Compilations: XUNDL and

Atomic Masses

(October 1, 2007 – Sept 30, 2008)

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(McMaster)
XUNDL database managed by J.K. Tuli (BNL)

US-NDP November 5-7, 2008

Current Contents of XUNDL

- Since the start in December 1998,
  2830 compiled datasets added up to September 30, 2008.

- Covers mainly high-spin structures up to 2003,
  almost all experimental structure papers between 2004 - 2008.

- 1570 nuclides: ^{7}Li to $^{294}118$, spread over 270 A-chains;
  some datasets for hypernuclides also.

- Data from 2050 primary journal articles published during 1995 – 2008

- About 250 communications with the original authors to resolve data inconsistencies and to obtain additional data details.

Work during October 1, 2007 to September 30, 2008

- 450 datasets compiled from about 220 publications

  430 at McMaster (S. Geraedts, B. Singh); 20 at ANL (F. Kondev).
  (12 at U.of Jordan (K. Abusaleem) for training in ENSDF formats)

- 60 existing datasets underwent major revisions based on new papers from previous authors/groups

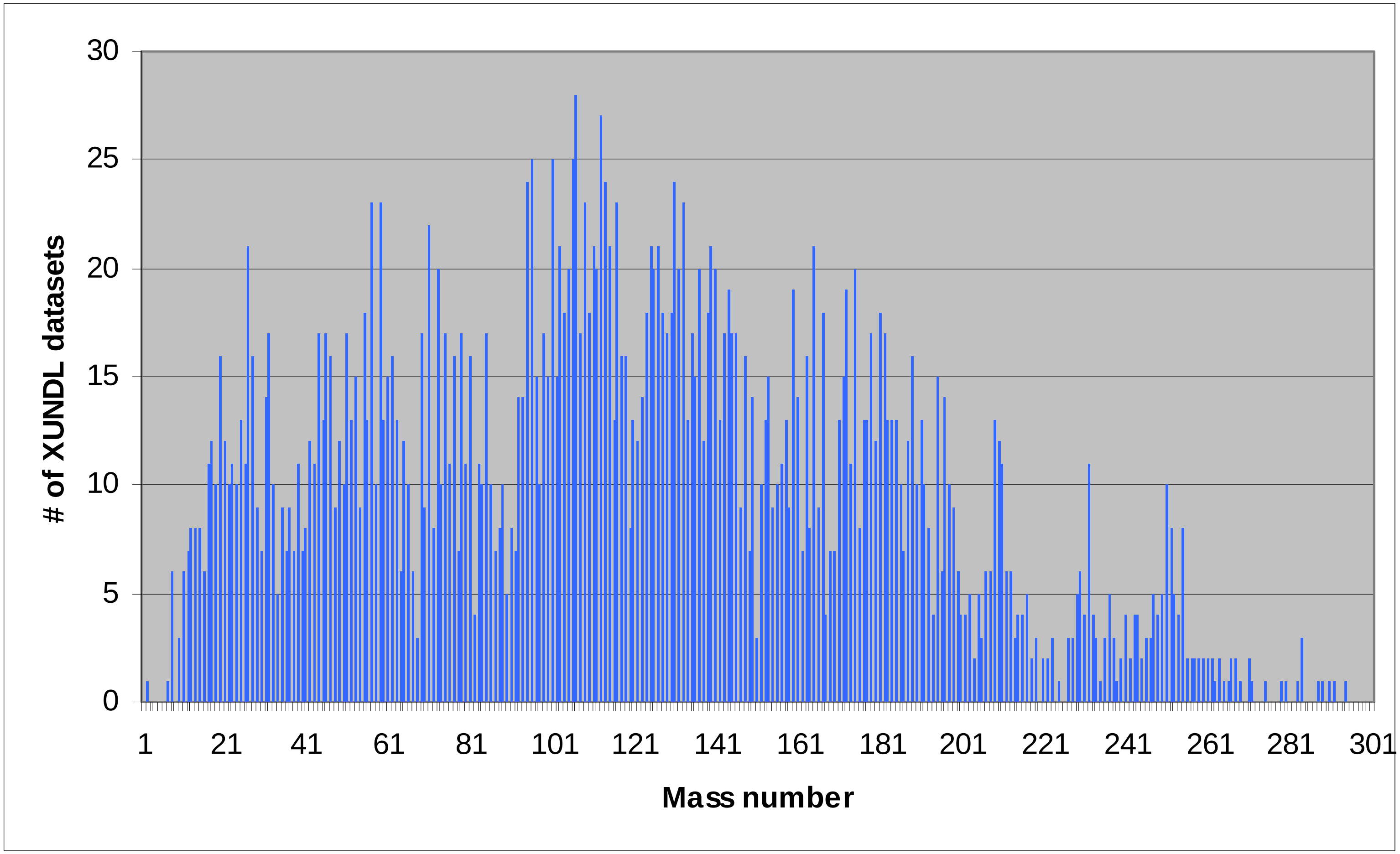
- Since Nov 2007, we revisit compiled datasets to identify permanent NSR keynumbers.

- As of November 2, 2008 we are current on the compilation of current papers. Five papers published in the last couple of weeks are being compiled and checked.

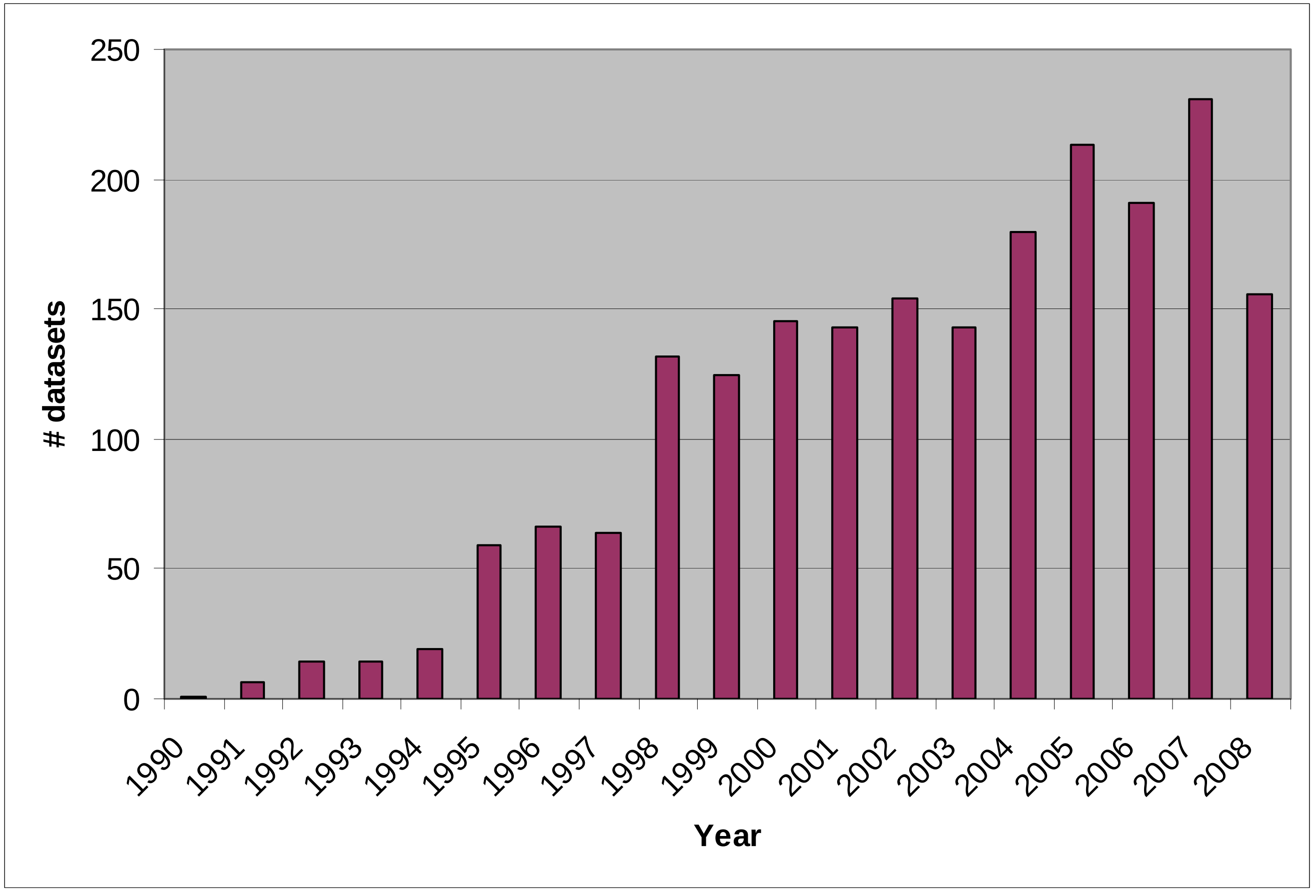
- Active communications with the authors continued throughout the year. In a few cases such communications prompted authors to publish errata.

- Reverse communication: request to include data for half-lives of new isotopes from 2006 GSI lab report. ??

XUNDL content as of Oct. 1, 2008



XUNDL content as of Oct 1, 2008



Novel use of XUNDL database

- By pre-arrangement with the author, all relevant data for a recent PRL publication were included in XUNDL database. 14 datasets were prepared and included in XUNDL for particle-transfer studies covered in PRL paper, with a cross reference to XUNDL database in the paper itself.

- Potential of XUNDL database as a depositary of relevant unpublished data for a publication.

PRL **100,** 112501 (2008) PHYSICAL REVIEW LETTERS week ending 21 MARCH 2008

Nuclear Structure Relevant to Neutrinoless Double β Decay: ^{76}Ge and ^{76}Se

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(Received 2 October 2007; published 17 March 2008)

The possibility of observing neutrinoless double β decay offers the opportunity of determining the *effective* neutrino mass *if* the nuclear matrix element were known. Theoretical calculations are uncertain, and measurements of the occupations of valence orbits by nucleons active in the decay can be important. The occupation of valence neutron orbits in the ground states of ^{76}Ge (a candidate for such decay) and ^{76}Se (the daughter nucleus) were determined by precisely measuring cross sections for both neutron-adding and removing transfer reactions. Our results indicate that the Fermi surface is much more diffuse than in theoretical calculations. We find that the populations of at least three orbits change significantly between these two ground states while in the calculations, the changes are confined primarily to one orbit.

DOI: 10.1103/PhysRevLett.100.112501 PACS numbers: 23.40.Hc, 23.40.−s, 25.40.Hs, 27.50.+e

is the missing $5/2^-$ state. Its strength was included in the sums.

Our data are available online in the XUNDL database [11]. The vacancies and occupancies from the summed normalized spectroscopic factors are shown in Table I. Listed in the Table are the numbers of holes and particles from neutron adding and removing, their sum, and the best average value of the occupancy, all computed with the same normalization for all targets, one normalization for

Compilation of Atomic mass measurements since AME-2003

- RIB facilities and Penning-trap systems developed at various labs have produced a significant amount of new and very precise mass values in the nuclei far off the stability line where AME-2003 mostly had systematic values only.

- About 45 main publications were identified between 2003-2008, where data were not covered in AME-2003. Others ~30 papers were conference / review papers which contained data that were already covered in the primary publications.

- A sample file based on publications during Jan-July 2008 has been posted on www.nuclearmasses.org at ORNL. We are keeping track of papers after July 2008 and will try to submit a compiled file every six months or so.

- All mass papers since AME-2003 have been compiled, but for 2007-2004 years, we are double checking the entries. By April 2009, all such data will probably become available on above webpage. Perhaps a link could also be added in NNDC webpage.

- Such compiled data have already been requested by a user at RIKEN

Compilation of atomic masses

nuclearmasses.org

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- contributions
- meetings
- contact

M c M a s t e r   M a s s   C o m p i l a t i o n   0 2

Compiler: Balraj Singh, Scott Geraedts, McMaster Univ., Canada

Date: August 7, 2008

Compilation Dates: January - July, 2008

References:

NSR Key#	Citation	Author	Title	Method	Facility
2008WE02	NP-A 803,1	C. Weber et al.	"Atomic mass measurements of short-lived nuclides around the doubly-magic 208Pb"	Penning trap	ISOLDE/CERN
2008RY03	PRL 101, 012501	V.L.Ryjkov et al.	"Direct Mass Measurement of the Four-Neutron Halo Nuclide 8He"	Penning trap	TITAN/TRIUMF
2008RA03	PRL 100, 012501	C. Rauth et al.	"First Penning Trap Mass Measurments beyond the proton dripline"	Penning trap	SHIPTRAP
2008MU05	EPJ-A 35, 31	M. Mukherjee et al.	"Mass measurements and evaluation around A=22"	Penning trap	ISOLDE/CERN
2008HA23	PRL 101, 052502	J. Hakala et al.	"Evolution of the N=50 Shell Gap Energy towards 78Ni"	Penning trap	IGISOL/JYFLTRAP
2008ER04	PRL 100, 132502	T. Eronen et al.	"Qec values of the Superallowed beta Emitters 50Mn and 54Co"	Mass differences Penning trap	IGISOL/JYFLTRAP
2008DW01	PRL 100, 072501	M. Dworschak et al.	"Restoration of the N=82 Shell Gap from Direct Mass Measurements of 132,134Sn"	Penning trap	ISOLDE/CERN
2008BL05	PRL 100, 132501	M. Block et al.	"Discovery of a Nuclear Isomer in 65Fe with Penning Trap Mass Spectroscopy"	Penning trap	NSCL
2008BH08	PR-C 77, 065503	M. Bhattacharya et al.	"ft value of the 0+-0+ B+ decay of 32Ar: A measurement of isospin symmetry breaking in superallowed decay	Q value	NSCL/CERN
2008BA18	PRL 100, 182501	C. Bachelet et al.	"New Binding Energy for the Two-Neutron Halo of 11Li"		ISOLDE/CERN

Comments: compilation of new experimental mass measurements [January - July, 2008] in a new proposed format [comments requested]

Contact: Balraj Singh, McMaster Univ. Nuclear Data Group

NUCLIDE	LEVEL-ENERGY (keV)	HALF-LIFE	SPIN-PARITY	MEASURED MASS EXCESS (KeV)	AME-2003 MASS EXCESS (keV)	(MEASURED - AME 2003) (keV)	REFERENCE

8He	0	119 ms	0+	31610.77(69)	31598(7)	13	2008RY03: PRL 101,012501
11Li	0	8.75 ms	3/2-	40719(5)	40797(19)	-78	2008BA18: PRL 100,182501
21Na	0	22.49 s	3/2+	-2184.71(21)	-2184.2(7)	-0.5	2008MU05: EPJ-A 35,31
22Mg	0	3.857 s	0+	-399.92(27)	-397.0(13)	-2.9	2008MU05: EPJ-A 35,31
22Na	0	2.6019 y	3+	-5181.56(16)	-5182.4(4)	0.8	2008MU05: EPJ-A 35,31
23Na	0	stable	3/2+	-9529.8535(27)	-9529.8536(27)	0.0001	2008MU05: EPJ-A 35,31
24Mg	0	stable	0+	-13933.565(13)	-13933.567(13)	0.002	2008MU05: EPJ-A 35,31
32Cl	0	298 ms	1+	-13337.0(16)	-13330(7)	-7	2008BH08: PR-C 77,065503
37K	0	1.226 s	3/2+	-24800.21(9)	-24800.20(9)	-0.01	2008MU05: EPJ-A 35,31
39K	0	stable	3/2+	-33807.16(16)	-33807.01(19)	-0.15	2008MU05: EPJ-A 35,31
50Mn	0	283.9 ms	0+	-42625.0(10)	-42626.8(10)	1.78	2008ER04: PRL 100,132502
50Mn	225.28(9)	1.75 min	5+	-42400.0(10)	-42398(7)	2.0	2008ER04: PRL 100,132502
54Co	0	193.23 ms	0+	-48007.96(71)	-48009.5(7)	1.54	2008ER04: PRL 100,132502
54Co	197.64(13)	1.48 min	(7)+	-47810.41(71)	-47812.1(9)	1.69	2008ER04: PRL 100,132502
63Fe	0	6.1 s	(5/2)-	-55630.7(96)	-55550(170)	-81	2008BL05: PRL 100,132501
64Co	0	300 ms	1+	-59685.8(42)	-59793(20)	107	2008BL05: PRL 100,132501
64Fe	0	2.0 s	0+	-54969.4(48)	-54770(280)	-199	2008BL05: PRL 100,132501
65Co	0	1.20 s	(7/2)-	-59185.1(21)	-59170(13)	-15	2008BL05: PRL 100,132501
65Fe	0	1.3 s	1/2-	-51221.3(33)	-50880(240)	-341	2008BL05: PRL 100,132501
65Fe	402(5)	>150 ms	(9/2+)	-50819.4(38)	----		2008BL05: PRL 100,132501
66Co	0	194 ms	(3+)	-56407.7(143)	-56110(250)	-298	2008BL05: PRL 100,132501
76Zn	0	5.7 s	0+	-62303.8(23)	-62140(80)	-164	2008HA23: PRL 101,052502
77Zn	0	2.08 s	(7/2+)sys	-58789.5(42)	-58720(120)	-70	2008HA23: PRL 101,052502
78Ga	0	5.09 s	(3+)	-63704.9(30)	-63706.6(24)	1.7	2008HA23: PRL 101,052502
78Zn	0	1.47 s	0+	-57483.0(27)	-57340(90)	-143	2008HA23: PRL 101,052502
79Ga	0	2.847 s	(3/2-)sys	-62547.6(19)	-62510(100)	-38	2008HA23: PRL 101,052502
79Zn	0	995 ms	(9/2+)	-53430.9(27)	-53420(260) sys	-11	2008HA23: PRL 101,052502
80Ga	0	1.697 s	(3)	-59223.7(29)	-59140(120)	-84	2008HA23: PRL 101,052502
80Ge	0	29.5 s	0+	-69535.3(21)	-69515(28)	-20	2008HA23: PRL 101,052502
80Zn	0	545 ms	0+	-51650(7)	-51840(170)	190	2008HA23: PRL 101,052502
81As	0	33.3 s	3/2-	-72533.3(30)	-72533(6)	-0.3	2008HA23: PRL 101,052502
81Ga	0	1.217 s	(5/2-)	-57628.0(33)	-57980(190)	352	2008HA23: PRL 101,052502
81Ge	0	8 s	(9/2+)sys	-66291.7(21)	-66300(120)	8.3	2008HA23: PRL 101,052502
82As	0	19.1 s	(1+)	-70103.1(43)	-70320(200)	217	2008HA23: PRL 101,052502
82As	250(200)	13.6 s	(5-)	-69975.1(38)	-70075(25)	100	2008HA23: PRL 101,052502
82Ga	0	599 ms	(1,2,3)	-52930.8(24)	-53100(300) sys	169	2008HA23: PRL 101,052502
82Ge	0	4.55 s	0+	-65415.1(22)	-65620(240)	205	2008HA23: PRL 101,052502
83As	0	13.4 s	(3/2-)sys	-69669.3(28)	-69880(220)	211	2008HA23: PRL 101,052502
83Ga	0	308 ms	(3/2-)sys	-49257.2(26)	-49390(300) sys	133	2008HA23: PRL 101,052502
83Ge	0	1.85 s	(5/2+)sys	-60976.5(25)	-60900(200) sys	-77	2008HA23: PRL 101,052502
84As	0	4.02 s	(3)(+)sys	-65853.5(32)	-66080(300) sys	226	2008HA23: PRL 101,052502
84Ge	0	954 ms	0+	-58148.4(32)	-58250(300) sys	102	2008HA23: PRL 101,052502
84Se	0	3.1 min	0+	-75947.7(20)	-75952(15)	4.3	2008HA23: PRL 101,052502
85As	0	2.021 s	(3/2-)sys	-63189.1(31)	-63320(200) sys	131	2008HA23: PRL 101,052502
85Ge	0	540 ms	(5/2+)sys	-53123.4(37)	-53070(400) sys	-53	2008HA23: PRL 101,052502
85Se	0	31.7 s	(5/2+)sys	-72413.5(26)	-72428(30)	14.5	2008HA23: PRL 101,052502
86As	0	945 ms		-58962.1(34)	-59150(300) sys	188	2008HA23: PRL 101,052502
86Se	0	15.3 s	0+	-70503.2(25)	-70541(16)	38	2008HA23: PRL 101,052502
87As	0	610 ms	(3/2-)sys	-55617.9(30)	-55980(300) sys	362	2008HA23: PRL 101,052502
87Se	0	5.50 s	(5/2+)sys	-66426.1(22)	-66580(40)	154	2008HA23: PRL 101,052502
88Se	0	1.53 s	0+	-63884.1(33)	-63880(50)	-4.1	2008HA23: PRL 101,052502

89Se	0	410 ms	(5/2+)sys	-58992.4(38)	-59200(300) sys	208	2008HA23: PRL 101,052502
127Sn	0	2.10 h	(11/2-)	-83463(11)	-83499(25)	36	2008DW01: PRL 100,072501
131Sn	0	56.0 s	(3/2+)	-77264(10)	-77314(21)	50	2008DW01: PRL 100,072501
132Sn	0	39.7 s	0+	-76547(7)	-76554(14)	7	2008DW01: PRL 100,072501
133Sn	0	1.45 s	(7/2-)sys	-70847(23)	-70950(40)	103	2008DW01: PRL 100,072501
134Sn	0	1.12 s	0+	-66320(150)	-66800(100)	480	2008DW01: PRL 100,072501
144Ho	0	700 ms	(5-)	-44609.5(90)	-45200(300) sys	590	2008RA03: PRL 100,012501
145Cs	0	582 ms	3/2+	-60052(11)	-60057(11)	5	2008WE02: NP-A 803,1
145Ho	0	2.4 s	(11/2-)	-49120.1(80)	-49180(300) sys	60	2008RA03: PRL 100,012501
146Ho	0	3.6 s	(10+)	-51238.2(70)	-51570(200) sys	330	2008RA03: PRL 100,012501
147Cs	0	225 ms	(3/2+)	-52011(60)	-52020(50)	9	2008WE02: NP-A 803,1
147Ho	0	5.8 s	(11/2-)	-55757.1(50)	-55837(28)	80	2008RA03: PRL 100,012501
147Tm	0	580 ms	11/2-	-35969.8(10)	-36370(300) sys	400	2008RA03: PRL 100,012501
148Tm	0	700 ms	(10+)	-38765(10)	-39270(400) sys	500	2008RA03: PRL 100,012501
181Tl	0	3.2 s	(1/2+)sys	-12802(10)	-12801(9)	-1	2008WE02: NP-A 803,1
183Tl	0	6.9 s	(1/2+)sys	-16592(10)	-16587(10)	5	2008WE02: NP-A 803,1
186Tl	40(190)	27.5 s	(7+)	-19874.4(86)	-19874(9)	-0.4	2008WE02: NP-A 803,1
187Tl	335(3)	15.6 s	(9/2-)	-22154(23)	-22109(8)	-45	2008WE02: NP-A 803,1
190Bi	420(190)	>500 ns	(7+)sys	-10535(25)	-10483(10)	-52	2008WE02: NP-A 803,1
191Bi	0	12.3 s	(9/2-)	-13244.9(80)	-13240(7)	-5	2008WE02: NP-A 803,1
192Bi	210(50)	39.6 s	(10-)	-13398.5(90)	-13399(9)	0.5	2008WE02: NP-A 803,1
193Bi	0	67 s	(9/2-)	-15875(10)	-15873(10)	-2	2008WE02: NP-A 803,1
194Bi	100(70)	125 s	(6+,7+)	-15878(50)	-15880(50)	2	2008WE02: NP-A 803,1
195Bi	0	183 s	(9/2-)	-18023.7(56)	-18024(6)	0.3	2008WE02: NP-A 803,1
196Bi	167(3)	0.6 s	(7+)	-17868(50)	-17842(25)	-26	2008WE02: NP-A 803,1
196Tl	0	1.84 h	2-	-27103(12)*	-27497(12)	394	2008WE02: NP-A 803,1
196Tl	394.2(5)	1.41 h	(7+)	-27103(12)*	-27103(12)	0	2008WE02: NP-A 803,1
197Bi	0	9.3 min	(9/2-)	-19706(25)	-19688(8)	-18	2008WE02: NP-A 803,1
197Pb	319.31(11)	43 min	13/2+	-24429.5(55)	-24429(6)	-0.5	2008WE02: NP-A 803,1
203Fr	0	550 ms	(9/2-)sys	861(16)	861(16)	0	2008WE02: NP-A 803,1
205Fr	0	3.85 s	(9/2-)	-1308.6(90)	-1310(8)	1	2008WE02: NP-A 803,1
205Tl	0	stable	1/2+	-23818(10)	-23820.6(13)	3	2008WE02: NP-A 803,1
208Pb	0	stable	0+	-21742.2(52)	-21748.5(12)	6.3	2008WE02: NP-A 803,1
209Bi	0	1.9E+19 Y	9/2-	-18254.9(43)	-18258.5(14)	3.6	2008WE02: NP-A 803,1
214Ra	0	2.46 s	0+	100(20)	101(9)	-1	2008WE02: NP-A 803,1
215Bi	0	7.6 min	(9/2-)	1648(15)	1649(15)	1	2008WE02: NP-A 803,1
216Bi	0	2.17 min	(1-)sys	5873(11)	5874(11)	1	2008WE02: NP-A 803,1
229Fr	0	50.2 s	(1/2+)sys	35816(37)	35820(40)	-4	2008WE02: NP-A 803,1
229Ra	0	4.0 min	5/2(+)	32575(19)	32563(19)	12	2008WE02: NP-A 803,1
230Ra	0	93 min	0+	34518(12)	34518(12)	0	2008WE02: NP-A 803,1

sys: from systematics in AME-2003

*Unclear whether the measured mass excess is for the ground state or the isomer.