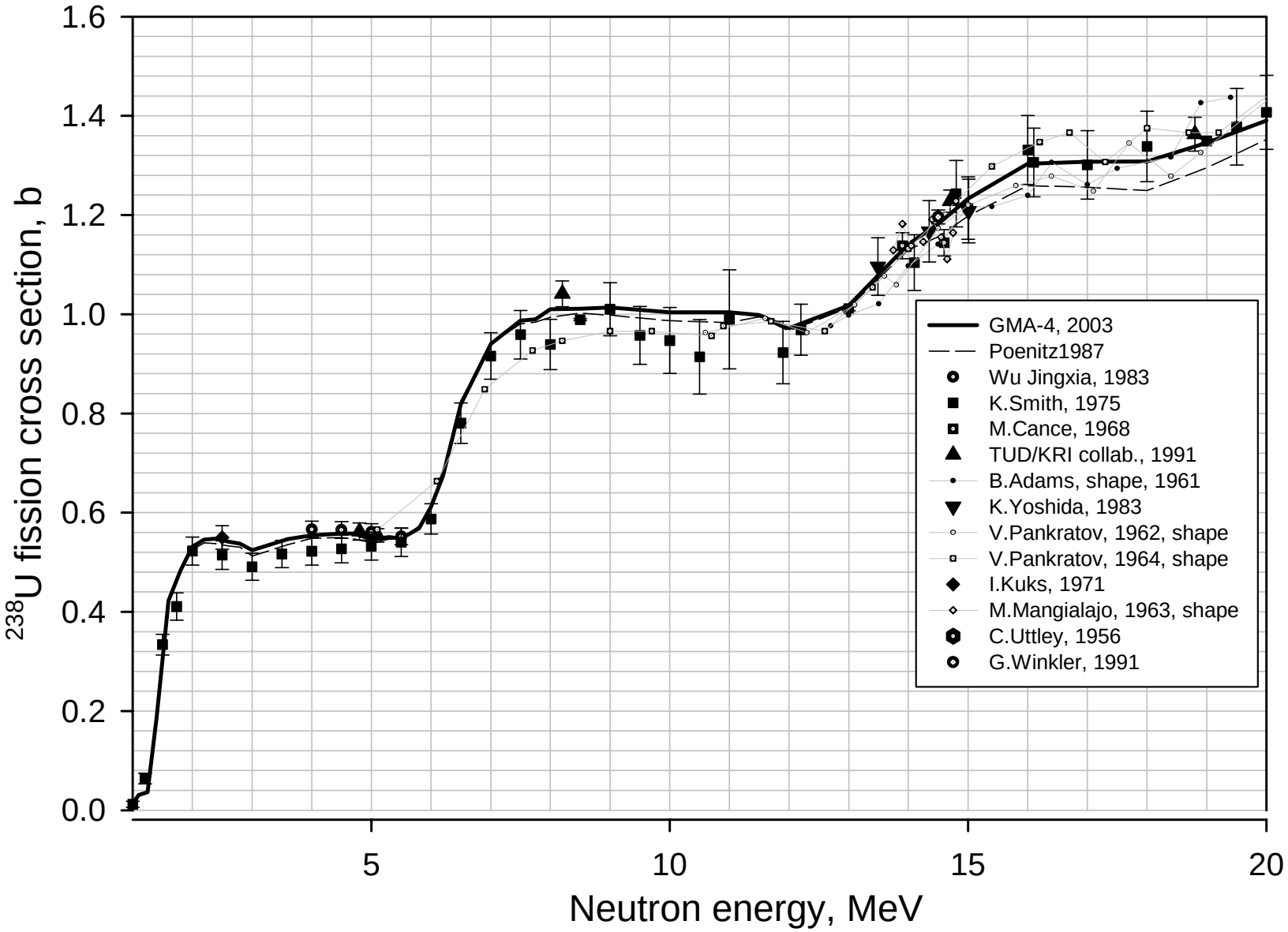

1.10
1.05
1.00
0.95
0.90
Ratio of GMA-4 to Poenitz evaluation
0.001
0.01
0.1
1
Neutron energy, MeV

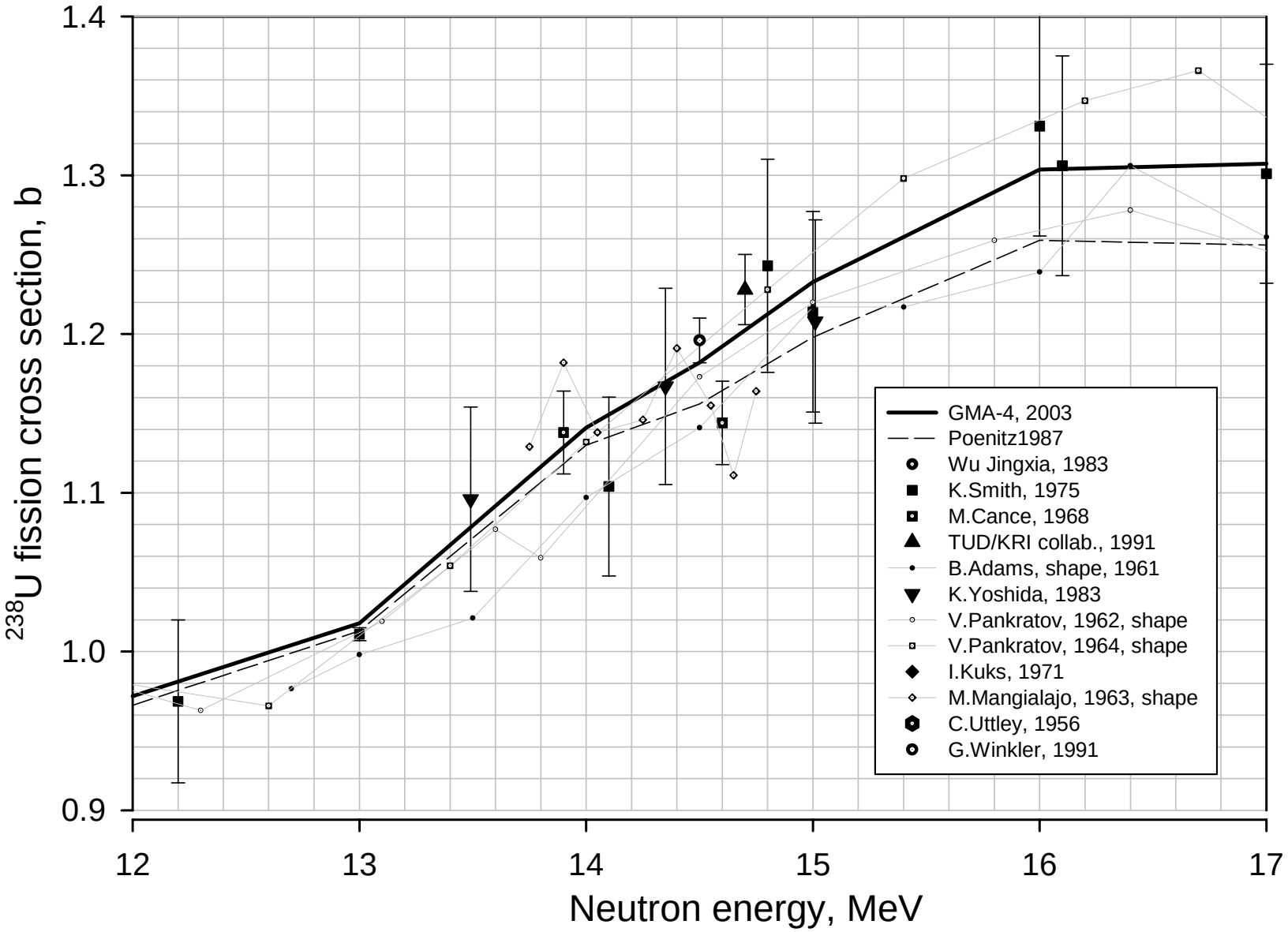

1.35
1.30
1.25
1.20
1.15
1.10
^{235}U fission cross section, b
GMA-4, 2003
W.Poenitz, 1987
JENDL-3.3, 2001
1
Neutron energy, MeV

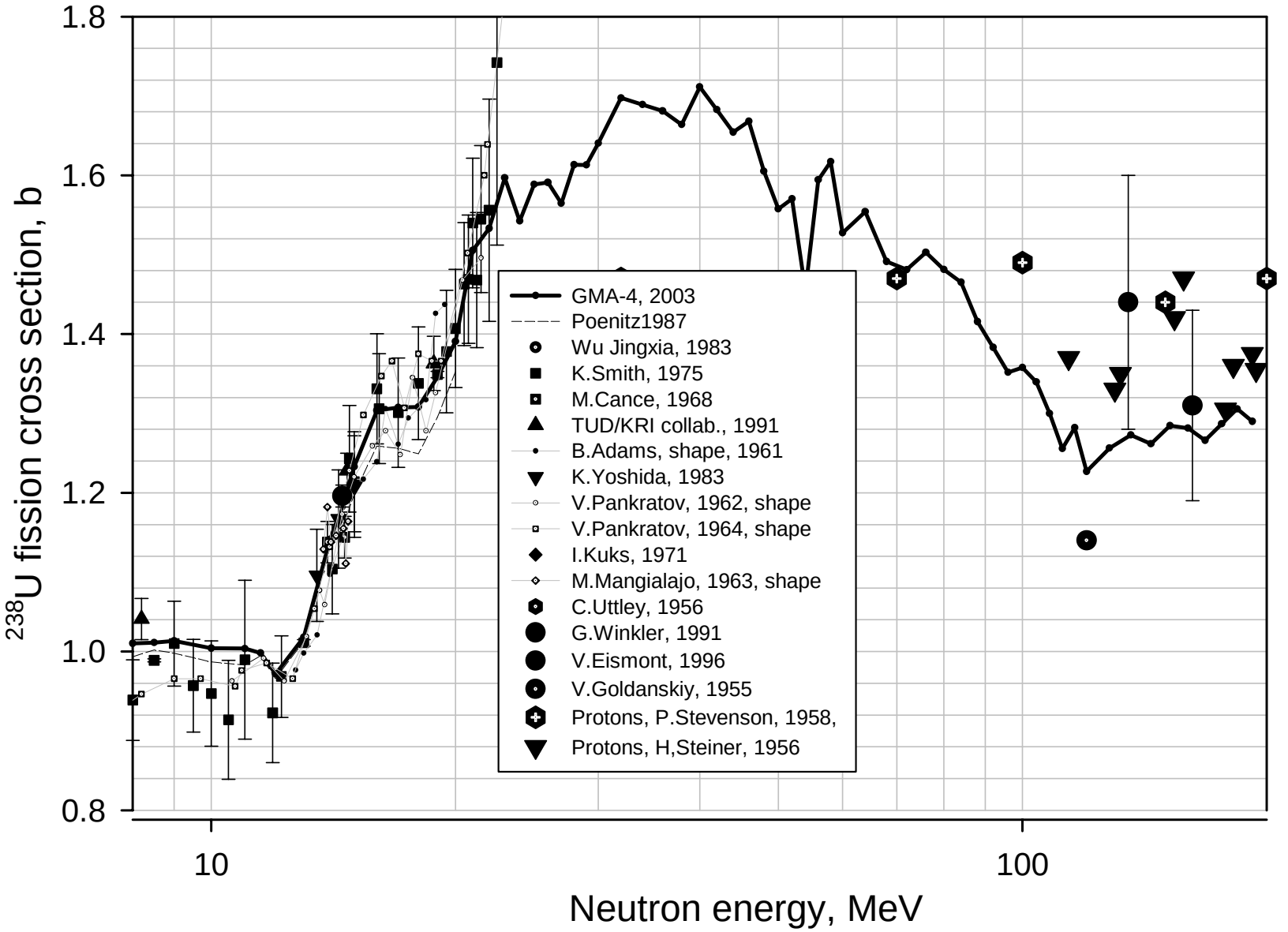

1.30
1.25
1.20
1.15
1.10
1.05
^{235}U fission cross section, b
GMA-4, 2003
W.Poenitz, 1987
JENDL-3.3, 2001
LASL evaluation, 2003
1
2
3
4
5
Neutron energy, MeV

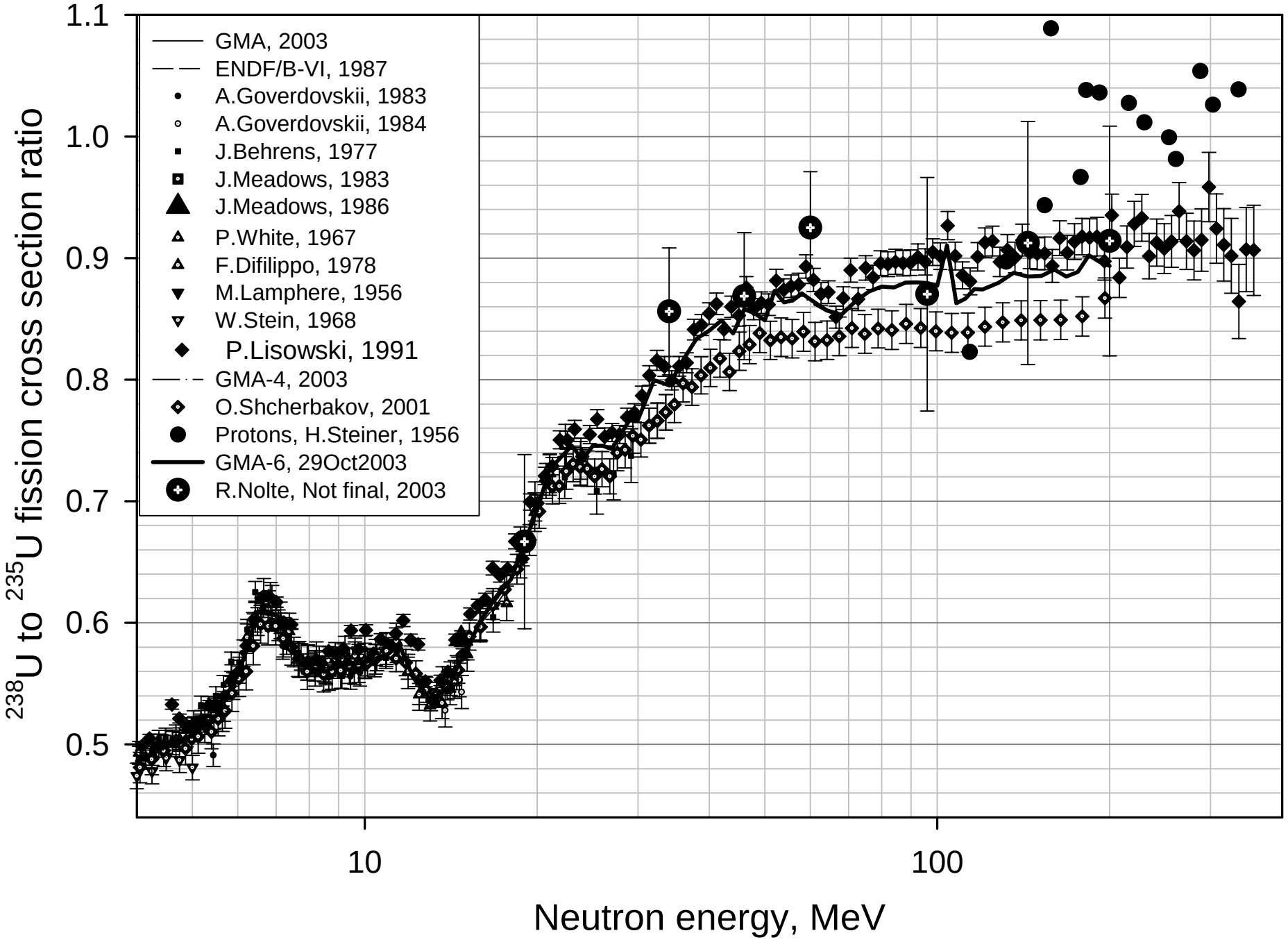

2.2
2.0
1.8
1.6
1.4
1.2
^{235}U fission cross section, b
6
8
10
12
14
16
18
20
Neutron energy, MeV
GMA-4, 2003
W.Poenitz, 1987
JENDL-3.3, 2001
LASL evaluation, 2003

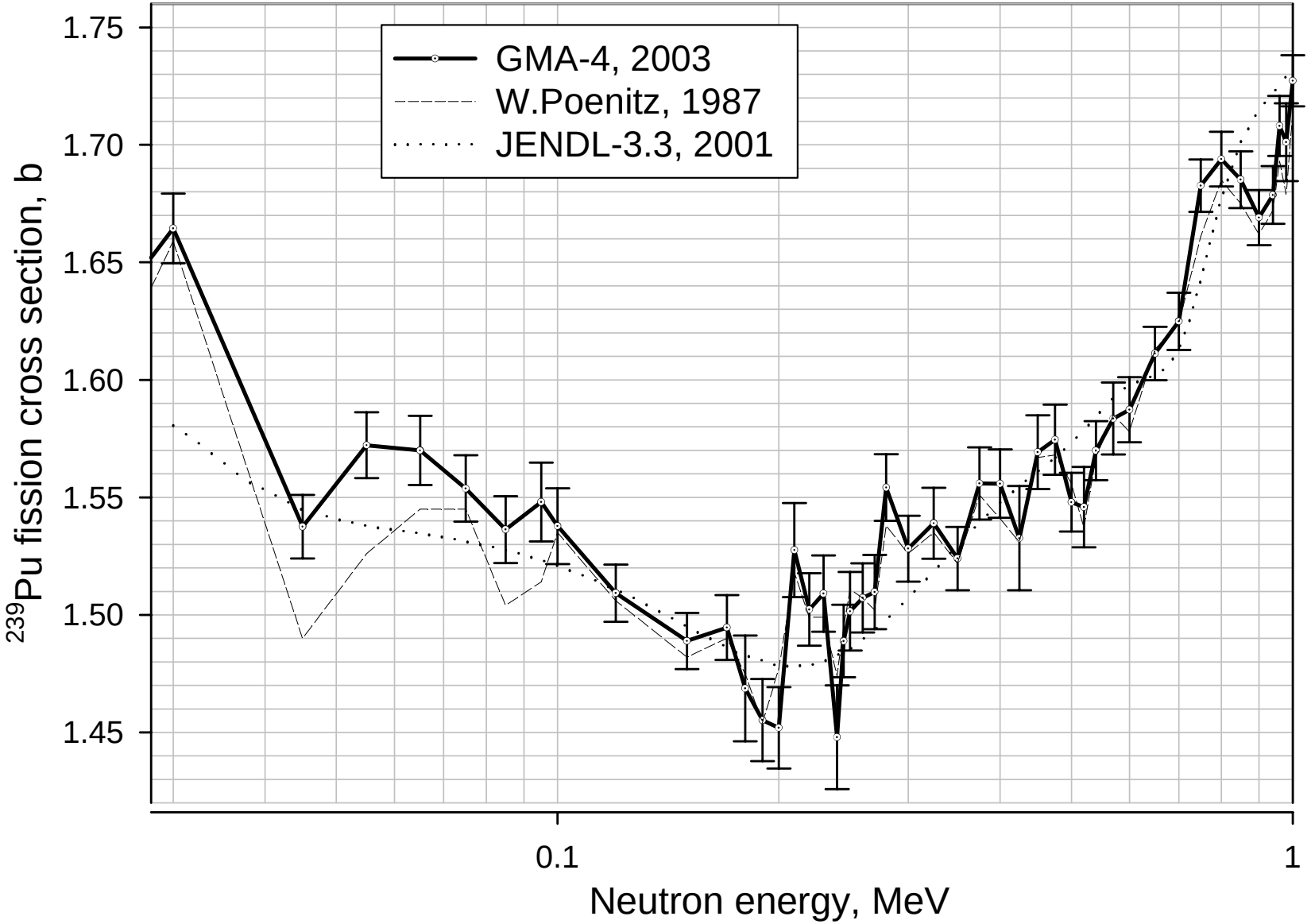

2.2
2.0
1.8
1.6
1.4
1.2
^{235}U fission cross section, b
10
100
Neutron energy, MeV
GMA-1, 2003
JENDL-3.3, 2001
GMA-4, 2003
A prior, "old" standard
Shape, P.Lisowski,1991

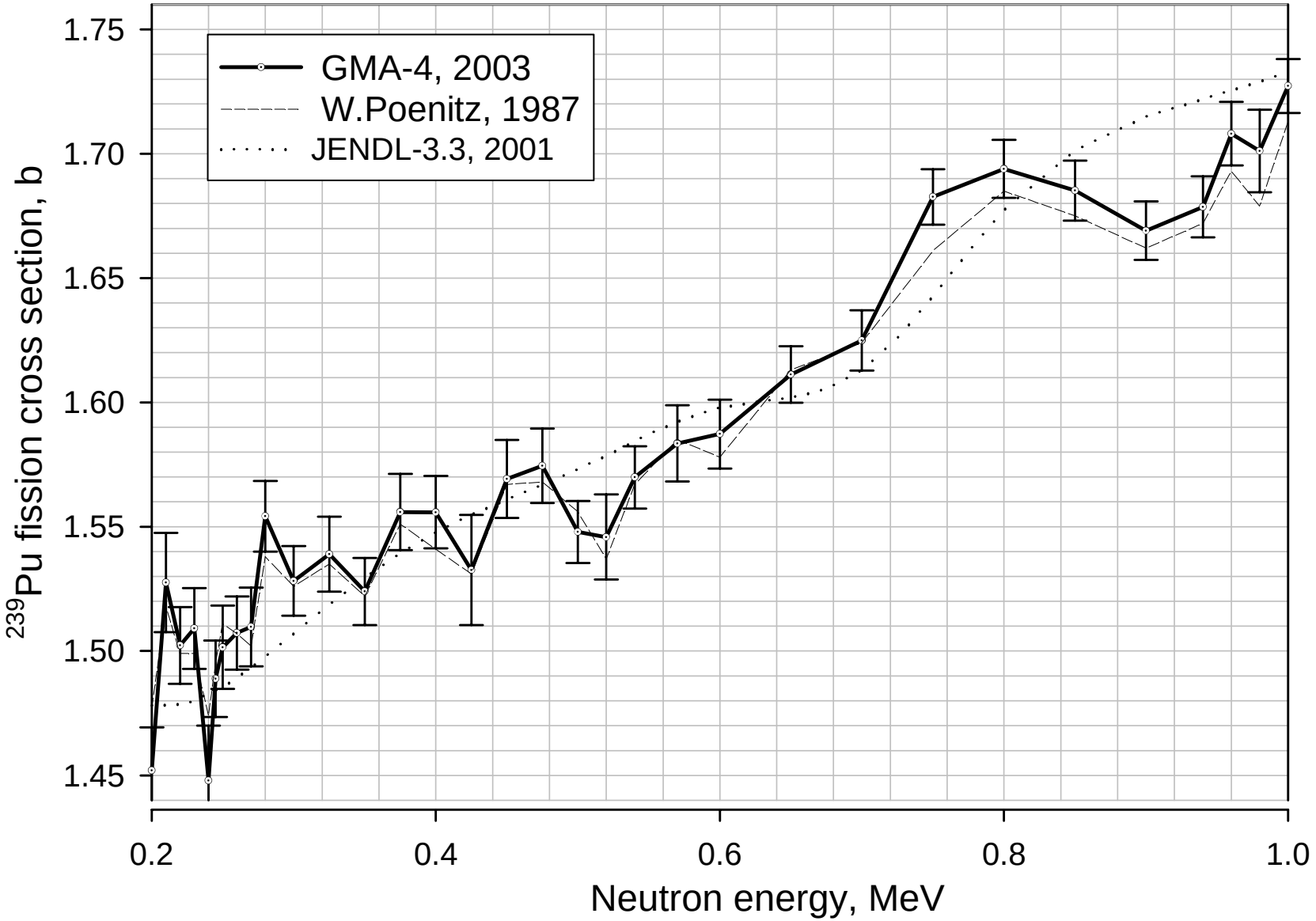

1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
^{238}U fission cross section, b
5
10
15
20
Neutron energy, MeV
GMA-4, 2003
Poenitz1987
Wu Jingxia, 1983
K.Smith, 1975
M.Cance, 1968
TUD/KRI collab., 1991
B.Adams, shape, 1961
K.Yoshida, 1983
V.Pankratov, 1962, shape
V.Pankratov, 1964, shape
I.Kuks, 1971
M.Mangialajo, 1963, shape
C.Uttley, 1956
G.Winkler, 1991

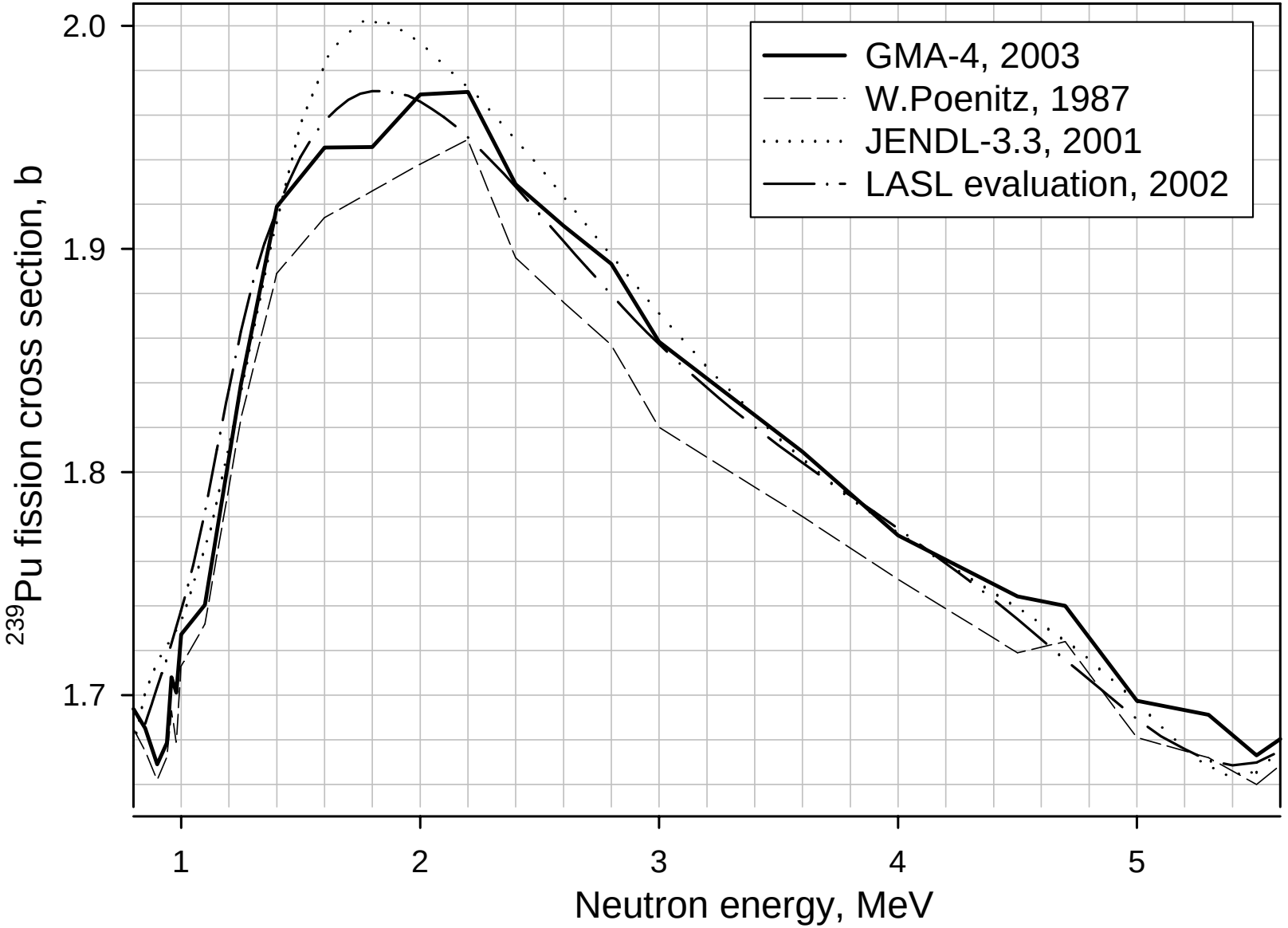

1.4
1.3
1.2
1.1
1.0
0.9
^{238}U fission cross section, b
12
13
14
15
16
17
Neutron energy, MeV
GMA-4, 2003
Poenitz1987
Wu Jingxia, 1983
K.Smith, 1975
M.Cance, 1968
TUD/KRI collab., 1991
B.Adams, shape, 1961
K.Yoshida, 1983
V.Pankratov, 1962, shape
V.Pankratov, 1964, shape
I.Kuks, 1971
M.Mangialajo, 1963, shape
C.Uttley, 1956
G.Winkler, 1991

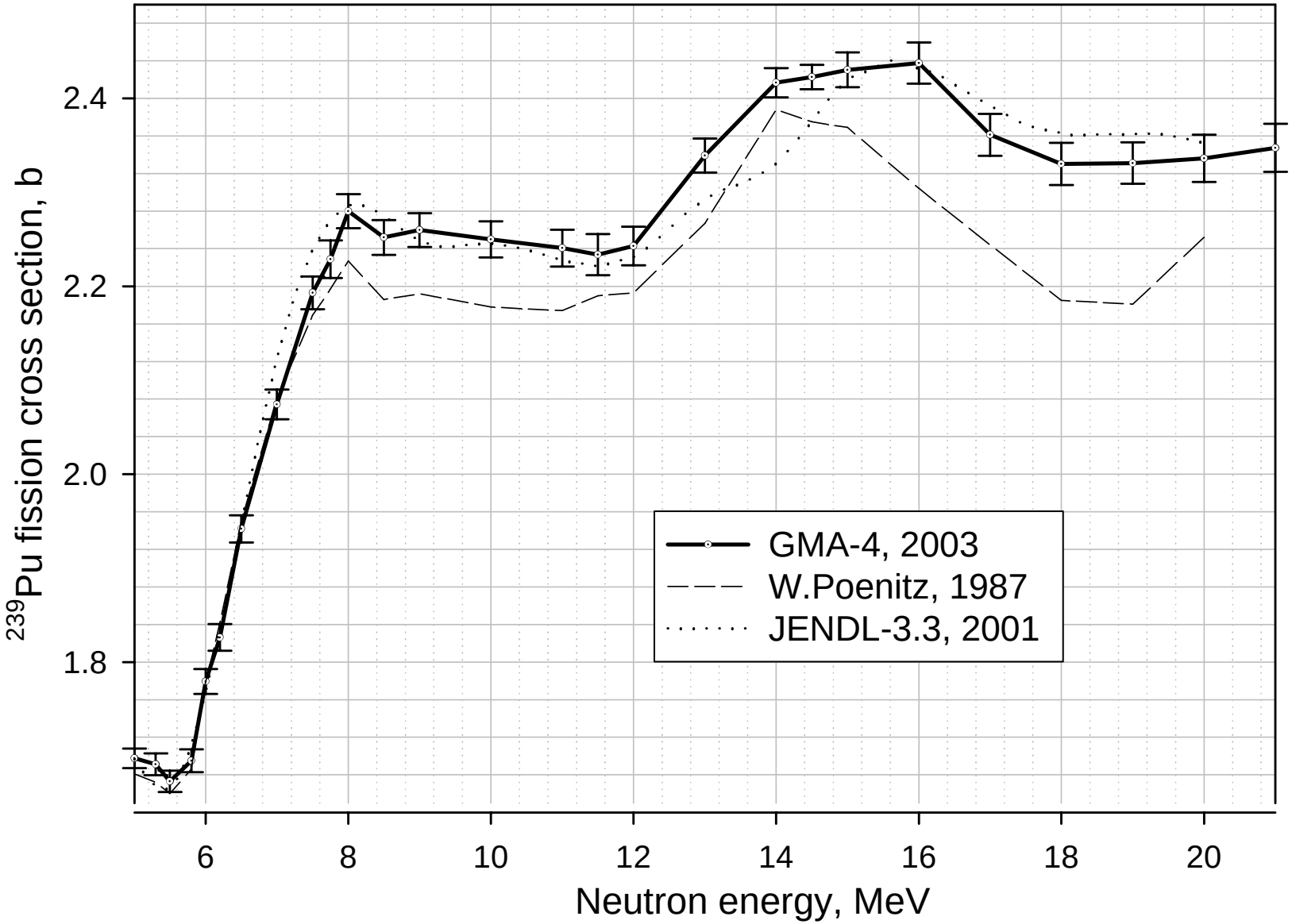

1.8
1.6
1.4
1.2
1.0
0.8
^{238}U fission cross section, b
10
100
Neutron energy, MeV
GMA-4, 2003
Poenitz1987
Wu Jingxia, 1983
K.Smith, 1975
M.Cance, 1968
TUD/KRI collab., 1991
B.Adams, shape, 1961
K.Yoshida, 1983
V.Pankratov, 1962, shape
V.Pankratov, 1964, shape
I.Kuks, 1971
M.Mangialajo, 1963, shape
C.Uttley, 1956
G.Winkler, 1991
V.Eismont, 1996
V.Goldanskiy, 1955
Protons, P.Stevenson, 1958,
Protons, H,Steiner, 1956

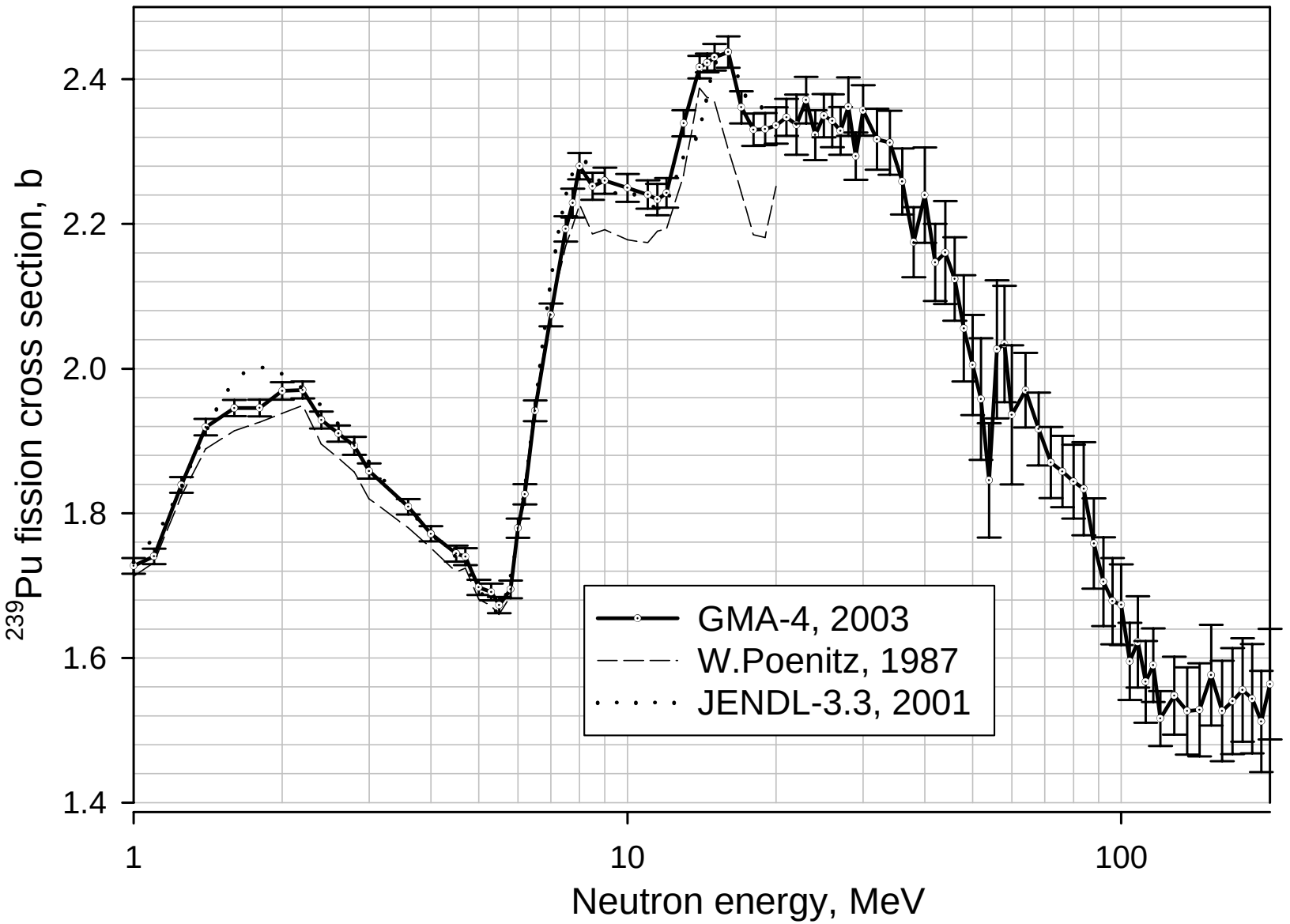

GMA, 2003
ENDF/B-VI, 1987
A.Goverdovskii, 1983
A.Goverdovskii, 1984
J.Behrens, 1977
J.Meadows, 1983
J.Meadows, 1986
P.White, 1967
F.Difilippo, 1978
M.Lamphere, 1956
W.Stein, 1968
P.Lisowski, 1991
GMA-4, 2003
O.Shcherbakov, 2001
Protons, H.Steiner, 1956
GMA-6, 29Oct2003
R.Nolte, Not final, 2003
1.1
1.0
0.9
0.8
0.7
0.6
0.5
10
100
238U to 235U fission cross section ratio
Neutron energy, MeV

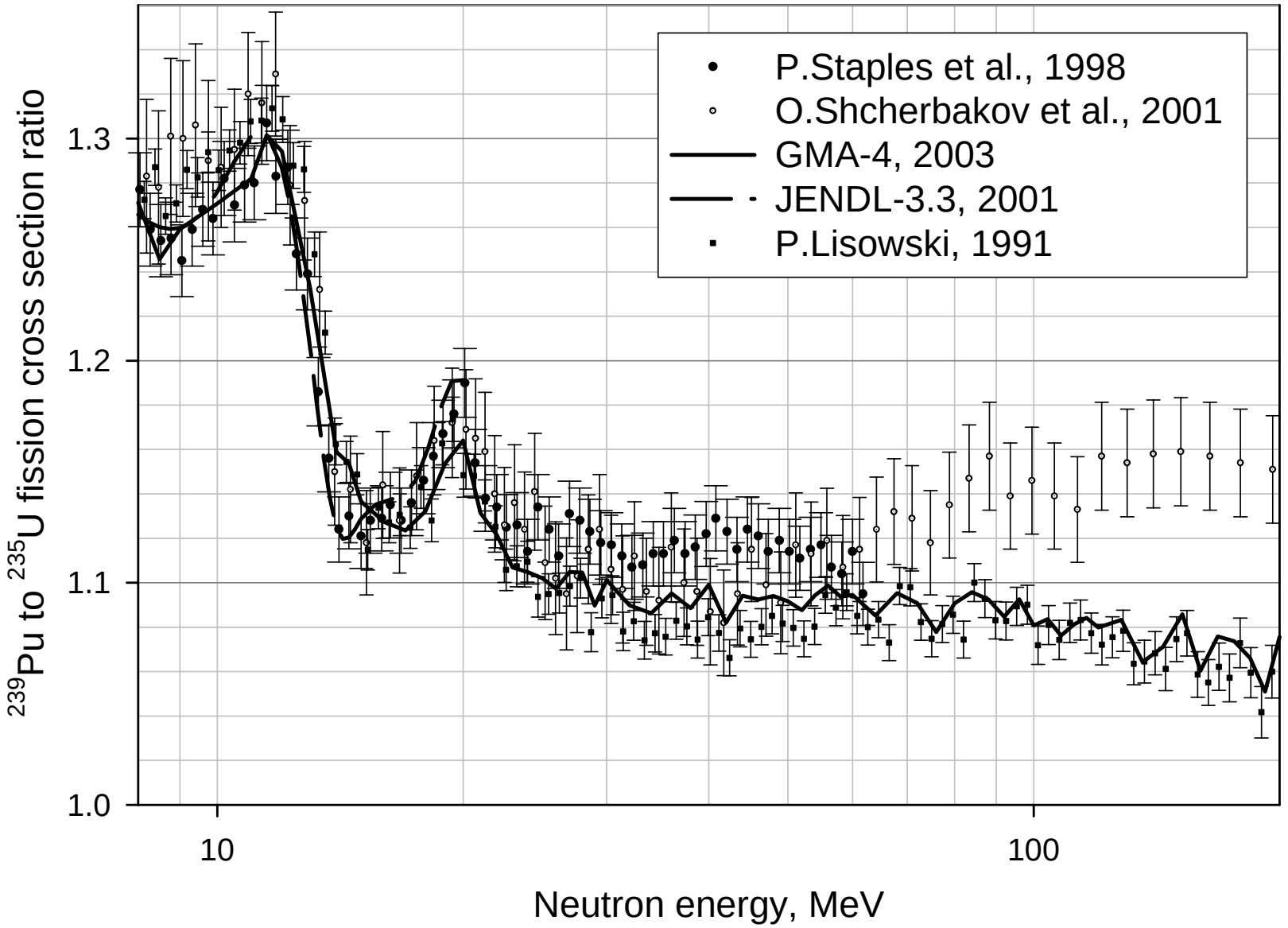

GMA-4, 2003
W.Poenitz, 1987
JENDL-3.3, 2001
1.75
1.70
1.65
1.60
1.55
1.50
1.45
239Pu fission cross section, b
0.1
1
Neutron energy, MeV

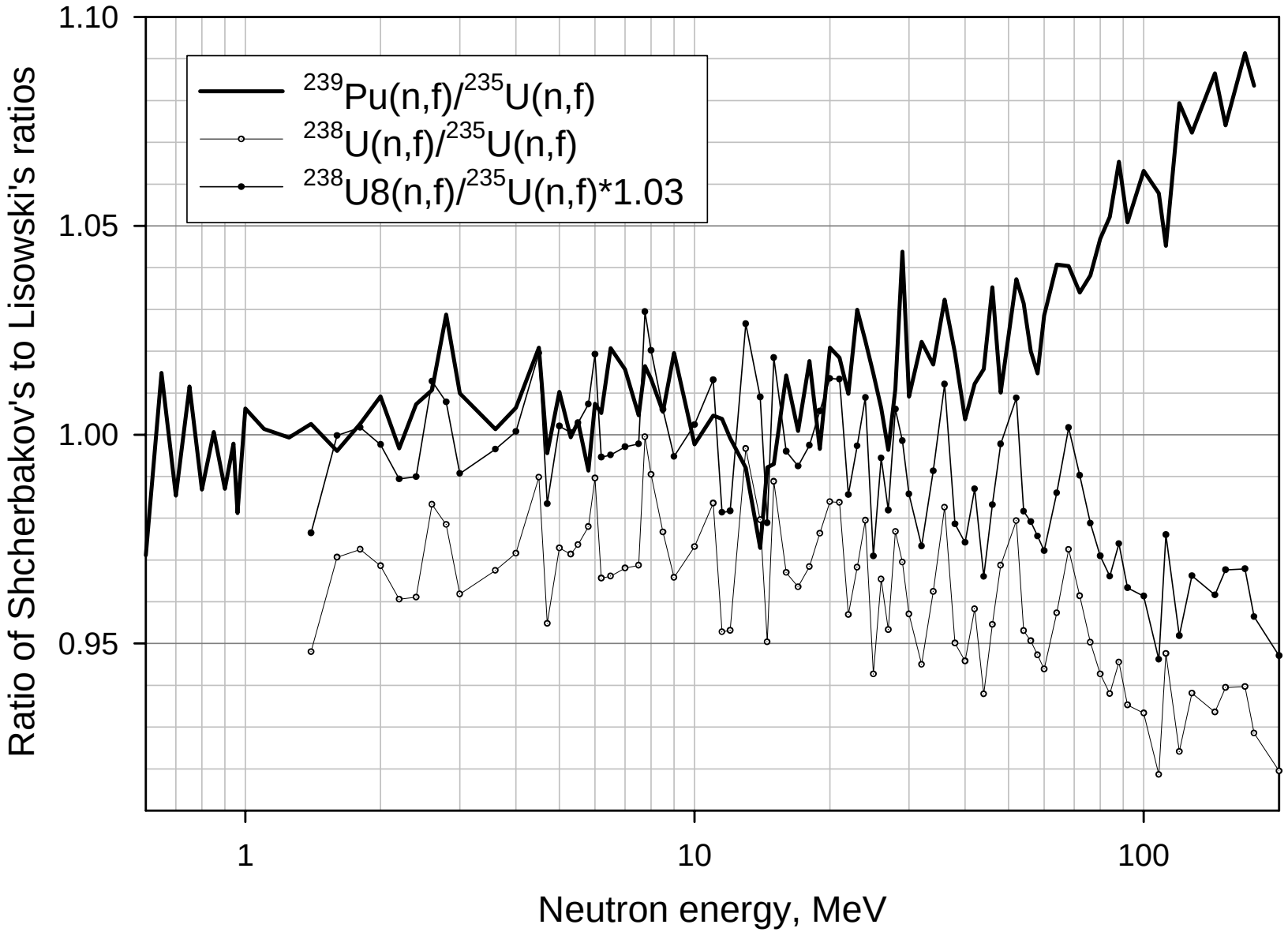

GMA-4, 2003
W.Poenitz, 1987
JENDL-3.3, 2001
239Pu fission cross section, b
1.75
1.70
1.65
1.60
1.55
1.50
1.45
0.2
0.4
0.6
0.8
1.0
Neutron energy, MeV


GMA-4, 2003
W.Poenitz, 1987
JENDL-3.3, 2001
LASL evaluation, 2002
^{239}Pu fission cross section, b
2.0
1.9
1.8
1.7
1
2
3
4
5
Neutron energy, MeV


^{239}Pu fission cross section, b
2.4
2.2
2.0
1.8
6
8
10
12
14
16
18
20
Neutron energy, MeV
GMA-4, 2003
W.Poenitz, 1987
JENDL-3.3, 2001


^{239}Pu fission cross section, b
2.4
2.2
2.0
1.8
1.6
1.4
1
10
100
Neutron energy, MeV
GMA-4, 2003
W.Poenitz, 1987
JENDL-3.3, 2001


P.Staples et al., 1998
O.Shcherbakov et al., 2001
GMA-4, 2003
JENDL-3.3, 2001
P.Lisowski, 1991
239Pu to 235U fission cross section ratio
1.0
1.1
1.2
1.3
10
100
Neutron energy, MeV


1.10
1.05
1.00
0.95
Ratio of Shcherbakov's to Lisowski's ratios
239Pu(n,f)/235U(n,f)
238U(n,f)/235U(n,f)
238U8(n,f)/235U(n,f)*1.03
1
10
100
Neutron energy, MeV

CRP Work Now Underway (cont.)

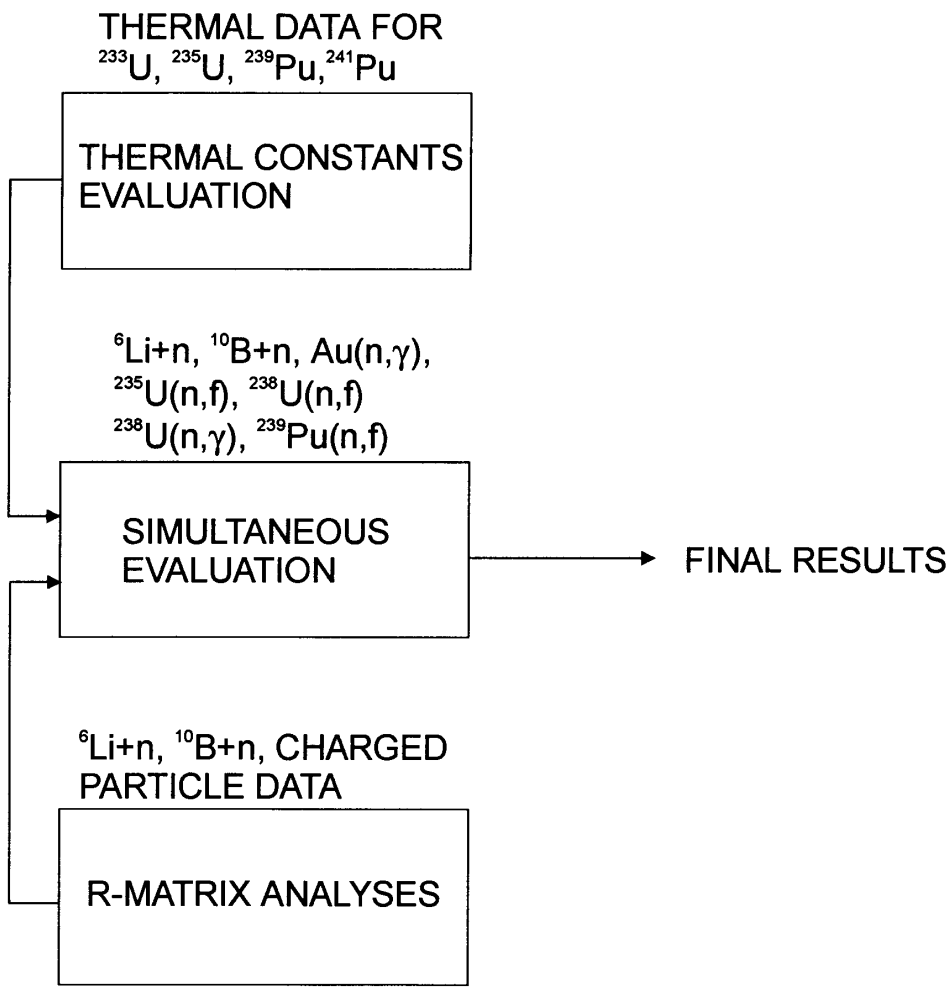
- Generalized least squares evaluations for the ^{6}Li(n,t), ^{10}B(n,α), ^{10}B(n,$\alpha_1\gamma$), Au(n,γ), ^{235}U(n,f), and ^{238}U(n,f) standard cross sections.
  - •GMA Coding improvement by Pronyaev
  - •GMA calculations using 419 sets of data
  - •Calculations for Godiva using these ^{235}U(n,f) cross sections
    - •MacFarlane NJOY Result is 0.99893 using CSEWG specifications

CRP Work Now Underway (cont.)

- Combining of R-matrix and generalized least squares evaluations
  - R-matrix results for the ^{6}Li(n,t) cross section from the RAC code were used as input to the GMA program to provide a combining of R-matrix and generalized least squares outputs. The R-matrix input was cross section, uncertainty and the correlation matrix.

- Studies of the small uncertainties resulting from evaluations

NEW STANDARDS EVALUATION PROCEDURE



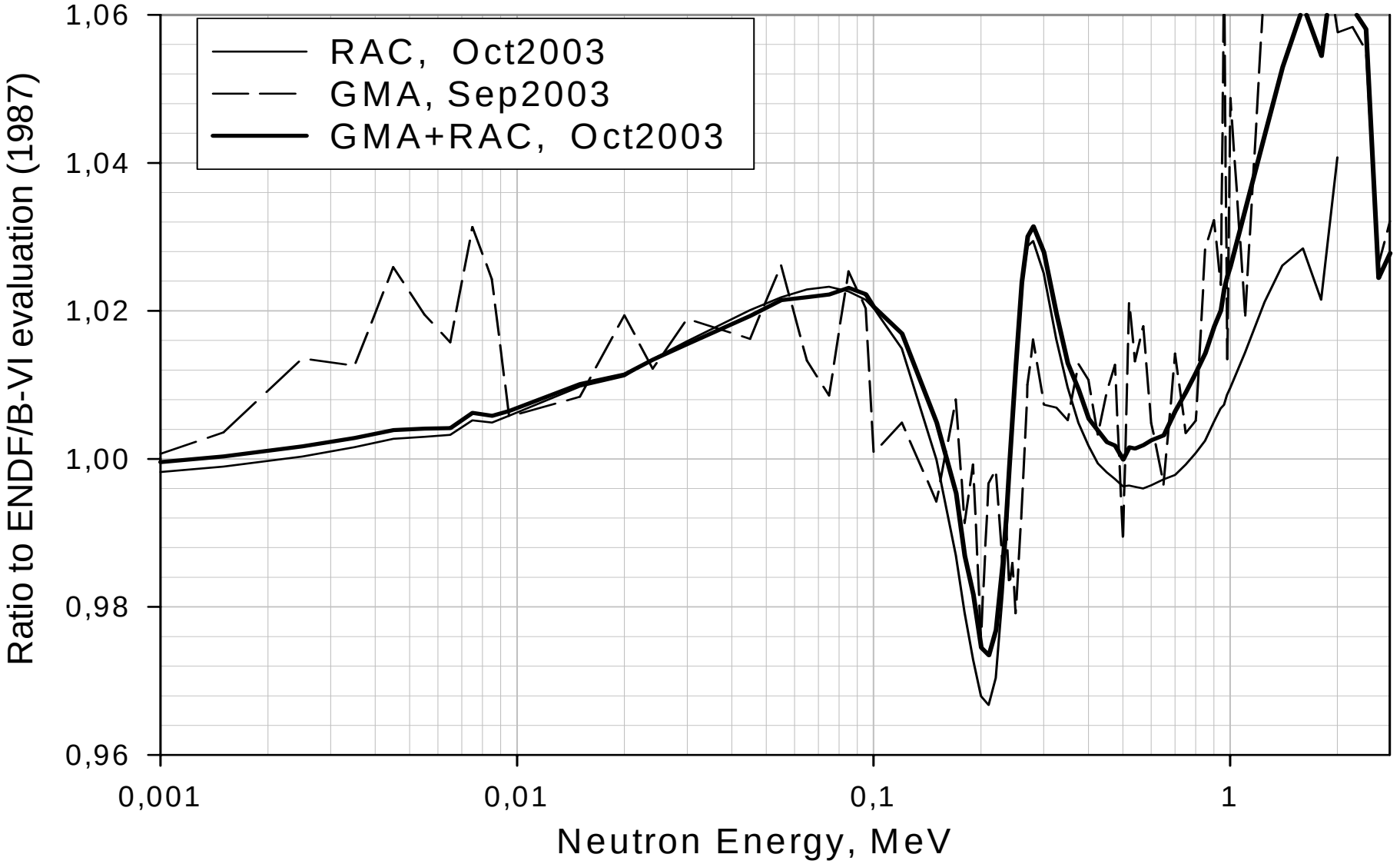


Fig.2 Results of fitting of ^{6}Li(n,t) reaction with GMA, RAC and in the combining of GMA and RAC fits (GMA+RAC).

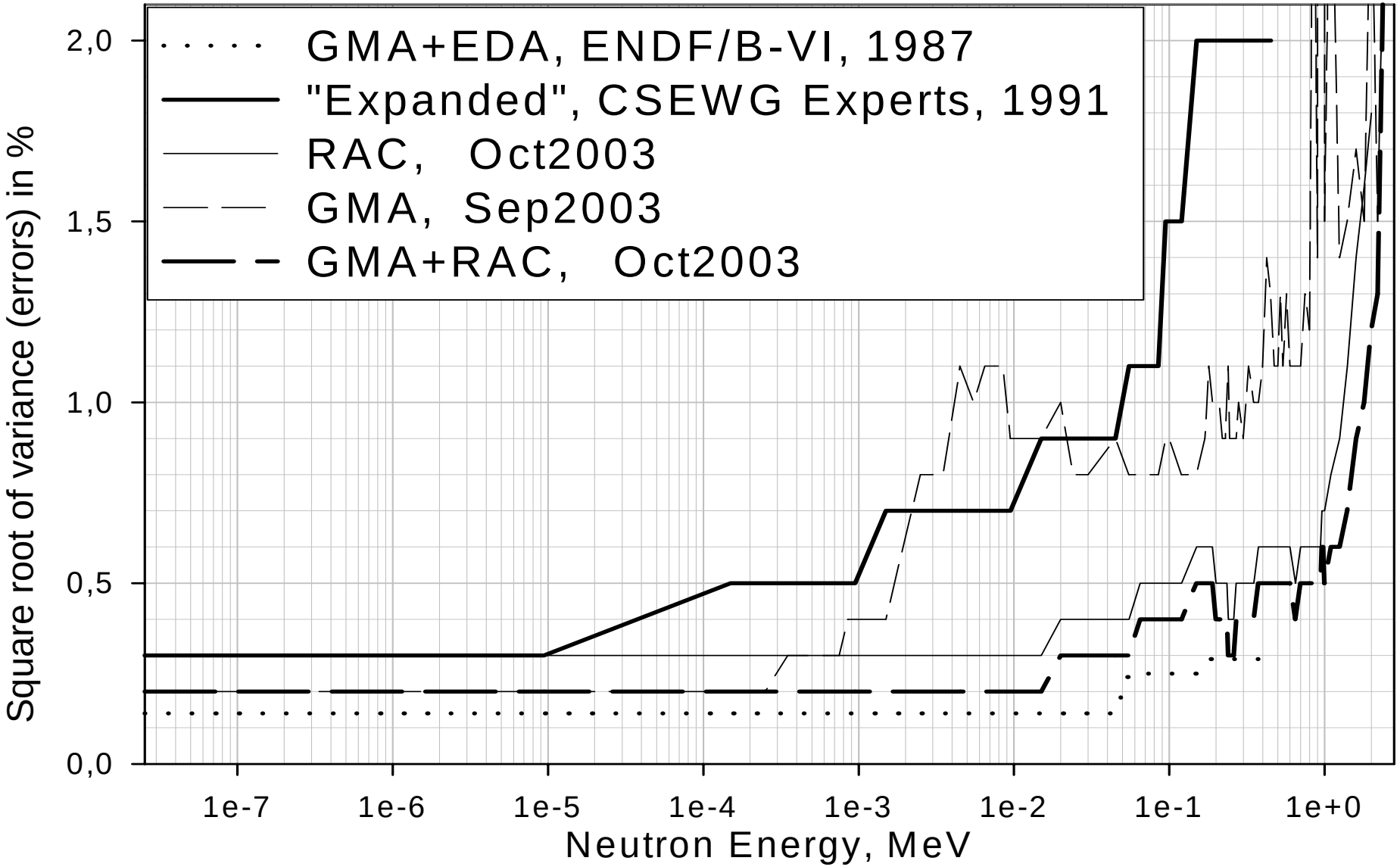


Fig.3 Percent errors presenting only diagonal components of the covariance matrices (variances) obtained in different fil
and estimated by the experts

CRP Work Now Underway (cont.)

- Studies of the effect of Peelle's Pertinent Puzzle (PPP) and its effect on the standards evaluation
  - Results from use of correlated discrepant data
  - Noticed early in the activities of the CRP
  - Seen in model independent LS analyses
  - Maybe not present in EDA R-matrix work
    - Only normalization and relative uncertainty used
  - Seen in RAC R-matrix work
    - Normalization, relative and medium range correlations used
  - Plans made to test different methods to reduce (or eliminate PPP), e.g. Box-Cox (logarithmic) transformation, weigh by percentage errors, Chiba method, Pronyaev method

- Methods for handling discrepant data
  - Poenitz method (down weight data 3 sigma from output results)
  - Incorporate medium energy range correlation component (yields larger final uncertainty)

CRP Work Now Underway (cont.)

- Comparisons of R-matrix and model independent least squares codes for values of the cross sections and covariances produced
  - Done using 5 ^{6}Li(n,t) data sets, (Fort, Fort & Marquette, Friesenhahn, Lamaze and Poenitz & Meadows)
  - With R-matrix codes, differences are observed near the 250 keV resonance, for relativistic vs non-calculations
  - Model independent codes GMA, GLUCS & SOK agree
  - R-matrix codes give smaller variances than model independent codes
  - Some comparisons of R-matrix and model independent codes done

Table 3. Comparison of model with non-model least squares fit of 5 experimental data sets for $^{6}Li(n,\alpha)$ reaction.

Energy, MeV	Cross section (central values), b			Error, %		
	GLUCS Bayesian non-model fit	GMA general least squares non-model fit	RAC R-matrix model fit	GLUCS Bayesian non-model fit	GMA general least squares non-model fit	RAC R-matrix model fit
0.2500E-02	2.5643E+00	2.56791130	0.265435E+01	3.4736E+00	3.4	1.4952
0.3500E-02	2.1340E+00	2.13894272	0.224569E+01	3.2550E+00	3.2	1.3900
0.4500E-02	1.8435E+00	1.85487058	0.198312E+01	3.0100E+00	3.0	1.3163
0.5500E-02	1.7385E+00	1.73921302	0.179651E+01	2.5948E+00	2.6	1.2631
0.6500E-02	1.5777E+00	1.57732333	0.165529E+01	2.5518E+00	2.5	1.2244
0.7500E-02	1.4669E+00	1.46900573	0.154373E+01	2.4718E+00	2.5	1.1960
0.8500E-02	1.4182E+00	1.41379212	0.145280E+01	2.2237E+00	2.2	1.1754
0.9500E-02	1.2888E+00	1.28802753	0.137692E+01	1.8064E+00	1.8	1.1606
0.1500E-01	1.0487E+00	1.04513353	0.110908E+01	1.7278E+00	1.7	1.1330
0.2000E-01	9.5192E-01	0.95499096	0.972498E+00	1.8265E+00	1.8	1.1359
0.2400E-01	8.6783E-01	0.86615244	0.897389E+00	1.9348E+00	1.9	1.1403
0.3000E-01	7.6349E-01	0.76628620	0.816803E+00	1.7740E+00	1.8	1.1429
0.4500E-01	6.6971E-01	0.66950549	0.701441E+00	1.8026E+00	1.8	1.1279
0.5500E-01	6.3158E-01	0.63043012	0.659942E+00	1.7502E+00	1.8	1.1120
0.6500E-01	6.0471E-01	0.60438930	0.634664E+00	1.8674E+00	1.9	1.0988
0.7500E-01	5.7693E-01	0.57853288	0.621291E+00	1.9369E+00	1.9	1.0907
0.8500E-01	6.0873E-01	0.60810755	0.617734E+00	1.4020E+00	1.4	1.0873
0.9500E-01	5.9780E-01	0.59926541	0.623171E+00	1.7722E+00	1.8	1.0869
0.1000E+00	5.9648E-01	0.59749230	0.629247E+00	1.5888E+00	1.6	1.0872
0.1200E+00	6.3976E-01	0.64001517	0.678214E+00	1.4318E+00	1.4	1.0877
0.1500E+00	7.9289E-01	0.79463003	0.854758E+00	1.4012E+00	1.4	1.0836
0.1700E+00	1.0061E+00	1.00507612	0.109228E+01	1.5597E+00	1.6	1.0828
0.1800E+00	1.2084E+00	1.20947152	0.127076E+01	1.6308E+00	1.6	1.0826
0.1900E+00	1.4454E+00	1.44870074	0.150399E+01	1.5343E+00	1.5	1.0816
0.2000E+00	1.7253E+00	1.72745634	0.180166E+01	1.5556E+00	1.6	1.0802
0.2100E+00	2.0577E+00	2.06036584	0.216218E+01	1.3899E+00	1.4	1.0810
0.2200E+00	2.4852E+00	2.49007621	0.255463E+01	1.3842E+00	1.4	1.0861
0.2300E+00	2.8005E+00	2.80415714	0.290012E+01	1.4850E+00	1.5	1.0930
0.2400E+00	2.9316E+00	2.94171942	0.308564E+01	1.7320E+00	1.8	1.0950

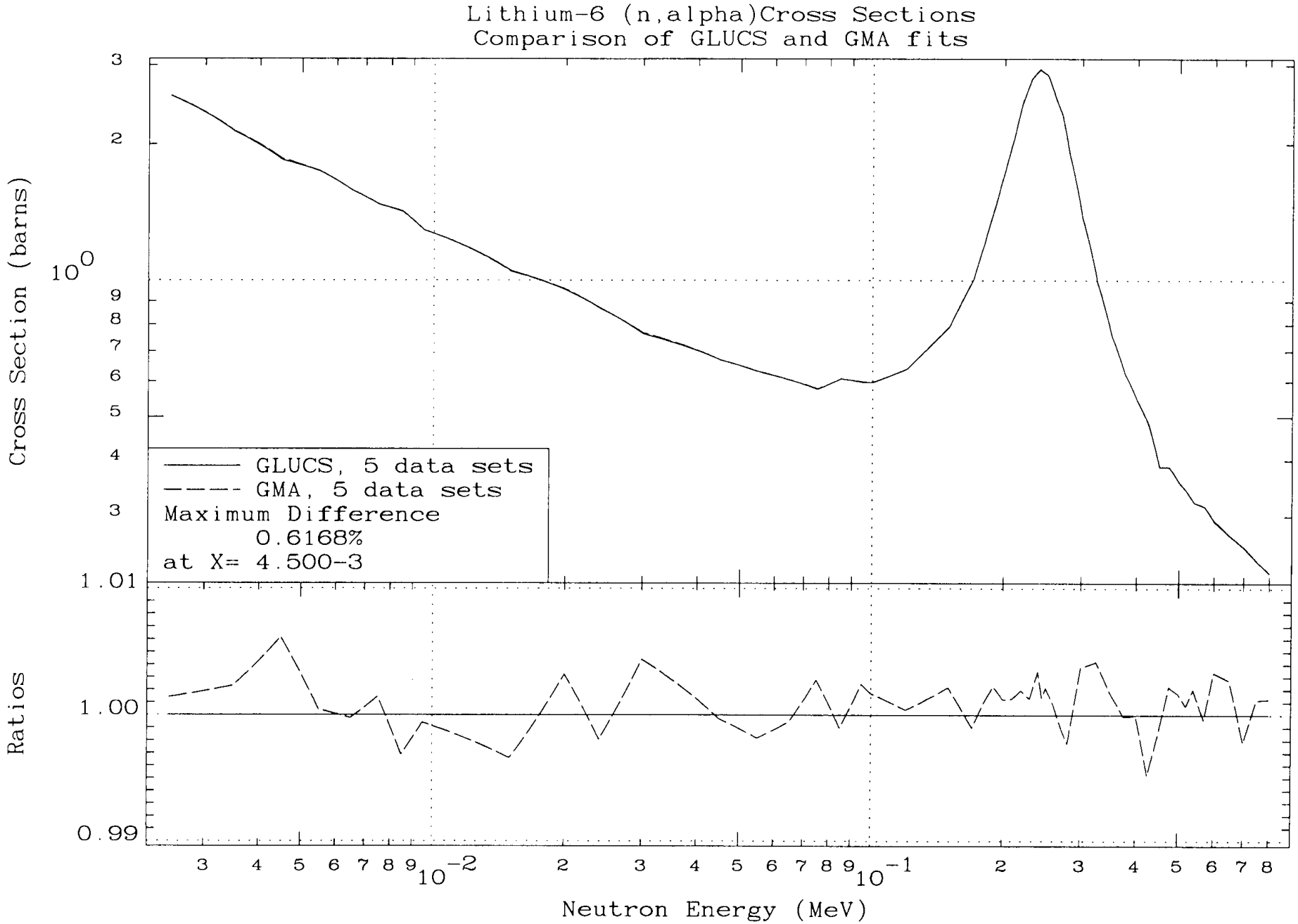


Fig.2. Intercomparison of GMA and GLUCS fitting for five data sets in TEST1 case.

Table 2. Comparison of the correlation coefficients obtained with GMA and GLUCS

Code	Pt #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
GMA	9	8	8	12	16	16	**18**	19	24	100											
GLUCS	9	8	8	12	16	16	**17**	19	24	100											
GMA	10	8	8	12	16	16	**18**	19	24	42	100										
GLUCS	10	8	8	12	16	16	**17**	19	24	42	100										
GMA	11	8	8	12	16	16	**18**	19	24	**42**	**42**	100									
GLUCS	11	8	8	12	16	16	**17**	19	24	**43**	**43**	100									
GMA	12	8	9	12	16	17	**19**	20	26	44	44	**45**	100								
GLUCS	12	8	9	12	16	17	**18**	20	26	44	44	**44**	100								
GMA	13	9	9	13	**17**	18	20	**21**	**27**	**47**	**47**	48	50	100							
GLUCS	13	9	9	13	**18**	18	20	**22**	**28**	**48**	**48**	48	50	100							
GMA	14	9	10	14	18	19	21	**22**	29	**50**	50	51	53	**57**	100						
GLUCS	14	9	10	14	18	19	21	**23**	29	**51**	50	51	53	**58**	100						
GMA	15	9	10	14	18	19	**21**	22	**29**	51	51	52	54	58	61	100					
GLUCS	15	9	10	14	18	19	**20**	22	**28**	51	51	52	54	58	61	100					
GMA	16	9	10	14	19	19	21	23	29	**51**	**51**	52	**55**	59	62	**63**	100				
GLUCS	16	9	10	14	19	19	21	23	29	**52**	**52**	52	**54**	59	62	**62**	100				
GMA	17	8	9	13	17	18	19	**20**	**27**	46	46	47	49	53	**56**	56	57	100			
GLUCS	17	8	9	13	17	18	19	**21**	**26**	46	46	47	49	53	**55**	56	57	100			
GMA	18	10	10	14	19	20	**22**	23	30	52	52	53	55	**59**	62	63	64	57	100		
GLUCS	18	10	10	14	19	20	**21**	23	30	52	52	53	55	**60**	62	63	64	57	100		
GMA	19	10	11	15	20	21	22	**24**	31	54	54	55	57	**61**	65	**66**	67	60	67	100	
GLUCS	19	10	11	15	20	21	22	**25**	31	54	54	55	57	**63**	65	**65**	67	60	67	100	
GMA	20	10	**10**	15	20	**20**	22	24	31	**53**	**53**	54	56	**60**	64	**65**	65	59	66	**68**	100
GLUCS	20	10	**11**	15	20	**21**	22	24	31	**54**	**54**	54	56	**61**	64	**64**	65	59	66	**69**	100
GMA	21	9	9	13	18	18	20	**21**	28	48	48	**49**	**51**	55	58	**59**	59	53	60	62	61
GLUCS	21	9	9	13	18	18	20	**22**	28	48	48	**48**	**50**	55	58	**58**	59	53	60	62	61

Table 4. Covariances (in b^2) for point #1 and #25 with variances marked by **bold** for model and non-model least squares fits of five sets of experimental data

Point #	Point #1		Point#25	
	GMA non-model fit	RAC R-matrix model fit	GMA non-model fit	RAC R-matrix model fit
1	**0.00775**	**0.00158**	0.00047	0.00044
2	0.00076	0.00123	0.00039	0.00038
3	0.00064	0.00102	0.00034	0.00034
4	0.00051	0.00086	0.00031	0.00031
5	0.00050	0.00076	0.00029	0.00029
6	0.00048	0.00067	0.00027	0.00027
7	0.00042	0.00060	0.00025	0.00025
8	0.00038	0.00055	0.00023	0.00024
9	0.00032	0.00036	0.00019	0.00020
10	0.00028	0.00027	0.00017	0.00018
11	0.00025	0.00023	0.00016	0.00016
12	0.00022	0.00019	0.00014	0.00015
13	0.00020	0.00015	0.00012	0.00012
14	0.00018	0.00014	0.00011	0.00011
15	0.00017	0.00014	0.000109	0.000109
16	0.00017	0.00015	0.000106	0.000104
17	0.00016	0.00015	0.000109	0.000103
18	0.00016	0.00016	0.000106	0.000104
19	0.00017	0.00017	0.000108	0.000105
20	0.00018	0.00019	0.00011	0.00012
21	0.00022	0.00024	0.00014	0.00016
22	0.00028	0.00029	0.00018	0.00022
23	0.00033	0.00032	0.00022	0.00026
24	0.00039	0.00038	0.00026	0.00031
25	0.00047	0.00044	**0.00072**	**0.00038**
26	0.00056	0.00053	0.00037	0.00045
27	0.00067	0.00064	0.00045	0.00051
28	0.00075	0.00074	0.00050	0.00055
29	0.00075	0.00080	0.00051	0.00054
30	0.00076	0.00082	0.00052	0.00053
31	0.00075	0.00080	0.00051	0.00050
32	0.00065	0.00071	0.00046	0.00045
33	0.00064	0.00061	0.00043	0.00040
34	0.00052	0.00051	0.00035	0.00035
35	0.00038	0.00036	0.00024	0.00026
36	0.00027	0.00026	0.00018	0.00019
37	0.00021	0.00021	0.00014	0.00014
38	0.00017	0.00018	0.00011	0.00012
39	0.00014	0.00015	0.000094	0.000097
40	0.00014	0.00014	0.000089	0.000083
41	0.000098	0.00012	0.000070	0.000073
42	0.000102	0.00012	0.000065	0.000066
43	0.000106	0.000104	0.000065	0.000061
44	0.000100	0.000098	0.000061	0.000059
45	0.000075	0.000092	0.000052	0.000057
46	0.000087	0.000083	0.000058	0.000054
47	0.000079	0.000076	0.000050	0.000052
48	0.000079	0.000068	0.000050	0.000050
49	0.000071	0.000064	0.000047	0.000048
50	0.000065	0.000064	0.000043	0.000045
51	0.000063	0.000067	0.000041	0.000041
Sum	0.023875	0.019656	0.011163	0.011191
Ratio, model to Non-model	**0.82**		**1.002**	

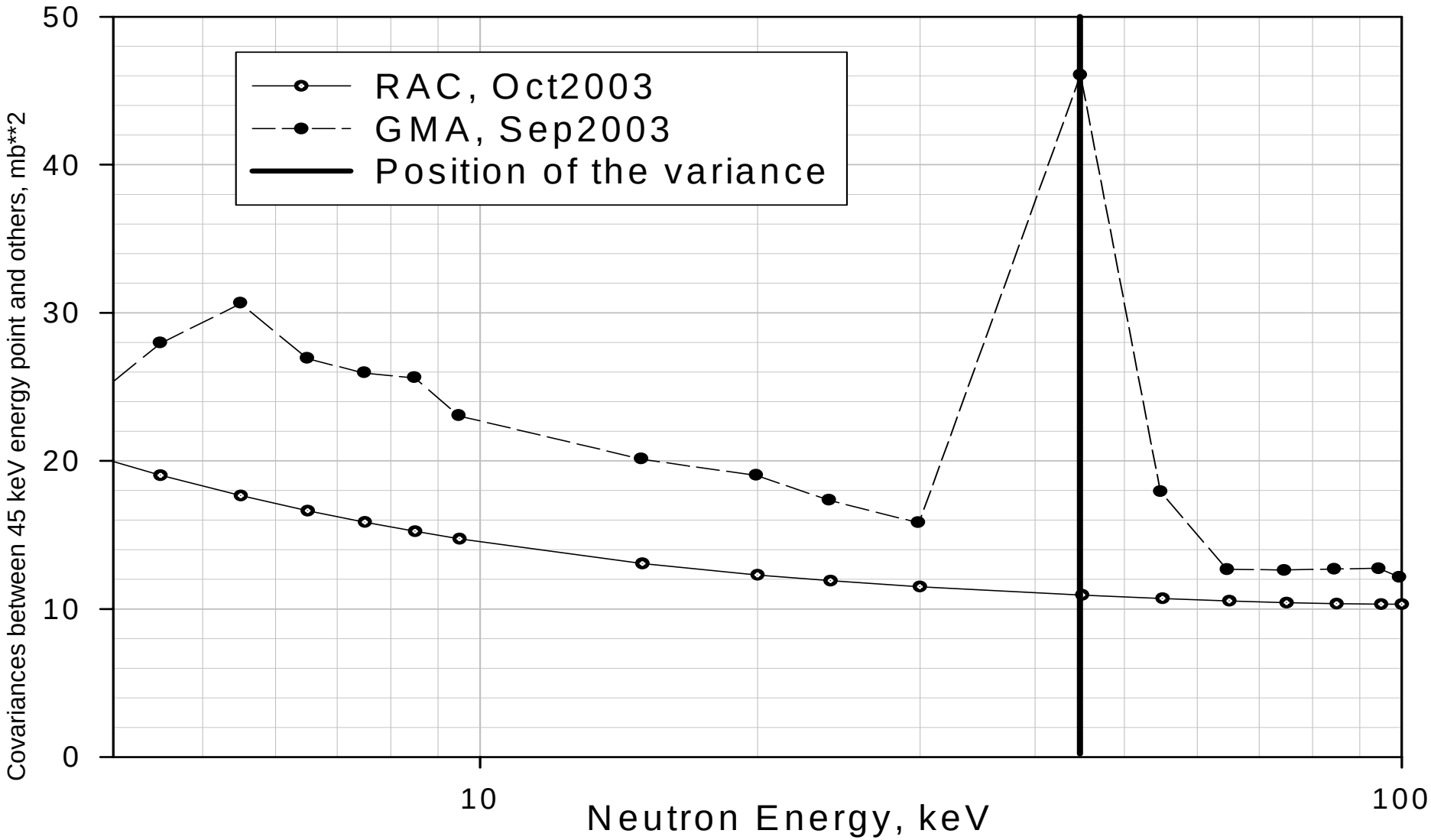


Fig.5 Covariances between energy point 45 keV and other points evaluated with GMA and RAC. Position of the variance is shown by solid vertical line.

CRP Work Now Underway (cont.)

- Methods for smoothing evaluated data
  - ^{6}Li(n,t), ^{10}B(n,α) and ^{10}B(n,α$_{1}$γ) data can be fit with R-matrix
  - Models may provide insight on defining curves

- Effects of experimental resolution on evaluated results
  - R-matrix analyses handle resolution effects but model independent codes generally don't
  - Unfolding data used for model independent codes is not appropriate
  - Folding resolution functions into R-matrix and model independent codes is difficult and would result in broadened cross sections for the evaluation
  - The simple approach taken is to not include poor resolution data for the model independent codes

Conclusions

The work on the evaluation is progressing. However, there is still much work to be done to fully complete the evaluation. The evaluation of the standards depends strongly on the progress of the CRP. It should be emphasized that the activities of the CRP are strongly research orientated so it is difficult to establish a firm schedule for completion of the tasks.

If we knew what it was we were doing,
it would not be called research, would it?

Albert Einstein