WPEC Meeting, Antwerp, Belgium, April 8-9, 2005

Status of the ENDF Project

Pavel Oblozinsky

National Nuclear Data Center
Brookhaven National Laboratory, Upton, NY 11973

1. CSEWG Organization

- Chair — P. Oblozinsky, BNL
- Working Committees
  - Measurements — D. Smith, ANL (chair)
  - Evaluation — M. Chadwick, LANL (chair)
  - Formats & Processing — M. Greene, ORNL (chair)
  - Validation — R. McKnight, ANL (chair)
- Database Manager — M. Herman, BNL

2. ENDF/B-VI release 8

The current version of the library, ENDF/B-VI release 8, was issued in October 2001. Since then, the library remains frozen. The library includes neutron cross-section evaluations for 328 materials (313 isotopic and 15 elemental). For details see www.nndc.bnl.gov/csewg and www.nndc.bnl.gov/endf.

3. Development of ENDF/B-VII

Three recent U.S. events, of importance for ENDF/B-VII, should be highlighted: Santa Fe conference (Sep 2004), CSEWG meeting (Nov 2004) and release of the beta0 version (March 2005).

A. Santa Fe conference

ND2004 conference at Santa Fe (Sep 26 – Oct 1, 2004), organized by LANL (chairs M. Chadwick and R. Haight) provided an important opportunity to address various aspects of ENDF/B-VII development. Six invited talks were directly related to ENDF/B-VII, P. Young (evaluation of U isotopes), R. MacFarlane (actinide validation), L. Leal (neutron resonance data) V. Pronyaev (cross-section standards), A. Courcelle (238U – ueval) and P. Oblozinsky (ENDF summary),

B. CSEWG meeting

CSEWG annual meeting (Nov 2-6, 2004; 48 participants) was fully devoted to development and testing of the Preliminary ENDF/B-VII. Some of the highlights and actions:

- Standards cross sections will be provided by A. Carlson, NIST (IAEA CRP project) shortly, covariances will follow in 2005.
- LANL will build new actinide evaluations based on new standards by December 2004.
- Number of detailed actions related to actinides was identified, including 238U capture, 16O(n,alpha), nubar for 235U, U-minor isotopes, and delayed neutron data for 235, 238U.
- LANL dosimetry files (89Y, 191,193Ir, 169Tm) should be integrated into full evaluations.
- New evaluations should be submitted for 241, 242, 242m, 243Am.
- So far, no new covariance data were submitted to ENDF/B-VII. Covariance data for a set of 7 isotopes of Gd (may be also Re) will be provided by ORNL and LANL. Covariance data are expected also for 235U, 238U and 239Pu.
- Extensive ENDF/B-VII paper will be prepared, most likely for Nucl. Sci. Eng.

C. ENDF/B-VII beta0 release

ENDF/B-VIIbeta0 (neutron evaluations only) was assembled and released for data validation on March 11, 2005. This was done in response to an offer from A. Koning who wanted to compare Preliminary ENDF/B-VII with JEFF-3.1. The JEFF project should run a massive validation exercise including 600-700 benchmarks, to be completed before the present WPEC meeting.

The list of ENDF/B-VIIbeta0 materials is given in **Appendix**. There are 340 materials with neutron cross-section evaluations; out of them 85 materials represent new or improved evaluations, 255 materials are taken from ENDF/B-VI.8. There are 12 entirely new materials that were not available in ENDF/B-VI.8:

- ^{7}Be, ^{70}Ge, $^{196, 198, 199, 200, 201, 202, 204}$Hg, and $^{239, 240, 241}$U

New features of ENDF/B-VII

The ENDF/B-VII library intends to have the following new features:

- New version of standard cross sections
- Energies up to 150 MeV for selected materials
- Photonuclear data
- Improved evaluations for major actinides
- Improved evaluations for criticality safety
- Improved evaluations for fission products
- New and improved charged particle evaluations relevant to astrophysics
- Evaluations relevant to RIA, ADS and next generation reactors.

ENDF/B-VII library uses the current ENDF-6 format and there is no ENDF-7 format.

New and improved evaluations

Altogether, 265 new/improved evaluations have been submitted for inclusion into the ENDF/B-VII library. These include the following number of materials:

- 85 materials for neutrons (mostly actinides and fission products),
- 20 materials for charged particles (10 for protons; 10 for D, T and He3), and
- 160 materials for photonuclear, that is,
- **265 materials in total.**

Three laboratories (LANL, ORNL and BNL) contributed new/revised evaluations. Short summary is given below, including examples of plots that highlight recent improvements in neutron-induced reactions.

Los Alamos. LANL is major contributor of new evaluations with focus on actinides and revised LA150 library:

- 52 materials for neutrons
  - ^{27}Al
  - ^{241,242,242m}Am
  - ^{7}Be
  - ^{40}Ca
  - ^{50,52,53,54} Cr
  - ^{63,65} Cu
  - ^{54,56,57} Fe
  - ^{1}H (two files provided; one with thermal capture cross section 332.0 mb (official B-VII submittal) and the other with 332.6 mb (for testing, as in the standard))
  - ^{196,198,199,200,201,202,204} Hg
  - ^{93} Nb
  - ^{58,60,61,62,64} Ni
  - ^{237} Np
  - ^{31} P
  - ^{206,207,208} Pb
  - ^{239} Pu
  - ^{28,29,30} Si
  - ^{232,233,234,235,236,237,238,239,240,241} U
  - ^{182,183,184,186} W

- 160 materials for photonuclear, mostly up to 150 MeV, includes considerable international input (IAEA CRP project)

- 20 materials for light charged-particle reactions, with Hg up to 150 MeV
  - 10 materials for protons (^{3}H, ^{6,7}Li; $^{196, 198, 199, 200, 201, 202, 204}$Hg)
  - 10 materials for D (2,3-H, 3-He, 6,7-Li), tritons (3-H, 3-He, 6-Li) and 3-He (3-He, 6-Li)

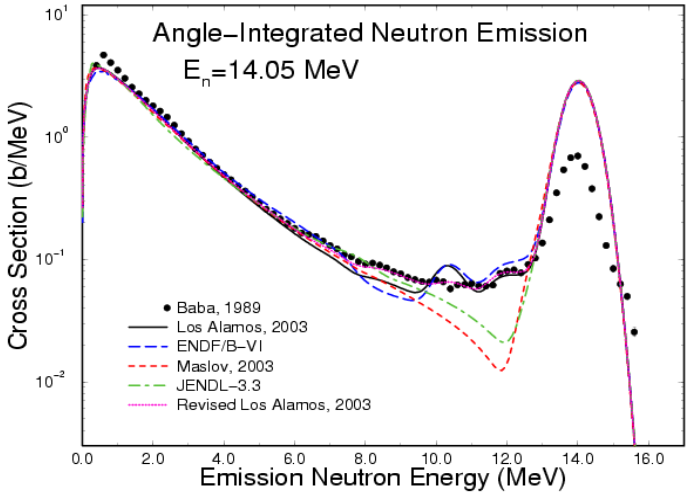


Fig. 1. Recent improvement in ^{238}U(n,xn) evaluation performed by LANL. New evaluation is supported by LLNL integral pulsed sphere benchmark.

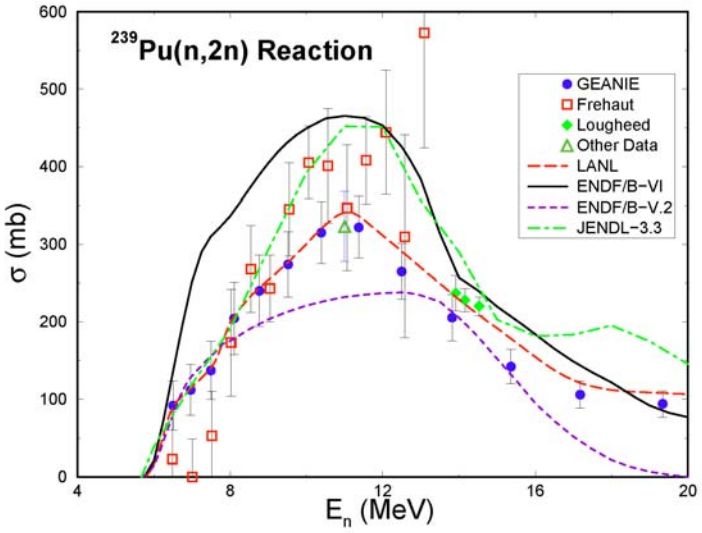


Fig. 2. Improved ^{239}Pu(n, 2n) evaluation performed by LANL, driven by recent GEANIE measurement.

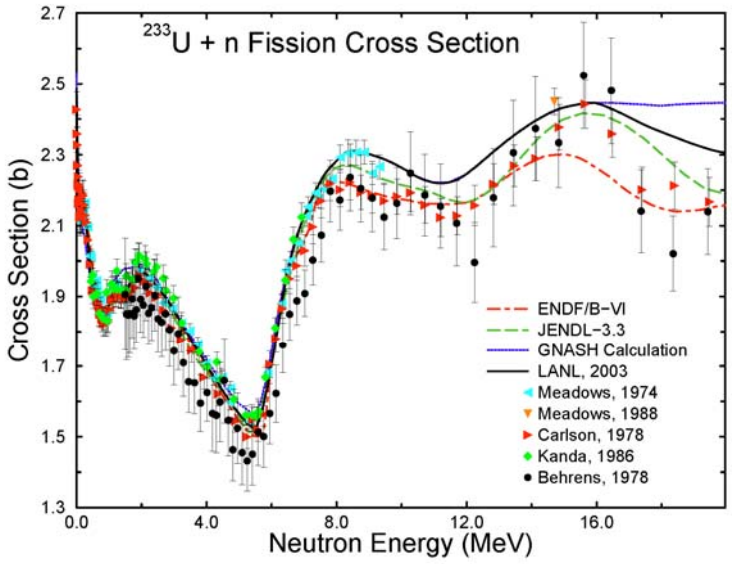


Fig. 3. Fission cross sections for ^{233}U+n by LANL, part of entirely new evaluation with modern treatment of direct reactions.

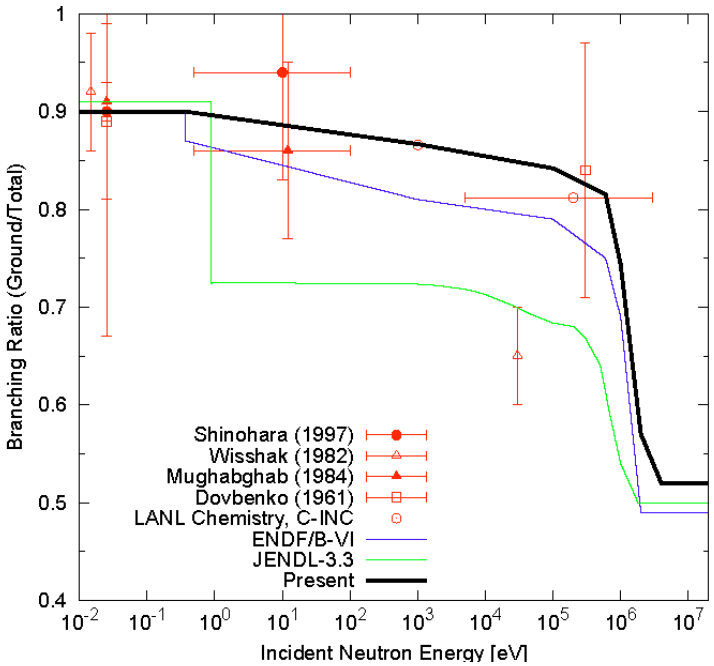


Fig. 4. New evaluation of branching ratio for ^{242g}Am to ^{242tot}Am in ^{241}Am(n, gamma) reaction as performed by LANL.

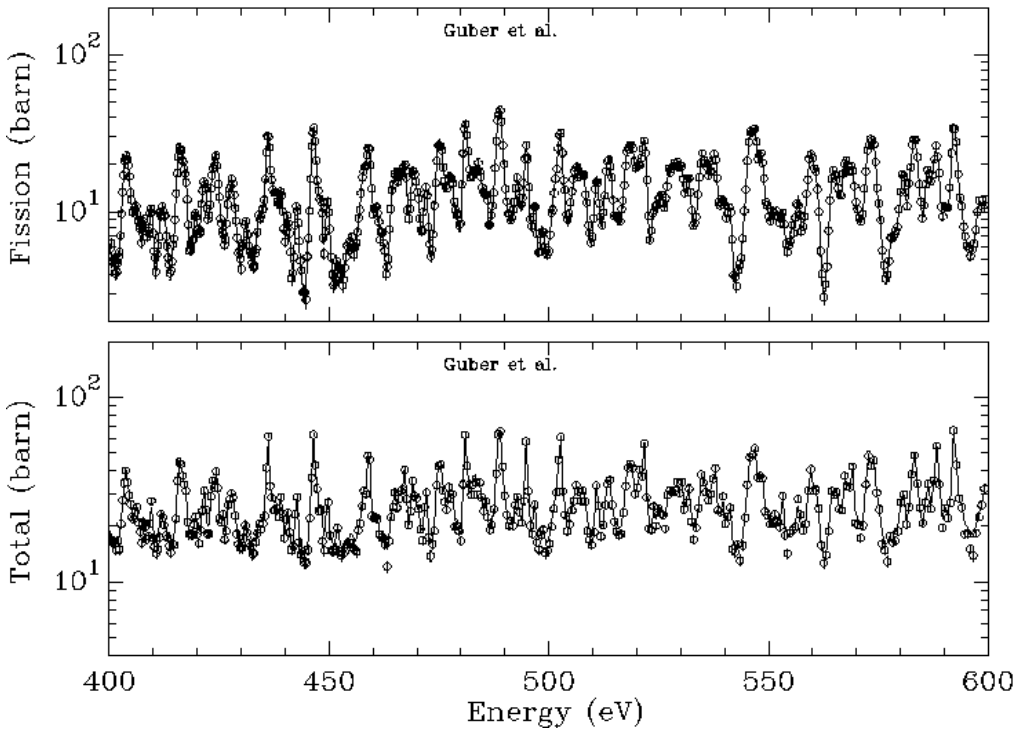


Fig. 5. Total and fission cs for ^{233}U+n in the resonance region measured and fitted by ORNL.

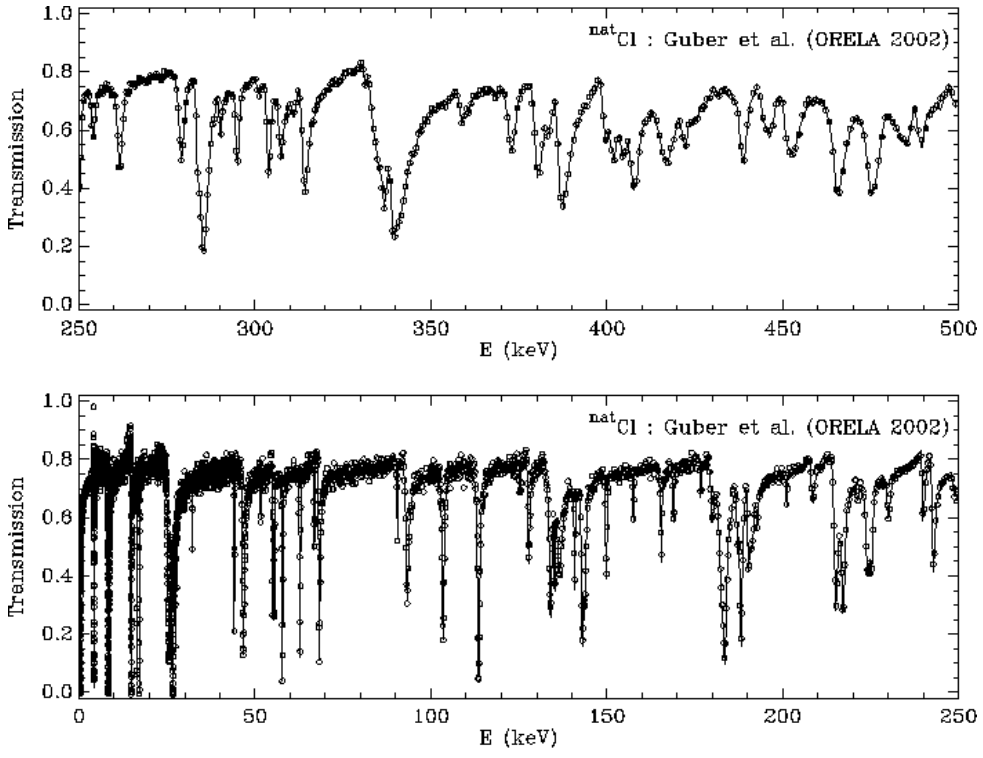


Fig. 6. Transmission for ^{nat}Cl+n in the resonance region measured and fitted by ORNL.

Oak Ridge. ORNL is focusing on materials important for criticality safety, in particular in resolved resonance region & unresolved resonance region.

- 4 materials for neutrons: ^{19}F, ^{35,37}Cl, ^{241}Pu
- 7 materials for neutrons together with LANL: ^{28}Si, ^{208}Pb, ^{232,233,234,235,238}U
- Expected: 7 isotopes of Gd with covariances (in collaboration with LANL)

Brookhaven. BNL is focusing on fission products evaluations.

- 24 materials for neutrons (resonance + fast region), in collaboration with KAERI:
  - ^{95}Mo, ^{99}Tc, ^{101}Ru, ^{103}Rh, ^{105}Pd, ^{109}Ag, ^{131}Xe, ^{133}Cs, ^{141}Pr, $^{143, 145}$Nd, $^{147, 149,1 50, 151,}$ ^{152}Sm, ^{153}Eu, $^{155, 157}$Gd and $^{160, 161, 162, 163, 164}$Dy

- 5 materials for neutrons (resonance + fast region), in collaboration with JAERI and IAEA
  - $^{70, 72, 73, 74, 76}$Ge, with focus on photon production

- Atlas of Neutron Resonances by S. Mughabghab
  - Z = 2-100, resonance parameters and thermal cross sections
  - To be submitted to Elsevier by June 15, 2005 and published early 2006

- Development of FP library (WPEC Subgroup 23 collaboration)

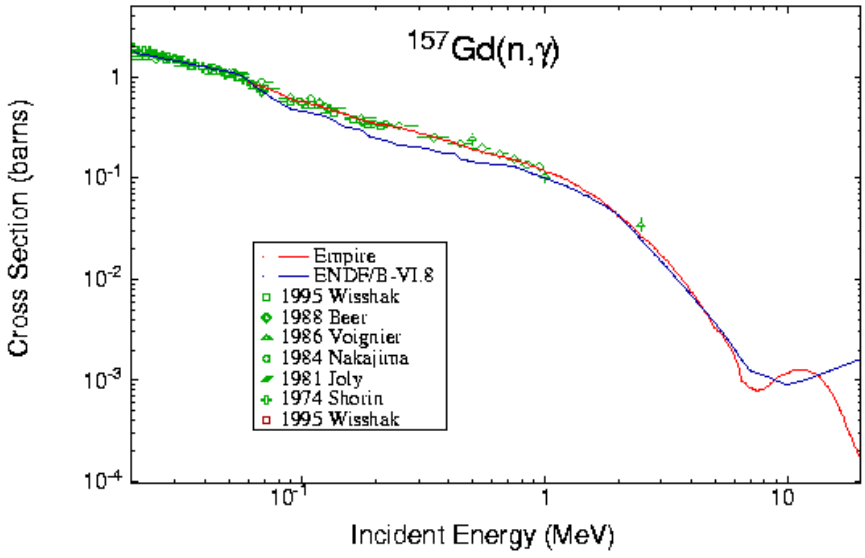


Fig. 7. Neutron capture for ^{157}Gd evaluated by BNL using the code EMPIRE.

D. Data testing

Data verification

The NNDC takes care about data verification (Phase 1 data testing). This includes:

- Runs with checking codes (CHECKR, FIZCON, PSYCHE)
- Runs with NJOY 2003
- Simple runs with MCNP

All new/revised non-actinide neutron evaluations in ENDF/B-VIIbeta0 successfully passed the NJOY/MCNP test, while actinides were extensively validated at LANL. In spite of this encouraging result there are numerous format warnings reported by the checking codes that will have to be fixed.

To facilitate review of new evaluations and data testing, the NNDC has setup the CSEWG Members Website containing Preliminary ENDF/B-VII Library. It provides access to ENDF/B-VII beta 0 version of the library (March 11, 2005), to the ENDF web retrieval interface that includes beta0 version, and to the page with files, outputs of checking codes and graphical inter-comparisons for the new/revised evaluations.

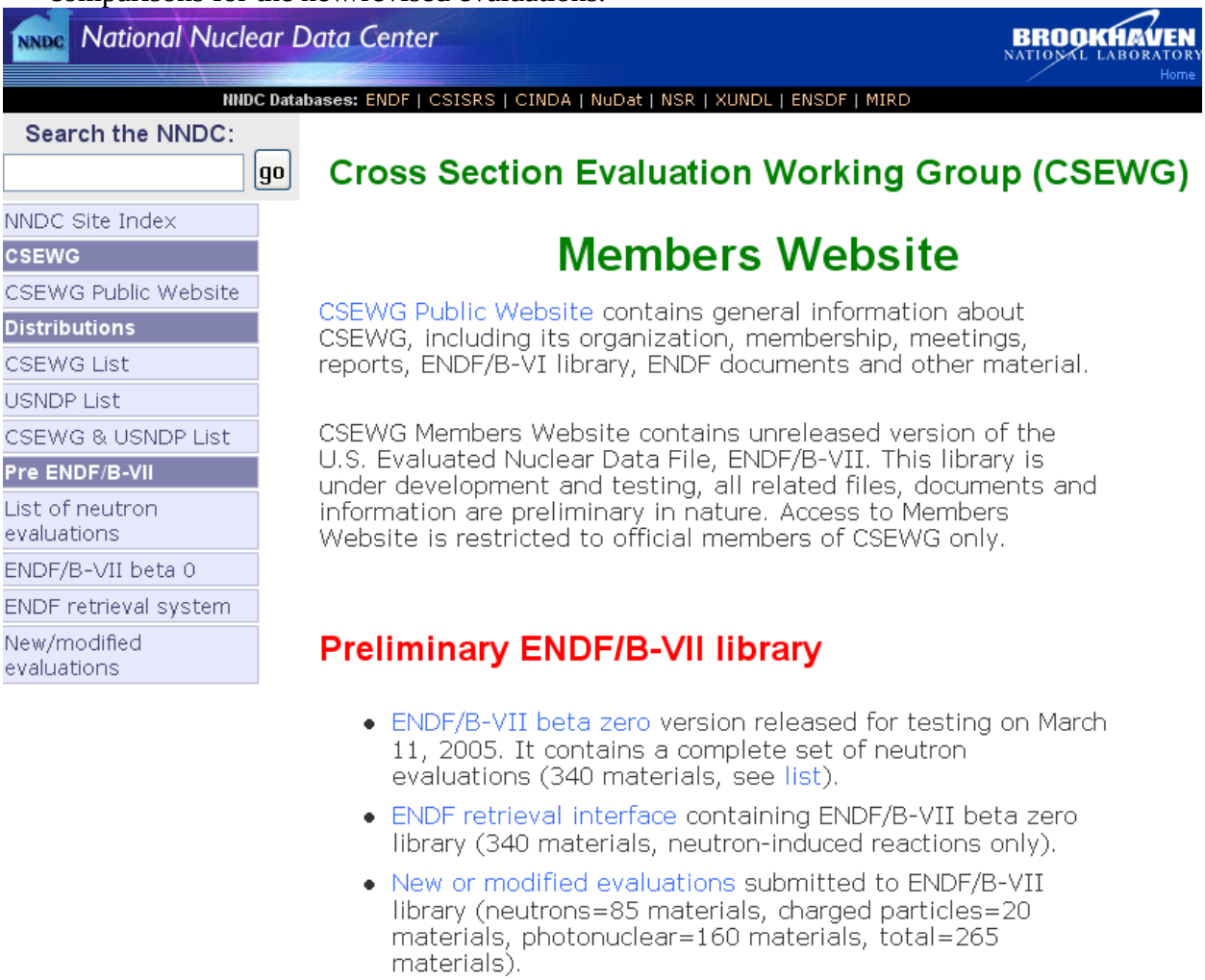


Fig.8. CSEWG members website maintained by the NNDC.

Data validation

Quantitative data validation by integral benchmarks represents an important component in the development of ENDF/B-VII. A considerable amount of benchmarking was reported at the CSEWG Meeting (Nov 2004), including LANL, KAPL, Westinghouse, Bechtel Bettis and others.

As shown below, the first round of responses to ENDF/B-VII beta0 (released on March 11, 2005) was pretty positive.

R. MacFarlane, LANL observed that the actinides have new fission cross sections that were made consistent with the final cross-section standards. The U-233 fission is a new Bayesian fit, and some change was also made in nubar. The U-238 capture cross section also changed due to the standards work. There are new delayed-neutron time constants and fractions, but the spectra have not yet been updated. The new hydrogen evaluation has a photon-production representation that will cause difficulties, therefore a version with photons removed has been used for testing. Two different thermal capture values are being tried, 332.0 mb (as in current ENDF) and 332.6 mb (as in the standard).

In many cases, the benchmarking results are pretty similar to the ones reported at the Santa Fe conference and the recent CSEWG meeting. Some improvement is seen for U-233, while Bigten/ZPR-type assemblies come up a bit due to the reduced U-238 capture. The thermal results are still looking good, but it is hard to decide between the two different H-1 capture cross sections due to small set and insufficient statistics. The effect of this cross section is within numerical accuracy of the codes, which complicates the issue.

R.MacFarlane, LANL, March 2005:
Data Testing with CSEWG and ICSBEP Criticality Models

Effects of actinides evaluations

		<-------------- C/E -------------------->		
Assembly	Experiment	Release 8	preVII May'04	preVII Mar'05
Godiva	1.0000(10)	.99665(19)	.99970(19)	.99950(15)
HMF001	1.0000(10)	.99664(19)	.99942(19)	.99979(15)
Jezebel	1.0000(20)	.99722(18)	1.00051(18)	1.00032(14)
PMF001	1.0000(20)	.99750(19)	1.00024(18)	1.00034(15)
Flattop-25	1.0000(10)	1.00193(19)	1.00299(21)	1.00283(16)
HMF028	1.0000(30)	1.00147(21)	1.00328(20)	1.00330(16)
Flattop-Pu	1.0000(14)	1.00203(22)	1.00194(23)	1.00178(17)
PMF006	1.0000(30)	1.00203(22)	1.00128(22)	1.00033(18)
Jezebel-23	1.0000(10)	.99255(18)	.99883(18)	.99974(15)
UMF001	1.0000(10)	.99256(18)	.99857(18)	.99984(15)
Flattop-23	1.0000(14)	1.00239(23)	1.00061(17)	1.00093(17)
UMF006	1.0000(14)	1.00055(21)	.99864(21)	.99963(17)
HMF004	.9985	.99625(25)	.99995(24)	.99964(25)
PMF011	1.0000(10)	.99715(23)	.99908(23)	.99910(24)
Bigten	.9960(30)	1.01355(17)	1.00108(16)	1.00174(13)
IMF007h	.9948(13)	1.01251(16)	.99985(16)	1.00035(13)
IMF007s	1.0045(07)	1.01167(24)	.99989(24)	1.00001(13)
ZPR-6/6A	.9939(23)	.99921(26)	.99792(26)	.99817(16)
MCF001(ZPR-6/7)	.9866(23)	1.00605(33)	.99878(33)	1.00087(15)

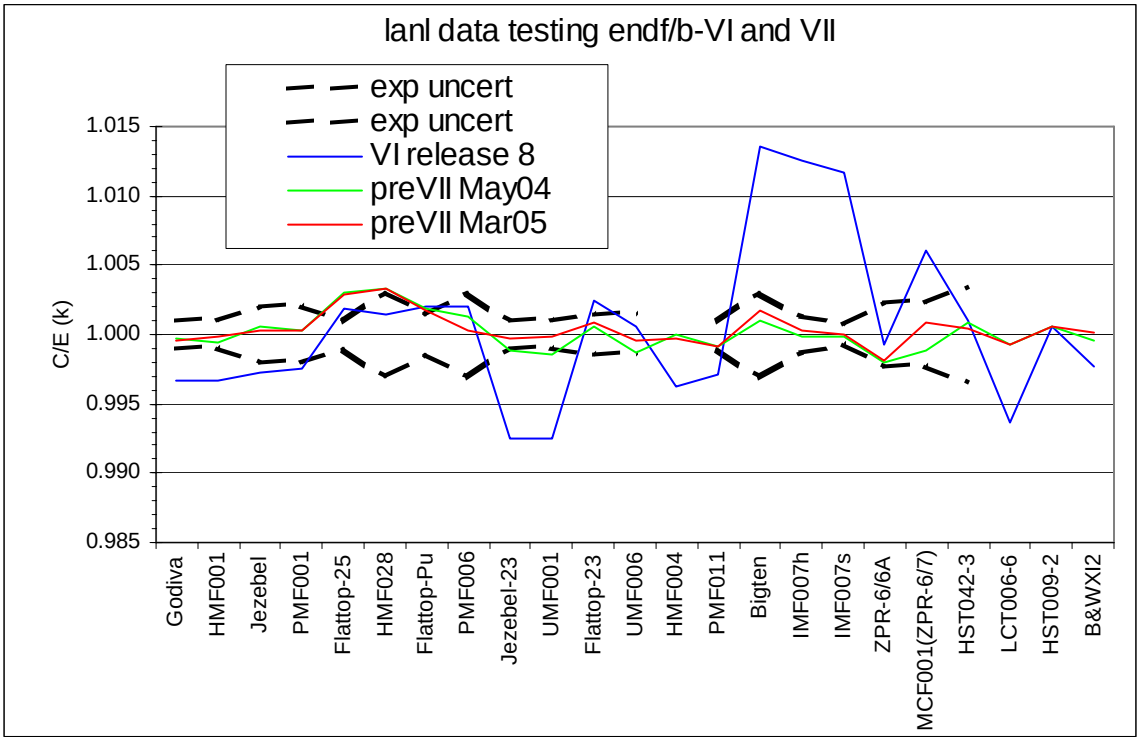
HST042-3	.9994(34)	1.00100(11)	1.00093(12)	1.00045(09)
LCT006-6	1.0000	.99367(25)	.99931(22)	.99935(18)
HST009-2	1.0000(57)	1.00055(22)	1.00051(22)	1.00061(22)
B&WXI2	1.0000	.99770(22)	.99959(20)	1.00010(21)
Godiva Ratios				
U238f/U235f	.1643(18)	.965	.961	.965
Np237f/U235f	.8516(120)	.959	.954	.958
U233f/U235f	1.590(30)	1.001	.987	.988
Pu239f/U235f	1.4152(140)	.977	.974	.978
Jezebel Ratios				
U238f/U235f	.2133(23)	.968	.977	.974
Np237f/U235f	.9835(140)	.973	.972	.972
U233f/U235f	1.578(27)	1.001	.989	.988
Pu239f/U235f	1.4609(130)	.976	.973	.976
Flattop-25 Ratios				
U238f/U235f	.1492(16)	.981	.970	.968
Np237f/U235f	.7804(100)	.981	.971	.970
U233f/U235f	1.608(30)	.990	.975	.976
Pu239f/U235f	1.3847(120)	.985	.980	.983
Flattop-Pu Ratios				
U238f/U235	.1799(20)	.986	.979	.982
Np237f/U235f	.8561(120)	.989	.976	.978
Jezebel-23 Ratios				
U238f/U235f	.2131(26)	1.011	.981	.993
Np237f/U235f	.9970(150)	.988	.981	.986
Flattop-23 Ratios				
U238f/U235f	.1916(21)	.999	.9785	.987
Np237f/U235f	.9103(130)	.994	.9791	.988
Bigten Ratios				
U238f/U235f	.03739(30)	1.041	.961	.959
Np237f/U235f	.3223(39)	1.034	.943	.942
U233f/U235f	1.580(30)	.998	.971	.980
Pu239f/U235f	1.1936(84)	.987	.973	.977
U238c/U235f	.1100(30)	.959	.973	.972

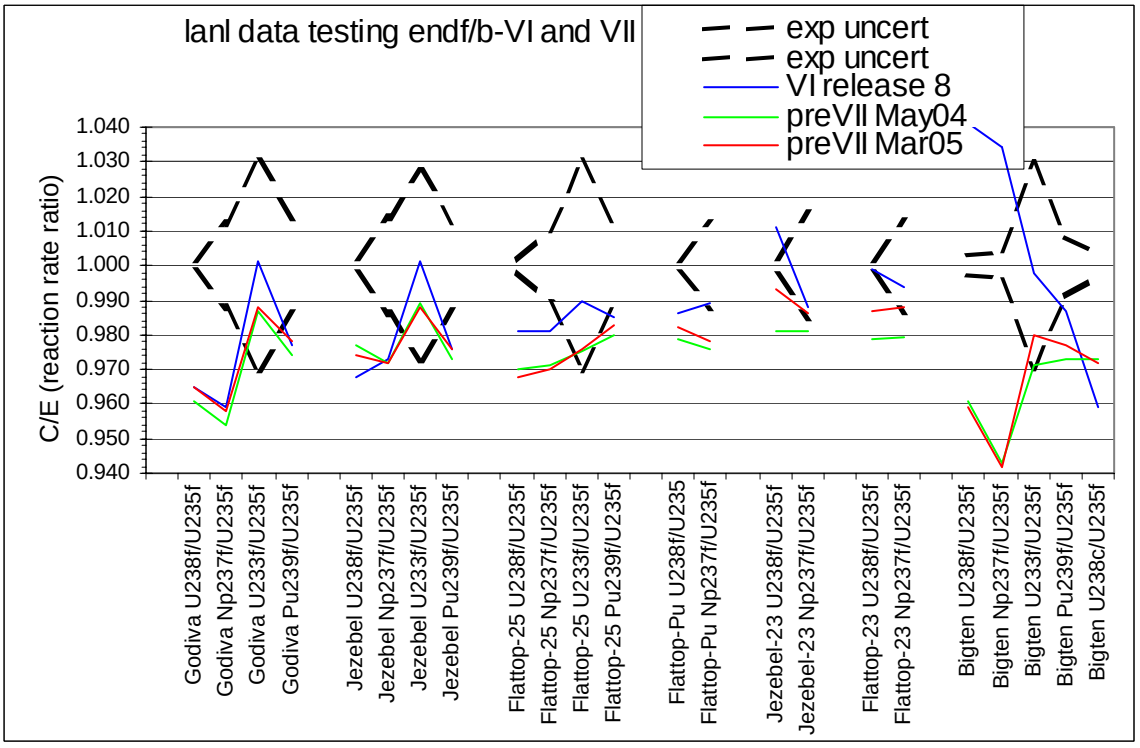
Effects of new hydrogen evaluations

		<-------------- C/E ---------------->		
Assembly	Experiment	preVII Mar'05	new 332.0	new 332.6
PMF011	1.0000(10)	.99910(24)	.99871(21)	.99936(21)
HST042-3	.9994(34)	1.00045(09)	1.00032(12)	.99925(12)
HST009-2	1.0000(57)	1.00061(22)	1.00020(21)	.99965(22)
LCT006-6	1.0000	.99935(18)	.99965(19)	.99905(18)
B&WXI2	1.0000	1.00010(21)	1.00040(21)	.99960(20)

P. Reuven, Hebrew University Jerusalem produced plots of the above MacFarlane's results and concluded that the agreement of k-eff with experiment is amazing, particularly when compared to previous version of the library, ENDF/B-VI.8.

Fig. 9. LANL benchmarking results, March 2005





4. Conclusion

Impressive progress was made on ENDF/B-VII by CSEWG since the last WPEC meeting. The current timetable for future work is as follows:

- July 12, 2005, CSEWG Evaluation and Validation Committee (ORNL), validation
- Nov 8-10, 2005, CSEWG Annual Meeting (BNL), final review
- December 2005, Release of ENDF/B-VII

Appendix

List of Materials in ENDF/B-VI beta0
Distributed on March 11, 2005

Explanation of the Table

- Source:
  - ENDF/B-VII = new or revised evaluation
  - blank = evaluation taken from ENDF/B-VI.8
- Comment:
  - SG23? = may be replaced by WPEC SG23 evaluation

#	Material	Lab.	Source	Authors	MAT	Comment
1)	1-H - 1	LANL	ENDF/B-VII	G.M.HALE	125	th. cap. 332.0 mb
2)	1-H - 2	LANL		P.G.YOUNG,G.M.HALE,M.B.CHADWICK	128	
3)	1-H - 3	LANL		LEONA STEWART	131	
4)	2-He- 3	LANL		G.HALE, D.DODDER, P.YOUNG	225	
5)	2-He- 4	LANL		NISLEY, HALE, YOUNG	228	
6)	3-Li- 6	LANL		G.M.HALE, P.G.YOUNG	325	
7)	3-Li- 7	LANL		P.G.YOUNG	328	
8)	4-Be- 7	LANL	ENDF/B-VII	P.R.PAGE	419	
9)	4-Be- 9	LLNL,LANL		PERKINS,PLECHATY,HOWERTON,FRANKLE	425	
10)	5-B - 10	LANL		G.M.HALE, P.G.YOUNG	525	
11)	5-B - 11	LANL		P.G.YOUNG	528	
12)	6-C - 0	LANL,ORNL		M.B.CHADWICK, P.G.YOUNG, C.Y. FU	600	
13)	7-N - 14	LANL		M.B.CHADWICK & P.G.YOUNG	725	
14)	7-N - 15	LANL		E.ARTHUR,P.YOUNG,G.HALE	728	
15)	8-O - 16	LANL		HALE,YOUNG,CHADWICK,CARO,LUBITZ	825	
16)	8-O - 17	BNL		B.A.MAGURNO	828	
17)	9-F - 19	CNDC,ORNL	ENDF/B-VII	Z.X.ZHAO,C.Y.FU,D.C.LARSON	925	
18)	11-Na- 23	ORNL		D. C. LARSON	1125	
19)	12-Mg- 0	ORNL		D.C.LARSON	1200	
20)	12-Mg- 24	HEDL,ORNL		MANN,LARSON	1225	
21)	13-Al- 27	LANL	ENDF/B-VII	M.B.CHADWICK & P.G.YOUNG	1325	
22)	14-Si- 0	ORNL		LARSON,PEREY,DRAKE,YOUNG	1400	
23)	14-Si- 28	LANL,ORNL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,D.HETRICK	1425	
24)	14-Si- 29	LANL,ORNL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,D.HETRICK	1428	
25)	14-Si- 30	LANL,ORNL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,D.HETRICK	1431	
26)	15- P- 31	LANL,LLNL	ENDF/B-VII	M.CHADWICK,P.YOUNG,R.HOWERTON	1525	
27)	16-S - 0	BNL		DIVADEENAM	1600	
28)	16-S - 32	LLNL		HOWERTON	1625	
29)	17-Cl- 0	GGA		M.S.ALLEN AND M.K.DRAKE	1700	
30)	17-CL- 35	ORNL	ENDF/B-VII	R.SAYER,K.GUBER,L.LEAL,N.LARSON	1725	
31)	17-CL- 37	ORNL	ENDF/B-VII	R.SAYER,K.GUBER,L.LEAL,N.LARSON	1731	
32)	18-Ar- 40	HEDL		MANN	1837	
33)	19-K - 0	GGA		M.K.DRAKE	1900	
34)	19-K - 41	HEDL		MANN	1931	
35)	20-Ca- 0	LANL,ORNL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,C.Y.FU	2000	
36)	21-Sc- 45	ANL,LLNL		A.B.SMITH, R.J.HOWERTON	2125	
37)	22-Ti- 0	BRC,ANL+		C.PHILIS,A.SMITH,R.HOWERTON	2200	
38)	22-Ti- 46	BRC,ANL		C.PHILIS,O.BERSILLON,D.SMITH,+	2225	
39)	22-Ti- 47	BRC,ANL		C.PHILIS,O.BERSILLON,D.SMITH+	2228	
40)	22-Ti- 48	BRC,ANL+		C.PHILIS,O.BERSILLON,D.SMITH+	2231	
41)	22-Ti- 50	LANL		E.ARTHUR	2237	
42)	23-V - 0	ANL,LLNL,+		A.SMITH,D.SMITH+	2300	
43)	24-Cr- 50	LANL,ORNL	ENDF/B-VII	S.CHIBA,M.CHADWICK,D.HETRICK	2425	
44)	24-Cr- 52	LANL,ORNL	ENDF/B-VII	S.CHIBA,M.CHADWICK,D.HETRICK	2431	
45)	24-Cr- 53	LANL,ORNL	ENDF/B-VII	S.CHIBA,M.CHADWICK,K.SHIBATA	2434	
46)	24-Cr- 54	LANL,ORNL	ENDF/B-VII	S.CHIBA,M.CHADWICK,D.HETRICK	2437	
47)	25-Mn- 55	JAERI,ORNL		K.SHIBATA	2525	
48)	26-Fe- 54	LANL,ORNL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,D.HETRICK	2625	
49)	26-Fe- 56	LANL,ORNL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,C.Y.FU	2631	
50)	26-Fe- 57	LANL,ORNL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,D.HETRICK	2634	
51)	26-Fe- 58	ORNL		HETRICK,FU,N.M.LARSON	2637	
52)	27-Co- 59	ANL,ORNL		A.SMITH+,G.DESAUSSURE+	2725	
53)	28-Ni- 58	LANL,ORNL	ENDF/B-VII	S.CHIBA,M.B.CHADWICK,LARSON	2825	
54)	28-Ni- 59	HEDL		F.M.MANN	2828	
55)	28-Ni- 60	LANL,ORNL	ENDF/B-VII	S.CHIBA,M.B.CHADWICK,LARSON	2831	
56)	28-Ni- 61	LANL,ORNL	ENDF/B-VII	S.CHIBA,M.B.CHADWICK,HETRICK	2834	
57)	28-Ni- 62	LANL,ORNL	ENDF/B-VII	S.CHIBA,M.B.CHADWICK,HETRICK	2837	
58)	28-Ni- 64	LANL,ORNL	ENDF/B-VII	S.CHIBA,M.B.CHADWICK,HETRICK	2843	
59)	29-Cu- 63	LANL,ORNL	ENDF/B-VII	A.KONING,M.CHADWICK,HETRICK	2925	
60)	29-Cu- 65	LANL,ORNL	ENDF/B-VII	A.KONING,M.CHADWICK,HETRICK	2931	
61)	31-Ga- 0	LLNL,LANL		HOWERTON,YOUNG	3100	SG23?
62)	32-Ge- 70	BNL,JAERI	ENDF/B-VII	O.Iwamoto,M.Herman,S.Mughabghab+	3225	Update expected
63)	32-Ge- 72	BNL,JAERI	ENDF/B-VII	O.Iwamoto,M.Herman,S.Mughabghab+	3231	Update expected
64)	32-Ge- 73	BNL,JAERI	ENDF/B-VII	O.Iwamoto,M.Herman,S.Mughabghab+	3234	Update expected
65)	32-Ge- 74	BNL,JAERI	ENDF/B-VII	O.Iwamoto,M.Herman,S.Mughabghab+	3237	Update expected
66)	32-Ge- 76	BNL,JAERI	ENDF/B-VII	O.Iwamoto,M.Herman,S.Mughabghab+	3243	Update expected

66)	32-Ge- 76	BNL,JAERI	ENDF/B-VII	O.Iwamoto,M.Herman,S.Mughabghab+	3243	Update expected
67)	33-As- 75	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	3325	SG23?
68)	34-Se- 74	HEDL		F.M.MANN	3425	SG23?
69)	34-Se- 76	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	3431	SG23?
70)	34-Se- 77	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	3434	SG23?
71)	34-Se- 78	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	3437	SG23?
72)	34-Se- 80	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	3443	SG23?
73)	34-Se- 82	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	3449	SG23?
74)	35-Br- 79	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	3525	SG23?
75)	35-Br- 81	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	3531	SG23?
76)	36-Kr- 78	BNL		A.PRINCE	3625	SG23?
77)	36-Kr- 80	BNL		A.PRINCE	3631	SG23?
78)	36-Kr- 82	BNL		A.PRINCE	3637	SG23?
79)	36-Kr- 83	BNL		A.PRINCE	3640	SG23?
80)	36-Kr- 84	BNL		A.PRINCE	3643	SG23?
81)	36-Kr- 85	HEDL		SCHENTER & SCHMITTROTH	3646	SG23?
82)	36-Kr- 86	BNL		A.PRINCE	3649	SG23?
83)	37-Rb- 85	BNL-BRC		A. PRINCE	3725	SG23?
84)	37-Rb- 86	HEDL		SCHENTER & SCHMITTROTH	3728	SG23?
85)	37-Rb- 87	BNL-BRC		A. PRINCE	3731	SG23?
86)	38-Sr- 84	HEDL		F.M.MANN	3825	SG23?
87)	38-Sr- 86	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	3831	SG23?
88)	38-Sr- 87	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	3834	SG23?
89)	38-Sr- 88	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	3837	SG23?
90)	38-Sr- 89	HEDL		SCHENTER & SCHMITTROTH	3840	SG23?
91)	38-Sr- 90	HEDL		SCHENTER & SCHMITTROTH	3843	SG23?
92)	39-Y - 89	ANL,LLNL		R.HOWERTON(LLNL),A.+D.SMITH(ANL)	3925	SG23?
93)	39-Y - 90	HEDL		SCHENTER & SCHMITTROTH	3928	SG23?
94)	39-Y - 91	HEDL		SCHENTER & SCHMITTROTH	3931	SG23?
95)	40-Zr- 0	SAI,BNL		M.DRAKE,D.SARGIS,T.MAUNG,P.ROSE	4000	SG23?
96)	40-Zr- 90	SAI,BNL		M.DRAKE,D.SARGIS,T.MAUNG,P.ROSE	4025	SG23?
97)	40-Zr- 91	SAI,BNL		M.DRAKE,D.SARGIS,T.MAUNG,P.ROSE	4028	SG23?
98)	40-Zr- 92	SAI,BNL		M.DRAKE,D.SARGIS,T.MAUNG,P.ROSE	4031	SG23?
99)	40-Zr- 93	HEDL		SCHENTER & SCHMITTROTH	4034	SG23?
100)	40-Zr- 94	SAI,BNL		M.DRAKE,D.SARGIS,T.MAUNG,P.ROSE	4037	SG23?
101)	40-Zr- 95	HEDL		SCHENTER & SCHMITTROTH	4040	SG23?
102)	40-Zr- 96	SAI,BNL		M.DRAKE,D.SARGIS,T.MAUNG,P.ROSE	4043	SG23?
103)	41-Nb- 93	LANL,ANL	ENDF/B-VII	M.CHADWICK,P.YOUNG,D.L.SMITH	4125	Update expected
104)	41-Nb- 94	HEDL		SCHENTER & SCHMITTROTH	4128	SG23?
105)	41-Nb- 95	HEDL		SCHENTER & SCHMITTROTH	4131	SG23?
106)	42-Mo- 0	LLNL,HEDL		HOWERTON,SCHMITTROTH,SCHENTER	4200	SG23?
107)	42-Mo- 92	HEDL,RCN		SCHENTER,SCHMITTROTH, ET AL	4225	SG23?
108)	42-Mo- 94	HEDL,RCN		R.E.SCHENTER AND F.SCHMITTROTH	4231	SG23?
109)	42-Mo- 95	BNL+KAERI	ENDF/B-VII	Lee,Oh,Mughabghab,Oblozinsky	4234	Update expected
110)	42-Mo- 96	HEDL,RCN		R.E.SCHENTER,F.SCHMITTROTH+	4237	SG23?
111)	42-Mo- 97	HEDL,RCN		R.E.SCHENTER, F.SCHMITTROTH +	4240	SG23?
112)	42-Mo- 98	HEDL,RCN		SCHENTER,SCHMITTROTH, ET AL	4243	SG23?
113)	42-Mo- 99	HEDL		SCHENTER & SCHMITTROTH	4246	SG23?
114)	42-Mo-100	HEDL,RCN		SCHENTER,SCHMITTROTH, ET AL	4249	SG23?
115)	43-Tc- 99	BNL,KAERI	ENDF/B-VII	P.Oblozinsky,I.Sirakov,Y.Lee+	4325	Update expected
116)	44-Ru- 96	HEDL		F.M.MANN	4425	SG23?
117)	44-Ru- 98	HEDL		F.M.MANN	4431	SG23?
118)	44-Ru- 99	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	4434	SG23?
119)	44-Ru-100	HEDL,RCN		R.E.SCHENTER AND F.SCHMITTROTH	4437	SG23?
120)	44-Ru-101	BNL+KAERI	ENDF/B-VII	Lee,Oh,Mughabghab,Oblozinsky	4440	Update expected
121)	44-Ru-102	ORNL,HEDL		R.Q.WRIGHT, R. E. SCHENTER+	4443	SG23?
122)	44-Ru-103	HEDL		SCHENTER & SCHMITTROTH	4446	SG23?
123)	44-Ru-104	HEDL,RCN		R.E.SCHENTER AND F.SCHMITTROTH	4449	SG23?
124)	44-Ru-105	HEDL		SCHENTER & SCHMITTROTH	4452	SG23?
125)	44-Ru-106	HEDL		SCHENTER & SCHMITTROTH	4455	SG23?
126)	45-Rh-103	BNL+KAERI	ENDF/B-VII	Lee,Chang,Mughabghab,Oblozinsky	4525	Update expected
127)	45-Rh-105	HEDL		SCHENTER & SCHMITTROTH	4531	SG23?
128)	46-Pd-102	LANL		P. G. YOUNG	4625	SG23?
129)	46-Pd-104	LANL		P. G. YOUNG	4631	SG23?
130)	46-Pd-105	BNL+KAERI	ENDF/B-VII	Lee,Chang,Mughabghab,Oblozinsky	4634	Update expected
131)	46-Pd-106	LANL		P. G. YOUNG	4637	SG23?
132)	46-Pd-107	ORNL,HEDL+		R.Q.WRIGHT, R.E.SCHENTER+	4640	SG23?

132)	46-Pd-107	ORNL,HEDL+		R.Q.WRIGHT, R.E.SCHENTER+	4640	SG23?
133)	46-Pd-108	LANL		P. G. YOUNG	4643	SG23?
134)	46-Pd-110	LANL		P. G. YOUNG	4649	SG23?
135)	47-Ag-107	BNL,HEDL		A.PRINCE,R.E.SCHENTER	4725	SG23?
136)	47-Ag-109	BNL+KAERI	ENDF/B-VII	Lee,Chang,Mughabghab,Oblozinsky	4731	Update expected
137)	47-Ag-111	HEDL		SCHENTER & SCHMITTROTH	4737	SG23?
138)	48-Cd-106	UA,ANL,+		J.MCCABE, A.B. SMITH, +	4825	SG23?
139)	48-Cd-108	UA,ANL,+		J.MCCABE, A.B. SMITH, +	4831	SG23?
140)	48-Cd-110	UA,ANL		J.MCCABE, A.B. SMITH	4837	SG23?
141)	48-Cd-111	UA,ANL		J.MCCABE, A.B. SMITH	4840	SG23?
142)	48-Cd-112	UA,ANL, +		J.MCCABE, A.B. SMITH, +	4843	SG23?
143)	48-Cd-113	UA,ANL		J.MCCABE, A.B. SMITH	4846	SG23?
144)	48-Cd-114	UA,ANL, +		J.MCCABE, A.B. SMITH, +	4849	SG23?
145)	48-Cd-115M	HEDL		SCHENTER & SCHMITTROTH	4853	SG23?
146)	48-Cd-116	UA,ANL, +		J.MCCABE, A.B. SMITH, +	4855	SG23?
147)	49-In- 0	ANL		A.SMITH,D.SMITH,P.GUENTHER	4900	SG23?
148)	49-In-113	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	4925	SG23?
149)	49-In-115	HEDL,ANL		F.SCHMITTROTH,D.L.SMITH,S.CHIBA	4931	SG23?
150)	50-Sn-112	HEDL		F.M.MANN	5025	SG23?
151)	50-Sn-114	HEDL		F.M.MANN	5031	SG23?
152)	50-Sn-115	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5034	SG23?
153)	50-Sn-116	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5037	SG23?
154)	50-Sn-117	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5040	SG23?
155)	50-Sn-118	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5043	SG23?
156)	50-Sn-119	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5046	SG23?
157)	50-Sn-120	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5049	SG23?
158)	50-Sn-122	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5055	SG23?
159)	50-Sn-123	HEDL		SCHENTER & SCHMITTROTH	5058	SG23?
160)	50-Sn-124	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5061	SG23?
161)	50-Sn-125	HEDL		SCHENTER & SCHMITTROTH	5064	SG23?
162)	50-Sn-126	HEDL		SCHENTER & SCHMITTROTH	5067	SG23?
163)	51-Sb-121	ANL		A. SMITH + A. FESSLER	5125	SG23?
164)	51-Sb-123	ANL		A.SMITH,A.FESSLER	5131	SG23?
165)	51-Sb-124	HEDL		SCHENTER & SCHMITTROTH	5134	SG23?
166)	51-Sb-125	HEDL		SCHENTER & SCHMITTROTH	5137	SG23?
167)	51-Sb-126	HEDL		SCHENTER & SCHMITTROTH	5140	SG23?
168)	52-Te-120	HEDL		F.M.MANN	5225	SG23?
169)	52-Te-122	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5231	SG23?
170)	52-Te-123	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5234	SG23?
171)	52-Te-124	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5237	SG23?
172)	52-Te-125	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5240	SG23?
173)	52-Te-126	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5243	SG23?
174)	52-Te-127M	HEDL		SCHENTER & SCHMITTROTH	5247	SG23?
175)	52-Te-128	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5249	SG23?
176)	52-Te-129M	HEDL		SCHENTER & SCHMITTROTH	5253	SG23?
177)	52-Te-130	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5255	SG23?
178)	52-Te-132	HEDL		SCHENTER & SCHMITTROTH	5261	SG23?
179)	53-I -127	LANL		P.G.YOUNG, R.E.MACFARLANE	5325	SG23?
180)	53-I -129	HEDL,RCN		SCHENTER & SCHMITTROTH	5331	SG23?
181)	53-I -130	HEDL		SCHENTER & SCHMITTROTH	5334	SG23?
182)	53-I -131	HEDL		SCHENTER & SCHMITTROTH	5337	SG23?
183)	53-I -135	HEDL		SCHENTER & SCHMITTROTH	5349	SG23?
184)	54-Xe-124	BNL		M.R.BHAT AND S.F.MUGHABGHAB	5425	SG23?
185)	54-Xe-126	BNL		M.R.BHAT AND S.F.MUGHABGHAB	5431	SG23?
186)	54-Xe-128	BNL		M.R.BHAT AND S.F.MUGHABGHAB	5437	SG23?
187)	54-Xe-129	BNL		M.R.BHAT AND S.F.MUGHABGHAB	5440	SG23?
188)	54-Xe-130	BNL		M.R.BHAT AND S.F.MUGHABGHAB	5443	SG23?
189)	54-Xe-131	BNL,KAERI	ENDF/B-VII	Lee,Oh,Mughabghab,Oblozinsky	5446	Update expected
190)	54-Xe-132	BNL		M.R.BHAT AND S.F.MUGHABGHAB	5449	SG23?
191)	54-Xe-133	HEDL		SCHENTER & SCHMITTROTH	5452	SG23?
192)	54-Xe-134	BNL		M.R.BHAT AND S.F.MUGHABGHAB	5455	SG23?
193)	54-Xe-135	BNW,HEDL		B.LEONARD,K.STEWART,R.SCHENTER+	5458	SG23?
194)	54-Xe-136	BNL		M.R.BHAT AND S.F.MUGHABGHAB	5461	SG23?
195)	55-Cs-133	BNL+KAERI	ENDF/B-VII	Lee,Chang,Mughabghab,Oblozinsky	5525	Update expected
196)	55-Cs-134	ORNL,HEDL		WRIGHT, SCHENTER+	5528	SG23?
197)	55-Cs-135	ORNL,HEDL		WRIGHT, SCHENTER+	5531	SG23?
198)	55-Cs-136	HEDL		SCHENTER & SCHMITTROTH	5534	SG23?

198)	55-Cs-136	HEDL		SCHENTER & SCHMITTROTH	5534	SG23?
199)	55-Cs-137	HEDL		SCHENTER & SCHMITTROTH	5537	SG23?
200)	56-Ba-134	ORNL,JNDC		WRIGHT,JNDC FPND WORKING GROUP	5637	SG23?
201)	56-Ba-135	ORNL, HEDL		WRIGHT, SCHENTER+	5640	SG23?
202)	56-Ba-136	ORNL, HEDL		WRIGHT, SCHENTER+	5643	SG23?
203)	56-Ba-137	ORNL, HEDL		WRIGHT, SCHENTER+	5646	SG23?
204)	56-Ba-138	ORNL,LLNL		WRIGHT, HOWERTON	5649	SG23?
205)	56-Ba-140	HEDL		SCHENTER & SCHMITTROTH	5655	SG23?
206)	57-La-139	HEDL,RCN		R.E.SCHENTER AND F.SCHMITTROTH	5728	SG23?
207)	57-La-140	HEDL		SCHENTER & SCHMITTROTH	5731	SG23?
208)	58-Ce-140	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5837	SG23?
209)	58-Ce-141	HEDL		SCHENTER & SCHMITTROTH	5840	SG23?
210)	58-Ce-142	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	5843	SG23?
211)	58-Ce-143	HEDL		SCHENTER & SCHMITTROTH	5846	SG23?
212)	58-Ce-144	HEDL		SCHENTER & SCHMITTROTH	5849	SG23?
213)	59-Pr-141	BNL+KAERI	ENDF/B-VII	Lee,Chang,Oblozinsky,Mughabghab	5925	Update expected
214)	59-Pr-142	HEDL		SCHENTER & SCHMITTROTH	5928	SG23?
215)	59-Pr-143	HEDL		SCHENTER & SCHMITTROTH	5931	SG23?
216)	60-Nd-142	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	6025	SG23?
217)	60-Nd-143	BNL+KAERI	ENDF/B-VII	Lee,Chang,Mughabghab,Oblozinsky	6028	Update expected
218)	60-Nd-144	HEDL		SCHENTER & SCHMITTROTH	6031	SG23?
219)	60-Nd-145	BNL+KAERI	ENDF/B-VII	Lee,Chang,Mughabghab,Oblozinsky	6034	Update expected
220)	60-Nd-146	HEDL,BNL+		SCHENTER,SCHMITTROTH,PRINCE+	6037	SG23?
221)	60-Nd-147	ORNL, HEDL		WRIGHT, SCHENTER+	6040	SG23?
222)	60-Nd-148	HEDL,BNL+		SCHENTER,SCHMITTROTH,PRINCE+	6043	SG23?
223)	60-Nd-150	HEDL,BNL+		SCHENTER,SCHMITTROTH,PRINCE+	6049	SG23?
224)	61-Pm-147	ORNL,HEDL,+		R.Q.WRIGHT,R.E.SCHENTER +	6149	SG23?
225)	61-Pm-148	HEDL		SCHENTER & SCHMITTROTH	6152	SG23?
226)	61-Pm-148M	HEDL		SCHENTER & SCHMITTROTH	6153	SG23?
227)	61-Pm-149	HEDL		SCHENTER & SCHMITTROTH	6155	SG23?
228)	61-Pm-151	HEDL		SCHENTER & SCHMITTROTH	6161	SG23?
229)	62-Sm-144	ORNL,HEDL		R.Q. WRIGHT, F.M.MANN	6225	SG23?
230)	62-Sm-147	BNL+KAERI	ENDF/B-VII	Lee,Oh,Mughabghab,Oblozinsky	6234	Update expected
231)	62-Sm-148	HEDL		SCHENTER & SCHMITTROTH	6237	SG23?
232)	62-Sm-149	KAERI+BNL	ENDF/B-VII	Lee,Chang,Mughabghab,Oblozinsky	6240	Update expected
233)	62-Sm-150	BNL+KAERI	ENDF/B-VII	Lee,Oh,Mughabghab,Oblozinsky	6243	Update expected
234)	62-Sm-151	KAERI+BNL	ENDF/B-VII	Lee,Oh,Oblozinsky,Mughabghab	6246	Update expected
235)	62-Sm-152	BNL+KAERI	ENDF/B-VII	Lee,Oh,Mughabghab,Oblozinsky	6249	Update expected
236)	62-Sm-153	HEDL		SCHENTER & SCHMITTROTH	6252	SG23?
237)	62-Sm-154	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	6255	SG23?
238)	63-Eu-151	LANL		P.G.YOUNG AND E.D.ARTHUR	6325	SG23?
239)	63-Eu-152	ORNL, BNL		R. Q. WRIGHT, H.TAKAHASHI	6328	SG23?
240)	63-Eu-153	BNL+KAERI	ENDF/B-VII	P.Oblozinsky,Y.Lee,J.Chang,S.Oh+	6331	Update expected
241)	63-Eu-154	ORNL,BNL		R.Q.WRIGHT, H.TAKAHASHI	6334	SG23?
242)	63-Eu-155	ORNL, HEDL		WRIGHT,PRINCE,SCHENTER	6337	SG23?
243)	63-Eu-156	HEDL		SCHENTER & SCHMITTROTH	6340	SG23?
244)	63-Eu-157	HEDL		R.E.SCHENTER AND F.SCHMITTROTH	6343	SG23?
245)	64-Gd-152	ORNL,JNDC		R.Q.WRIGHT,JNDC FP NUC.DATA W.G.	6425	SG23?
246)	64-Gd-154	ORNL,JNDC		R.Q.WRIGHT,JNDC FP NUC.DATA W.G.	6431	SG23?
247)	64-Gd-155	BNL+KAERI	ENDF/B-VII	Lee,Chang,Mughabghab,Oblozinsky	6434	Update expected
248)	64-Gd-156	BNL		B.A.MAGURNO	6437	SG23?
249)	64-Gd-157	BNL+KAERI	ENDF/B-VII	P.Oblozinsky,Y.Lee,J.Chang,S.Oh+	6440	Update expected
250)	64-Gd-158	BNL		B.A.MAGURNO	6443	SG23?
251)	64-Gd-160	BNL		B.A.MAGURNO	6449	SG23?
252)	65-Tb-159	HEDL,RCN		R.E.SCHENTER AND F.SCHMITTROTH	6525	SG23?
253)	65-Tb-160	HEDL		SCHENTER & SCHMITTROTH	6528	SG23?
254)	66-Dy-160	BNL+KAERI	ENDF/B-VII	Lee,Oh,Mughabghab	6637	Update expected
255)	66-Dy-161	BNL+KAERI	ENDF/B-VII	Lee,Oh,Mughabghab	6640	Update expected
256)	66-Dy-162	BNL+KAERI	ENDF/B-VII	Lee,Oh,Mughabghab	6643	Update expected
257)	66-Dy-163	BNL+KAERI	ENDF/B-VII	Lee,Oh,Mughabghab	6646	Update expected
258)	66-Dy-164	BNL+KAERI	ENDF/B-VII	Lee,Oh,Mughabghab	6649	Update expected
259)	67-Ho-165	LANL		P.G.YOUNG AND E.D.ARTHUR	6725	SG23?
260)	68-Er-166	ORNL, HEDL		R. Q. WRIGHT, R. E. SCHENTER+	6837	SG23?
261)	68-Er-167	ORNL, HEDL		R.Q. WRIGHT, R.E.SCHENTER+	6840	SG23?
262)	71-Lu-175	ORNL,BNW		R.Q. WRIGHT, LEONARD-STEWART	7125	
263)	71-Lu-176	ORNL,BNW		R.Q. WRIGHT, LEONARD-STEWART	7128	
264)	72-Hf- 0	SAI		M.DRAKE,D.SARGES,T.MAUNG	7200	

264)	72-Hf- 0	SAI		M.DRAKE,D.SARGES,T.MAUNG	7200
265)	72-Hf-174	ORNL,SAI,+		R.Q.WRIGHT, M.K.DRAKE+	7225
266)	72-Hf-176	ORNL,SAI,+		R.Q.WRIGHT, M.K.DRAKE+	7231
267)	72-Hf-177	ORNL,SAI,+		R.Q.WRIGHT, M.K.DRAKE+	7234
268)	72-Hf-178	ORNL,SAI,+		R.Q.WRIGHT, M.K.DRAKE+	7237
269)	72-Hf-179	ORNL,SAI,+		R.Q.WRIGHT, M.K.DRAKE+	7240
270)	72-Hf-180	ORNL,SAI,+		R.Q.WRIGHT, M.K.DRAKE+	7243
271)	73-Ta-181	LLNL		HOWERTON, PERKINS, MACGREGOR	7328
272)	73-Ta-182	AI		J.OTTER,C.DUNFORD,AND E.OTTEWITTE	7331
273)	74-W - 0	LANL		E.D.ARTHUR	7400
274)	74-W -182	LANL,ANL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,E.ARTHUR	7431
275)	74-W -183	LANL,ANL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,ARTHUR	7434
276)	74-W -184	LANL,ANL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,ARTHUR	7437
277)	74-W -186	LANL,ANL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,ARTHUR	7443
278)	75-Re-185	ORNL,LANL		L.W.WESTON AND P.G.YOUNG	7525
279)	75-Re-187	ORNL,LANL		L.W.WESTON AND P.G.YOUNG	7531
280)	77-Ir-191	ORNL		R.Q.WRIGHT, R.R.SPENCER	7725
281)	77-Ir-193	ORNL		R.Q.WRIGHT, R.R.SPENCER	7731
282)	79-Au-197	LANL		P.G.YOUNG	7925
283)	80-Hg-196	LANL	ENDF/B-VII	S.CHIBA, M.CHADWICK,P.YOUNG	8025
284)	80-Hg-198	LANL	ENDF/B-VII	M.CHADWICK, S.CHIBA,P.YOUNG	8031
285)	80-Hg-199	LANL	ENDF/B-VII	S.CHIBA, M.CHADWICK,P.YOUNG	8034
286)	80-Hg-200	LANL	ENDF/B-VII	M.CHADWICK, S.CHIBA,P.YOUNG	8037
287)	80-Hg-201	LANL	ENDF/B-VII	S.CHIBA, M.CHADWICK,P.YOUNG	8040
288)	80-Hg-202	LANL	ENDF/B-VII	M.CHADWICK, S.CHIBA,P.YOUNG	8043
289)	80-Hg-204	LANL	ENDF/B-VII	S.CHIBA, M.CHADWICK,P.YOUNG	8049
290)	82-Pb-206	LANL,ORNL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,C.Y.FU	8231
291)	82-Pb-207	LANL,ORNL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,C.Y.FU	8234
292)	82-Pb-208	LANL,ORNL	ENDF/B-VII	M.B.CHADWICK,P.G.YOUNG,C.Y.FU	8237
293)	83-Bi-209	LANL,ANL		M.CHADWICK,P.YOUNG,A.SMITH	8325
294)	90-Th-230	HEDL		MANN	9034
295)	90-Th-232	BNL,ANL+		BHAT,SMITH,LEONARD,DESAUSSURE+	9040
296)	91-Pa-231	HEDL		MANN	9131
297)	91-Pa-232	ORNL,TIT		R. Q. WRIGHT, N. TAKAGI	9134
298)	91-Pa-233	GA,BNL,LANL		MATHEWS,KINSEY,YOUNG	9137
299)	92-U -232	ORNL,LANL+	ENDF/B-VII	M.B.CHADWICK, P.G.YOUNG	9219
300)	92-U -233	LANL,ORNL	ENDF/B-VII	YOUNG,CHADWICK,TALOU,LEAL,DERRIEN	9222
301)	92-U -234	ORNL,LANL+	ENDF/B-VII	P.G.YOUNG,M.B.CHADWICK	9225
302)	92-U -235	ORNL,LANL,+	ENDF/B-VII	YOUNG, CHADWICK, TALOU, LEAL	9228
303)	92-U -236	LANL	ENDF/B-VII	YOUNG,CHADWICK,MACFARLANE,ET AL.	9231
304)	92-U -237	LANL	ENDF/B-VII	P.G.Young, M.B.Chadwick	9234
305)	92-U -238	ORNL,LANL+	ENDF/B-VII	YOUNG,CHADWICK,DERRIEN,COURCELLE	9237
306)	92-U -239	LANL	ENDF/B-VII	P.G.Young, M.B.Chadwick	9240
307)	92-U -240	LANL	ENDF/B-VII	YOUNG,CHADWICK,MACFARLANE,ET AL.	9243
308)	92-U -241	LANL	ENDF/B-VII	P.G.Young, M.B.Chadwick	9246
309)	93-Np-236	ORNL-JAERI		R. Q. WRIGHT, T. NAKAGAWA	9343
310)	93-Np-237	LANL	ENDF/B-VII	P.YOUNG, E.ARTHUR, F.MANN	9346
311)	93-Np-238	SRL		BENJAMIN AND MCCROSSON	9349
312)	93-Np-239	ORNL		R. Q. WRIGHT	9352
313)	94-Pu-236	ORNL,MAPI+		R. Q. WRIGHT,T.HOJUYAMA,+	9428
314)	94-Pu-237	HEDL		MANN AND SCHENTER	9431
315)	94-Pu-238	HEDL,AI,+		MANN,SCHENTER,ALTER,DUNFORD,+	9434
316)	94-Pu-239	LANL	ENDF/B-VII	TALOU, CHADWICK, MADLAND, YOUNG	9437
317)	94-Pu-240	ORNL		L.W. WESTON AND E. D. ARTHUR	9440
318)	94-Pu-241	ORNL	ENDF/B-VII	L.WESTON,R.WRIGHT,H.DERRIEN +	9443
319)	94-Pu-242	HEDL,SRL,+		MANN,BENJAMIN,MADLAND,HOWERTON,+	9446
320)	94-Pu-243	BNL,SRL,+		KINSEY-ASSEMBLER(SEE COMMENTS)	9449
321)	94-Pu-244	HEDL,SRL		MANN,SCHENTER,BENJAMIN,MCCROSSON	9452
322)	95-Am-241	LANL,	ENDF/B-VII	Kawano, Chadwick	9543
323)	95-AM-242G	LANL	ENDF/B-VII	TALOU, YOUNG, KAWANO, CHADWIC	9546
324)	95-AM-242M	LANL	ENDF/B-VII	TALOU, YOUNG, CHADWICK, KAWANO	9547
325)	95-Am-243	LANL,ORNL		P. G. YOUNG,L. W. WESTON	9549
326)	96-Cm-241	HEDL		MANN AND SCHENTER	9628
327)	96-Cm-242	HEDL,SRL,+		MANN,BENJAMIN,HOWERTON,ET AL.	9631
328)	96-Cm-243	MINSK		V.MASLOV,ET AL.	9634
329)	96-Cm-244	HEDL,SRL,+		MANN,BENJAMIN,HOWERTON,ET AL.	9637
330)	96-Cm-245	MINSK		V.MASLOV ET AL	9640

330)	96-Cm-245	MINSK	V.MASLOV ET AL	9640
331)	96-Cm-246	MINSK	V.MASLOV ET AL.	9643
332)	96-Cm-247	BNL,SRL,+	KINSEY-ASSEMBLER(SEE COMMENTS)	9646
333)	96-Cm-248	HEDL,SRL,+	MANN,BENJAMIN,HOWERTON,ET AL.	9649
334)	97-Bk-249	CNDC	ZHOU DELIN ET. AL.	9752
335)	98-Cf-249	CNDC	ZHOU DELIN, SU ZHONGDI ET AL.	9852
336)	98-Cf-250	BNL,SRL,+	KINSEY-ASSEMBLER(SEE COMMENTS)	9855
337)	98-Cf-251	BNL,SRL,+	KINSEY-ASSEMBLER(SEE COMMENTS)	9858
338)	98-Cf-252	BNL,SRL,+	KINSEY-ASSEMBLER(SEE COMMENTS)	9861
339)	98-Cf-253	SRL	BENJAMIN AND MCCROSSON	9864
340)	99-Es-253	BNL,SRL	KINSEY,BENJAMIN, AND MCCROSSON	9913