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Nuclear Data Sheets for A = 113*

Jean Blachot

CEA/IN2P3
Service de Physique Nucleaire
CEA, B.P. 12
F–91680 Bruyeres–le–Chatel, France

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Abstract: This evaluation for A=113 updates one by J. Blachot, (1998Bl04), published in *Nuclear Data Sheets 83, 647* (1998)

Cutoff Date: All data available before October 2004 have been considered.

General Policies and Organization of Material: See the introductory pages.

General Comments: Throughout this evaluation, rotational band parameters have been calculated from the standard energy equation:

$$E(J,K)=E_0+A[J(J+1)+\delta_{K,1/2}(-1)^{J+1/2}a(J+1/2)]+BJ^2(J+1)^2$$

The constant A is reported in keV and the constant B, in eV. When "A" alone is given, "B" is assumed to be 0.

Acknowledgments: Many useful comments and suggestions by the editors are greatly appreciated. The author wishes to thank the compilers of the Experimental Unevaluated Nuclear Data List (XUNDL), an experimental file maintained by the NNDC. XUNDL may be accessed via the NNDC web site (www.nndc.bnl.gov). Thanks to G. Audi and O. Bersillon for many enlightening discussions. This work was done at the facilities of the ISN–Grenoble and DRFMC–Grenoble.

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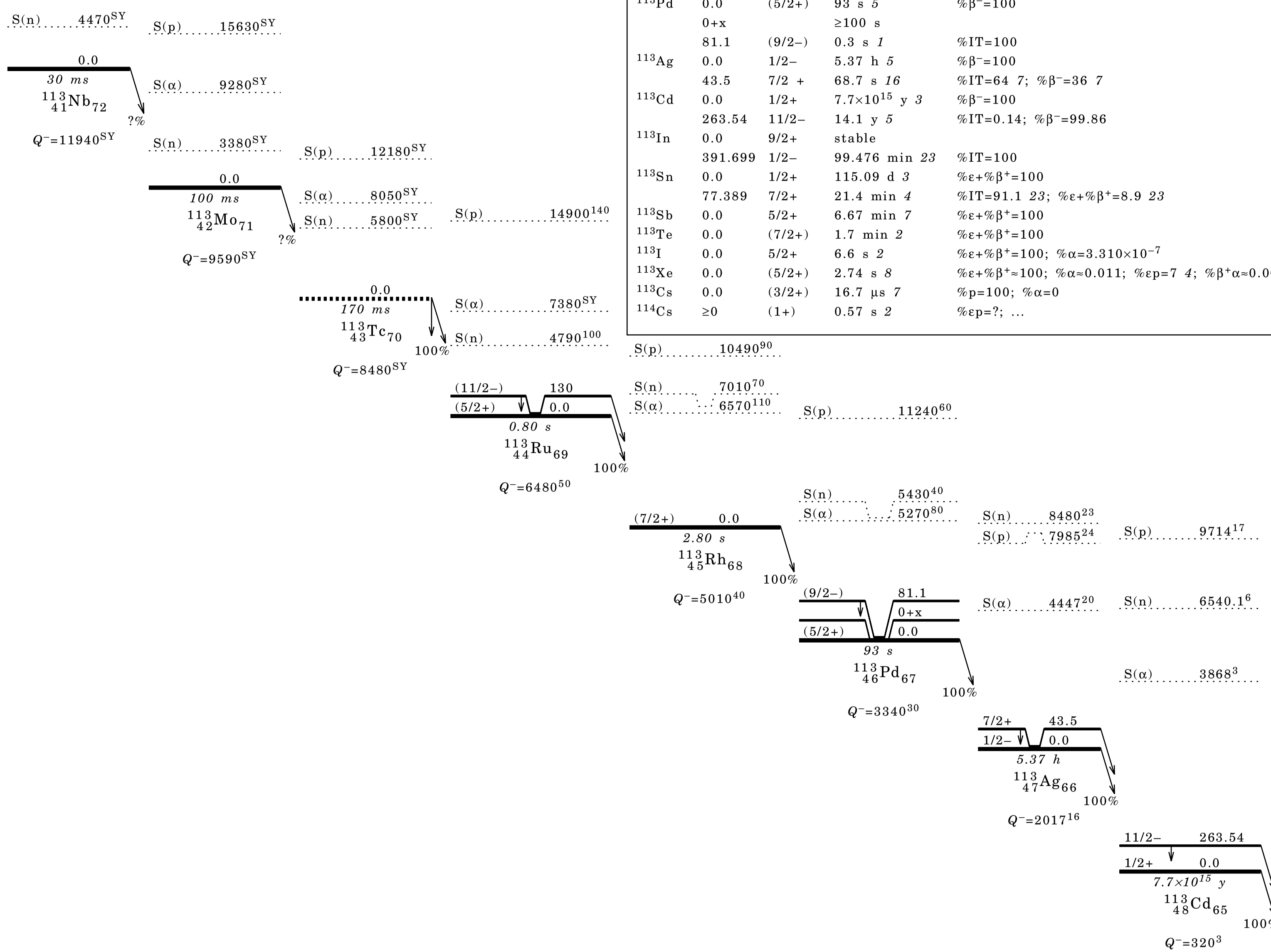
Index for A = 113

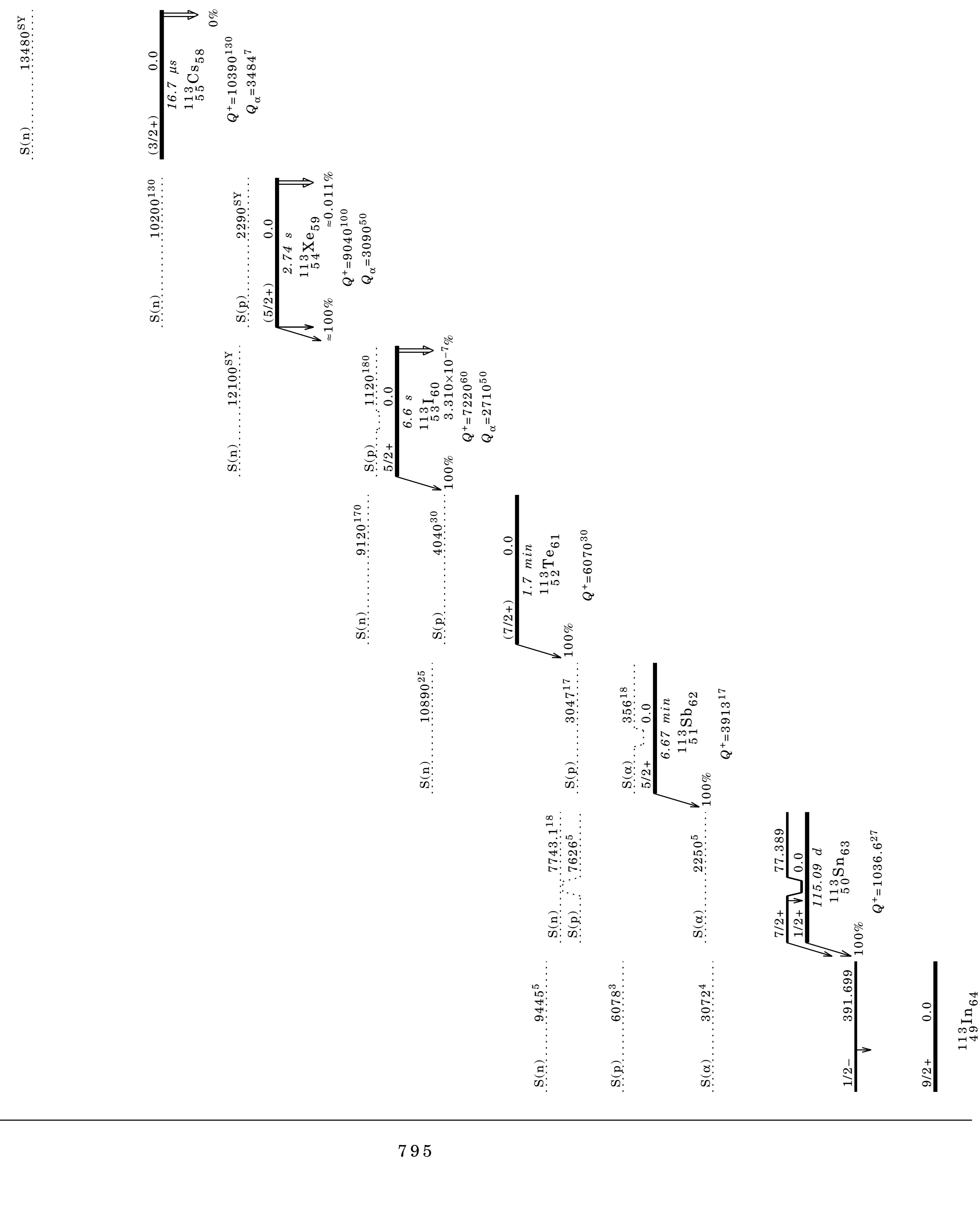
Skeleton Scheme for A=113

Ground-State and Isomeric-Level Properties

Nuclide	Level	Jπ	$T_{1/2}$	Decay Modes
^{113}Nb	0.0		30 ms syst	%β^-=?
^{113}Mo	0.0		100 ms syst	%β^-=?
^{113}Tc	0.0		170 ms *20*	%β^-=100; %β^-n=2.1 *3*
^{113}Ru	0.0	(5/2+)	0.80 s *5*	%β^-=100
	130	(11/2−)	510 ms *30*	%β^-=92; %IT=8
^{113}Rh	0.0	(7/2+)	2.80 s *12*	%β^-=100
^{113}Pd	0.0	(5/2+)	93 s *5*	%β^-=100
	0+x		≥100 s	
	81.1	(9/2−)	0.3 s *1*	%IT=100
^{113}Ag	0.0	1/2−	5.37 h *5*	%β^-=100
	43.5	7/2 +	68.7 s *16*	%IT=64 *7*; %β^-=36 *7*
^{113}Cd	0.0	1/2+	7.7×10^{15} y *3*	%β^-=100
	263.54	11/2−	14.1 y *5*	%IT=0.14; %β^-=99.86
^{113}In	0.0	9/2+	stable	
	391.699	1/2−	99.476 min *23*	%IT=100
^{113}Sn	0.0	1/2+	115.09 d *3*	%ε+%β^+=100
	77.389	7/2+	21.4 min *4*	%IT=91.1 *23*; %ε+%β^+=8.9 *23*
^{113}Sb	0.0	5/2+	6.67 min *7*	%ε+%β^+=100
^{113}Te	0.0	(7/2+)	1.7 min *2*	%ε+%β^+=100
^{113}I	0.0	5/2+	6.6 s *2*	%ε+%β^+=100; %α=3.310×10^{-7}
^{113}Xe	0.0	(5/2+)	2.74 s *8*	%ε+%β^+≈100; %α≈0.011; %εp=7 *4*; %β^+α≈0.007 *4*
^{113}Cs	0.0	(3/2+)	16.7 μs *7*	%p=100; %α=0
^{114}Cs	≥0	(1+)	0.57 s *2*	%εp=?; ...



Skeleton Scheme for A=113 (continued)



Adopted Levels

Q(β⁻)=11940 *SY*; S(n)=4470 *SY* 2003Au03.
Produced from ^{208}Pb(U,f) E=750 MeV/u (1994Be24).
Identified with on–line fragment separator at GSI and time of flight.

^{113}Nb Levels

E(level)	$T_{1/2}$	Comments
0.0	30 ms *SY*	$T_{1/2}$: tof measurement implies $T_{1/2}$>300 ns. Using extrapolation for Z=41 (2003Au03), the evaluator estimates $T_{1/2}$=30 ms. %β⁻=?

$^{113}_{42}Mo_{71}$ $^{113}_{42}Mo_{71}$

Adopted Levels

Q(β⁻)=9590 *SY*; S(n)=3380 *SY*; S(p)=15630 *SY*; Q(α)=–9280 *SY* 2003Au03.
Produced from ^{208}Pb(U,f) E=750 MeV/u (1994Be24).
Identified with on–line fragment separator at GSI and time of flight.

^{113}Mo Levels

E(level)	$T_{1/2}$	Comments
0.0	100 ms *SY*	$T_{1/2}$: tof measurement implies $T_{1/2}$>300 ns. Using extrapolation for Z=42 (2003Au03), the evaluator estimates $T_{1/2}$=100 ms. %β⁻=?

$^{113}_{43}Tc_{70}$ $^{113}_{43}Tc_{70}$

Adopted Levels

Q(β⁻)=8480 *SY*; S(n)=5800 *SY*; S(p)=12180 *SY*; Q(α)=–8050 *SY* 2003Au03.
Production and identification: ^{238}U(p,F) E=20 MeV, on–line isotopic separator IGISOL. Measured: γ, Xγ (1988Pe13).

^{113}Tc Levels

E(level)	$T_{1/2}$	Comments
0.0?	170 ms *20*	%β⁻=100; %β⁻n=2.1 *3* (1999Wa09). $T_{1/2}$: from 1999Wa09. Also 130 ms *50* (1992Ay02).

Adopted Levels, Gammas

Q(β⁻)=6480 *50*; S(n)=4790 *100*; S(p)=14900 *140*; Q(α)=−7380 *SY* 2003Au03.
Production and identification: ^{238}U(p,F) E=20 MeV, on–line isotopic separator IGISOL. Measured: γ, Xγ (1988Pe13).
^{252}Cf SF decay. K x–ray coin (1969WiZX).
Thermal–neutron–induced fission of ^{239}Pu and ^{249}Cf. Chemical separation. Relative activity compared with mass distribution (1978Fr16).

^{113}Ru Levels

Cross Reference (XREF) Flags

A ^{252}Cf SF Decay
B ^{113}Ru IT Decay

E(level)‡	Jπ†	XREF	$T_{1/2}$	Comments
0.0	(5/2+)	AB	0.80 s *5*	%β⁻=100. $T_{1/2}$: from decay of 263.5γ assigned to ^{113}Ru after mass separation (1998Ku17). This value confirms previous values of the same group: 0.80 s *10* (1988Pe13) and 0.80 s *6* (1992PeZX). Others: 2.69 s *10* (1969WiZX) 3.2 s *3* (1976MaYL), 3.0 s *7* (1978Fr16). These early assignments seem close to the new assignment ^{113}Rh half–life. Jπ: from syst.
98.5 *3*	(7/2+)	B		
113.36# *24*	(9/2−)	A		
130 *18*	(11/2−)	B	510 ms *30*	%β⁻=92; %IT=8. $T_{1/2}$: from 1998Ku17. E(level): from 2003Au03 because above the 99 Kev level and below 160 Kev.
260.44§ *24*	(11/2−)	A		E(level): from 2003Zh14. There is no connection between this band head given by 2003Zh14 and the previous level scheme from 1998Ku17. More work is needed to clarify the level scheme.
522.5# *3*	(13/2−)	A		
676.5§ *4*	(15/2−)	A		
1082.4# *4*	(17/2−)	A		
1238.8§ *5*	(19/2−)	A		
1935.6§ *6*	(23/2−)	A		
2740.2§ *6*	(27/2−)	A		
3612.2§ *7*	(31/2−)	A		

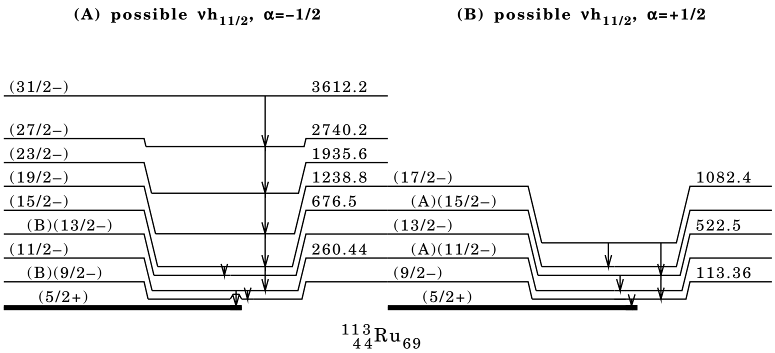
† Jπ without comments are based on band assignments.
‡ From least–squares fit to Eγ's, assuming Δ(Eγ)=0.3 keV.
§ (A): possible $\nu h_{11/2}$, α=−1/2.
\# (B): possible $\nu h_{11/2}$, α=+1/2.

γ(^{113}Ru)

E(level)	Eγ†	Iγ	Mult.	Comments
98.5	98.5 *3*	100	D	Mult.: From α(K)exp in ^{113}Ru it decay.
113.36	113.4 *3*	100		
260.44	147.1 *3*	100		
	260.4 *3*	14		
522.5	262.1 *3*	100		
	409.2 *3*	91		
676.5	154.0 *3*	14		
	416.1 *3*	100		
1082.4	405.9 *3*	90		
	559.9 *3*	100		
1238.8	562.3 *3*	100		
1935.6	696.8 *3*	100		
2740.2	804.5 *3*	100		
3612.2	872.0 *3*	100		

† From ^{113}Ru IT decay and ^{252}Cf SF decay.

Adopted Levels, Gammas (continued)



^{113}Ru IT Decay 1998Ku17

Parent ^{113}Ru: E=130 *18*; Jπ=(11/2−); $T_{1/2}$=510 ms *30*; %IT decay=100.
Activity: ^{238}U(p,f), E=20 MeV, on-line isotope separator IGISOL.
Measured: γ, γγ, γ(t), ce, Ge(Li), Ge, Si(Li), elli spectrometer.

^{113}Ru Levels

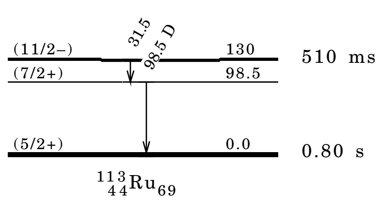
E(level)	Jπ	$T_{1/2}$	Comments
0.0	(5/2+)	0.80 s *5*	
98.5 *3*	(7/2+)		
130 *18*	(11/2−)	510 ms *30*	$T_{1/2}$: from 1998Ku17.

γ(^{113}Ru)

Eγ	E(level)	Mult.	Comments
31.5	130		Eγ: Not seen by 1998Ku17.
98.5 *3*	98.5	D	α(K)exp=0.24 *12*.

Decay Scheme

Intensities: I(γ+ce)
per 100 parent decays
%IT=100



^{252}Cf SF Decay 2003Zh14

Parent ^{252}Cf: E=0.0; Jπ=0+; $T_{1/2}$=2.645 y *8*; %SF decay=100.
Measured Eγ, Iγ, γγ, and γγγ using the GAMMASPHERE detector array comprised of 102 Compton–suppressed Ge detectors.

^{113}Ru Levels

E(level)†	Jπ‡
0.0	
113.36# *24*	(9/2–)
260.44§ *24*	(11/2–)
522.5# *3*	(13/2–)
676.5§ *4*	(15/2–)
1082.4# *4*	(17/2–)
1238.8§ *5*	(19/2–)
1935.6§ *6*	(23/2–)
2740.2§ *6*	(27/2–)
3612.2§ *7*	(31/2–)

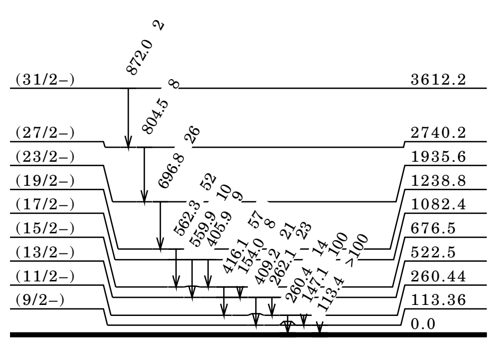
† From least–squares fit to Eγ's, assuming Δ(Eγ)=0.3 keV.
‡ Based on band assignment.
§ (A): possible $\nu h_{11/2}$, α=–1/2.
\# (B): possible $\nu h_{11/2}$, α=+1/2.

γ(^{113}Ru)

Eγ	E(level)	Iγ
113.4	113.36	>100
147.1	260.44	100
154.0	676.5	8
260.4	260.44	14
262.1	522.5	23
405.9	1082.4	9
409.2	522.5	21
416.1	676.5	57
559.9	1082.4	10
562.3	1238.8	52
696.8	1935.6	26
804.5	2740.2	8
872.0	3612.2	2

Level Scheme

Intensities: relative Iγ



Adopted Levels, Gammas

Q(β⁻)=5010 *40*; S(n)=7010 *70*; S(p)=10490 *90*; Q(α)=–6570 *110* 2003Au03.
Production and identification: ^{238}U(p,F) E=20 MeV, on–line isotopic separator IGISOL.
^{252}Cf SF decay. Mass from kinetic energy of fragment (1970Jo20). (K x–ray)γ coin (1972Ho08).

^{113}Rh Levels

Cross Reference (XREF) Flags

A ^{113}Ru β⁻ Decay (0.9 s)
B ^{113}Ru β⁻ Decay (0.5 s)
C ^{252}Cf SF Decay
D ^{208}Pb(^{18}O,Fγ)

E(level)[†]	Jπ[‡]	XREF	$T_{1/2}$	Comments
0.0[§]	(7/2+)	ABCD	2.80 s *12*	$T_{1/2}$: From 1993Pe11. %β⁻=100.
211.71[#] *6*	(9/2+)	ABCD	0.21 ns *13*	$T_{1/2}$: From centroid–shift in βγ(t)(2002Ku18).
263.21[b] *7*	(3/2+)	ABC	0.38 ns *12*	$T_{1/2}$: From centroid–shift in βγ(t)(2002Ku18).
351.36[b] *7*	(5/2+)	AB		
444.00[§] *7*	(11/2+)	BCD		
570.95[@] *7*	(11/2+)	CD		
578.98[b] *7*	(7/2+)	ABC	0.66 ns *14*	$T_{1/2}$: From centroid–shift in βγ(t)(2002Ku18).
600.73[c] *7*	(3/2+)	ABC		
684.66[#] *8*	(13/2+)	CD		
785.14[e] *10*	(7/2–)	ABC		
786.55[c] *12*	(7/2+)	ABC		
823.4 *4*		A		
834.37[d] *8*	(5/2+)	ABC		
911.93[b] *10*	(9/2+)	C		
936.32[&] *8*	(13/2+)	CD		
967.9 *4*		A		
978.0 *3*		A		
1008.9 *3*		A		
1034.0 *5*		A		
1060.9 *3*		A		
1075.72[§] *9*	(15/2+)	CD		
1206.4 *6*		B		
1258.63[d] *13*	(9/2+)	C		
1284.25[@] *8*	(15/2+)	CD		
1320.21[#] *10*	(17/2+)	CD		
1412.0[@] *7*		CD		
1463.9 *7*		A		
1485.2 *6*		A		
1529.8 *6*		B		
1673.61[&] *9*	(17/2+)	C		
1775.48[§] *11*	(19/2+)	CD		
1843.4 *7*		B		
1908.6 *6*		A		
1945.8[§] *5*		A		
1965.8 *6*		A		
2025.30[@] *9*	(19/2+)	C		
2037.97[#] *12*	(21/2+)	CD		
2058.4 *6*	(9/2–)	B		
2122.0 *4*	(5/2,7/2)+	A		
2133.18 *12*	(21/2+)	C		
2191.3 *4*		A		
2221.4 *4*		A		
2287.5 *5*		A		
2297.4 *7*		A		
2367.9 *4*	(9/2–)	B		
2398.48[&] *11*	(21/2+)	C		
2417.6 *5*	(9/2,11/2)–	B		
2446.49[a] *15*	(23/2+)	C		
2470.32[§] *13*	(23/2+)	C		
2525.7 *5*		A		
2623.6 *9*		A		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{113}Rh Levels (continued)

E(level)†	Jπ‡	XREF
2675.4 13		A
2723.24# 14	(25/2+)	C
2776.89 15	(25/2+)	C
3090.76§ 14	(27/2+)	C
3133.06a 18	(27/2+)	C
3334.75# 15	(29/2+)	C
3770.04§ 16	(31/2+)	C
4006.03# 17	(33/2+)	C

† From least–squares fit to adopted gamma energies.
‡ Based on bands assignments and systematics.
§ (A): g.s. band, α=–1/2.
# (B): g.s. band, α=+1/2.
@ (C): 11/2+ band, α=–1/2.
& (D): 13/2+ band, α=+1/2.
a (E): 23/2+ band, α=–1/2.
b (F): 3/2+ band.
c (G): π1/2[431] band, α=–1/2.
d (H): π1/2[431] band, α=+1/2.
e (I): π1/2[301] band.

γ(^{113}Rh)

E(level)	Eγ†	Iγ†
211.71	211.70 10	100
263.21	263.17 10	100
351.36	88.17 10	78 16
	351.44 10	100 20
444.00	232.28 10	100 13
	443.95 10	91 13
570.95	359.26 10	100 20
	571.0 1	15 3
578.98	227.68 10	100 20
	315.73 10	
	367.25 10	29 6
600.73	337.58 10	100 20
	600.7 1	14 3
684.66	240.65 10	82 11
	472.93 10	100 12
785.14	206.10 10	100
	433.82 10	
	785	
786.55	185.82 10	100
823.4	560.1 4	100
834.37	233.69 10	100 20
	483.04 10	27 6
	571.07 10	82 16
911.93	332.97 10	100
	560.54 10	
936.32	365.33 10	100 20
	724.60 10	42 9
967.9	181.0 7	28 14
	367.2 5	100 14
	704.9 7	31 3
978.0	626.8 5	40 2
	715.1 4	100 3
1008.9	657.8 5	86 4
	745.9 5	83 4
	1008.7 6	100 7
1034.0	247.0 8	50 30
	682.8 8	58 17
1034.0	770.9 7	100 8
1060.9	226.0 7	30 15
	274.7 7	33 4
	709.4 5	100 5
	797.8 6	85 4
	1061.2 6	93 7
1075.72	391.18 10	100 14
	631.65 10	62 8
1206.4	994.7 5	100
1258.63	424.26 10	100
1284.25	347.84 10	100 20
	599.45 10	46 9
	713.40 10	23 5
	840.3 1	
1320.21	244.48 10	51 10
	635.55 10	100 16
1412.0	475.7 7	100
1463.9	1112.2 10	70 60
	1464.3 10	100 15
1485.2	906.2 8	73 9
	1133.9 8	100 30
1529.8	1318.4 7	100
1673.61	389.36 10	100 20
	737.34 10	65 13
1775.48	455.34 10	100 20
	699.76 10	38 12
1843.4	1631.7 6	100
1908.6	1123.0 8	33 10
	1645.7 7	100 20
1945.8	1367.6 6	100 8
	1593.8 7	83 8
1965.8	1180.4 7	100 50
	1614.7 8	100 50
2025.30	351.65 10	100 20
	740.95 10	23 5
	949.61 10	69 14
2037.97	262.55 10	44 9
2037.97	717.66 10	100 20
2058.4	1225.0 10	30 20
	1846.1 8	100 10
	2058.4 13	15 15
2122.0	1770.2 7	79 9
	1858.1 7	100 6
	1911.0 9	32 3
	2121.8 11	21 3
2133.18	357.67 10	100
	813.0 1	
2191.3	246.4 11	7 4
	1223.3 7	38 4
	1367.6 6	64 22
	1840.8 7	64 4
	1927.6 7	100 7
	2191.0 8	64 22
2221.4	1160.8 9	19 3
	1213.1 7	36 3
	1869.7 7	64 6
	1957.8 7	100 8
2287.5	1226.6 6	100 3
	1936.3 10	19 8
	2023.9 10	24 11
2297.4	2034.5 10	47 6
	2297.1 9	100 18
2367.9	1534.6 11	10 5
	1583.1 6	100 10
	1922.9 7	100 10
	2156.5 11	20 5
	2368.0 9	40 9
2398.48	373.09 10	100
	724.95 10	60
2417.6	888.1 8	10 3
	1973.2 6	100 10
	2417.6 10	12 4
2446.49	313.35 10	100
2470.32	432.26 10	100 20

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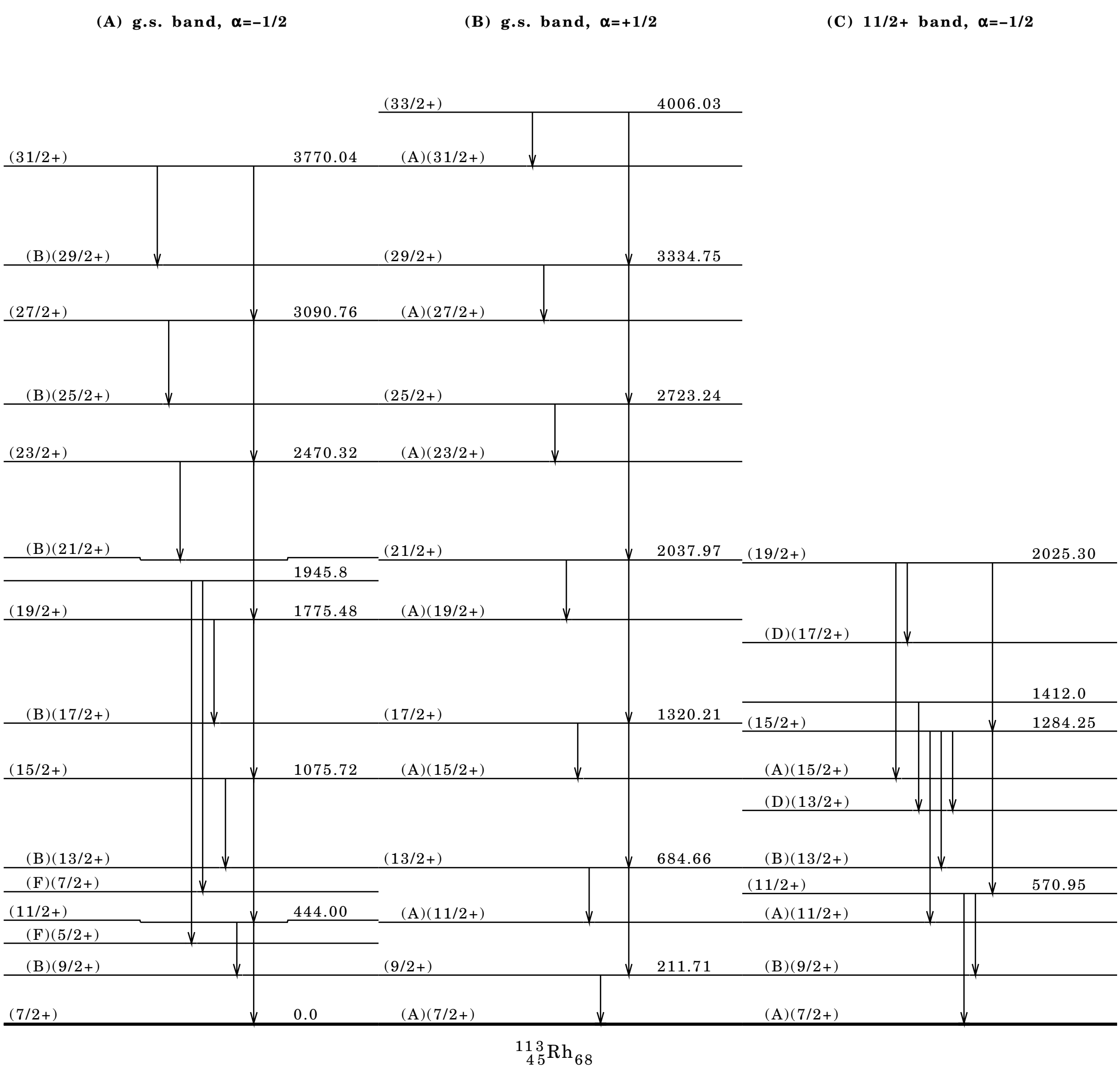
Adopted Levels, Gammas (continued)

γ(^{113}Rh) (continued)

E(level)	Eγ†	Iγ†	E(level)	Eγ†	Iγ†	E(level)	Eγ†	Iγ†
2470.32	694.87 *10*	74 *15*	2723.24	685.32 *10*	100 *20*	3334.75	244.0 *1*	
2525.7	403.4 *5*	100 *21*	2776.89	330.45 *10*	100 *20*		611.45 *10*	100
	1548.9 *7*	71 *4*		643.66 *10*	56 *11*	3770.04	435.24 *10*	
	2173.6 *8*	21 *4*	3090.76	367.67 *10*	100 *20*		679.33 *10*	100
2623.6	2360.4 *9*	100		620.35 *10*	40 *8*	4006.03	236.0 *1*	
2675.4	2324.0 *13*	100 *1*	3133.06	356.1‡			671.27 *10*	100
2723.24	252.95 *10*	69 *14*		686.57 *10*	100			

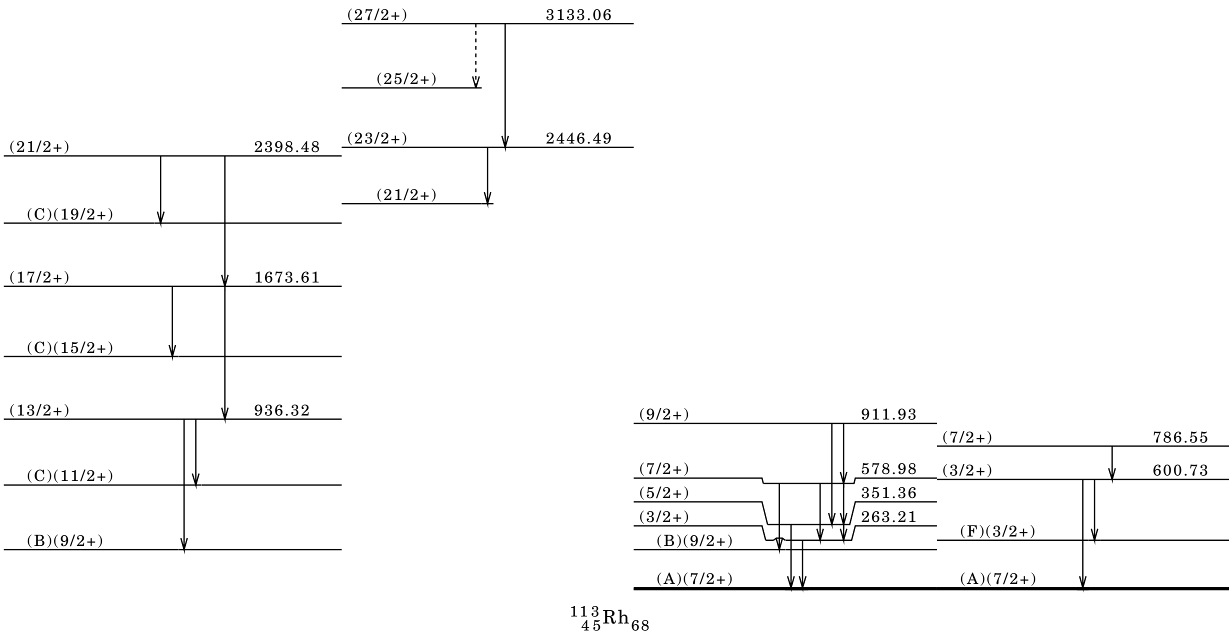
† If possible, taken from 2004Lu03, otherwise from 2002Ku18.

‡ Placement of transition in the level scheme is uncertain.

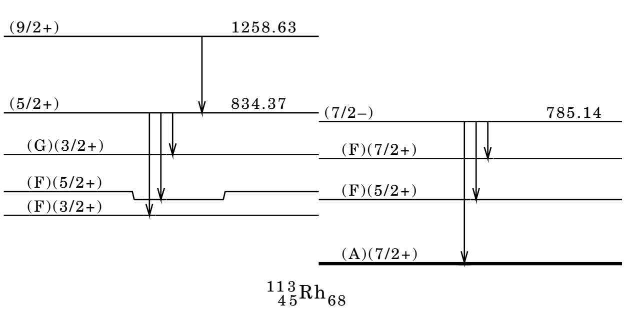


Adopted Levels, Gammas (continued)

(D) 13/2+ band, α=+1/2 **(E) 23/2+ band, α=−1/2** **(F) 3/2+ band** **(G) π1/2[431] band, α=−1/2**



(H) π1/2[431] band, α=+1/2 **(I) π1/2[301] band**



^{113}Ru β⁻ Decay (0.9 s) 2002Ku18

Parent ^{113}Ru: E=0; Jπ=(5/2+); $T_{1/2}$=0.9 s; Q(g.s.)=6480 *50*; %β⁻ decay=100.
^{113}Ru–Q(β⁻): 2002Ku18 give 6480, adopted by 2003Au03.
See also ^{113}Ru β⁻ decay (0.5 s).
Preliminary decay scheme was given by 1992PeZX. They show decay up to 1009 Kev.
Measured Eγ, Iγ, γγ, βγ coin, lifetimes by βγ(t) using a LEGe–detector and a 37% Ge–detector operated with two plastic scintillators and in anti–coincidence with a BGO shield.

^{113}Rh Levels

E(level)†	Jπ‡	$T_{1/2}$#
0.0	(7/2+)	
211.66 *19*	(9/2+)	0.21 ns *13*
263.16 *16*	(3/2+)	0.38 ns *12*
351.29 *18*	(5/2+)	
578.77 *24*	(7/2+)	
600.65 *24*	(3/2+)	0.66 ns *14*
785.1 *4*	(7/2−)	
786.5 *4*	(7/2+)	
823.4 *4*		
834.4 *3*	(5/2+)	
967.8 *4*		
978.0 *4*		
1008.9 *3*		
1033.9 *5*		
1060.8 *3*		
1463.9 *8*		
1485.1 *6*		
1711.6? *10*		
1908.5 *6*		
1945.7§ *5*		
1965.7 *6*		
2121.9 *4*	(5/2,7/2)+	
2191.3 *4*		
2221.4 *4*		
2287.4?§ *5*		
2297.4 *7*		
2525.7?§ *5*		
2623.6?§ *10*		
2675.3?§ *14*		

† From least–squares fit to Eγ's.
‡ From Adopted levels.
§ Level not shown in figure 1 of 2002Ku18.
\# From centroid–shift method in βγ(t).

β⁻ radiations

Eβ⁻	E(level)	Iβ⁻	Log *ft*
(4180 *50*)	2297.4	2.0	5.6
(4260 *50*)	2221.4	6.2	5.1
(4290 *50*)	2191.3	12.1	4.8
(4360 *50*)	2121.9	6.2	5.2
(4510 *50*)	1965.7	2.2	5.7
(4530 *50*)	1945.7	3.7	5.5
(4570 *50*)	1908.5	2.8	5.6
(4990 *50*)	1485.1	1.5	6.1
(5020 *50*)	1463.9	0.9	6.3
(5420 *50*)	1060.8	6.6	5.6
(5450 *50*)	1033.9	2.0	6.1
(5470 *50*)	1008.9	5.1	5.7
(5500 *50*)	978.0	6.3	5.6
(5510 *50*)	967.8	2.3	6.1
(5650 *50*)	834.4	6.5	5.7
(5660 *50*)	823.4	1.7	6.2
(5690 *50*)	786.5	2.7	6.1
(5690 *50*)	785.1	0.3	7.0
(5880 *50*)	600.65	10.2	5.5
(5900 *50*)	578.77	4.5	5.9
(6220 *50*)	263.16	18.9	5.4

γ(^{113}Rh)

Iγ normalization: From level scheme, assuming no β− feeding to the ground state.

Eγ	E(level)	Iγ§	Comments
48.1 *13*	834.4	0.2 *2*	
88.1 *3*	351.29	12.4‡ *13*	Iγ: combined intensity from both isomers=13.1 *13*.
181.0 *7*	967.8	0.8 *4*	
185.8 *3*	786.5	6.8 *8*	
206.2 *4*	785.1	0.9‡	Iγ: combined intensity from both isomers=2.7 *4*.
211.7 *2*	211.66	2.9‡ *8*	Iγ: combined intensity from both isomers=32.8 *8*.
226.0# *7*	1060.8	0.8 *4*	
227.6 *3*	578.77	7.0‡ *4*	Iγ: combined intensity from both isomers=8.2 *4*.
233.9 *4*	834.4	2.4‡ *4*	Iγ: combined intensity from both isomers=2.7 *4*.
246.4# *11*	2191.3	0.3 *2*	
247.0# *8*	1033.9	0.6 *4*	
263.2 *2*	263.16	98.3‡ *5*	Iγ: combined intensity from both isomers=100.0 *5*.

Continued on next page (footnotes at end of table)

^{113}Ru β^- Decay (0.9 s) 2002Ku18 (continued)

$\gamma(^{113}Rh)$ (continued)

Eγ	E(level)	Iγ§	Comments
274.7 *7*	1060.8	0.9 *1*	
337.6 *3*	600.65	23.1‡ *4*	Iγ: combined intensity from both isomers=23.4 *4*.
351.2 *3*	351.29	11.2‡ *17*	Iγ: combined intensity from both isomers=11.8 *17*.
367.1 *5*	578.77	1.8‡ *2*	Iγ: combined intensity from both isomers=2.1 *2*.
367.2 *5*	967.8	2.9 *4*	
x401.0† *7*		1.1 *1*	In coin with 88, 117, 152, 186, 263 γ's; fits between levels 2368–1966.
403.4# *5*	2525.7?	2.4 *5*	
x422.9† *5*		2.3 *1*	In coin with 88, 162, 263, 338 γ's; fits between levels 2368–1945.
482.0 *8*	834.4	0.6‡ *2*	Iγ: combined intensity from both isomers=0.7 *2*.
560.1 *4*	823.4	5.1 *2*	
571.1 *4*	834.4	5.9‡ *2*	Iγ: combined intensity from both isomers=6.6 *2*.
578.7# *6*	578.77	1.6‡ *2*	Iγ: combined intensity from both isomers=1.9 *2*.
600.5 *5*	600.65	2.1 *3*	
626.8 *5*	978.0	2.3 *1*	
657.8 *5*	1008.9	2.5 *1*	
682.8# *8*	1033.9	0.7 *2*	
704.9 *7*	967.8	0.9 *1*	
709.4 *5*	1060.8	2.7 *1*	
715.1 *4*	978.0	5.8 *1*	
745.9 *5*	1008.9	2.4 *1*	
770.9 *7*	1033.9	1.2 *1*	
785.0# *5*	785.1	0.9‡ *2*	Iγ: combined intensity from both isomers=2.7 *2*.
797.8 *6*	1060.8	2.3 *1*	
906.2# *8*	1485.1	0.8 *1*	
1008.7# *6*	1008.9	2.9 *2*	
1061.2# *6*	1060.8	2.5 *2*	
1112.2 *10*	1463.9	0.5 *4*	
1123.0# *8*	1908.5	0.9 *1*	
1133.9 *8*	1485.1	1.1 *3*	Eγ: also fits between levels 1966–834.
1160.8# *9*	2221.4	0.7 *1*	
1180.4# *7*	1965.7	1.4 *7*	
x1194.6† *6*		2.6 *2*	In coin with 135, 212, 263 γ's.
1213.1# *7*	2221.4	1.3 *1*	
1223.3# *7*	2191.3	1.7 *2*	
1226.6# *6*	2287.4?	3.7 *1*	
1367.6@ *6*	1945.7	2.9@ *1*	
	2191.3	2.9@ *1*	
1448.4 *9*	1711.6?	0.8 *8*	Eγ: placement not shown in figure 1; also fits between levels 2417–968.
1464.3# *10*	1463.9	0.7 *1*	
1548.9# *7*	2525.7?	1.7 *1*	
1593.8 *7*	1945.7	2.4 *2*	
1614.7 *8*	1965.7	1.4 *1*	
1645.7 *7*	1908.5	2.7 *2*	
x1661.2† *10*		0.6 *1*	In coin with 88, 212 γ's.
1770.2 *7*	2121.9	2.7 *3*	
1840.8 *7*	2191.3	2.9 *2*	
1858.1 *7*	2121.9	3.4 *2*	
1869.7 *7*	2221.4	2.3 *2*	
1911.0 *9*	2121.9	1.1 *1*	
1927.6 *7*	2191.3	4.5 *2*	
1936.3# *10*	2287.4?	0.7 *3*	
1957.8 *7*	2221.4	3.6 *3*	
2023.9# *10*	2287.4?	0.9 *4*	
2034.5 *10*	2297.4	0.8 *1*	
2121.8# *11*	2121.9	0.7 *1*	
2173.6# *8*	2525.7?	0.5 *1*	
2191.0 *8*	2191.3	2.9 *1*	
2297.1 *9*	2297.4	1.7 *3*	
2324.0 *13*	2675.3?	0.3 *1*	
2360.4 *9*	2623.6?	1.8 *2*	

† This unplaced γ belongs to the decay of either or both the isomers.
‡ From figure 1 of 2002Ku18.

Footnotes continued on next page

^{113}Ru β^- Decay (0.9 s) 2002Ku18 (continued)

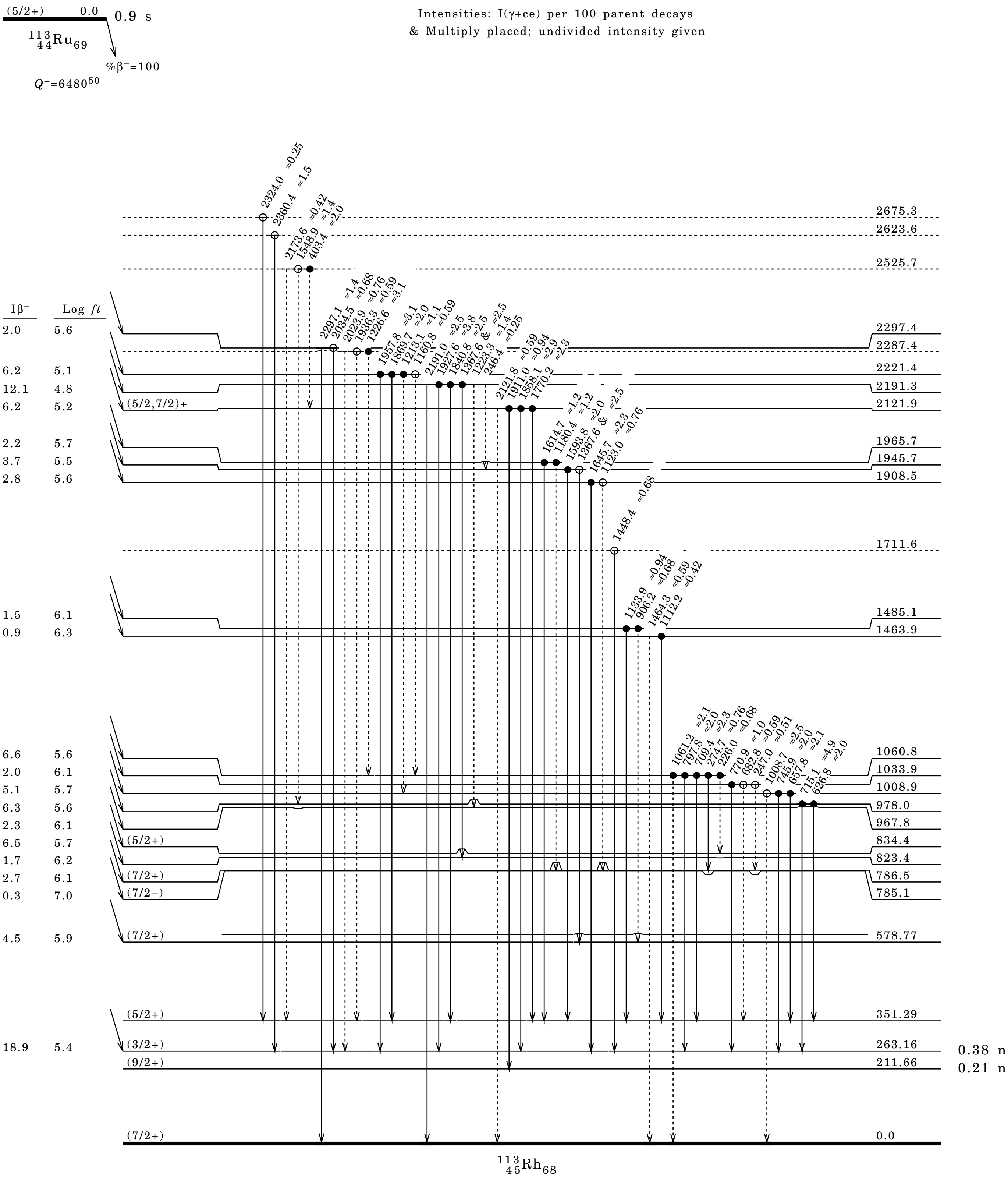
$\gamma(^{113}Rh)$ (continued)

§ For absolute intensity per 100 decays, multiply by ≈0.85.
# Placement of transition in the level scheme is uncertain.
@ Multiply placed; undivided intensity given.
x γ ray not placed in level scheme.

^{113}Ru β⁻ Decay (0.9 s) 2002Ku18 (continued)

Decay Scheme

Intensities: I(γ+ce) per 100 parent decays
& Multiply placed; undivided intensity given

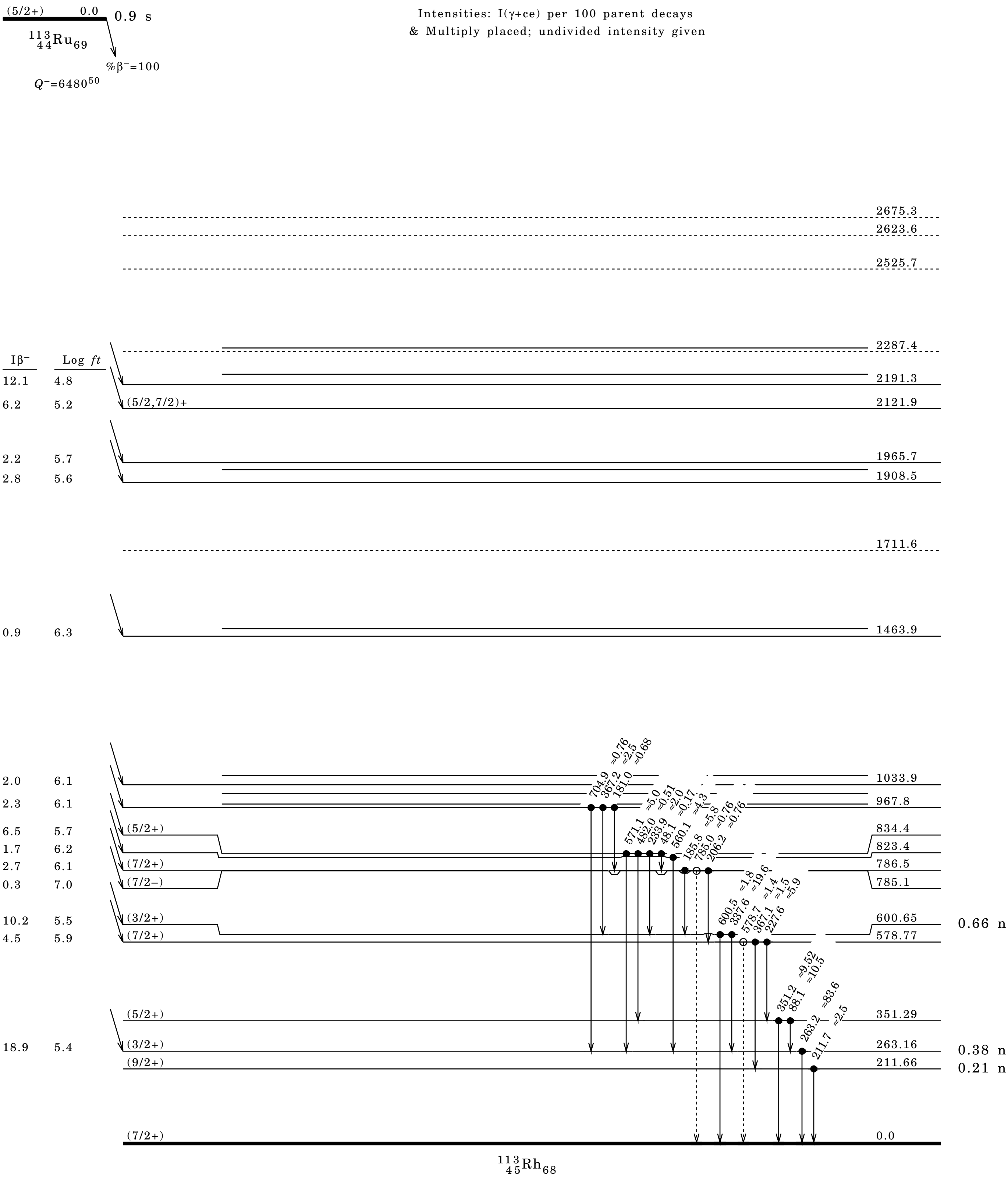


^{113}Ru β^- Decay (0.9 s) 2002Ku18 (continued)

Decay Scheme (continued)

Intensities: I(γ+ce) per 100 parent decays

& Multiply placed; undivided intensity given



^{113}Ru β^- Decay (0.5 s) 2002Ku18

Parent ^{113}Ru: E=130 *30*; Jπ=(11/2−); $T_{1/2}$=0.5 s; Q(g.s.)=6480 *50*; %β^- decay=100.
^{113}Ru–Q(β^-): 6480 *50* (2003Au03).
^{113}Ru–E,J: Tentative assignment based on a known level near this energy.
See also ^{113}Ru β^- decay (0.9 s).
Measured Eγ, Iγ, γγ, βγ coin, βγ(t) using a LEGe–detector and a 37% Ge–detector operated with two plastic scintillators and in anti–coincidence with a BGO shield.

^{113}Rh Levels

E(level)†	Jπ	$T_{1/2}$‡
0.0	(7/2+)	
211.73 *18*	(9/2+)	0.21 ns *13*
263.10 *17*	(3/2+)	
351.24 *20*	(5/2+)	
444.12 *25*	(11/2+)	
578.80 *25*	(7/2+)	
600.5 *3*	(3/2+)	
785.0 *4*	(7/2−)	
786.3 *4*	(7/2+)	
834.1 *3*	(5/2+)	
1206.4 *6*		
1529.8? *6*		
1843.4 *7*		
2058.4 *6*	(9/2−)	
2367.9 *4*	(9/2−)	
2417.6 *5*	(9/2,11/2)−	

† From least–squares fit to Eγ's.
‡ From centroid–shift in βγ(t).

β^- radiations

Eβ⁻	E(level)	Iβ⁻	Log *ft*
(4190 *60*)	2417.6	24.1	4.2
(4240 *60*)	2367.9	23.4	4.3
(4550 *60*)	2058.4	6.3	5.0
(4770 *60*)	1843.4	11.2	4.8
(5080 *60*)	1529.8?	1.2	5.9
(5400 *60*)	1206.4	7.7	5.2
(6170 *60*)	444.12	2.3	6.0
(6400 *60*)	211.73	23.8	5.1

γ(^{113}Rh)

See 401.0, 422.9, 1194.6 and 1661.2 unplaced γ's in ^{113}Ru β^- decay (0.9 s).

Eγ	E(level)	Iγ‡	Mult.	Comments
48.1 *13*	834.1	0.02†		
88.1 *3*	351.24	0.7†		
185.8 *3*	786.3	0.02†		
206.2 *4*	785.0	1.8† *4*		Iγ: combined intensity from both isomers=2.7 *4*.
211.7 *2*	211.73	29.9† *8*	M1(+E2)	Iγ: combined intensity from both isomers=32.8 *8*. α(K)exp=0.06 *2*.
227.6 *3*	578.80	1.2† *4*		
232.3 *3*	444.12	7.4 *3*		
233.9 *4*	834.1	0.3†		
263.2 *2*	263.10	1.7† *5*	E2	
337.6 *3*	600.5	0.3†		
351.2 *3*	351.24	0.6†		
367.1 *5*	578.80	0.3†		
443.9 *4*	444.12	5.5 *2*		
482.0 *8*	834.1	0.1†		
571.1 *4*	834.1	0.7†		
578.7 *6*	578.80	0.3†		
600.5 *5*	600.5	0.02†		
785.0 *5*	785.0	1.8† *2*		Iγ: combined intensity from both isomers=2.7 *2*.
888.1§ *8*	2417.6	0.9 *4*		
994.7 *5*	1206.4	3.3 *4*		
1225.0§ *10*	2058.4	0.6 *4*		
1318.4 *7*	1529.8?	1.4 *1*		
1534.6§ *11*	2367.9	0.5 *1*		

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^{113}Ru β^- Decay (0.5 s) 2002Ku18 (continued)

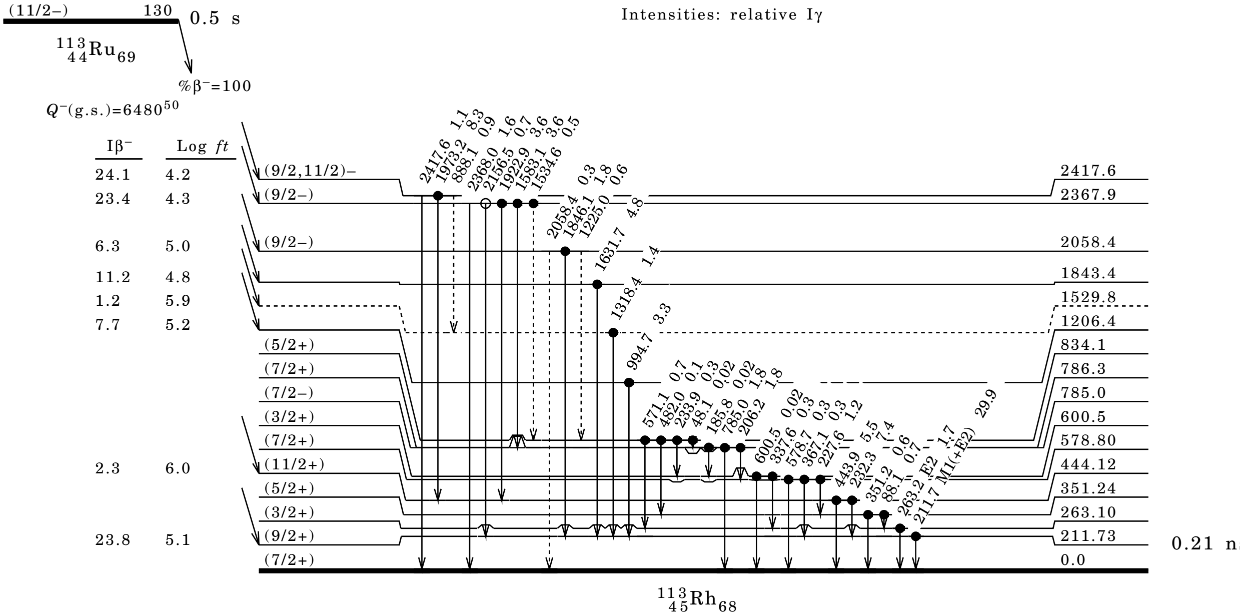
$\gamma(^{113}$Rh) (continued)

Eγ	E(level)	Iγ‡
1583.1 *6*	2367.9	3.6 *2*
1631.7 *6*	1843.4	4.8 *3*
1846.1 *8*	2058.4	1.8 *1*
1922.9 *7*	2367.9	3.6 *1*
1973.2 *6*	2417.6	8.3 *2*
2058.4§ *13*	2058.4	0.3 *3*
2156.5 *11*	2367.9	0.7 *1*
2368.0 *9*	2367.9	1.6 *1*
2417.6 *10*	2417.6	1.1 *1*

† From figure 2 of 2002Ku18.
‡ For absolute intensity per 100 decays, multiply by 2.4.
§ Placement of transition in the level scheme is uncertain.

Decay Scheme

Intensities: relative Iγ



^{252}Cf SF Decay 2004Lu03

Parent ^{252}Cf: E=0; Jπ=0+; $T_{1/2}$=2.645 y *8*; %SF decay=100.

Measured Eγ, Iγ, γγ using GAMMASPHERE array of 102 Compton–suppressed Ge detectors.

First mass assignment from fragment–γ coin, 1970Jo20. Z assignment of 304γ from (K x–ray)γ coin, 1972Ho08. Cascade assignment from half–lives, 1970Jo20.

154.6γ and 304γ seen by 1970Jo20 and 1972Ho08 could belong to an other nuclide.

^{113}Rh Levels

E(level)†	Jπ
0.0‡	(7/2+)
211.72§ *10*	(9/2+)
263.21b *10*	(3/2+)
351.36b *10*	(5/2+)
444.00‡ *10*	(11/2+)

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^{252}Cf SF Decay 2004Lu03 (continued)

^{113}Rh Levels (continued)

E(level)[†]	Jπ	E(level)[†]	Jπ	E(level)[†]	Jπ
570.96[#] *10*	(11/2+)	1258.63[d] *13*	(9/2+)	2470.32[‡] *13*	(23/2+)
578.99[b] *10*	(7/2+)	1284.26[#] *10*	(15/2+)	2723.24[§] *14*	(25/2+)
600.72[c] *10*	(3/2+)	1320.21[§] *10*	(17/2+)	2776.90[&] *15*	(25/2+)
684.66[§] *10*	(13/2+)	1673.62[@] *10*	(17/2+)	3090.76[‡] *14*	(27/2+)
785.13[e] *10*	(7/2−)	1775.49[‡] *11*	(19/2+)	3133.06[a] *18*	(27/2+)
786.54[c] *13*	(7/2+)	2025.30[#] *10*	(19/2+)	3334.76[§] *15*	(29/2+)
834.36[d] *10*	(5/2+)	2037.97[§] *12*	(21/2+)	3770.04[‡] *16*	(31/2+)
911.93[b] *10*	(9/2+)	2133.19[&] *12*	(21/2+)	4006.03[§] *17*	(33/2+)
936.33[@] *10*	(13/2+)	2398.48[@] *11*	(21/2+)		
1075.73[‡] *10*	(15/2+)	2446.49[a] *15*	(23/2+)		

[†] From least-squares fit to Eγ's, assuming Δ(Eγ)=0.1 keV; stated by 2004Lu03 as systematic error. Minimum uncertainty in level energy is assigned as 1 keV.
[‡] (A): g.s. band, α=−1/2.
[§] (B): g.s. band, α=+1/2.
[#] (C): 11/2+ band, α=−1/2.
[@] (D): 13/2+ band, α=+1/2.
[&] (E): 21/2+ band, α=+1/2.
[a] (F): 23/2+ band, α=−1/2.
[b] (G): 3/2+ band.
[c] (H): π1/2[431] band, α=−1/2.
[d] (I): π1/2[431] band, α=+1/2.
[e] (J): π1/2[301] band.

γ(^{113}Rh)

Eγ	E(level)	Iγ	Comments
88.17 *10*	351.36	5.4	
185.82 *10*	786.54	4.5	
206.10 *10*	785.13	0.6	
211.70 *10*	211.72	100	Decays with half-life=5 ns *1* (1970Jo20).
227.68 *10*	578.99	0.7	
232.28 *10*	444.00	20.7	
233.69 *10*	834.36	2.2	
236.0 *1*	4006.03		
240.65 *10*	684.66	15.8	
244.0 *1*	3334.76		
244.48 *10*	1320.21	7.3	
252.95 *10*	2723.24	1.1	
262.55 *10*	2037.97	2.2	
263.17 *10*	263.21	20.3	
313.35 *10*	2446.49	2.7	
315.73 *10*	578.99		
330.45 *10*	2776.90	0.9	
332.97 *10*	911.93	0.3	
337.58 *10*	600.72	5.1	
347.84 *10*	1284.26	2.6	
351.44 *10*	351.36	6.9	
351.65 *10*	2025.30	1.3	
356.1[†]	3133.06		
357.67 *10*	2133.19	5.1	
359.26 *10*	570.96	6.2	
365.33 *10*	936.33	5.2	
367.25 *10*	578.99	0.2	
367.67 *10*	3090.76	1.0	
373.09 *10*	2398.48	0.5	Eγ: 373.2 in figure 6 of 2004Lu03.
389.36 *10*	1673.62	1.7	
391.18 *10*	1075.73	8.4	
424.26 *10*	1258.63	1.2	
432.26 *10*	2470.32	1.9	
433.82 *10*	785.13		

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^{252}Cf SF Decay 2004Lu03 (continued)

$\gamma(^{113}Rh)$ (continued)

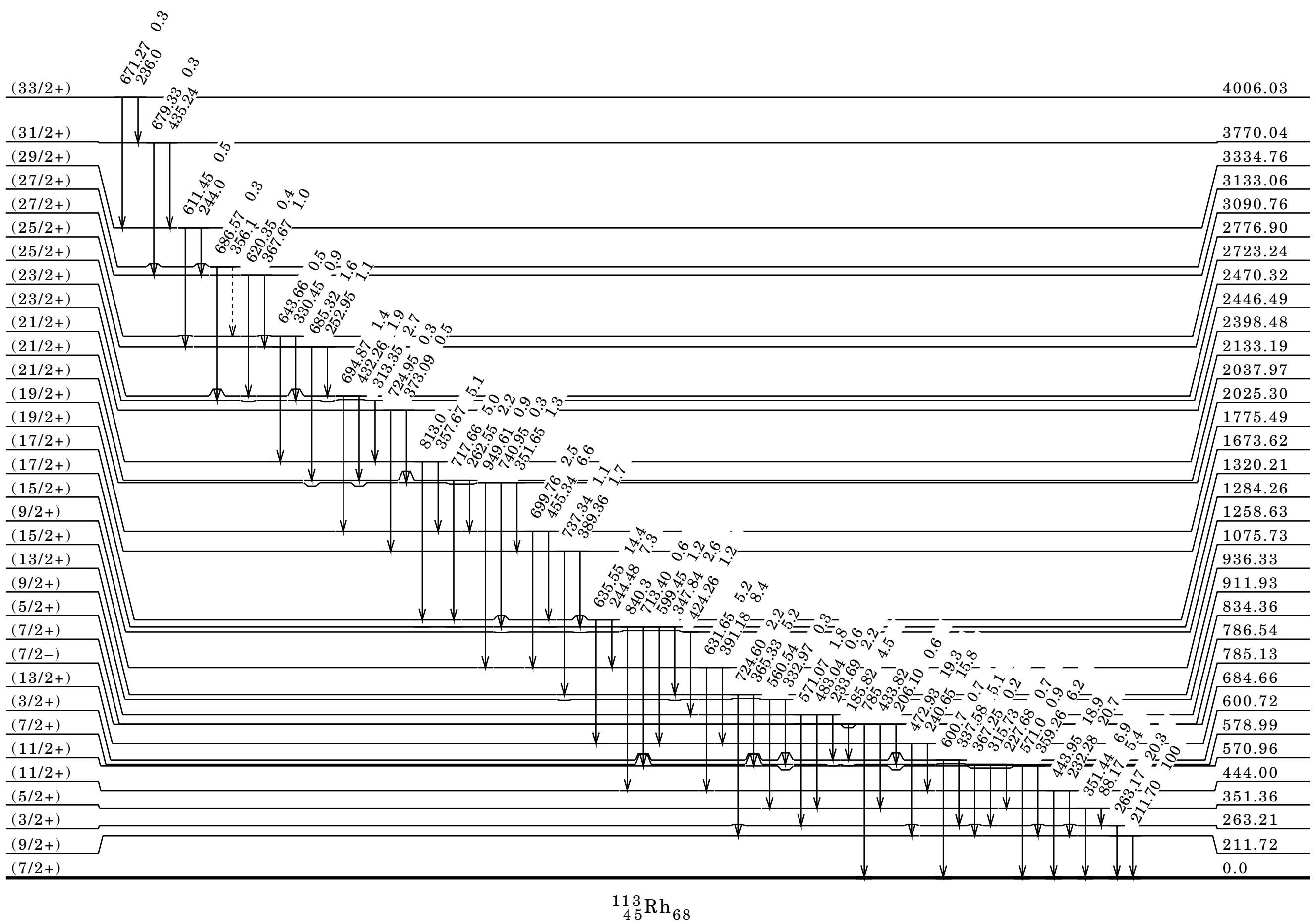
Eγ	E(level)	Iγ	Comments
435.24 *10*	3770.04		
443.95 *10*	444.00	18.9	
455.34 *10*	1775.49	6.6	
472.93 *10*	684.66	19.3	
483.04 *10*	834.36	0.6	
560.54 *10*	911.93		
571.0 *1*	570.96	0.9	
571.07 *10*	834.36	1.8	
599.45 *10*	1284.26	1.2	Eγ: 599.6 in figure 6 of 2004Lu03.
600.7 *1*	600.72	0.7	
611.45 *10*	3334.76	0.5	
620.35 *10*	3090.76	0.4	Eγ: 620.5 in figure 6 of 2004Lu03.
631.65 *10*	1075.73	5.2	
635.55 *10*	1320.21	14.4	
643.66 *10*	2776.90	0.5	
671.27 *10*	4006.03	0.3	
679.33 *10*	3770.04	0.3	
685.32 *10*	2723.24	1.6	
686.57 *10*	3133.06	0.3	
694.87 *10*	2470.32	1.4	
699.76 *10*	1775.49	2.5	
713.40 *10*	1284.26	0.6	Eγ: 713.2 in figure 6 of 2004Lu03.
717.66 *10*	2037.97	5.0	
724.60 *10*	936.33	2.2	
724.95 *10*	2398.48	0.3	
737.34 *10*	1673.62	1.1	
740.95 *10*	2025.30	0.3	
785	785.13		
813.0 *1*	2133.19		Eγ: from figure 6 of 2004Lu03.
840.3 *1*	1284.26		Eγ: 840.2 in figure 6 of 2004Lu03.
949.61 *10*	2025.30	0.9	Eγ: 949.5 in figure 6 of 2004Lu03.

† Placement of transition in the level scheme is uncertain.

^{252}Cf SF Decay 2004Lu03 (continued)

Level Scheme

Intensities: relative Iγ



^{208}Pb(^{18}O,Fγ) 2002Ve08

E=85 MeV. Measured Eγ, Iγ, γγ using the Euroball IV array comprised of 15 cluster Ge detectors, 26 clover Ge detectors and 30 tapered single–crystal Ge detectors.

^{113}Rh Levels

E(level)†	Jπ	E(level)†	Jπ	E(level)†	Jπ
0.0‡	(7/2+)	683.7§ *4*	(13/2+)	1319.3§ *5*	(17/2+)
211.7§ *3*	(9/2+)	935.1# *6*	(13/2+)	1410.8# *10*	(17/2+)
443.4‡ *3*	(11/2+)	1074.7‡ *5*	(15/2+)	1773.7‡ *7*	(19/2+)
570.1# *5*	(11/2+)	1282.7# *8*	(15/2+)	2036.9§ *10*	(21/2+)

† From least–squares fit to Eγ's.

‡ (A): $\pi g_{9/2}$, α=−1/2.

§ (B): $\pi g_{9/2}$, α=+1/2.

(C): Band based on (11/2+).

$^{208}Pb(^{18}O,F\gamma)$ 2002Ve08 (continued)

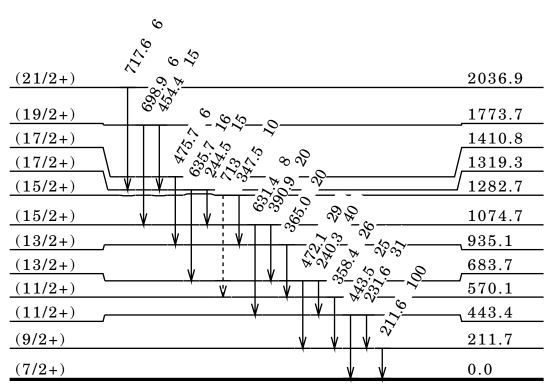
$\gamma(^{113}Rh)$

Eγ	E(level)	Iγ	Comments
211.6 *3*	211.7	100 *15*	
231.6 *3*	443.4	31 *5*	
240.3 *3*	683.7	40 *5*	
244.5 *4*	1319.3	15 *4*	
347.5 *5*	1282.7	10 *3*	
358.4 *4*	570.1	26 *5*	
365.0 *4*	935.1	20 *4*	
390.9 *4*	1074.7	20 *4*	
443.5 *4*	443.4	25 *6*	
454.4 *6*	1773.7	15 *4*	
472.1 *4*	683.7	29 *5*	
475.7 *7*	1410.8	6 *2*	
631.4 *5*	1074.7	8 *2*	
635.7 *5*	1319.3	16 *4*	
698.9 *8*	1773.7	6 *2*	
713†	1282.7		Eγ: from figure 4 of 2002Ve08.
717.6 *8*	2036.9	6 *2*	

† Placement of transition in the level scheme is uncertain.

Level Scheme

Intensities: relative Iγ



$^{113}_{45}Rh_{68}$

Adopted Levels, Gammas

Q(β⁻)=3340 *30*; S(n)=5430 *40*; S(p)=11240 *60*; Q(α)=–5270 *80* 2003Au03.
$T_{1/2}$(128.5γ)=0.91 s *8*, assigned either to ^{113}Pd or ^{111}Pd (1970WiZN) via ^{113}Rh (^{111}Rh) β⁻ decay, is not seen by 1988Pe13 after mass separation.

^{113}Pd Levels

Cross Reference (XREF) Flags

A ^{113}Rh β⁻ Decay
B ^{113}Pd IT Decay
C ^{208}Pb(^{18}O,Fγ)
D ^{238}U(^{12}C,Fγ)
E ^{252}Cf SF Decay

E(level)[†]	Jπ[‡]	XREF	$T_{1/2}$	Comments
0.0	(5/2+)	AB	93 s *5*	%β⁻=100. E(level): tentative g.s. assignment based on $T_{1/2}$ syst. $T_{1/2}$: weighted av of 84 s *6* (1958Al90), 91 s *12* (1970Ar19), 100 s *5* (1975BrYM), 90 s (1981Me17), 90 s *3* (1974Gr29). Jπ: from syst and log *ft*=5.5 to 7/2+.
0+x		A	≥100 s	$T_{1/2}$: from 1981Me17. This isomer is proposed from their half–life measurement and also because ^{107,109,111}Pd have isomeric states. This isomer is not reported by 1988FoZY in ^{113}Pd β⁻ decay and an isomer was found by 1993Pe11 with $T_{1/2}$=0.3 s *1*.
35.08 *17*	(1/2+)	A		Jπ: E2 γ to (5/2+) and syst.
81.1 *3*	(9/2−)	AB	0.3 s *1*	%IT=100. Jπ: M2 γ to (5/2+). Syst gives 11/2−. $T_{1/2}$: from 1993Pe11.
99[§] *1*	(11/2−)	CD		
151.89 *17*	(3/2+)	A		Jπ: M1 γ's to (5/2+) and (1/2+).
172.55 *21*	(1/2+)	A		Jπ: M1 γ to (1/2+) and no γ to (5/2+) g.s.
189.61[&] *15*	(5/2+,7/2+)	A E		Jπ: M1 γ to (5/2+) and log *ft*=5.5 from (7/2+).
252.18 *16*	(3/2+,1/2+)	A		Jπ: E2,M1 γ to (5/2+) and M1,E2 γ to (1/2)+.
349.13 *20*	(5/2+,7/2+)	A		Jπ: M1,E2 γ to (5/2+) and log *ft*=4.9 from (7/2+).
372.97 *22*	(1/2+,3/2+,5/2+)	A		Jπ: E2 γ to (1/2+,3/2+).
409.26 *18*	+	A		
409.8 *5*		A		
454.55[@] *23*		A E		
482.2[§] *15*	(15/2−)	CDE		
500.35 *23*		A		
506.1[#] *11*	(13/2−)	D		
538.7 *4*		A		
715.9[&] *3*	(11/2+)	E		
730.6 *4*		A		
742.3 *5*		A		
861.2 *4*		A		
1031.3[@] *3*	(13/2+)	E		
1052.7[§] *15*	(19/2−)	CDE		
1081.2 *6*		A		
1082.1[#] *15*	(17/2−)	D		
1111.0 *4*		E		
1345.6[&] *4*	(15/2+)	E		
1678.3[@] *5*	(17/2+)	E		
1774.9[§] *16*	(23/2−)	CDE		
1784.3 *16*		E		
1799.1[#] *18*	(21/2−)	DE		
2030.1[&] *5*	(19/2+)	E		
2219.5[a] *16*	(23/2+)	E		
2342.2[@] *6*	(21/2+)	E		
2604.4[§] *16*	(27/2−)	CDE		
2617.1[#] *21*	(25/2−)	CD		
2705.4[a] *16*	(27/2+)	E		
2707.3[&] *6*	(23/2+)	E		
3000.5[@] *6*	(25/2+)	E		
3341.3[a] *16*	(31/2+)	E		
3491.1[#] *23*	(29/2−)	D		

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Adopted Levels, Gammas (continued)

^{113}Pd Levels (continued)

E(level)[†]	Jπ[‡]	XREF
3495.6[§] *16*	(31/2−)	CDE
4450.6[§] *19*	(35/2−)	CD

[†] From least–squares fit to γ energies.
[‡] Jπ for levels above 482 keV are based on band assignments.
[§] (A): $\nu h_{11/2}$, α=−1/2 band.
[#] (B): $\nu h_{11/2}$, α=+1/2 band.
[@] (C): band 3.
[&] (D): band 4.
[a] (E): band 5.

γ(^{113}Pd)

E(level)	Eγ[‡]	Iγ[‡]	Mult.[†]	α	Comments
35.08	34.9 *3*	100	E2	63.0	
81.1	81.1 *3*	100	M2	8.66	B(M2)(W.u.)=0.00013 *5*.
151.89	116.8 *2*	100 *5*	M1,E2	0.2473	
	151.8 *3*	76 *4*	M1	0.1200	
172.55	137.5 *2*	100	M1	0.1572	
189.61	189.7 *2*	100	M1	0.066	
252.18	79.7 *3*	30 *3*			
	100.4 *3*	8 *1*			
	217.0 *2*	100 *5*	M1,E2		
	252.1 *3*	75 *5*	E2,M1		
349.13	96.8 *3*	38 *6*			
	159.9 *3*	100 *10*			
	197.0 *4*	19 *6*			
	348.9 *5*	44 *10*	M1,E2		Iγ: from γγ.
372.97	120.8 *3*	51 *7*	E2	0.715	
	221.0 *3*	100 *12*			
	373.1 *4*	42 *9*			
409.26	157.1 *3*	14 *1*			
	219.6 *3*	24.4 *14*			
	236.7 *4*	2.1 *7*			
	409.3 *3*	100 *3*	E2	0.01091	
409.8	257.9 *4*	100			
454.55	265.0 *3*	100 *14*			
	454.7 *4*	100 *14*			
482.2	383.1 *3*	100			
500.35	310.8 *4*	22 *5*			
	348.5 *6*	40 *9*			Iγ: from γγ.
	500.3 *3*	100 *7*			
506.1	407 *1*				
	425				
538.7	348.9 *5*	30 *7*			
	538.8 *4*	100 *7*			
715.9	261.4 *3*				
	526.1 *3*				
730.6	357.6 *3*	100			
742.3	332.7 *3*	100			
861.2	609.0 *3*	100			
1031.3	315.4 *3*				
	576.8 *3*				
1052.7	570.5 *3*	100			
1081.2	339.1 *4*	<22			
	671.1 *4*	100 *22*			
1082.1	576	100			
1111.0	656.4 *3*				
1345.6	629.7 *3*				
1678.3	647.0 *3*				
1774.9	722.2 *3*	100			

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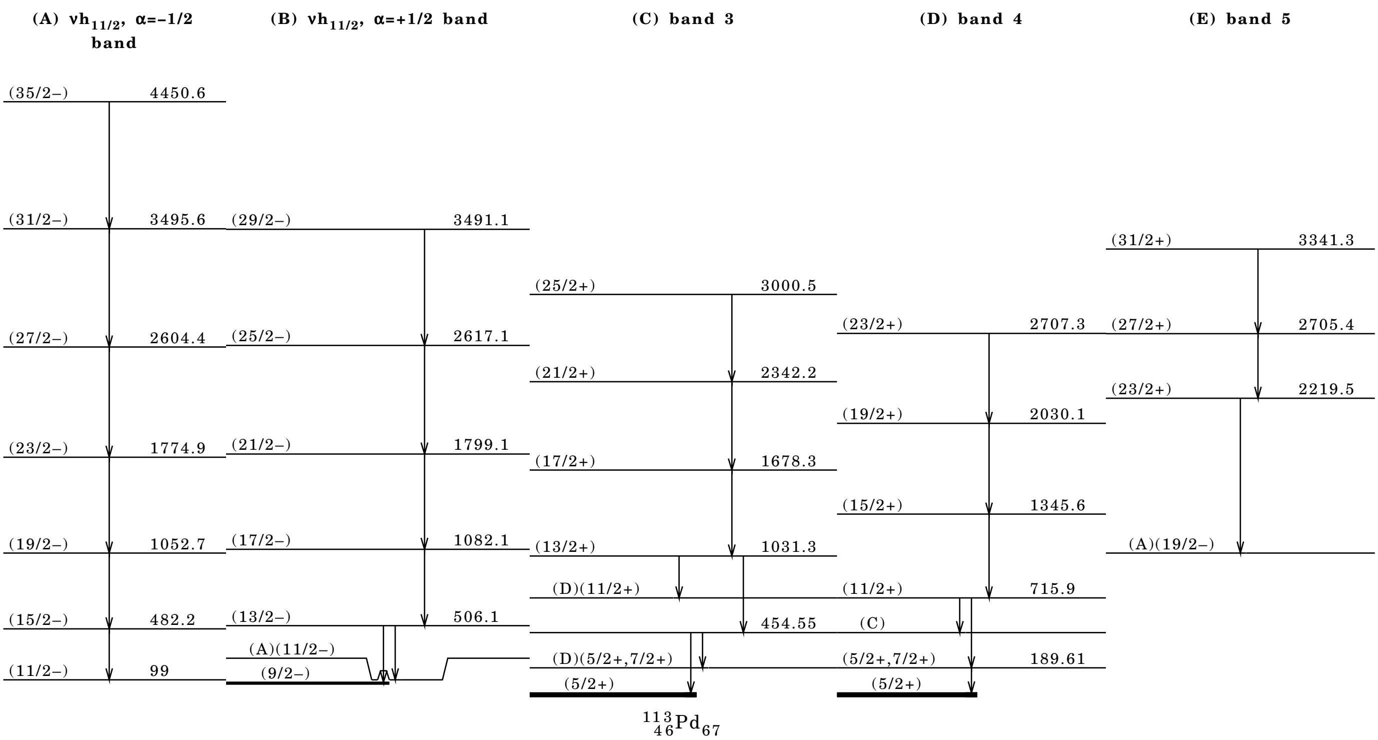
Adopted Levels, Gammas (continued)

$\gamma(^{113}Pd)$ (continued)

E(level)	Eγ‡	Iγ‡	E(level)	Eγ‡	Iγ‡	E(level)	Eγ‡	Iγ‡
1784.3	731.6 *3*		2604.4	829.5 *3*	100	3341.3	635.9 *3*	
1799.1	717 *1*	100	2617.1	818	100	3491.1	874	100
2030.1	684.5 *3*		2705.4	485.9 *3*		3495.6	891.2 *3*	100
2219.5	1166.8 *3*		2707.3	677.2 *3*		4450.6	955	100
2342.2	663.9 *3*		3000.5	658.3 *3*				

† From α(K)exp in ^{113}Ru β^- decay.
‡ From ^{113}Ru β^- decay placed below 482 keV and from ^{252}Cf SF for the others.



^{113}Rh β^- Decay 1993Pe11

Parent ^{113}Rh: E=0.0; Jπ=(7/2+); $T_{1/2}$=2.80 s *12*; Q(g.s.)=5010 *40*; %β^- decay=100.
Preliminary results given in 1992PeZX, same author.
Activity: $^{238}U(p,f)$, E=20 MeV, on-line isotope separator IGISOL.
Measured: γ, γγ, γ(t), ce, Ge(Li), Ge, Si(Li), elli spectrometer.
Evaluator considers the level scheme as preliminary.

^{113}Pd Levels

E(level)†	Jπ	$T_{1/2}$	Comments
0.0	(5/2+)	93 s *5*	$T_{1/2}$: from adopted levels.
35.08 *17*	(1/2+)		
81.1 *3*	(9/2−)	0.3 s *1*	$T_{1/2}$: from 1993Pe11. Other: 0.4 s (1992PeZX), preliminary, same authors.
151.88 *17*	(3/2+)		
172.55 *21*	(1/2+)		

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^{113}Rh β^- Decay 1993Pe11 (continued)

^{113}Pd Levels (continued)

E(level)[†]	Jπ	E(level)[†]	Jπ	E(level)[†]
189.60 *15*	(5/2+,7/2+)	409.26 *18*	+	742.3 *5*
252.18 *16*	(3/2+,1/2+)	454.6 *3*		861.2 *4*
349.13 *20*	(3/2+,5/2+,7/2+)	500.34 *23*		1081.2 *6*
372.97 *22*	(1/2+,3/2+,5/2+)	538.7 *4*		
408.8 *8*		730.6 *4*		

† From least-squares fit to γ energies.

β^- radiations

Eβ⁻	E(level)	Iβ⁻[†]	Log *ft*	Eβ⁻	E(level)	Iβ⁻[†]	Log *ft*
(3930 *40*)	1081.2	1.0 *2*	6.23 *9*	(4600 *40*)	409.26	2.2 *3*	6.19 *7*
(4150 *40*)	861.2	2.7 *3*	5.90 *6*	(4640 *40*)	372.97	2.2 *3*	6.20 *7*
(4270 *40*)	742.3	0.7 *2*	6.54 *13*	(4660 *40*)	349.13	42.1 *24*	4.93 *4*
(4280 *40*)	730.6	1.8 *2*	6.14 *6*	(4760 *40*)	252.18	1.3 *6*	6.48 *21*
(4470 *40*)	538.7	3.6 *4*	5.92 *6*	(4820 *40*)	189.60	10.6 *9*	5.59 *5*
(4510 *40*)	500.34	3.4 *4*	5.96 *6*	(4840 *40*)	172.55	1.4 *3*	6.48 *10*
(4560 *40*)	454.6	2.2 *3*	6.17 *7*	(4860 *40*)	151.88	3.7 *6*	6.07 *8*

† For β⁻ intensity per 100 decays, multiply by 1.0.

γ(^{113}Pd)

Iγ normalization: assuming no β feeding to g.s. (tentative).

Eγ	E(level)	Iγ[§]	Mult.[†]	α	Comments
34.9 *3*	35.08	1.2 *2*	E2	63.0	α(L)exp=29 *7*.
79.7 *3*	252.18	2.7 *3*	M1[‡]	0.727	Mult.: the electron intensity taken from the beta–gated electron spectrum. α(K)exp=0.56 *15*.
81.3 *3*	81.1	6.9 *4*	M2	8.7	Mult.: the ce(K) (79γ) (M1) is calculated and subtracted from the electron intensity. α(K)exp=5.4 *9*; K/L=4.1 *12*. B(M2)(W.u.)=0.00013 *5*.
ˣ84.9 *2*		8.2 *5*	E1	0.245	Mult.: the electron intensity taken from the beta–gated electron spectrum. α(K)exp=0.12 *3*.
96.8 *3*	349.13	1.8 *3*			
100.4 *3*	252.18	0.7 *1*			
116.8 *2*	151.88	9.7 *5*	M1,E2	0.247	α(K)exp=0.31 *3*.
ˣ119.4 *3*		0.5 *1*			
120.8 *3*	372.97	2.2 *3*	E2[‡]	0.715	α(K)exp=0.57 *12*.
ˣ135.0 *2*		2.8 *3*	M1	0.165	α(K)exp=0.15 *5*.
137.5 *2*	172.55	7.8 *3*	M1	0.157	α(K)exp=0.16 *3*.
151.8 *3*	151.88	7.4 *4*	M1	0.120	α(K)exp=0.08 *2*.
157.1 *3*	409.26	5.7 *4*			
159.9 *3*	349.13	4.8 *5*			
189.7 *2*	189.60	45.0 *8*	M1	0.0659	α(K)exp=0.063 *4*.
197.0 *4*	349.13	0.9 *3*			
217.0 *2*	252.18	9.1 *4*	M1,E2[‡]		α(K)exp=0.05 *3*.
219.6 *3*	409.26	10.3 *6*			
221.0 *3*	372.97	4.3 *5*			
236.7 *4*	409.26	0.9 *3*			
252.1 *3*	252.18	6.8 *5*	E2,M1[‡]		α(K)exp=0.04 *3*.
257.9 *4*	408.8	2.7 *4*			
265.5 *3*	454.6	2.8 *4*			
310.8 *4*	500.34	1.2 *3*			
ˣ332.7 *3*		2.0 *3*			
332.7 *3*	742.3	2.0 *3*			
339.1 *4*	1081.2	<0.5			

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^{113}Rh β^- Decay 1993Pe11 (continued)

$\gamma(^{113}Pd)$ (continued)

Eγ	E(level)	Iγ§	Mult.†	α	Comments
348.5 *6*	500.34	2.1 *5*			Iγ: from γγ.
348.9 *5*	349.13	100.0 *9*	M1,E2		Iγ: from γγ. α(K)exp=0.0144 *20*.
	538.7	2.1 *5*			
357.6 *3*	730.6	4.5 *3*			
373.1 *4*	372.97	1.8 *4*			
409.3 *3*	409.26	42.2 *8*	E2‡	0.0109	α(K)exp=0.020 *6*.
454.7 *4*	454.6	2.8 *4*			
500.3 *3*	500.34	5.5 *4*			
538.8 *4*	538.7	7.0 *5*			
x543.0 *4*		3.8 *4*			
609.0 *3*	861.2	6.8 *5*			
671.1 *4*	1081.2	2.3 *5*			
x749.1 *4*		1.7 *4*			
x932.7 *4*		3.8 *5*			
x980.0 *5*		2.0 *4*			
x1053.0 *5*		1.9 *4*			

† Simultaneous measurement of conversion electrons and gammas.

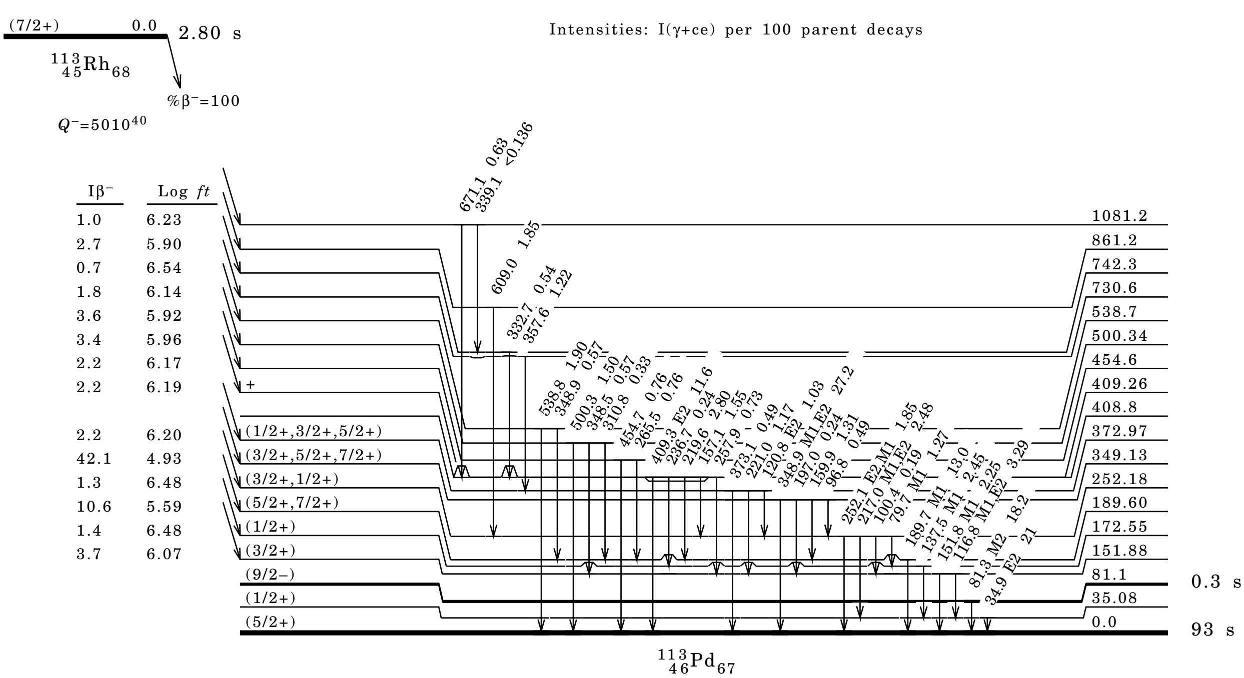
‡ Electron and gamma intensities are deduced from single spectra taken in separated runs. Normalized to the 189.7 keV transition (M1).

§ For absolute intensity per 100 decays, multiply by 0.272 *14*.

x γ ray not placed in level scheme.

Decay Scheme

Intensities: I(γ+ce) per 100 parent decays



^{113}Pd IT Decay 1993Pe11,1992PeZX

Parent ^{113}Pd: E=81.3; Jπ=(9/2−); $T_{1/2}$=0.3 s *1*; %IT decay=100.
Activity: ^{238}U(p,f), E=20 MeV, on–line isotope separator IGISOL.
Measured: γ, γγ, γ(t), ce, Ge(Li), Ge, Si(Li), elli spectrometer.

^{113}Pd Levels

E(level)	Jπ	$T_{1/2}$	Comments
0.0	(5/2+)	93 s *5*	
81.3	(9/2−)	0.3 s *1*	$T_{1/2}$: from 1993Pe11. Preliminary data: 0.4 s *1* (1992PeZX), same author.

γ(^{113}Pd)

Eγ	E(level)	Iγ‡	Mult.†	α	Comments
81.1 *3*	81.3	6.9 *4*	M2	8.7	α(K)exp=5.4 *9*; K/L=4.1 *12*. B(M2)(W.u.)=0.00013 *5*.

† Simultaneous measurement of γ and ce.
‡ For absolute intensity per 100 decays, multiply by 1.0.

^{252}Cf SF Decay 2000Zh04

Parent ^{252}Cf: E=0; Jπ=0+; $T_{1/2}$=2.645 y *8*; %SF decay=100.
Prompt γ rays from ^{252}Cf SF decay.
Measured Eγ, Iγ, γγ using GAMMASPHERE array with 72 Compton suppressed Ge detectors.

^{113}Pd Levels

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
0.0	(5/2+)	1110.9 *4*		2342.2@ *6*	(21/2+)
x§	(11/2−)	1345.6& *5*	(15/2+)	2505.3+x§ *6*	(27/2−)
189.8& *3*	(7/2+)	1670.7+x# *6*		2606.3+x# *6*	(27/2+)
383.1+x§ *3*	(15/2−)	1675.8+x§ *6*	(23/2−)	2707.3& *6*	(23/2+)
454.5@ *3*	(9/2+)	1678.3@ *5*	(17/2+)	3000.5@ *7*	(25/2+)
715.9& *3*	(11/2+)	1685.2+x# *6*		3242.2+x# *7*	(31/2+)
953.6+x§ *5*	(19/2−)	2030.1& *6*	(19/2+)	3396.5+x§ *7*	(31/2−)
1031.3@ *4*	(13/2+)	2120.4+x# *6*	(23/2+)		

† From least–squares fit to γ energies.
‡ From syst. and Band assignments.
§ (A): $\nu h_{11/2}$, α=−1/2 band.
# (B): band 2.
@ (C): band 3.
& (D): band 4.

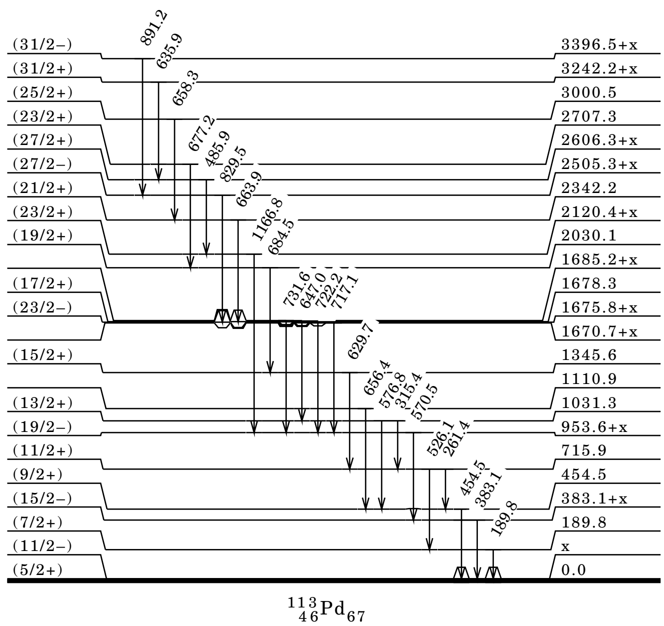
γ(^{113}Pd)

Eγ†	E(level)	Eγ†	E(level)	Eγ†	E(level)
189.8 *3*	189.8	576.8 *3*	1031.3	684.5 *3*	2030.1
261.4 *3*	715.9	629.7 *3*	1345.6	717.1 *3*	1670.7+x
315.4 *3*	1031.3	635.9 *3*	3242.2+x	722.2 *3*	1675.8+x
383.1 *3*	383.1+x	647.0 *3*	1678.3	731.6 *3*	1685.2+x
454.5 *3*	454.5	656.4 *3*	1110.9	829.5 *3*	2505.3+x
485.9 *3*	2606.3+x	658.3 *3*	3000.5	891.2 *3*	3396.5+x
526.1 *3*	715.9	663.9 *3*	2342.2	1166.8 *3*	2120.4+x
570.5 *3*	953.6+x	677.2 *3*	2707.3		

† ΔE not given in the paper, estimated 0.3 by evaluator.

^{252}Cf SF Decay 2000Zh04 (continued)

Level Scheme



^{208}Pb(^{18}O,Fγ) 1999Kr17

Prompt γ rays from heavy–ion induced fission.
E=91 MeV. Measured prompt γ, γγ using GAMMASPHERE array of 100 Compton suppressed HPGe detectors.

^{113}Pd Levels and Gammas

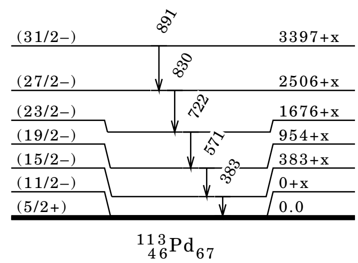
E(level)	Jπ
0.0	(5/2+)
0+x†	(11/2−)
383+x†	(15/2−)
954+x†	(19/2−)
1676+x†	(23/2−)
2506+x†	(27/2−)
3397+x†	(31/2−)

† (A): $\nu h_{11/2}$ band.

Eγ	E(level)
383	383+x
571	954+x
722	1676+x
830	2506+x
891	3397+x

^{208}Pb(^{18}O,Fγ) 1999Kr17 (continued)

Level Scheme



^{238}U(^{12}C,Fγ) 1999Ho25

Prompt γ rays from heavy−ion induced fission.

E=90 MeV. Measured Eγ, Iγ, γγ using Euroball III array with 15 Cluster Ge detectors, 26 Clover Ge detectors located in two rings around 90° and 30 tapered Ge detectors, with each Ge detector surrounded by its own BGO Compton suppression shield.

^{113}Pd Levels

E(level)	Jπ	$T_{1/2}$	E(level)	Jπ	E(level)	Jπ
0.0	5/2+		1053†	(19/2−)	2617‡	(25/2−)
81‡	9/2−	0.3 s	1082‡	(17/2−)	3491‡	(29/2−)
99†	(11/2−)		1775†	(23/2−)	3495†	(31/2−)
482†	(15/2−)		1799‡	(21/2−)	4450†	(35/2−)
506‡	(13/2−)		2605†	(27/2−)		

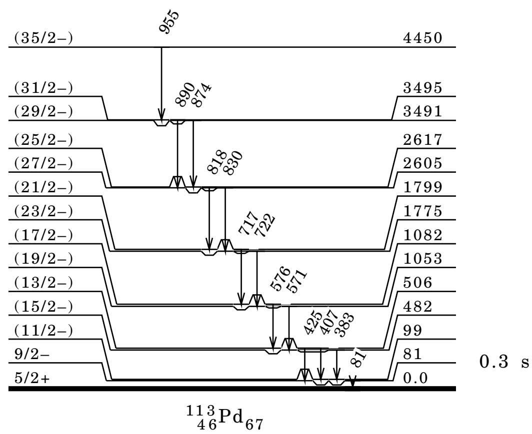
† (A): $\nu h_{11/2}$, α=−1/2 band.
‡ (B): $\nu h_{11/2}$, α=+1/2 band.

γ(^{113}Pd)

Eγ	E(level)	Comments
81	81	Eγ: from ENSDF for ^{113}Pd.
383	482	
407	506	
425	506	
571	1053	
576	1082	
717	1799	
722	1775	
818	2617	
830	2605	
874	3491	
890	3495	
955	4450	

$^{238}U(^{12}C,F\gamma)$ 1999Ho25 (continued)

Level Scheme



Adopted Levels, Gammas

Q(β^-)=2017 *16*; S(n)=8480 *23*; S(p)=7985 *24*; Q(α)=−4447 *20* 2003Au03.
1988KaZE suggest that the 222, 369, 476 levels could be intruder states and have tried to derive parameter sets for this collective rotational–like band with K=1/2.

^{113}Ag Levels

Cross Reference (XREF) Flags

A ^{113}Pd β^- Decay
B ^{113}Ag IT Decay

E(level)‡	Jπ	XREF	$T_{1/2}$	Comments
0.0	1/2−	A	5.37 h *5*	%β^-=100; μ=0.159 *2* (1989Ra17). Jπ: atomic beam (1976Fu06), negative parity from μ. $T_{1/2}$: from 1970Tr02. Other: 5.25 h *4* (1968RoZZ).
43.5 *1*	7/2+	AB	68.7 s *16*	%IT=64 *7*; %β^-=36 *7*. %IT: from 1990Fo07. Jπ: allowed β^- decay to 5/2+ level. E3 γ to 1/2−. $T_{1/2}$: weighted av of 67.8 s *21* (1974Gr29) and 70.0 s *25* (1975BrYM). Others: 72 s *9* (1958Al90), 66 s *12* (1970Ma47).
139.30 *15*	9/2+	A		Jπ: M1 γ to 7/2+ and syst.
222.08§ *13*	3/2+	A	23 ns *2*	Jπ: E1 γ to 1/2−, band assignment favors 3/2+.
270.82 *14*	(3/2−)†	A		Jπ: γ to 1/2−, not fed from (5/2)+ parent, no γ to 7/2+, syst.
273.59 *16*	(1/2)	A	≈30 ns	Jπ: γ's to 1/2− and 1/2+,3/2+, not fed from 5/2+ parent.
280.0§ *2*	1/2+	A		Jπ: member of the intruder band.
366.84 *20*	(5/2−)†	A		Jπ: γ's to 1/2− and 3/2−, syst favors 5/2−.
369.80§ *17*	7/2+	A	<0.8 ns	Jπ: E2 γ to 3/2+. γ to 9/2+.
476.70§ *14*	5/2+	A	<0.5 ns	Jπ: member of the intruder band.
526.16 *16*		A		
607.06 *23*		A		
611.31 *25*	(3/2−)†	A		Jπ: from syst.
673.35 *23*		A		
781.79 *20*	(5/2−)†	A		Jπ: γ's to 3/2− and sys.
783.16 *14*	(3/2,5/2,7/2)	A		Jπ: log *ft*≈6.1 from (5/2+).

† 1988KaZE have derived low–lying negative parity states in odd–mass Ag: A=^{107,109,111,113,115}Ag.
‡ From least–squares fit to γ energies.
§ (A): Intruder–rotational band (1990Ro16) with A=17.23, E0=228.9 keV, a=−1.92.

γ(^{113}Ag)

E(level)	Eγ†	Iγ†	Mult.‡	α	Comments
43.5	43.6 *2*	100	E3	1047	B(E3)(W.u.)=0.048 *6*.
139.30	95.74 *20*	100	M1	0.478	
222.08	222.06 *20*	100	E1	0.01660	B(E1)(W.u.)=1.13×10^{-6} *10*.
270.82	270.81 *20*	100			
273.59	51.5 *2*	25			
	273.6 *2*	100			
280.0	57.9 *3*	1.2 *6*			
	280.0 *2*	100 *4*			
366.84	96.0 *3*	76			
	366.8 *3*	100			
369.80	147.73 *20*	100	E2	0.362	B(E2)(W.u.)>110.
	230.49 *20*	77			
	326.28 *20*	60			
476.70	205.87 *20*	19			
	254.61 *20*	100			
	337.32 *20*	9			
	433.4 *2*	26			
526.16	49.6 *2*	2.3			
	386.9 *2*	16			
	482.4 *3*	100			
607.06	336.3 *3*	48			
	607.0 *3*	100			

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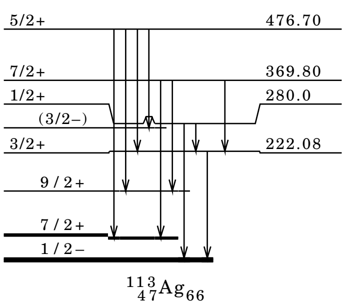
Adopted Levels, Gammas (continued)

γ(^{113}Ag) (continued)

E(level)	Eγ†	Iγ†
611.31	472.1 *3*	7
	567.7 *3*	100
673.35	534.2 *3*	100
	673.2 *3*	39
781.79	414.9 *3*	67
	510.9 *3*	100
	781.9 *3*	33
783.16	257.1 *3*	4.5
	643.7 *3*	100
	739.63 *3*	80

† From ^{113}Pd β⁻ decay.
‡ From α(K)exp in ^{113}Pd β⁻ decay and ^{113}Ag IT decay.

(A) intruder-rotational band (1990Ro16)



^{113}Pd β⁻ Decay 1988FoZY,1990Ro16

Parent ^{113}Pd: E=0.0; Jπ=(5/2+); $T_{1/2}$=93 s *5*; Q(g.s.)=3340 *30*; %β⁻ decay=100.
Activity: ^{235}U(n,f) on-line mass separator OSIRIS (1988FoZY).
Measured γ, Iγ, γγ, γ(t), β, βγ, ce, Ge(Li), Si detector (1988FoZY).
^{249}Cf(n,F) radiochemical separation (1990Ro16), measured: γ, γγ, γγ(t).
Others: 1958Al90, 1968Kj01, 1970Ar19, 1975BrYM, 1981Me17.
Decay mode: 81.5% *20* of ^{113}Pd decay is via 5.37-h ^{113}Ag and 18.5% *20* is via 68.7-s ^{113}Ag, from Iγ(5.37-h ^{113}Ag)/Iγ(68.7-s ^{113}Ag) (1975BrYM). Other: from Iβ(5.37-h ^{113}Ag)/Iβ(68.7-s ^{113}Ag), 90% *5* of ^{113}Pd decay is via 5.37-h ^{113}Ag (1958Al90).

^{113}Ag Levels

E(level)	Jπ†	$T_{1/2}$‡	Comments
0.0	1/2−	5.37 h *5*	
43.53 *14*	7/2+	68.7 s *16*	
139.30 *15*	9/2+		
222.08§ *13*	3/2+	23 ns *2*	Jπ: 3/2+.
270.82 *14*	(3/2−)		Jπ: 3/2−.
273.59 *16*	(1/2)	30 ns *+30−15*	Jπ: 1/2+,3/2+.
280.0§	1/2+		
366.84 *20*	(5/2−)		Jπ: 5/2−.
369.80§ *17*	7/2+	<0.8 ns	
476.70§ *14*	5/2+	<0.5 ns	

Continued on next page (footnotes at end of table)

^{113}Pd β⁻ Decay 1988FoZY,1990Ro16 (continued)

^{113}Ag Levels (continued)

E(level)	Jπ†	Comments
526.16 *16*		
607.06 *23*		
611.31 *25*	(3/2−)	
673.35 *23*		
781.79 *20*	(5/2−)	
783.16 *14*	(3/2,5/2,7/2)	Jπ: 5/2+,7/2+.

† Adopted values. Jπ given by 1988FoZY are shown under comments.
‡ Levels>43 keV $T_{1/2}$ are from 1988FoZY, other from adopted levels.
§ (A): Intruder rotational band (1990Ro16) with A=17.23, E0=228.9 keV a=−1.92.

β⁻ radiations

Eβ⁻	E(level)	Iβ⁻†	Log *ft*
(2560 *30*)	783.16	7.2	6.1
(2560 *30*)	781.79	0.46	7.3
(2670 *30*)	673.35	0.36	7.5
(2730 *30*)	607.06	0.41	7.5
(2860 *30*)	476.70	0.59	7.4
(2970 *30*)	369.80	0.9	7.3
(2970 *30*)	366.84	0.84	7.3
(3120 *30*)	222.08	1.14	7.3
(3200 *30*)	139.30	1.89	7.1
(3300 *30*)	43.53	86	5.5

† For β⁻ intensity per 100 decays, multiply by 1.0.

γ(^{113}Ag)

Iγ normalization: from ΣI(γ+ce) to g.s.=81.5 *20* assuming Iβ(g.s.)=0. (ΔJ=2, Δπ=−). 1990Fo07 give Iγ(222γ)=2.3%.

Eγ†	E(level)	Iγ†§	Mult.‡	α	Comments
43.6 *2*	43.53	0.15	E3	1047	α(K)exp=90 *40*; α(L)exp=700 *300*. α(K)=95.5; α(L)=745; α(M)=155.3. B(E3)(W.u.)=0.074 *4*.
49.6 *2*	526.16	0.04			
51.5 *2*	273.59	0.01			
57.9 *3*	280.0				Eγ,Iγ: from 1990Ro16. Iγ(280)=100 *4*, Iγ(57.9)=1.2 *6*.
95.74 *20*	139.30	6.5	M1	0.478	α(K)exp=0.46 *4*. α(K)=0.415; α(L)=0.0515; α(M)=0.00975; α(N+..)=0.00196.
96.0 *3*	366.84	0.50			
147.73 *20*	369.80	0.35	E2	0.362	α(K)exp=0.38 *15*. α(K)=0.294; α(L)=0.0557; α(M)=0.01075; α(N+..)=0.00200. B(E2)(W.u.)>110.
178.5	222.08	0.02	[E2]		Eγ,Iγ: from 1990Ro16. B(E2)(W.u.)=0.034 *4*.
205.87 *20*	476.70	0.08			
222.06 *20*	222.08	2.4	E1	0.0166	α(K)exp≤0.03. B(E1)(W.u.)=1.12×10^{-6} *10*.
230.49 *20*	369.80	0.27			
254.61 *20*	476.70	0.43			
257.1 *3*	783.16	0.27			
270.81 *20*	270.82	1.1			
273.6 *2*	273.59	0.04			
280.0 *2*	280.0				
326.28 *20*	369.80	0.21			
336.3 *3*	607.06	0.11			
337.32 *20*	476.70	0.04			
366.8 *3*	366.84	0.66			
386.9 *2*	526.16	0.28			
414.9 *3*	781.79	0.14			
433.4 *2*	476.70	0.11			
472.1 *3*	611.31	0.11			
482.6 *2*	526.16	1.7			
510.9 *3*	781.79	0.21			

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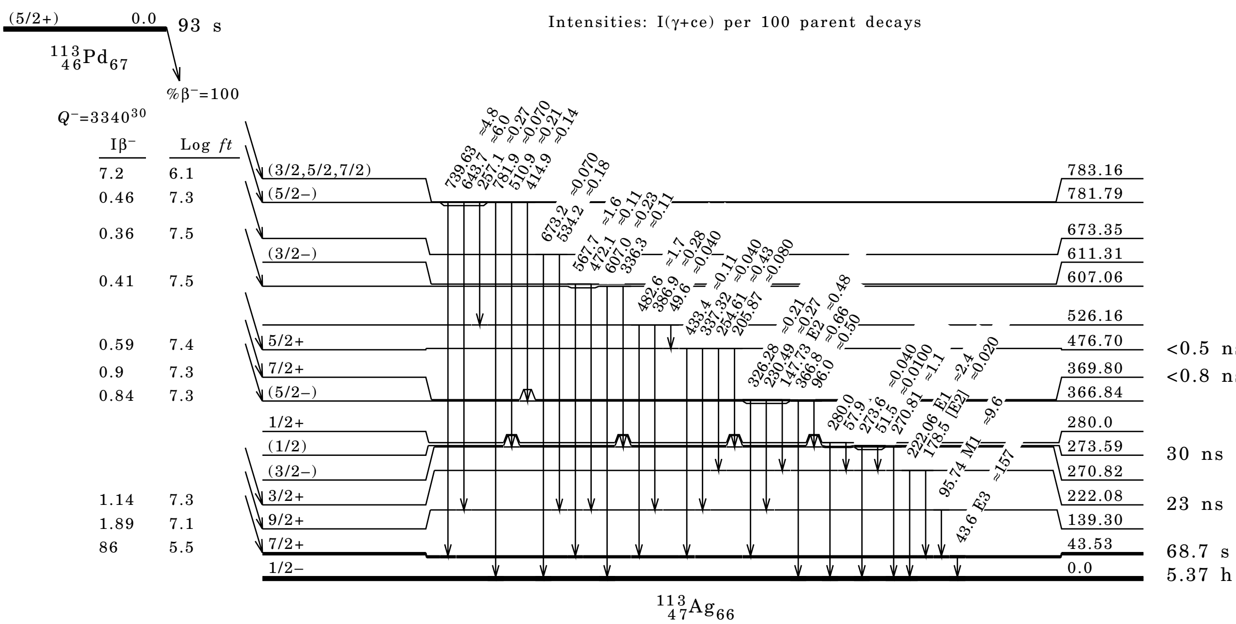
^{113}Pd β^- Decay 1988FoZY,1990Ro16 (continued)

γ(^{113}Ag) (continued)

Eγ†	E(level)	Iγ†§
534.2 *3*	673.35	0.18
567.7 *3*	611.31	1.6
607.0 *3*	607.06	0.23
643.7 *3*	783.16	6.0
673.2 *3*	673.35	0.07
739.63 *3*	783.16	4.8
781.9 *3*	781.79	0.07

† From 1988FoZY.
‡ From α(K)exp (1988FoZY). The conversion coefficients were determined by simultaneous measurements of γ and ce.
§ For absolute intensity per 100 decays, multiply by ≈1.0.

Decay Scheme



^{113}Ag IT Decay 1990Fo07

Parent ^{113}Ag: E=43.6 *2*; Jπ=7/2+; $T_{1/2}$=68.7 s *16*; %IT decay=64 *7*.
Activity: ^{235}U(n,f) on-line mass separator OSIRIS.
Measured γ, Iγ, γγ, γ(t), β, βγ, ce, Ge(Li), Si detector (1988FoZY).
%IT: 1990Fo07 have measured %IT=64 *7*.

^{113}Ag Levels

E(level)	Jπ	$T_{1/2}$†
0.0	1/2−	5.37 h *5*
43.6 *2*	7/2+	68.7 s *16*

† From adopted levels.

^{113}Ag IT Decay 1990Fo07 (continued)

$\gamma(^{113}Ag)$

Eγ	E(level)	Iγ†	Mult.	α	I(γ+ce)†	Comments
43.6 *2*	43.6	0.64 *7*	E3	1047	100	α(K)exp=90 *40*; α(L)exp=700 *300*. B(E3)(W.u.)=0.048 *6*.

† For absolute intensity per 100 decays, multiply by 0.64 *7*.

Adopted Levels, Gammas

Q(β⁻)=320 *3*; S(n)=6540.1 *6*; S(p)=9714 *17*; Q(α)=−3868 *3* 2003Au03.
Neutron resonance parameters can be found in 1981MuZQ.

^{113}Cd Levels

Cross Reference (XREF) Flags

A ^{113}Ag β⁻ Decay (5.37 h)
B ^{113}Ag β⁻ Decay (68.7 s)
C ^{113}Cd IT Decay (14.1 y)
D ^{112}Cd(n,γ) E=res
E ^{112}Cd(d,p),^{114}Cd(d,t)
F ^{113}Cd(p,p'),(p,p'γ)
G ^{113}Cd(d,d')
H Coulomb Excitation
I ^{113}Cd(n,n'γ)
J ^{113}Cd(γ,γ')
K ^{110}Pd(α,nγ)
L ^{176}Yb(^{28}Si,Fγ)
M ^{173}Yb(^{24}Mg,Fγ)

E(level)‡	Jπ	XREF	$T_{1/2}$	Comments
0.0	1/2+	ABCDEFGHIJKLM	7.7×10^{15} y *3*	%β⁻=100; μ=−0.6223009 *9* (1989Ra17). μ: optical pumping, NMR. Jπ: NMR and optical spectroscopy (1976Fu06), L(d,p)=0. $T_{1/2}$: from 1996Da11 using scintillation crystals of CDW04. Other: 9.3×10^{15} y *19* (1970Gr20) from activity measurements on enriched and natural cadmium samples. Others: 1962Wa15, 1994Al49.
263.54§ *3*	11/2−	A C E KLM	14.1 y *5*	%IT=0.14; %β⁻=99.86 (1969De25); μ=−1.0877842 *17* (1989Ra17). Q=−0.71 *7* (1989Ra17). μ: NMR. Q: optical double res, recalculated. Jπ: optical double res (1976Fu06), 264γ is E5. $T_{1/2}$: unweighted av of 13.6 y *2* (1965Fl02) and 14.6 y *5* (1972Wa11), β(t) for about one half-life.
298.597 *10*	3/2+	AB E GHI K	29 ps *9*	$T_{1/2}$: from B(E2) in Coul. ex. μ=−0.39 *80* (1988Be45,1989Ra17). Jπ: M1+E2 γ to 1/2+.
316.206 *15*	5/2+	AB EF HI K	10.8 ns *3*	Jπ: L(d,p)(316)=2, L(d,p)(458)=4, and M1+E2 γ from 459 to 316 gives Jπ(316)=5/2+ and Jπ(458)=7/2+. $T_{1/2}$: weighted av of 10.7 ns *4* (1980Oh01), 11.0 ns *6* (1972RaZM). Other: 4.9 ns *7* from B(E2) in Coul. ex.
458.633 *17*	7/2+	B E I K		Jπ: see 316 level.
522.259 *24*	7/2−	A I K	0.322 ns *12*	Jπ: E2 γ to 11/2− and E1 γ to 5/2+. $T_{1/2}$: from γγ(t) (1980Oh01).
530 *10*	7/2+,9/2+	E		Jπ: from L(d,p)=4.
583.962 *24*	5/2+	AB E HI K	6.9 ps *14*	μ=+0.15 *12* (1988Be45,1989Ra17). Jπ: γ(θ) in Coul. ex. for E2 γ to 1/2+. $T_{1/2}$: from B(E2) in Coul. ex.
638.19 *3*	9/2−	A F I K		Jπ: M1+E2 γ to 11/2−. γ to 5/2+.
680.526 *20*	3/2+	A E HI K	12 fs *3*	$T_{1/2}$: from B(E2) in Coul. ex. Jπ: M1+E2 γ to 1/2+ and M1+E2 γ to 3/2+.
708.571 *19*	5/2+	AB HI K		Jπ: M1+E2 γ to 3/2+ and 7/2+.
760 *10*	1/2+	E		Jπ: L(d,p)=0.
815.34§ *3*	15/2−	KLM		
816.707 *22*	7/2+	E I K		Jπ: L(d,p)=4, and M1+E2 γ to 5/2+.
855.28 *3*	5/2−	A I K		Jπ: E2 γ to 9/2−, M1+E2 γ to 7/2−.
869.81 *22*	15/2−	I		Jπ: E2 γ to 11/2−, no γ to low J.
878.54 *6*	(3/2+)	I K		Jπ: γ's to 1/2+,5/2+,7/2+.
883.62 *6*	1/2+	E I K		Jπ: L(d,p)=0.
897.53 *4*	3/2+	E I K		Jπ: L(d,p)=2, σ(d,p)/σ(d,t) favors 3/2+.
939.788 *19*	9/2+	I K		Jπ: E2 γ to 5/2+ and M1+E2 γ to 7/2+.
960 *10*		E		
988.40 *6*	1/2+	A E I K		Jπ: L(d,p)=0.
999.42 *7*		K		
1002.87 *4*	3/2+	A E I		Jπ: M1+E2 γ's to 1/2+ and 5/2+.
1007.20 *5*	(5/2+)	B E I K		Jπ: log *ft*≈5.3 from 7/2+, M1+E2 γ decay to 5/2+.
1034.09 *6*	(3/2+)	I K		Jπ: M1+E2 γ's to 1/2+ and 5/2+.
1037.40 *3*	(7/2+)	I K		Jπ: E2 γ to 3/2+ and M1+E2 γ to 5/2+.
1047.65 *4*	7/2+	B I K		Jπ: log *ft*≈5.6 from 7/2+, γ(θ) in (n,n'γ).

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Adopted Levels, Gammas (continued)

^{113}Cd Levels (continued)

E(level)‡	Jπ	XREF	Comments
1049.66 *9*	3/2+	A I K	Jπ: M1 γ to 1/2+, and av res in (n,γ).
1051.248 *22*	7/2−	I K	Jπ: M1+E2 γ to 9/2−, γ to 5/2−.
1109.32 *3*	13/2−	I K	
1124.636 *20*	9/2+	I K	
1126.25 *6*	3/2+	A E I K	Jπ: M1 γ to 1/2+, and av res in (n,γ).
1170 *20*		E	
1177.723 *23*	(9/2−)	K	
1177.8 *3*	(3/2+)	I K	Jπ: M1+E2 γ to 1/2+.
1181.35 *4*		K	
1190.72 *5*		K	
1192.09 *4*	−	K	
1194.6 *2*	3/2−	A I K	Jπ: M1+E2 γ to (5/2−), av res.
1195.30 *20*	5/2+,7/2+,9/2+	B E K	XREF: E(1200). Jπ: log *ft*=5.3 from 7/2+.
1209.53 *15*	13/2−	I	Jπ: M1+E2 γ to 11/2−, γ to 15/2−.
1214.674 *24*	11/2+	I K	Jπ: E2 γ to 7/2+ and M1+E2 γ to 9/2+.
1261.92 *4*	(9/2)	K	
1268.21 *5*	3/2+	I K	Jπ: M1+E γ's to 1/2+ and 5/2+.
1279.62 *7*	3/2+	E I K	Jπ: L(d,p)=2.
1301.07 *7*	3/2+,5/2+	I	Jπ: γ's to 1/2+,5/2+.
1313.75 *3*	(5/2+)	I K	Jπ: γ's to 5/2+,7/2+ and syst.
1322.03 *12*	(7/2−,9/2−)	E I K	Jπ: γ's to 7/2−,11/2−.
1327.6 *4*		K	
1346.53 *4*	11/2−	K	E(level): 1991NeZX suggested a 1423−keV level with Jπ=11/2− based on syst, but not confirmed by 1997Wa20 in (α,nγ).
1351.58 *7*	5/2,7/2	I	Jπ: γ's to 5/2+,7/2−.
1364.76 *7*		I K	
1367.569 *24*	7/2+	K	
1387.47 *8*	5/2+,3/2+	I K	Jπ: γ's to 1/2+,5/2+.
1390.56 *9*	(1/2+,3/2+)	E I	Jπ: γ's to 1/2+,3/2+.
1395.83 *3*	(9/2+)	I K	
1405.82 *10*	(1/2+,3/2+)	I K	Jπ: γ's to 1/2+,3/2+.
1407.5 *3*	(9/2+)	I	Jπ: from syst, analog to 1552 keV in ^{111}Cd.
1410.68 *6*		K	
1430 *10*	(3/2)+	E	Jπ: L(d,p)=2, σ(d,p)/σ(d,t) favors 3/2+.
1450.30 *7*		A I K	
1461.67 *4*		K	
1479.08 *5*	3/2+	A E I	Jπ: from L(d,p)=2 at 1490 *10* with σ(d,p)/σ(d,t) favoring 3/2+, av res.
1493.03 *9*	1/2+,3/2+	I	Jπ: M1+E2 to 5/2+ and γ to 1/2+.
1504.90 *4*	7/2+	K	
1513.72 *4*		K	
1542.28 *9*	(1/2+)	E I	Jπ: γ's to 1/2+,3/2+.
1561.69 *3*	+	I K	
1575.66 *14*	7/2−	E I	Jπ: L(d,p)=(3).
1607.21 *10*	5/2+	E I	Jπ: L(d,p)=2, σ(d,p)/σ(d,t) favors 5/2+.
1620.43 *3*		K	
1626.41 *4*		K	
1647.23 *5*		K	
1656.6§ *3*	(19/2−)	L	
1657.41 *5*	11/2−	I KLM	
1658.51 *7*		K	
1670.89 *10*		K	
1675.09 *9*	3/2+	E I	Jπ: L(d,p)=(2).
1732.84 *4*	11/2+	I K	
1737.53 *7*		K	
1743.56 *21*		K	
1746.00 *14*	(3/2−)	I	Jπ: γ's to 1/2+,5/2−.
1758† *10*	(5/2−,7/2−)	FG	Jπ: L(p,p')=3. π=+ is assigned in (d,d').
1778.92 *18*	9/2−	I	Jπ: E2 γ to 13/2− and M1+E2 γ to 11/2−.
1798.89 *12*	(1/2,3/2)	I	Jπ: γ to 1/2+.
1813 *10*	(1/2,3/2)	E J	Jπ: excitation in (γ,γ').

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Adopted Levels, Gammas (continued)

^{113}Cd Levels (continued)

E(level)[‡]	Jπ	XREF	$T_{1/2}$	Comments
1823.24 *4*	(13/2−)	I K		
1842.74 *13*	(3/2−)	E I		Jπ: γ's to 7/2−,3/2−.
1867.86 *8*	7/2−,9/2−	I		Jπ: γ's to 11/2−,5/2−.
1871.7 *3*		K		
1892.32[†] *11*	7/2−	F I K		Jπ: L(p,p')=3, E2 γ to 11/2−.
1896.44 *4*		K		
1900 *10*	(1/2+)	E		Jπ: L(d,p)=(0).
1902.41 *5*		I K		
1903.97 *9*		K		
1904.35 *11*	(5/2,7/2)	I		Jπ: γ's to 7/2+.
1942		J	607 fs *+90−70*	$T_{1/2}$: from (γ,γ').
1986[†] *10*	5/2−,7/2−	EF		Jπ: L(p,p')=3.
2037.76 *18*	5/2−,7/2−	E I		Jπ: L(d,p)=3.
2042.06 *6*		K		
2046.23 *7*	(15/2+)	K		
2080 *10*	(1/2+)	E		Jπ: L(d,p)=(0).
2113.04 *22*	7/2−	E I		Jπ: L(d,p)=(3), preferred from shell−model syst.
2120 *20*		E		
2140 *20*	(1/2+)	E		Jπ: L(d,p)=(0).
2146.81 *5*		K		
2164.48 *11*		K		
2173.60 *12*	3/2−	E IJ	90 fs *7*	Jπ: L(d,p)=1, 3/2, preferred from shell−model syst. $T_{1/2}$: from (γ,γ').
2180 *10*	(3/2)−	E J	228 fs *+85−50*	Jπ: L(d,p)=1, 3/2, preferred from shell−model syst. $T_{1/2}$: from (γ,γ').
2219.64 *4*		K		
2240 *10*	(5/2−,7/2−)	E		Jπ: L(d,p)=(3).
2270 *10*		E		
2319.62 *18*	3/2−	E I		Jπ: L(d,p)=(1), M1+E2 γ to 5/2−.
2324.5[#] *4*	(21/2+)	L		
2330 *10*		E		
2354		J	3.0×10^{2} fs *+16−6*	$T_{1/2}$: from (γ,γ').
2370 *10*		E		
2410 *10*	7/2+,9/2+	E		Jπ: L(d,p)=4.
2440 *10*		E		
2538.3[@] *4*	(19/2+)	L		
2540 *10*	(7/2−)	E		Jπ: L(d,p)=(3), preferred from shell−model syst.
2580 *10*	(3/2−)	E J		Jπ: L(d,p)=(1), preferred from shell−model syst.
2613.4[§] *4*	(23/2−)	LM		
2630 *10*	(1/2+)	E		Jπ: L(d,p)=(0).
2690 *10*		E		
2757.8[#] *4*	(25/2+)	L		
2759.33 *13*	(3/2+,5/2+)	E I		Jπ: γ's to 3/2+,7/2+.
2770 *10*	(3/2−)	E		Jπ: from L(d,p)=(1), preferred from shell−model syst.
2810 *10*	1/2+	E		Jπ: L(d,p)=0.
2962.6[@] *4*	(23/2+)	L		
3448.9[§] *4*	(27/2−)	LM		
3473.9[#] *5*	(29/2+)	L		
4201.5[§] *5*	(31/2−)	LM		

† From ^{113}Cd(p,p').

‡ From least−squares fit to Γ energies.

§ (A): Member of ΔJ=2 band on 11/2− band.

\# (B): Band based on 23/2−.

@ (C): Band based on (19/2).

Adopted Levels, Gammas (continued)

γ(^{113}Cd)

E(level)	Eγ[†]	Iγ[†]	Mult.[‡#]	δ[#]	α	Comments
263.54	263.7 3	100	E5		5.1	Mult.,Eγ: from ^{113}Cd IT decay (14.1 y). B(E5)(W.u.)=0.0499 23.
298.597	298.60 1	100	M1+E2[§]	+0.30 +3−1	0.029 5	δ: δ from 1987BaYW in (n,n'γ) is discrepant with δ>1.1 in β⁻ decay, but agrees with δ=0.29 1 (1958Mc02) in Coul. ex. B(M1)(W.u.)=0.025 8; B(E2)(W.u.)=20 8.
316.206	17.78 9	3.1 4	M1[§]		10.2	B(M1)(W.u.)=0.0082 12.
	316.21 2	100 4	E2		0.0274	B(E2)(W.u.)=0.372 25.
458.633	142.42 1	100	M1+E2	−0.04 3		
522.259	205.86 8	1.22 12	E1			B(E1)(W.u.)=1.19×10^{-6} 13.
	258.72 2	100.0 19	E2[§]		0.044 9	B(E2)(W.u.)=44.2 22.
583.962	126 1	<10				Eγ: not seen in ^{113}Cd(n,n'γ).
	267.77 6	2.5 2				
	285.3 1	1.4 2	M1,E2			
	583.93 7	100 1	E2			Mult.: see Coul. ex. B(E2)(W.u.)=34 8.
638.19	115.6 2	12.5 19	D			
	374.64 3	100	M1+E2	−0.25 2		
680.526	96.9 3	5.3 3	[M1,E2]		1.1 6	
	364.31 3	20.1 4	M1+E2	−0.02 7		B(M1)(W.u.)=5.0 13; B(E2)(W.u.)=12 +84−12.
	381.95 3	20.9 4	M1+E2	+0.16 15		B(M1)(W.u.)=4.4 12; B(E2)(W.u.)=6.×10^{2} +12−6.
	680.6 1	100.0 23	M1+E2	−1.8 1		B(M1)(W.u.)=0.90 24; B(E2)(W.u.)=5.0×10^{3} 13.
708.571	249.95 2	11 1	M1+E2	+0.34 8		
	392.36 2	100 2	M1+E2	−0.24 4		
	410.11 9	11 2	M1+E2	−0.10 4		
	708.52 5	100 2				
815.34	551.79 1	100	E2			
816.707	358.09 5	35 1				
	500.47 3	100 2	M1+E2	−0.45 16		
	517.67 15	3.2 2				
855.28	217.08 3	4.7 3	E2			
	332.99 3	100 2	M1+E2[§]	−0.27 2		
	539.3 1	2.7 9	E1			
869.81	606.3 3	100	E2			
878.54	294.52[@] 21	48[@] 14				
	419.8 3	9.2 23				
	562.26 9	100 15				
	878.62 9	100 15				
883.62	585 1	3.5 18				
	883.6 1	100.0 25				
897.53	313.48 6	12.4 4	M1+E2	+0.41		
	439.7 5	22.4 7				
	581.26 9	9 4				
	598.95 5	100 2	E2			
939.788	481.13 2	100 2	M1			
	623.58[@] 2	51[@] 2	E2			
988.40	279.8 2	2.5 4				
	988.43 7	100 8				
999.42	540.78 6	100				
1002.87	294.52[@] 21	44[@] 13				
	322.35 3	100 7	M1+E2	−0.8 2		Mult.: δ=−0.8 2 or −2.2 10.
	1002.76 9	59 11	M1			
1007.20	423.3 2	6.5 12	M1			
	548.54 5	35 7	M1			
	691.00 8	100 15	M1+E2	0.35 5		
1034.09	449.9 3	4.8 10	M1			
	735.1 3	68 18	M1			
	1033.80 12	100 20	M1+E2	0.52 22		
1037.40	356.7 4	9 3	E2			
	453.44 1	14 3	M1			
	721.22 8	100 28	M1+E2	0.29 1		
	738.76 9	88 24	E2			
	1037.2 1	55 5				

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

γ(^{113}Cd) (continued)

E(level)	Eγ†	Iγ†	Mult.‡#	δ#	Comments
1047.65	231.0 *1*	2.2 *9*			
	463.69 *13*	16 *2*	M1		
	589.02 *4*	42 *2*	M1+E2	+0.12 *+17−7*	
	731.3 *4*	100 *4*	M1		
1049.66	369.1 *1*	18 *4*	M1		
	733.3 *5*	22 *11*			Eγ: not seen in ^{113}Cd(n,n'γ) and (α,nγ).
	1049.75 *16*	100 *7*	M1+E2	+0.49 *8*	
1051.248	370.72 *1*	21 *4*			
	412.90 *6*	100 *2*	M1+E2	−0.41 *1*	
	528.81 *8*	49 *2*			
1109.32	293.79 *7*	24.0 *8*			
	471.20 *5*	4.3 *7*	E2		
	845.78 *1*	100 *2*	D		
1124.636	184.83 *2*	6.3 *8*			
	307.89 *2*	19.1 *10*	D		
	416.09 *4*	23.9 *10*	E2		
	666.1 *1*	100 *3*			
	808.48 *2*	41 *3*	E2		
1126.25	242.64 *4*	1.2 *3*	M1		
	827.6 *3*	12 *4*	M1		
	1126.20 *8*	100 *6*	M1+E2	−0.02 *3*	Mult.: E2 is ruled out, ΔI=0.
1177.723	126.48 *1*	33 *3*	E2		
	322.36 *6*	60.8 *23*			
	655.48 *1*	100 *4*	M1+E2	−0.001 *2*	
1177.8	879.2 *3*	100			
1181.35	543.20 *5*	11 *4*			
	659.08 *3*	100 *7*			
1190.72	892.12 *5*	100			
1192.09	553.9 *4*	100 *6*	M1+E2	0.0 *1*	
	670.2 *5*	37 *3*			Eγ: placed as deexciting a 2094 level by 1991NeZX in (n,n'γ).
1194.6	339.33& *2*	99& *5*	M1+E2	−0.20 *15*	
	611.0 *5*	4.0 *4*	E1		
	672.34 *2*	100 *6*	E2		
	1194.4 *1*	12.9 *13*	E1		
1195.30	896.7 *2*	100			
1209.53	945.96 *15*	100 *18*	M1		
1214.674	274.89 *4*	7 *4*	M1		
	756.03 *2*	100 *3*	E2		
1261.92	444.9 *5*	38 *8*			
	677.95 *4*	79 *10*			
	803.23 *5*	100 *11*	D		
	946.0 *1*	67 *33*			
1268.21	969.59 *5*	58 *8*			
	1268.5 *2*	100 *10*	M1		
1279.62	232.6 *3*	0.8 *6*			
	291.54 *25*	1.7 *5*	M1		
	963.25 *15*	2.7 *8*	M1		
	980.94 *25*	2.3 *8*	M1		
	1279.84 *10*	100 *10*	M1		
1301.07	174.79 *9*	16 *5*			
	717.13 *11*	100 *19*			
	1301.07 *10*	26 *5*			
1313.75	729.79 *2*	100 *4*	E2		
	855.10 *6*	6.9 *17*			
1322.03	799.9 *6*	97 *4*			
	1058.48 *11*	100 *27*			
1327.6	743.6 *4*	100			
1346.53	824.27 *3*	100	E2		
1351.58	344.31 *12*	6.7 *16*			
	496.8 *3*	22 *7*			
	767.65 *13*	100 *17*			
	829.4 *3*	61 *21*			
	892.9 *3*	8 *3*			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

$\gamma(^{113}Cd)$ (continued)

E(level)	Eγ†	Iγ†	Mult.‡#	δ#	Comments
1351.58	1052.95 *12*	39 *11*			
1364.76	780.81 *11*	36 *11*			
	906.1 *3*	17.1 *14*			
	1066.16 *8*	100 *7*			
1367.569	153.0 *1*	3.0 *13*			
	427.71 *16*	50 *3*	D		
	469.5 *5*	1.5 *15*			
	550.86 *1*	100 *15*	M1+E2	−0.006 *7*	
	909.5 *8*	15 *10*			
1387.47	928.77 *18*	77 *23*			
	1088.89 *9*	100 *23*			
	1387.3 *5*	13 *6*			
1390.56	264.2 *4*	10 *3*			
	402.19 *13*	18 *5*			
	1092.18 *21*	11 *6*			
	1390.42 *15*	100 *29*			
1395.83	937.19 *3*	73 *7*			
	1079.63 *4*	100 *7*			
1405.82	1107.11 *18*	100 *27*			
	1405.85 *11*	86 *17*			
1407.5	823.64	100 *20*			
	948.9 *3*	7 *3*			
1410.68	952.04 *5*	100			
1450.30	171.07 *12*	46 *13*			Eγ: this γ is not seen in (α,nγ).
	770.42 *16*	100 *30*			
1461.67	606.39 *3*	100	D		
1479.08	623.59@ *7*	100@ *22*			
	770.42 *16*	33 *10*			
	1180.8 *3*	31 *7*			
	1479.2 *1*	67 *10*			
1493.03	224.69 *25*	2.7 *9*			
	784.6 *3*	10 *4*			
	812.7 *4*	12 *5*			
	909.12 *13*	33 *10*			
	1176.76 *15*	100 *27*	M1+E2	+0.23 *17*	
	1492.88 *25*	5.5 *18*			
1504.90	920.94 *3*	100	E2		
1513.72	335.98 *9*	100			
	875.54 *3*	100 *5*	E2		
	929.4 *2*	28 *6*			
1542.28	539.39 *22*	78 *15*			
	658.66 *8*	100 *37*			
1561.69	621.5 *2*	21 *6*			
	664.13 *5*	82 *5*	E2		
	744.99 *2*	100 *5*			
1575.66	937.2 *3*	100 *29*			
	1312.18 *15*	54 *13*			
1607.21	926.6 *4*	48 *20*	M1		
	1023.0 *3*	100 *40*	M1		
	1308.70 *11*	57 *13*	M1		
	1606.96 *22*	13 *3*	E2		
1620.43	765.15 *1*	44 *4*	D		
	1098.06 *7*	100 *12*			
1626.41	501.77 *3*	100	M1+E2	0.00 *3*	
1647.23	707.44 *4*	100			
1656.6	842.0 *2*	100			
1657.41	842.06 *3*	100	E2		
1658.51	1020.6 *5*	57 *7*			
	1135.8 *2*	79 *8*			
	1394.8 *1*	100 *13*			
1670.89	561.56 *9*	100			
1675.09	791.49 *15*	100 *29*	M1		
	994.53 *11*	95 *19*	M1		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

$\gamma(^{113}Cd)$ (continued)

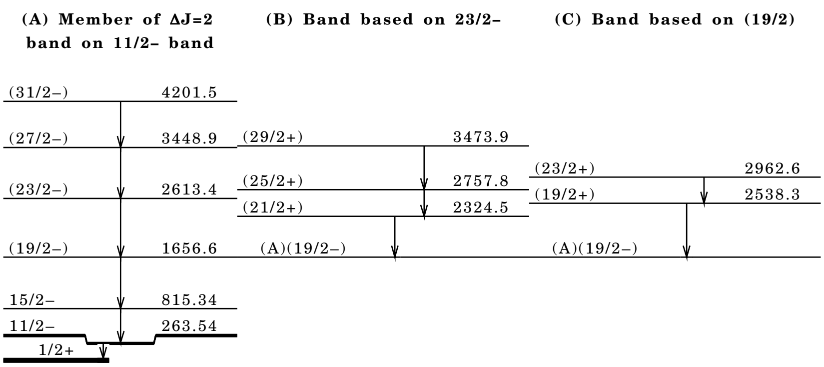
E(level)	Eγ†	Iγ†	Mult.‡#	δ#	Comments
1675.09	1376.64 *25*	66 *26*	M1		
1732.84	365.4 *1*	23 *23*			
	518.15 *3*	33 *3*	D		
	793.4 *3*	100 *8*			
1737.53	1215.27 *6*	100			
1743.56	1221.3 *2*	100			
1746.00	890.84 *22*	62 *19*			
	1429.9 *4*	50 *15*			
	1746.0 *5*	100 *35*			
1778.92	569.3 *3*	21 *5*	E2		
	1515.4 *2*	100 *19*	M1		
1798.89	765.1 *3*	14 *6*			
	1214.8 *2*	100 *14*			
	1482.9 *3*	11 *4*			
	1798.7 *3*	3.6 *7*			
1823.24	713.91 *5*	64 *7*	M1+E2	−0.01 *2*	
	1007.90 *3*	100 *7*			
1842.74	648.26 *25*	87 *34*			
	1320.43 *15*	100 *17*			
1867.86	1012.91 *21*	73 *23*			
	1345.56 *8*	100 *7*			
	1604.23 *23*	17 *4*			
1871.7	931.9 *3*	100			
1892.32	1036.87 *15*	100 *30*	M1		
	1370.22 *15*	67.8 *7*			
	1628.8 *4*	26 *7*	E2		
1896.44	237.78 *8*	14 *3*			
	238.96 *9*	11 *3*			
	787.12 *2*	100 *8*	E2		
	1081.38 *20*	62 *14*			
1902.41	534.87 *5*	100 *5*	M1+E2	0.00 *5*	
	687.6 *1*	60 *5*			
1903.97	1088.63 *8*	100			
1904.35	856.73 *25*	7 *3*			
	1445.70 *11*	100 *17*			
2037.76	1097.89 *22*	69 *25*			
	1221.3 *4*	100 *8*			
	1579.1 *5*	16 *5*			
2042.06	1226.71 *5*	100			
2046.23	831.55 *6*	100	E2		
2113.04	1474.8 *3*	57 *28*	M1		
	1590.8 *3*	100 *26*	M1		
2146.81	633.08 *2*	100	(E2)		
2164.48	949.8 *1*	100			
2173.60	427.68 *16*	76 *15*	M1		B(M1)(W.u.)=0.87 *21*.
	979.08 *23*	38 *15*	M1		B(M1)(W.u.)=0.036 *16*.
	1289.4 *3*	59 *15*	E1		B(E1)(W.u.)=0.00032 *10*.
	2173.64 *21*	100 *18*	E1		B(E1)(W.u.)=0.00011 *3*.
2219.64	593.23 *2*	100 *1*	E2		
2319.62	1464.32 *18*	22 *6*	M1		
	2319.7 *6*	100 *41*	E1		
2324.5	667.9 *2*	100			
2538.3	881.7 *2*	100			
2613.4	956.8 *2*	100			
2757.8	433.3				
2759.33	960.46 *15*	13 *4*			
	1942.71 *25*	49 *15*			
	2460.6 *2*	100 *20*			
2962.6	424.3 *2*	100			
3448.9	835.5 *2*	100			
3473.9	716.1 *2*	100			
4201.5	752.6 *2*	100			

Footnotes continued on next page

Adopted Levels, Gammas (continued)

γ(^{113}Cd) (continued)

† From ^{113}Cd(n,n'γ) or ^{113}Ag β^- decay, except as noted. When the branching is discrepant between (n,n'γ) and decay evaluator has chosen (n,n'γ) because uncertainties are available.
‡ From ^{113}Cd(n,n'γ).
§ See ^{113}Ag β^- decay (5.37 h).
# From γ(θ) and linear polarization in ^{113}Cd(n,n'γ) and in (α,nγ), except as noted.
@ Multiply placed; undivided intensity given.
& Multiply placed; intensity suitably divided.



$^{113}_{48}Cd_{65}$

^{113}Ag β^- Decay (5.37 h) 1978Ma17,1970Ma47

Parent ^{113}Ag: E=0; Jπ=1/2–; $T_{1/2}$=5.37 h *5*; Q(g.s.)=2016 *17*; %β^- decay=100.
Measured Eγ, Iγ, Ice, γγ coin, β endpoint, βγ coin, 1978Ma17, 1970Ma47.
Others: 1958Al90, 1960Kj01, 1969Cl11, 1969Hn01, 1969Li20, 1973BuZW.

^{113}Cd Levels

E(level)	Jπ	$T_{1/2}$†	Comments
0.0	1/2+	7.7×10^{15} y *3*	
263.58 *13*	11/2–	14.1 y *5*	
298.53 *6*	3/2+		
316.18 *6*	5/2+	10.7 ns *4*	$T_{1/2}$: from βγ(t) with scin, 1980Oh01.
522.34 *9*	(7/2)–	0.322 ns *12*	$T_{1/2}$: from γγ(t) with scin, 1980Oh01.
584.06 *9*	5/2+		
638.06 *12*			
680.58 *7*	3/2+		
708.58 *12*	5/2+		
855.31 *8*	(5/2–)		
883.60 *10*	1/2+		
988.44 *8*	1/2+		
1049.90 *10*	3/2+		
1126.09 *8*	1/2+		
1194.66 *6*	(3/2–)		
1479.29 *7*	3/2+,5/2+		

† From adopted levels, except as noted.

^{113}Ag β^- Decay (5.37 h) 1978Ma17,1970Ma47 (continued)

β^- radiations

Eβ^-	E(level)	Iβ^-†‡	Log *ft*	Comments
(537 *17*)	1479.29	≈0.12	≈7.7	
(821 *17*)	1194.66	≈2.1	≈7.1	
(890 *17*)	1126.09	≈0.086	≈8.6	
(966 *17*)	1049.90	≈0.065	≈8.8	
(1028 *17*)	988.44	≈0.45	≈8.1	
(1132 *17*)	883.60	≈0.29	≈8.4	
(1307 *17*)	708.58	≈0.020	≈10.9^{1u}	Log *ft*: calculated as first–forbidden unique.
(1335 *17*)	680.58	≈1.0	≈8.2	
(1432 *17*)	584.06	≈0.13	≈10.0^{1u}	Log *ft*: calculated as first–forbidden unique.
(1700 *17*)	316.18	≈1.7	≈9.3^{1u}	Log *ft*: calculated as first–forbidden unique.
(1717 *17*)	298.53	≈9.4	≈7.6	
(2016 *17*)	0.0	≈85	≈7.0	Eβ^-: Eβ=2020 from 1957Je07. Other: 2030 (1970Ma47). Iβ^-: from Iβ(total)/Iγ(299) compared with ^{198}Au Iβ(total)/Iγ(412), 1970Ma47. Other: 88% (1969Hn01).

† β branches were obtained from (γ+ce) imbalance at each level, except for the g.s.
‡ For β^- intensity per 100 decays, multiply by 1.0.

γ(^{113}Cd)

α(K)exp normalized by 316γ keV to E2 theory. If 316γ is M1, δ and α will be different for 259γ and 299γ.
Iγ normalization: from ΣI(γ+ce) to g.s.+Iβ(g.s.)=100. The normalization factor is uncertain, since Iβ(g.s.) is approximate.

Eγ	E(level)	Iγ‡	Mult.	α	Comments
17.7 *2*	316.18	0.42 *5*	M1	10.23 *66*	Iγ: obtained by low–energy photon spectrometer. I(γ+ce): from I(γ+ce)(17.7γ)/I(γ+ce)(316.3γ) in ^{113}Ag β^- decay (68.7 s). Mult.: from Iγ and I(γ+ce). B(M1)(W.u.)=0.0084 *14*.
96.2 *2*	680.58	0.37 *2*			
x133.5 *2*		0.66 *2*			
206.4 *2*	522.34	0.20 *2*			
217.2 *1*	855.31	0.28 *2*			
258.8 *1*	522.34	16.35 *30*	E2	0.048 *5*	Mult.: from α(K)exp=0.049 *6*. E1+M2 is not excluded. B(E2)(W.u.)=44.0 *21*.
298.6 *1*	298.53	100	E2+(M1)	0.031 *2*	δ: >1.1. Mult.: from α(K)exp=0.027 *1*.
316.3 *1*	316.18	13.43 *20*	[E2]	0.0274	Mult.: based on Jπ values in proposed decay scheme. B(E2)(W.u.)=0.373 *21*.
333.1 *1*	855.31	5.98 *9*	(M1,E2)	0.025 *11*	Mult.: from α(K)exp=0.021 *9*.
339.4 *1*	1194.66	6.38 *10*	M1,E2	0.0196 *22*	Mult.: from α(K)exp=0.019 *5*.
364.4 *1*	680.58	1.40 *3*			
369 *1*	1049.90	0.10 *5*			
374.3 *2*	638.06	0.25 *2*			
382.1 *1*	680.58	1.45 *3*			
392.4 *1*	708.58	0.20 *2*			
x410.8 *1*		0.12 *2*			
539 *1*	855.31	0.08 *3*			
584.0§ *1*	584.06	2.1†§ *3*			
585§ *1*	883.60	0.10†§ *5*			
611.0 *5*	1194.66	0.45 *10*			
624.0 *1*	1479.29	0.19 *1*			
672.3§ *1*	988.44	0.3†§ *1*			
	1194.66	8.7†§ *3*			
680.6 *1*	680.58	6.95 *16*			
734 *1*	1049.90	0.10 *5*			
809.9 *1*	1126.09	0.15 *2*			
x816.1 *1*		0.11 *2*			
827 *1*	1126.09	0.10 *5*			
878.5 *1*	1194.66	0.52 *2*			
883.6 *1*	883.60	2.82 *7*			

Continued on next page (footnotes at end of table)

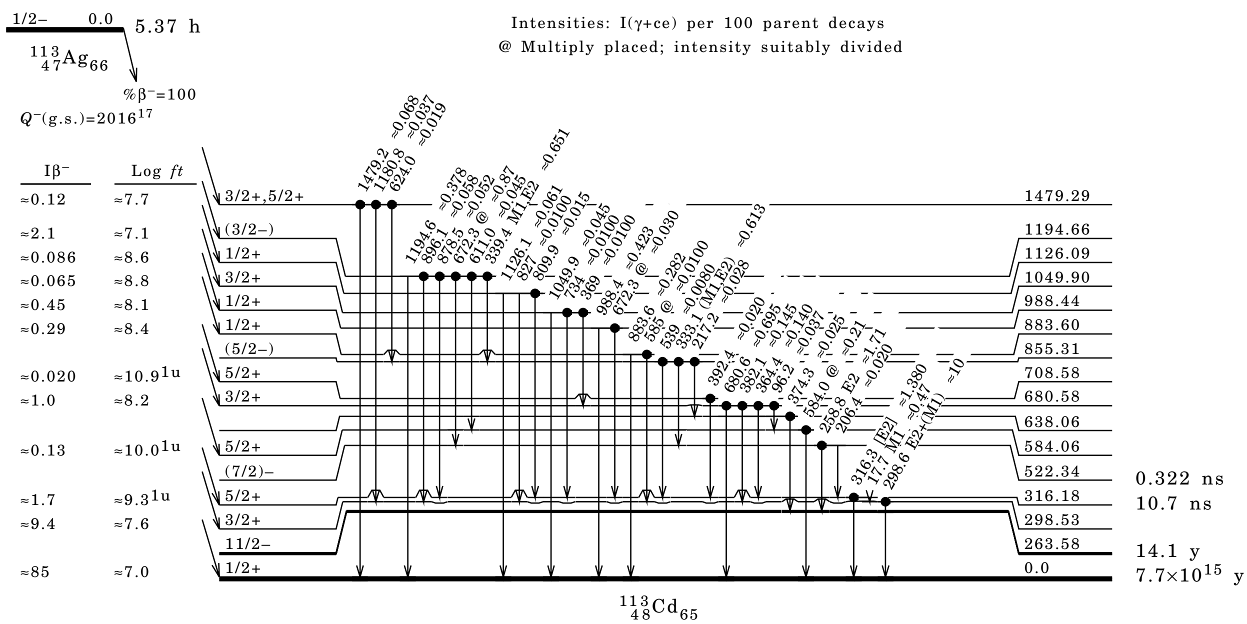
^{113}Ag β⁻ Decay (5.37 h) 1978Ma17,1970Ma47 (continued)

γ(^{113}Cd) (continued)

Eγ	E(level)	Iγ‡
896.1 *1*	1194.66	0.58 *10*
988.4 *1*	988.44	4.23 *9*
1049.9 *1*	1049.90	0.45 *3*
x1084.5 *1*		0.16 *3*
1126.1 *1*	1126.09	0.61 *3*
1180.8 *1*	1479.29	0.37 *3*
1194.6 *1*	1194.66	3.78 *10*
1479.2 *1*	1479.29	0.68 *4*

† Unresolved doublet. Iγ from γγ–coin results. Iγ divided into two parts on the basis of intensity balances.
‡ For absolute intensity per 100 decays, multiply by ≈0.10.
§ Multiply placed; intensity suitably divided.
x γ ray not placed in level scheme.

Decay Scheme



^{113}Ag β⁻ Decay (68.7 s) 1975BrYM,1990Fo07

Parent ^{113}Ag: E=43.2; Jπ=7/2+; $T_{1/2}$=68.7 s *50*; Q(g.s.)=2017 *16*; %β⁻ decay=36 *7*.
Measured Eγ, Iγ, γγ coin, γ(t), Eβ, βγ coin, (1975BrYM) Eγ, Iγ (1981Me17).
Eγ, branching for IT decay (1990Fo07). Others: 1969Hn01, 1970Ma47.

^{113}Cd Levels

E(level)	Jπ	$T_{1/2}$	Comments
0.0	1/2+	7.7×10^{15} y *3*	$T_{1/2}$: from adopted levels.
298.30 *8*	3/2+		
316.09 *8*	5/2+		
458.30 *16*	7/2+		
583.87 *25*	5/2+		
708.34 *17*	5/2+		
1007.1 *3*	(5/2)+		

Continued on next page (footnotes at end of table)

^{113}Ag β^- Decay (68.7 s) 1975BrYM,1990Fo07 (continued)

^{113}Cd Levels (continued)

E(level)	Jπ
1047.4 *4*	7/2+
1195.3 *6*	5/2+,7/2+,9/2+

β^- radiations

Eβ⁻	E(level)	Iβ⁻†‡	Log *ft*
(865 *16*)	1195.3	0.5 *3*	≈5.3
(1013 *16*)	1047.4	≈0.44	≈5.6
(1053 *16*)	1007.1	≈0.99	≈5.3
(1352 *16*)	708.34	≈8.9	≈4.8
(1476 *16*)	583.87	≈2.4	≈5.5
(1602 *16*)	458.30	≈0.60	≈6.3
(1744 *16*)	316.09	≈5.8	≈5.4

† β^- branches were obtained from (γ+ce) imbalance at each level.
‡ For β^- intensity per 100 decays, multiply by 1.8 *4*.

γ(^{113}Cd)

Iγ normalization: assuming no β^- feeding to g.s. ΔJ=3, Δπ=no.

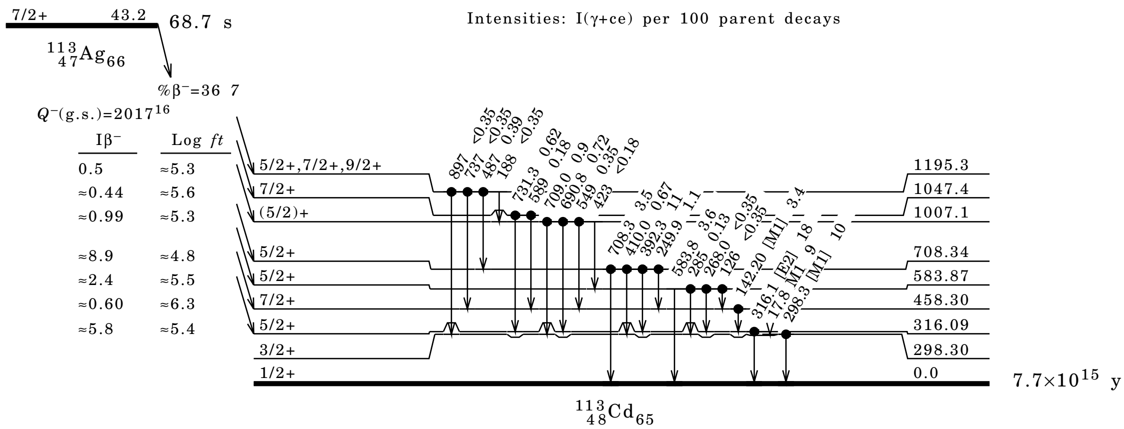
Eγ	E(level)	Iγ‡	Mult.	α	I(γ+ce)‡	Comments
17.8 *1*	316.09		M1	10.06	48.66	I(γ+ce): calculated from the decay scheme with assumption of no β^- feeding of the 298 level. Iγ: from I(γ+ce) and α. Mult.: from ^{113}Ag β^- decay (5.37 h).
126 *1*	583.87	<2				
142.20† *15*	458.30	16.5	[M1]	0.1748		
188 *1*	1195.3	<2				
249.9† *4*	708.34	6.3				
268.0 *6*	583.87	<2				
285 *1*	583.87	0.75				
298.3† *1*	298.30	57.5	[M1]	0.02432		
316.1† *1*	316.09	100	[E2]	0.0274		
392.3† *2*	708.34	63				
410.0† *6*	708.34	3.8				
423 *1*	1007.1	<1				
487 *1*	1195.3	2.2				
549 *1*	1007.1	2.0				
583.8 *3*	583.87	20.5				Iγ: 1981Me17 gives 17.7 *9*.
589 *1*	1047.4	1				
690.8 *4*	1007.1	4.1				
708.3 *4*	708.34	20				
709.0 *5*	1007.1	5				Eγ: not seen by 1981Me17 and also by 1987BaYW in (n,n'γ).
731.3 *4*	1047.4	3.5				
737 *1*	1195.3	<2				
897 *1*	1195.3	<2				

† Also seen by 1981Me17 which agrees on Iγ.
‡ For absolute intensity per 100 decays, multiply by 0.18 *4*.

^{113}Ag β^- Decay (68.7 s) 1975BrYM,1990Fo07 (continued)

Decay Scheme

Intensities: I(γ+ce) per 100 parent decays



^{113}Cd IT Decay (14.1 y) 1969De25

Parent ^{113}Cd: E=263.7 *3*; Jπ=11/2−; $T_{1/2}$=14.1 y *5*; %IT decay=0.14.
Measured Eγ, Iγ, α(K)exp from Iγ and I(K x ray).

^{113}Cd Levels

E(level)	Jπ	$T_{1/2}$†
0.0	1/2+	7.7×10^{15} y *3*
263.7 *3*	11/2−	14.1 y *5*

† From adopted levels.

γ(^{113}Cd)

Eγ	E(level)	Iγ†	Mult.	α	I(γ+ce)†	Comments
263.7 *3*	263.7	16.4 *5*	E5	5.1	100	Iγ: from I(γ+ce) and α, 3% uncertainty chosen for α. Mult.: α(K)exp=3.0 *5* yields M4,E5. ΔJ rules out M4. B(E5)(W.u.)=0.0499 *23*.

† For absolute intensity per 100 decays, multiply by 0.0014.

^{110}Pd(α,nγ) 1997Wa20

E=12.2, 14.9, 16.2, 18.0 MeV. Enriched targets.
Measured: γ, γγ, γγ(θ), excitations functions, two Ge detectors with BGO–NaI(Tl) Compton suppression shields.

^{113}Cd Levels

E(level)	Jπ†	E(level)	Jπ†	E(level)	Jπ†
0.0‡	1/2+	638.18§ *3*	9/2−	883.58‡ *15*	1/2+
263.5§ *5*	11/2−	680.533‡ *23*	3/2+	897.63‡ *3*	7/2+
298.599‡ *10*	3/2+	708.563‡ *22*	5/2+	939.766‡ *21*	9/2+
316.194‡ *19*	5/2+	815.29§ *3*	15/2−	988.29‡ *3*	1/2+
458.620‡ *20*	7/2+	816.737‡ *24*	7/2+	999.40 *7*	
522.28§ *3*	7/2−	855.26§ *3*	5/2−	1007.43‡ *7*	(5/2+)
583.975‡ *10*	5/2+	878.5‡ *2*	+	1033.801‡ *22*	(5/2+)

Continued on next page (footnotes at end of table)

^{110}Pd(α,nγ) 1997Wa20 (continued)

^{113}Cd Levels (continued)

E(level)	Jπ†	E(level)	Jπ†	E(level)	Jπ†
1037.437‡ *14*	(5/2+)	1313.763‡ *21*	9/2+	1657.37§ *5*	11/2−
1047.654‡ *24*	7/2+	1321.84 *9*		1658.47 *7*	
1049.71‡ *10*	(3/2,5/2+)	1327.6 *4*		1670.85 *10*	
1051.243§ *25*	5/2−	1346.54§ *4*	11/2−	1732.83‡ *4*	11/2+
1109.28§ *3*	13/2−	1364.70‡ *7*	(5/2+)	1737.54 *7*	
1124.640‡ *23*	9/2+	1367.60‡ *3*	7/2+	1743.58 *21*	
1126.22‡ *15*	3/2+	1387.51 *4*		1823.20§ *4*	(13/2−)
1177.74§ *3*	(9/2−)	1395.82‡ *3*	(9/2+)	1871.7 *3*	
1177.8‡ *3*	(3/2+)	1405.69 *7*		1892.36 *6*	
1181.35 *4*		1410.66 *6*		1896.40 *4*	
1190.72 *5*		1451.03 *7*		1902.43 *5*	
1192.07§ *4*	−	1461.65 *5*		1903.93 *9*	
1194.58 *3*		1504.92‡ *4*	7/2+	2042.01 *6*	
1195.22‡ *5*	+	1513.71 *4*		2046.21‡ *7*	(15/2+)
1214.651‡ *22*	11/2+	1561.73 *3*	+	2146.80 *5*	
1261.92 *4*	(9/2)	1620.42 *3*		2164.46 *11*	
1268.21 *5*		1626.40 *4*		2219.64 *5*	
1279.85 *6*	(3/2)	1647.21 *5*			

† From the authors based on previous known Jπ and γ multipolarities.
‡ (A): Positive parity levels.
§ (B): Negative parity levels.

γ(^{113}Cd)

Eγ	E(level)	Iγ	Mult.§	δ§	α	Comments
115.6 *2*	638.18	6.0 *9*	D			
126.48 *1*	1177.74	8.6 *8*	E2			
142.42 *1*	458.620	540	M1+E2	−0.020 *2*		
153.0 *1*	1367.60	1.2 *5*				
184.83 *2*	1124.640	4.5 *6*				
205.9† *1*	522.28	6.4 *7*				
217.08 *2*	855.26	4.7 *5*				
231.0 *1*	1047.654	1.0 *4*				
237.78 *8*	1896.40	1.8 *5*				
238.96 *9*	1896.40	1.4 *6*				
242.64 *4*	1126.22	2.5 *4*				
249.95 *2*	708.563	7.4 *5*	D			
258.77 *1*	522.28	493 *8*				
267.77‡ *6*	583.975	7.5 *5*	M1+E2	+0.10 *4*		
274.89 *2*	1214.651	9.8 *5*	M1+E2	−0.02 *1*		
285.3 *1*	583.975	4 *1*				
293.79 *7*	1109.28	30 *1*				
298.60 *1*	298.599	860 *11*	M1+E2	+0.40 *1*		
307.89 *2*	1124.640	13.6 *7*	D			
313.48‡ *6*	897.63	18.3 *6*	M1+E2	+0.41		
316.22‡ *6*	316.194	1000 *10*	E2		0.0274	
322.36 *6*	1177.74	15.8 *6*				
332.99 *1*	855.26	111 *2*	M1+E2	−0.21 *7*		
335.98 *9*	1513.71	1.4 *6*				
339.33 *1*	1194.58	16.9 *8*				
358.09‡ *5*	816.737	50 *1*	M1+E2	+0.003 *3*		
364.31 *3*	680.533	17 *8*				
365.4 *1*	1732.83	6 *9*				
370.72 *1*	1051.243	12 *2*				
374.64 *3*	638.18	48 *2*				
381.95 *3*	680.533	16.1 *6*	M1+E2			Mult.: δ=+0.02 *1* or +4.7 *2*.
392.36 *2*	708.563	72 *1*	M1+E2	−0.05 *2*		
410.11 *9*	708.563	8.7 *6*	M1+E2	−0.08 *4*		
412.90 *6*	1051.243	57 *1*	E2			
416.09 *4*	1124.640	17.0 *7*	E2			

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^{110}Pd(α,nγ) 1997Wa20 (continued)

γ(^{113}Cd) (continued)

Eγ	E(level)	Iγ	Mult.[§]	δ[§]	Comments
427.71 16	1367.60	20 1	D		
439.74[‡] 22	897.63	33 1			
444.9 5	1261.92	3.4 7			
453.4 1	1037.437	4.3 7			
463.84 13	1047.654	7 1	M1+E2	−0.02 3	
469.5 5	1367.60	0.6 8			
471.20 5	1109.28	5.4 9	E2		
481.13 1	939.766	153 2	M1+E2	−0.04 5	
500.50 3	816.737	147 3	M1+E2	+0.04 5	
501.77 3	1626.40	35 2	M1+E2	0.00 3	
518.15 3	1732.83	9.1 7	D		
528.81[‡] 8	1051.243	27.8 9	D		
534.87 5	1902.43	20 1	M1+E2	0.00 5	
539.3 1	855.26	3 1	E1		
540.78 6	999.40	6 1			
543.20 5	1181.35	3 1			
550.86 1	1367.60	40 6	M1+E2	−0.006 7	
551.79 1	815.29	343 6	E2		
553.90 1	1192.07	35 2	M1+E2	0.0 1	
561.56 9	1670.85	9.1 9			
579.8 1	878.5	6 1			
581.26 9	897.63	13 6			
583.97 1	583.975	301 3	E2		
589.02 2	1047.654	19 1	M1+E2	+0.005 10	
593.23 2	2219.64	11 1	E2		
598.95[‡] 5	897.63	147 2	E2		
606.39 3	1461.65	4 1	D		
621.5 2	1561.73	8 2			
623.58 2	939.766	77 2			
633.08 2	2146.80	22 2	(E2)		
655.48 1	1177.74	26 1	M1+E2	−0.001 2	
659.08 3	1181.35	27 2			
664.13[‡] 5	1561.73	32 1	E2		
666.1[†] 1	1124.640	71 2			
670.2[†] 5	1192.07	13 1			
672.34 2	1194.58	17 1			
677.95 4	1261.92	7.1 9			
680.6 1	680.533	78 2	M1+E2		Mult.: δ=+1.34 5 or −0.13 2.
687.6 1	1902.43	12 1			
691.23 6	1007.43	25 2			
696.5 5	1405.69	<1.0			
707.44 4	1647.21	24 4			
708.58 6	708.563	62 5			
713.91 5	1823.20	9 1	M1+E2	−0.01 2	
721.24 4	1037.437	22 1	D		
729.79 2	1313.763	58 2	E2		
731.47 2	1047.654	45 2	M1+E2	−0.03 4	
735.20 2	1033.801	12.6 9			
738.84 1	1037.437	21 1	M1+E2	+1.1 5	
743.6 4	1327.6	<3			
744.99 2	1561.73	19 1			
756.03 1	1214.651	140 4	E2		
765.15 1	1620.42	7.4 9	D		
770.50 6	1451.03	14 4			
787.12 2	1896.40	13 1	E2		
793.4[†] 3	1732.83	28 2			
799.57 8	1321.84	48 5	D		
803.23 5	1261.92	9 1	D		
808.48 2	1124.640	29 2	E2		
824.27 3	1346.54	31 4	E2		
831.55 6	2046.21	18 2	E2		
842.06 3	1657.37	53 2	E2		
845.78 1	1109.28	125 2	D		

Continued on next page (footnotes at end of table)

^{110}Pd(α,nγ) 1997Wa20 (continued)

γ(^{113}Cd) (continued)

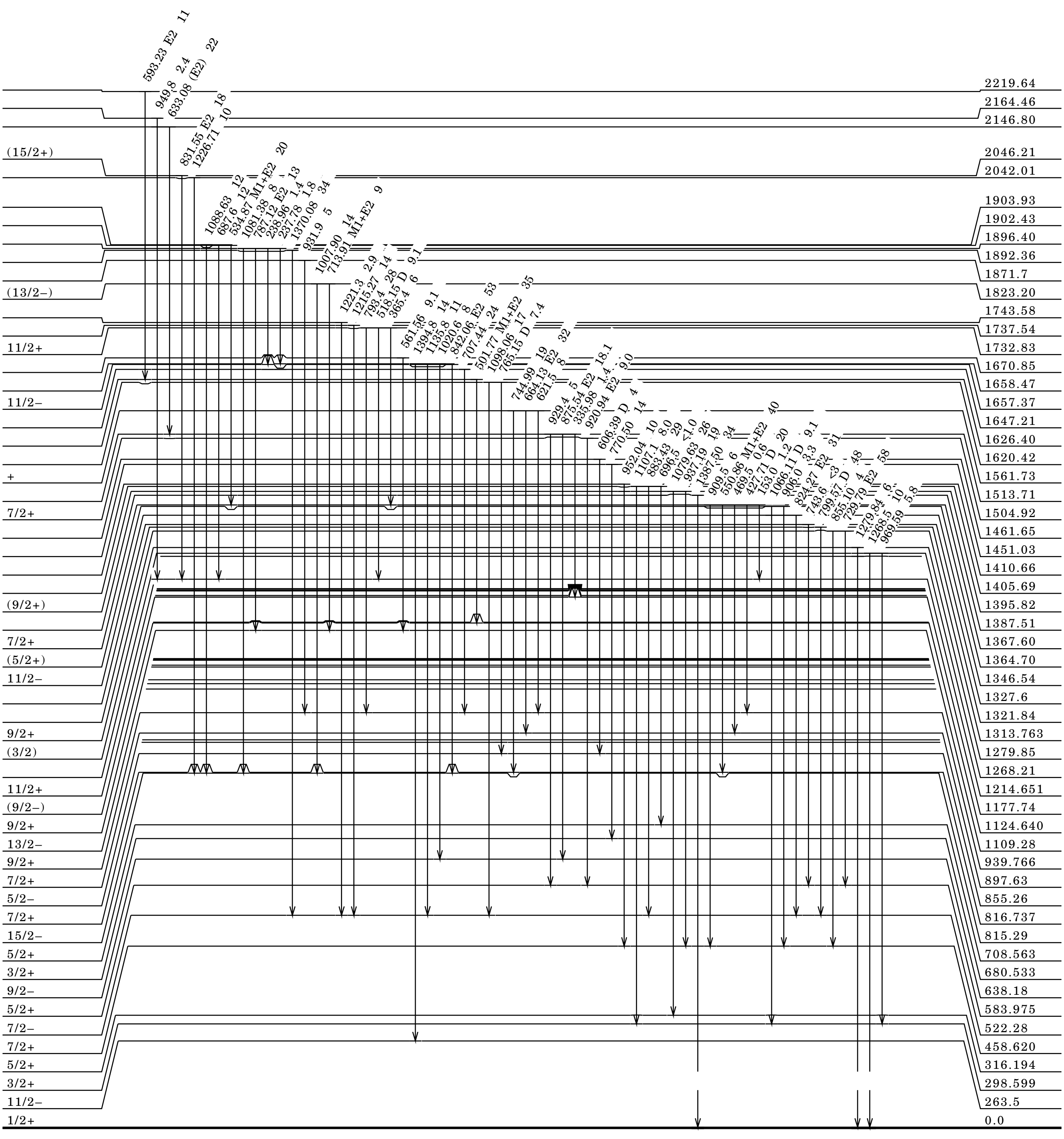
Eγ	E(level)	Iγ	Mult.§	Comments
855.10 *6*	1313.763	4 *1*		
875.54 *3*	1513.71	18.1 *9*	E2	
878.4 *2*	878.5	4 *1*		
879.2 *3*	1177.8	2 *2*		
883.43 *9*	1405.69	29 *1*		
883.6 *2*	883.58			Eγ: not observed in this work, but 1997Wa20 do not rule its existence.
892.12 *5*	1190.72	6 *1*		
896.62 *4*	1195.22	22 *2*		
906.0 *2*	1364.70	3.3 *9*		
909.5‡ *8*	1367.60	6 *4*		
920.94 *3*	1504.92	9.0 *9*	E2	
929.4 *2*	1513.71	5 *1*		
931.9 *3*	1871.7	5 *1*		
937.19 *3*	1395.82	19 *2*		
946.0† *1*	1261.92	6 *3*		
949.8 *1*	2164.46	2.4 *8*		
952.04 *5*	1410.66	10 *1*		
969.59 *5*	1268.21	5.8 *8*		
988.29 *3*	988.29	24 *1*		
1007.90 *3*	1823.20	14 *1*		
1020.6† *5*	1658.47	8 *1*		
1033.9 *5*	1033.801	12 *1*		
1037.2† *1*	1037.437	12 *1*		
1049.7 *1*	1049.71	12.4 *1*		
1066.11 *7*	1364.70	9.1 *1*	D	
1079.63 *4*	1395.82	26 *2*		
1081.38‡ *20*	1896.40	8 *2*		
1088.63 *8*	1903.93	12 *1*		
1098.06 *7*	1620.42	17 *2*		
1107.1 *1*	1405.69	8.0 *9*		
1126.2‡ *2*	1126.22	18 *1*		
1135.8‡ *2*	1658.47	11 *1*		
1215.27 *6*	1737.54	14 *2*		
1221.3 *2*	1743.58	2.9 *9*		
1226.71 *5*	2042.01	10 *1*		
1268.5† *2*	1268.21	10 *1*		
1279.84 *6*	1279.85	6 *1*		
1370.08 *5*	1892.36	34 *1*		
1387.50 *4*	1387.51	34 *2*		
1394.8 *1*	1658.47	14 *2*		

† γ ray placed by coincidence relations. ΔE fixed to at least 0.1 keV to allow a fit with the other gammas.
‡ ΔE increased by evaluator to allow fit with levels.
§ From γ(θ) and excitation functions (five energies).

$^{110}Pd(\alpha,n\gamma)$ 1997Wa20 (continued)

Level Scheme

Intensities: relative Iγ

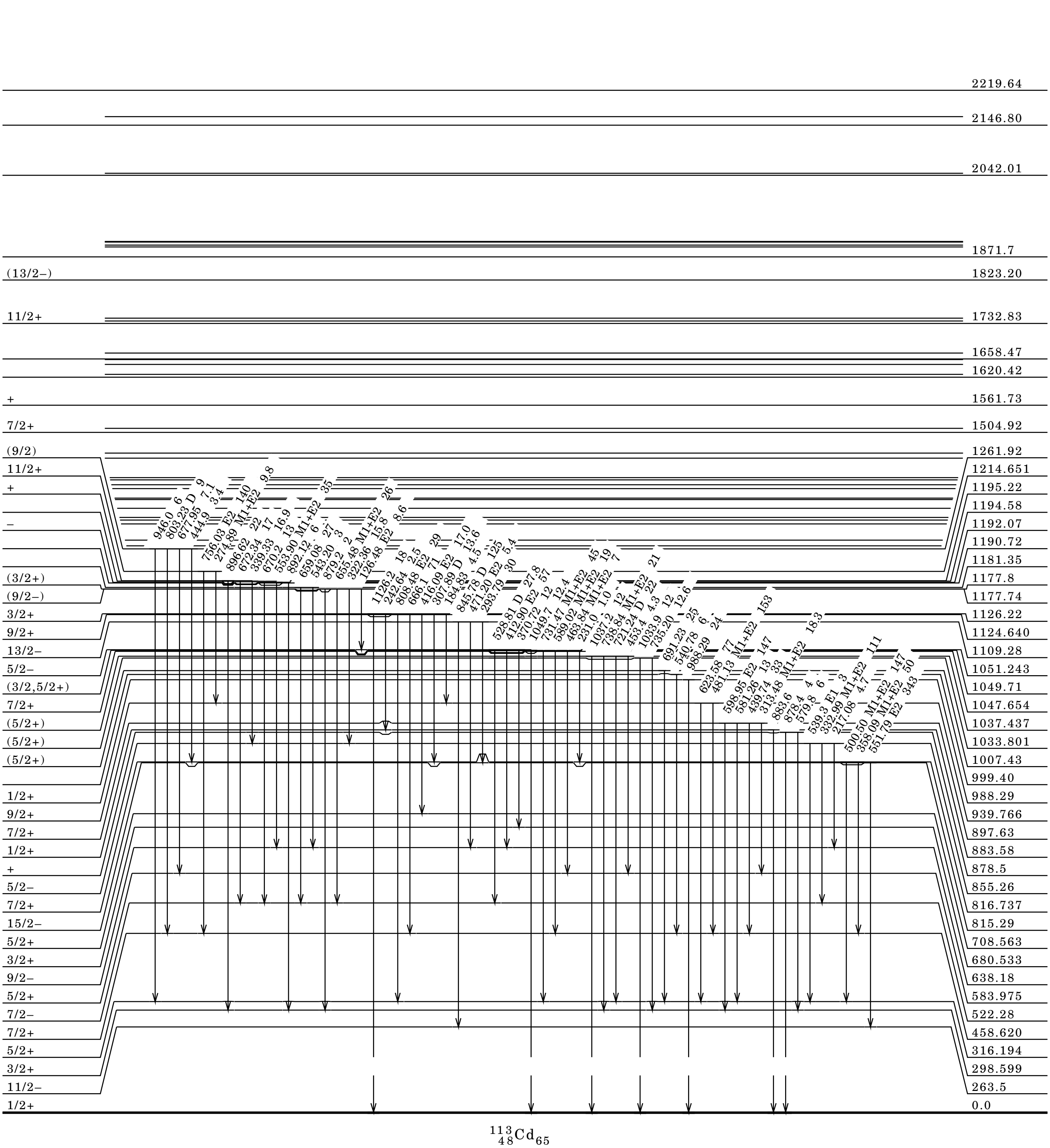


$^{113}_{48}Cd_{65}$

$^{110}Pd(\alpha,n\gamma)$ 1997Wa20 (continued)

Level Scheme (continued)

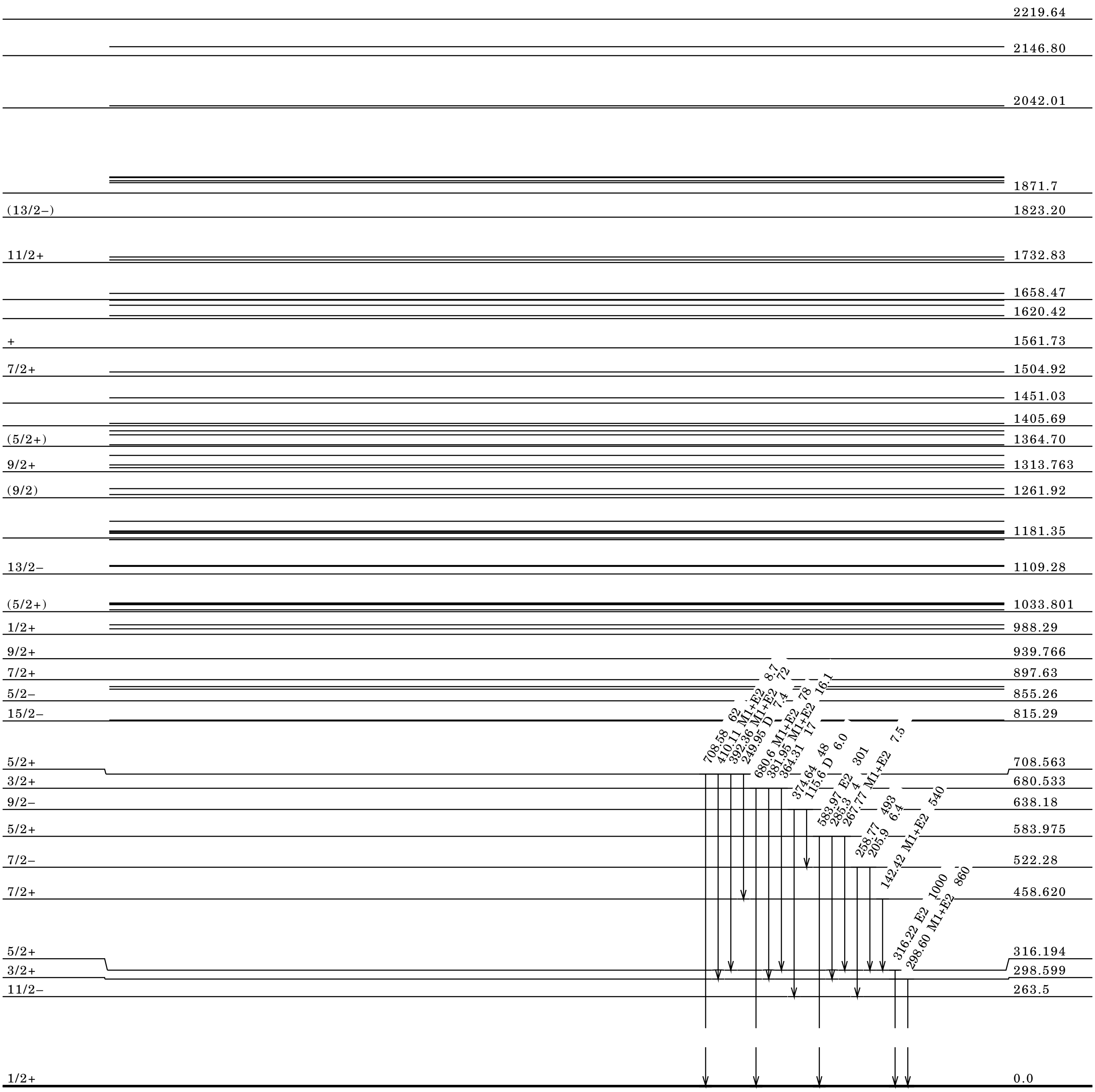
Intensities: relative Iγ



$^{110}Pd(\alpha,n\gamma)$ 1997Wa20 (continued)

Level Scheme (continued)

Intensities: relative Iγ



^{112}Cd(n,γ) E=res 1969Ju01

E=4–2000 eV. Measured cross section; neutron time of flight. For deduced resonance parameters for resonances with E=66.7 eV and E=83.3 eV, see 1981MuZQ.

^{112}Cd(d,p),^{114}Cd(d,t) 1969Go03

^{112}Cd(d,p): E=13 MeV.
Other: 1964Ro17.

^{113}Cd Levels

E(level)	Jπ‡	L†	C^2S	Comments
0.0	1/2+	0	0.34	
270 *10*	11/2−	5	0.40	
300 *10*	3/2+	2	0.40	
320 *10*	5/2+	2	0.14	
460 *10*	7/2+	4	0.26	
530 *10*	7/2+	4	0.36	
590 *10*	(5/2+)	2	0.05	
680 *10*	(3/2+)	2	0.27	
760 *10*	1/2+	0	0.14	
820 *10*	7/2+	4	0.12	
880 *10*	1/2+	0	0.07	
900 *10*	3/2+	2	0.21	
960 *10*				
980 *10*	1/2+	0	0.04	
1010 *10*				
1130 *20*				
1170 *20*				
1200 *10*		2,3		Jπ: authors assign Jπ=7/2+ but it is not compatible with given L. A level at 1195.4 has been adopted with Jπ=5/2+,7/2+,9/2+.
1280 *10*	(5/2+)	2	0.03	
1320 *10*				
1390 *20*				
1430 *10*	(3/2+)	2	0.06	
1450 *20*				
1490 *15*	(3/2+)	2	0.06	
1540 *10*				
1580 *10*	(7/2−)	(3)	0.02	
1610 *10*	(5/2+)	2	0.02	
1670 *10*	(3/2+)	(2)	0.02	
1810 *10*				
1840 *10*		1,2		
1880 *10*				
1900 *10*	(1/2+)	(0)	0.02	
1990 *10*				
2040 *10*	7/2−	3	0.04	
2080 *10*	(1/2+)	(0)	0.01	
2110 *10*	(7/2−)	(3)	0.02	
2120 *20*				
2140 *20*	(1/2+)	(0)		
2170 *10*	3/2−	1	0.04	
2180 *10*	3/2−	1	0.03	
2240 *10*		(3)		
2270 *10*				
2310 *10*	(3/2−)	(1)	0.01	
2330 *10*				
2370 *10*				
2410 *10*		(4)		
2440 *10*				
2540 *10*	(7/2−)	(3)	0.03	
2580 *10*	(3/2−)	(1)	0.02	
2630 *10*	(1/2+)	(0)	0.04	
2690 *10*				
2750 *10*				

Continued on next page (footnotes at end of table)

^{112}Cd(d,p),^{114}Cd(d,t) 1969Go03 (continued)

^{113}Cd Levels (continued)

E(level)	Jπ‡	L†	C^2S
2770 *10*	(3/2−)	(1)	0.02
2810 *10*	1/2+	0	0.03

† Deduced from proton angular distributions at 16 angles, θ=5°−115° compared with DWBA calculations. For L≥3 the agreement with DWBA is rather poor.

‡ Determined from L by use of the shell model. The d5/2 shell−model state is almost full, while the d3/2 state is almost empty. For L=2, J was therefore assigned 5/2 or 3/2 from a comparison of σ(d,t) and σ(d,p).

^{113}Cd(γ,γ') 1994Ge07

Bremsstrahlung at the Stuttgart Dynamitron Facility.
Bremsstrahlung endpoint energy: 4.20 Mev 5.
Enriched Cd (94.6%). Scattered photons were detected by three Ge detectors under angles of 88°, 125°, 149° with respect to the incoming photon beams.

^{113}Cd Levels

E(level)	Jπ‡	$T_{1/2}$†	E(level)
0.0	1/2+	stable	2796
1813	(3/2+)		2817
1855			2902
1873			2913
1942		607 fs *+90−70*	2929
2044	3/2+,(3/2−,1/2−)		2943
2128			3040
2173	3/2−	90 fs *7*	3058
2182	(3/2−)	228 fs *+86−50*	3105
2318			3222
2335			3281
2354		3.0×10^{2} fs *+16−6*	3301
2409			3333
2428	3/2−,1/2−		3378
2449			3412
2535	(3/2)		3480
2545			3486
2556			3526
2578			3547
2588	3/2−		3741
2743			3814
2753			3850
2773			3902

† From nuclear resonance fluorescence, assuming J=3/2.

‡ The spins of the excited levels have been determined for few levels.

^{113}Cd(n,n'γ) 1987BaYW,1991NeZX

Enriched≈96% target.
Measured: γ, γγ, γ(θ), linear polarization.
Also measurement ^{112}Cd(n,γ) E=res.
1991NeZX has reanalyzed the data of 1987BaYW and placed many new gammas.

^{113}Cd Levels

E(level)	Jπ†	E(level)	Jπ†	E(level)	Jπ†
0.0	1/2+	1051.2 5	7/2−	1542.28 9	(1/2)+
263.68 6	11/2−	1109.5 6		1561.5 5	
298.567 17	3/2+	1124.5 6		1575.8 5	7/2−
316.207 16	5/2+	1126.22 6	3/2+	1605.7 3	
458.578 24	7/2+	1177.26 8	3/2+	1607.17 9	5/2+
522.1 6	7/2−	1195.0 3	3/2−	1658.5 5	
583.89 4	5/2+	1209.56 13	13/2−	1675.11 9	3/2+
638.35 6	9/2−	1214.31 13	11/2+	1732.5 5	
680.550 21	3/2+	1268.13 6	3/2+	1746.09 14	3/2−
708.556 22	5/2+	1279.55 7	3/2+	1779.02 18	9/2−
816.62 4	7/2+	1301.03 7	3/2+,5/2+	1798.9 5	(1/2,3/2,5/2)+
855.4 3	5/2−	1313.74 12	5/2+	1823.5 5	
870.20 14	15/2−	1322.17 13	7/2−	1842.94 14	(3/2−)
878.5 5	3/2+	1351.6 5	5/2,7/2	1867.99 9	7/2−,9/2−
883.62 5	1/2+	1364.71 7		1892.44 12	7/2−
897.3 5	3/2+	1387.44 8	5/2+,3/2+	1902.5 5	
939.72 5	9/2+	1390.56 9	1/2+,3/2+	1904.28 11	5/2+,7/2+
988.40 6	1/2+	1395.5 5		2037.69 19	5/2,7/2,9/2
1002.89 4	3/2+	1405.81 10	1/2+,3/2+	2094.3 4	7/2−
1007.16 5	7/2+	1407.44 25	(9/2)+	2113.18 22	7/2−
1034.1 5	3/2+	1423.85 12	‡	2173.71 12	1/2−,3/2−
1037.4 2	7/2+	1450.3 5		2219.5 5	
1047.49 10	7/2+	1479.1 5	1/2,3/2	2319.70 18	3/2−
1049.68 10	3/2+	1492.99 9	1/2+,3/2+	2759.32 12	3/2+,5/2+

† As given by 1991NeZX, see adopted levels for comments.
‡ 1991NeZX suggested a 11/2− from syst, not adopted in (α,2nγ) 1997Wa20.

γ(^{113}Cd)

Eγ	E(level)	Iγ	Mult.†	δ
96.9 2	680.550	1.6 3		
142.35 2	458.578	34 3	M1+E2	−0.04 3
×162.32 5		0.23 5		
171.07 12	1450.3	0.27 8		
174.79 9	1301.03	0.25 8		
184.62‡ 25	1124.5	0.24 8		
×186.17 12		0.09 2		
×196.90 26		0.28 8		
×198.27 13		0.47 14		
205.86 8	522.1	0.42 4	E1	
217.00 3	855.4	0.56 6	E2	
224.69 25	1492.99	0.03 1		
×228.7 3		0.05 2		
×230.34 25		0.16 5		
×232.6 3		0.05 3		
242.6 3	1126.22	0.04 1	M1	
×244.73 11		0.26 5		
249.93 6	708.556	1.2 1	M1+E2	+0.24 8
258.72 2	522.1	34 2	E2	
264.2 4	1390.56	0.14 4		
267.68 6	583.89	0.82 16	M1	
×271.04 19		0.06 2		
×273.05 19		0.09 3		
274.67 18	1214.31	0.14 4	M1	

Continued on next page (footnotes at end of table)

^{113}Cd(n,n'γ) 1987BaYW,1991NeZX (continued)

γ(^{113}Cd) (continued)

Eγ	E(level)	Iγ	Mult.†	δ	Comments
279.80# 15	988.40	0.12# 2			
	1405.81	0.12# 2			
285.19 8	583.89	0.46 4	M1		
x288.53 30		0.05 3			
291.54 25	1279.55	0.10 3	M1		
294.52# 21	878.5	0.62# 18			
	1002.89	0.62# 18			
298.58 2	298.567	100	M1+E2	+0.30 +3−1	
307.9 20	988.40	0.05 2			
313.66 30	897.3	0.71 5			
316.21 2	316.207	73 4	E2		
322.35 3	1002.89	1.4 1	M1+E2	−0.8 2	Mult.: δ=−0.8 2 or −2.2 10.
332.97 3	855.4	12.2 11	M1+E2	−0.27 2	
339.30§ 10	1195.0	1.6§ 3	M1+E2	−0.20 15	
	1209.56	0.1§			
x341.89 8					
344.31 12	1351.6	0.08 2			
356.7# 4	1037.4	0.23# 7	E2		
	1390.56	0.23# 7			
358.03 21	816.62	2.2 6			
364.37 3	680.550	3.2 3	M1+E2	−0.02 7	
369.10 11	1049.68	0.55 11	M1		
374.64 3	638.35	13.6 14	M1+E2	−0.25 2	
x378.21 23		0.14 4			
381.96 3	680.550	3.0 3	M1+E2	+0.16 15	Mult.: δ=+0.16 15 or 2.3 7.
x389.3 3		0.43 8			
392.36 2	708.556	10 1	M1+E2	−0.24 4	
x398.08 15		0.19 3			
402.19 13	1390.56	0.25 7			
409.97 9	708.556	1.0 2	M1+E2	−0.10 4	
412.85 6	1051.2	3.3 6	M1+E2	−0.41 1	
416.11 4	1450.3	0.31 4			
	1542.28	0.31 4			
417.4# 3	1126.22	0.44# 8	M1		
	1301.03	0.44# 8			
	1405.81	0.44# 8			
419.8 3	878.5	0.12 3			
423.34 18	1007.16	0.22 6	M1		
427.68 16	2173.71	0.26 5	M1		
438.95 25	897.3	0.16 3			
445.2 3	1479.1	0.18 4			
449.9 3	1034.1	0.19 4	M1		
453.44 11	1037.4	0.36 7	M1		
463.69 13	1047.49	0.23 4	M1		
481.10 5	939.72	3.3 3	M1		
496.8 3	1351.6	0.26 8			
	1904.28	0.26 8			
500.43 3	816.62	6.2 7			Eγ: from private communication to 1991NeZX.
x500.47 3		6.2 7	M1+E2	+0.47	δ: +0.47<δ<3.0.
517.67 15	816.62	0.20 4			
528.78 5	1051.2	1.6 3	M1+E2	−2.25 115	
539.39 22	1542.28	0.53 10			
542.4 3	1126.22	0.32 6	M1		
548.54 5	1007.16	1.2 2	M1		
551.50 21	1746.09	1.3 3			
553.9 3	1423.85	0.38 11	E2		Eγ: placed from a 1192 level in (α,2nγ).
562.26 9	878.5	1.3 2			
x565.7 3		0.16 3			
x567.2 3		0.16 3			
569.3 3	1779.02	0.17 4	E2		
580.0# 5	878.5	2.5# 7			
	897.3	2.5# 7			
583.93 7	583.89	33 3	E2		

Continued on next page (footnotes at end of table)

^{113}Cd(n,n'γ) 1987BaYW,1991NeZX (continued)

γ(^{113}Cd) (continued)

Eγ	E(level)	Iγ	Mult.[†]	δ	Comments
588.92 16	1047.49	1.1 2	M1		
x593.45 25		0.31 9			
598.88[§] 15	897.3	6.0[§] 8			
	1279.55	6.0[§] 8	M1		
606.33 25	870.20	1.04 13	E2		
x608.8 4		0.19 6			
611.0 3	1195.0	0.34 4	E1		
620.76[‡] 8	1561.5	1.1 3			
623.59 7	939.72	1.8 4	E2		
624.2 3	1479.1				
643.1 3	1351.6	0.14 3			
648.26 25	1842.94	0.41 16			
658.66 8	1542.28	0.68 25			
x661.57 25		0.10 3			
663.96 12	1561.5	0.13 6			
x665.98 25		0.79 15			
665.98 25	1605.7	0.79 15			
670.4 4	2094.3	0.37 15	E2		
672.25[#] 15	988.40	0.1[#]			
	1195.0	2.5[#] 6	E2		
678.9	1387.44				
680.59 5	680.550	14.1 9	M1+E2	−1.8 1	
684.10[#] 11	1268.13	0.72[#] 15	M1		
	1322.17	0.72[#] 15			
687.4[‡] 3	1902.5	0.12 4			
691.00 8	1007.16	3.4 6	M1+E2	0.35 5	
x703.82 25		0.08 3			
708.52[§] 5	708.556	4.9[§] 5	E2		
	1007.16	≈1.6[§]	E2		
717.13 11	1301.03	1.6 3			
721.22 8	1037.4	2.5 7	M1+E2	0.29 1	
731.37	1047.49	2.8 7	M1		
733.3	1049.68	0.6			Eγ: from 1978Ma17.
735.10 10	1034.1	2.7 7	M1		
738.76 9	1037.4	2.2 6	E2		
745.00 17	1561.5	0.53 16			
x751.95 21		0.62 18			
755.67 16	1214.31	1.4 3	E2		
x760.39 25		0.10 2			
x763.6 3		0.25 7			
765.1 3	1798.9	0.20 8			
767.65 13	1351.6	1.2 2			
770.4 3	1450.3	0.59 18			
x777.43 25		0.18 5			
780.81 11	1364.71	0.51 16			
784.6 3	1492.99	0.11 4			
788.0 3	1051.2	0.08 2			
791.49 15	1675.11	0.42 12	M1		
794.75[‡] 18	1732.5	0.56 16			
799.9 6	1322.17	0.68 3			
808.3 5	1124.5	0.45 20			
809.96 25	1126.22	1.2 5	M1		
812.7 4	1492.99	0.13 6			
823.64	1407.44	1.5 3			
827.65 25	1126.22	0.40 12	M1		
829.4 3	1351.6	0.73 25			
x838.64 22		0.20 10			
845.80[‡] 9	1109.5	0.88 17			
855.05 19	1313.74	0.08 3			
856.73 25	1904.28	0.08 3			
861.24 15	1177.26	1.5 2			
x870.10 25		0.09 4			
878.62[#] 9	878.5	8.4[#] 8			

Continued on next page (footnotes at end of table)

^{113}Cd(n,n'γ) 1987BaYW,1991NeZX (continued)

γ(^{113}Cd) (continued)

Eγ	E(level)	Iγ	Mult.†	δ	Comments
878.62# *9*	1177.26	8.4# *8*			
	1195.0	8.4# *8*			
883.60 *5*	883.62	6.5 *6*			
x888.02 *11*		0.28 *8*			
890.84 *22*	1746.09	0.16 *5*			
892.9 *3*	1351.6	0.09 *3*			
896.7 *2*	1195.0	2.7 *3*	E1		
x903.2 *4*		0.20 *8*			
906.08 *25*	1364.71	0.24 *2*			
909.12 *13*	1492.99	0.36 *12*			
x917.81 *5*		1.2 *2*			
926.6 *4*	1607.17	0.29 *12*	M1		
928.77 *18*	1387.44	1.0 *3*			
x933.6 *3*		0.06 *2*			
937.2 *3*	1575.8	0.24 *7*			
x938.98 *25*		0.22 *6*			
x942.52 *25*		0.10 *3*			
945.96 *15*	1209.56	1.1 *2*			
948.85 *25*	1407.44	0.11 *5*			
951.95 *13*	1268.13	1.5 *3*	M1+E2	−0.8 *3*	
x957.70 *22*		0.13 *4*			
960.46 *15*	2759.32	0.07 *2*			
963.25 *15*	1279.55	0.16 *5*	M1		
969.55 *10*	1268.13	1.1 *2*	M1		
x974.06 *11*		0.16 *2*			
979.08 *23*	2173.71	0.13 *5*	M1		
980.94 *25*	1279.55	0.14 *5*	M1		
987.5	1842.94				
988.43 *7*	988.40	4.8 *3*			
994.53 *11*	1675.11	0.40 *8*	M1		
997.58 *14*	1313.74	0.25 *5*			
1002.76 *9*	1002.89	0.82 *16*	M1		
x1007.50 *25*		0.12 *4*			
1007.50‡ *25*	1823.5	0.12 *4*			
1012.91 *21*	1867.99	0.52 *16*			
1023.00 *25*	1607.17	0.60 *24*	M1		
x1027.0 *3*		0.06 *2*			
1033.80 *12*	1034.1	4.0 *8*	M1+E2	0.52 *22*	
1036.87 *15*	1892.44	0.90 *27*	M1		
1049.75 *16*	1049.68	3.1 *3*	M1+E2	−0.49 *8*	Mult.: δ=−0.49 *8* or −30 *+60−20*.
1052.95 *12*	1351.6	0.47 *14*			
1053.0 *3*	1575.8	0.47 *14*			
1058.48 *11*	1322.17	0.70 *19*			
1066.16 *8*	1364.71	1.4 *1*			
x1076.08 *10*		0.18 *5*			
1079.46‡ *11*	1395.5	0.53 *10*			
1088.89 *9*	1387.44	1.3 *3*			
1092.18 *21*	1390.56	0.16 *8*			
1097.89 *22*	2037.69	0.52 *19*			
1107.11 *18*	1405.81	1.1 *3*			
x1116.51 *17*		0.16 *3*			
1126.20 *8*	1126.22	3.4 *3*	M1+E2	−0.02 *3*	
1135.45‡	1658.5	0.45 *9*			
x1144.0 *4*		0.35 *11*			
x1147.2 *4*		0.35 *14*			
1147.2 *4*	1605.7	0.35 *14*			
1160.12 *11*	1423.85	0.64 *19*	M1		
x1165.49 *11*		0.55 *11*			
1176.76# *24*	1177.26	<1.1#			
1176.76# *15*	1492.99	1.1# *3*	M1+E2	+0.23 *17*	
1180.70 *18*	1479.1	0.56 *11*			
1194.43 *10*	1195.0	1.08 *11*	E1		
1214.8 *5*	1798.9	1.4 *2*			

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^{113}Cd(n,n'γ) 1987BaYW,1991NeZX (continued)

γ(^{113}Cd) (continued)

Eγ	E(level)	Iγ	Mult.†
^{x}1218.4 4		0.09 4	
1221.3 4	2037.69	0.75 6	
^{x}1230.74 21		0.20 8	
^{x}1240.8 5		0.29 12	
^{x}1248.3 5		0.21 6	
^{x}1253.2 3		0.31 6	
^{x}1261.93 10		0.40 11	
1268.32 15	1268.13	0.44 6	M1
^{x}1273.23 17		0.12 4	
1279.81 11	1279.55	0.09 2	M1
1289.4 3	2173.71	0.20 5	E1
^{x}1293.46 12		0.45 8	
1301.07 10	1301.03	0.41 8	
1308.70 11	1607.17	0.34 8	M1
1312.18 15	1575.8	0.13 3	
^{x}1315.84 16		0.08 3	
1320.43 15	1842.94	0.47 8	
	1904.28	0.47 8	
^{x}1325.46 22		0.17 5	
^{x}1326.95 15		0.21 6	
^{x}1332.94 21		0.06 2	
1345.56 8	1867.99	0.71 5	
^{x}1354.34 25		0.04 1	
1370.22 15	1892.44	0.610 6	
1376.64 25	1675.11	0.28 11	M1
1387.3 5	1387.44	0.17 8	
1390.42 15	1390.56	1.4 4	
1394.7 4	2759.32	0.37 14	
1405.85 11	1405.81	0.95 19	
^{x}1413.11 25		0.34 14	
^{x}1417.21 25		0.09 2	
^{x}1423.7 4		0.9 2	
1429.9 4	1746.09	0.13 4	
^{x}1433.6		0.2 1	
1445.70 11	1904.28	1.2 2	
^{x}1452.96 14		0.04 1	
^{x}1460.41 25		0.04 1	
1464.32 18	2319.70	0.12 3	M1
^{x}1468.79 25		0.20 8	
^{x}1472.0 3		0.64 9	
1474.8 3	2113.18	0.2 1	M1
1479.19 15	1479.1	1.2 2	
1482.85 25	1798.9	0.16 5	
^{x}1484.80 25		0.05 2	
1492.88$^{\#}$ 25	1492.99	0.06$^{\#}$ 2	
	2173.71	0.06$^{\#}$ 2	E1
^{x}1496.66 15		0.29 5	
^{x}1504.05 21		0.07 2	
^{x}1507.83 21		0.06 2	
1515.4 2	1779.02	0.82 16	M1
^{x}1525.71 17		0.37 7	
^{x}1534.46 25		0.05 2	
^{x}1538.06 25		0.06 2	
^{x}1541.23 25		0.05 2	
^{x}1545.17 25		0.08 3	
^{x}1549.05 25		0.05 2	
^{x}1552.68 14		0.19 6	
^{x}1571.3 5		0.15 5	
^{x}1574.16 25		0.41 12	
1579.1 5	2037.69	0.12 4	
^{x}1585.74 25		0.11 3	
1590.8 3	2113.18	0.35 9	M1
1604.23 23	1867.99	0.12 3	
1606.96 22	1607.17	0.08 2	E2
^{x}1609.91 25		0.08 2	
^{x}1612.30 25		0.10 2	
^{x}1622.30 25		0.10 2	
^{x}1626.7 4		0.13 3	
1628.8 4	1892.44	0.23 6	E2
^{x}1645.33 20		0.24 4	
^{x}1656.6 5		0.10 4	
^{x}1666.37 22		0.04 1	
^{x}1670.3 3		0.04 1	
^{x}1675.7 4		0.03 1	
^{x}1678.97 22		0.15 6	
^{x}1682.79 25		0.022 4	
^{x}1689.34 15		0.20 4	
^{x}1694.06 18		0.06 1	
^{x}1698.18 16		0.19 3	
^{x}1705.48		0.37 7	
^{x}1717.40 15		0.16 3	
^{x}1721.06 16		0.049 15	
^{x}1743.2 5		0.064 22	
1746.0 5	1746.09	0.26 9	
^{x}1758.8 4		0.092 23	
^{x}1764.4 4		0.036 6	
^{x}1767.7 4		0.15 4	
^{x}1781.8 5		0.26 7	
^{x}1785.83 25		0.46 11	
^{x}1791.2 3		0.051 13	
^{x}1792.7 4		0.015 4	
^{x}1794.7 3		0.015 4	
1798.65 25	1798.9	0.051 10	
^{x}1803.7 4		0.14 4	
^{x}1806.1 4		0.17 5	
^{x}1812.96		0.72 14	
^{x}1820.8 4		0.09 2	
^{x}1826.12 20		0.34 8	
1830.7 5	2094.3	0.17 5	E2
^{x}1837.45 23		0.032 8	
^{x}1855.18		0.13 3	
^{x}1867.6 4		0.15 4	
^{x}1873.02 25		0.030 7	
^{x}1881.5 4		0.040 10	
^{x}1888.7 4		0.032 8	
^{x}1895.4 4		0.032 8	
^{x}1923.8 4		0.031 9	
^{x}1926.7 5		0.029 9	
^{x}1930.29 25		0.05 2	
^{x}1937.8 4		0.08 2	
1942.71 25	2759.32	0.27 8	
^{x}1952.9 3		0.11 4	
^{x}1969.0 3		0.028 8	
^{x}1970.9 3		0.048 14	
^{x}1974.2 3		0.036 11	
^{x}1976.1 4		0.015 6	
^{x}1995.7 4		0.06 2	
^{x}2044.43 22		0.16 3	
^{x}2053.9 4		0.18 4	
^{x}2091.2 4		0.14 4	
^{x}2112.2 3		0.041 10	
^{x}2135.6 3		0.14 3	
2173.64 21	2173.71	0.34 6	E1
^{x}2182.5 4		0.14 2	
^{x}2209.0 4		0.032 8	
^{x}2230.5 3		0.17 4	

Continued on next page (footnotes at end of table)

^{113}Cd(n,n'γ) 1987BaYW,1991NeZX (continued)

γ(^{113}Cd) (continued)

Eγ	E(level)	Iγ	Mult.†
x2278.8 *4*		0.07 *2*	
x2313.7 *6*		0.14 *4*	
2319.7 *6*	2319.70	0.54 *22*	E1
x2336.0 *4*		0.12 *2*	
x2353.0		0.13 *3*	
x2383.7 *4*		0.10 *3*	
x2394.9 *6*		0.16 *7*	
x2409.0 *4*		0.13 *5*	
x2413.0 *4*		0.13 *5*	
x2428.9 *5*		0.11 *4*	
x2450.4 *4*		0.04 *1*	
2460.6 *2*	2759.32	0.55 *11*	
x2506.5 *7*		0.08 *2*	
x2525.6 *4*		0.11 *3*	
x2535.4 *4*		0.12 *3*	
x2545.6 *5*		0.10 *4*	
x2557.5 *5*		0.08 *2*	
x2588.6 *5*		0.216	
x2598.8 *6*		0.16 *4*	
x2674.6 *8*		0.6 *3*	
x2767.8 *6*		0.14 *5*	
x2800.3 *4*		0.14 *4*	
x3213.6 *8*		0.04 *2*	

† From 1987BaYW, with new results from 1991NeZX.
‡ γ placed by evaluator using the (α,nγ) of 1997Wa20.
§ Multiply placed; intensity suitably divided.
# Multiply placed; undivided intensity given.
x γ ray not placed in level scheme.

^{113}Cd(p,p'),(p,p'γ) 1967Ko07

E=14 MeV. σ(θ), θ=30°–145° with magnetic spectrograph, FWHM≈40 keV, 1967Ko07.

^{113}Cd Levels

E(level)	Jπ‡	$T_{1/2}$	L†	β_L	Comments
0.0	1/2+				Jπ: from adopted levels.
292 *10*	3/2+		2	0.19	
316		11.0 ns *6*			$T_{1/2}$: from pulsed–beam γ(t) with semi, 1972RaZM looking at 316γ.
576 *10*	5/2+		2	0.22	
670 *10*	3/2+,5/2+		2	0.11,0.99	
879 *10*	3/2+,5/2+		2	0.098,0.08	
1758 *10*	5/2−,7/2−		3	0.20,0.17	
1887 *10*	5/2−,7/2−		3	0.15,0.13	
1986 *10*	5/2−,7/2−		3	0.12,0.10	

† From comparison with DWBA calculations.
‡ Assumed for β_L calculation.

^{113}Cd(d,d') 1962Jo05

E=15 MeV. Magnetic spectrograph, resolution≈40 keV.

^{113}Cd Levels

E(level)	Jπ†	Comments
0.0		
300	+	
580	+	
690	+	
1160		
1760	+	Jπ: note that π=– for the 1758 level seen in (p,p').
2010?		

† From σ(42)/σ(59).

Coulomb Excitation 1991KrZR,1958Mc02,1972An28

1991KrZR: ^{113}Cd(^{197}Au,^{197}Au',γ) E=approximately 4.5 MeV/u.
Enriched ^{113}Cd target with thick lead–backing to stop the recoils 3 HPGe detectors at 0°, 54°, and 90°.
γ–intensities, γ–γ–coincidences and angular distributions. Spins and multipole mixing ratios deduced from angular distributions.
1958Mc02: ^{113}Cd(p,p'γ) E=2.1–3.3 MeV, scin. Measured Eγ, Iγ, γ(θ), linear pol.
1972An28: ^{113}Cd(α,α'γ) E=12.4 MeV. ^{113}Cd(^{12}C,^{12}C'γ) E=35.3, 41.1 MeV, semi. Measured Eγ, Iγ.
Other: 1971GeZW.

^{113}Cd Levels

E(level)	Jπ†	$T_{1/2}$‡	Comments
0.0	1/2+		
298.59 *7*	3/2+	29 ps *9*	B(E2)=0.13 *2* (1972An28).
316.18 *7*	5/2+	4.9 ns *7*	B(E2)=0.0080 *10* (1972An28).
583.95 *7*	5/2+	6.9 ps *14*	B(E2)=0.32 *6* (1972An28).
680.41 *8*	3/2+	<12 fs	B(E2)=0.070 *15* (1972An28).
708.49 *7*	3/2+		
897.49 *9*	3/2+		
1006.88 *12*	7/2+		
1313.77 *9*	5/2+		
1450.81 *13*	3/2+		
1513.05 *12*	7/2+		

† As given by 1991KrZR.
‡ From B(E2).

γ(^{113}Cd)

Eγ†	E(level)	Iγ‡	Mult.	δ	α	Comments
17.7	316.18	3.1 *4*	M1		10.2 *3*	Iγ: from 1972An28. B(M1)(W.u.)=0.019 *5*.
96.2 *1*	680.41	147.2	[M1,E2]		1.1 *6*	
267.7 *1*	583.95	>0.0				
285.2 *1*	583.95	>0.0				
298.6 *1*	298.59	100	M1+E2	+0.30 *+3−1*	0.029 *5*	δ: from 1972An28. δ=0.29 (1958Mc02) from γ(θ) and linear polarization. δ=0.26 +5−5 or −3.6 +6−10 (1991KrZR). B(M1)(W.u.)=0.025 *8*; B(E2)(W.u.)=20 *8*.
316.2 *1*	316.18	100	[E2]		0.0080 *10*	B(E2)(W.u.)=0.83 *13*.
364.3 *1*	680.41	30.2	M1+E2	−0.02 *7*		δ: from 1972An28. δ=−0.17 +7−6 or 2.7 +6−4 (1991KrZR). B(M1)(W.u.)>2.5.

Continued on next page (footnotes at end of table)

Coulomb Excitation 1991KrZR,1958Mc02,1972An28 (continued)

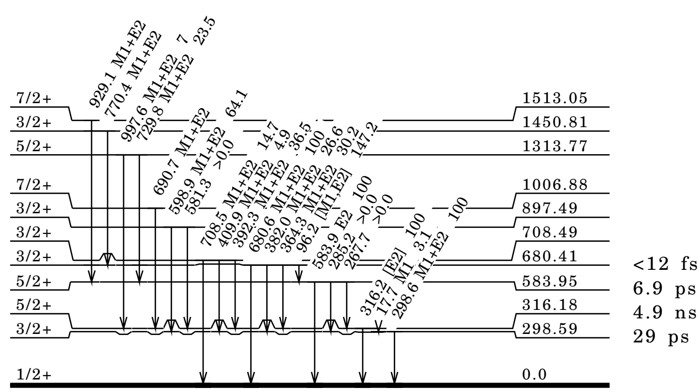
γ(^{113}Cd) (continued)

Eγ†	E(level)	Iγ‡	Mult.	δ	Comments
382.0 *1*	680.41	26.6 *4*	M1+E2	+0.16 *15*	δ: from 1972An28. δ=0.16 +5–5 or –11 +7–5 (1991KrZR). B(M1)(W.u.)>1.7.
392.3 *1*	708.49	36.5	M1+E2		δ: δ=–0.17 +12–17 or –2.7 +8–16 (1991KrZR).
409.9 *1*	708.49	4.9	M1+E2		δ: δ=+7 +14–3 or –0.17 +17–20 (1991KrZR).
581.3 *1*	897.49	>0.0			
583.9 *1*	583.95	100	E2		B(E2)(W.u.)=37 *8*.
598.9 *1*	897.49	64.1	M1+E2		δ: δ=+5.9 +87–18 or –0.09 +7–8 (1991KrZR).
680.6	680.41	100 *23*	M1+E2	+0.02 *+2–6*	δ: from 1972An28. δ=0.15 +5–6 or –2.4 +3–4 (1991KrZR). B(M1)(W.u.)>1.2.
690.7 *1*	1006.88		M1+E2	3.7 *+63–17*	δ: from 1991KrZR.
708.5 *1*	708.49	14.7	M1+E2		δ: δ=+0.29 +9–9 or –4 +1–3 (1991KrZR).
729.8 *1*	1313.77	23.5	M1+E2	–0.18 *+11–12*	δ: from 1991KrZR.
770.4 *1*	1450.81		M1+E2		δ: δ=+0.01 +25–25 or 4.1 –23 (1991KrZR).
929.1 *1*	1513.05		M1+E2	0.26 *+10–10*	δ: from 1991KrZR.
997.6 *1*	1313.77	7	M1+E2	1.6 *+11–11*	δ: from 1991KrZR.

† From 1991KrZR.
‡ % photon branching from each level (1991KrZR).

Level Scheme

Intensities: relative Iγ



$^{113}_{48}Cd_{65}$

^{173}Yb(^{24}Mg,Fγ) 2000Fo10

E=134.5 MeV. Measured Eγ, and Iγ using the GAMMASPHERE with 92 Compton–suppressed large volume HPGe detectors.

^{113}Cd Levels

E(level)‡	Jπ	Comments
0.0	1/2+	
263.54† *3*	11/2–	E(level): from Adopted Levels, Gammas.
815.09† *20*	15/2–	
1657.0† *3*	19/2–	
2613.7† *5*	(23/2–)	
3448.8† *8*	(27/2–)	
4201.3† *12*	(31/2–)	

† (A): $\nu h_{11/2}$ sequence.
‡ From least–squares fit to Eγ's.

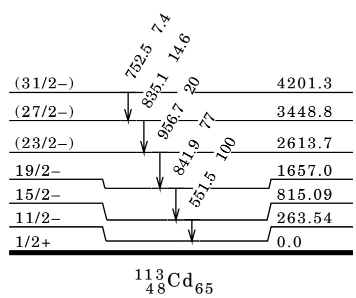
$^{173}Yb(^{24}Mg,F\gamma)$ 2000Fo10 (continued)

$\gamma(^{113}Cd)$

Eγ	E(level)	Iγ
551.5 *2*	815.09	100
752.5 *8*	4201.3	7.4 *8*
835.1 *6*	3448.8	14.6 *10*
841.9 *2*	1657.0	77 *5*
956.7 *4*	2613.7	20 *3*

Level Scheme

Intensities: relative Iγ



$^{176}Yb(^{28}Si,F\gamma)$ 2000Bu06

E=145 MeV.
Measured: γ, γγ, γ(θ), eurogam2 array.

^{113}Cd Levels

E(level)†	Jπ	E(level)†	Jπ	E(level)†	Jπ
0.0	1/2+	2324.5§ *4*	(21/2+)	2962.6# *4*	(23/2+)
263.0	11/2−	2538.3# *4*	(19/2+)	3448.9‡ *4*	(27/2−)
814.60‡ *20*	15/2−	2613.4‡ *4*	(23/2−)	3473.9§ *5*	(29/2+)
1656.6‡ *3*	(19/2−)	2757.8§ *4*	(25/2+)	4201.5‡ *5*	(31/2−)

† From least-squares fit to Eγ's.
‡ (A): 11/2− band.
§ (B): band based on 23/2−.
\# (C): band 3.

$\gamma(^{113}Cd)$

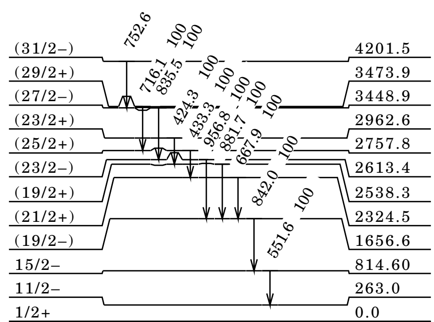
Eγ†	E(level)	Iγ†	Eγ†	E(level)	Iγ†
424.3 *2*	2962.6	100	752.6 *2*	4201.5	
433.3 *2*	2757.8	100	835.5 *2*	3448.9	100
551.6 *2*	814.60	100	842.0 *2*	1656.6	100
667.9 *2*	2324.5	100	881.7 *2*	2538.3	100
716.1 *2*	3473.9	100	956.8 *2*	2613.4	100

† ΔEγ assumed to be 0.2 keV by evaluator no Iγ given in the paper.

$^{176}Yb(^{28}Si,F\gamma)$ 2000Bu06 (continued)

Level Scheme

Intensities: relative Iγ



$^{113}_{48}Cd_{65}$

Adopted Levels, Gammas

$Q(\beta^-)$=–1036.6 *27*; S(n)=9445 *5*; S(p)=6078 *3*; $Q(\alpha)$=–3072 *4* 2003Au03.

^{113}In Levels

Cross Reference (XREF) Flags

A ^{113}Cd β^- Decay (7.7×10^{15} y)	H ^{112}Cd(^{3}He,d)	O Others:
B ^{113}Cd β^- Decay (14.1 y)	I ^{112}Cd(α,t)	^{114}Sn(d,^{3}He)
C ^{113}In IT Decay (99.476 min)	J ^{113}Cd(p,nγ)	^{115}In(p,t)
D ^{113}Sn ε Decay (115.09 d)	K ^{113}In(γ,γ')	^{116}Sn(p,α)
E ^{113}Sn ε Decay (21.4 min)	L ^{113}In(d,d')	^{112}Cd(p,p) IAR
F ^{110}Pd(^{7}Li,4nγ)	M ^{113}In(α,α')	
G ^{110}Pd(^{6}Li,3nγ)	N Coulomb Excitation	

E(level)[§]	Jπ[†]	XREF	$T_{1/2}$	Comments
0.0	9/2+	ABCDEFGHIJKL NO	stable	μ=+5.5289 *2* (1989Ra17); Q=+0.799 (1989Ra17). μ: NMR. Q: atomic beam. Value includes pol correction. Jπ: atomic beam (1976Fu06), L(^{3}He,d)=4.
391.699 *3*	1/2–	CD GHIJK NO	99.476 min *23*	%IT=100; μ=–0.21074 *2* (1989Ra17). %IT: K–electron capture <0.0036% (1970De22). μ: atomic beam. Jπ: atomic beam (1976Fu06), M4 γ to 9/2+. $T_{1/2}$: From weighted average of 99.3 min *2* (1967Ok02), 99.2 min *6* (1969Va04), 99.48 min *3* (1970Go48), 99.48 min *8* (1970Le07), 99.8 min *2* (1970Ro29), 99.47 min *7* (1971Ha18), 99.2 min *6* (1971Oo01), 99.78 (18) (1971Em01), 102 min *2* (1975Bu24), 99.21 min *13* (1982HoZJ), 99.49 min *6* (1982RuZV), 99.45 min *7* (1984Iw06), and 99.6 min *3* (1987Ne01). In the Limited Relative Statistical Weight method, the uncertainty for the 1970Go48 value is increased from 0.03 to 0.0316 to reduce its relative weight from 53% to 50%. For either weighting, the results are the same, with the internal uncertainty of 0.022 and the reduced–χ^2=1.07. Since these data are consistent, the Rajeval and Normalized Residual methods give the same result. Others: 105 min *10* (1939Ba03), 104 min 2 (1940La07), 102 min *2* (1958Gi06), 114 min (1965Ca13), 102.4 min (1975Ku10), and 99.8 min *7* (1997We13).
646.833 *8*	3/2–	D GHIJ O		Jπ: L(^{3}He,d)=1, γ(θ) of 255γ in (p,nγ).
1024.24[e] *5*	5/2+	GHIJK NO	3.6 ps *3*	Jπ: L(^{3}He,d)=2, level excited in Coul. ex., E2 γ to 9/2+.
1029.63 *5*	1/2+,3/2+	D J	0.33 ns *3*	Jπ: 638γ is E1, 1/2+ preferred from syst. $T_{1/2}$: from ^{113}Cd(p,nγ).
1063.88 *7*	3/2+	HIJ	0.58 ns *3*	Jπ: L(^{3}He,d)=2, E1 γ to 1/2–. $T_{1/2}$: from ^{113}Cd(p,nγ).
1106.42 *8*	3/2–,5/2–	J		Jπ: M1,E2 γ to 1/2–, γ(θ) of 714γ in (p,nγ).
1131.45 *5*	5/2+	F HIJK NO	0.97 ps *7*	Jπ: L(^{3}He,d)=2, level excited in Coul. ex., E2 γ to 9/2+. $T_{1/2}$: from ^{113}In Coul. ex.
1173.06 *9*	11/2+	FG JK MNO	60 fs *6*	Jπ: γ(θ) of 1173γ and 171γ in Coul. ex., L(p,t)=2 from 9/2+. $T_{1/2}$: from ^{113}In(γ,γ').
1191.11[d] *9*	7/2+	FGHIJ L		Jπ: L(^{3}He,d)=4, M1 γ's to 5/2+.
1344.90 *10*	13/2+	FG J NO	0.33 ps *3*	Jπ: γ(θ) of E2 1344γ. $T_{1/2}$: from ^{113}In Coul. ex.
1351.01 *20*		J LM		
1380.76 *7*	1/2–,3/2–,5/2–	J		Jπ: E1 γ to 1/2+,3/2+ level.
1453.0 *3*		J		
1471.87 *8*	3/2–,5/2–,7/2–	G J		Jπ: M1,E2 γ to 3/2–, γ(θ) of 825γ in (p,nγ).
1496.38 *8*		J		
1504.0 *5*		JK		

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Adopted Levels, Gammas (continued)

^{113}In Levels (continued)

E(level)§	Jπ†	XREF	$T_{1/2}$	Comments
1509.00 *16*	7/2+,9/2+	G J L NO	≤0.2 ps	Jπ: γ(θ) of 1509γ in Coul. ex., L(p,t)=2, 7/2+ preferred in analogy with ^{115}In. $T_{1/2}$: from ^{113}In Coul. ex.
1535.92 *9*	1/2–,3/2–,5/2–	G J		Jπ: E1 γ to 3/2+.
1552.0 *4*		J MO		
1567.05 *9*	7/2+,9/2+	GHIJ NO	0.24 ps *10*	XREF: H(1571)I(1571)O(1569). Jπ: γ(θ) of 1567γ in Coul. ex., 9/2+ preferred in analogy with ^{115}In, L(^{3}He,d)=4. $T_{1/2}$: from ^{113}In Coul. ex.
1569.54 *7*	–	G J		Jπ: M1,E2 γ to 3/2–.
1618.88 *9*		J		
1630.56 *9*	(7/2+,9/2+)	G JK NO		Jπ: γ's to 5/2+,11/2+.
1634 *5*		HI L O		XREF: L(1648). Jπ: L(p,t)=(3) from 9/2+.
1675.47 *8*		J		
1684.12 *9*		J		
1689.6[d] *5*	11/2+	FG J		Jπ: E2 γ to 7/2+.
1700 *5*	1/2+	H		Jπ: L(^{3}He,d)=0. E(level): probably not the same as 1706.99 level, since E(levels) from (^{3}He,d) in the range 393 to 1567 appear to be about 1–4 keV too high.
1707.35 *9*	+	J		Jπ: M1,E2 γ to 5/2+.
≈1758	9/2+	O		E(level): from (p,t). Jπ: L(p,t)=0+2 from 9/2+.
1760.27 *14*		J		
1768.04 *8*	3/2+,5/2+	HIJ L		XREF: H(1774)I(1774). Jπ: L(^{3}He,d)=2 at 1774 *8*.
1802.30 *8*		J		
1822.53 *10*	‡	J		
1835.71 *18*	1/2+	GH J		Jπ: L(^{3}He,d)=0 at 1831. XREF: H(1831).
1865.33 *22*	–	J		Jπ: M1,E2 γ to 3/2–,5/2– level.
1914.10 *10*		J		
1920.77 *9*		J		
1937.87 *10*		J O		
1947.56 *10*		J		
1980? *15*		L		
1999.12 *12*		J		
2032.73 *21*		J		
2039.72 *14*		J		
2048 *10*	7/2+,9/2+	HI		Jπ: L(^{3}He,d)=4.
2051.43 *8*		J		
2063.99 *21*		J		
2070.09 *14*		J		
≈2094?		O		E(level): from (p,t), possibly same as 2104 level. L(p,t)=(3).
2095.38 *8*		J		
2104 *10*	9/2–,11/2–	I		Jπ: L(α,t)=5, 11/2– preferred from shell-model syst.
≈2116?		L O		E(level): from (p,t), possibly same as 2104 level, 2120 level (d,d') could also correspond to 2104 or 2116 level, L(p,t)=(3).
2118.32 *18*		J		
2144.53 *11*		J		
2153 *10*	1/2+	H		Jπ: L(^{3}He,d)=0.
2164.9 *10*		G LM O		E(level): a level with L=3 observed in (α,α') at 2170 which gives parity=(–).
2170.32 *14*		J		
2180.8 *5*		J		
2183.22 *10*		J		
2190 *10*	3/2+,5/2+	H		Jπ: L(^{3}He,d)=2.
2224.8 *10*		G L O		
2233.2[a] *5*	(15/2–)	F		Jπ: (E1) γ to 13/2+ and systematics.
2253.38 *9*		J O		

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Adopted Levels, Gammas (continued)

^{113}In Levels (continued)

E(level)[§]	Jπ[†]	XREF	Comments
2281.04 18		J	
2283.5[c] 3	17/2+	FG L	E(level): 2283 level seems different from 2298 level because γ to 13/2+ limits Jπ to 9/2+.
2295.25 13		J	
2298 10	3/2+,5/2+	H	Jπ: L(^{3}He,d)=2.
2331.25 21		J	
2339.46 17		J	
2346 10	3/2+,5/2+	H	Jπ: L(^{3}He,d)=2.
2371.65 11		J O	
2376 10	9/2−,11/2−	I	Jπ: L(α,t)=5, 11/2− preferred from shell-model syst. E(level): a 2380 level (d,d') could be 2376, 2391, or 2396 level.
2378.17 14		J	
2383.82 15		J	
2391? 10	3/2+,5/2+	H	Jπ: L(^{3}He,d)=2.
2391.5?[d] 6	(15/2+)	F	
2396.1[a] 6	(17/2−)	F	
2442.8 10		F L O	
2475.29 21		G J M	
2515.5 3		J	
2540 15		L	
2556.99 17		J	
2559 10	9/2−,11/2−	I	Jπ: L(α,t)=5, 11/2− preferred from shell-model syst.
2560.61 23		J	
2586 5		O	E(level): from (p,α).
2654.1 4		FG	
2664.1[a] 5	(19/2−)	FG	
2665.0 4		J	
2665+x[b]	(19/2−)	F	
2669.6[c] 3	17/2+	F	
2728.01 23		J	
2783.84 10		J	
2786.0 5		FG	
2853.9[a] 6	(21/2−)	FG	
2880.9 5		F	
2904.8 3		J	
3023.4[a] 7	(23/2−)	FG	
3050.6[@] 5		F	
3071.6[c] 4	(19/2+)	F	
3122.4[c] 4	(21/2+)	F	
3172.1+x[b] 3	(23/2−)	F	
3194.5[d] 6	(19/2+)	F	
3214.2[c] 5	(23/2+)	F	
3249.6[@] 6		F	
3280.2[a] 7	(25/2−)	F	
3290.1[#] 6	(21/2−)	F	
3305.9 6		F	
3350.9 6		F	
3397.5[c] 6	(25/2+)	F	
3599.2 6		F	
3743.9+x[b] 5	(27/2−)	F	
3788.3[c] 7	(27/2+)	F	
3854.2[#] 7	(23/2−)	F	
3866.9[@] 6		F	
3968.1[d] 6	(23/2+)	F	
3973.0[a] 8	(27/2−)	F	
4090.0[#] 7	(25/2−)	F	
4377.8[c] 7	(29/2+)	F	
4431.0 6	(27/2−)	F	
4431.9[@] 6		F	
4441.0+x[b] 6	(31/2−)	F	
4606.0[d] 7	(27/2+)	F	
4715.3[a] 8	(29/2−)	F	
4800.3 6		F	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{113}In Levels (continued)

E(level)[§]	Jπ[†]	XREF	Comments
5062.4[c] *7*	(31/2+)	F	
5126.2 *6*		F	
5259.2+x[b] *6*	(35/2−)	F	
5393.0[a] *6*	(31/2−)	F	
5394+y[&]	(33/2−)	F	
5448.0 *7*		F	
5731.0 *7*		F	
5734.8+y[&] *3*	(35/2−)	F	
5790.6[c] *8*	(33/2+)	F	
6113.9+y[&] *5*	(37/2−)	F	
6187.6+x[b] *7*	(39/2−)	F	
6476.0+y[&] *6*	(39/2−)	F	
7215.9+x[b] *9*	(43/2−)	F	
12883		G	IAS of 1/2+ ^{113}Cd g.s.
13190		G	IAS of 299–keV, (3/2+) ^{113}Cd excitation.
13427		G	IAS of 584–keV, 5/2+ ^{113}Cd excitation.
13541		G	IAS of 681–keV, (3/2+) ^{113}Cd excitation.
13748		G	IAS of 884–keV, 1/2+ ^{113}Cd excitation.
13867		G	IAS of 988–keV, 1/2+ ^{113}Cd excitation.
14074		G	
14389		G	
14488		G	
14683?		G	
15043		G	
15096?		G	
15141		G	
15335?		G	
15476		G	
15518		G	
15610?		G	
15639		G	
15684?		G	
15758		G	
15801?		G	
15880?		G	
15934?		G	
15971?		G	
16038		G	
16146		G	
16236		G	
16344?		G	
16503?		G	
16597		G	

† J for levels greater than 13738 were not adopted because most of these levels are questionable, see ^{112}Cd(p,p) IAR. Jπ without comments are tentative and based on γ's multipolarities and bands consideration.
‡ Jπ=1/2+ from L(^{3}He,d)=0 for E=1831 *5*.
§ From least–squares fit to γ energies.
\# (A): Band 1.
@ (B): Band 2.
& (C): Band 3.
a (D): Band 4.
b (E): Band 5.
c (F): Band 6.
d (G): Band 7.
e (H): Suggested members of rotational band with Nilsson orbit 1/2+(431).

Adopted Levels, Gammas (continued)

$\gamma(^{113}In)$

E(level)	Eγ†	Iγ‡	Mult.§	δ	α	Comments
391.699	391.698 3	100	M4		0.540 4	Mult.,Eγ: from ^{113}In IT decay. A weak E5 admixture could not be excluded from α(K)exp (1985HaZA), not adopted. B(M4)(W.u.)=8.31 9.
646.833	255.134 10	100 3	M1+E2	0.7 6	0.046 6	Mult.,Eγ: from ^{113}In IT decay. δ: from ^{113}Sn ε decay (115.09 d).
	646.830 10	0.00018 9	[E3]			Mult.,Eγ: from ^{113}Sn IT decay.
1024.24	377.59 10	10.3 5	[E1]			B(E1)(W.u.)=0.000139 14.
	1024.30 10	100.0 7	E2@			B(E2)(W.u.)=3.9 4.
1029.63	382.90 8	6.7 3	[E1]			B(E1)(W.u.)=9.8×10^{-7} 11.
	638.03 8	100 3	E1#			B(E1)(W.u.)=3.2×10^{-6} 4. Mult.: from $^{113}Cd(p,n\gamma)$. Eγ: from ^{113}Sn IT decay.
1063.88	416.9 1	2.0 5	#			
	672.4 2	100 5	E1#			B(E1)(W.u.)=1.61×10^{-6} 14.
1106.42	459.8 2	11.0 10	M1,E2#			
	714.9 2	100 5	M1,E2#			
1131.45	107.21 20	1.32 20	[M1,E2]			
	484.90 10	16.5 3	E1(+M2)@	−0.03 5		δ: from B(E2) (see Coul. ex.) and $T_{1/2}$. B(E1)(W.u.)=(0.00037 3); B(M2)(W.u.)=(6 +22−6).
	1131.5 1	100.0 6	E2@			B(E2)(W.u.)=8.2 6.
1173.06	1173.1 1	100	M1+E2#	0.47 5		δ: from B(E2) (see Coul. ex.) and $T_{1/2}$. B(M1)(W.u.)=0.186 20; B(E2)(W.u.)=24 5.
1191.11	167.1 3	2.2 4	M1(+E2)#	<0.89		δ: from Coul. ex.
	1191.1 1	100 4	M1,E2#			
1344.90	171.4 7	2.14 10	M1+E2@	+0.03 3	0.1155 3	B(M1)(W.u.)=0.28 3; B(E2)(W.u.)=7 +14−7.
	1344.89 10	100 2	E2@			B(E2)(W.u.)=11.7 12.
1351.01	1351.0 2	100				
1380.76	316.7 1	77 4				
	351.4 1	100 5	E1#			
	734.1 2	12.3 18				
	989.0 1	36.8 18				
1453.0	1453.0 3	100				
1471.87	825.01 10	100 45	M1,E2#			
	1080.1 2	45 4				
1496.38	472.1 1	100 5				
	1496.4 1	10.0 25				
1504.0	1504.0 5	100				
1509.00	377.8 10	7 3				
	1509.04 19	100 3				
1535.92	345.0 3	15.0 25				
	429.5 2	15.0 25				
	472.1 1	100 5	E1#			
	889.3 10					
	1144.5 4	17.5 25	M1,E2#			
1552.0	1552.0 4	100				
1567.05	394.0 5	14.2 10	[M1,E2]			
	1567.0 1	100 1	[M1,E2]			
1569.54	922.71 10	100 6	M1,E2#			
	1177.8 1	31 4	#			
1618.88	972.1 1	22 2				
	1619.0 2	100 10				
1630.56	457.7 2	35 6				
	606.4 3	76 5				
	1630.5 1	100 4				
1675.47	544.0 1	30.1 14				
	651.1 3	8.2 14				
	1675.5 1	100 6				
1684.12	1037.6 1	100				
1689.6	497.5 2	100	E2#			
1707.35	576.0 1	81 6	M1,E2#			
	677.5 5	44 3	#			
	683.2 2	100 6	M1,E2#			

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Adopted Levels, Gammas (continued)

γ(^{113}In) (continued)

E(level)	Eγ†	Iγ‡	Mult.§
1707.35	1060.4 10		
	1315.3 2	25 3	
1760.27	587.2 1	100	
1768.04	738.4 1	19.6 18	
	743.8 1	100 5	
1802.30	266.8 2	15.4 19	
	330.2 2	3.8 19	
	696.0 2	30.8 19	
	1155.5 4	5.8 19	
	1802.2 1	100 6	
1822.53	792.9 1	100 4	
	1430.8 2	6.7 22	
1835.71	160.3 4	17 4	
	326.7 1	100 4	
1865.33	758.9 2	100	M1,E2#
1914.10	347.0 3	2.9 19	
	782.9 2	8.6 10	
	889.8 1	100 5	
1920.77	789.3 2	21.7 22	
	856.6 2	34.8 22	
	896.6 1	100 4	
1937.87	831.3 8	3.1 15	
	1291.1 1	100 6	
	1546.3 3	12.3 15	
1947.56	841.2 5	33 4	
	1300.8 1	100 7	
	1555.9 3	15 4	
1999.12	291.8 1	100 7	
	808.0 3	36 7	
	1352.0 4	29 7	
2032.73	1003.1 2	100	
2039.72	848.6 1	100	
2051.43	945.0 1	100 8	
	2051.4 1	33 8	
2063.99	1000.1 2	100	
2070.09	598.1 2	100 5	
	689.5 2	18.9 13	
	1040.5 5	6.8 14	
	1423.2 3	8.1 14	
2095.38	388.1 3	8 3	
	411.5 1	39 3	
	528.1 3	14 3	
	963.7 2	42 6	
	2095.2 1	100 6	
2118.32	548.7 2	9.5 16	
	609.5 3	100 6	
2144.53	1114.9 1	100	
2164.9	991.8	100	
2170.32	979.2 1	100	
2180.8	835.9 4	100	
2183.22	613.3 2	24 6	
	711.0 3	18 6	
	1052.1 2	100 6	
	1076.5 3	47 6	
	1159.5 2	53 6	
	1536.0 3	88 6	
2224.8	1051.7	100	
2233.2	888.7 3	100	(E1)
2253.38	1147.1 4	17 4	
	1606.6 1	91 4	
	1861.7 2	100 9	
2281.04	1149.8 3	19 9	
	1256.7 2	100 6	
2283.5	938.7 3	100	E2
2295.25	1164.3 3	60 10	
	1648.6 2	100 10	
	1903.2 2	90 10	
2331.25	1307.0 2	100	
2339.46	1233.1 2	100 5	
	1692.6 3	36 5	
	1947.6 5	18 5	
2371.65	1347.4 1	100	
2378.17	759.3 2	100 12	
	1271.9 2	56 4	
	1731.0 3	32 4	
2383.82	1359.6 2	42 7	
	1737.0 3	14 7	
	1992.1 3	100 7	
2391.5?	700.4 3	100	E2
2396.1	163.3 3	100	
2442.8	1097.9	100	
2475.29	1451.0 2	100 8	
	2476.3 10		
2515.5	1409.1 3	100	
2556.99	1532.8 3	100 11	
	1910.2 2	56 11	
2560.61	646.5 2	100	
2654.1	211.7& 3	40 5	
	420.4 3	100 10	
2664.1	267.7 3	100	
2665.0	1034.4 4	100	
2669.6	1324.6 3	100	E2
2728.01	813.9 2	100	
2783.84	1759.6 1	100 6	
	2137.0 2	22 3	
2786.0	131.8 3	52.4 16	
	388.9 3	100 3	
2853.9	68.6 3	100	
	189.7 3	100	(M1,E2)
2880.9	483.9 3	100	
2904.8	1136.5 5	67 17	
	1274.4 4	100 17	
	1773.4 4	83 17	
3023.4	169.5 3	100	(M1,E2)
3050.6	170.2 3	100	
	386.5 3	100	
3071.6	401.8 3	56 2	(M1,E2)
	788.2 3	100 3	(M1,E2)
3122.4	838.9 3	100	E2
3172.1+x	507.1 3	100	E2
3194.5	803.2 3	100	E2
3214.2	91.8 3	100	(M1,E2)
3249.6	199.1 3	100	
	395.8 3	100	
3280.2	256.9 3	100	(M1,E2)
3290.1	625.3 3	100	(E2)
3305.9	641.1 3	100	
3350.9	686.1 3	100	
3397.5	183.3 3	100	(M1,E2)
3599.2	744.6 3	100	
3743.9+x	571.8 3	100	E2
3788.3	390.9 3	100	(M1,E2)
3854.2	564.8 3	100	(M1,E2)
3866.9	617.2 3	100	
3968.1	772.9 3	100	E2
3973.0	692.6 3	100	(M1,E2)

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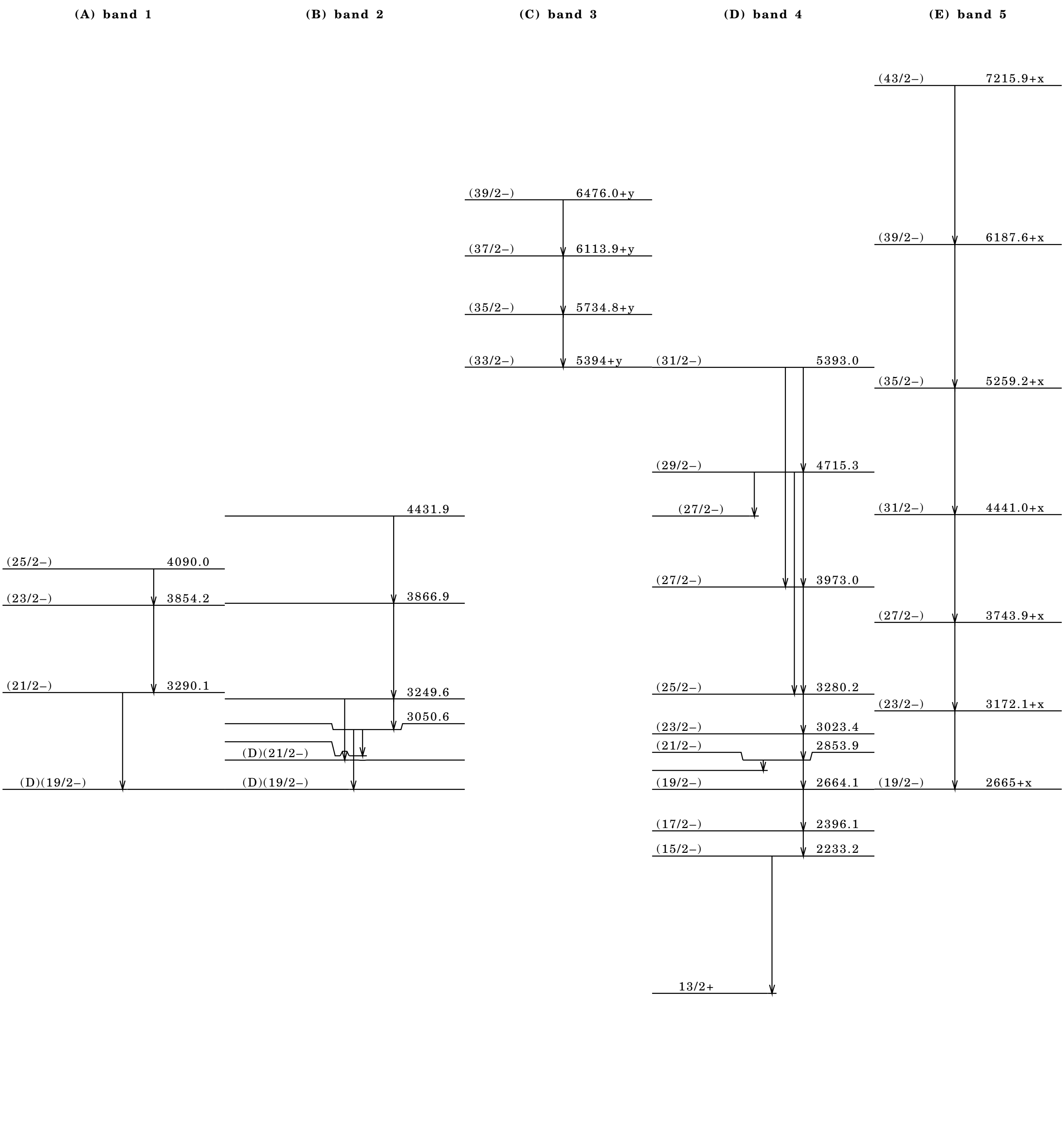
Adopted Levels, Gammas (continued)

γ(^{113}In) (continued)

E(level)	Eγ†	Iγ‡	Mult.§
4090.0	236.1 *3*	100	(M1,E2)
4377.8	589.4 *3*	100 *3*	(M1,E2)
	980.2 *3*	<14	(E2)
4431.0	1406.7 *3*	100	E2
4431.9	564.8 *3*		
4441.0+x	697.1 *3*	100	E2
4606.0	637.8 *3*	100	(E2)
4715.3	284.5 *3*	100	(M1,E2)
	742.40 *3*	78 *6*	(M1,E2)
	1434.9 *3*	100 *9*	E2
4800.3	826.30 *3*	<71	
	1518.3 *3*	100 *21*	
5062.4	684.6 *3*	100	(M1,E2)
	1274.2 *3*	<10	
5126.2	326.2 *3*	<40	
	409.7 *3*	100 *8*	(M1,E2)
5259.2+x	818.2 *3*	100	E2
5393.0	677.7 *3*	100 *12*	(M1,E2)
	1418.6 *3*	82 *17*	(E2)
5448.0	731.6 *3*	100	
5731.0	1014.6 *3*	100	
5734.8+y	340.8 *3*	100	
5790.6	728.2 *3*	100	(M1,E2)
6113.9+y	379.1 *3*	100	(M1,E2)
6187.6+x	928.4 *3*	100	(E2)
6476.0+y	362.1 *3*	100	(M1,E2)
7215.9+x	1028.3 *6*	100	(E2)

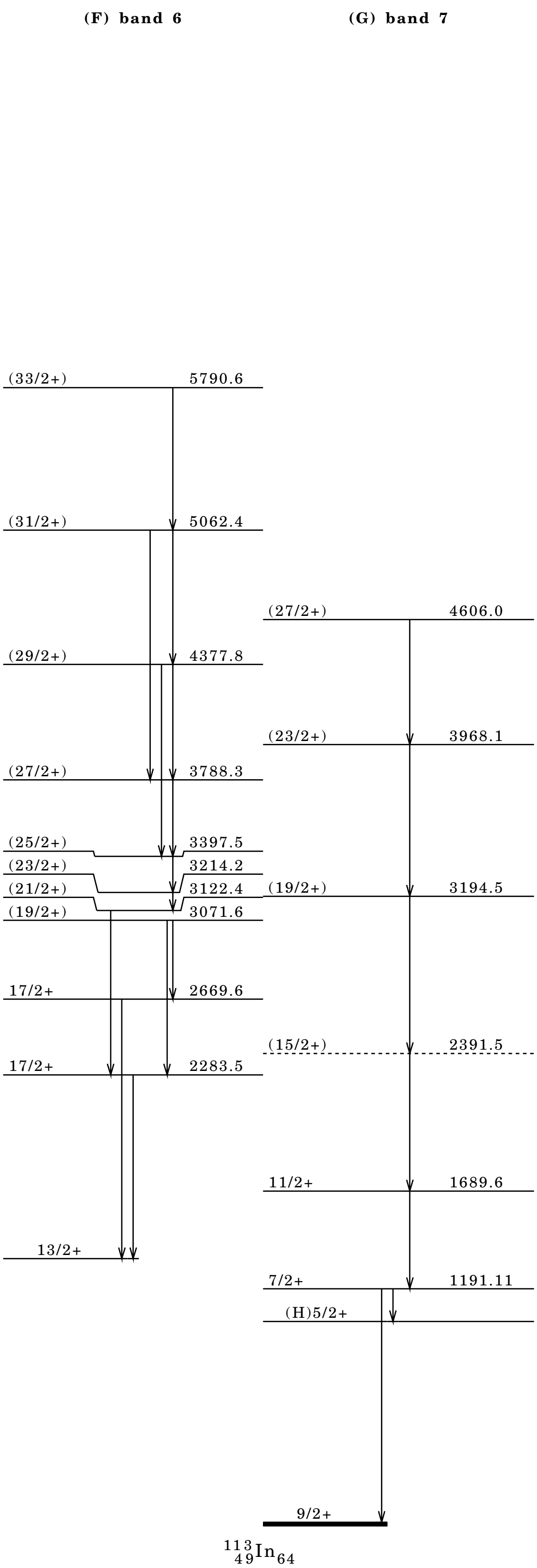
† From ^{113}Cd(p,nγ), except as noted and when possible.
‡ Relative branchings are given.
§ From DCO ratios in ^{110}Pd(^{7}Li,4n).
\# From α(K)exp in ^{113}Cd(p,nγ).
@ Mult and δ from ^{113}In Coul. ex.
& Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas (continued)



$^{113}_{49}In_{64}$

Adopted Levels, Gammas (continued)



^{113}Cd β^- Decay (7.7×10^{15} y) 1996Da11,1970Gr20

Parent ^{113}Cd: E=0.0; Jπ=1/2+; $T_{1/2}$=7.7×10^{15} y *3*; Q(g.s.)=320 *3*; %β^- decay=100.
1996Da11: measured scintillation crystals of CDW04.
1970Gr20: measured β^- activity of enriched and natural cadmium samples.
Others: 1962Wa15, 1969De25, 1994Al49.

^{113}In Levels

E(level)	Jπ	$T_{1/2}$†
0.0	9/2+	stable

† See adopted levels.

β^- radiations

Eβ⁻	E(level)	Iβ⁻†	Log *ft*	Comments
(320 *3*)	0.0	100	23.20 *10*	Eβ⁻: 1996Da11 give endpoint energy=337.4 keV with error of 0.3 (statistical) and 22 (syst).

† For β^- intensity per 100 decays, multiply by 1.0.

^{113}Cd β^- Decay (14.1 y) 1969De25

Parent ^{113}Cd: E=263.7 *3*; Jπ=11/2−; $T_{1/2}$=14.1 y *5*; Q(g.s.)=320 *3*; %β^- decay=99.86.
Measured Eβ, βγ coin. No βγ coin were observed, 1969De25.

^{113}In Levels

E(level)	Jπ	$T_{1/2}$†
0.0	9/2+	stable

† From adopted levels.

β^- radiations

Eβ⁻	E(level)	Iβ⁻†	Log *ft*
580 *4*	0.0	99.977	9.25 *5*

† For β^- intensity per 100 decays, multiply by 1.0.

^{113}In IT Decay (99.476 min) 1971Ha18

Parent ^{113}In: E=391.691 *8*; Jπ=1/2−; $T_{1/2}$=99.476 min *23*; %IT decay=100.
Evaluation by M.–M. Be, March 1999 This evaluation was done as part of a collaboration of evaluators from Laboratoire National Henri Becquerel (LNHB) in France; Physikalisch–Technische Bundesanstalt (PTB) in Germany; HMS Sultan and AEA Technology in the United Kingdom; Khlopin Radium Institute (KRI) in Russia; Centro de Investigaciones Energeticas, Medioambientales, y Tecnologicas (CIEMAT) and Universidad Nacional a Distancia (UNED) in Spain; and Brookhaven National Laboratory (BNL), Lawrence Berkeley National Laboratory (LBNL), and Idaho National Engineering and Environmental Laboratory (INEEL) in the United States.
Measured Ice, Ice(K) from (ce)(K x ray)–coin, Iγ, 1971Ha18.

^{113}In Levels

E(level)	Jπ	$T_{1/2}$†
0.0	9/2+	stable
391.699 *3*	1/2−	1.6579 h *4*

† See ^{113}In Adopted Levels.

^{113}In IT Decay (99.476 min) 1971Ha18 (continued)

$\gamma(^{113}In)$

Branching: From the presence of Cd K x rays from a ^{113}In (99 min) source, 1970Ra05 (and 1969RaZP) reported ε decay of this level with I_ε = 0.07% *1*. Such a transition to ^{113}Cd would be 1st forbidden, 1/2− to 1/2+, and would have a log*ft* of 5.1. which is possible but unlikely since the log*ft* systematics (1998Si17) indicate that is the lower limit of the observed values. Also, 1970De22 (see also 1969De25) repeated the experiment and placed a limit of <0.0036% on this ε transition for which the log*ft* is >6.5. Such an electron capture branch is therefore negligible and has not been included in this scheme.

Eγ	E(level)	Iγ†	Mult.	α	Comments
391.698 *3*	391.699	64.94 *17*	M4	0.540 *4*	Eγ: from 2000He14 evaluation. Iγ: From Iγ(391)=[100.0 − I(γ+ce)(646)] / [1 + α(391)]; the uncertainty is all from the 0.26% uncertainty in (1 + α). Mult.: from α(K)exp=0.437 *7*, α(exp)=0.540 *7*, α(K)exp/α(L+...)exp=4.21 *8* (1971Ha18); α(L)exp/α(M)exp, α(L)exp/α(N)exp, α(M)exp/α(N)exp (1972Ko38). Others: 1970Go48, 1970Le07, 1971GoYM, 1985HaZA. α: α and α_K are from 1985HaZA evaluation of measured values; these values average 3% lower than the theoretical values of 1978Ro21. The α_L and α_M were then computed as 3% lower than the corresponding theoretical values. B(M4)(W.u.)=8.31 *9*.

† For absolute intensity per 100 decays, multiply by 1.0.

^{113}Sn ε Decay (115.09 d)

Parent ^{113}Sn: E=0; Jπ=1/2+; $T_{1/2}$=115.09 d *3*; Q(g.s.)=1036.6 *27*; %ε+%β^+ decay=100.

^{113}Sn–J: From 1998Bl04 evaluation.

^{113}Sn–$T_{1/2}$: 115.09 d *3* from weighted average of 115.2 d *8* (1972Em01), 115.07 d *10* (1972La14), 115.09 d *4* (1980Ho17), 115.12 d *13* (1982RuZV), and 115.08 d *8* (1992Un01). The reduced–χ^2=0.03. Because this set of values is consistent, the Limited Relative Statistical Weight method does not increase the uncertainty for the 1980Ho17 value even though it contributes 66% of the relative weight. If the 1980Ho17 uncertainty were increased from 0.04 to 0.056 in order decrease its relative weight to 50%, the weighted average average would still be 115.09 with an uncertainty of 0.04. The very small reduced–χ^2 value suggests that the reported uncertainties are overestimated. It also means that the Rajeval and Normalized Residual methods give the same result. Others: 107 d (1959Bu08) and 115.06 d *7* (1982HoZJ, replaced by 1992Un01).

^{113}Sn–Q(ε): From 2003Au03.

In addition to the 3 excited levels populated in this decay scheme, there is a level below the decay energy in ^{113}In at 1024 (Jπ=5/2+). The β^- decay to this level will be negligible.

Decay data evaluated by R. γ. Helmer, August 1996 with minor editing done in July 1998. This evaluation was done under the collaboration which includes evaluators from Laboratoire Primaire des Rayonnments Ionisants (LPRI) in France; Physikalisch–Technische Bundesanstalt (PTB) in Germany; Imperial College in the United Kingdom; and Brookhaven National Laboratory (BNL), Lawrence Berkeley National Laboratory (LBNL), and Idaho National Engineering Laboratory (INEL) in the United States. This evaluation was reviewed and accepted by evaluators in this collaboration.

The main γ ray of 391 keV depopulates a level with a $T_{1/2}$ of 99 min, so the ratio of its emission rate to the ^{113}Sn decay rate will vary with time. After a sufficient time, about five half–lives for the level, the ratio of the ^{113}In (99 min) and ^{113}Sn activities remains constant and is $T_{1/2}(^{113}Sn)/[T_{1/2}(^{113}Sn)-T_{1/2}(113min)]$=1.0006.

The total average radiation energy released by 113Sn is 1035.5 keV *5* (calculated by evaluators using the computer program radlst). This value agrees remarkably well with Q(ε)=1036.6 keV *27* (2003Au03) and confirms the quality of the decay scheme.

^{113}In Levels

E(level)	Jπ†	$T_{1/2}$
0.0	9/2+	stable

Continued on next page (footnotes at end of table)

^{113}Sn ε Decay (115.09 d) (continued)

^{113}In Levels (continued)

E(level)	Jπ[†]	$T_{1/2}$	Comments
391.699 *3*	1/2−	99.476 min *23*	$T_{1/2}$: From weighted average of 99.3 min *2* (1967Ok02), 99.2 min *6* (1969Va04), 99.48 min *3* (1970Go48), 99.48 min *8* (1970Le07), 99.8 min *2* (1970Ro29), 99.47 min *7* (1971Ha18), 99.2 min *6* (1971Oo01), 99.78 (18) (1971Em01), 102 min *2* (1975Bu24), 99.21 min *13* (1982HoZJ), 99.49 min *6* (1982RuZV), 99.45 min *7* (1984Iw06), and 99.6 min *3* (1987Ne01). In the Limited Relative Statistical Weight method, the uncertainty for the 1970Go48 value is increased from 0.03 to 0.0316 to reduce its relative weight from 53% to 50%. For either weighting, the results are the same, with the internal uncertainty of 0.022 and the reduced−χ^2=1.07. Since these data are consistent, the Rajeval and Normalized Residual methods give the same result. Others: 105 min *10* (1939Ba03), 104 min 2 (1940La07), 102 min *2* (1958Gi06), 114 min (1965Ca13), 102.4 min (1975Ku10), and 99.8 min *7* (1997We13). From the presence of Cd K x rays from a ^{113}In (99 min) source, 1970Ra05 (and 1969RaZP) reported ε decay of this level with I(ε)=0.07% *1*. Such a transition to ^{113}Cd would be 1st forbidden, 1/2− to 1/2+, and would have a log *ft* of 5.1. This ε intensity is unlikely since the log *ft* systematics (1973Ra10) indicate that such transitions have log *ft*'s of >5.9. Also, 1970De22 (see also 1969De25) repeated the experiment and placed a limit of <0.0036% on this ε transition for which the log *ft* is >6.5. Such an electron capture branch is therefore negligible and has not been included in this scheme.
646.833 *10*	3/2−		
1029.73 *8*	1/2+,3/2+	0.33 ns *3*	$T_{1/2}$: From Adopted Level data in 1998Bl04 evaluation.

† From 1998Bl04 evaluation.

β^+,ε Data

The electron−capture decay from the 1/2+ parent to the ground state (9/2+) is 4th forbidden. From log *ft* systematics (1973Ra10), one expects this log *ft* value to be ≥22, with a corresponding I(ε)≤$1.\times10^{-12}$%. For the unpopulated level at 1024 keV, the decay is 2nd forbidden, with an expected log *ft* value of >11.0. The corresponding I(ε) is <$2.\times10^{-7}$%; so this branch is also completely negligible.

εK,εL,εM Calculated from tables of 1995ScZY.

Eε	E(level)	Iε[†]	Log *ft*
(7 *3*)	1029.73	0.00103 *4*	6.5 *8*
(390 *3*)	646.833	2.21 *8*	8.20 *2*
(645 *3*)	391.699	97.79 *8*	7.010 *4*

† For intensity per 100 decays, multiply by 1.00.

γ(^{113}In)

Eγ	E(level)	Iγ[†‡#]	Mult.[§]	δ[§]	α	Comments
255.134 *10*	646.833	2.11 *8*	M1+E2	0.7 *6*	0.046 *6*	Eγ: Based on value of 255.126 *10* (1973In06) scaled by the evaluator by the ratio Eγ(391,here)/Eγ(391,1973In06). Iγ: From Iγ(255)/Iγ(392)=0.0325 *12* from Limited Relative Statistical Weight analysis of 0.0333 *13* (1973In06), 0.0285 *9* (1978He08), 0.0337 *8* (1993Mu14), and 0.0327 *8* (1994DeZX). Others: 0.030 *3* (1958Gi06), 0.027 *2* (1959Bu08), 0.028 *1* (1961Gr11), 0.029 *3* (1967Bo18), 0.0322 (1968Fo07), and 0.0285 *7* (1976De35 from same data as 1978He08).
382.90 *8*	1029.73	0.000060 *3*				Eγ: Calculated from level energies; γ not observed in this decay. Iγ: From Iγ(382)/Iγ(638)=6.2/100 from Adopted γ data in 1998Bl04 evaluation and based on observed decay of this level in ^{113}Cd(p,nγ) (1976Di03,1974Ki02).

Continued on next page (footnotes at end of table)

^{113}Sn ε Decay (115.09 d) (continued)

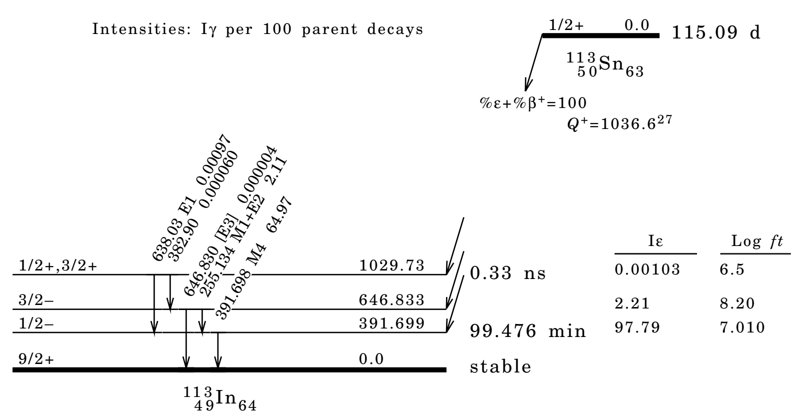
γ(^{113}In) (continued)

Eγ	E(level)	Iγ†‡#	Mult.§	α	Comments
391.698 *3*	391.699	64.97 *17*	M4	0.540 *4*	Eγ: From 1997HeZZ. Iγ: From Iγ(391)=[100.0 − I(γ+ce)(646)] / [1 + α(391)]; the uncertainty is all from the 0.26% uncertainty in (1 + α). α: α(K) and α are from 1985HaZA evaluation of measured values; these values average 3% lower than the theoretical values of 1978Ro21. The α(L) and α(M) were then computed as 3% lower than the corresponding theoretical values. B(M4)(W.u.)=8.31 *9*.
638.03 *8*	1029.73	0.00097 *4*	E1		Eγ,Iγ: From 1978He08. Mult.: from ^{113}Cd(p,nγ). α: Theoretical value from 1968Ha54. B(E1)(W.u.)=3.2×10^{-6} *4*.
646.830 *10*	646.833	4×10^{-6} *2*	[E3]		Eγ: Calculated from level energy. Iγ: From 1978He08.

† Values are with ^{113}In in equilibrium (i.e., at long decay times).
‡ I(Kα_2 x ray)=27.85 *22*, I(Kα_1 x ray)=52.2 *4*, I(Kβ x ray)=17.44 *14* calculated by radlst.
§ From 1998Bl04 evaluation.
\# For absolute intensity per 100 decays, multiply by 1.00.

Decay Scheme

Intensities: Iγ per 100 parent decays



^{113}Sn ε Decay (21.4 min) 1961Sc12

Parent ^{113}Sn: E=77.38 *2*; Jπ=7/2+; $T_{1/2}$=21.4 min *4*; Q(g.s.)=1035.9 *28*; %ε+%β$^+$ decay=8.9 *23*.
Measured I(K x ray), 1961Sc12.

^{113}In Levels

E(level)	Jπ	$T_{1/2}$†
0.0	9/2+	stable

† From adopted levels.

β$^+$,ε Data

Eε	E(level)	Iε†	Log *ft*
(1113 *3*)	0.0	100 *25*	4.65 *12*

† For intensity per 100 decays, multiply by 0.089 *23*.

$^{110}Pd(^{6}Li,3n\gamma)$ 1976TuZX

E=24 MeV. Measured Eγ, Iγ, γγ–coin, γ(θ), 1976TuZX.
For information on coin relations for unplaced γ's, see 1976TuZX.

^{113}In Levels

E(level)	Jπ†	$T_{1/2}$‡
0.0	9/2+	stable
391.7	1/2−	1.6582 h *6*
646.9	3/2−	
1024.2	5/2+	
1131.7	5/2+	
1173.0	11/2+	
1191.3§	(7/2+)	
1344.4	13/2+	
1472.9		
1509.5		
1536.2?		
1566.7		
1570.7		
1630.7		
1688.8§	(11/2+)	
1836.2		
2164.8		
2224.7		
2233.1	(15/2−)	
2264.1	(11/2,15/2)	
2282.7	(17/2+)	
2358.8?	(15/2+)	
2389.7§	(13/2+)	
2396.4	(17/2−)	
2442.3	(11/2,15/2)	
2466.7		
2654.2	(17/2)	
2664.0	(19/2−)	
2786.2	(19/2)	
2853.6	(21/2−)	
3023.2	(23/2−)	

† Jπ for levels below 1400 keV are from adopted levels. Jπ for higher levels are suggested on the basis of directional correlation of oriented nuclei.
‡ From adopted levels.
§ (A): Suggested members of rotational band with Nilsson Orbit 1/2+(431).

γ(^{113}In)

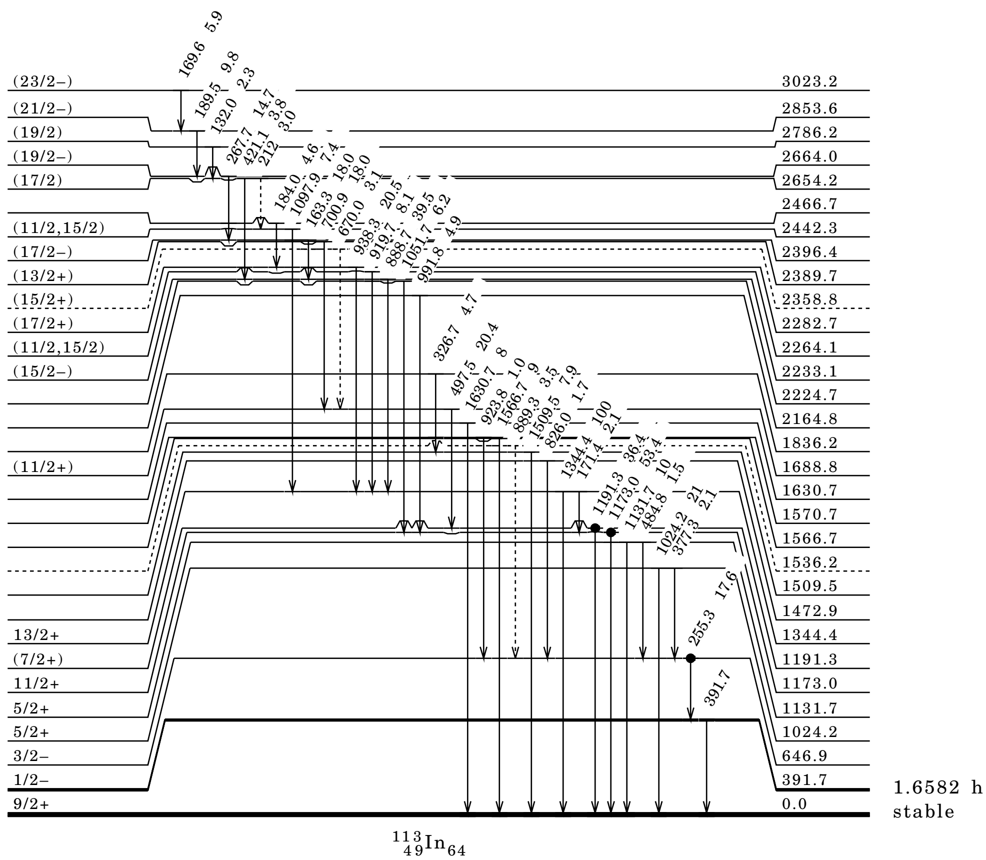
Eγ	E(level)	Iγ†
x91		
x123.0		
132.0	2786.2	2.3
163.3	2396.4	18.0
169.6	3023.2	5.9
171.4	1344.4	2.1
184.0	2466.7	4.6
189.5	2853.6	9.8
x198.7		
212§	2654.2	3.0
255.3	646.9	17.6
267.7	2664.0	14.7
326.7	1836.2	4.7
377.3	1024.2	2.1
391.7	391.7	
x414		
421.1	2654.2	3.8
484.8	1131.7	1.5
497.5	1688.8	20.4
670.0§	2358.8?	3.1
x673.5		
700.9	2389.7	18.0
826.0	1472.9	1.7
888.7	2233.1	39.5
889.3‡§	1536.2?	3.5
919.7	2264.1	8.1
923.8	1570.7	1.0
938.3	2282.7	20.5
991.8	2164.8	4.9
1024.2	1024.2	21
1051.7	2224.7	6.2
1097.9	2442.3	7.4
1131.7	1131.7	10
1173.0	1173.0	53.4
1191.3	1191.3	36.4
1344.4	1344.4	100
1509.5	1509.5	7.9
1566.7	1566.7	9
1630.7	1630.7	8

† Measured at 55°.
‡ From coin data in ^{113}Cd(p,nγ), this γ deexcites the 1914–keV level and not the 1536–keV level.
§ Placement of transition in the level scheme is uncertain.
x γ ray not placed in level scheme.

^{110}Pd(^{6}Li,3nγ) 1976TuZX (continued)

Level Scheme

Intensities: relative Iγ



^{110}Pd(^{7}Li,4nγ) 1997Ch01

1997Ch01: E=35–45 MeV. Measured Eγ, Iγ, $\gamma\gamma$–coin, $\gamma(\theta)$, DCO. Array detectors: five Compton–suppressed Ge with eight NaI multiplicity filter.

1976TuZX: ^{110}Pd(^{6}Li,3nγ), E=24 MeV. Preliminary. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma(\theta)$.

The level scheme is as given by 1997Ch01, some discrepancies are noted in comments in the level scheme by evaluator.

^{113}In Levels

E(level)[‡]	Jπ[†]	T$_{1/2}$	E(level)[‡]	Jπ[†]	E(level)[‡]	Jπ[†]
0.0	9/2+	stable	2653.8 *4*		3172.1+y[a] *3*	(23/2−)
1173.11 *25*	11/2+		2664.2[&] *5*	(19/2−)	3190.1 *6*	
1191.3[c] *3*	(7/2+)		2665+y[a]	(19/2−)	3192.2[c] *6*	(19/2+)
1344.51[b] *25*	13/2+		2669.2[b] *4*	17/2+	3213.8[b] *6*	(23/2+)
1688.6[c] *5*	(11/2+)		2785.5 *5*		3249.7[#] *5*	
2233.4[&] *4*	(15/2−)		2854.1[&] *5*	(21/2−)	3280.9[&] *6*	(25/2−)
2283.1[b] *4*	17/2+		2880.5 *5*		3289.5[§] *6*	(21/2−)
2357.6 *11*			3023.8[&] *6*	(23/2−)	3305.3 *6*	
2389.0[c] *6*	(15/2+)		3050.7[#] *5*		3350.3 *6*	
2396.6[&] *4*	(17/2−)		3071.2[b] *4*	(19/2+)	3397.1[b] *7*	(25/2+)
2442.3 *4*			3122.0[b] *5*	(21/2+)	3598.7 *6*	

Continued on next page (footnotes at end of table)

^{110}Pd(^{7}Li,4nγ) 1997Ch01 (continued)

^{113}In Levels (continued)

E(level)‡	Jπ†	E(level)‡	Jπ†	E(level)‡	Jπ†
3743.9+y[a] *5*	(27/2−)	4441.0+y[a] *6*	(31/2−)	5447.3 *7*	
3787.9[b] *7*	(27/2+)	4602.9[c] *8*	(27/2+)	5730.3 *7*	
3854.3[§] *7*	(23/2−)	4715.7[&] *6*	(29/2−)	5734.8+x[@] *3*	(35/2−)
3866.7[#] *6*		4799.4 *6*		5790.3[b] *8*	(33/2+)
3965.1[c] *7*	(23/2+)	5062.1[b] *7*	(31/2+)	6113.9+x[@] *5*	(37/2−)
3973.5[&] *6*	(27/2−)	5125.5 *6*		6187.6+y[a] *7*	(39/2−)
4090.4[§] *7*	(25/2−)	5172.5 *12*		6476.0+x[@] *6*	(39/2−)
4377.4[b] *7*	(29/2+)	5259.2+y[a] *6*	(35/2−)	7215.9+y[a] *9*	(43/2−)
4430.5 *6*	(27/2−)	5392.7[&] *6*	(31/2−)		
4431.4[#] *6*		5394+x[@]	(33/2−)		

† Jπ as given by 1997Ch01 derived from γ(θ), DCO the gammas's multipolarities, and bands consideration.
‡ From least–squares fit to γ energies.
§ (A): Band 1.
# (B): Band 2.
@ (C): Band 3.
& (D): Band 4.
a (E): Band 5.
b (F): Band 6.
c (G): Band 7.

γ(^{113}In)

Eγ†	E(level)	Iγ†	Mult.‡	Comments
y	2665+y			
x	5394+x			
68.6 *3*	2854.1	17 *2*		
91.8 *3*	3213.8	122 *2*	(M1,E2)	Mult.: DCO=0.57 *5*.
131.8 *3*	2785.5	33 *1*		
163.2 *3*	2396.6	443 *4*	(M1,E2)	Mult.: DCO=0.49 *1*.
169.5 *3*	3023.8	254 *2*	(M1,E2)	Mult.: DCO=0.45 *4*.
170.2[#] *3*	3050.7	44[#] *3*		
171.5 *3*	1344.51	44 *3*	(M1,E2)	Mult.: DCO=0.57 *5*.
183.3 *3*	3397.1	228 *2*	(M1,E2)	Mult.: DCO=0.55 *3*.
189.7 *3*	2854.1	228 *2*	(M1,E2)	Mult.: DCO=0.58 *4*.
199.1 *3*	3249.7	39 *1*		
211.7 *3*	2653.8	17 *2*		
226.7 *3*	2880.5	23 *2*		Eγ: given also deexciting the 3050 level but no level to feed?
236.1 *3*	4090.4	17 *2*	(M1,E2)[§]	
256.9 *3*	3280.9	167 *2*	(M1,E2)	Mult.: DCO=0.59 *5*.
267.5 *3*	2664.2	349 *2*	(M1,E2)	Mult.: DCO=0.57 *5*.
[x]271.1 *3*		12 *2*		
[x]278.2 *3*		56 *2*		
284.5 *3*	4715.7	12 *2*	(M1,E2)[§]	
326.2 *3*	5125.5	<10		
340.8 *3*	5734.8+x	25 *2*	[§]	
362.1 *3*	6476.0+x	16 *2*	(M1,E2)[§]	
[x]377.2 *3*				
379.1 *3*	6113.9+x	15 *2*	(M1,E2)[§]	
386.5 *3*	3050.7	45 *2*	(M1,E2)	Mult.: DCO=0.55 *10*.
388.9 *3*	2785.5	63 *2*	(M1,E2)	Mult.: DCO=0.47 *12*. Eγ: placed as deexciting the 2652 level and feeding the 2396 level by 1997Ch01, placed from this level by evaluator.
390.9 *3*	3787.9	167 *2*	(M1,E2)	Mult.: DCO=0.52 *5*.
395.8 *3*	3249.7	19 *1*	(M1,E2)	Mult.: DCO=0.53 *10*.
401.8 *3*	3071.2	70 *2*	(M1,E2)	Mult.: DCO=0.61 *20*.
409.7 *3*	5125.5	24 *2*	(M1,E2)[§]	
420.4 *3*	2653.8	42 *4*	(M1,E2)	Mult.: DCO=0.49 *15*.
[x]474.3 *3*		10 *2*		
483.9 *3*	2880.5	23 *2*		
497.3 *3*	1688.6	90 *3*	E2	Mult.: DCO=0.9 *1*.

Continued on next page (footnotes at end of table)

^{110}Pd(^{7}Li,4nγ) 1997Ch01 (continued)

γ(^{113}In) (continued)

Eγ†	E(level)	Iγ†	Mult.‡	Comments
507.1 *3*	3172.1+y	25 *2*	E2	Mult.: DCO=0.9 *3*.
525.9 *3*	3190.1	35 *2*		
564.8 *3*	3854.3	23 *2*	(M1,E2)	
	4431.4			
571.8 *3*	3743.9+y	63 *2*	E2	Mult.: DCO=0.9 *3*.
589.4 *3*	4377.4	72 *2*	(M1,E2)	Mult.: DCO=0.49 *2*.
617.2 *3*	3866.7	45 *3*		
625.3 *3*	3289.5	28 *2*	(E2)	
637.8 *3*	4602.9	31 *2*	(E2)	
641.1 *3*	3305.3	15 *2*		
669 *1*	2357.6			Eγ: not given in Table 1, only in figure 1 (1997Ch01).
677.7 *3*	5392.7	17 *2*	(M1,E2)	
684.6 *3*	5062.1	47 *2*	(M1,E2)	Mult.: DCO=0.48 *16*.
686.1 *3*	3350.3	<10		
692.6 *3*	3973.5	68 *2*	(M1,E2)	Mult.: DCO=0.57 *17*.
697.1 *3*	4441.0+y	12 *2*	E2	Mult.: DCO=0.9 *2*.
700.4 *3*	2389.0	85 *2*	E2	Mult.: DCO=0.9 *2*.
728.2 *3*	5790.3	31 *2*	(M1,E2)	
731.6 *3*	5447.3	<10		
742.4 *3*	4715.7	25 *2*	(M1,E2)§	
744.6 *3*	3598.7	19 *2*		
772.9 *3*	3965.1	51 *3*	E2	
788.2 *3*	3071.2	124 *2*	(M1,E2)	Mult.: DCO=0.68 *2*.
803.2 *3*	3192.2	80 *2*	E2	Mult.: DCO=0.9 *2*.
818.2 *3*	5259.2+y	23 *4*	E2	Mult.: DCO=1.1 *3*.
826.3 *3*	4799.4	<10		
838.9 *3*	3122.0	87 *2*	E2	Mult.: DCO=0.95 *8*.
888.7 *3*	2233.4	515 *3*	(E1)	Mult.: DCO=0.44 *2*.
x919.2 *3*		31 *3*		
928.4 *3*	6187.6+y	<20	(E2)	
938.7 *3*	2283.1	256 *2*	E2	Mult.: DCO=0.99 *4*.
980.2 *3*	4377.4	<10	(E2)	
x991.5 *3*		56 *1*		
1014.6 *3*	5730.3	33 *3*		
1028.3 *6*	7215.9+y	<20	(E2)	
1097.9 *3*	2442.3	24 *2*		
1173.2 *3*	1173.11	25 *2*	(M1,E2)§	
1191.3 *3*	1191.3	88 *3*	(M1,E2)	
1199 *1*	5172.5			Eγ: not given in Table 1, only in figure 1 (1997Ch01).
1274.2 *3*	5062.1	<5		
1324.6 *3*	2669.2	82 *2*	E2	Mult.: DCO=0.89 *9*.
1344.4 *3*	1344.51	1000	E2	Mult.: DCO=1.07 *6*.
x1390.3 *3*		<10		
1406.7 *3*	4430.5	14 *2*	E2§	
1418.6 *3*	5392.7	14 *3*	(E2)	
1434.9 *3*	4715.7	32 *3*	E2§	
x1444.5 *3*		<10		
1518.3 *3*	4799.4	14 *3*		
x1583.5 *3*		14 *3*		

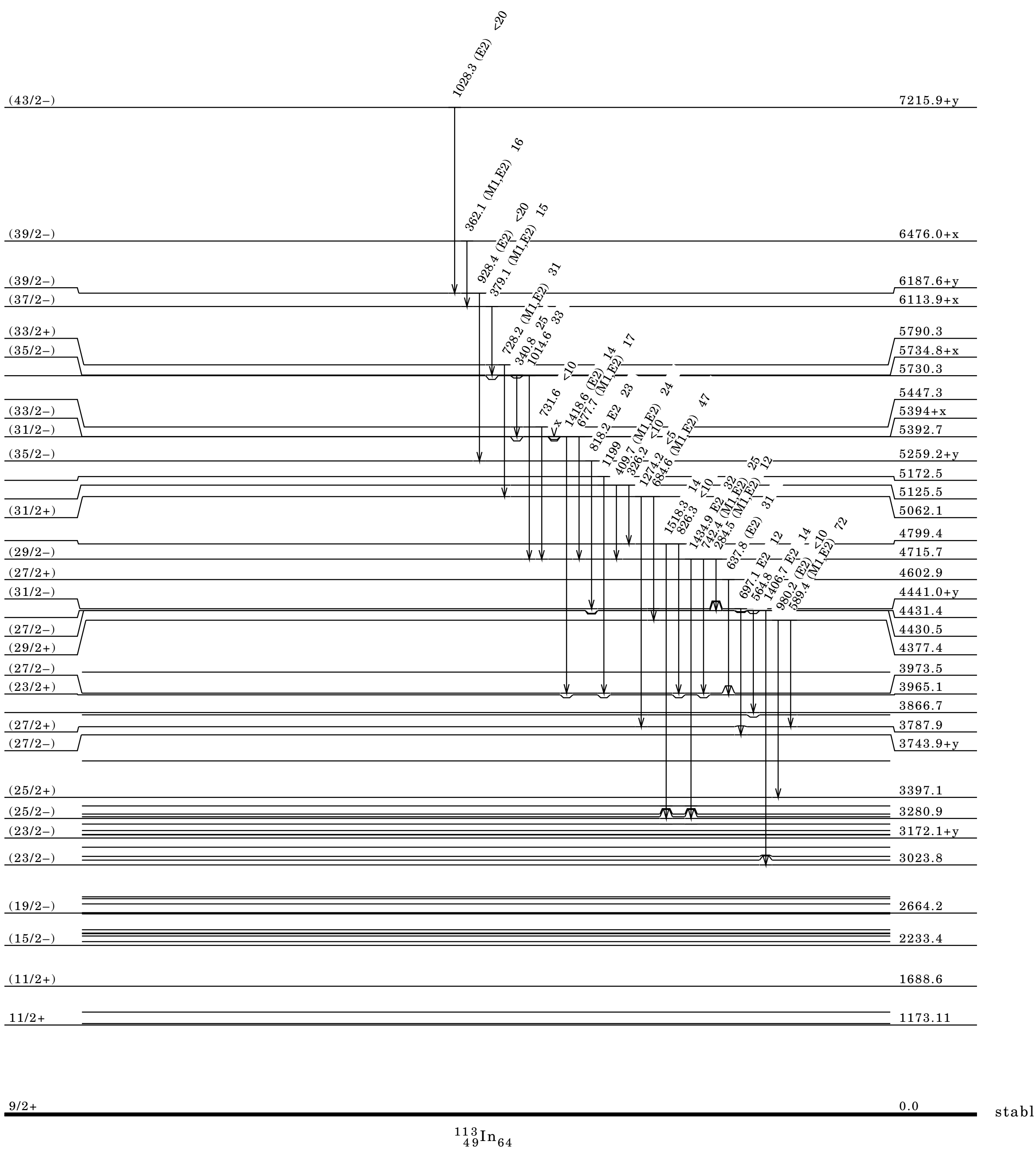
† From 1991Ch01.
‡ From DCO ratio and/or γ(θ). The values for DCO with the gating transition(s) as quadrupole are given in comments.
§ Mult from DCO when the gating transition is a dipole.
\# Multiply placed; undivided intensity given.
x γ ray not placed in level scheme.

$^{110}Pd(^{7}Li,4n\gamma)$ 1997Ch01 (continued)

Level Scheme

& Multiply placed; undivided intensity given

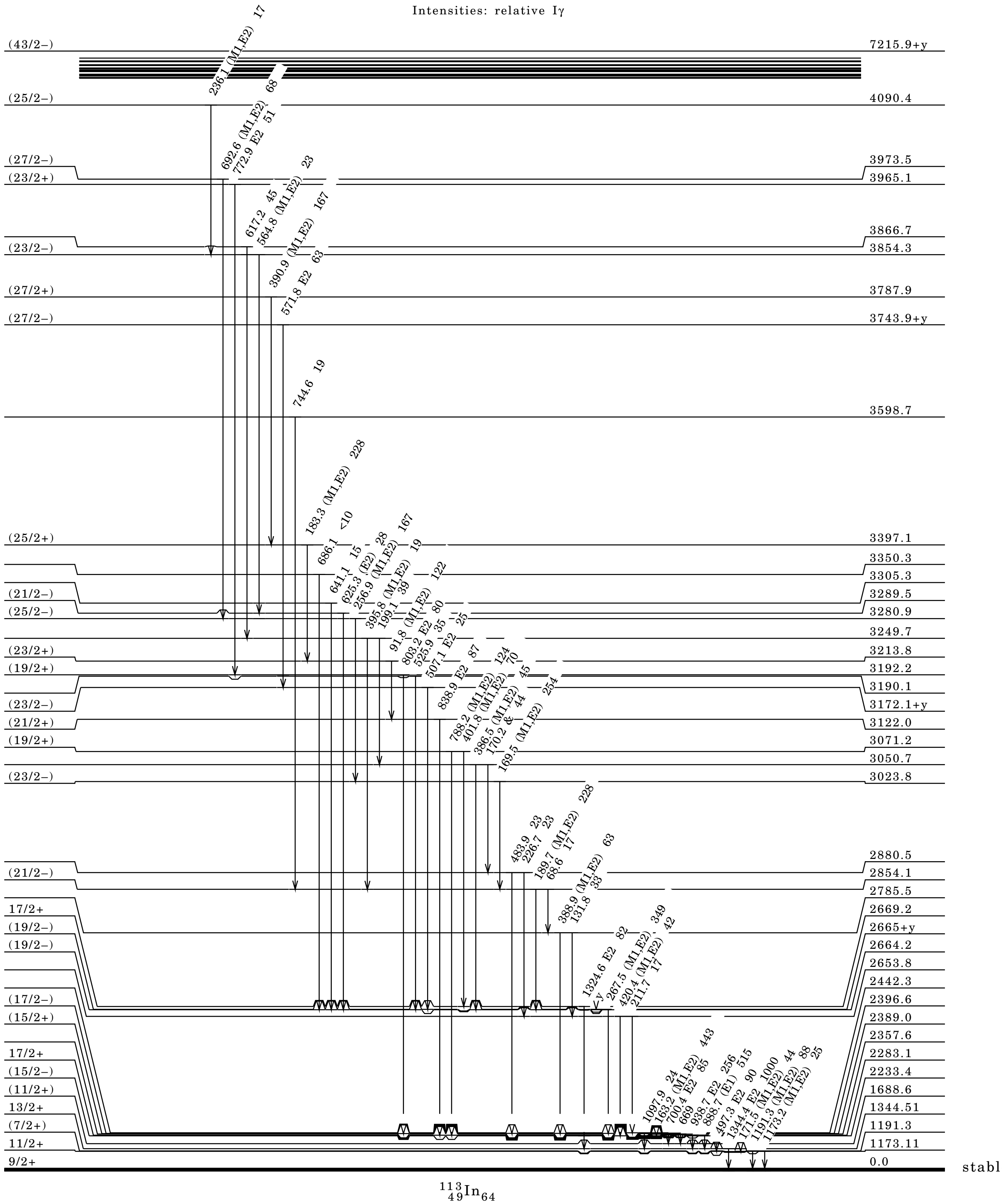
Intensities: relative Iγ



$^{110}Pd(^{7}Li,4n\gamma)$ 1997Ch01 (continued)

Level Scheme (continued)

& Multiply placed; undivided intensity given
Intensities: relative Iγ



^{112}Cd(p,p) IAR 1970Mi08

E=6–11 MeV. Measured σ(E(p),θ), θ=90°, 120°, 150°, and 170°, semi, 1970Mi08.
For level widths, see 1970Mi08.
Others: 1969Ab09, 1975Ab09, 1977So10.

^{113}In Levels

E(level)#	Jπ‡	L†	Comments
12873	1/2+	0	IAS of 1/2+ ^{113}Cd g.s.
13180	3/2+	2	IAS of 299 keV, (3/2+) ^{113}Cd excitation.
13417	5/2+	2	IAS of 584 keV, 5/2+ ^{113}Cd excitation.
13531	3/2+	2	IAS of 681 keV, (3/2+) ^{113}Cd excitation.
13738	1/2+	0	IAS of 884 keV, 1/2+ ^{113}Cd excitation.
13857	1/2+	0	IAS of 988 keV, 1/2+ ^{113}Cd excitation.
14064	5/2+	2	
14379	3/2+	2	
14478	3/2+	2	
14673?	(5/2+)	(2)	
15033	1/2+	0	
15086?	(1/2+)	(0)	
15131	7/2−	3	
15325?	(3/2−)	(1)	
15466	3/2−	1	
15508	7/2−	3	
15600?	(3/2−)	(1)	
15629	(7/2−)	(3)	
15674?	(1/2+)	(0)	
15748	7/2−	3	
15791?	(7/2−)	(3)	
15870?	(5/2+)	(2)	
15924?	(1/2+)	(0)	
15961?	(5/2+)	(2)	
16028	3/2−	1	
16136	3/2−	1	
16226	7/2−	3	
16334?	(3/2−)	(1)	
16493?	(1/2+)	(0)	
16587	3/2−	1	

† From shape of σ(E(p),θ).
‡ Based on L–values, known Jπ in ^{113}Cd or shell–model considerations.
# From S(p)=6074 *4* (1985Wa02) + res E(p)(c.m.) (1970Mi08).

^{112}Cd(^{3}He,d) 1974Ma09

E=27 MeV. Magnetic spectrograph with spark counter. σ(θ) at 12 angles (5°–40°), compared with DWBA calculations, 1974Ma09.

^{113}In Levels

E(level)	Jπ†	L	C²S‡
0.0	9/2+	4	0.17
393 *5*	1/2−	1	0.059
648 *5*	3/2−	1	0.048
1026 *5*	5/2+	2	0.52
1066 *5*	3/2+	2	0.15
1133 *5*	5/2+	2	0.02
1194 *5*	7/2+	4	0.21
1571 *5*	7/2+,9/2+	4	0.03,0.04
1634 *5*		(3,4)	
1700 *5*	1/2+	0	0.024
1774 *10*	3/2+	2	0.14
1831 *8*	1/2+	0	0.029
2048 *10*	7/2+	4	0.097
2153 *10*	1/2+	0	0.048
2190 *10*	3/2+,5/2+	2	0.045,0.03
2298 *10*	3/2+,5/2+	2	0.04,0.024
2346 *10*	3/2+,5/2+	2	0.033,0.02
2391 *10*	3/2+,5/2+	2	0.10,0.064

† Assumed for calculation of C²S.
‡ C²S normalized to the sum rule limit for the 3 lowest levels.

^{112}Cd(α,t) 1974Ma09

E=27 MeV. Magnetic spectrograph with spark counter. σ(θ) at 10 angles (10°–80°), compared with DWBA calculations.

^{113}In Levels

E(level)	Jπ†	L	C^2S‡	Comments
0.0	9/2+	4	0.15	
393 *5*	1/2−	1	0.083	
648 *5*	3/2−	1	0.078	
1026 *5*	5/2+	2	0.30	E(level): probable doublet.
1066 *5*	3/2+	2	0.090	
1133 *5*	5/2+	2	0.021	
1194 *5*	7/2+	4	0.19	
1571 *5*	7/2+,9/2+	4	0.022,0.03	
1634 *5*		(3,4)		
1774 *10*	3/2+	2	0.099	
2048 *10*	7/2+	4	0.063	
2104 *10*	11/2−	5	0.028	
2376 *10*	11/2−	5	0.11	
2559 *10*	11/2−	5	0.080	

† Assumed for calculation of C^2S.
‡ C^2S normalized to the sum rule limit for the 3 lowest levels.

^{113}Cd(p,nγ) 1990Vi09,1976Di03,1974Ki02

Jπ(^{113}Cd)=1/2+.
1976Di03: E=6–11 MeV. Measured (semi) Eγ, Iγ, γγ coin, γ(θ), E(ce), I(ce), excit. γ(θ) measured at 9 angles (30°–145°) at E=7.5 MeV.
1974Ki02: E=2.7–5.2 MeV. Measured neutron time of flight, Eγ, Iγ (semi), nγ coin.
1990Vi09: E=6.8 MeV. Measured Eγ, Iγ (semi), γγ.
The level scheme is as proposed by 1990Vi09, it is in agreement with the one given by 1976Di03 and 1974Ki02 upto the 1999–keV level. All levels above that have been proposed by 1990Vi09.

^{113}In Levels

E(level)	Jπ‡	$T_{1/2}$†
0.0	9/2+	
391.73 *6*	1/2−	
646.76 *6*	3/2−	
1024.23§ *6*	5/2+	
1029.60§ *8*	1/2+,(3/2+)	0.33 ns *3*
1063.89§ *8*	3/2+,(1/2+)	0.58 ns *3*
1106.46 *9*	3/2−,5/2−	
1131.45 *6*	5/2+	
1173.06 *9*	(7/2+,9/2+),11/2+	
1191.11§ *9*	7/2+	
1344.91 *10*	(9/2+,11/2+),13/2+	
1351.01 *20*		
1380.77 *8*	1/2−,3/2−	
1453.0 *3*		
1471.87 *9*	3/2−,5/2−,7/2−	
1496.34 *11*		
1504.0 *5*		
1508.97 *17*	(3/2,5/2),7/2+	
1535.93 *10*	3/2−,5/2−	
1552.0 *4*		
1567.04 *9*	(5/2),7/2+,9/2+	
1569.55 *9*	1/2−,3/2−	
1618.89 *10*		
1630.56 *9*	5/2+,7/2+,9/2+	
1675.47 *8*		
1684.12 *9*		
1688.61 *22*	9/2+	
1707.35 *9*	(3/2,5/2)+	
1760.26 *14*		
1768.03 *9*	3/2+,5/2+,7/2+	
1802.30 *8*		
1822.51 *11*	1/2,3/2,5/2	
1835.68 *19*		
1865.36 *22*	5/2−,7/2−	
1914.08 *10*	3/2+,5/2+	
1920.77 *10*	3/2+,5/2+,7/2+	
1937.88 *11*	3/2−,5/2−	
1947.57 *11*		
1999.13 *12*	1/2,3/2	
2032.71 *22*		
2039.72 *14*		
2051.45 *12*		
2064.00 *22*		
2070.10 *14*		
2095.38 *8*		
2118.32 *19*		
2144.51 *13*		
2170.32 *14*		
2180.8 *5*		
2183.23 *11*		
2253.39 *11*		
2281.04 *18*		

Continued on next page (footnotes at end of table)

$^{113}Cd(p,n\gamma)$ 1990Vi09,1976Di03,1974Ki02 (continued)

^{113}In Levels (continued)

E(level)	E(level)	E(level)
2295.27 *14*	2383.83 *16*	2665.0 *4*
2331.24 *21*	2476.0 *2*	2727.98 *23*
2339.49 *17*	2515.6 *4*	2783.84 *11*
2371.64 *12*	2557.00 *18*	2904.8 *3*
2378.18 *15*	2560.46# *22*	

† From pulsed–beam γ(t) with semi, 1971Ki14.
‡ Based on γ(θ), γ–decay properties, excit and systematics.
§ (A): Suggested members of rotational band with Nilsson Orbit 1/2+(431).
# A 1451.1γ is given in Table 4 of 1990Vi09 but not in Table 2, does not fit in the level scheme.

$\gamma(^{113}In)$

Eγ†	E(level)	Iγ†	Mult.§	δ	Comments
107.2 *2*	1131.45	0.5 *1*			
160.3 *4*	1835.68	0.4 *1*			
167.1 *3*	1191.11	0.6 *1*	M1(+E2)	<0.89	Mult.: α(K)exp=0.081 *35* yields D(+Q). From decay scheme D=M1.
255.0 *1*	646.76	100 *3*	M1(+E2)	<1.17	Mult.: from α(K)exp=0.035 *4*.
266.8 *2*	1802.30	0.8 *1*			
291.8 *1*	1999.13	1.4 *1*			
316.7 *1*	1380.77	4.4 *2*			
326.7 *1*	1835.68	2.3 *1*			
330.2 *2*	1802.30	0.2 *1*			
345.0 *3*	1535.93	0.6 *1*			
347.0 *3*	1914.08	0.3 *2*			
351.4 *1*	1380.77	5.7 *3*	E1		Mult.: from α(K)exp=0.0058 *14*.
377.6 *1*	1024.23	7.9 *5*			
382.9 *1*	1029.60	2.5 *1*			
388.1 *3*	2095.38	0.3 *1*			
391.8 *1*	391.73				
394.0 *5*	1567.04	0.4 *1*			
411.5 *1*	2095.38	1.4 *1*			
416.9 *1*	1063.89	0.4 *1*			
429.5 *2*	1535.93	0.6 *1*			
457.7 *2*	1630.56	1.0 *2*			
459.8 *2*	1106.46	2.3 *2*	M1,E2		Mult.: from α(K)exp=0.0074 *20*.
472.1 *1*	1496.34	4.0 *2*			
	1535.93	4.0 *2*	E1		Mult.: from α(K)exp=0.0024 *6*.
484.9 *1*	1131.45	5.5 *3*	E1		Mult.: from α(K)exp=0.0027 *7*.
497.5 *2*	1688.61	2.7 *2*	M1,E2		Mult.: from α(K)exp=0.0062 *10*.
528.1 *3*	2095.38	0.5 *1*			
544.0 *1*	1675.47	2.2 *1*			
548.7 *2*	2118.32	0.6 *1*			
576.0 *1*	1707.35	2.6 *2*	M1,E2		Mult.: from α(K)exp=0.0043 *11*.
587.2 *1*	1760.26	1.7 *1*			
598.1 *2*	2070.10	7.4 *4*			
606.4 *3*	1630.56	4.8 *3*			
609.5 *3*	2118.32	6.3 *4*			
613.3 *2*	2183.23	0.4 *1*			
638.0 *1*	1029.60	37 *2*	E1		Mult.: from α(K)exp=0.00130 *25*. B(E1)(W.u.)=3.2×10^{-6} *4*.
646.5 *2*	2560.46	0.6 *1*			
651.1 *3*	1675.47	0.6 *1*			
672.4 *2*	1063.89	20 *1*	E1		Mult.: from α(K)exp=0.00095 *18*. B(E1)(W.u.)=1.61×10^{-6} *14*.
677.5 *5*	1707.35	1.4 *1*			
683.2 *2*	1707.35	3.2 *2*	M1,E2		Mult.: from α(K)exp=0.0039 *10*.
689.5 *2*	2070.10	1.4 *1*			
696.0 *2*	1802.30	1.6 *1*			
711.0 *3*	2183.23	0.3 *1*			
714.9 *2*	1106.46	21 *1*	M1,E2		Mult.: from α(K)exp=0.0022 *3*.

Continued on next page (footnotes at end of table)

^{113}Cd(p,nγ) 1990Vi09,1976Di03,1974Ki02 (continued)

γ(^{113}In) (continued)

Eγ†	E(level)	Iγ†	Mult.§	Comments
734.1 2	1380.77	0.7 1		
738.4 1	1768.03	1.1 1		
743.8 1	1768.03	5.6 3		
758.9 2	1865.36	2.6 1	M1,E2	Mult.: from α(K)exp=0.0018 4.
759.3 2	2378.18	2.5 3		
782.9 2	1914.08	0.9 1		
789.3 2	1920.77	1.0 1		
792.9 1	1822.51	4.5 2		
808.0 3	1999.13	0.5 1		
813.9 2	2727.98	1.0 2		
825.0 1	1471.87	11 5	M1,E2	Mult.: from α(K)exp=0.0022 4.
831.3 8	1937.88	0.2 1		
835.9 4	2180.8	1.0 1		
841.2 5	1947.57	0.9 1		
848.6 1	2039.72	2.1 1		
856.6 2	1920.77	1.6 1		
889.8 1	1914.08	10.5 5		
896.6 1	1920.77	4.6 2		
922.7 1	1569.55	8.3 5	M1,E2	Mult.: from α(K)exp=0.0018 3.
945.0 1	2051.45	1.2 1		
963.7 2	2095.38	1.5 2		
972.1 1	1618.89	1.1 1		
979.2 1	2170.32	1.3 1		
989.0 1	1380.77	2.1 1		
1000.1 2	2064.00	2.5 3		
1003.1 2	2032.71	3.9 4		
1024.3 1	1024.23	73 3	E2	
1034.4 4	2665.0	1.0 1		
1037.6 1	1684.12	6.8 4		
1040.5 5	2070.10	0.5 1		
1052.1 2	2183.23	1.7 1		
1060.4	1707.35			
ˣ1064.4 3		0.2 1		
1076.5 3	2183.23	0.8 1		
1080.1 2	1471.87	5.0 4		
1114.9 1	2144.51	8.0 5		
1131.5 1	1131.45	31 2	E2	
1136.5 5	2904.8	0.4 1		
1144.5 4	1535.93	0.7 1		
1147.1 4	2253.39	0.4 1		
1149.8 3	2281.04	0.2 1		
1155.5 4	1802.30	0.3 1		
1159.5 2	2183.23	0.9 1		
1164.3 3	2295.27	0.6 1		
1173.1 1	1173.06	11.3 6	M1,E2	Mult.: from α(K)exp=0.00090 15.
1177.8 1	1569.55	2.6 3		
1191.1 1	1191.11	27 1	M1,E2	Mult.: from α(K)exp=0.00085 14.
1233.1 2	2339.49	2.2 1		
1256.7 2	2281.04	1.2 1		
1271.9 2	2378.18	1.4 1		
1274.4 4	2904.8	0.6 1		
1291.1 1	1937.88	6.5 4		
1300.8 1	1947.57	2.7 2		
1307.0 2	2331.24	1.2 1		
1315.3 2	1707.35	0.8 1		
1344.9 1	1344.91	2.9 2	E2	
1347.4 1	2371.64	1.4 1		
1351.0‡ 2	1351.01	2.8 2		
1352.0 4	1999.13	0.4 1		
1359.6 2	2383.83	0.6 1		
1409.1 3	2515.6	0.6 1		
1423.2 3	2070.10	0.6 1		
1430.8 2	1822.51	0.3 1		

Continued on next page (footnotes at end of table)

^{113}Cd(p,nγ) 1990Vi09,1976Di03,1974Ki02 (continued)

γ(^{113}In) (continued)

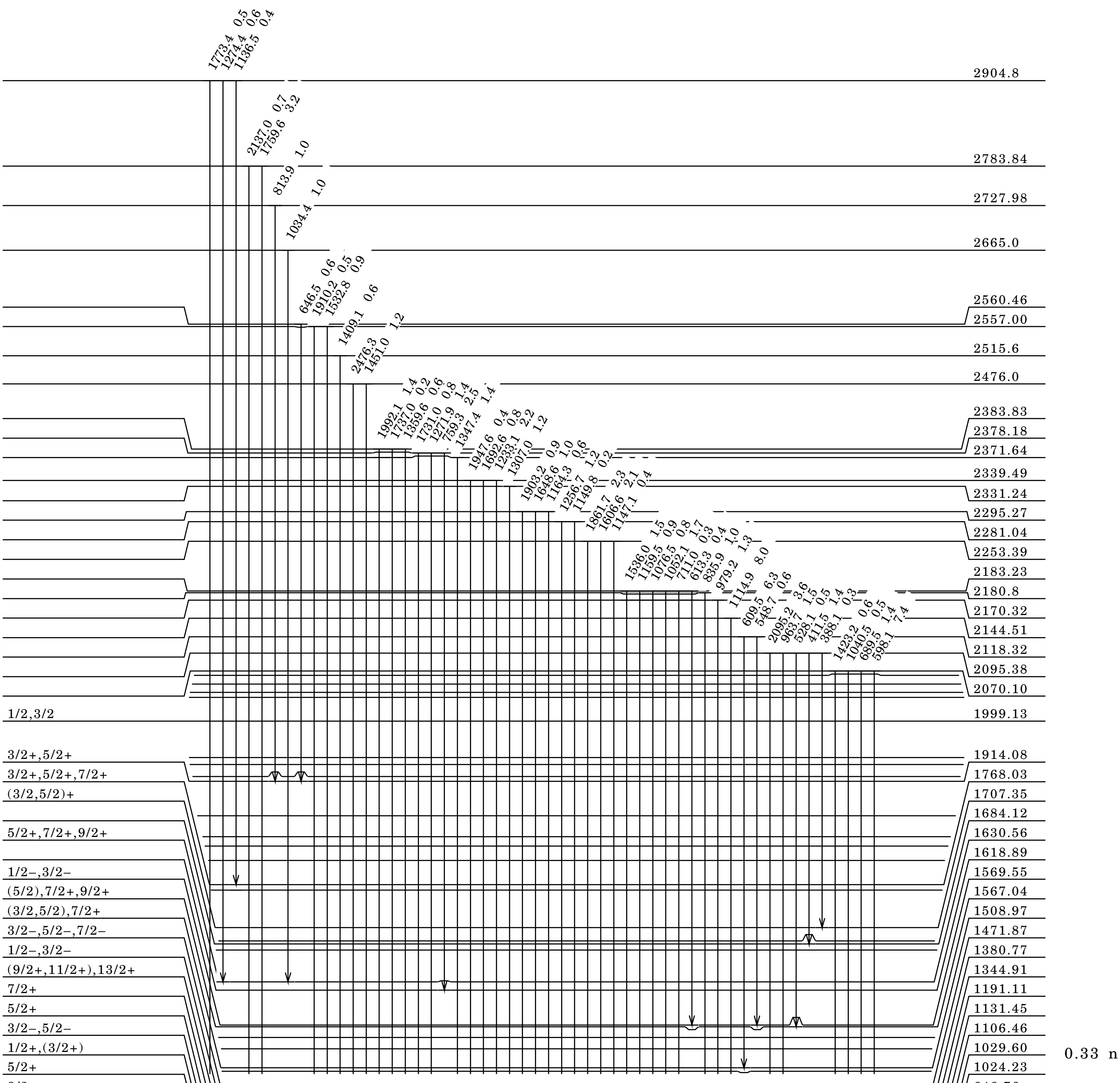
Eγ†	E(level)	Iγ†
1451.0 *2*	2476.0	1.2 *1*
1453.0‡ *3*	1453.0	1.1 *1*
x1454.1 *5*		0.7 *1*
1496.4 *3*	1496.34	0.4 *1*
1504.0‡ *5*	1504.0	0.4 *1*
1509.0 *2*	1508.97	13.0 *6*
1532.8 *3*	2557.00	0.9 *1*
1536.0 *3*	2183.23	1.5 *1*
1546.3 *3*	1937.88	0.8 *1*
1552.0‡ *4*	1552.0	0.4 *1*
1555.9 *3*	1947.57	0.4 *1*
1567.0 *1*	1567.04	6.7 *4*
1606.6 *1*	2253.39	2.1 *1*
1619.0 *2*	1618.89	5.0 *5*
1630.5 *1*	1630.56	6.3 *4*
1648.6 *2*	2295.27	1.0 *1*
1675.5 *1*	1675.47	7.3 *4*
1692.6 *3*	2339.49	0.8 *1*
1731.0 *3*	2378.18	0.8 *1*
1737.0 *3*	2383.83	0.2 *1*
1759.6 *1*	2783.84	3.2 *2*
1773.4 *4*	2904.8	0.5 *1*
1802.2 *1*	1802.30	5.2 *3*
1861.7 *2*	2253.39	2.3 *2*
1903.2 *2*	2295.27	0.9 *1*
1910.2 *2*	2557.00	0.5 *1*
1947.6 *5*	2339.49	0.4 *1*
1992.1 *3*	2383.83	1.4 *1*
2051.4 *2*	2051.45	0.4 *1*
2095.2 *1*	2095.38	3.6 *2*
2137.0 *2*	2783.84	0.7 *1*
x2475.3 *3*		0.2 *1*
2476.3	2476.0	

† From 1990Vi09, Iγ at 90° to beam.
‡ Not observed by 1976Di03.
§ α(K)exp calculated by evaluators normalizing 1024γ, 1132γ and 1345γ to E2 theory. These E2 assignments are based on adopted Jπ values for the levels involved.
x γ ray not placed in level scheme.

$^{113}Cd(p,n\gamma)$ 1990Vi09,1976Di03,1974Ki02 (continued)

Level Scheme

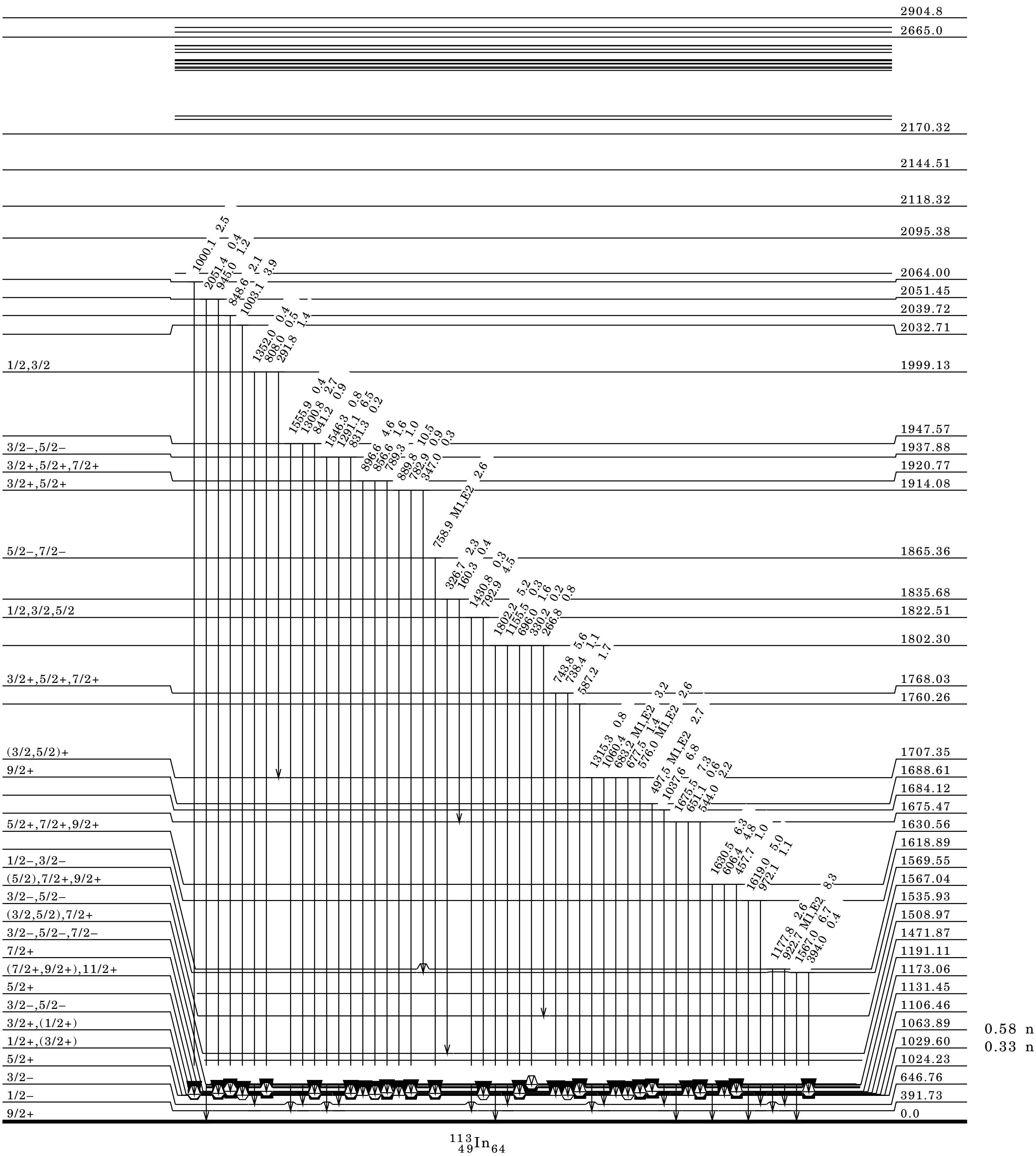
Intensities: relative Iγ



^{113}Cd(p,nγ) 1990Vi09,1976Di03,1974Ki02 (continued)

Level Scheme (continued)

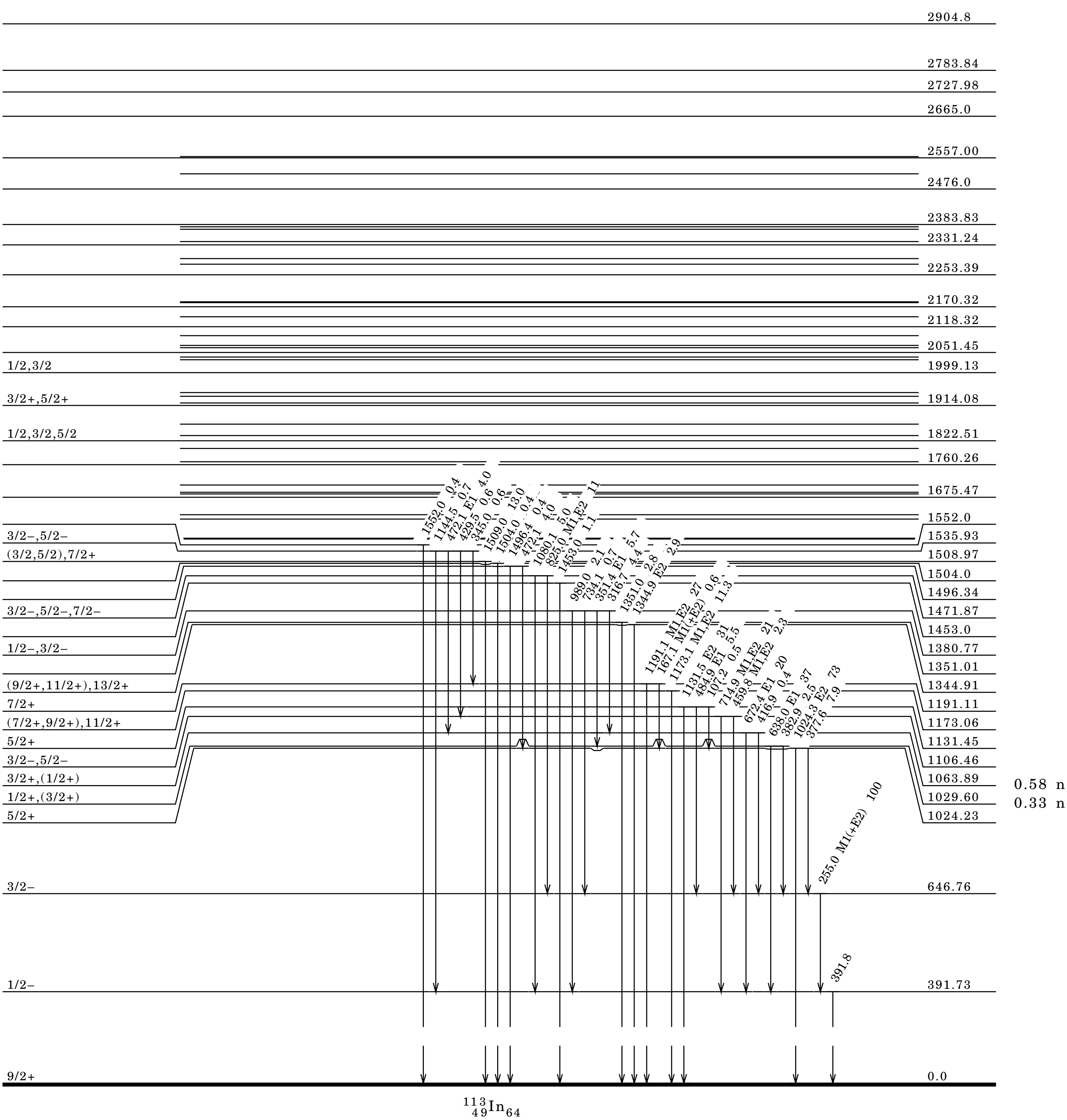
Intensities: relative Iγ



^{113}Cd(p,nγ) 1990Vi09,1976Di03,1974Ki02 (continued)

Level Scheme (continued)

Intensities: relative Iγ



^{113}In(γ,γ') 1969Bo42

Bremsstrahlung, E=1000–1800. Measured yield of 392γ, semi, 1969Bo42.
Others: 1967Bo10, 1977Ca14.
1991Vo05 has shown a resonant and a non–resonant contribution to photoactivation process.

^{113}In Levels

E(level)	Jπ†	$T_{1/2}$†	Comments
0.0	9/2+	stable	
392	1/2−	1.6582 h *6*	
1025 *5*			
1130 *10*			
1177 *1*	11/2+	60 fs *6*	E(level): from 1977Ca14. $T_{1/2}$ from Γ of level.
1500 *10*			
1630 *10*			

† From adopted levels.

^{113}In(d,d') 1967Hj03

E=15 MeV. θ=45° and 60°, magnetic–wedge spectrograph, 1967Hj03.

^{113}In Levels

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
0.0	9/2+	1648 *15*		2290 *15*	(+)
1117? *15*	(7/2+)	1697? *15*		2380 *15*	
1187 *15*	(13/2+)	1786 *15*		2450 *15*	(−)
1360 *15*	(11/2+)	1980? *15*		2540 *15*	
1477? *15*		2120 *15*		2610 *15*	
1520? *15*	(9/2+)	2180 *15*	(−)		
1587? *15*		2240 *15*			

† Systematically≈15 keV too high in comparison to adopted values.
‡ π from the ratio σ(45)/σ(60). Spin assignments from the strengths.

^{113}In(α,α') 1968St17

E=42.2 MeV. Measured σ(θ) semi, energy resolution≈100.

^{113}In Levels

E(level)	L†	E(level)	L†
1170	2	2170	3
1360	2	2480	3
1560 *20*	2		

† From differential cross sections between 30° and 80°, characteristic shape.

Coulomb Excitation 1976Tu02

E(α)=9.4, 10.0, 10.6 MeV.
E(^{16}O)=42, 45 MeV.
Enriched target (96%) were chemically processed to eliminate contaminants.
Measured: γ singles, γ(θ) and γγ coin, semi, Doppler broadening.
Others: 1970Be02, 1974Er06, 1974Le34.

^{113}In Levels

B(E2) B(E2) and B(E3) values were calculated from measured yield at 55° in ^{113}In(α,α'γ); see 1976Tu02.

E(level)	Jπ†	$T_{1/2}$	Comments
0.0	9/2+	stable	
391.7 *8*	1/2−		
646.9 *8*	3/2−		B(E3)=0.0048 *5*.
1024.2 *7*	5/2+	3.6 ps *3*	B(E2)=0.0075 *6*. $T_{1/2}$: from B(E2). 3.8 ps *7* from DSA.
1131.7 *7*	5/2+	0.97 ps *7*	B(E2)=0.0160 *10*. $T_{1/2}$: from B(E2).
1173.0 *7*	11/2+	0.07 ps‡ *4*	B(E2)=0.093 *6*. $T_{1/2}$: from B(E2). Jπ: x,γ(θ) for 171γ and 1173γ consistent with 11/2+ only.
1344.4 *8*	13/2+	0.33 ps *3*	B(E2)=0.053 *3*. Jπ: x,γ(θ) gives 9/2+ or 13/2+. $T_{1/2}$(DSA) and B(E2) not mutually consistent with 9/2+. $T_{1/2}$: from B(E2). 0.28 ps *7* from DSA.
1509.5 *8*	7/2+,9/2+	≤0.2 ps‡	B(E2)=0.0145 *10*. $T_{1/2}$: from B(E2). Jπ: from x,γ(θ) and adopted levels.
1566.9 *8*	7/2+,9/2+	0.24 ps‡ *10*	B(E2)=0.0178 *12*. Jπ: from x,γ(θ) and adopted levels. $T_{1/2}$: from B(E2).
1630.7 *7*			B(E2)=0.0032 *12*.

† From adopted levels, except as noted.
‡ From DSA–method line shapes in ^{113}In(^{16}O,^{16}O'γ).

γ(^{113}In)

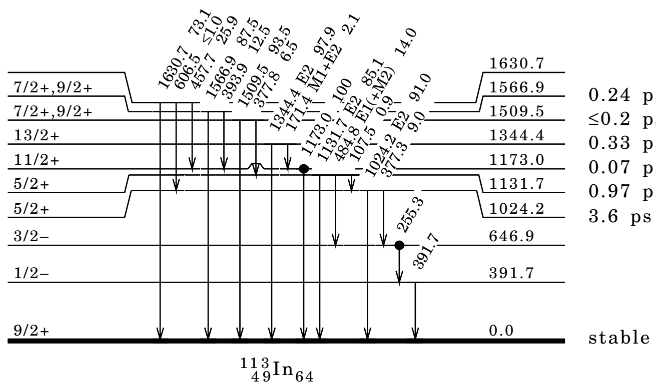
Eγ†	E(level)	Iγ‡	Mult.§	δ	Comments
107.5	1131.7	0.9 *2*			
171.4	1344.4	2.1 *1*	M1+E2	+0.03 *3*	B(M1)(W.u.)=0.28 *3*; B(E2)(W.u.)=7 *+14−7*.
255.3	646.9				
377.3	1024.2	9.0 *6*			
377.8	1509.5	6.5 *32*			
391.7	391.7				
393.9	1566.9	12.5 *9*			
457.7	1630.7	25.9 *48*			
484.8	1131.7	14.0 *3*	E1(+M2)	−0.03 *5*	δ: −3.0 *5* excluded from transition strength. B(E1)(W.u.)=(0.00037 *3*); B(M2)(W.u.)=(6 *+22−6*).
606.5	1630.7	≤1.0			
1024.2	1024.2	91.0 *6*	E2		B(E2)(W.u.)=3.9 *4*.
1131.7	1131.7	85.1 *5*	E2		B(E2)(W.u.)=8.2 *6*.
1173.0	1173.0	100			
1344.4	1344.4	97.9 *1*	E2		B(E2)(W.u.)=11.8 *11*.
1509.5	1509.5	93.5 *32*			
1566.9	1566.9	87.5 *9*			
1630.7	1630.7	73.1 *48*			

† Uncertainty not given, 1 keV assumed by evaluator.
‡ % photon branching from each level.
§ Mult and δ from γ(θ).

Coulomb Excitation 1976Tu02 (continued)

Level Scheme

Intensities: relative Iγ



$^{114}Sn(d,^{3}He)$ 1969Co03

E=22 MeV. Measured σ(θ), θ=30°–70°, 1969Co03.

^{113}In Levels

E(level)	Jπ‡	L†	C^2S
0.0	9/2+	4	6.0
380 *25*	1/2−	1	1.3
635 *25*	3/2−	1	1.7

† From comparison with DWBA calculations.
‡ Assumed for calculation of C^2S.

$^{115}In(p,t)$ 1974Ma09

Jπ(^{115}In)=9/2+.
E=17, 19 MeV. σ(θ), θ=5°–50° with magnetic spectrograph, 1974Ma09.
L–values are from comparisons with DWBA calculations.

^{113}In Levels

E(level)	L	E(level)	L	E(level)	L
0.0	0	1569	2	2230	(3)
1026	2	1634	(3)	2263	(3)
1133	2	1758	0+2	2407	(3)
1171	2	2094	(3)	2439	(3)
1345	2	2116	(3)		
1511	2	2167	(3)		

$^{116}Sn(p,\alpha)$ 1976Sm04

E=22 MeV. Measured σ(θ), θ=10°–60°, 1976Sm04.

^{113}In Levels

E(level)	Jπ†
0.0	9/2+
393 *1*	1/2−
645 *1*	3/2−
1110 *2*	5/2−
1349 *3*	13/2+
1561 *3*	9/2+
1633 *3*	9/2+
1753 *4*	
1944 *4*	
2092 *4*	
2249 *5*	
2369 *5*	
2451 *5*	
2586 *5*	

† From comparisons of σ(θ) with known transfers in $^{118}Sn(p,\alpha)$.

Adopted Levels, Gammas

Q(β⁻)=–3913 *17*; S(n)=7743.1 *18*; S(p)=7626 *5*; Q(α)=–2250 *5* 2003Au03.

^{113}Sn Levels

For neutron resonance, see ^{112}Sn(n,γ) (1981MuZQ).
For gross structure of deeply bound hole states in odd tin isotopes observed with the (^{3}He,α) reaction, see 1978Ta22. For onset of neutron single–particle strengths with (α,^{3}He) at 183 MeV, see 1991Ma06.

Cross Reference (XREF) Flags

A ^{113}Sn IT Decay (21.4 min)	F ^{112}Sn(n,γ) E=95 eV	K ^{115}Sn(p,t)
B ^{113}Sb ε Decay	G ^{112}Sn(d,p),^{114}Sn(d,t)	L ^{114}Sn(p,d) IAS
C ^{110}Cd(α,nγ)	H ^{113}In(p,nγ)	M ^{100}Mo(^{18}O,5nγ)
D ^{111}Cd(α,2nγ)	I ^{113}In(p,3nγ)	
E ^{112}Cd(α,3nγ)	J ^{114}Sn(p,d)	

E(level)[#]	Jπ[†]	XREF	$T_{1/2}$[§]	Comments
0.0	1/2+	ABCDEFGHIJKLM	115.09 d *3*	%ε+%β⁺=100. μ=–0.8791 *6* (1989Ra17). μ: atomic beam. $T_{1/2}$: from weighted average of 115.2 d *8* (1972Em01), 115.07 d *10* (1972La14), 115.09 d *4* (1980Ho17), 115.12 d *13* (1982RuZV), and 115.08 d *8* (1992Un01). The reduced–χ^2 = 0.03. Because this set of values is consistent, the Limited Relative Statistical Weight method (1985ZiZY, 1992Ra09) does not increase the uncertainty for the 1980Ho17 value even though it contributes 66% of the relative weight. If the 1980Ho17 uncertainty were increased from 0.04 to 0.056 in order to decrease its relative weight to 50%, the weighted average average would still be 115.09 with an uncertainty of 0.04. The very small reduced–χ^2 value suggests that the reported uncertainties are overestimated. Other measurements: 107 d (1959Bu08), 115.12 d *20* (1976MeZR, replaced by 1982RuZV), and 115.06 d 7 (1982HoZJ, replaced by 1992Un01). Jπ: atomic beam (1976Fu06), L(d,p)=0.
77.389 *19*	7/2+	ABCDE GHIJK	21.4 min *4*	%IT=91.1 *23*; %ε+%β⁺=8.9 *23* (1961Sc12). $T_{1/2}$: from 1974Ho17. Others: 21 min *1* (1961Se08), 20 min *1* (1961Sc12). %IT from I(Kα x ray,^{113}In)/I(Kα x ray,^{113}Sn). Jπ: atomic beam (1976Fu06), 77γ is M3(+E4).
409.83 *4*	5/2+	BCD GHIJK		Jπ: L(d,p)=2, σ(d,p)/σ(d,t) favors 5/2+.
498.07 *5*	3/2+	BCD FGHIJK	>0.35 ps	Jπ: L(d,p)=2, σ(d,p)/σ(d,t) favors 3/2+.
738.4[b] *3*	11/2–	CDE GHIJ M	86 ns *2*	μ=–1.293 *16* (1989Ra17); Q=+0.41 *1* (1989Ra17). μ: μ and Q: differential perturbed angular distribution. Jπ: L(d,p)=5, M2(+E3) γ to 7/2+. $T_{1/2}$: unweighted av of 88 ns *3* (1973IsZQ), 89 ns *3* (1974Di18), 82.1 ns *17* (1974Br29).
1013.94 *14*	3/2+	BCD GH	0.2 ps *1*	E(level): a level with L(d,p)=2 observed at 1014 *5*, may correspond to either 1013.22 or 1018.09 level. Jπ: log *ft*=5.86 *3* from 5/2+, M1+E2 γ to 1/2+.
1018.08 *5*	5/2+	BCD HI K	1.0 ps *5*	Jπ: allowed ε decay from 5/2+. E2 γ to 1/2+.
1042 *25*	3/2+,5/2+	J		E(level): from (p,d), possibly same as 1018 level. Jπ: L(p,d)=2.
1140 *25*		J		
1248.7 *3*		D H		
1284.06 *11*	5/2+	BCD HI	0.5 ps *2*	Jπ: E2 γ to 1/2+. log *ft*=6.93 *7* from 5/2+.
1303 *25*	1/2+	J		Jπ: L(p,d)=0.
1314.07 *15*	3/2+	BCD FGHI		Jπ: L(d,p)=2.
1355.90 *20*	3/2+	CD HI	0.7 ps *3*	Jπ: M1 γ to 1/2+.
1472.54 *15*	5/2+	CD HI	0.8 ps *5*	Jπ: γ(θ) gives 3/2,5/2. E2 to 1/2+ g.s.
1537 *5*	(7/2+,9/2+)	G		Jπ: L(d,p)=(4).
1539.0 *7*	5/2+	CD HI	0.6 ps *1*	Jπ: M1+E2 γ to 1/2+.
1539.9 *4*	(11/2–)	CD HI	0.2 ps *1*	Jπ: from γ(θ), γ to 11/2–.
1556.50 *10*	3/2+	BCD FGHI		Jπ: allowed ε decay from 5/2+, M1 γ to 1/2+.

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Adopted Levels, Gammas (continued)

^{113}Sn Levels (continued)

E(level)[#]	Jπ[†]	XREF	$T_{1/2}$[§]	Comments
1646.06 *14*	3/2+,5/2+	BCD H		Jπ: L(d,p)=2. E(level): the 1646 level in (d,p) could also correspond to the 1651 level.
1647.2 *3*		D		
1651.62 *17*	5/2+	BCD H J		Jπ: L(p,d)=2, M1 γ to 7/2+.
1732.22 *17*	(3/2+,5/2+)	BCD H		Jπ: log *ft*=6.05 *5* from 5/2+.
1744.81 *14*	3/2+,5/2+	BCD HIJ	0.31 ps *8*	Jπ: L(d,p)=2 at 1745 *5*.
1781.1 *3*	9/2−	D HI	0.19 ps *7*	Jπ: M1+E2 γ to 11/2− and γ to 7/2+.
1821.0 *3*	1/2+	C H J		Jπ: L(d,p)=0.
1831.0 *3*	1/2+	C H J		Jπ: L(p,d)=0.
1867.28 *20*	5/2+	CD HI	0.33 ps *10*	Jπ: M1,E2 γ to 3/2+,5/2+, γ(θ) in ^{113}In(p,nγ).
1906.6[b] *4*	15/2−	CDE GHI M	0.8 ps *2*	Jπ: stretched E2 to 11/2−.
1909.64 *18*	(5/2+,7/2+)	CD HI		Jπ: γ's to 3/2+,5/2+, γ(θ) in ^{113}In(p,nγ).
1935.4 *4*	(11/2−)	CD HI	1.9 ps *8*	Jπ: γ to 11/2−, M1+E2 γ to 11/2−.
1945.3 *4*	(9/2−)	CD HI	0.40 ps *20*	Jπ: γ to 11/2−.
1952.1 *4*	13/2−	CDE HI	1.0 ps *4*	Jπ: γ to 11/2−, γ(θ) in ^{113}In(p,nγ).
1957.05 *16*	3/2(+),5/2(+)	B		Jπ: log *ft*=6.40 *10* from 5/2+, γ to 1/2+ and 7/2+.
2031.4 *3*		D H		
2039.88 *19*	7/2+	CD H	0.2 ps *1*	Jπ: γ's to 3/2+,5/2+ and 5/2+,7/2+. γ(θ) in ^{113}In(p,nγ).
2045.47 *20*	(3/2+,5/2+)	B E JK		Jπ: log *ft*=6.63 *12* from 5/2+, γ to 7/2+.
2050 *5*	1/2−,3/2−	G		E(level): probably not identical to 2045 level from γ decay. Jπ: L(d,p)=1.
2105 *5*	(3/2−)	G		Jπ: L(d,p)=1, and from shell-model syst.
2128.14 *21*	3/2+,5/2+	B G		Jπ: L(d,p)=2 at 2129 *5*, the 2129 level in (d,p) does not seem to correspond to the 2134 level (no γ to g.s.).
2135.0 *3*		D H		
2176.27 *18*	7/2+	D HI	0.3 ps *2*	Jπ: M1 γ to 5/2+ and 7/2+.
2200.7 *3*	5/2+	CD GHI	>0.24 ps	Jπ: M1+E2 γ to 3/2+, γ(θ) in ^{113}In(p,nγ).
2258.6 *3*	5/2+	CD HI	0.3 ps *1*	Jπ: from γ(θ) and linear polarization in (α,2nγ).
2275.8 *3*	1/2−,3/2−	D GH		Jπ: L(d,p)=1.
2336.7 *4*	11/2−	CD HI	0.35 ps *8*	Jπ: γ to 11/2−.
2385.77 *25*	7/2+	CD H	0.7 ps *6*	Jπ: γ's to 5/2+.
2410.8 *5*		D		
2448.38 *23*	7/2+	CD HI		Jπ: M1+E2 γ to 5/2+.
2457.11 *22*		C H		
2467.9 *3*		H		
2506.0 *3*		CD H		
2512.0 *3*	(3/2,5/2)	CD H		Jπ: γ to 3/2+,5/2+, γ(θ) in ^{113}In(p,nγ).
2538.27 *22*	3/2+,5/2+	B HI		Jπ: L(d,p)=2.
2540 *5*	5/2−,7/2−	G		Jπ: L(d,p)=3.
2540.0 *4*	(15/2−)	CD H	0.07 ps *3*	Jπ: E2 γ to 11/2−.
2552.4 *3*	(3/2,5/2,7/2)	D H		Jπ: γ's to 3/2+,5/2+, γ(θ) in ^{113}In(p,nγ).
≈2579		F		E(level): not the same as 2583 level with Jπ between 7/2− and 15/2−.
2582.3 *4*	(15/2−)	CD HI	0.22 ps *9*	Jπ: E2 γ to 11/2−.
2590.77 *22*		HI		
2616.7 *5*		C HI		
2619.4 *4*		D		
2620 *5*	1/2+	CD GHI		E(level): could correspond to 2617 or 2624 level, who have γ feeding to low Jπ. Jπ: L(d,p)=0.
2624.04 *21*		CD H		
2649.0 *4*	(9/2−)	CD H		
2662.8 *3*	(3/2+,5/2+)	CD HI		Jπ: γ to 3/2+,5/2+, γ(θ) in ^{113}In(p,nγ).
2671.1 *4*		CD H		
2675.3 *4*		D		E(level): from coin between 1284–583–808 gammas.
2700.4 *4*		D	0.4 ps *1*	
2717.8 *4*	(11/2−)	D		Jπ: M1 γ to 11/2−.
2749.7 *4*	17/2−	D	0.21 ps *7*	Jπ: E2 γ to 13/2−.
2764 *5*	(7/2)−[‡]	G		Jπ: L(d,p)=3.
2777.9 *4*		CD GHI		
2780 *5*		F		
2806.6[b] *5*	19/2−	CDE I M	0.31 ps *10*	Jπ: stretched (E2) to 15/2−.

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Adopted Levels, Gammas (continued)

^{113}Sn Levels (continued)

E(level)#	Jπ†	XREF	$T_{1/2}$§	Comments
2851.6 *4*	(17/2−)	D	1.2 ps *6*	
2862 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
2888.9 *4*		CD H		
2915.9 *4*		D		
2932.2 *5*		B		
2956.5 *4*		CD H		
2975.0 *4*	(19/2−)	CDE I M	0.28 ps *14*	
3004 *5*	1/2−,3/2−	G		Jπ: L(d,p)=1.
3080 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
3091.2 *4*	19/2−	DE I M	0.45 ps *18*	Jπ: (E2) to 15/2−.
3128.7 *5*	21/2−	CDE I		Jπ: M1,E2 to 19/2−.
3130.3 *5*		D M		
3138.9 *6*		D		
3204 *5*	1/2−,3/2−	G		Jπ: L(d,p)=1.
3223.2 *5*	(19/2)−	D M	>1.4 ps	Jπ: Q γ to 15/2−.
3307 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
3409.5@ *6*	17/2	M		
3412.5 *4*		D		
3418 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
3420.4 *5*	(21/2−)	D M		Jπ: M1+E2 γ to (21/2−).
3456.5 *5*		D		
3458.3 *5*	(23/2−)	DE M		Jπ: M1,E2 to (21/2−).
3494 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
3499 *5*		G		
3539 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
3584 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
3680.4 *6*	(23/2−)	E		Jπ: M1+E2 γ to (21/2−).
3696 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
3743 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
3796 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
3808 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
3822 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
3837.5 *6*	−	D		
3846 *5*		G		
3873 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
3901.9 *5*	(23/2−)	DE M	0.6 ps *2*	Jπ: (E2) γ to 19/2−.
3906 *2*	(7/2)−‡	G		Jπ: L(d,p)=3.
3913.8 *6*	(21/2−)	D		Jπ: M1 γ to (19/2−).
3960 *5*		G		
3972.1 *5*	(23/2−)	DE M	0.5 ps *2*	Jπ: M1+E2 γ to (21/2−).
4022 *5*		G		
4044 *5*	(7/2)−‡	F		Jπ: L(d,p)=3.
4051.8@ *5*	21/2	M		
4058.0 *6*	25/2+	DE M	0.69 ns *28*	Jπ: E1 γ to 23/2−, a three quasi-particle neutron configuration proposed by 1997Ka40. $T_{1/2}$: from γ-rf(t) in (α,2nγ).
4233 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
4265 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
4315 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
4335 *5*		G		
4343 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
4364 *5*		G		
4397 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
4430 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
4438 *5*		G		
4475.1 *6*	(27/2+)	DE M	>1.1 ps	Jπ: D+Q γ to (25/2).
4504 *5*		G		
4589 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
4609 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.
4649 *5*		G		
4714.4 *6*	(27/2−)	DE M	0.31 ps *10*	Jπ: (E2) γ to (23/2−).
4752.2@ *6*	25/2	M		
4992 *5*	(7/2)−‡	G		Jπ: L(d,p)=3.

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Adopted Levels, Gammas (continued)

^{113}Sn Levels (continued)

E(level)#	Jπ†	XREF	Comments
5012 *5*	(7/2)–‡	G	Jπ: L(d,p)=3.
5067 *5*	(7/2)–‡	G	Jπ: L(d,p)=3.
5239 *5*	(7/2)–‡	G	Jπ: L(d,p)=3.
5291 *5*	(7/2)–‡	G	Jπ: L(d,p)=3.
5318 *5*		G	
5450 *5*	(7/2)–‡	G	Jπ: L(d,p)=3.
5534.4@ *6*	29/2	M	
5605.7 *8*	31/2+	M	
5645.6a *7*	31/2–	M	
5647 *5*	(7/2)–‡	G	Jπ: L(d,p)=3.
6385.3@ *7*	33/2	M	
6682.3a *9*	35/2–	M	
7322.0@ *9*	37/2	M	
7784.4a *10*	39/2–	M	
7883.1& *10*	39/2–	M	
8347.8@ *10*	41/2	M	
8811.7a *10*	43/2–	M	
9014.0& *10*	43/2–	M	
9466.9@ *11*	45/2	M	
9936.4a *11*	47/2–	M	
10209.7& *11*	47/2–	M	
10589.1@ *12*	49/2	M	
11242.0a *12*	51/2–	M	
11405.1& *12*	51/2–	M	
11723.5@ *13*	53/2	M	
11826 *50*		L	IAS of ^{113}In g.s.
12254 *50*		L	IAS of ^{113}In 392 level.
12513 *50*		L	IAS of ^{113}In 647 level.
12642.9& *13*	55/2–	M	
12736.8a *13*	(55/2–)	M	
13034.6@ *14*	57/2	M	
14032.6& *14*	59/2–	M	
14286.5a *14*	59/2–	M	
14577.5@ *15*	(61/2)	M	
15653.9& *15*	(63/2–)	M	
15990.8a *18*	(63/2–)	M	
16309.8@ *18*	(65/2)	M	
17504.3& *18*	(67/2–)	M	
18219.8?@ *20*	(69/2)	M	

† Jπ without comments are based on band assignments.
‡ J is assigned to 7/2 from shell–model syst.
§ In the ps range are from Doppler shift in (α,2nγ) (1991Vi09).
# From least–squares fit to γ energies.
@ (A): ΔJ=2 band based on 17/2.
& (B): ΔJ=2 band based on 39/2–.
a (C): ΔJ=2 band based on 31/2–.
b (D): Proposed neutron h11/2 band. ΔJ=2 spacings.

γ(^{113}Sn)

E(level)	Eγ†	Iγ†	Mult.‡	δ	α	Comments
77.389	77.38 *2*	100	M3+E4	0.13 *2*	181 *5*	Mult.,δ: see ^{113}Sn IT decay (21.4 min). B(M3)(W.u.): the calculated B(E4)(W.u.) gives 140 *50* which violates RUL. B(M3)(W.u.)=0.0281 *15*; B(E4)(W.u.)=140 *50*.
409.83	332.41 *5*	100 *4*	M1+E2	−0.08 *2*		
	409.9 *2*	0.87 *11*				
498.07	88.25 *2*	3.4 *4*				
	420.7 *2*	0.3 *2*				
	497.96 *9*	100 *5*	M1+E2	0.12 *6*		B(M1)(W.u.)<0.49; B(E2)(W.u.)<44.

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Adopted Levels, Gammas (continued)

γ(^{113}Sn) (continued)

E(level)	Eγ†	Iγ†	Mult.‡	δ	α	Comments
738.4	661.0 3	100	M2(+E3)	<2.6	0.0133 16	Mult.,δ: from 1972Br38. RUL gives δ≤0.65, then B(M2)(W.u.)=0.10 2. B(M2)(W.u.)>0.015?; B(E3)(W.u.)<300.
1013.94	603.0 4	0.65 14				
	936.7 2	100 5				
	1014.4 3	96 6	M1+E2	0.5 1		B(M1)(W.u.)=0.041 21; B(E2)(W.u.)=8 5.
1018.08	608.2 2	100 7	M1+E2	3 1		B(M1)(W.u.)=0.006 5; B(E2)(W.u.)=110 60.
	940.63 6	59 3	M1+E2	0.5 2		B(M1)(W.u.)=0.007 4; B(E2)(W.u.)=1.6 13.
	1018.12 6	15 3	E2			B(E2)(W.u.)=1.4 8.
1248.7	838.9 3	100				
1284.06	786.1 3	11 1				
	873.9 4	6.3 3	M1+E2	2.7 8		B(M1)(W.u.)=0.0004 3; B(E2)(W.u.)=3.0 13.
	1206.3 3	9 5				
	1284.2 2	100 5	E2			B(E2)(W.u.)=8 4.
1314.07	816.3 3	18.3 22				
	1314.0 2	100 11	M1			
1355.90	1356.0 3	100	M1+E2	0.14 6		B(M1)(W.u.)=0.012 6; B(E2)(W.u.)=0.10 10.
1472.54	1472.8 3	100	E2			B(E2)(W.u.)=3.1 20.
1539.0	1129.2 7	100	M1+E2	−2.5 10		B(M1)(W.u.)=0.0035 25; B(E2)(W.u.)=14 3.
1539.9	801.5 3	100	M1+E2	−0.3 1		B(M1)(W.u.)=0.20 10; B(E2)(W.u.)=22 18.
1556.50	242.6 3	2.2 5				
	273.4 8	3.6 4				Eγ: not reported in (α,2nγ).
	538.2 2	5.6 4				
	1058.3 2	5.2 5				
	1146.6 4	43 3				
	1478.8 2	11.5 15				
	1557.0 2	100 8	M1+E2	0.2 1		
1646.06	1147.2 4	88 22				
	1568.9 2	34 4				
	1646.0 2	100 15				
1647.2	1149.3 4	100 30				
	1237.1 4	30 15				
1651.62	1241.6 3	100 20	M1			
	1574.3 2	50 5	M1+E2	−1.0 5		
1732.22	448.3 5	4.8 20				
	718.4 3	7 4				
	1234.2 3	100 13	M1			
	1654.6 3	13.0 13				
1744.81	725.3 10	6 3				
	1247.1 3	15 2	M1+E2	2.1 15		B(M1)(W.u.)=0.0006 +8−6; B(E2)(W.u.)=1.4 6.
	1334.9 2	100 5	M1+E2	0.6 4		B(M1)(W.u.)=0.014 6; B(E2)(W.u.)=2.2 22.
	1667.5 3	41 3				
1781.1	1042.6 5	100 5	M1+E2	−0.5 3		Mult.: δ=0.5 3 or −1.6 3. B(M1)(W.u.)=0.08 4; B(E2)(W.u.)=14 +15−14.
	1703.8 4	5 2	[E1]			B(E1)(W.u.)=1.5×10^{-5} 8.
1821.0	1821.0 3	100				
1831.0	1831.0 3	100				
1867.28	394.8 3	11.3 25				
	583.2 3	100 5	M1+E2	0.15 10		B(M1)(W.u.)=0.30 10; B(E2)(W.u.)=15 +21−15.
1906.6	1168.3 3	100	E2			B(E2)(W.u.)=10 3.
1909.64	1411.7 2	100 14				
	1499.5 3	45 9				
1935.4	1196.9 3	100	M1+E2	−5 3		B(M1)(W.u.)=0.0003 +4−3; B(E2)(W.u.)=3.6 16.
1945.3	1206.9 3	100	M1+E2	0.15 5		B(M1)(W.u.)=0.031 16; B(E2)(W.u.)=0.4 3.
1952.1	1213.6 3	100	M1+E2	3.4 2		B(M1)(W.u.)=0.0010 4; B(E2)(W.u.)=6.1 25.
1957.05	1458.9 2	85 8				
	1547.2 5	≈100				
	1880.1 4	33 4				
	1956.9 4	100 10				
2031.4	1621.6 3	100				
2039.88	172.7 3	80 7	M1+E2	0.4 2		B(M1)(W.u.)=5 3; B(E2)(W.u.)=2.0×10^{4} 20.
	567.2 3	80 7	M1+E2	6 3		B(M1)(W.u.)=0.004 4; B(E2)(W.u.)=380 200.
	684.0 2	100 7	E2			B(E2)(W.u.)=190 100.

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Adopted Levels, Gammas (continued)

$\gamma(^{113}Sn)$ (continued)

E(level)	Eγ†	Iγ†	Mult.‡	δ	Comments
2039.88	755.8 3	47 5			
2045.47	573.0 3	53 5	(M1)		
	1547.9 5	≈100			
	1635.3 3	63 8			
	1968.3 5	35 5			
2128.14	1718.3 2	100			
2135.0	1725.2 3	100			
2176.27	892.1 3	64 4	M1+E2	−0.2 1	Mult.: δ=−0.2 1 or −2.1 6. B(M1)(W.u.)=0.029 20; B(E2)(W.u.)=1.2 +14−2.
	1766.4 3	100 8	M1		B(M1)(W.u.)=0.006 4.
	2099.0 3	56 4	M1		B(M1)(W.u.)=0.0020 14.
2200.7	1702.6 3	100	M1+E2	−0.5 3	B(M1)(W.u.)<0.018; B(E2)(W.u.)<2.0.
2258.6	786.0 3	67 25			
	974.6 4	100 8			
2275.8	1866.0 3	100			
2336.7	1598.3 3	100	M1+E2	1.9 2	B(M1)(W.u.)=0.0033 10; B(E2)(W.u.)=3.7 9.
2385.77	518.4 5	17 7			
	913.2 3	100 30	M1+E2	0.4 2	B(M1)(W.u.)=0.03 3; B(E2)(W.u.)=4 +6−4.
	1101.8 4	14 7			
2410.8	543.5 4	100			
2448.38	975.8 3	70.8			
	1092.6 5	7 3			
	1164.3 3	100	M1+E2	1.4 6	
2457.11	1959.1 3	100 5			
	2047.2 3	14 1			
2467.9	1969.8 3	100			
2506.0	1034.0 4	66 22			
	1221.7 3	100 10			
2512.0	2013.9 3	100			
2538.27	2040.3 3	100 18			
	2128.3 3	60 10			
2540.0	633.3 3	70 5	M1+E2	−1.2 8	B(M1)(W.u.)=0.21 19; B(E2)(W.u.)=6.×10^2 5.
	1801.6 3	100 5	E2		B(E2)(W.u.)=8 4.
2552.4	1079.8 4	100 66			
	1268.4 3	100 20			
2582.3	1843.8 3	100			
2590.77	2092.9 3	12 3			
	2180.7 3	100 10			
2616.7	2206.9 5	100			
2619.4	282.7 3	33 13			
	838.4 4	100 13			
	1881.0 3	60 7			
2624.04	879.4 3	56 3			
	1151.8 5	25 13			
	2213.9 3	100 10			
2649.0	1910.6 3	100	(E2)		
2662.8	2164.7 3	100			
2671.1	1932.7 3	100			
2675.3	808.0 4	83 33			
	1202.8 4	100 33			
2700.4	363.7 4	56 22			
	748.4 3	100 22			
	765.0 4	44 22			
	1962.0 3	78 22			
2717.8	381.1 5	66 33			
	772.5 3	100 33	M1		
	1979.4 3	100 33			
2749.7	797.7 3	100	(E2)		B(E2)(W.u.)=260 90.
2777.9	2039.5 3	100 12			
2806.6	900.0 3	100	E2		B(E2)(W.u.)=100 30.
2851.6	899.1 4	100 50			
	945.0 2	84 11			
2888.9	2150.5 3	100			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

$\gamma(^{113}Sn)$ (continued)

E(level)	Eγ†	Iγ†	Mult.‡	δ	Comments
2915.9	963.8 *2*	100 *17*			
	1009.1 *5*	17 *8*			
2932.2	1918.7 *8*	37 *15*			
	2433.9 *8*	100 *19*			
	2854.4 *8*	48 *11*			
2956.5	1672.4 *3*	100			
2975.0	225.3 *3*	60 *30*	M1+E2	0.25 *5*	B(M1)(W.u.)=1.8 *13*; B(E2)(W.u.)=1.7×10^{3} *15*.
	392.7 *2*	61 *5*			
	1068.3 *3*	100 *30*	E2		B(E2)(W.u.)=20 *13*.
3091.2	1184.7 *3*	100	E2		B(E2)(W.u.)=17 *7*.
3128.7	153.0	3 *1*			
	322.4 *3*	100 *13*	M1+E2	0.15 *5*	
3130.3	510.9 *5*	100 *57*			
	1223.6 *4*	29 *14*			
3138.9	1271.6 *5*	100			
3223.2	1316.5 *3*	100	Q		Mult.: From ^{100}Mo(^{18}O,5nγ).
3409.5	1502.6 *5*	100	D		Mult.: From ^{100}Mo(^{18}O,5nγ).
3412.5	1502.8 *3*	100			
3420.4	291.7 *2*	100 *11*	M1+E2	0.35 *15*	
	613.9 *4*	39 *11*	M1+E2	0.4 *1*	
3456.5	1546.8 *4*	100			
3458.3	329.3 *3*	100	M1+E2	0.16 *5*	
	651.1 *5*	3.4 *17*			
3680.4	551.7 *3*	100	M1+E2	>10	
3837.5	379.2 *4*	33 *17*			
	708.7 *4*	100 *8*	M1		
3901.9	678.7 *4*	44 *11*	(E2)		B(E2)(W.u.)=60 *30*.
	810.8 *3*	100	(E2)		B(E2)(W.u.)=58 *20*.
3913.8	1107.2 *3*	100	M1		
3972.1	551.9 *3*	14 *14*	M1+E2	>10	B(M1)(W.u.)<0.00067.
	843.7 *3*	100 *18*	M1+E2	0.25 *5*	B(M1)(W.u.)=0.06 *3*; B(E2)(W.u.)=4 *3*.
4051.8	642.0 *5*	100 *5*	E2		
	960.7 *5*	73 *5*	D		
4058.0	86.1 *2*	40 *20*			
	599.1 *3*	100 *20*	E1		B(E1)(W.u.)=1.4×10^{-6} *7*.
4475.1	417.1 *3*	100	M1+E2	0.4 *2*	B(M1)(W.u.)<0.27; B(E2)(W.u.)<320.
4714.4	812.4 *3*	100	(E2)		B(E2)(W.u.)=160 *60*.
4752.2	700.3 *5*	88 *5*	E2		
	850.5 *5*	100 *5*	D		
5534.4	782.3 *5*	100 *4*	E2		
	820.3 *5*	34.9 *18*	D		
5605.7	1130.6 *5*	100	E2		
5645.6	930.8 *5*	100	E2		
6385.3	739.4 *5*	17.8 *9*	D		
	851.3 *5*	100 *3*	E2		
6682.3	1036.7 *5*	100	E2		
7322.0	936.7 *5*	100	E2		
7784.4	1102.3 *5*	100	E2		
7883.1	1200.7 *5*	100	E2		
8347.8	1025.7 *5*	100	E2		
8811.7	928.4 *5*	≤14	E2		
	1027.4 *5*	100 *4*	E2		
9014.0	1130.8 *5*	91 *5*	E2		
	1229.6 *5*	100 *5*	E2		
9466.9	1119.1 *5*	100	E2		
9936.4	1124.7 *5*	100	E2		
10209.7	1195.7 *5*	100	E2		
10589.1	1122.2 *5*	100	E2		
11242.0	1305.6 *5*	100	E2		
11405.1	1195.4 *5*	100	E2		
11723.5	1134.4 *5*	100	E2		
12642.9	1237.8 *5*	100	E2		
12736.8	1494.8 *5*	100	(E2)		

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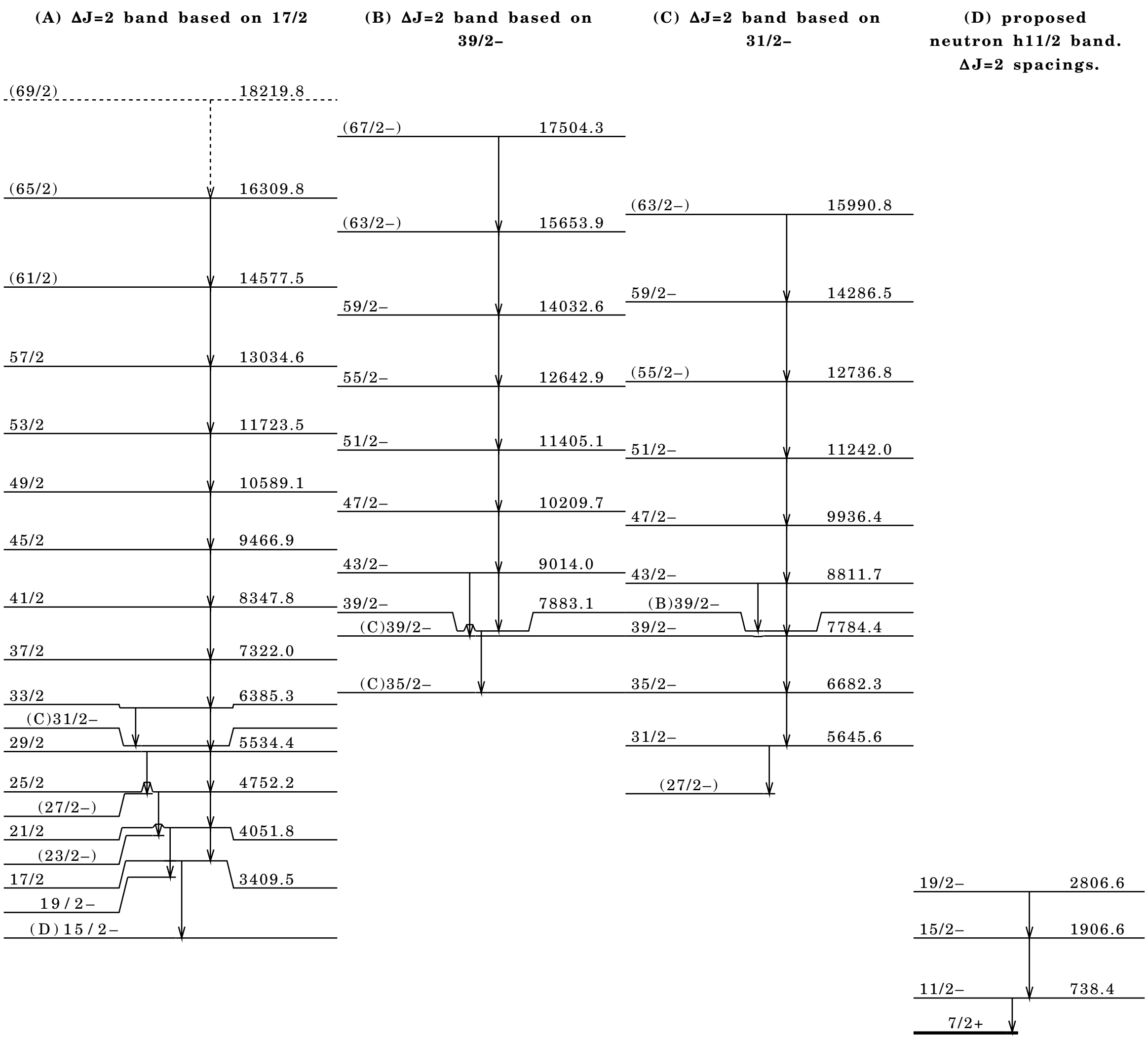
Adopted Levels, Gammas (continued)

γ(^{113}Sn) (continued)

E(level)	Eγ†	Iγ†	Mult.‡
13034.6	1311.1 *5*	100	E2
14032.6	1389.7 *5*	100	E2
14286.5	1549.7 *5*	100	(E2)
14577.5	1542.9 *5*	100	(E2)
15653.9	1621.3 *5*	100	(E2)
15990.8	1704.3 *10*	100	(E2)
16309.8	1732.3 *10*	100	(E2)
17504.3	1850.4 *10*	100	(E2)
18219.8?	1910.8§ *10*	100	(E2)

† Average from (p,nγ), (p,3nγ), (α,2n), (α,3n) when they are given.
‡ The M and δ are from (α,2nγ), unless otherwise noted.
§ Placement of transition in the level scheme is uncertain.



$^{113}_{50}Sn_{63}$

^{113}Sn IT Decay (21.4 min) 1961Sc12

Parent ^{113}Sn: E=77; Jπ=7/2+; $T_{1/2}$=21.4 min *4*; %IT decay=91.1 *23*.
Measured Eγ, Iγ, α(K)exp from Iγ and I(K x–ray), 1961Sc12.

^{113}Sn Levels

E(level)	Jπ	$T_{1/2}$†	Comments
0.0	1/2+	115.09 d *4*	
77	7/2+	21.4 min *4*	Jπ: atomic beam (1976Fu06), 77γ is M3(+E4).

† See adopted levels.

γ(^{113}Sn)

Eγ	E(level)	Iγ†	Mult.	δ	α	Comments
77	77	0.55	M3+E4	0.13 *2*	181 *5*	Eγ: from 1960Se06; other: 79 *3* (1961Sc12). Mult.,δ: M and δ: from α(K)exp=95 *15* (1961Sc12) and α(K)exp/α(L)exp=1.7 *1*(1961Se08). %IT from I(Kα x ray,^{113}In)/I(Kα x ray,^{113}Sn). B(M3)(W.u.)=0.029 *3*; B(E4)(W.u.)=150 *50*.

† For absolute intensity per 100 decays, multiply by 0.911 *23*.

^{113}Sb ε Decay 1976Wi10,1975WiZX

Parent ^{113}Sb: E=0.0; Jπ=5/2+; $T_{1/2}$=6.67 min *7*; Q(g.s.)=3913 *17*; %ε+%$β^+$ decay=100.
Chemical and mass separation. γ singles with escape–suppression spectrometer and semi, γγ coin, γ(t), 1976Wi10, 1975WiZX.
Others: 1969Ki16, 1972Si28.

^{113}Sn Levels

New levels are proposed only if they could be based on coincidence relations.

E(level)	Jπ	$T_{1/2}$†
0.0	1/2+	115.09 d *4*
77.39 *2*	7/2+	21.4 min *4*
409.77 *4*	5/2+	
498.01 *5*	3/2+	
1013.22 *5*	3/2+	
1018.09 *4*	5/2+	
1283.17 *12*	5/2+	
1314.04 *14*	3/2+	
1556.36 *9*	3/2+	
1646.18 *13*	3/2+,5/2+	
1651.75 *20*	5/2+	
1731.90 *17*	(3/2+,5/2+)	
1743.94 *14*	3/2+,5/2+	
1957.02 *16*	3/2,5/2	
2045.39 *23*	(5/2+,5/2+)	
2128.08 *21*	3/2+,5/2+	
2540.3 *4*	3/2+,5/2+	
2931.9 *5*		

† From adopted levels.

$β^+$,ε Data

ε branches were obtained from (γ+ce) imbalance at each level.

Eε	E(level)	I$β^+$	Iε	Log *ft*	I(ε+$β^+$)
(981 *17*)	2931.9		0.040 *6*	6.42 *7*	0.040 *6*
(1373 *17*)	2540.3	0.00036 *8*	0.131 *11*	6.20 *4*	0.131 *11*
(1785 *17*)	2128.08	0.0112 *15*	0.213 *24*	6.22 *5*	0.224 *25*
(1868 *17*)	2045.39	0.0067 *18*	0.088 *23*	6.64 *12*	0.095 *25*
(1956 *17*)	1957.02	0.017 *4*	0.16 *4*	6.42 *10*	0.18 *4*
(2169 *17*)	1743.94	0.090 *10*	0.42 *4*	6.10 *5*	0.51 *5*
(2181 *17*)	1731.90	0.10 *1*	0.46 *5*	6.06 *5*	0.56 *6*
(2261 *17*)	1651.75	0.037 *9*	0.13 *3*	6.63 *11*	0.17 *4*
(2267 *17*)	1646.18	0.11 *2*	0.37 *5*	6.19 *7*	0.48 *7*
(2357 *17*)	1556.36	0.47 *3*	1.32 *8*	5.67 *3*	1.79 *10*
(2599 *17*)	1314.04	0.047 *8*	0.076 *13*	7.00 *8*	0.123 *21*

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^{113}Sb ε Decay 1976Wi10,1975WiZX (continued)

β+,ε Data (continued)

Eε	E(level)	Iβ+	Iε	Log ft	I(ε+β+)
(2630 17)	1283.17	0.058 8	0.088 12	6.94 6	0.146 20
(2895 17)	1018.09	1.76 9	1.67 8	5.750 24	3.43 16
(2900 17)	1013.22	1.34 7	1.26 7	5.874 25	2.60 13
(3415 17)	498.01	60.3 19	26.7 9	4.691 18	87.0 26
(3503 17)	409.77	4.2 19	1.7 7	5.92 20	5.9 26
(3836† 17)	77.39	<2	<0.4	>6.6	<2.4

† Existence of this branch is questionable.

γ(^{113}Sn)

Measured Iγ of annihilation radiation is 168 4, 1976Wi10.

Iγ normalization: Calculated from measured annihilation radiation intensity and theoretical ε/β+ ratios by assuming no ε decay to g.s., since I(ε+β+) to g.s. $<8\times10^{-5}$% from log ft>11 for a second–forbidden transition.

Eγ	E(level)	Iγ†	Mult.	δ	α	I(γ+ce)†	Comments
77.38 2	77.39	0.13 1	M3+E4	0.13 2	181 5	23 1	Iγ: from I(γ+ce) and α (from adopted levels). I(γ+ce): deduced from decay scheme. B(M3)(W.u.)=0.0309 14; B(E4)(W.u.)=160 50.
88.25 2	498.01	3.4 4	M1,E2		1.7 9		α: 88γ is M1,E2 from spin difference.
242.6 3	1556.36	0.029 6					
273.4 2	1556.36	0.047 5					
332.0 4	1646.18	0.030 14					
332.41 5	409.77	18.5 8					
409.9 2	409.77	0.16 2					
420.7 2	498.01	0.3 2					
448.3 5	1731.90	0.027 11					
497.96 9	498.01	100					
538.2 2	1556.36	0.073 5					
603.0 4	1013.22	0.014 3					
608.4 1	1018.09	0.50 3					
718.4 3	1731.90	0.04 2					
725.3 10	1743.94	0.015 8					
785.2 3	1283.17	0.019 4					
x801.0 2		0.034 4					
816.3 3	1314.04	0.033 4					
x886.5 2		0.10 2					
935.77 6	1013.22	2.14 11					
940.63 6	1018.09	3.27 16					
1013.28 6	1013.22	1.14 7					
1018.12 6	1018.09	0.60 3					
1058.3 2	1556.36	0.068 6					
x1128.8 2		0.034 4					
1146.6 4	1556.36	0.56 4					
1148.4 4	1646.18	0.14 4					
1205.7 3	1283.17	0.027 4					
1234.2 3	1731.90	0.56 7					
1236.8 7	1646.18	0.21 7					
1242.8 8	1651.75	0.14 5					
1246.2 3	1743.94	0.27 5					
1283.3 2	1283.17	0.21 2					
1314.0 2	1314.04	0.18 2					
1334.0 2	1743.94	0.21 2					
x1355.9 3		0.036 4					
x1390.7 2		0.058 5					
1458.9 2	1957.02	0.060 6					
1478.8 2	1556.36	0.15 2					
1547.2 5	1957.02	0.07 4					
1547.9 5	2045.39	0.06 3					
1556.3 2	1556.36	1.31 10					
1568.9 2	1646.18	0.055 6					
1574.3 2	1651.75	0.070 7					

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^{113}Sb ε Decay 1976Wi10,1975WiZX (continued)

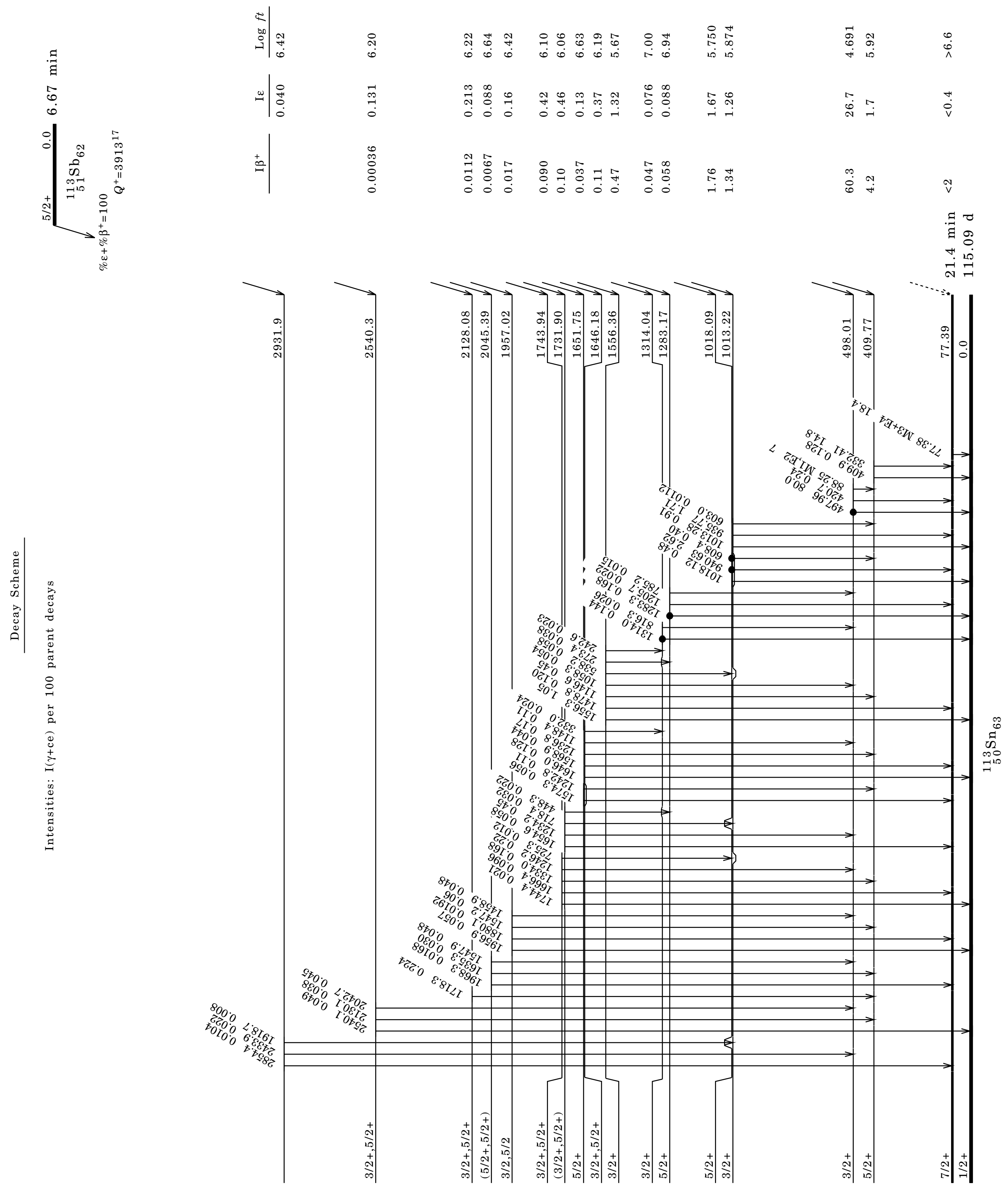
γ(^{113}Sn) (continued)

Eγ	E(level)	Iγ†
1635.3 *3*	2045.39	0.038 *5*
1646.0 *2*	1646.18	0.16 *2*
1654.6 *3*	1731.90	0.073 *7*
1666.4 *3*	1743.94	0.12 *2*
1718.3 *2*	2128.08	0.28 *3*
1744.4 *4*	1743.94	0.026 *4*
ˣ1806.1 *3*		0.035 *4*
1880.1 *4*	1957.02	0.024 *3*
ˣ1889.4 *3*		0.078 *7*
1918.7 *8*	2931.9	0.010 *4*
1956.9 *4*	1957.02	0.071 *7*
1968.3 *5*	2045.39	0.021 *3*
ˣ2006.7 *6*		0.033 *4*
ˣ2014.7 *6*		0.044 *6*
2042.7 *6*	2540.3	0.056 *7*
2130.1 *6*	2540.3	0.047 *6*
ˣ2304.8 *7*		0.016 *3*
ˣ2337.2 *7*		0.015 *3*
2433.9 *8*	2931.9	0.027 *5*
2540.1 *7*	2540.3	0.061 *8*
ˣ2624.6 *6*		0.015 *3*
ˣ2791.5 *13*		0.011 *3*
2854.4 *8*	2931.9	0.013 *3*
ˣ3143.7 *12*		0.016 *3*
ˣ3192.5 *12*		0.014 *3*
ˣ3605.6 *13*		0.021 *5*

† For absolute intensity per 100 decays, multiply by 0.80 *2*.

ˣ γ ray not placed in level scheme.

^{113}Sb ε Decay 1976Wi10,1975WiZX (continued)



^{100}Mo(^{18}O,5nγ) 1998Se14,1998Ch38

1998Se14: ^{100}Mo(^{18}O,5nγ) E=94 MeV. Measured Eγ, Iγ, γγ, γγ(θ)(DCO) using 20 Ge detectors and 71–detector BGO filter at "TASCC" facility at "CHALK RIVER".
See 1998Se14 for detailed orbital configurations for each band.
1998Ch39: ^{100}Mo(^{18}O,5nγ) E=70 MeV. Measured Eγ, Iγ, γγ, using the OSIRIS spectrometer array.
The data of 1998Se14 are adopted. Only a figure is given in 1998Ch38. without table, however 1998Ch38 agree with the 1998Se14 until the 8810 level (43/2–).

^{113}Sn Levels

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
0.0§	1/2+	4474.3 *10*	27/2+	10208.9@ *13*	47/2–
77.4§	7/2+	4713.5& *8*	27/2–	10588.3# *14*	49/2
738.4§	11/2–	4751.6# *8*	25/2	11241.2& *14*	51/2–
1906.3 *5*	15/2–	5533.7# *8*	29/2	11404.3@ *14*	51/2–
2806.1 *7*	19/2–	5604.9 *11*	31/2+	11722.7# *15*	53/2
2973.8 *7*	19/2–	5644.8& *9*	31/2–	12642.1@ *14*	55/2–
3091.0 *7*	19/2–	6384.6# *9*	33/2	12736.0& *14*	(55/2–)
3128.4 *7*	21/2–	6681.5& *10*	35/2–	13033.8# *15*	57/2
3222.7 *7*	19/2–	7321.3# *10*	37/2	14031.8@ *15*	59/2–
3409.1# *7*	17/2	7783.6& *11*	39/2–	14285.7& *15*	59/2–
3419.7 *9*	21/2–	7882.3@ *11*	39/2–	14576.7# *16*	(61/2)
3457.6 *9*	23/2–	8347.0# *12*	41/2	15653.1@ *16*	(63/2–)
3901.3& *7*	23/2–	8810.9& *12*	43/2–	15990.0& *18*	(63/2–)
3971.6 *8*	23/2(+)	9013.2@ *12*	43/2–	16309.0# *19*	(65/2)
4051.4# *7*	21/2	9466.1# *13*	45/2	17503.5@ *19*	(67/2–)
4057.1 *9*	25/2+	9935.6& *13*	47/2–	18219.8?# *20*	(69/2)

† From least–squares fit to Eγ's.
‡ From 1998Se14, based on their γγ(θ)(DCO) data and band assignments.
§ From adopted levels, Rounded–off value.
\# (A): ΔJ=2 band based on on 17/2 at 3409.5 Kev, [21,3].
@ (B): ΔJ=2 band based on on 39/2– at 7883.1 Kev, [21,4].
& (C): ΔJ=2 band based on on 31/2– at 5645.6 Kev, [20,3].

γ(^{113}Sn)

E(level)	Eγ	Iγ	Mult.†	Comments
77.4	77.4‡			
738.4	661.0‡			
1906.3	1167.9 *5*	100.0 *37*	E2	
2806.1	899.9 *5*	38.9 *13*	E2	DCO=0.97 *3*.
2973.8	1067.4 *5*	9.1 *5*	E2	DCO=1.01 *10*.
3091.0	1184.9 *5*	31.0 *11*	E2	DCO=0.98 *4*.
3128.4	154.5 *5*	≤1.0	M1,E2	
	322.4 *5*	20.3 *6*	M1+E2	DCO=0.84 *2*.
3222.7	1316.4 *5*	17.7 *7*	E2	DCO=1.01 *7*.
3409.1	1502.6 *5*	3.3 *3*	D	
3419.7	291.3 *5*	1.9 *1*	M1+E2	DCO=1.16 *12*.
3457.6	329.1 *5*	7.8 *2*	M1+E2	DCO=0.86 *3*.
3901.3	678.6 *5*	12.2 *4*	E2	DCO=0.97 *9*.
	810.3 *5*	23.2 *8*	E2	DCO=1.00 *2* for 810.3+812.0.
3971.6	551.9 *5*	2.1 *1*	(E1)	DCO=0.66 *7*.
	843.3 *5*	9.3 *3*	(E1)	DCO=0.56 *3*.
4051.4	642.0 *5*	2.2 *1*	E2	DCO=1.02 *13*.
	960.7 *5*	1.6 *1*	D	
4057.1	85.5 *5*	≤1.0	(M1+E2)	
	599.4 *5*	7.6 *2*	E1	DCO=0.78 *5*.
4474.3	417.2 *5*	4.5 *1*	M1,E2	DCO=0.89 *3*.
4713.5	812.0 *5*	32.8 *11*	E2	DCO=1.00 *2* for 810.3+812.0.
4751.6	700.3 *5*	3.8 *2*	E2	DCO=1.02 *11*.
	850.5 *5*	4.3 *2*	D	DCO=0.85 *3* for 850.5+851.3.
5533.7	782.3 *5*	10.9 *4*	E2	DCO=0.95 *8*.
	820.3 *5*	3.8 *2*	D	DCO=0.58 *9*.
5604.9	1130.6 *5*	3.8 *1*	E2	DCO=1.09 *10*.

Continued on next page (footnotes at end of table)

$^{100}Mo(^{18}O,5n\gamma)$ 1998Se14,1998Ch38 (continued)

$\gamma(^{113}Sn)$ (continued)

E(level)	Eγ	Iγ	Mult.†	Comments
5644.8	930.8 *5*	30.9 *10*	E2	DCO=0.98 *2*.
6384.6	739.4 *5*	2.1 *1*	D	DCO=0.61 *20*.
	851.3 *5*	11.8 *4*	E2	DCO=0.85 *3* for 850.5+851.3.
6681.5	1036.7 *5*	23.2 *7*	E2	DCO=0.98 *3*.
7321.3	936.7 *5*	15.9 *5*	E2	DCO=0.97 *4*.
7783.6	1102.3 *5*	13.6 *4*	E2	DCO=1.00 *5*.
7882.3	1200.7 *5*	4.2 *2*	E2	DCO=1.07 *15*.
8347.0	1025.7 *5*	12.6 *4*	E2	DCO=0.98 *8* for 1025.7+1027.4.
8810.9	928.4 *5*	≤1.0	E2	
	1027.4 *5*	7.3 *3*	E2	DCO=0.98 *8* for 1025.7+1027.4.
9013.2	1130.8 *5*	3.9 *2*	E2	DCO=0.93 *19*.
	1229.6 *5*	4.3 *2*	E2	DCO=1.06 *13*.
9466.1	1119.1 *5*	7.8 *3*	E2	DCO=0.98 *3* for 1119.1+1122.2.
9935.6	1124.7 *5*	6.3 *2*	E2	DCO=0.92 *14*.
10208.9	1195.7 *5*	3.5 *2*	E2	DCO=1.07 *9* for 1195.4+1195.7.
10588.3	1122.2 *5*	6.9 *3*	E2	DCO=0.98 *3* for 1119.1+1122.2.
11241.2	1305.6 *5*	3.9 *1*	E2	DCO=1.05 *9*.
11404.3	1195.4 *5*	2.6 *2*	E2	DCO=1.07 *9* for 1195.4+1195.7.
11722.7	1134.4 *5*	7.2 *2*	E2	DCO=0.95 *6*.
12642.1	1237.8 *5*	2.2 *1*	E2	DCO=1.04 *14*.
12736.0	1494.8 *5*	1.5 *1*	(E2)	
13033.8	1311.1 *5*	3.2 *1*	E2	DCO=0.97 *6*.
14031.8	1389.7 *5*	1.9 *1*	E2	DCO=1.11 *18*.
14285.7	1549.7 *5*	1.2 *1*	(E2)	
14576.7	1542.9 *5*	1.8 *1*	(E2)	
15653.1	1621.3 *5*	≤1.0	(E2)	
15990.0	1704.3 *10*	≤1.0	(E2)	
16309.0	1732.3 *10*	≤1.0	(E2)	
17503.5	1850.4 *10*	≤1.0	(E2)	
18219.8?	1910.8§ *10*	≤1.0	(E2)	

† Primarily from DCO.
‡ Rounded-off value from adopted gammas.
§ Placement of transition in the level scheme is uncertain.

$^{110}Cd(\alpha,n\gamma)$ 1997Ka40,1976Ma09

1997Ka40: E=18 MeV. Measured: γ and ce singles, excit, γγ coin. Preliminary report was given in 1995KaZV.
1976Ma09: E=15–18 MeV. Measured: γ and ce singles, excit functions, γγ.

^{113}Sn Levels

E(level)†	Jπ‡	$T_{1/2}$
0.0	1/2+	
77.38 *1*	7/2+	
410.37 *18*	5/2+	
498.16 *16*	3/2+	
739.3 *4*	11/2−	86 ns§ *2*
1014.66 *24*	(1/2),3/2+	
1018.36 *21*	5/2+	
1284.22 *17*	5/2+	
1314.0 *3*	3/2+	
1356.0 *3*	3/2+	
1472.77 *23*	5/2+	
1539.4 *4*	5/2+	
1540.8 *5*	(11/2−)	
1557.0 *3*	3/2+	
1645.2 *4*		
1652.1 *3*	5/2+	
1732.3 *4*	(3/2+,5/2+)	
1745.29 *23*	5/2+	
1781.5 *3*	9/2−	
1831.0 *3*		
1867.5 *3*	5/2+	
1907.6 *5*	15/2−	
1909.9 *3*	(5/2+,7/2+)	
1936.3 *5*	(11/2−)	
1946.2 *5*	(9/2−)	
1952.9 *5*	(13/2−)	
2039.97 *25*	(7/2+)	
2045.9 *3*	(3/2+,5/2+)	
2176.9 *5*	7/2+	
2200.8 *4*	5/2+	
2258.8 *4*	5/2+	
2337.6 *5*	11/2−	

Continued on next page (footnotes at end of table)

^{110}Cd(α,nγ) 1997Ka40,1976Ma09 (continued)

^{113}Sn Levels (continued)

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
2386.0 *4*	7/2+	2617.3 *4*		2807.7 *6*	19/2−
2448.6 *3*	7/2+	2620.1 *4*		2890.0 *5*	11/2−
2457.4 *3*		2624.7 *4*		2956.6 *4*	
2505.8 *4*		2649.9 *5*		2976.0 *7*	(19/2−)
2512.1 *4*	(3/2+,5/2+)	2662.9 *4*	(3/2+,5/2+)	3130.2 *6*	21/2−
2540.9 *5*	(15/2−)	2672.0 *5*			
2583.1 *5*		2750.7 *6*	17/2−		
2591.1 *3*		2778.8 *5*			

† From least-squares fit to γ energies.
‡ From adopted levels. All the reactions works (α,xnγ) and (p,nγ) of 1997Ka40 are in the same paper and have the same Jπ.
§ From adopted levels. Measured in ^{111}Cd(α,2nγ).

γ(^{113}Sn)

Eγ†	E(level)	Iγ†	Mult.‡	Comments
77.38 *1*	77.38			Eγ: from adopted levels, gammas.
172.4 *3*	2039.97	1.2 *1*		
225.3 *3*	2976.0	0.5 *2*		
322.5 *3*	3130.2	1.1 *1*		
332.6 *3*	410.37	44 *3*	M1,E2	Mult.: from α(K)exp=0.0192 *13*.
498.1 *2*	498.16	30 *2*	M1	Mult.: from γ(θ) and linear polarization.
567.2 *3*	2039.97	1.2 *1*		
583.2 *3*	1867.5	7.1 *4*	M1,E2	Mult.: from α(K)exp=0.0038 *7*.
608.0 *3*	1018.36	2.5 *2*	M1	Mult.: from γ(θ) and linear polarization.
633.3 *3*	2540.9	1.2 *1*		
661.5 *3*	739.3	100 *4*	M2	Mult.: from γ(θ) and linear polarization. B(M2)(W.u.)=0.122 *3*.
755.8 *3*	2039.97	0.6 *1*		
786.0§ *3*	2258.8	4.4§ *2*		
786.1§ *3*	1284.22	4.4§ *2*		
797.8 *3*	2750.7	1.4 *1*		
801.5 *3*	1540.8	3.6 *3*		Eγ: the placement of this transition is questionable. 1987Vi09 in (p,nγ) has found 801γ in coin with 662γ but not with 1018γ and 332γ.
838.4§ *3*	2620.1	2.3§ *2*		
x838.9§ *3*		2.3§ *2*		
873.9 *3*	1284.22	2.0 *2*		
879.4 *3*	2624.7	1.1 *1*		
892.6 *3*	2176.9	2.8 *2*		
x899.7§ *3*		3.9§ *2*		
900.1§ *3*	2807.7	3.9§ *2*		
913.2 *3*	2386.0	1.8 *1*		
936.7 *3*	1014.66	5.5 *3*		
940.6 *3*	1018.36	12.0 *6*		
975.8 *3*	2448.6	1.1 *1*		
1014.4 *3*	1014.66	3.6 *2*		
1018.3 *3*	1018.36	2.5 *2*		
1042.3 *3*	1781.5	6.8 *3*		
1068.3 *3*	2976.0	1.2 *1*		
1129.0 *3*	1539.4	4.4 *3*		
1147.2 *3*	1645.2	1.5 *1*		
1164.3 *3*	2448.6	1.2 *1*		
1168.3 *3*	1907.6	22.1 *9*		
1197.0 *3*	1936.3	7.3 *4*		
1206.9 *3*	1946.2	3.8 *3*		
1213.6 *3*	1952.9	11.3 *6*		
1221.6 *3*	2505.8	0.9 *2*		
1234.1 *3*	1732.3	3.8 *3*		
1241.6 *3*	1652.1	4.0 *3*		
1247.1 *3*	1745.29	1.4 *1*		
1284.2 *3*	1284.22	28 *2*	E2	Mult.: M1,E2 from α(K)exp=0.0006 *1*, E2 from γ(θ) and linear polarization.

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^{110}Cd(α,nγ) 1997Ka40,1976Ma09 (continued)

γ(^{113}Sn) (continued)

Eγ†	E(level)	Iγ†	Mult.‡	Comments
1314.0 *3*	1314.0	5.0 *3*	M1	Mult.: from γ(θ) and linear polarization.
1334.9 *3*	1745.29	7.3 *4*		
1356.0 *3*	1356.0	8.8 *4*		
1411.7 *3*	1909.9	3.7 *3*		
1472.8 *3*	1472.77	23.3 *2*	E2	Mult.: from γ(θ) and linear polarization.
1499.5 *3*	1909.9	2.9 *2*		
x1546.8 *3*		2.0 *2*		
1547.7§ *3*	2045.9	2.0§ *2*		
1557.0 *3*	1557.0	1.4 *1*		
1574.5 *3*	1652.1	2.4 *2*		
1598.3 *3*	2337.6	4.0 *3*		
1667.5 *3*	1745.29	3.5 *3*		
1672.4 *3*	2956.6	0.6 *2*		
1702.6 *3*	2200.8	3.9 *3*		
1801.6 *3*	2540.9	0.7 *2*		
1831.0 *3*	1831.0	1.4 *1*		
1843.8 *3*	2583.1	2.4 *2*		
1910.6 *3*	2649.9	0.4 *1*		
1932.7 *3*	2672.0	0.6 *2*		
1959.1 *3*	2457.4	1.1 *1*		
2013.9 *3*	2512.1	1.4 *1*		
2039.5 *3*	2778.8	1.4 *1*		
2092.9 *3*	2591.1	0.1 *1*		
2099.3 *3*	2176.9	1.2 *1*		
2150.5 *3*	2890.0	0.6 *2*		
2164.7 *3*	2662.9	1.3 *1*		
2206.9 *3*	2617.3	0.3 *1*		

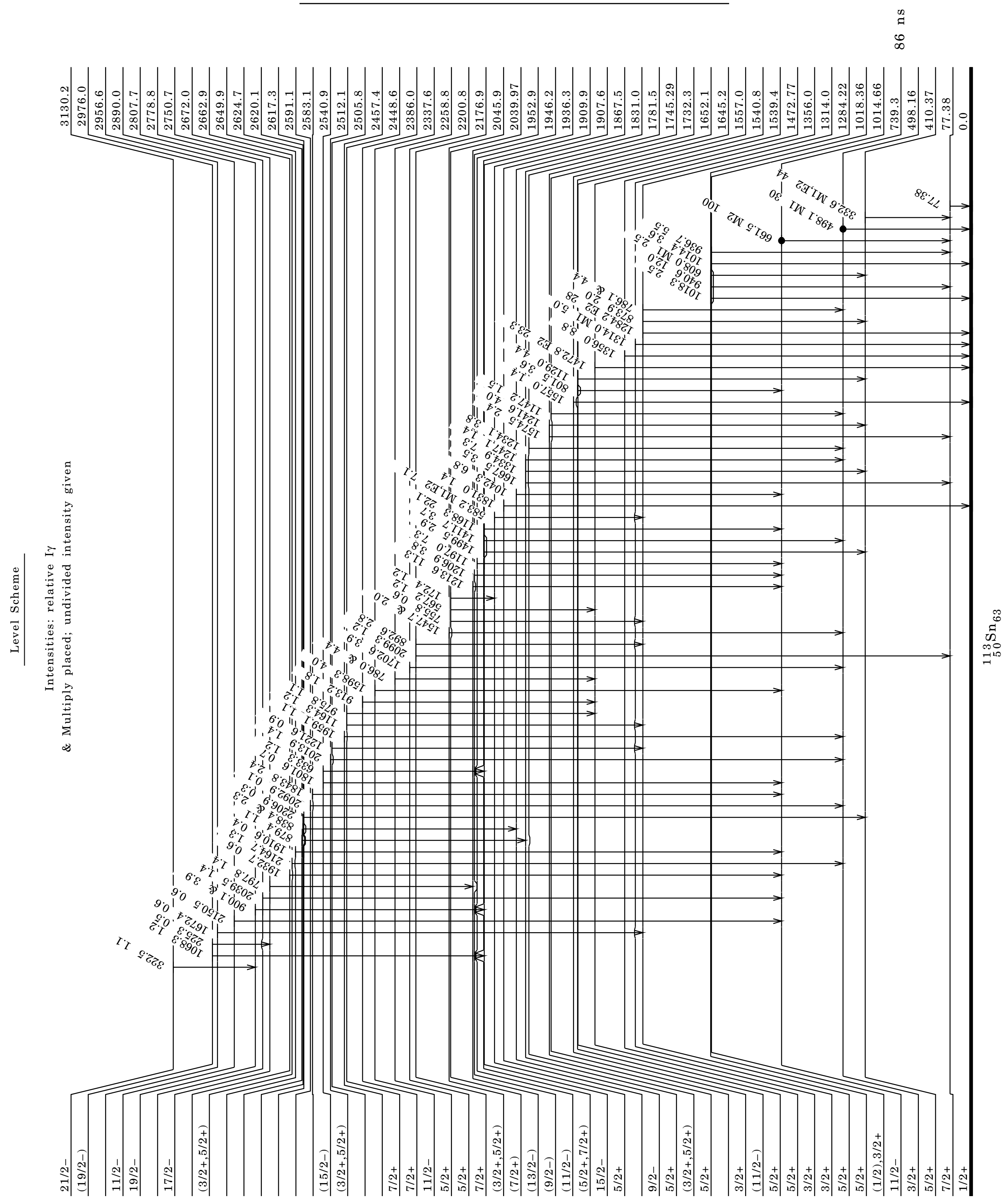
† From 1997Ka40, ΔEγ=0.3 keV estimated by evaluator, average of ΔEγ=0.1–0.4 keV (1997Ka40).

‡ α(K)exp normalized by 498γ and 662γ to M1 and M2 theory, respectively. 498γ is M1,E2 from decay scheme, and 662γ is M2(+E3) from ^{113}Sn IT decay (86 ns). The other multipolarity assignments are not affected by this uncertainty.

§ Multiply placed; undivided intensity given.

x γ ray not placed in level scheme.

$^{110}Cd(\alpha,n\gamma)$ 1997Ka40,1976Ma09 (continued)



^{111}Cd(α,2nγ) 1997Ka40,1991Vi09

1997Ka40: E=27 MeV. Measured: γ, excit, γγ coin, γ(θ), γ(t) Doppler shift, linear polarization, γ–rf distribution. Preliminary report was given in 1995KaZV.

1991Vi09: E=27 MeV. Measured: γ, excit, γγ coin, γ(θ), γ(t) Doppler shift.

Others: 1972Br38, 1973IsZQ, 1974Br29. Measured: $T_{1/2}$ of 739 level.

^{113}Sn Levels

E(level)	Jπ†	$T_{1/2}$‡	Comments
0.0§	1/2+		
77.38§	7/2+		
410.36§ *14*	5/2+		
498.11§ *9*	3/2+	>0.35 ps	
739.17# *18*	11/2−	86 ns *2*	$T_{1/2}$: from adopted levels.
1014.39§ *22*	3/2+	0.2 ps *1*	
1018.31§ *18*	5/2+	1.0 ps *5*	
1249.3 *5*			
1284.27§ *12*	5/2+	0.5 ps *2*	
1314.01§ *20*	3/2+		
1356.00§ *16*	3/2+	0.7 ps *3*	
1472.78§ *9*	5/2+	0.8 ps *5*	
1539.36§ *24*	5/2+	0.6 ps *1*	
1540.7# *4*	(11/2−)	0.2 ps *1*	
1557.0§ *3*	3/2+		
1645.3 *5*			
1647.4 *3*			
1652.0§ *3*	5/2+		
1732.5§ *5*	(3/2+,5/2+)		
1745.22§ *18*	5/2+	0.31 ps *8*	
1781.52# *24*	9/2−	0.19 ps *7*	
1867.55§ *16*	5/2+	0.33 ps *10*	
1907.45# *20*	15/2−	0.8 ps *2*	
1909.83§ *19*	(5/2+,7/2+)		
1936.18# *20*	11/2−	1.9 ps *8*	
1946.08# *25*	(9/2−)	0.4 ps *2*	
1952.78# *20*	13/2−	1.0 ps *4*	
2031.7 *6*			
2039.99§ *16*	7/2+	0.2 ps *1*	
2045.81§ *24*	(3/2+,5/2+)		
2135.5 *6*			
2176.83§ *16*	7/2+	0.3 ps *2*	
2200.72 *22*	(5/2)	>0.24 ps	
2258.8§ *3*	(5/2+)	0.3 ps *1*	
2275.2 *6*			
2337.47# *24*	11/2−	0.35 ps *8*	
2386.01§ *24*	7/2+	0.7 ps *4*	
2411.0 *5*			E(level): from coin between 1284–583–543 gammas.
2448.59 *18*	(7/2)		
2506.2 *3*			
2512.0§ *5*	(3/2+,5/2+)		
2540.78# *25*	(15/2−)	0.07 ps *3*	
2552.6 *4*			
2583.10# *24*	(15/2−)	0.22 ps *9*	
2620.1 *3*			
2624.6 *3*			
2649.8# *6*	(9/2−)		
2662.8§ *4*	(3/2+,5/2+)		
2671.9 *6*			
2675.6 *3*			E(level): from coin between 1284–583–808 gammas.
2701.15 *25*		0.4 ps *1*	
2718.6# *3*	(11/2−)		
2750.61# *25*	17/2−	0.21 ps *7*	
2778.7 *4*			
2807.50# *22*	19/2−	0.31 ps *10*	
2852.5# *3*	(17/2−)	1.2 ps *6*	
2889.9 *6*			
2916.6 *3*			

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^{111}Cd(α,2nγ) 1997Ka40,1991Vi09 (continued)

^{113}Sn Levels (continued)

E(level)	Jπ[†]	$T_{1/2}$[‡]	Comments
2956.7 4			
2975.92[#] 24	(19/2−)	0.28 ps 14	
3092.55[#] 22	19/2−	0.45 ps 18	
3129.9[#] 3	21/2−	>0.35 ps	
3131.0 4			
3139.2 6			
3224.0[#] 4	(19/2−)	>1.4 ps	
3410.3 4			
3421.4[#] 3	21/2−		
3454.3 5			
3459.5[#] 3	23/2−		
3838.7[#] 4	(23/2−)		
3902.7[#] 4	(23/2−)	0.6 ps 2	
3914.7[#] 4	(21/2−)		
3973.4[#] 3	(23/2−)	0.5 ps 2	
4059.2[§] 4	25/2+	0.69 ns 28	$T_{1/2}$: from γ−rf(t) (1997Ka40).
4476.6[§] 4	(27/2+)	>1.1 ps	
4714.7[#] 6	(27/2−)	0.31 ps 10	

† From decay properties, as given by 1997Ka40.
‡ From Doppler shift.
§ (A): Positive−parity levels.
\# (B): Negative−parity levels.

γ(^{113}Sn)

Eγ[†]	E(level)	Iγ[†]	Mult.[‡]	δ	Comments
77.38	77.38				Eγ: from adopted levels, gammas.
86.1 3	4059.2				
87.8	498.11				
153.5 3	3129.9	0.4 2			
172.4 2	2039.99	1.2 1	M1+E2	0.4 2	B(M1)(W.u.)=5 3; B(E2)(W.u.)=2.1×10^4 21.
225.3 2	2975.92	1.6 1	M1+E2	0.25 5	B(M1)(W.u.)=1.3 7; B(E2)(W.u.)=1.2×10^3 8.
282.7 3	2620.1	0.5 2			
291.7 2	3421.4	1.8 2	M1+E2	0.35 15	
322.5 1	3129.9	15.9 8	M1+E2	0.15 5	B(M1)(W.u.)<1.8; B(E2)(W.u.)<510.
329.5[§] 2	3459.5	5.8[§] 5	M1+E2	0.16 5	
332.6 2	410.36	11.2 6	M1+E2	−0.08 2	
363.7 4	2701.15	0.5 2			
379.2 4	3838.7	0.4 2			
381.1 5	2718.6	0.4 2			
392.7 2	2975.92	2.5 2			
394.8 3	1867.55	0.9 2			
410.3 3	410.36	0.6 2			
417.4 2	4476.6	1.3 1	M1+E2	0.4 2	B(M1)(W.u.)<0.27; B(E2)(W.u.)<320.
498.1 1	498.11	6.6 4	M1+E2	0.12 6	B(M1)(W.u.)<0.51; B(E2)(W.u.)<46.
510.9 5	3131.0	1.4 8			
518.4 5	2386.01	0.5 2			
543.5 4	2411.0	0.4 2			
551.9 3	3973.4	0.9 1	M1+E2	>10	B(M1)(W.u.)<0.00044; B(E2)(W.u.)>47.
567.2 3	2039.99	1.2 1	M1+E2	6 3	B(M1)(W.u.)=0.004 4; B(E2)(W.u.)=380 200.
573.0 3	2045.81	1.0 1	(M1)		
583.2 2	1867.55	8.0 4	M1+E2	0.15 10	B(M1)(W.u.)=0.30 10; B(E2)(W.u.)=15 +21−15.
599.5 2	4059.2	3.0 2	E1		B(E1)(W.u.)=1.9×10^{-6} 9.
608.0 2	1018.31	4.2 3	M1+E2	3 1	B(M1)(W.u.)=0.006 5; B(E2)(W.u.)=110 60.
613.3 3	3421.4	0.7 2	M1+E2	0.4 1	
633.3 3	2540.78	1.0 1	M1+E2	−1.2 8	B(M1)(W.u.)=0.24 22; B(E2)(W.u.)=7.×10^2 5.
652.1 5	3459.5	0.2 1			
661.5 1	739.17	100 4	M2		B(M2)(W.u.)=0.122 3.
678.7 4	3902.7	0.8 2	(E2)		B(E2)(W.u.)=60 30.
684.0 2	2039.99	1.5 1	E2		B(E2)(W.u.)=190 100.

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^{111}Cd(α,2nγ) 1997Ka40,1991Vi09 (continued)

γ(^{113}Sn) (continued)

Eγ†	E(level)	Iγ†	Mult.‡	δ	Comments
708.7 4	3838.7	1.2 1	M1		
748.3 3	2701.15	0.9 2			
755.8 3	2039.99	0.7 2			
765.0 4	2701.15	0.4 2			
772.5 3	2718.6	0.6 2	M1		
786.0 4	2258.8	0.8 3			
786.1 3	1284.27	2.0 2			
797.8 2	2750.61	4.9 3	(E2)		B(E2)(W.u.)=260 90.
801.5 3	1540.7	2.0 2	M1+E2	−0.3 1	B(M1)(W.u.)=0.20 10; B(E2)(W.u.)=22 18.
808.0 4	2675.6	0.5 2			
810.1 3	3902.7	1.8 2	(E2)		B(E2)(W.u.)=58 22.
812.0 4	4714.7	0.7 1	(E2)		B(E2)(W.u.)=160 60.
838.4§ 4	2620.1	<1.5§			
838.9§ 4	1249.3	<1.5§			
843.7 2	3973.4	6.6 3	M1+E2	0.25 5	B(M1)(W.u.)=0.061 25; B(E2)(W.u.)=4.2 24.
873.9 4	1284.27	0.6 2	M1+E2	2.7 8	B(M1)(W.u.)=0.00032 24; B(E2)(W.u.)=2.4 13.
879.4 3	2624.6	0.4 2			
892.6 2	2176.83	1.6 1	M1+E2	−0.2 1	Mult.: δ=−0.2 1 or −2.1 6. B(M1)(W.u.)=0.029 20; B(E2)(W.u.)=1.1 +14−1.
899.7§ 4	2852.5	20.5§ 9			
900.1§ 1	2807.50	20.5§ 9	E2		B(E2)(W.u.)=100 30.
913.2 3	2386.01	2.9 2	M1+E2	0.4 2	B(M1)(W.u.)=0.027 17; B(E2)(W.u.)=4 +5−4.
936.7 2	1014.39	1.6 1	E2		B(E2)(W.u.)=60 40.
940.6 2	1018.31	2.5 2	M1+E2	0.5 2	B(M1)(W.u.)=0.008 4; B(E2)(W.u.)=1.7 14.
945.0 2	2852.5	1.6 2			
963.8 2	2916.6	1.2 2			
974.6 4	2258.8	1.2 1			
975.8 3	2448.59	1.9 1			
1009.1 5	2916.6	0.2 1			
1014.4 4	1014.39	1.5 1	M1+E2	0.5 1	B(M1)(W.u.)=0.041 21; B(E2)(W.u.)=8 5.
1018.3 5	1018.31	0.3 2	E2		B(E2)(W.u.)=0.7 6.
1034.0 4	2506.2	0.6 2			
1042.3 2	1781.52	4.1 2	M1+E2	−0.5 3	Mult.: δ=−0.5 3 or −1.6 3. B(M1)(W.u.)=0.08 4; B(E2)(W.u.)=14 +15−14.
1068.3 3	2975.92	4.1 2	E2		B(E2)(W.u.)=22 12.
1079.8 4	2552.6	0.3 2			
1092.6 5	2448.59	0.2 1			
1101.8 4	2386.01	0.4 2			
1107.2 3	3914.7	1.1 1	M1		
1129.0 2	1539.36	1.2 2	M1+E2	−2.5 10	B(M1)(W.u.)=0.0035 25; B(E2)(W.u.)=14 3.
1147.2 5	1645.3	0.3 2			
1149.3 4	1647.4	0.6 2			
1151.8 5	2624.6	0.1 1			
1164.3 2	2448.59	2.9 2	M1+E2	1.4 6	
1168.3 1	1907.45	57 3	E2		B(E2)(W.u.)=10 3.
1185.1 1	3092.55	5.3 3	E2		B(E2)(W.u.)=17 7.
1197.0 1	1936.18	3.3 2	M1+E2	−5 3	B(M1)(W.u.)=0.0003 +4−3; B(E2)(W.u.)=3.6 16.
1202.8 4	2675.6	0.6 2			
1206.9 2	1946.08	2.5 2	M1+E2	0.15 5	B(M1)(W.u.)=0.031 16; B(E2)(W.u.)=0.4 3.
1213.6 1	1952.78	12.1 6	M1+E2	3.4 2	B(M1)(W.u.)=0.0010 4; B(E2)(W.u.)=6.1 25.
1221.6 3	2506.2	0.9 1			
1223.6 4	3131.0	0.4 2			
1234.4 4	1732.5	0.2 1	M1		
1237.1 4	1647.4	0.2 1			
1241.6 3	1652.0	1.0 2	M1		
1247.1 5	1745.22	0.1 1	M1+E2	2.1 15	B(M1)(W.u.)=0.00013 +21−13; B(E2)(W.u.)=0.3 +4−3.
1268.4 5	2552.6	0.2 2			
1271.6 5	3139.2	0.4 2			
1284.2 2	1284.27	12.5 6	E2		B(E2)(W.u.)=8 4.
1314.0 2	1314.01	2.6 2	M1		
1316.5 3	3224.0	2.4 2			
1334.9 2	1745.22	3.9 2	M1+E2	0.6 4	B(M1)(W.u.)=0.016 8; B(E2)(W.u.)=3 3.
1356.0 2	1356.00	2.2 2	M1+E2	0.14 6	B(M1)(W.u.)=0.012 6; B(E2)(W.u.)=0.10 10.

Continued on next page (footnotes at end of table)

$^{111}Cd(\alpha,2n\gamma)$ 1997Ka40,1991Vi09 (continued)

$\gamma(^{113}Sn)$ (continued)

Eγ†	E(level)	Iγ†	Mult.‡	δ	Comments
1411.7 *2*	1909.83	1.2 *2*			
1472.8 *1*	1472.78	13.3 *7*	E2		B(E2)(W.u.)=3.1 *20*.
1499.5 *3*	1909.83	0.5 *2*			
1502.8 *3*	3410.3	0.6 *2*			
1546.8 *4*	3454.3	<1.9			
1547.7 *5*	2045.81	<1.9			
1557.0 *3*	1557.0	0.7 *2*	M1+E2	0.2 *1*	
1574.5 *4*	1652.0	0.5 *2*	M1+E2	−1.0 *5*	
1598.3 *2*	2337.47	2.2 *2*	M1+E2	1.9 *2*	B(M1)(W.u.)=0.0033 *10*; B(E2)(W.u.)=3.7 *9*.
1621.3 *5*	2031.7	0.1 *1*			
1635.5 *5*	2045.81	0.1 *1*			
1667.5 *2*	1745.22	1.2 *1*			
1672.4 *3*	2956.7	0.3 *1*			
1702.6 *2*	2200.72	1.3 *1*	M1+E2	−0.5 *3*	B(M1)(W.u.)<0.018; B(E2)(W.u.)<2.0.
1703.8 *4*	1781.52	0.2 *1*	[E1]		B(E1)(W.u.)=1.4×10^{-5} *9*.
1725.1 *5*	2135.5	0.2 *1*			
1766.5 *2*	2176.83	2.5 *2*	M1		B(M1)(W.u.)=0.006 *4*.
1801.6 *2*	2540.78	1.1 *1*			
1843.8 *2*	2583.10	3.7 *2*	E2		B(E2)(W.u.)=3.7 *16*.
1864.8 *5*	2275.2	0.1 *1*			
1881.0 *3*	2620.1	0.9 *1*			
1910.6 *5*	2649.8	0.2 *1*	(M1)		
1932.7 *5*	2671.9	0.1 *1*			
1962.0 *3*	2701.15	0.7 *2*			
1979.4 *3*	2718.6	0.6 *2*			
2013.9 *4*	2512.0	0.5 *2*			
2039.5 *3*	2778.7	1.6			
2099.3 *3*	2176.83	1.4 *1*	M1		B(M1)(W.u.)=0.0020 *14*.
2150.5 *5*	2889.9	0.2 *1*			
2164.7 *3*	2662.8	0.9 *3*			

† From 1997Ka40, ΔEγ=0.3 keV estimated by evaluator, average of ΔEγ=0.1–0.4 keV (1997Ka40). The data of 1991Vi09 are in agreement with 1997Ka40.

‡ From γ(θ) at seven angles, linear polarization.

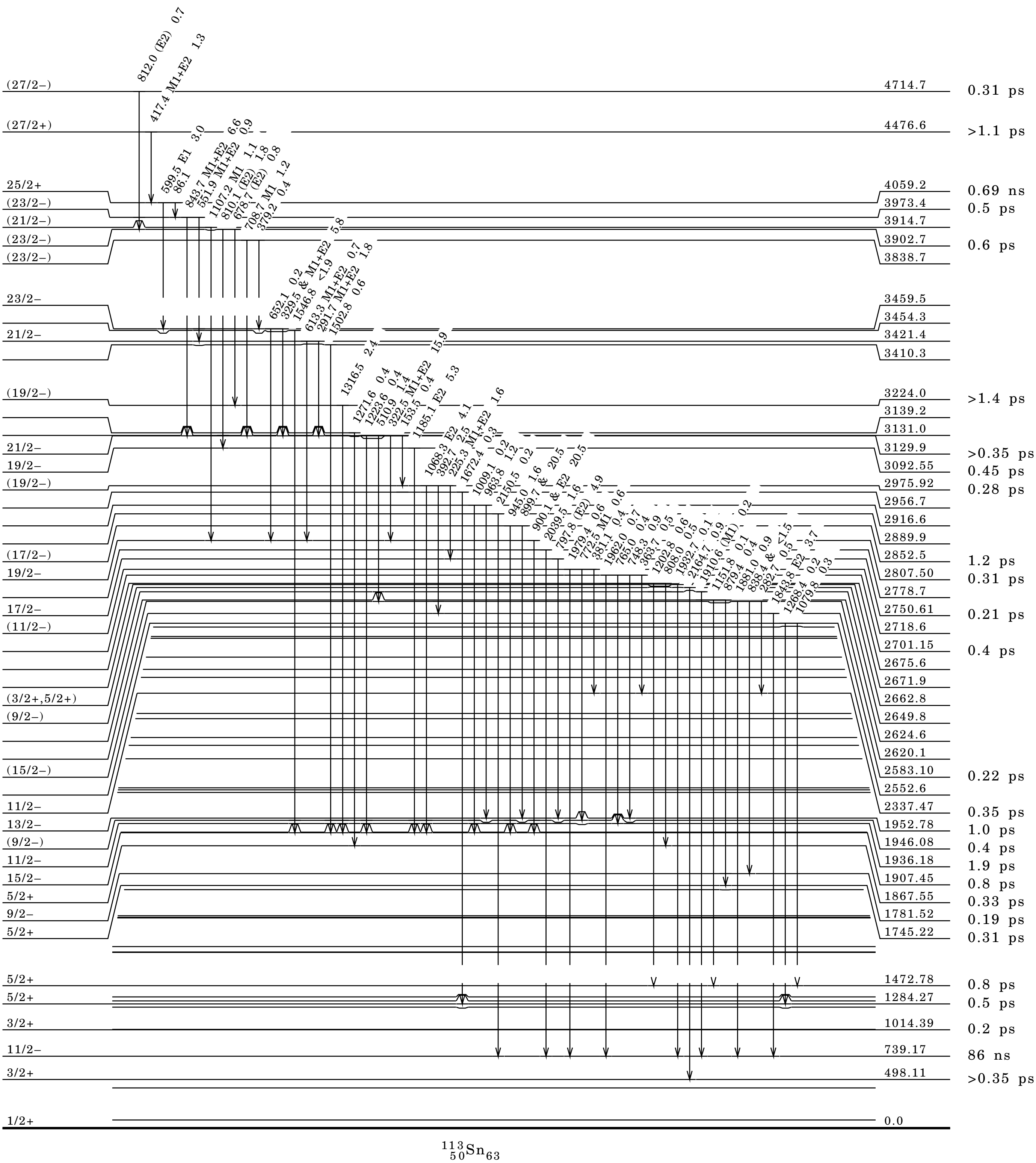
§ Multiply placed; undivided intensity given.

$^{111}Cd(\alpha,2n\gamma)$ 1997Ka40,1991Vi09 (continued)

Level Scheme

Intensities: relative Iγ

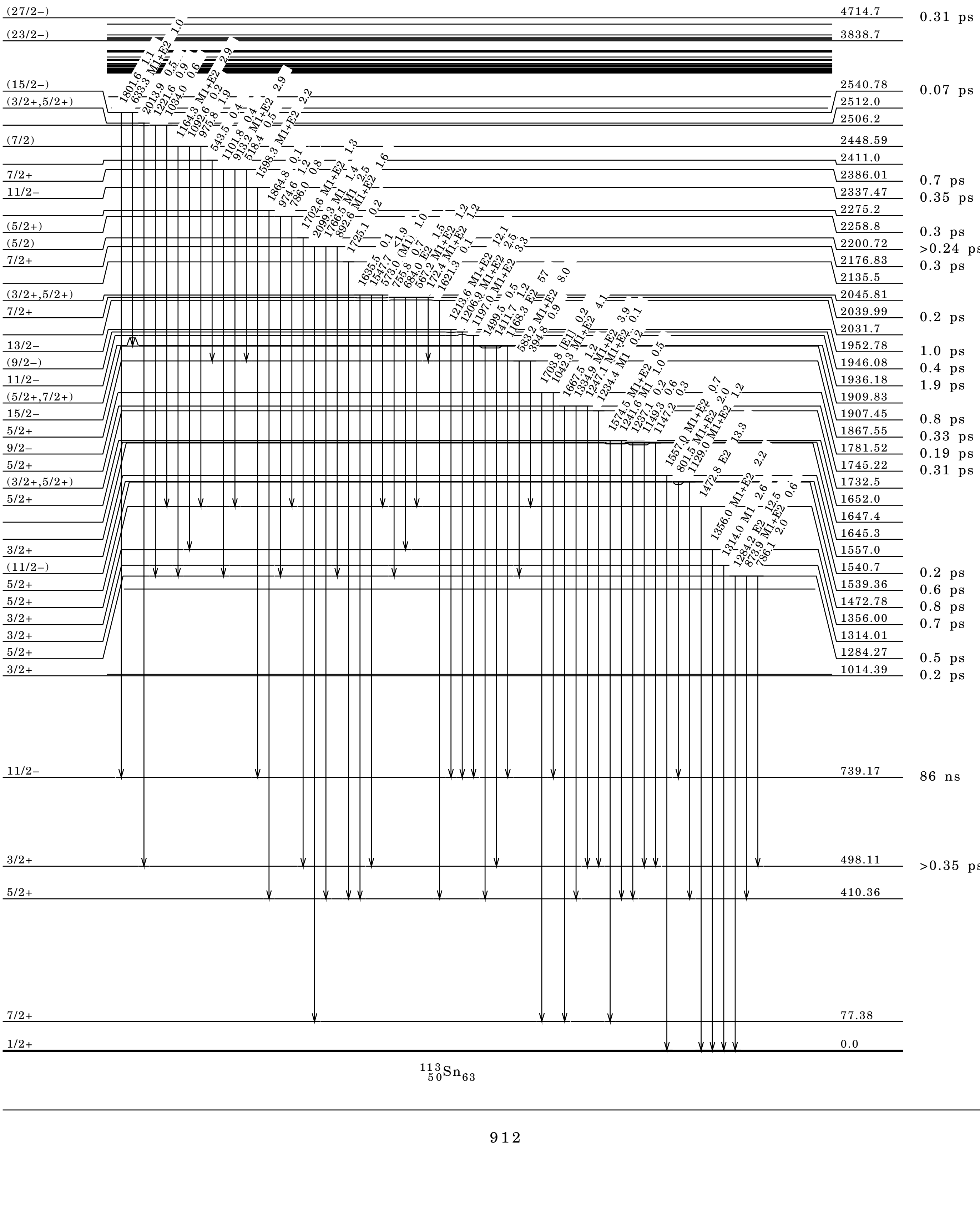
& Multiply placed; undivided intensity given



^{111}Cd(α,2nγ) 1997Ka40,1991Vi09 (continued)

Level Scheme (continued)

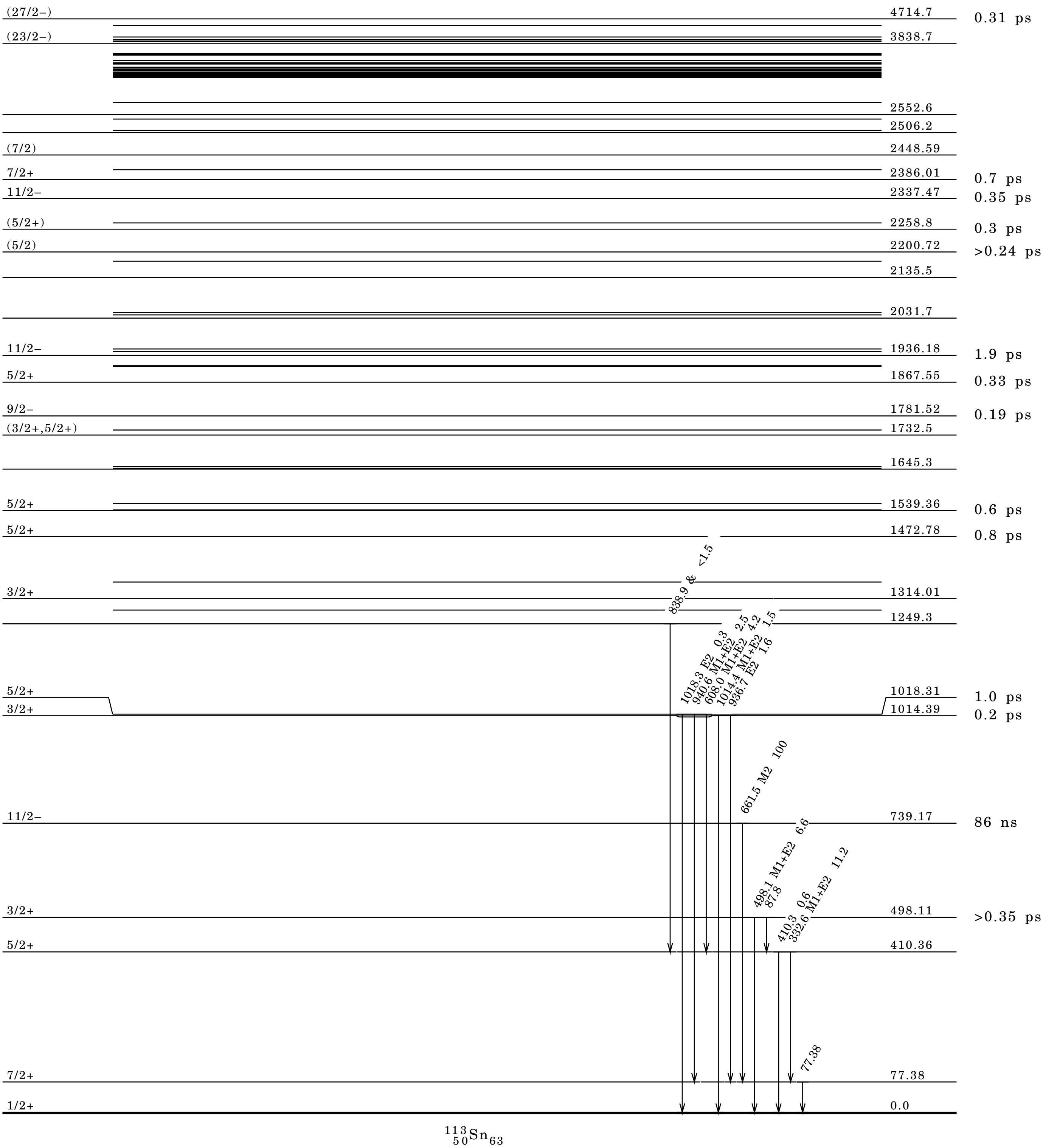
Intensities: relative Iγ
& Multiply placed; undivided intensity given



$^{111}Cd(\alpha,2n\gamma)$ 1997Ka40,1991Vi09 (continued)

Level Scheme (continued)

Intensities: relative Iγ
& Multiply placed; undivided intensity given



^{112}Cd(α,3nγ) 1979Ha12

Other: 1969Ya05, E=40 MeV.
E=40 MeV. Measured Eγ, Iγ, γγ-coin, γ(θ), excit, E(ce), I(ce), 1979Ha12.

^{113}Sn Levels

E(level)	Jπ‡	E(level)	Jπ‡	E(level)	Jπ‡
0.0	1/2+	2807.4 *12*	19/2−†	3902.9 *12*	(23/2−)
77.7 *10*	7/2+	2976.1 *11*	(17/2−)	3972.7 *12*	(23/2−)
738.7 *11*	11/2−†	3092.1 *12*	19/2−	4058.2 *12*	
1907.4 *11*	15/2−†	3129.8 *12*	21/2−	4475.3 *13*	
1952.4 *11*	(13/2−)	3459.1 *12*	(23/2−)	4715.3 *12*	(27/2−)
2750.1 *11*	(15/2−)	3681.2 *12*	23/2−		

† Proposed neutron h11/2 band. ΔJ=2 spacings correspond with ^{112}Sn, ^{114}Sn g.s. band up to 4+.
‡ Suggested by 1979Ha12 on the bases of angular distributions, α(K)exp, and known Jπ (g.s., 77 and 738 levels).

γ(^{113}Sn)

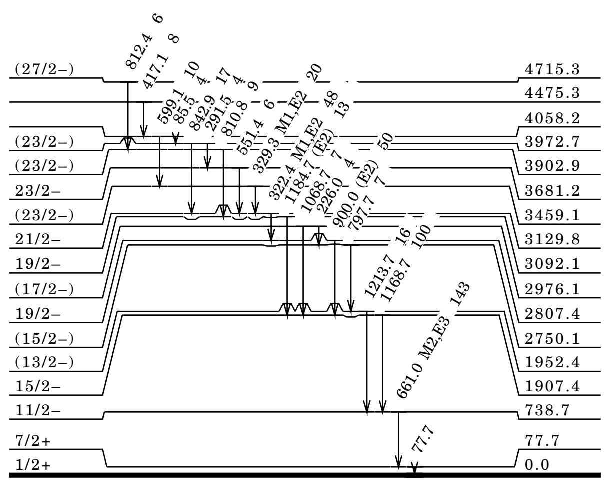
Eγ	E(level)	Iγ	Mult.†	Comments
77.7	77.7			
85.5 *3*	4058.2	4 *2*		
226.0 *3*	2976.1	4 *2*		
291.5 *3*	3972.7	4 *2*		Eγ: The placement of this γ is not as in (α,2nγ).
322.4 *3*	3129.8	48 *6*	M1,E2	Mult.: α(K)exp=0.024 *4*.
329.3 *3*	3459.1	20 *3*	M1,E2	Mult.: α(K)exp=0.025 *6*.
417.1 *3*	4475.3	8 *2*		
551.4 *3*	3681.2	6 *2*		Eγ: The placement of this γ is from the 3972 level in (α,2nγ).
599.1 *3*	4058.2	10 *2*		
x617.8		15 *3*		
661.0 *3*	738.7	143 *16*	M2,E3	Mult.: α(K)exp=0.0088 *12*.
797.7 *3*	2750.1	7 *3*		
810.8 *3*	3902.9	9 *3*		
812.4 *3*	4715.3	6 *2*		
842.9 *3*	3972.7	17 *3*		
900.0 *3*	2807.4	50 *7*	(E2)‡	
x1042.8		12 *3*		
1068.7 *3*	2976.1	7 *2*		
1168.7 *3*	1907.4	100		
1184.7 *3*	3092.1	13 *2*	(E2)‡	
1213.7 *3*	1952.4	16 *3*		

† From I(ce) and Iγ calibrated by means of known pure E2 transitions in adjacent even tin isotopes.
‡ γ(θ) typical of a J+2 to J transition.
x γ ray not placed in level scheme.

^{112}Cd(α,3nγ) 1979Ha12 (continued)

Level Scheme

Intensities: relative Iγ



$^{113}_{50}Sn_{63}$

^{112}Sn(n,γ) E=95 eV 1968Sa16,1981MuZQ

E=95–eV resonance with neutron time of flight, semi (1968Sa16).
For resonance parameters, see 1981MuZQ. Other: 1969Ju01.

^{113}Sn Levels

E(level)†	Jπ‡	Comments
0.0	1/2+	
504		
1317		
1557		
2060		
2579		
7745.5 *29*	1/2+	Jπ: 1968Sa16, 1981MuZQ.

† Rounded off level energies based on S(n)=7742.9 *18* (1995Au04).
‡ From adopted levels.

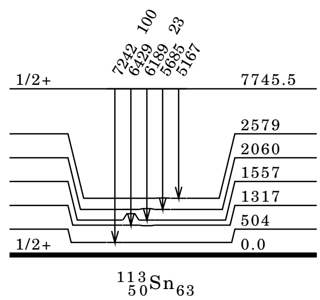
γ(^{113}Sn)

Eγ	E(level)	Iγ
5167	7745.5	
5685	7745.5	
6189	7745.5	23 *7*
6429	7745.5	
7242	7745.5	100 *9*

^{112}Sn(n,γ) E=95 eV 1968Sa16,1981MuZQ (continued)

Level Scheme

Intensities: relative Iγ



^{112}Sn(d,p),^{114}Sn(d,t) 1972Bo76

Others: 1966Co35, E=12 MeV; 1967Sc12, E=15 MeV.
E=12 MeV. Magnetic spectrograph resolution≈9 keV, 80% enriched ^{112}Sn target, 1972Bo76.
Also authors have measured σ(d,t) and σ(d,p).

^{113}Sn Levels

E(level)	Jπ[‡]	L[†]	C^2S
0.0[§]	1/2+	0	0.57
76[§] *5*	7/2+	4	0.23
407[§] *5*	5/2+	2	0.15
496[§] *5*	3/2+	2	0.60
735[§] *5*	11/2−	5	1.00
1014[§] *5*	3/2+,5/2+	2	0.02,0.014
1222? *5*			
1314 *5*	3/2+,5/2+	2	0.014,0.01
1537 *5*	(7/2+)	(4)	0.27
1556[§] *5*			
1646 *5*	3/2+	2	0.044
1745 *5*	3/2+	2	0.011
1817[§] *5*	1/2+	0	0.036
1907 *5*			
1939[§] *5*	(7/2−)	(3)	0.012
2050 *5*	(3/2−)	1	0.007
2105 *5*	(3/2−)	1	0.005
2129[§] *5*	3/2+,5/2+	2	0.04,0.026
2203 *5*			
2272[§] *5*	(3/2−)	1	0.007
2540[§] *5*	(7/2−)	3	0.028
2596 *5*	(3/2−,3/2+)	1,2	0.003,0.01
2620[§] *5*	1/2+	0	0.027
2764 *5*	(7/2−)	3	0.008
2780[§] *5*			
2862[§] *5*	(7/2−)	3	0.040
3004[§] *5*	(3/2−)	1	0.009
3080 *5*	(7/2−)	3	0.008
3204 *5*	(3/2−)	1	0.012
3307 *5*	(7/2−)	3	0.045
3418 *5*	(7/2−)	3	0.018
3494 *5*	(7/2−)	3	0.015
3499 *5*			
3539 *5*	(7/2−)	3	0.020
3584 *5*	(7/2−)	3	0.012
3696 *5*	(7/2−)	3	0.007
3743 *5*	(7/2−)	3	0.012
3796 *5*	(7/2−)	3	0.005
3808 *5*	(7/2−)	3	0.007
3822 *5*	(7/2−)	3	0.006
3846 *5*	(3/2−,3/2+)	1,2	0.005,0.01
3873 *5*	(7/2−)	3	0.009
3906 *5*	(7/2−)	3	0.016
3960 *5*			
4022 *5*	(3/2−,3/2+)	1,2	0.003,0.01
4044 *5*	(7/2−)	3	0.009
4233 *5*	(7/2−)	3	0.011
4265 *5*	(7/2−)	3	0.029
4315 *5*	(7/2−)	3	0.007
4335 *5*			
4343 *5*	(7/2−)	3	0.007
4364 *5*			
4397 *5*	(7/2−)	3	0.006
4430 *5*	(7/2−)	3	0.021
4438? *5*			
4504 *5*			
4589 *5*	(7/2−)	3	0.016
4609 *5*	(7/2−)	3	0.018
4649 *5*			
4992 *5*	(7/2−)	3	0.009
5012 *5*	(7/2−)	3	0.017
5067 *5*	(7/2−)	3	0.015
5239 *5*	(7/2−)	3	0.018
5291 *5*	(7/2−)	3	0.009
5318 *5*	(3/2−,7/2−)	1,3	0.005,0.01
5450 *5*	(7/2−)	3	0.013
5647 *5*	(7/2−)	3	0.008

† Based on angular distributions at 10 angles (10°–69°) compared with DWBA calc. For L≥3, the agreement with DWBA is rather poor.

Footnotes continued on next page

^{112}Sn(d,p),^{114}Sn(d,t) 1972Bo76 (continued)

^{113}Sn Levels (continued)

‡ In the lighter Sn isotopes, the d5/2 shell–model state is almost full, while the d3/2 state is relatively empty. For L=2, J was therefore assigned 5/2 or 3/2 from comparison of σ(d,t) and σ(d,p). For L=1 and L=3, J was assigned 3/2 and 7/2, respectively, from shell–model syst as corresponding to the lower energy levels.

§ Also observed by 1967Sc12.

^{113}In(p,nγ) 1997Ka40,1987Vi09

1997Ka40: ^{113}In(p,nγ) E=6.7 MeV. Preliminary report was given in 1995KaZV.

1987Vi09: ^{113}In(p,nγ) E=3.2–6 MeV.

Also ^{115}In(p,3nγ) E=30 MeV.

1990ViZV (same group) present levels and gammas from ^{111}Cd(α,2nγ), but without information on Jπ or γ properties.

Measured: γ, γγ, γγ(t), γ(θ).

The energy gap between the 15/2– and 11/2– states is approximately equal to the energies of the first 2+ states in adjacent even Sn nuclides. The authors suggest the presence of a multiplet formed by a quasiparticle in the h11/2 neutron state and collective core excitation.

The 1908, 1953, 1947, 1936, and 1782 levels could be members of this multiplet.

The levels around 2650 with two 19/2– states could be also members of another multiplet formed by coupling of the (ν h11/2) with two–phonon core excitations.

^{113}Sn Levels

E(level)‡	Jπ†
0.0	1/2+
77.38	7/2+
410.44 17	3/2+
498.33 18	3/2+
739.3 4	11/2–
1014.46 23	3/2+,5/2+
1018.39 20	3/2+,5/2+
1249.3 4	5/2–
1284.15 18	5/2+
1313.98 23	3/2+,5/2+
1356.0 3	3/2+
1472.74 23	3/2+,5/2+
1539.4 4	5/2+,7/2+
1540.8 5	(13/2–)
1557.0 3	3/2+
1645.3 4	3/2+
1652.3 3	5/2+,9/2+
1732.7 4	
1745.31 22	5/2+
1781.9 5	9/2–,11/2–,13/2–
1821.0 3	3/2+,5/2+
1831.0 3	
1867.4 3	5/2+,7/2+
1907.6 5	15/2–
1910.0 3	5/2+
1936.3 5	(9/2–,11/2–,13/2–)
1946.2 5	
1952.9 5	(9/2–,13/2–)
2031.8 4	
2039.9 3	(3/2+,5/2+,7/2+)
2046.0 3	(3/2+,5/2+)
2135.6 4	
2176.8 3	(5/2+,7/2+)
2200.9 4	(3/2+,5/2+)
2258.7 4	
2275.3 4	
2337.6 5	
2385.9 4	
2448.5 3	
2457.6 3	
2468.1 4	
2505.8 4	
2512.2 4	(3/2+,5/2+)
2538.7 3	
2540.9 5	(13/2–,15/2–)
2552.0 3	(3/2+,5/2+,7/2+)
2583.1 5	
2591.2 3	
2617.4 4	
2624.5 3	
2649.9 5	
2663.1 4	(3/2+,5/2+)
2672.0 5	
2778.8 5	
2852.7 5	(17/2–)
2889.8 5	11/2–
2956.6 4	

† From γ(θ) taken at six angles (13°,90°,120°,130°,140°,150°) and linear polarization in (α,2nγ), same authors and same paper.

‡ From least–squares fit to γ energies.

γ(^{113}Sn)

Eγ†	E(level)	Iγ†	Comments
77.38	77.38		Eγ: from adopted levels, gammas.
172.4 3	2039.9	1.7 1	
332.6 3	410.44	62 4	
498.1 3	498.33	33 2	
567.2 3	2039.9	1.4 1	
583.2 3	1867.4	7.4 4	
608.0 3	1018.39	3.8 3	
633.3 3	2540.9	0.9 1	
661.5 3	739.3	100 5	
755.8 3	2039.9	0.8 1	
786.0‡ 3	2258.7	3.9‡ 3	
786.1‡ 3	1284.15	3.9‡ 3	

Continued on next page (footnotes at end of table)

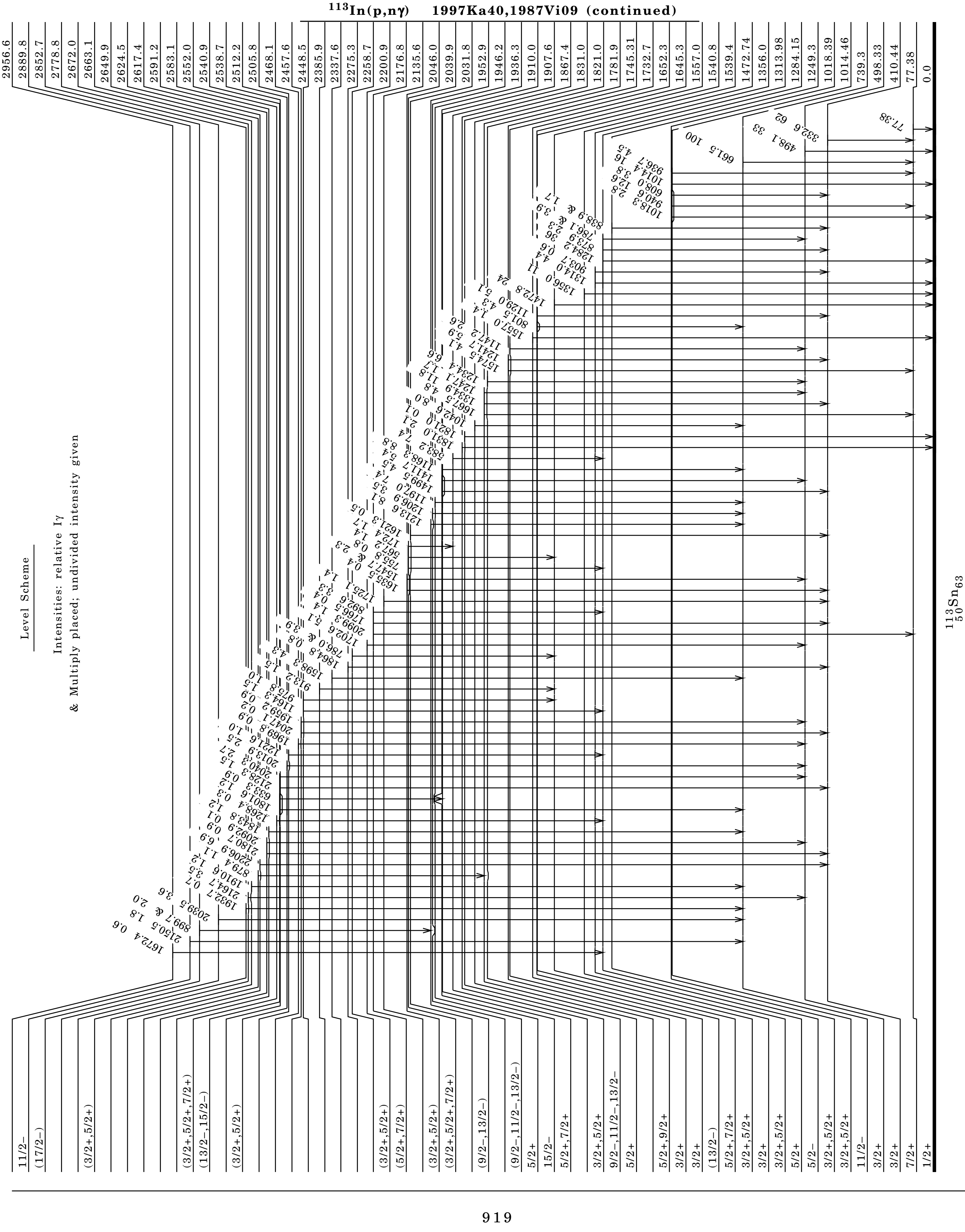
^{113}In(p,nγ) 1997Ka40,1987Vi09 (continued)

γ(^{113}Sn) (continued)

Eγ†	E(level)	Iγ†
801.5 3	1540.8	4.3 3
x838.4‡ 3		1.7‡ 2
838.9‡ 3	1249.3	1.7‡ 2
873.9 3	1284.15	2.3 1
879.4 3	2624.5	1.1 1
892.6 3	2176.8	3.3 2
x899.7‡ 3		2.0‡ 2
899.7‡ 3	2852.7	2.0‡ 2
903.7 3	1313.98	0.6 1
913.2 3	2385.9	1.5 2
936.7 3	1014.46	4.5 3
940.6 3	1018.39	12.6 6
975.8 3	2448.5	1.0 1
1014.4 3	1014.46	16 6
1018.3 3	1018.39	2.8 1
1042.6 3	1781.9	8.0 4
1129.0 3	1539.4	5.1 3
1147.2 3	1645.3	2.6 1
1164.3 3	2448.5	1.5 1
1168.3 3	1907.6	8.8 6
1197.0 3	1936.3	7.4 5
1206.9 3	1946.2	3.5 3
1213.6 3	1952.9	8.1 4
1221.6 3	2505.8	1.0 1
1234.4 3	1732.7	6.6 4
1241.7 3	1652.3	5.9 4
1247.1 3	1745.31	1.7 2
1268.4 3	2552.0	0.3 1
1284.2 3	1284.15	36 2
1314.0 3	1313.98	4.4 3
1334.9 3	1745.31	11.8 6
1356.0 3	1356.0	11 1
1411.7 3	1910.0	5.4 3
1472.8 3	1472.74	24 2
1499.5 3	1910.0	4.5 2
x1546.8 3		2.3 1
1547.7‡ 3	2046.0	2.3‡ 1
1557.0 3	1557.0	1.4 1
1574.5 3	1652.3	4.1 3
1598.3 3	2337.6	4.3 3
1621.3 3	2031.8	0.5 1
1635.5 3	2046.0	0.4 1
1667.5 3	1745.31	4.8 3
1672.4 3	2956.6	0.6 1
1702.6 3	2200.9	5.1 3
1725.1 3	2135.6	1.4 1
1766.5 3	2176.8	0.4 1
1801.6 3	2540.9	1.2 1
1821.0 3	1821.0	0.1 1
1831.0 3	1831.0	2.1 2
1843.8 3	2583.1	1.2 1
1864.8 3	2275.3	0.8 1
1910.6 3	2649.9	1.2 3
1932.7 3	2672.0	0.7 1
1959.2 3	2457.6	0.9 1
1969.8 3	2468.1	0.9 1
2013.9 3	2512.2	2.5 2
2039.5 3	2778.8	3.6 4
2040.3 3	2538.7	2.7 4
2047.1 3	2457.6	0.2 4
2092.9 3	2591.2	0.1 1
2099.3 3	2176.8	1.4 1
2128.3 3	2538.7	1.5 1
2150.5 3	2889.8	1.8 1
2164.7 3	2663.1	3.5 3
2180.7 3	2591.2	0.9 1
2206.9 3	2617.4	6.9 6

† From 1997Ka40, ΔEγ=0.3 keV estimated by evaluator, average of ΔEγ=0.1–0.4 keV (1997Ka40).
‡ Multiply placed; undivided intensity given.
x γ ray not placed in level scheme.

$^{113}In(p,n\gamma)$ 1997Ka40,1987Vi09 (continued)



^{113}In(p,3nγ) 1997Ka40,1987Vi09

1997Ka40: ^{113}In(p,3nγ) E=30 MeV. Preliminary report was given in 1995KaZV.
1987Vi09: ^{113}In(p,3nγ) E=30 MeV.
Measured: γ, γγ, γγ(t), γ(θ).
The energy gap between the 15/2– and 11/2– states is approximately equal to the energies of the first 2+ states in adjacent even Sn nuclides. The authors suggest the presence of a multiplet formed by a quasiparticle in the h11/2 neutron state and collective core excitation.
The 1908, 1953, 1947, 1936, and 1782 levels could be members of this multiplet.
The levels around 2650 with two 19/2– states could be also members of another multiplet formed by coupling of the (ν h11/2) with two-phonon core excitations.

^{113}Sn Levels

E(level)‡	Jπ†	E(level)‡	Jπ†	E(level)‡	Jπ†
0.0	1/2+	1745.33 *22*	5/2+	2448.6 *3*	5/2+
77.7 *3*	7/2+	1781.6 *4*	9/2–	2538.6 *3*	
410.39 *18*	3/2+	1867.4 *4*	5/2+	2583.1 *4*	(15/2–)
498.21 *18*	3/2+	1907.6 *4*	15/2–	2617.3 *4*	
739.3 *3*	11/2–	1909.9 *3*	5/2+	2662.9 *4*	(3/2+,5/2+)
1018.37 *20*	3/2+,5/2+	1936.3 *4*	(9/2–,11/2–,13/2–)	2750.6 *5*	(15/2–)
1284.23 *19*	5/2+	1946.2 *4*		2778.7 *3*	
1313.94 *21*	3/2+,5/2+	1952.8 *4*	(9/2–,13/2–)	2807.7 *5*	19/2–
1356.0 *3*	3/2+	2045.9 *3*	3/2+	2975.9 *5*	(17/2–)
1472.8 *3*	3/2+,5/2+	2176.8 *3*	(5/2+,7/2+)	3092.7 *5*	19/2–
1539.4 *3*	5/2+,7/2+	2200.8 *4*	(3/2+,5/2+)	3130.2 *6*	21/2–
1540.8 *4*	(13/2–)	2258.8 *4*			
1557.0 *3*	3/2+	2337.6 *4*	11/2–		

† From γ(θ) taken at six angles (13°,90°,120°,130°,140°,150°).
‡ From least-squares fit to γ energies.

γ(^{113}Sn)

Eγ†	E(level)	Iγ†	Comments
77.7 *3*	77.7		Eγ: from adopted levels, gammas.
206.0 *3*	1745.33		
225.3 *3*	2975.9	1.8 *3*	
322.5 *3*	3130.2	12 *1*	
332.6 *3*	410.39	14 *1*	
498.1 *3*	498.21	10 *1*	
583.2 *3*	1867.4	5.6 *7*	
608.0 *3*	1018.37		
661.5 *3*	739.3	100 *5*	
786.0‡ *3*	1284.23	2.5‡ *2*	
	2258.8	2.5‡ *2*	
797.8 *3*	2750.6	3.0 *3*	
801.5 *3*	1540.8	2.1 *2*	
892.6 *3*	2176.8	2.2 *2*	
900.1 *3*	2807.7	14 *2*	
940.6 *3*	1018.37	3.5 *4*	
1018.3 *3*	1018.37	0.9 *3*	
1042.3 *3*	1781.6	3.8 *4*	
1068.3 *3*	2975.9	2.0 *2*	
1129.0 *3*	1539.4	2.1 *2*	
1164.3 *3*	2448.6	4.9 *4*	
1168.3 *3*	1907.6	35 *2*	
1185.1 *3*	3092.7	2.5 *2*	
1197.0 *3*	1936.3	3.5 *4*	
1206.9 *3*	1946.2	2.6 *2*	
1213.6 *3*	1952.8	8.4 *7*	
1284.2 *3*	1284.23	16 *1*	
1314.0 *3*	1313.94	4.9 *4*	
1334.9 *3*	1745.33	3.1 *3*	
1356.0 *3*	1356.0	2.9 *2*	
1411.7 *3*	1909.9	2.2 *2*	

Continued on next page (footnotes at end of table)

^{113}In(p,3nγ) 1997Ka40,1987Vi09 (continued)

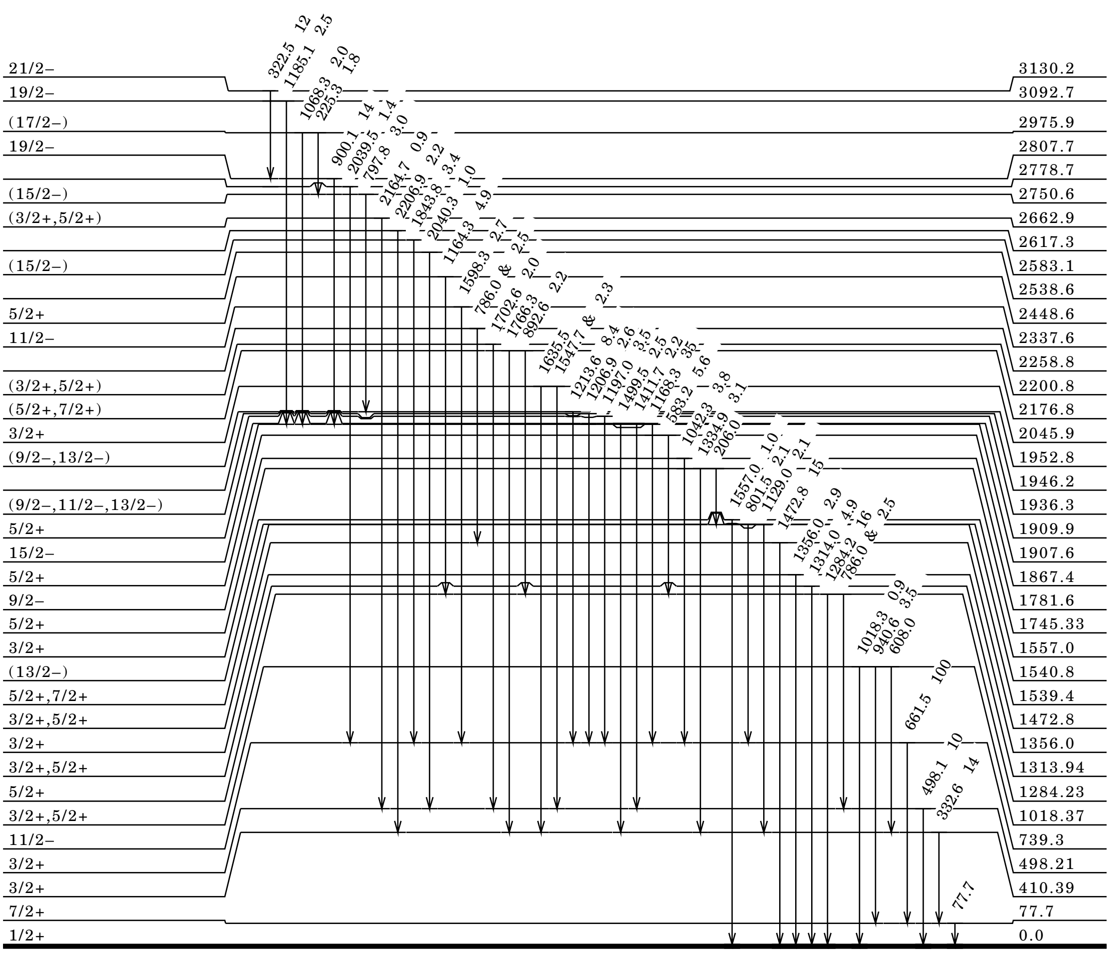
γ(^{113}Sn) (continued)

Eγ†	E(level)	Iγ†	Eγ†	E(level)	Iγ†	Eγ†	E(level)	Iγ†
1472.8 *3*	1472.8	15 *1*	1598.3 *3*	2337.6	2.7 *2*	2039.5 *3*	2778.7	1.4 *2*
1499.5 *3*	1909.9	2.5 *2*	1635.5 *3*	2045.9		2040.3 *3*	2538.6	1.0 *3*
ˣ1546.8 *3*		2.3 *3*	1702.6 *3*	2200.8	2.0 *2*	2164.7 *3*	2662.9	0.9 *1*
1547.7‡ *3*	2045.9	2.3‡ *3*	1766.3 *3*	2176.8		2206.9 *3*	2617.3	2.2 *2*
1557.0 *3*	1557.0	1.0 *1*	1843.8 *3*	2583.1	3.4 *2*			

† From 1997Ka40, ΔEγ=0.3 keV estimated by evaluator, average of ΔEγ=0.1–0.4 keV (1997Ka40).
‡ Multiply placed; undivided intensity given.
ˣ γ ray not placed in level scheme.

Level Scheme

Intensities: relative Iγ
& Multiply placed; undivided intensity given



$^{113}_{50}Sn_{63}$

^{114}Sn(p,d) IAS 1980Ta04

E=55 MeV. Measured E(d), θ=11° and 23°, magnetic spectrograph, 1980Ta04.

^{113}Sn Levels

E(level)	Jπ†	S‡	Comments
11826 *50*	(9/2+)	0.0	Γ=22 keV *10*. E(level): IAS of ^{113}In g.s.
12254 *50*	(1/2−)	428 *5*	Γ=20 keV *8*. E(level): IAS of ^{113}In(392).
12513 *50*	(3/2−)	687 *5*	Γ=25 keV *9*. E(level): IAS of ^{113}In(647).

† From Jπ of parent state.
‡ E(level)−E(g.s. analog).

^{114}Sn(p,d) 1970Ca01

E=30 MeV. σ(θ) with magnetic spectrograph, FWHM=55–70 keV, 1970Ca01.

^{113}Sn Levels

E(level)‡	Jπ†	L§	Comments
0.0		0	
72 *6*	7/2+	4	
404 *6*	5/2+	2	
492 *6*	3/2+	2	
740	11/2−	5	
1042 *6*	3/2+	2	
1140			
1303 *6*		0	
1360			
1450			L: L could be (5).
1570			
1670	5/2+	2	
1760			
1830		0	
1940			
2060		(1)	
2120		1	

† From J–dependence of angular distribution (for L=2) and shell–model syst.
‡ Systematic errors ≤25 keV.
§ From angular distributions compared with characteristic shapes.

^{115}Sn(p,t) 1971Fl05

E=20 MeV. σ(θ) with magnetic spectrograph, FWHM≈25 keV, 1971Fl05.
Jπ(^{115}Sn)=1/2+.

^{113}Sn Levels

E(level)	L†
0.0	0
79 *15*	
405 *10*	2
490 *20*	
≈1020?	

† From comparisons with DWBA calculations.

Adopted Levels, Gammas

Q(β⁻)=−6070 *30*; S(n)=10890 *25*; S(p)=3047 *17*; Q(α)=−356 *18* 2003Au03.
Using DSAM, 1993Ja04 extracted an average quadrupole moment for the rotational sequence, consistent with a prolate deformation: $\beta_2 \approx 0.32$.

^{113}Sb Levels

Cross Reference (XREF) Flags

A ^{113}Te ε Decay
B (HI,xnγ)
C ^{112}Sn(p,p) IAR
D ^{112}Sn(^{3}He,d)
E ^{114}Sn(p,2nγ)

E(level)[#]	Jπ[‡]	XREF	$T_{1/2}$[†]	Comments
0.0[&]	5/2+[§]	AB DE	6.67 min *7*	Jπ: ^{115}Sb to ^{121}Sb have Jπ=5/2+. Allowed ε to 3/2+, 5/2+ states in ^{115}Sn. %ε+%β⁺=100. $T_{1/2}$: from 1976Wi10. Others: 1962Pa04, 1969Ki16, 1972Si28.
644.78 *20*	1/2+	A DE	<1 ns	XREF: D(659). Jπ: L(^{3}He,d)=0.
814.17[&] *22*	7/2+[§]	AB DE	<1 ns	XREF: D(829).
1018.6 *3*	5/2+	A DE	<1 ns	XREF: D(1045). Jπ: L(^{3}He,d)=2. log *ft*=5.7 from (7/2+).
1181.0 *4*		A E	<1 ns	
1257.1 *3*	(9/2+)	AB E	<1 ns	Jπ: γ(θ) in (^{6}Li,3nγ), D+Q γ to 7/2+.
1347.9[@] *3*	11/2−	B D	<1 ns	XREF: D(1390). Jπ: L(^{3}He,d)=(5). (E3) γ to 5/2+.
1461.0[&] *3*	9/2+[§]	AB E	<1 ns	Jπ: could be the bandhead based on a Nilsson orbital (404) 9/2+ M1 γ to 7/2+, γ to 5/2+.
1551.0 *4*	5/2+	A D		XREF: D(1590). Jπ: L(^{3}He,d)=2. log *ft*=6.0 from (7/2+).
1716.5 *5*		A		
1853.2 *5*		A E	<1 ns	
1910.1[&] *4*	(11/2+)[§]	B E	<1 ns	
1995.2 *11*		E	<1 ns	
2094.2 *6*		A		
2115.5 *6*		A		
2132.1 *7*		A		
2172.1 *5*		A		
2217.7[&] *4*	(13/2+)[§]	B E	<1 ns	Jπ: D+Q γ to 11/2+, γ to (9/2+).
2307.6 *4*		B		
2395.3 *5*		B		
2504.8 *5*	(15/2+)	B		
2534.9 *3*		A		
2626.3 *5*	(15/2−)	BC		
2659.1[&] *4*	(15/2+)[§]	B		
2815.5[@] *4*	15/2−	B		
3009.7 *11*		B		
3044.7[a] *5*	19/2(−)	B	3.7 ns *3*	$T_{1/2}$: from 1990Ko42.
3083.8[&] *5*	(17/2+)[§]	B		
3173.4[a] *5*	21/2(−)	B		
3212.9[@] *5*	19/2−	B		
3344.8 *5*	(21/2)	B		
3473.2[&] *5*	(19/2+)[§]	B		
3552.9[a] *5*	(23/2)	B		
3777.9[@] *11*	23/2−	B		
3914.4[&] *5*	(21/2+)[§]	B		
4166.8[a] *5*	(25/2)	B		
4344.4[c] *6*	(23/2−)	B		
4363.1[&] *5*	23/2+[§]	B		
4459.7[@] *12*	27/2−	B		
4506.4 *5*	(25/2−)	B		
4525.2 *5*		B		
4535.9 *5*		B		
4642.7[c] *6*	(25/2−)	B		
4744.8[b] *5*	25/2+	B		

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Adopted Levels, Gammas (continued)

^{113}Sb Levels (continued)

E(level)[#]	Jπ[‡]	XREF	Comments
4783.9[a] *6*	(27/2)	B	
5014.3[c] *6*	(27/2−)	B	
5040.8[b] *6*	27/2+	B	
5166.1 *6*	29/2	B	
5177.7[&] *8*	27/2+[§]	B	
5239.0[@] *12*	31/2−	B	
5388.7[b] *6*	29/2+	B	
5391.1[c] *7*	(29/2−)	B	
5569.3[&] *9*	29/2+[§]	B	
5612.0 *6*	(29/2−)	B	
5716.4[a] *6*	(29/2)	B	
5762.6[b] *6*	31/2+	B	
5781.7[c] *7*	(31/2−)	B	
5960.1[&] *10*	31/2+[§]	B	
6052.6 *7*		B	
6093.7[@] *12*	35/2−	B	
6153.4[b] *6*	33/2+	B	
6195.9[c] *7*	(33/2−)	B	
6334.2[&] *11*	33/2+[§]	B	
6424.1[a] *7*		B	
6545.7[b] *6*	35/2+	B	
6625.4[c] *7*	(35/2−)	B	
6682.0[&] *12*	35/2+[§]	B	
6976.6[b] *6*	37/2+	B	
6977.6[&] *13*	37/2+[§]	B	
7012.8[@] *13*	39/2−	B	
7075.8[c] *7*	(37/2−)	B	
7544.5[c] *7*	(39/2−)	B	
7998.4[@] *13*	43/2−	B	
8025.2[c] *7*	(41/2−)	B	
9059.7[@] *14*	47/2−	B	
9280 *40*		C	IAS of ^{113}Sn g.s.
9720 *40*		C	IAS of ^{113}Sn 410 level.
9780 *40*		C	IAS of ^{113}Sn 498 level.
10215.4[@] *14*	51/2−	B	
11466.6[@] *14*	55/2−	B	
12800.9[@] *15*	59/2−	B	
14213.9[@] *18*	(63/2−)	B	
15717.9[@] *20*	(67/2−)	B	
17352.9[@] *23*	(71/2−)	B	
19143.9[@] *25*	(75/2−)	B	
21104[@] *3*	(79/2−)	B	

† From 1976Ka25 in ^{114}Sn(p,2nγ).
‡ Based on rotational band observed in (HI,xnγ) and Nilsson model consideration, unless given otherwise.
§ L(^{3}He,d)=2 and 4 for g.s. and 814 level, respectively. 814γ is not Q from γ(θ) in ^{110}Cd(^{6}Li,3nγ).
# From least–squares fit to γ energies.
@ (A): Suggested (1993Ja04) as members of a rotational band with the 1348–keV level as bandhead. Proton h11/2 orbital, 1/2 [550] Nilsson configuration.
& (B): Suggested as members of a rotational band with the 1461–keV level as bandhead. Nilsson orbital [404]9/2+.
a (C): Band Based on 19/2− at 3044.7 Kev.
b (D): Band Based on 25/2+ at 4744.8 Kev.
c (E): Band Based on (23/2−).

γ(^{113}Sb)

E(level)	Eγ[†]	Iγ[†]	Mult.[‡]	δ[‡]	Comments
644.78	644.8 *2*	100	[E2]		B(E2)(W.u.)>0.16. Mult.: from the level scheme.
814.17	814.4 *3*	100	D+Q	−0.22 *12*	B(M1)(W.u.)>3.7×10^{-5}.
1018.6	1018.1 *4*	100			

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Adopted Levels, Gammas (continued)

γ(^{113}Sb) (continued)

E(level)	Eγ†	Iγ†	Mult.‡	δ‡	Comments
1181.0	1181.0 4	100			
1257.1	238.4 5	8 3			
	443.3 4	12 4	D+Q	−0.02 9	B(M1)(W.u.)>2.5×10^{-5}.
	1256.7 5	100 12			
1347.9	90.9 2	100 1	(E1+M2)	0.01 5	B(E1)(W.u.)>0.00032?
	1347.9 7	20 2	(E3)		B(E3)(W.u.)>33.
1461.0	646.6 3	29 3	D+Q	+0.03 8	B(M1)(W.u.)>1.8×10^{-5}.
	1460.8 5	100 10			
1551.0	737.0 4	44 14			
	1550.3 7	100 30			
1716.5	1071.7 4	100			
1853.2	391.8 5	100 50			
	1039.5 5	58 17			
1910.1	449.3 3	100	D+Q	+0.24 6	B(M1)(W.u.)>0.00022; B(E2)(W.u.)>0.027.
1995.2	1181.0	100			
2094.2	1449.7 7	62 16			
	2093.7 10	100 23			
2115.5	1301.3 7	90 30			
	2115.5 10	100 22			
2132.1	1317.9 6	100			
2172.1	915.0 4	100 30			
	1358.0 8	84 22			
2217.7	306.7 5	100 10	D+Q	+0.16 6	B(M1)(W.u.)>0.00044; B(E2)(W.u.)>0.026.
	756.1 5	64 8			
2307.6	397.4 3	100			
2395.3	1047.2 5	100			
2504.8	197.1 3	47 5	D+Q	+0.09 6	
	287.2 3	100 11	D+Q	+0.08 9	
2534.9	1515.1 7	58 17			
	1719.8 10	33 10			
	2535.2 3	100 25			
2626.3	1278.9 6	100			
2659.1	351.5 3				
	440.9 3				
	749.5 3				
2815.5	1467.6 3	100	(E2)		
3009.7	504.9 10	100			
3044.7	418.5 3	100			
3083.8	424.8 3	100	D+Q	+0.07 8	
	865.7		Q		
3173.4	128.7 2	100	D+Q	−0.10 4	
3212.9	397.4 3		D+Q	0.24 5	
3344.8	171.5 3	100			
3473.2	389.9 3	100	D+Q	+0.47 5	
	813.8 3		D+Q	−0.22 12	
3552.9	379.6 4	100	D+Q	−0.25 5	
3777.9	564.7 3	100	(E2)		
3914.4	441.3 3				
	830.3 3				
4166.8	613.9 3	100	D		
4344.4	998.9 3				
4363.1	448.7 3				
	890.0 3				
4459.7	681.8 3	100	(E2)		
4506.4	339.5 3				
	1161.7 3		Q		
4525.2	358.4 3				
	972.3 3				
4535.9	369.1 3				
4642.7	298.3 3	100	D		
4744.8	209.0 3				
	219.7 3				
	381.7 3				

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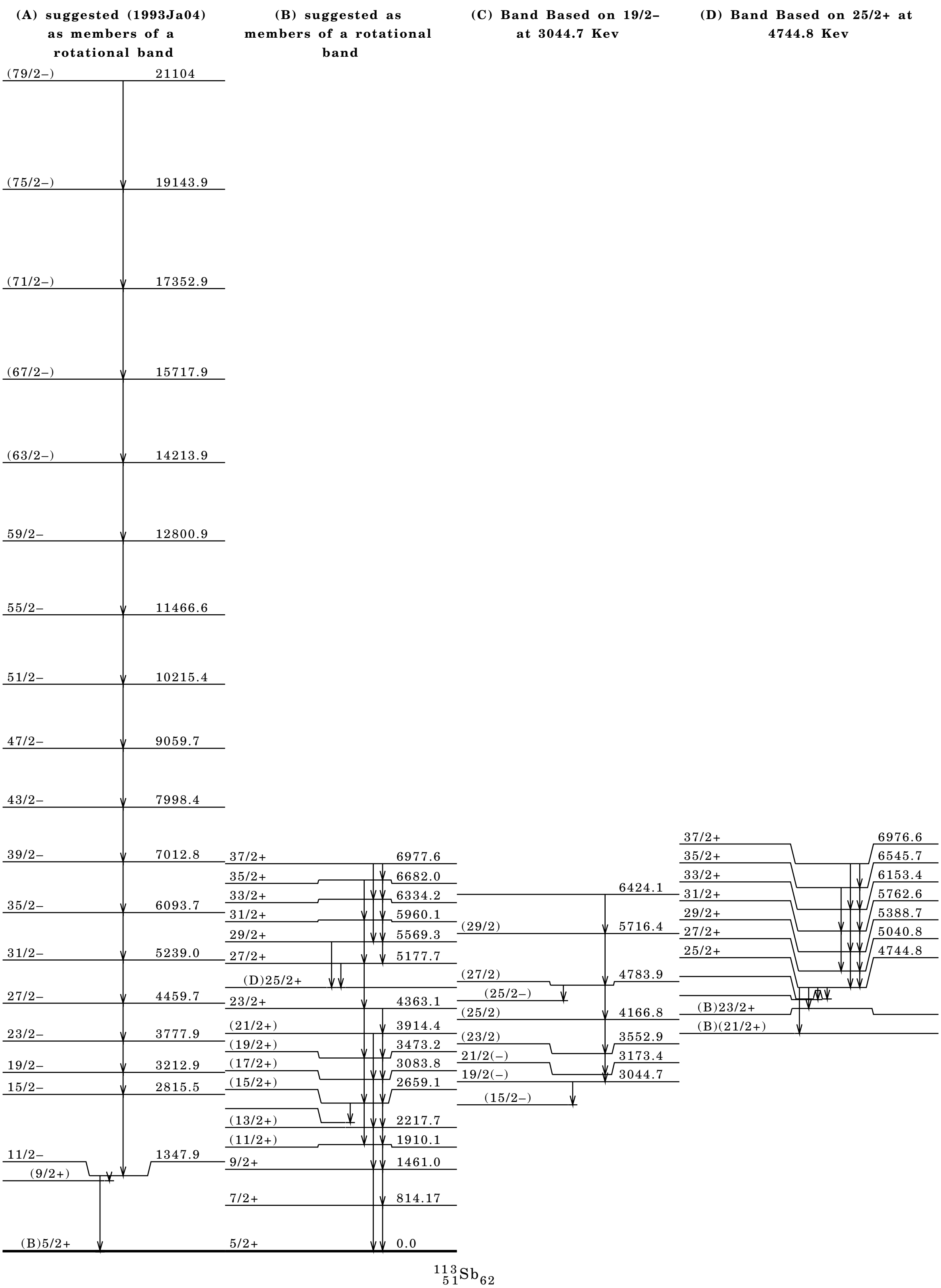
Adopted Levels, Gammas (continued)

γ(^{113}Sb) (continued)

E(level)	Eγ†	Iγ†	Mult.‡
4744.8	830.4 *3*		
4783.9	277.5 *3*		
	617.1 *3*		D
5014.3	371.6 *3*		
	669.9 *3*		
5040.8	295.8 *3*		
5166.1	999.3 *3*	100	Q
5177.7	432		D
	815		Q
5239.0	779.3 *3*	100	(E2)
5388.7	347.6 *3*		
	644.0 *3*		
5391.1	376.7 *3*		
	748.3 *3*		
5569.3	392		D
	824		Q
5612.0	1105.6 *3*	100	
5716.4	932.5 *3*	100	
5762.6	373.8 *3*		
	722.0 *3*		
5781.7	390.6 *3*		
	767.3 *3*		
5960.1	391		D
	782		Q
6052.6	886.5 *3*	100	
6093.7	854.7 *3*	100	(E2)
6153.4	390.8 *3*		
	764.6 *3*		
6195.9	414.2 *3*		
	804.8 *3*		
6334.2	374		D
	765		Q
6424.1	707.7 *3*	100	
6545.7	392.3 *3*		
	783.1 *3*		
6625.4	429.5 *3*		
	843.7 *3*		
6682.0	348		D
	722		Q
6976.6	430.9 *3*		
	823.2 *3*		
6977.6	296		D
	643		Q
7012.8	919.0 *3*	100	(E2)
7075.8	450.4 *3*		
	879.9 *3*		
7544.5	468.7 *3*		
	919.1 *3*		
7998.4	985.6 *3*	100	(E2)
8025.2	480.7 *3*		
	949.4 *3*		
9059.7	1061.3 *3*		(E2)
10215.4	1155.7 *3*	100	(E2)
11466.6	1251.2 *3*	100	(E2)
12800.9	1334.3 *3*	100	(E2)
14213.9	1413 *1*	100	Q
15717.9	1504 *1*	100	Q
17352.9	1635 *1*	100	Q
19143.9	1791 *1*	100	Q
21104	1960 *1*	100	Q

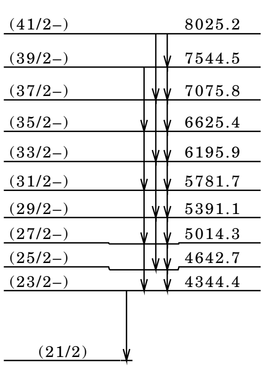
† From ^{110}Cd(^{6}Li,3nγ) and ^{113}Te ε decay.
‡ Mult and δ from γ(θ) (1979Sh03) and DCO ratios (1993Ja04) in (HI,xnγ).

Adopted Levels, Gammas (continued)



Adopted Levels, Gammas (continued)

(E) Band Based on (23/2−)



$^{113}_{51}Sb_{62}$

^{113}Te ε Decay 1975WiZX,1976Wi11

Parent ^{113}Te: E=0.0; Jπ=(7/2+); $T_{1/2}$=1.7 min *2*; Q(g.s.)=6070 *30*; %ε+%β^+ decay=100.
γ singles with escape–suppression spectrometer and semi, γγ coin, γ(t), 1975WiZX, 1976Wi11.
Others: 1974Ch17, 1974Bu21, 1975BuYW.

^{113}Sb Levels

E(level)	Jπ	$T_{1/2}$
0.0	5/2+	6.67 min *7*
644.78 *20*	1/2+	
814.07 *24*	7/2+	
1018.5 *4*	(5/2)+	
1181.0 *4*		
1257.1 *3*	(9/2+)	
1461.3 *5*	(9/2+)	
1550.9 *4*	(5/2)+	
1716.5? *5*		
1853.3 *5*		
2094.2 *6*		
2115.4 *6*		
2132.3? *8*		
2172.1 *5*		
2534.6 *4*		

β^+,ε Data

ε+β^+ branches were obtained from (γ+ce) imbalance at each level and measured annihilation radiation intensity.

Eε†	E(level)	$I\beta^+$†‡	Iε†‡	Log *ft*	I(ε+β^+)‡	Comments
(3540 *30*)	2534.6	≈3.5	≈1.5	≈5.4	≈5.0	
(3900 *30*)	2172.1	≈2.0	≈0.57	≈5.9	≈2.57	
(3950 *30*)	2115.4	≈2.9	≈0.77	≈5.8	≈3.7	
(3980 *30*)	2094.2	≈3.7	≈0.94	≈5.7	≈4.6	
(4220 *30*)	1853.3	≈3.5	≈0.71	≈5.9	≈4.2	
(4520 *30*)	1550.9	≈2.8	≈0.43	≈6.2	≈3.2	
(4810 *30*)	1257.1	≈4.6	≈0.57	≈6.1	≈5.2	
(4890 *30*)	1181.0	≈11	≈1.2	≈5.8	≈12.2	
(5050 *30*)	1018.5	≈10.0	≈1.0	≈5.9	≈11	
(5260 *30*)	814.07	≈13	≈1.1	≈5.9	≈14	
(5430 *30*)	644.78	<5.6	<0.44	>6.3	<6.0	
5700 *200*	0.0	≈28	≈1.4	≈5.9	≈29.4	Eε: from 1974Ch17. Other: 5600 *200* (1975BuYW).

† β^+ and ε intensities are approximate because of the large number of unplaced Iγ's.
‡ For intensity per 100 decays, multiply by 1.0.

γ(^{113}Sb)

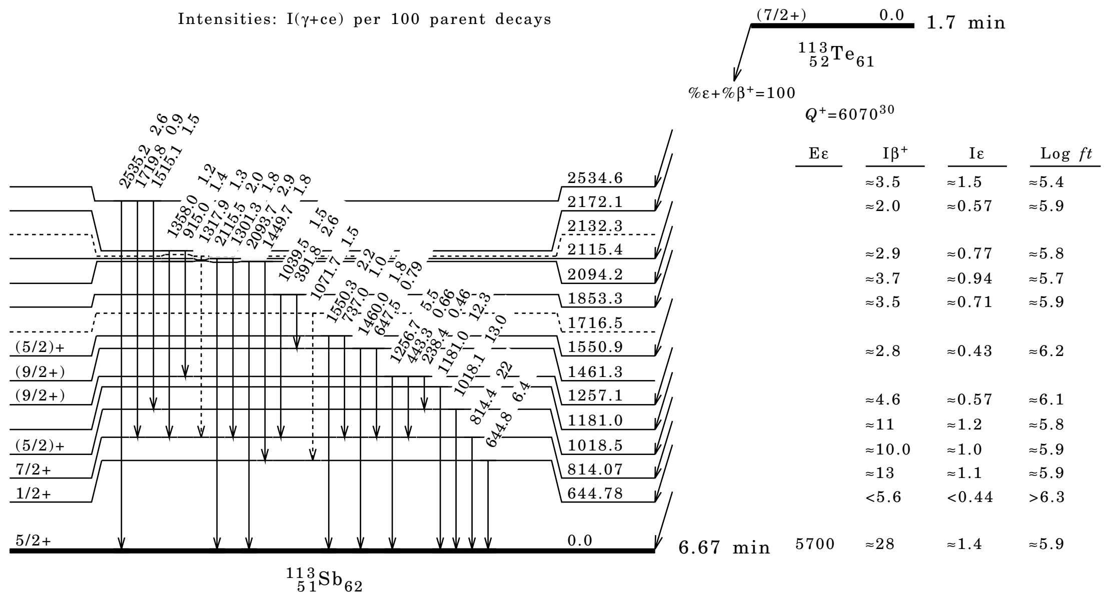
Measured Iγ($\gamma^\pm$) is 780 *200* relative to Iγ(814)=100, 1976Wi11.
Iγ normalization: from Σ(Iγ+ce) to g.s. + Σ(ε+β^+) to g.s.=100.

Eγ	E(level)	Iγ†
238.4 *5*	1257.1	2.1 *7*
^{x}269.8 *5*		2.7 *7*
391.8 *5*	1853.3	12 *6*
^{x}437.7 *4*		1.1 *6*
443.3 *4*	1257.1	3.0 *9*
^{x}473.1 *8*		2.5 *6*
^{x}583.0 *5*		3 *2*
^{x}609.3 *5*		5 *2*
644.8 *2*	644.78	29 *3*
647.5 *8*	1461.3	3.6 *10*
737.0 *4*	1550.9	4.4 *14*
814.4 *3*	814.07	100
915.0 *4*	2172.1	6.3 *16*
1018.1 *4*	1018.5	59 *6*
1039.5 *5*	1853.3	7 *2*
1071.7‡ *4*	1716.5?	7 *2*
1181.0 *4*	1181.0	56 *6*
^{x}1206.6 *6*		6 *2*
^{x}1245.4 *5*		4 *3*
1256.7 *5*	1257.1	25 *3*
1301.3 *7*	2115.4	8 *3*
1317.9‡ *6*	2132.3?	6 *2*
1358.0 *8*	2172.1	5.3 *14*
1449.7 *7*	2094.2	8 *2*
1460.0 *10*	1461.3	8 *4*
1515.1 *7*	2534.6	7 *2*
1550.3 *7*	1550.9	10 *3*
^{x}1567.2 *8*		6 *2*
1719.8 *10*	2534.6	3.9 *12*
^{x}1803.6 *7*		8 *3*
^{x}1868.1 *9*		11 *3*
^{x}1944.3 *11*		4 *2*
^{x}2047.8 *10*		7 *2*
2093.7 *10*	2094.2	13 *3*
2115.5 *10*	2115.4	9 *2*
^{x}2221.2 *9*		9 *3*
2535.2 *5*	2534.6	12 *3*
^{x}2552.4 *9*		7 *2*
^{x}2606.5 *5*		8 *3*

† For absolute intensity per 100 decays, multiply by 0.22.
‡ Placement of transition in the level scheme is uncertain.
x γ ray not placed in level scheme.

^{113}Te ε Decay 1975WiZX,1976Wi11 (continued)

Decay Scheme



^{112}Sn(p,p) IAR 1966Ri06

S(p)=3074 *31*.

σ(E(p)) at 92°, 125° and 165°, E(p)(c.m.)=6.1–6.9 MeV with semi. L–values from shape of σ(E(p)), 1966Ri06.

For resonance parameters, see 1966Ri06.

^{113}Sb Levels

E(level)‡	L	S†	Comments
9280 *40*	0	0.0	E(p)(c.m.)=6202 *15*. IAS of ^{113}Sn(g.s.) with Jπ=1/2+.
9720 *40*	2	440	E(p)(c.m.)=6649 *15*. IAS of ^{113}Sn(410) with Jπ=5/2+.
9780 *40*	2	500	E(p)(c.m.)=6710 *15*. IAS of ^{113}Sn(498) with Jπ=3/2+.

† E'=E(level)–E(g.s. analog).

‡ From E=res, E(p)(c.m.) + S(p).

^{112}Sn(^{3}He,d) 1966Ba25,1968Co22

E=18 MeV. σ(θ) with particle telescope, FWHM=70–110 keV, 1966Ba25, 1968Co22.

L–values and spectroscopic factors are from DWBA calculations.

^{113}Sb Levels

E(level)†	Jπ‡	L	C²S'	Comments
0.0	5/2+	2	4.2	C²S': for Jπ=5/2+.
659 *15*	1/2+	0	1.0	
829 *15*	7/2+	4	7.5	
1045 *30*	5/2+	2	2.3	

Continued on next page (footnotes at end of table)

^{112}Sn(^{3}He,d) 1966Ba25,1968Co22 (continued)

^{113}Sb Levels (continued)

E(level)†	Jπ‡	L	C²S'	Comments
1390 *50*	(11/2−)	(5)	4.8	L: both L=4 and L=5 fit the angular distribution. L=5 is assigned because of sum rule limit for L=4. C²S': Jπ=7/2+ gives C²S'=5.0.
1590 *40*	5/2+	2	0.6	C²S': Jπ=3/2+ gives C²S'=0.8.

† Systematically 15–40 keV too high in comparison with the adopted levels.
‡ Assumed for C²S'.

^{114}Sn(p,2nγ) 1976Ka25

E=15.8–18.2, 20, 28 MeV. Measured excit, pulsed beam γ(t), nγ coin, γγ coin, 1976Ka25.

^{113}Sb Levels

E(level)†	Jπ§	$T_{1/2}$
0.0	5/2+	
644.2 *5*	1/2+	<1 ns
814.3 *3*	7/2+	<1 ns
1018.1 *4*	(5/2)+	<1 ns
1181.2 *3*		<1 ns
1256.9 *4*	(9/2)+	<1 ns
1347.8 *7*	11/2−	<1 ns
1461.2 *5*	(9/2+)‡	<1 ns
1853.6 *11*		<1 ns
1910.0 *8*	(11/2+)‡	<1 ns
1995.5 *4*		<1 ns
2218.8 *9*	(13/2+)‡	<1 ns

† As given by 1976Ka25.
‡ Suggested [404] rotational band.
§ From adopted levels.

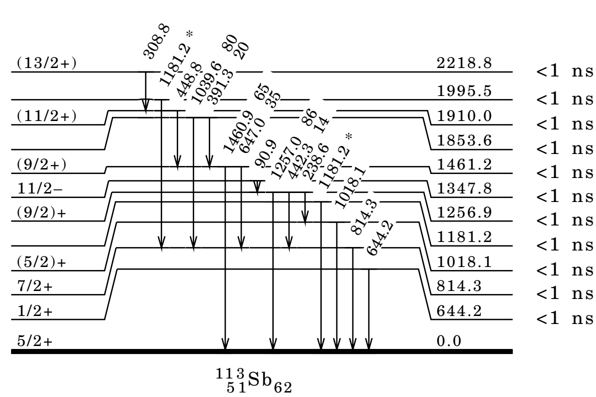
γ(^{113}Sb)

Eγ†	E(level)	Iγ‡
90.9	1347.8	
238.6	1256.9	
308.8	2218.8	
391.3	1853.6	20
442.3	1256.9	14
448.8	1910.0	
644.2	644.2	
647.0	1461.2	35
814.3	814.3	
1018.1	1018.1	
1039.6	1853.6	80
1181.2§	1181.2	
	1995.5	
1257.0	1256.9	86
1460.9	1461.2	65

† Uncertainty not given by authors.
‡ % photon branching from each level.
§ Multiply placed.

Level Scheme

Intensities: relative Iγ
* Multiply placed



(HI,xnγ) 1998Mo22,1993Ja04,1979Sh03

1998Mo22: ^{103}Rh(^{16}O,α2n) E=80 MeV. Measured Eγ, Iγ, γγ, γγ(θ)(DCO) using Spectrometer, 6 Compton–suppressed HPGe detectors.
1993Ja04,1995Ja15: ^{94}Mo(^{23}Na,2p2n) E=117 MeV. Preliminary data in 1993Ra08.
Measured Eγ, Iγ, γγ coin, γ(θ), DCO, 20 Compton–suppressed HPGe, spherical shell of 71 BGO.
1990Ko42: ^{104}Pd(^{12}C,p2nγ) E=63 MeV.
Measured Eγ, Iγ, γγ coin, γ(θ), γ(t).
1989Bu27: ^{112}Sn(α,pnγ) E=40–50 MeV.
Measured Eγ, Iγ, γγ coin, γ(θ), excit.
1979Sh03: ^{110}Cd(^{6}Li,3nγ) E=24–34 MeV.
Measured Eγ, Iγ, γγ coin, γ(θ), excit.
Other: 1975Ga11.
Using DSAM, 1993Ja04 extracted an average quadrupole moment for the rotational sequence, consistent with a prolate deformation: β_2≈0.32.

^{113}Sb Levels

E(level)[†]	Jπ[‡]	$T_{1/2}$	Comments
0.0	5/2+		
814.6 *3*	7/2+		
1257.1 *5*	9/2+		
1348.0[§] *5*	11/2−		
1461.1[#] *3*	9/2+		
1910.4[#] *4*	11/2+		
2218.4[#] *5*	13/2+		
2308.0 *5*	(13/2+)		
2395.5 *5*			
2505.3 *5*	(15/2+)		
2626.3[@] *5*	15/2−		
2659.9[#] *5*	15/2+		
2815.6[§] *5*	15/2−		
3010.2 *11*			
3044.8[@] *5*	19/2−	3.7 ns *3*	$T_{1/2}$: from 1990Ko42.
3084.5[#] *5*	17/2+		
3173.9 *5*	21/2(−)		
3213.0[§] *5*	19/2−		
3345.3 *6*	(21/2)		
3346.8 *6*			
3400.2 *12*			
3473.4[#] *5*	19/2+		
3553.2[@] *5*	23/2		
3777.7[§] *6*	23/2−		
3826.7 *6*			
3914.7[#] *5*	21/2+		
4167.1[@] *5*	25/2		
4345.7[a] *6*	(23/2−)		
4363.4[#] *5*	23/2+		
4459.5[§] *7*	27/2−		
4506.8 *6*	(25/2−)		
4525.5 *5*			
4536.2 *6*			
4644.0[a] *6*	(25/2−)		
4745.2[&] *5*	25/2+		
4784.2[@] *6*	27/2		
5015.6[a] *6*	(27/2−)		
5041.1[&] *6*	27/2+		
5166.4 *6*	29/2		
5177.7[#] *8*	27/2+		
5238.8[§] *8*	31/2−		
5389.0[&] *6*	29/2+		
5392.3[a] *7*	(29/2−)		
5569.3[#] *9*	29/2+		
5612.4 *6*	(29/2−)		
5716.7[@] *7*	29/2		
5762.9[&] *6*	31/2+		
5782.9[a] *7*	(31/2−)		
5960.1[#] *10*	31/2+		

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(HI,xnγ) 1998Mo22,1993Ja04,1979Sh03 (continued)

^{113}Sb Levels (continued)

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
6052.9 7		6976.9[&] 6	37/2+	11466.4[§] 11	55/2−
6093.5[§] 8	35/2−	6977.6[#] 13	37/2+	12800.7[§] 11	59/2−
6153.7[&] 6	33/2+	7012.5[§] 9	39/2−	14213.7[§] 15	63/2−
6197.1[a] 7	(33/2−)	7077.0[a] 7	(37/2−)	15717.7[§] 18	67/2−
6334.2[#] 11	33/2+	7545.7[a] 7	(39/2−)	17352.7[§] 21	71/2−
6424.4[@] 7		7998.2[§] 9	43/2−	19143.7[§] 23	75/2−
6546.0[&] 6	35/2+	8026.4[a] 8	(41/2−)	21103.8[§] 25	79/2−
6626.6[a] 7	(35/2−)	9059.5[§] 10	47/2−		
6682.0[#] 12	35/2+	10215.2[§] 10	51/2−		

† From least–squares fit to γ energies.
‡ From 1993Ja04. Based on levels being members of rotational band and Nilsson model consideration.
§ (A): Suggested (1993Ja04) as members of a rotational band with the 1348–keV level as bandhead. Proton h11/2 orbital? 1/2 [550] Nilsson configuration.
# (B): Suggested as members of a rotational band with the 1461–keV level as bandhead. Nilsson orbital [404]9/2+.
@ (C): Band based on 15/2−, only given in 1998Mo22.
& (D): Band 3 based on 25/2+, only given in 1998Mo22.
a (E): Band 4 based on 25/2−, only given in 1998Mo22.

γ(^{113}Sb)

E(level)	Eγ†	Iγ‡	Mult.#	δ§	Comments
814.6	814.8 3	157 16	D+Q	−0.22 12	
1257.1	443.0 10	41 4	D+Q	−0.02 9	
	1257.1 10				
1348.0	90.9 2	172 18	E1		
	1347.9 7	35 4	E3		Mult.: from large A_2 in γ(θ).
1461.1	646.6 3	34 3	D+Q	+0.03 8	
	1460.8 5	117 12	E2		
1910.4	449.3 3	100	D+Q	+0.24 6	
2218.4	306.7		D+Q	+0.16 6	Eγ: Eγ=306.7 (1979Sh03) Eγ=308.7 (1998Mo22).
	756.1		Q		Eγ: Eγ=756.1 (1979Sh03) Eγ=757.3 (1998Mo22).
2308.0	397.4 3	34 5	D+Q	+0.24 5	
2395.5	1047.2 5	38 4			
2505.3	197.1 3	18 2	D+Q	+0.09 6	
	287.2 3	38 4	D+Q	+0.08 9	
2626.3	230.8 3				Eγ: From 1998Mo22.
	1278.9 6	165 17	Q		
2659.9	441.5 10	43 4	D+Q	+0.09 5	
	749.5 3		Q		Eγ: Eγ=748.2 (1979Sh03).
2815.6	1467.6 3		(E2)		
3010.2	504.9 10	24 4			
3044.8	418.5 3	163 16	Q		
3084.5	425.6 3	23 3	D+Q	+0.07 8	
	865.7 3				
3173.9	129.1 2	122 13	D+Q	−0.10 4	
3213.0	397.4 3		(E2)		
	586.7 3				
3345.3	171.5 3				Mult.: DCO=1.10 25.
3346.8	173.0 3				
3400.2	390.0 3				
3473.4	389.0 3				
	813.8 3				
3553.2	379.2 3		D+Q	−0.25 5	Mult.: DCO=0.31 24.
3777.7	564.7 3		(E2)		
3826.7	652.7 3				
3914.7	441.3 3				
	830.3 3				
4167.1	340.3 3				
	613.9 3		D		Mult.: DCO=0.67 17.
4345.7	998.9 3				

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(HI,xnγ) 1998Mo22,1993Ja04,1979Sh03 (continued)

γ(^{113}Sb) (continued)

E(level)	Eγ[†]	Iγ[‡]	Mult.[#]	Comments
4345.7	1000.4 *3*		D	Mult.: DCO=0.92 *42*.
4363.4	448.7 *3*			
	890.0 *3*			
4459.5	681.8 *3*		(E2)	
4506.8	339.5 *3*			
	1161.7 *3*		Q	Mult.: DCO=1.50 *20*.
4525.5	358.4 *3*			
	972.3 *3*			
4536.2	369.1 *3*			
4644.0	298.3 *3*	7 *1*	D	Mult.: DCO=0.65 *16*.
4745.2	209.0 *3*			
	219.7 *3*			
	381.7 *3*			
	830.4 *3*			
4784.2	277.5 *3*			
	617.1 *3*		D	Mult.: DCO=0.32 *28*.
5015.6	371.6 *3*			
	669.9 *3*			
5041.1	295.8 *3*			
5166.4	999.3 *3*		Q	Mult.: DCO=1.21 *37*.
5177.7	432		D	
	815		Q	
5238.8	779.3 *3*		(E2)	
5389.0	347.6 *3*			
	644.0 *3*			
5392.3	376.7 *3*			
	748.3 *3*			
5569.3	392		D	
	824		Q	
5612.4	1105.6 *3*			
5716.7	932.5 *3*			
5762.9	373.8 *3*			
	722.0 *3*			
5782.9	390.6 *3*			
	767.3 *3*			
5960.1	391		D	
	782		Q	
6052.9	886.5 *3*			
6093.5	854.7 *3*		(E2)	
6153.7	390.8 *3*			
	764.6 *3*			
6197.1	414.2 *3*			
	804.8 *3*			
6334.2	374		D	
	765		Q	
6424.4	707.7 *3*			
6546.0	392.3 *3*			
	783.1 *3*			
6626.6	429.5 *3*			
	843.7 *3*			
6682.0	348		D	
	722		Q	
6976.9	430.9 *3*			
	823.2 *3*			
6977.6	296		D	
	643		Q	
7012.5	919.0 *3*		(E2)	
7077.0	450.4 *3*			
	879.9 *3*			
7545.7	468.7 *3*			
	919.1 *3*			
7998.2	985.6 *3*		(E2)	
8026.4	480.7 *3*			

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(HI,xnγ) 1998Mo22,1993Ja04,1979Sh03 (continued)

γ(^{113}Sb) (continued)

E(level)	Eγ†	Mult.#
8026.4	949.4 *3*	
9059.5	1061.3 *3*	(E2)
10215.2	1155.7 *3*	(E2)
11466.4	1251.2 *3*	(E2)
12800.7	1334.3 *3*	(E2)
14213.7	1413	Q
15717.7	1504	Q
17352.7	1635	Q
19143.7	1791	Q
21103.8	1960	Q

† From 1979Sh03 and 1998Mo22.
‡ Relative intensity normalized to the Iγ(449)=100 (1979Sh03).
§ Or Jπ's shown and for an assumed Gaussian distribution with σ=2.2 *3* for the population of magnetic substates (1979Sh03).
# From γ(θ) (1979Sh03).

Adopted Levels, Gammas

Q(β⁻)=−7220 *60*; S(n)=9120 *170*; S(p)=4040 *30*; Q(α)=1867 *30* 2003Au03.
Production and identification: ^{112}Sn(^{3}He,2n) E=25 MeV. Mass and chemical separation (1976Wi11).

^{113}Te Levels

Cross Reference (XREF) Flags

A ^{113}I ε Decay
B (HI,xnγ)

E(level)†	Jπ‡	XREF	$T_{1/2}$	Comments
0.0	(7/2+)	AB	1.7 min *2*	%ε+%β⁺=100. Jπ: 7/2+ probable from log *ft*≈5.7 to 5/2+ level and log *ft*≈5.9 to (9/2+) level. $T_{1/2}$: av of 2.0 min *2* (1974Ch17), 1.4 min *2* (1975BuYW), 1.6 min *2* (1976Wi11).
0+x§	(11/2−)	B		
587.2+x§ *5*	(15/2−)	B		
1311.4+x§ *7*	(19/2−)	B		
1994.4+x§ *9*	(23/2−)	B		
2506.0+x *10*		B		
2786.6+x *10*		B		
2798.3+x# *10*	(25/2)	B		
2891.2+x *10*		B		
3001.3+x§ *10*	(27/2−)	B		
3244.4+x *11*		B		
3430.7+x *11*		B		
3573.5+x *11*	(29/2+)	B		
3806.0+x@ *10*	(29/2)	B		
3917.5+x# *10*		B		
3927.3+x *11*		B		
3975.1+x *11*		B		
4034.6+x§ *11*	(31/2−)	B		
4184.7+x *11*		B		
4264.7+x *12*		B		
4273.4+x# *11*		B		
4377.9+x *11*		B		
4558.2+x *11*		B		
4616.5+x@ *11*		B		
4906.3+x *12*		B		
5018.8+x# *12*		B		
5071.2+x§ *12*		B		
5163.1+x@ *11*		B		
5188.7+x *11*		B		
5196.2+x *13*		B		
5389.9+x *11*		B		
5551.2+x *12*		B		
5553.6+x *13*		B		
5819.9+x# *13*		B		
6149.9+x§ *13*		B		
6155.9+x *13*		B		
6204.4+x@ *11*		B		
6523.2+x *13*		B		
6621.8+x@ *13*		B		
6786.8+x *14*		B		
6908.4+x# *14*		B		
7153.0+x§ *14*		B		
7212.3+x *14*		B		
7360.6+x *13*		B		
7689.7+x@ *14*		B		
8061.5+x@ *14*		B		
8764.3+x *14*		B		

† From least−squares fit to γ energies.
‡ From gammas, DCO ratios, decay patterns and systematics.
§ (A): Ground−state band.
\# (B): γ cascade, starting on 25/2 at 2798.3+x Kev.
@ (C): γ cascade, starting on 29/2 at 3806+x Kev.

Adopted Levels, Gammas (continued)

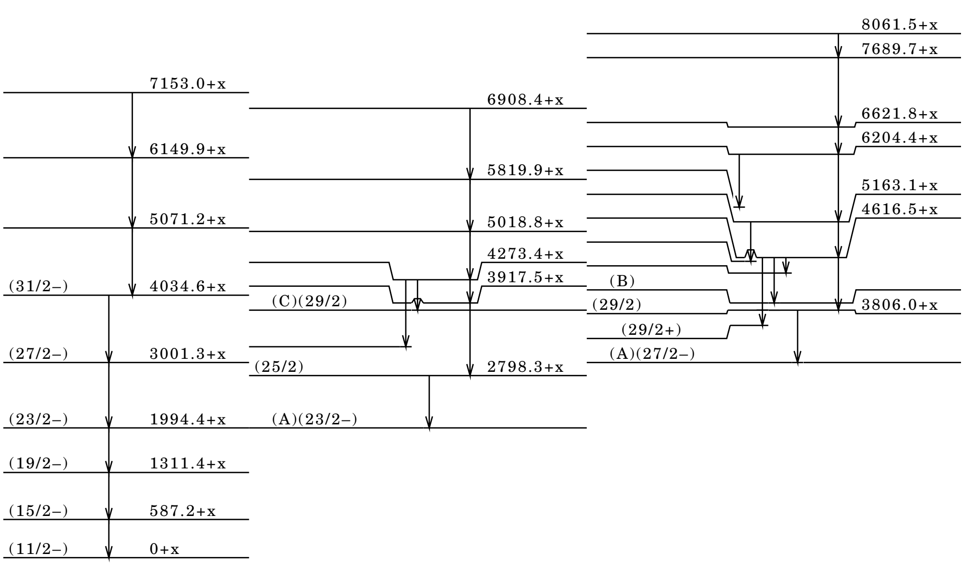
γ(^{113}Te)

E(level)	Eγ	Iγ	Mult.†
587.2+x	587.2 *5*	100	(E2)
1311.4+x	724.2 *5*	100	(E2)
1994.4+x	683.0 *5*	100	(E2)
2506.0+x	511.6 *5*	100	
2786.6+x	792.2 *5*	100	
2798.3+x	803.6 *5*	100	D
2891.2+x	896.8 *5*	100	
3001.3+x	1007.2 *5*	100	(E2)
3244.4+x	446.2 *5*	100	
3430.7+x	429.4 *5*	100	
3573.5+x	572.6 *5*	100	(E1)
3806.0+x	804.9 *5*	100	D
3917.5+x	1118.8 *5*	100	
3927.3+x	926.1 *5*	100	
3975.1+x	973.8 *5*	100	
4034.6+x	1033.0 *5*	100	(E2)
4184.7+x	1183.0 *5*	100	
4264.7+x	834.0 *5*	100	
4273.4+x	355.6 *5*	100 *5*	
	467.7 *5*	50 *4*	
	1029.2 *5*	46 *4*	
4377.9+x	572.0 *5*	100	
4558.2+x	523.2 *5*	42 *3*	
	984.8 *5*	100 *4*	
4616.5+x	238.6 *5*	10.1 *11*	
	699.0 *5*	100 *5*	
	810.6 *5*	97 *5*	
	1043.9 *5*	66 *3*	

E(level)	Eγ	Iγ
4906.3+x	931.2 *5*	100
5018.8+x	745.4 *5*	100
5071.2+x	1036.6 *5*	100
5163.1+x	546.8 *5*	100 *4*
	604.3 *5*	40.4 *21*
5188.7+x	1003.7 *5*	39 *11*
	1154.3 *5*	86 *11*
	1261.6 *5*	100 *11*
5196.2+x	931.5 *5*	100
5389.9+x	226.7 *5*	55 *4*
	832.1 *5*	100 *7*
5551.2+x	993.0 *5*	100
5553.6+x	482.4 *5*	100
5819.9+x	801.1 *5*	100
6149.9+x	1078.7 *5*	100
6155.9+x	1084.7 *5*	100
6204.4+x	814.9 *5*	41 *3*
	1041.0 *5*	100 *5*
6523.2+x	972.0 *5*	100
6621.8+x	417.4 *5*	100
6786.8+x	966.9 *5*	100
6908.4+x	1088.5 *5*	100
7153.0+x	1003.1 *5*	100
7212.3+x	1056.4 *5*	100
7360.6+x	1156.2 *5*	100
7689.7+x	1067.8 *5*	100
8061.5+x	371.8 *5*	100
8764.3+x	1074.6 *5*	100

† From DCO ratios.

(A) Ground-state band **(B) γ cascade, starting on 25/2 at 2798.3+x Kev** **(C) γ cascade, starting on 29/2 at 3806+x Kev**



$^{113}_{52}Te_{61}$

^{113}I ε Decay 1980GoZX

Parent ^{113}I: E=0.0≥; Jπ=?; $T_{1/2}$=6.6 s *2*; Q(g.s.)=7220 *60*; %ε+%$β^+$ decay=100.
Measured Eγ, Iγ, γ(t), K X–ray(t), γγ coin, βγ coin, (K x–ray)γ coin with semi. The results are only preliminary, 1980GoZX.
Other: 1977Ki11.

γ(^{113}Te)

Eγ†	Iγ	Comments
x55.0 *2*	32 *2*	Eγ: coin with 352γ, 567γ, 802γ.
x160.0 *2*	14 *2*	Eγ: coin with 463γ.
x216.5 *2*	7 *2*	Eγ: coin with tellurium X–ray and 352γ.
x320.4 *2*	33 *2*	
x351.5 *2*	43 *2*	Eγ: coin with tellurium X–ray and 216γ.
x406.1 *2*	8 *2*	
x462.5 *2*	100	Eγ: coin with tellurium X–ray.
x523.0 *5*	7.0 *10*	Eγ: coin with tellurium X–ray.
x567.4 *2*	36 *3*	Eγ: coin with tellurium X–ray.
x608.6 *5*	6.2 *10*	
x622.4 *2*	74 *3*	
x628.0 *2*	13 *2*	
x651.9 *5*	3.4 *10*	
x690.2 *5*	8.0 *10*	
x696.2 *5*	3.1 *10*	
x774.0 *5*	8.0 *10*	
x798.2 *2*	12 *2*	
x802.1 *5*	8.0 *20*	
x896.0 *5*	9.7 *10*	
x929.1 *3*	8.0 *10*	
x1161.0 *5*	8.7 *10*	
x1422.4 *3*	11 *2*	

† Assigned to ^{113}Te from $T_{1/2}$.
x γ ray not placed in level scheme.

(HI,xnγ) 1998Se05,1997Mo09

Includes ^{64}Ni(^{56}Fe,α3nγ) E=236 MeV and ^{90}Zr(^{31}P,αpnγ) E=150 MeV.
1998Se05: E(^{63}Cu)=245 MeV, ^{64}Ni(^{56}Fe,α3nγ) E=236 MeV. Measured Eγ, Iγ, γγ, γγ(θ)(DCO) using GAMMASPHERE array with six rings of 61 'HPGe' detectors (escape–suppressed).
Data (1998Se05) have been verified using ^{90}Zr(^{31}P,αpn) E=150 MeV with 'eurogam ii' spectrometer.
1997Mo09: ^{88}Sr(^{28}Si,3n) E=120 MeV, Measured: γ, γγ, γ(θ), DCO, seven Ge–Li with BGO anti Compton.
The data given below are from 1998Se05. 1997Mo09 give Band(A) up to 27/2–.

^{113}Te Levels

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†
0.0		3975.1+x *11*		5553.6+x *13*
0+x§	(11/2–)	4034.6+x§ *11*	(31/2–)	5819.9+x# *13*
587.2+x§ *5*	(15/2–)	4184.7+x *11*		6149.9+x§ *13*
1311.4+x§ *7*	(19/2–)	4264.7+x *12*		6155.9+x *13*
1994.4+x§ *9*	(23/2–)	4273.4+x# *11*		6204.4+x@ *11*
2506.0+x *10*		4377.9+x *11*		6523.2+x *13*
2786.6+x *10*		4558.2+x *11*		6621.8+x@ *13*
2798.3+x# *10*	(25/2)	4616.5+x@ *11*		6786.8+x *14*
2891.2+x *10*		4906.3+x *12*		6908.4+x# *14*
3001.3+x§ *10*	(27/2–)	5018.8+x# *12*		7153.0+x§ *14*
3244.4+x *11*		5071.2+x§ *12*		7212.3+x *14*
3430.7+x *11*		5163.1+x@ *11*		7360.6+x *13*
3573.5+x *11*	(29/2+)	5188.7+x *11*		7689.7+x@ *14*
3806.0+x@ *10*	(29/2)	5196.2+x *13*		8061.5+x@ *14*
3917.5+x# *10*		5389.9+x *11*		8764.3+x *14*
3927.3+x *11*		5551.2+x *12*		

Footnotes continued on next page

(HI,xnγ) 1998Se05,1997Mo09 (continued)

^{113}Te Levels (continued)

† From least–squares fit to γ energies.
‡ From gammas, DCO ratios, decay patterns and systematics.
§ (A): Ground–state band.
# (B): γ cascade, starting at 25/2.
@ (C): γ cascade, starting at 29/2.

γ(^{113}Te)

Eγ	E(level)	Iγ†	Mult.‡	Comments
226.7 5	5389.9+x	3.0 2		
238.6 5	4616.5+x	0.9 1		
355.6 5	4273.4+x	5.6 3		
371.8 5	8061.5+x	2.4 2		
417.4 5	6621.8+x	7.5 3		
429.4 5	3430.7+x	4.1 3		
446.2 5	3244.4+x	4.4 4		
467.7 5	4273.4+x	2.8 2		
482.4 5	5553.6+x	2.2 3		
511.6 5	2506.0+x	6.5 5		
523.2 5	4558.2+x	4.0 3		
546.8 5	5163.1+x	14.1 5		
572.0 5	4377.9+x	0.9 2		
572.6 5	3573.5+x	15.6 6	(E1)	DCO=0.47 6.
587.2 5	587.2+x	100 3	(E2)	DCO=1.00 used as reference.
604.3 5	5163.1+x	5.7 3		
683.0 5	1994.4+x	85 3	(E2)	
699.0 5	4616.5+x	8.9 4		
724.2 5	1311.4+x	100 3	(E2)	DCO=0.86 5.
745.4 5	5018.8+x	9.7 4		
792.2 5	2786.6+x	4.8 7		
801.1 5	5819.9+x	5.3 4		
803.6 5	2798.3+x	14.5 11	D	DCO=0.68 22 for 803.6+804.9.
804.9 5	3806.0+x	8.5 5	D	DCO=0.68 22 for 803.6+804.9.
810.6 5	4616.5+x	8.6 4		
814.9 5	6204.4+x	4.6 3		
832.1 5	5389.9+x	5.5 4		
834.0 5	4264.7+x	2.0 3		
896.8 5	2891.2+x	5.9 6		
926.1 5	3927.3+x	6.9 5		
931.2 5	4906.3+x	4.1 4		
931.5 5	5196.2+x	2.1 3		
966.9 5	6786.8+x	1.7 2		
972.0 5	6523.2+x	0.7 2		
973.8 5	3975.1+x	6.8 5		
984.8 5	4558.2+x	9.5 4		
993.0 5	5551.2+x	2.0 2		
1003.1 5	7153.0+x	1.6 3		
1003.7 5	5188.7+x	1.1 3		
1007.2 5	3001.3+x	50.0 16	(E2)	DCO=0.87 6.
1029.2 5	4273.4+x	2.6 2		
1033.0 5	4034.6+x	9.7 5	(E2)	DCO=0.90 35.
1036.6 5	5071.2+x	4.0 3		
1041.0 5	6204.4+x	11.2 5		
1043.9 5	4616.5+x	5.9 3		
1056.4 5	7212.3+x	1.7 2		
1067.8 5	7689.7+x	6.5 3		
1074.6 5	8764.3+x	2.3 2		
1078.7 5	6149.9+x	1.7 2		
1084.7 5	6155.9+x	1.6 3		
1088.5 5	6908.4+x	3.0 2		
1118.8 5	3917.5+x	11.0 5		
1154.3 5	5188.7+x	2.4 3		
1156.2 5	7360.6+x	2.1 3		

Continued on next page (footnotes at end of table)

(HI,xnγ) 1998Se05,1997Mo09 (continued)

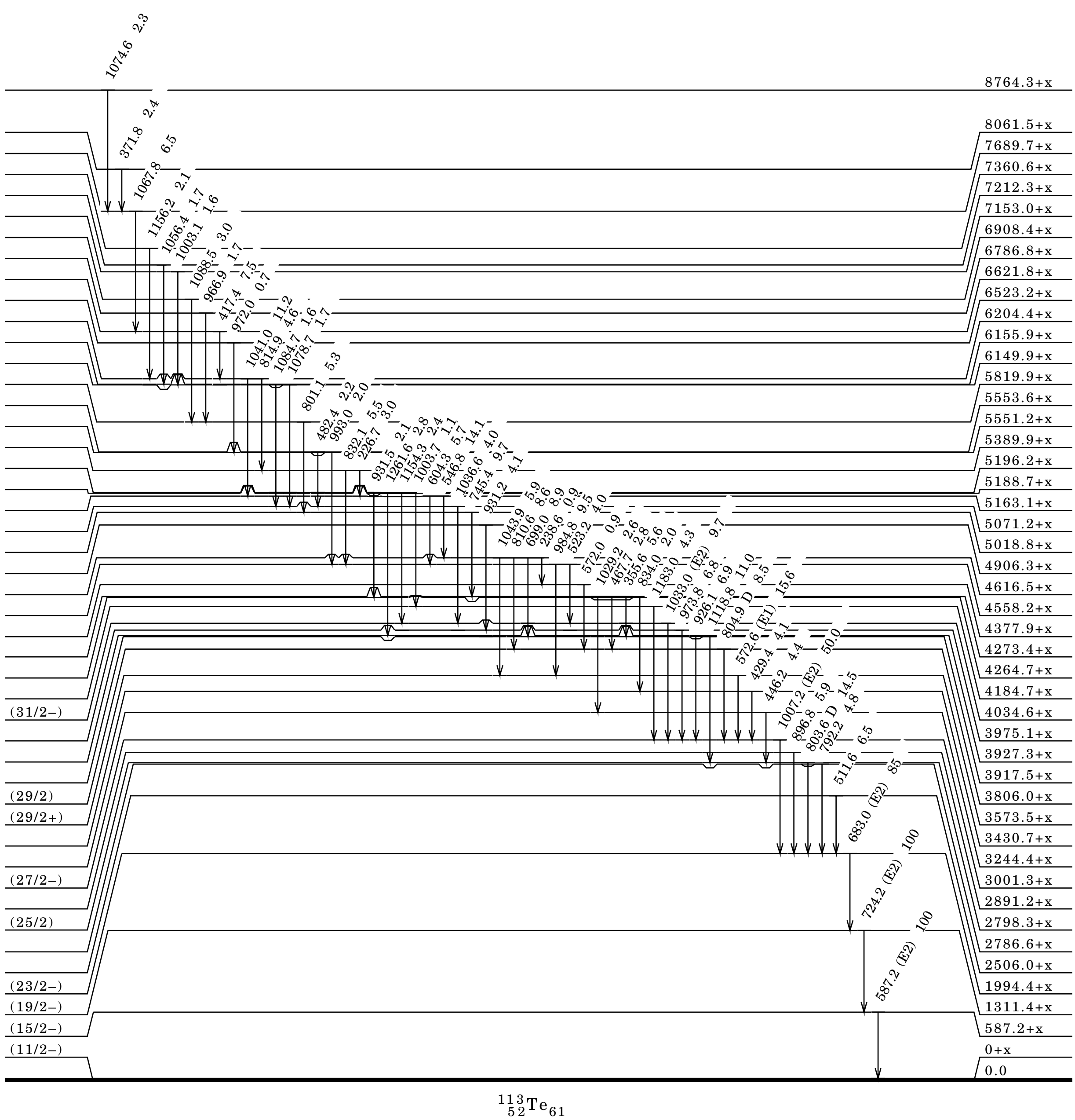
γ(^{113}Te) (continued)

Eγ	E(level)	Iγ†
1183.0 *5*	4184.7+x	4.3 *4*
1261.6 *5*	5188.7+x	2.8 *3*

† Normalized to 100% for the 587 and 724 γ from 1998Se05.
‡ From DCO ratios.

Level Scheme

Intensities: relative Iγ



Adopted Levels, Gammas

Q(β⁻)=–9040 *100*; S(n)=12100 *SY*; S(p)=1120 *180*; Q(α)=2710 *50* 2003Au03.
Production and identification: 290–MeV ^{58}Ni on ^{58}Ni. Mass separation, observed tellurium x rays, 1977Ki11. Chemical and mass separation, Q(α) syst (1979Sc22).

^{113}I Levels

Nomenclature for band labels:
[p_1p_2,n_1(n_2n_3)]; where p_1=number of $g_{9/2}$ proton holes; p_2=number of $h_{11/2}$ protons; n_1=number of $h_{11/2}$ neutrons; n_2=number $g_{9/2}$ or $f_{7/2}$ neutrons; n_3=number of $i_{13/2}$ neutrons.

Cross Reference (XREF) Flags

A ^{114}Cs εp Decay
B ^{58}Ni(^{58}Ni,3pγ)

E(level)[§]	Jπ[†#]	XREF	$T_{1/2}$[‡]	Comments
0.0	5/2+	B	6.6 s *2*	%ε+%β⁺=100; %α=3.310×10⁻⁷. %α: from 1981Sc17. E(level): tentative g.s. assignment for 6.6–s activity (1980GoZX). $T_{1/2}$: from 1980GoZX. Other: 5.9 s *5* (1979Sc22). Jπ: from systematics. All odd–a isotopes have Jπ=5/2+.
63.6[n] *5*	7/2+	B		
629.4 *4*	9/2+	B		
753.9[n] *6*	11/2+	B		
838.2 *6*	9/2+	B		
909.3[&] *4*	9/2+	B		
1017.9[l] *5*	11/2–	B	159 ps *36*	
1269.1[a] *6*	11/2+	B		
1548.7[l] *7*	15/2–	B	5.0 ps *3*	
1614.4[&] *6*	13/2+	B		
1616.7[n] *7*	15/2+	B		
1986.6[a] *7*	15/2+	B		
2186.4[l] *9*	19/2–	B	1.61 ps *17*	
2358.7[&] *8*	17/2+	B		
2684.9[n] *8*	19/2+	B		
2731.2[a] *9*	19/2+	B		
2870.3[l] *10*	23/2–	B	1.86 ps *30*	
3035.6[c] *10*	23/2–	B		
3106.2[&] *10*	21/2+	B		
3306.6 *10*	23/2–	B		
3480.9[a] *10*	23/2+	B		
3568.9[n] *10*	23/2+	B		
3696.2[l] *10*	27/2–	B	0.67 ps *25*	
3741.1[c] *10*	27/2–	B		
3766.8 *9*	23/2+	B		
3792.0 *9*	23/2+	B		
3861.1[&] *10*	25/2+	B		
4113.3 *11*	27/2–	B		
4127.9[k] *22*	25/2+	B		
4236.4[a] *10*	27/2	B		
4396.1[b] *9*	27/2+	B		
4497.0[c] *11*	31/2–	B	1.1 ps *3*	
4630.0[m] *10*	31/2–	B		
4630.4[&] *10*	29/2+	B		
4798.6[k] *20*	29/2+	B		
5015.4[a] *10*	31/2+	B		
5081.6[c] *10*	31/2+	B		
5211.8[m] *11*	35/2–	B	1.3 ps *4*	
5364.3[c] *12*	35/2–	B		
5423.5[&] *11*	33/2+	B		
5535.4[k] *17*	33/2+	B		
5838.6[a] *11*	35/2+	B		
5846.4[b] *10*	35/2+	B		
5947.3[m] *12*	39/2–	B		
6266.2[c] *13*	39/2–	B		
6278.3[&] *11*	37/2+	B		
6354.0[k] *14*	37/2+	B		

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Adopted Levels, Gammas (continued)

^{113}I Levels (continued)

E(level)[§]	Jπ[†#]	XREF
6688.0[b] *11*	39/2+	B
6712.1[m] *13*	43/2−	B
6741.4[a] *12*	39/2+	B
7214.6[&] *12*	41/2+	B
7247.1[k] *13*	41/2+	B
7249.2[c] *14*	43/2−	B
7610.0[b] *12*	43/2+	B
7680.7[m] *14*	47/2−	B
7699.5[a] *13*	43/2+	B
8198.4[k] *12*	45/2+	B
8213.6[&] *14*	45/2+	B
8296.2[c] *14*	47/2−	B
8347.6 *14*	47/2−	B
8586.3[m] *15*	51/2−	B
8613.6[b] *12*	47/2+	B
8738.6[a] *15*	47/2+	B
9229.7[k] *13*	49/2+	B
9279.6[&] *16*	49/2+	B
9496.6[c] *14*	51/2−	B
9611.0[m] *16*	55/2−	B
9686.6[b] *13*	51/2+	B
10332.7[k] *14*	53/2+	B
10767.2[c] *15*	55/2−	B
10834.3[b] *14*	55/2+	B
11066.9[m] *19*	59/2−	B
11510.1[k] *17*	57/2+	B
12083.4[b] *18*	59/2+	B
12120.1[c] *18*	59/2−	B
12769.5[k] *20*	61/2+	B
12990.5[m] *21*	63/2−	B
13414.8[b] *20*	63/2+	B
13554.5[c] *24*	63/2−	B
14117.4[k] *22*	65/2+	B
14841.4[b] *23*	67/2+	B
14993[c] *3*	67/2−	B
15559.3[k] *24*	69/2+	B
16366.9[b] *25*	71/2+	B
16436[c] *4*	71/2−	B
17104[k] *3*	73/2+	B
17990[c] *4*	75/2−	B
18005[b] *3*	75/2+	B
18756[k] *3*	77/2+	B
19670[c] *3*	79/2−	B
19773[b] *3*	79/2+	B
20523[k] *3*	81/2+	B
21514[c] *3*	83/2−	B
21688[b] *3*	83/2+	B
22419[k] *4*	85/2+	B
23498[c] *4*	87/2−	B
23561 *4*	87/2−	B
23764[b] *4*	87/2+	B
24459[k] *4*	89/2+	B
25743[c] *4*	91/2−	B
26005[b] *4*	91/2+	B
26660[k] *4*	93/2+	B
28185[c] *5*	(95/2−)[@]	B
28432[b] *5*	95/2+	B
29039[k] *4*	97/2+	B
31013[b] *5*	(99/2)+	B
31621[k] *5*	(101/2)+	B
x[e]	(53/2−)	B
11.9+x *15*		B
992+x[d] *3*	(57/2−)	B
1098.0+x[e] *10*	(57/2−)	B
2176+x[d] *3*	(61/2−)	B
2218.8+x[e] *15*	(61/2−)	B
3392.5+x[e] *18*	(65/2−)	B
3433+x[d] *3*	(65/2−)	B
3518.7+x *18*		B
4737.3+x[e] *20*	(69/2−)	B
4773.8+x[d] *24*	(69/2−)	B
4913.3+x *20*		B
6184.8+x[e] *22*	(73/2−)	B
6230.6+x[d] *22*	(73/2−)	B
6344.7+x *23*		B
7778.2+x[e] *25*	(77/2−)	B
7857.7+x[d] *25*	(77/2−)	B
9537+x[e] *3*	(81/2−)	B
9644+x[d] *3*	(81/2−)	B
11540+x[e] *3*	(85/2−)	B
11615+x[d] *3*	(85/2−)	B
13772+x[d] *4*	(89/2−)	B
13837+x[e] *4*	(89/2−)	B
13903+x *4*	(89/2−)	B
y[f]	(59/2−)	B
1235.5+y[f] *10*	(63/2−)	B
2579.5+y[f] *15*	(67/2−)	B
4032.9+y[f] *18*	(71/2−)	B
5624.1+y[f] *20*	(75/2−)	B
7355.6+y[f] *23*	(79/2−)	B
9261.4+y[f] *25*	(83/2−)	B
11310+y *4*	(87/2−)	B
11375+y[f] *4*	(87/2−)	B
z[g]	(53/2+)	B
19.0+z *15*		B
45.5+z *15*		B
1258.0+z[g] *10*	(57/2+)	B
2553.1+z[g] *15*	(61/2+)	B
3933.8+z[g] *18*	(65/2+)	B
5438.3+z[g] *20*	(69/2+)	B
7101.0+z[g] *23*	(73/2+)	B
8970.8+z[g] *25*	(77/2+)	B
11090+z[g] *4*	(81/2+)	B
u[h]	(63/2−)	B
1543.7+u[h] *10*	(67/2−)	B
3173.4+u[h] *15*	(71/2−)	B
4915.6+u[h] *18*	(75/2−)	B
6782.5+u[h] *20*	(79/2−)	B
8822+u[h] *3*	(83/2−)	B
11025+u[h] *4*	(87/2−)	B
v[i]	(55/2+)	B
1360.6+v[i] *10*	(59/2+)	B
2839.0+v[i] *15*	(63/2+)	B
4418.2+v[i] *18*	(67/2+)	B
6102.5+v[i] *20*	(71/2+)	B
7873.5+v[i] *23*	(75/2+)	B
9817.5+v[i] *25*	(79/2+)	B
11930+v[i] *4*	(83/2+)	B
w[j]	(77/2−)	B
1680.5+w[j] *10*	(81/2−)	B
3458.7+w[j] *15*	(85/2−)	B
5329.3+w[j] *18*	(89/2−)	B
7301.4+w[j] *20*	(93/2−)	B
9403+w[j] *3*	(97/2−)	B
11659+w[j] *4*	(101/2−)	B
14092+w[j] *4*	(105/2−)	B

† Assignments for several bands are based on theoretical calculations.
‡ From 2003Pe10, unless given.
§ From least–squares fit to Eγ's.
\# From the deduced transitions multipolarities and band assignments.
@ From figure 1 of 2001St16.
& (A): α=+1/2, based on 5/2+, ΔJ=2, [10,0].
a (B): α=−1/2, based on 11/2+, ΔJ=2, [10,0].
b (C): α=−1/2, based on 35/2+, ΔJ=2, [22,4].
c (D): α=+1/2, based on 31/2−, ΔJ=2, [22,3].
d (E): Based on (57/2−), ΔJ=2, [22,3].
e (F): Based on (53/2−), ΔJ=2, [22,3].
f (G): Based on (59/2−), ΔJ=2, [22,3].
g (H): Based on (53/2+), ΔJ=2, [21,3].
h (I): Based on (63/2−), ΔJ=2, [21,4].
i (J): Based on (55/2+), ΔJ=2, [21,3].
j (K): Based on (77/2−), ΔJ=2, [22,3(01)].
k (L): Based on 25/2+, ΔJ=2, [22,4].
l (M): Based on 11/2−, ΔJ=2, [01,0].
m (N): Based on 31/2−, ΔJ=2, [01,2].
n (O): Based on 7/2+, ΔJ=2, [00,0].

Adopted Levels, Gammas (continued)

$\gamma(^{113}I)$

E(level)	Eγ	Iγ	Mult.†	Comments
63.6	63.6			Eγ: from level energy difference.
629.4	565.7 *5*	66.6 *4*	M1,E2	
	629.2 *5*	100.0 *21*	E2	Iγ: uncertainty of 0.1 given by 2001St16 seems too low; increased to 1.0 by compilers.
753.9	690.4 *5*	100.0	E2	
838.2	774.3 *10*	100 *12*	M1,E2	
	838.0 *10*	94 *12*	E2	
909.3	846.0 *5*	100 *7*	M1,E2	
	909.4 *5*	59 *7*	E2	
1017.9	179.8 *5*	6.3 *7*	E1	B(E1)(W.u.)=1.4×10^{-5} *4*.
	263.9 *5*	31.9 *12*	E1	B(E1)(W.u.)=2.3×10^{-5} *6*.
	388.4 *5*	100 *4*	E1	B(E1)(W.u.)=2.2×10^{-5} *6*.
1269.1	360.0 *5*	100	M1,E2	
1548.7	530.8 *5*	100	E2	B(E2)(W.u.)=83 *5*.
1614.4	345.4 *5*	100 *6*	M1,E2	
	705.4 *8*	11 *3*	E2	
	775.0 *10*	17 *3*	E2	
	984.5 *10*	8 *3*	E2	
1616.7	862.8 *5*	100	E2	
1986.6	372.0 *10*	100 *30*	M1,E2	
	717.6 *5*	76 *7*	E2	
2186.4	637.7 *5*	100	E2	B(E2)(W.u.)=103 *11*.
2358.7	372.4 *10*	100 *40*	M1,E2	
	744.0 *10*	96 *18*	E2	
2684.9	1068.3 *5*	100	E2	
2731.2	373.0 *10*	100 *40*	M1,E2	
	744.4 *10*	97 *21*	E2	
2870.3	683.6 *5*	100	E2	B(E2)(W.u.)=63 *11*.
3035.6	165.1 *5*	21.2 *19*	M1,E2	
	848.6 *5*	100	E2	
3106.2	375.0 *10*	100 *40*	M1,E2	
	747.0 *10*	100 *15*	E2	
3306.6	271.0 *6*	25 *5*	M1,E2	
	1120.1 *9*	100 *10*	E2	
3480.9	374.0 *10*	96 *50*	M1,E2	
	750.0 *10*	100 *21*	E2	
3568.9	884.0 *5*	100	E2	
3696.2	825.7 *5*	100	E2	B(E2)(W.u.)=70 *30*.
3741.1	705.6 *5*	100 *7*	E2	
	870.9 *6*	17 *4*	E2	
3766.8	1081.7 *5*	100	E2	
3792.0	1107.3 *5*	100	E2	
3861.1	380.0 *10*	100 *9*	M1,E2	
	755.0 *10*	42 *15*	E2	
4113.3	806.6 *6*	100	E2	
4236.4	375.4 *10*	92 *50*	M1,E2	
	755.4 *10*	100 *30*	E2	
4396.1	604.3 *5*	57	E2	
	629.1 *5*	100 *14*	E2	
4497.0	756.0 *5*	25.1 *16*	E2	B(E2)(W.u.)=13 *4*.
	800.6 *5*	100 *3*	E2	B(E2)(W.u.)=39 *11*.
4630.0	516.6 *5*	18.7 *15*	E2	
	889.1 *5*	29.1 *15*	E2	
	933.9 *5*	100 *5*	E2	
4630.4	394.0 *5*	100 *6*	M1,E2	
	769.0 *10*	41 *6*	E2	
4798.6	670.7 *10*	100	E2	
5015.4	385.0 *5*	71 *8*	M1,E2	
	779.0 *10*	100 *8*	E2	
5081.6	685.6 *5*	100	E2	
5211.8	582.0 *5*	61.1 *25*	E2	B(E2)(W.u.)=76 *24*.
	714.5 *5*	100 *4*	E2	B(E2)(W.u.)=45 *14*.
5364.3	867.2 *5*	100	E2	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

γ(^{113}I) (continued)

E(level)	Eγ	Iγ	Mult.†
5423.5	408.0 5	100 11	M1,E2
	793.0 10	68 11	E2
5535.4	736.8 10	100	E2
5838.6	415.0 5	100	M1+E2
	823.0 10	67 19	E2
5846.4	423.3 10	13 9	M1,E2
	764.8 5	100 17	E2
	831.3 10	17 4	E2
5947.3	735.5 5	100	E2
6266.2	901.9 5	100	E2
6278.3	439.6 5	100 12	M1,E2
	854.6 10	81 6	E2
6354.0	818.6 10	100	E2
6688.0	841.9 5	100 9	E2
	849.1 10	23 9	E2
6712.1	764.8 5	100	E2
6741.4	463.0 5	100 12	M1,E2
	902.6 10	41 12	E2
7214.6	473.0 10	100 8	M1,E2
	936.0 10	92 8	E2
7247.1	505.8 10	33 22	M1,E2
	893.1 5	100 22	E2
7249.2	983.0 5	100	E2
7610.0	922.1 5	100	E2
7680.7	968.6 5	100	E2
7699.5	485.0 10	100 14	M1,E2
	958.0 10	43 30	E2
8198.4	589.2 10	36 9	M1,E2
	951.3 5	100 9	E2
	983.0 10	18 9	E2
8213.6	514.0 10	30 20	M1,E2
	999.0 10	100 20	E2
8296.2	1046.9 5	100	E2
8347.6	1098.5 5	100	E2
8586.3	905.6 5	100	E2
8613.6	1003.6 5	100	E2
8738.6	525.0 10	60 40	M1,E2
	1039.0 10	100 40	E2
9229.7	616.0 10	12 6	M1,E2
	1031.3 5	100 12	E2
9279.6	541.0 10	67 70	M1,E2
	1066.0 10	100 70	E2
9496.6	1149.1 3	100 8	E2
	1200.4 5	79 4	E2
9611.0	1024.7 5	100	E2
9686.6	1073.0 5	100	E2
10332.7	1103.0 5	100	E2
10767.2	1270.5 5	100	E2
10834.3	1147.7 5	100	E2
11066.9	1455.9 10	100	E2
11510.1	1177.4 10	100	E2
12083.4	1249.1 10	100	E2
12120.1	1352.9 10	100	E2
12769.5	1259.4 10	100	E2
12990.5	1923.6 10	100	E2
13414.8	1331.4 10	100	E2
13554.5	1434.4 15	100	E2
14117.4	1347.9 10	100	E2
14841.4	1426.6 10	100	E2
14993	1438.5 15	100	E2
15559.3	1441.9 10	100	E2
16366.9	1525.5 10	100	E2
16436	1443.0 15	100	E2
17104	1544.8 10	100	E2
17990	1554.0 10	100	E2
18005	1638.2 10	100	E2
18756	1651.8 10	100	E2
19670	1680.4 10	100	E2
19773	1767.7 10	100	E2
20523	1766.9 10	100	E2
21514	1844.2 10	100	E2
21688	1915.3 10	100	E2
22419	1895.8 10	100	E2
23498	1984.1 10	100	E2
23561	2046.6 20	100	E2
23764	2075.8 10	100	E2
24459	2039.9 10	100	E2
25743	2181.6 20	100	E2
	2244.5 20	100	E2
26005	2241.2 20	100	E2
26660	2201.0 10	100	E2
28185	2442.2‡ 20	100	E2
28432	2426.6 20	100	E2
29039	2379.5 20	100	E2
31013	2581.1‡ 20	100	E2
31621	2582.0‡ 20	100	E2
1098.0+x	1086.1 10	100 17	E2
	1098.0 10	92 17	E2
2176+x	1184.1 10	100	E2
2218.8+x	1120.8 10	100	E2
3392.5+x	1173.7 10	100	E2
3433+x	1257.4 10	100	E2
3518.7+x	1299.9 10	100	
4737.3+x	1344.8 10	100	E2
4773.8+x	1340.6 10	100	E2
4913.3+x	1394.6 10	100	
6184.8+x	1410.0 20	25 17	E2
	1447.8 10	100 17	E2
6230.6+x	1457.1 10	100 17	E2
	1493.0 10	33 17	E2
6344.7+x	1431.4 10	100	
7778.2+x	1593.3 10	100	E2
7857.7+x	1627.1 10	100	E2
9537+x	1758.4 10	100	E2
9644+x	1786.4 10	100	E2
11540+x	2003.2 10	100	E2
11615+x	1970.8 10	100	E2
13772+x	2156.9 20	100	E2
13837+x	2296.9 20	100	E2
13903+x	2363.0 20	100	E2
1235.5+y	1235.5 10	100	E2
2579.5+y	1344.0 10	100	E2
4032.9+y	1453.4 10	100	E2
5624.1+y	1591.2 10	100	E2
7355.6+y	1731.4 10	100	E2
9261.4+y	1905.8 10	100	E2
11310+y	2049.0 20	100	E2
11375+y	2113.1 20	100	E2
1258.0+z	1212.5 10	100 20	E2
	1239.0 10	60 20	E2
	1258.0 10	60 20	E2
2553.1+z	1295.1 10	100	E2
3933.8+z	1380.7 10	100	E2
5438.3+z	1504.5 10	100	E2
7101.0+z	1662.7 10	100	E2
8970.8+z	1869.7 10	100	E2

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

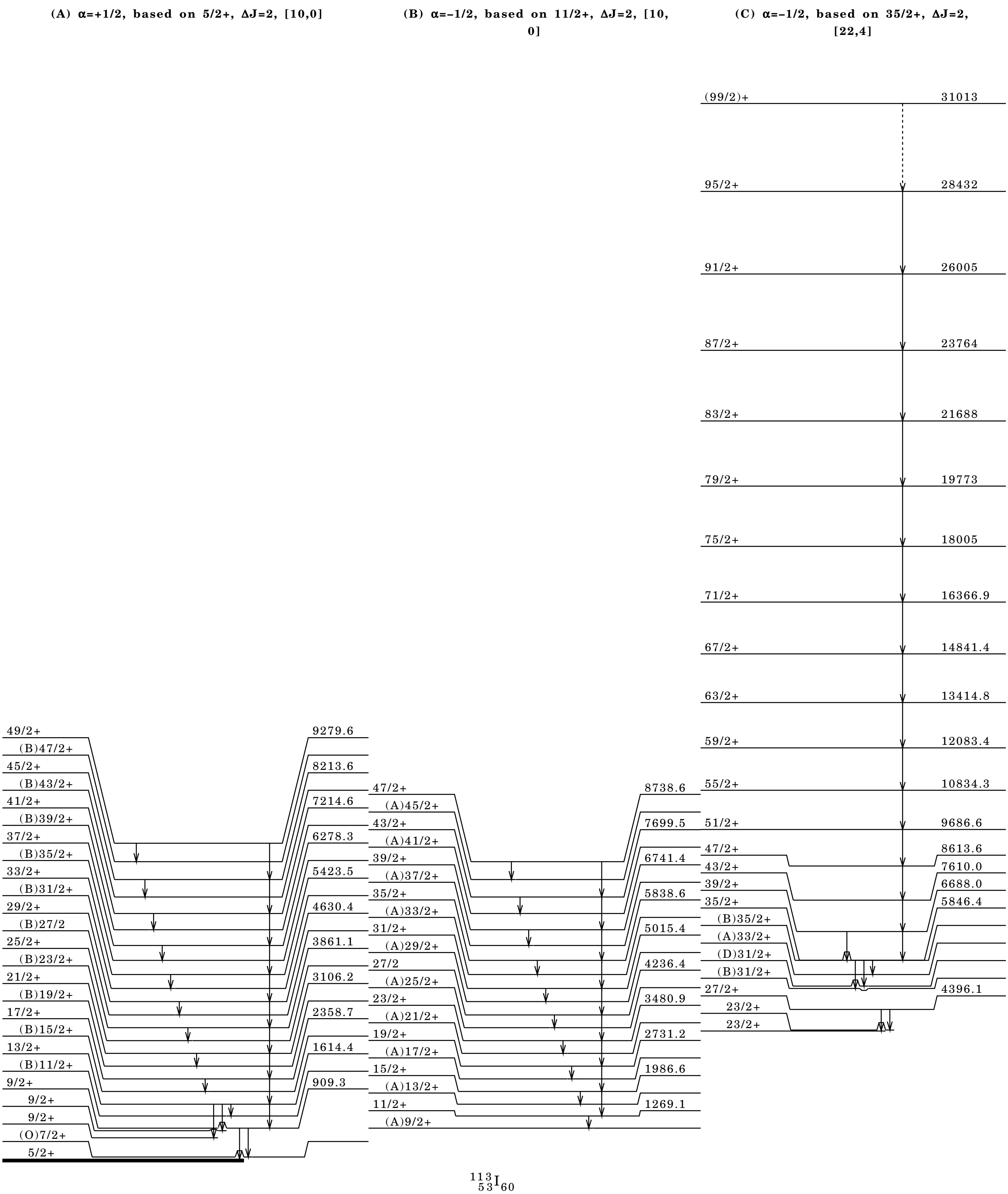
γ(^{113}I) (continued)

E(level)	Eγ	Iγ	Mult.†
11090+z	2118.9 *20*	100	E2
1543.7+u	1543.7 *10*	100	E2
3173.4+u	1629.6 *10*	100	E2
4915.6+u	1742.2 *10*	100	E2
6782.5+u	1866.9 *10*	100	E2
8822+u	2039.4 *20*	100	E2
11025+u	2202.9 *20*	100	E2
1360.6+v	1360.6 *10*	100	E2
2839.0+v	1478.4 *10*	100	E2
4418.2+v	1579.2 *10*	100	E2
6102.5+v	1684.3 *10*	100	E2
7873.5+v	1770.9 *10*	100	E2
9817.5+v	1944.0 *10*	100	E2
11930+v	2112.3 *20*	100	E2
1680.5+w	1680.5 *10*	100	E2
3458.7+w	1778.1 *10*	100	E2
5329.3+w	1870.6 *10*	100	E2
7301.4+w	1972.1 *10*	100	E2
9403+w	2101.2 *20*	100	E2
11659+w	2256.7 *20*	100	E2
14092+w	2432.7 *20*	100	E2

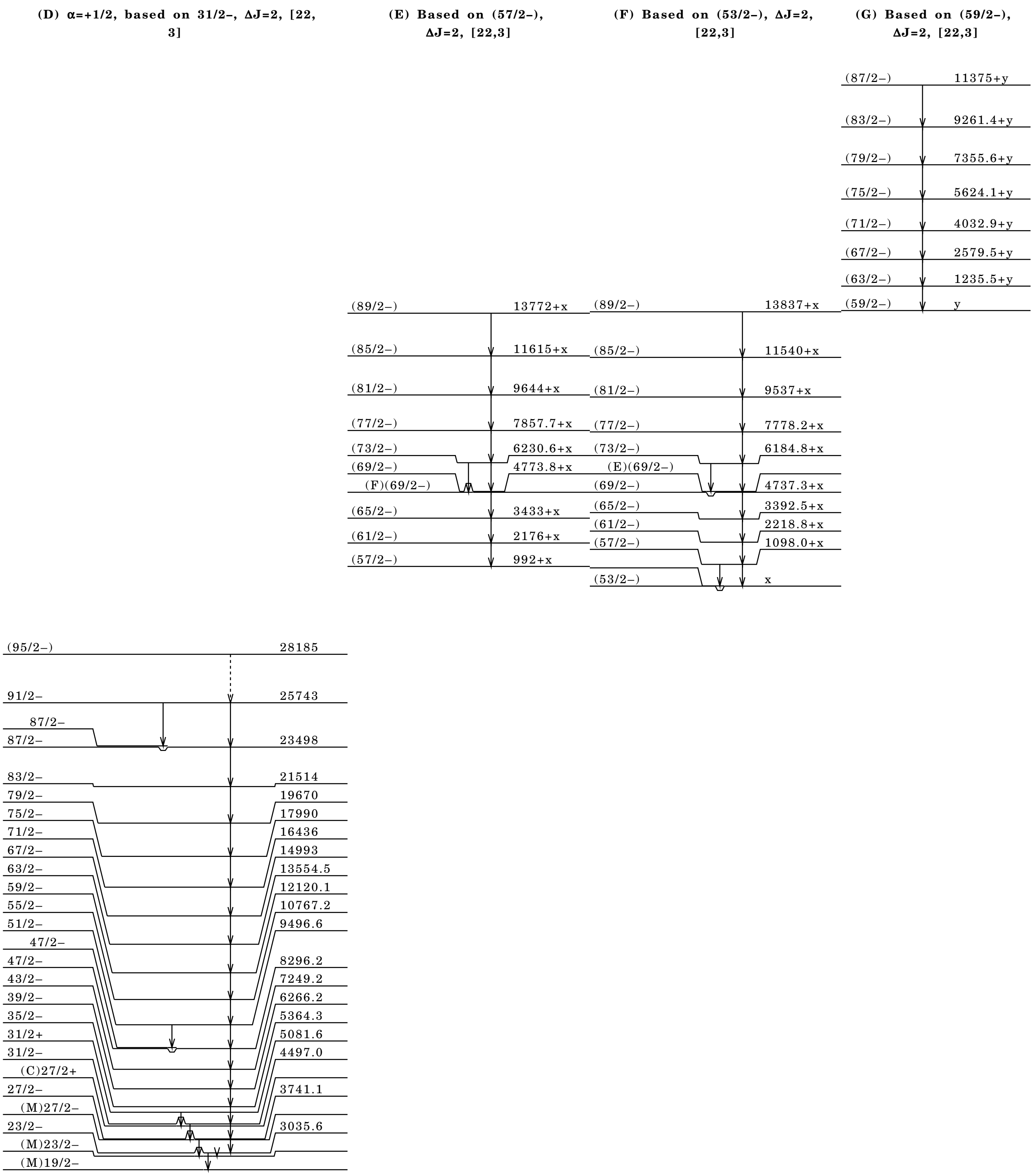
† From DCO Measurements.

‡ Placement of transition in the level scheme is uncertain.

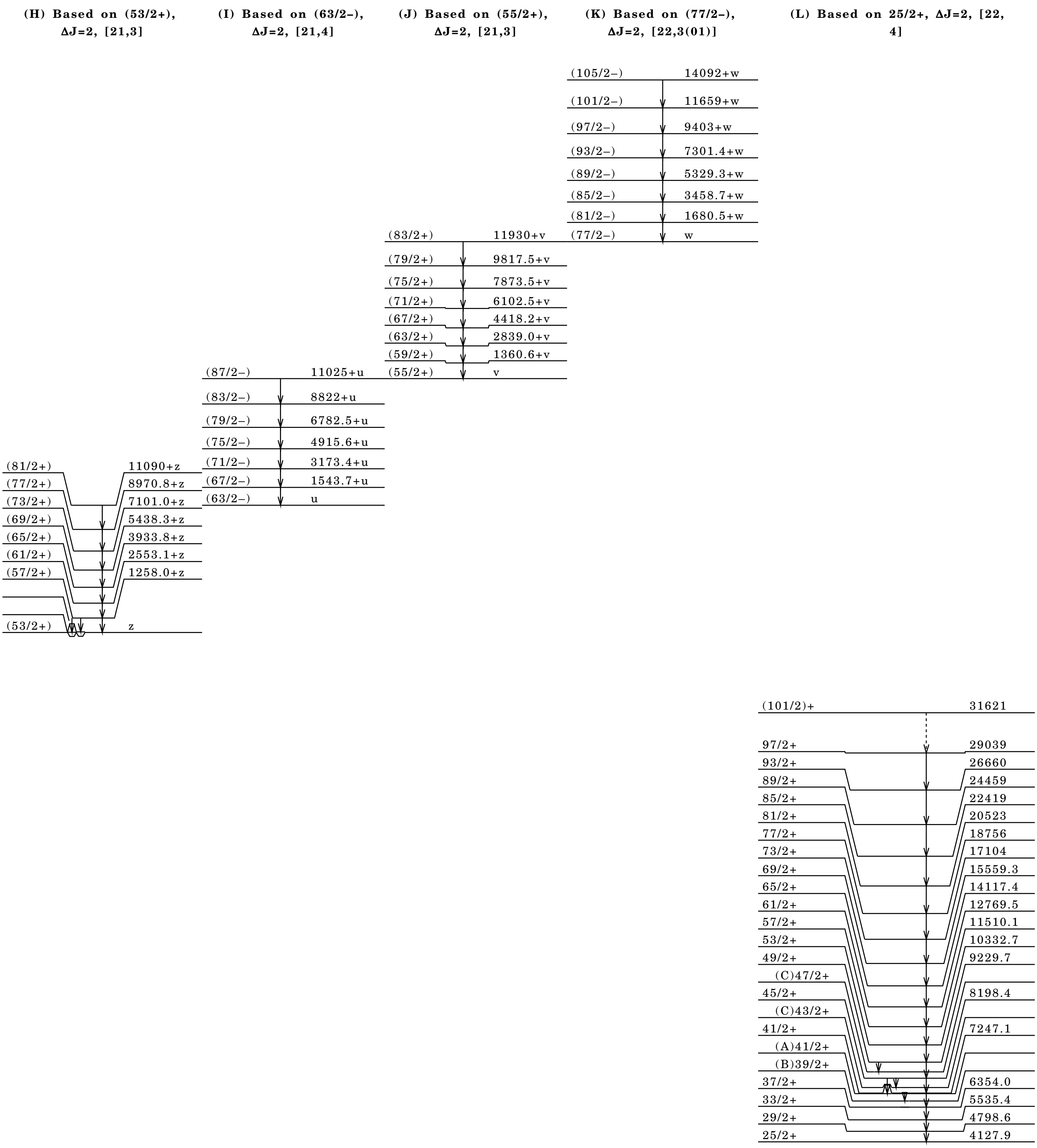
Adopted Levels, Gammas (continued)



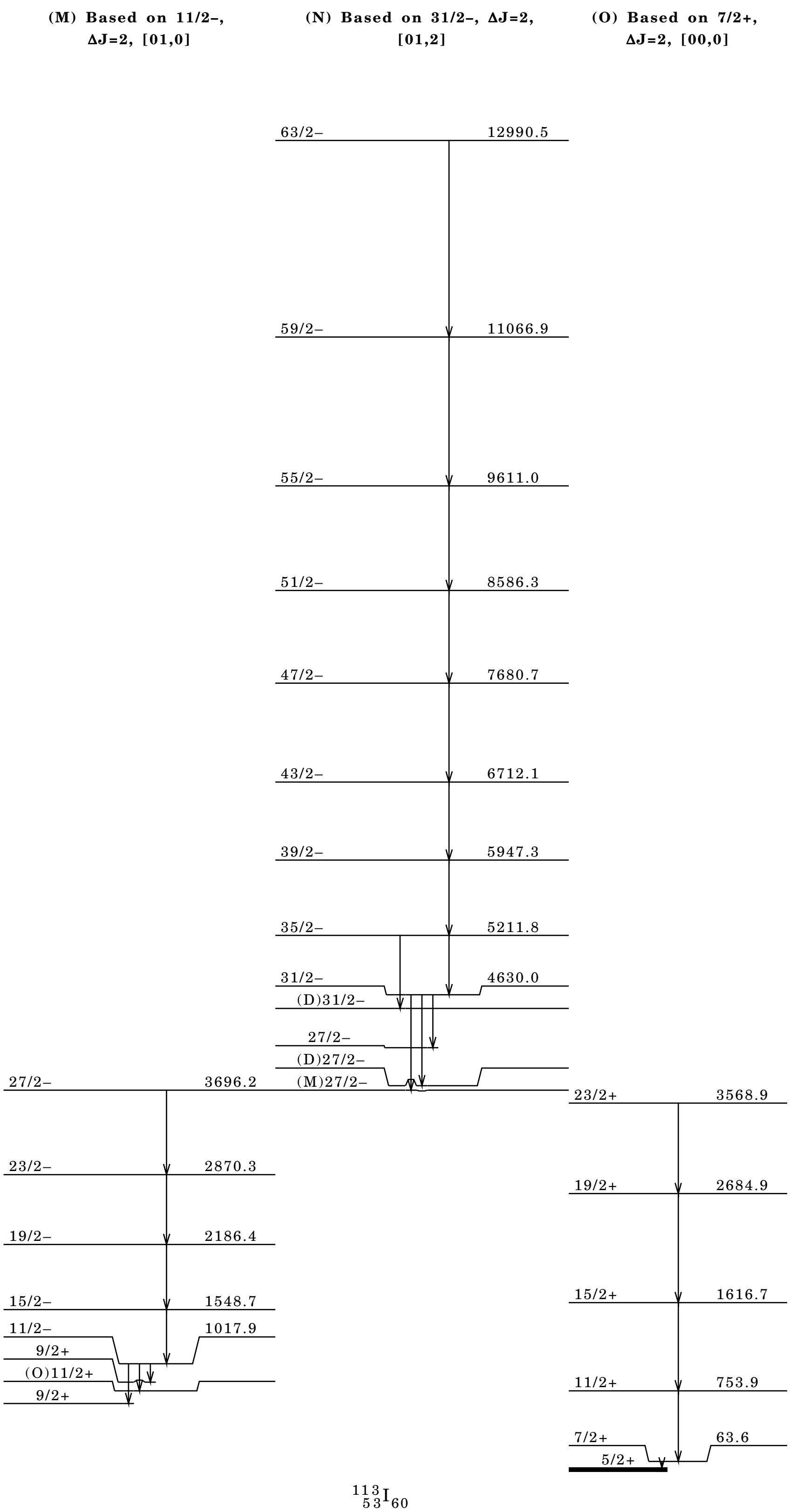
Adopted Levels, Gammas (continued)



Adopted Levels, Gammas (continued)



Adopted Levels, Gammas (continued)



^{114}Cs εp Decay 1980Ro04

Parent ^{114}Cs: E=0≥; Jπ=(1+); $T_{1/2}$=0.57 s *2*; Q(g.s.)=10380 *170*; %εp decay=100.
Measured energies, intensities, and half–lives for delayed protons, delayed α's and ground–state α's, E/ΔE telescope, Eγ, Iγ, γγ–coin, Iβ, βγ–coin, $T_{1/2}$; semi, 1980Ro04.

γ(^{113}I)

Eγ	Iγ
[x]30.7 *2*	39 *8*
[x]121.6 *2*	32 *6*

[x] γ ray not placed in level scheme.

^{58}Ni(^{58}Ni,3pγ) 2001St16,2003Pe10

2001St16: E=250 MeV. Measured Eγ, Iγ, γγ and γγ(θ)(DCO) using GAMMASPHERE array of 83 HPGe detectors coupled with the Microball array of 95 CsI(Tl) charged particle detectors and an array of 15 scintillators for neutron detection.
2003Pe10: ^{58}Ni(^{58}Ni,3πγ) E=210 MeV. Measured Eγ, Iγ, γγ and lifetimes by recoil–distance Doppler–shift using the 4π spectrometer euroball iv.
1993Pa13: ^{58}Ni(^{58}Ni,3p) E=240 MeV.
Measured: γ, γγ, Eurogam system.
1995Wa14: ^{58}Ni(^{58}Ni,3p) E=240 MeV.
Measured: γ, γγ, Eurogam system, same experiment with new analysis.
Except for lifetime data, all other data are from 2001St16.

^{113}I Levels

Nomenclature for band labels:
[p_1p_2,n_1(n_2n_3)]; where p_1=number of $g_{9/2}$ proton holes; p_2=number of $h_{11/2}$ protons; n_1=number of $h_{11/2}$ neutrons; n_2=number $g_{9/2}$ or $f_{7/2}$ neutrons; n_3=number of $i_{13/2}$ neutrons.

E(level)[‡]	Jπ[†]	$T_{1/2}$
0.0	5/2+	
63.6[l] *5*	7/2+	
629.4 *4*	9/2+	
753.9[l] *6*	11/2+	
838.2 *6*	9/2+	
909.3[#] *4*	9/2+	
1017.9[j] *5*	11/2−	159 ps *36*
1269.1[@] *6*	11/2+	
1548.7[j] *7*	15/2−	5.0 ps *3*
1614.4[#] *6*	13/2+	
1616.7[l] *7*	15/2+	
1986.6[@] *7*	15/2+	
2186.4[j] *9*	19/2−	1.61 ps *17*
2358.7[#] *8*	17/2+	
2684.9[l] *8*	19/2+	
2731.2[@] *9*	19/2+	
2870.3[j] *10*	23/2−	1.86 ps *30*
3035.6[a] *10*	23/2−	
3106.2[#] *10*	21/2+	
3306.6 *10*	23/2−	
3480.9[@] *10*	23/2+	
3568.9[l] *10*	23/2+	
3696.2[j] *10*	27/2−	0.67 ps *25*
3741.1[a] *10*	27/2−	
3766.8 *9*	23/2+	
3792.0 *9*	23/2+	
3861.1[#] *10*	25/2+	
4113.3 *11*	27/2−	
4127.9[i] *22*	25/2+	
4236.4[@] *10*	27/2	
4396.1[&] *9*	27/2+	
4497.0[a] *11*	31/2−	1.1 ps *3*
4630.0[k] *10*	31/2−	
4630.4[#] *10*	29/2+	
4798.6[i] *20*	29/2+	
5015.4[@] *10*	31/2+	
5081.6[a] *10*	31/2+	
5211.8[k] *11*	35/2−	1.3 ps *4*
5364.3[a] *12*	35/2−	
5423.5[#] *11*	33/2+	
5535.4[i] *17*	33/2+	
5838.6[@] *11*	35/2+	
5846.4[&] *10*	35/2+	
5947.3[k] *12*	39/2−	
6266.2[a] *13*	39/2−	
6278.3[#] *11*	37/2+	
6354.0[i] *14*	37/2+	
6688.0[&] *11*	39/2+	
6712.1[k] *13*	43/2−	
6741.4[@] *12*	39/2+	
7214.6[#] *12*	41/2+	
7247.1[i] *13*	41/2+	
7249.2[a] *14*	43/2−	
7610.0[&] *12*	43/2+	
7680.7[k] *14*	47/2−	
7699.5[@] *13*	43/2+	
8198.4[i] *12*	45/2+	
8213.6[#] *14*	45/2+	
8296.2[a] *14*	47/2−	
8347.6 *14*	47/2−	
8586.3[k] *15*	51/2−	
8613.6[&] *12*	47/2+	

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^{58}Ni(^{58}Ni,3pγ) 2001St16,2003Pe10 (continued)

^{113}I Levels (continued)

E(level)[‡]	Jπ[†]
8738.6[@] *15*	47/2+
9229.7[i] *13*	49/2+
9279.6[#] *16*	49/2+
9496.6[a] *14*	51/2−
9611.0[k] *16*	55/2−
9686.6[&] *13*	51/2+
10332.7[i] *14*	53/2+
10767.2[a] *15*	55/2−
10834.3[&] *14*	55/2+
11066.9[k] *19*	59/2−
11510.1[i] *17*	57/2+
12083.4[&] *18*	59/2+
12120.1[a] *18*	59/2−
12769.5[i] *20*	61/2+
12990.5[k] *21*	63/2−
13414.8[&] *20*	63/2+
13554.5[a] *24*	63/2−
14117.4[i] *22*	65/2+
14841.4[&] *23*	67/2+
14993[a] *3*	67/2−
15559.3[i] *24*	69/2+
16366.9[&] *25*	71/2+
16436[a] *4*	71/2−
17104[i] *3*	73/2+
17990[a] *4*	75/2−
18005[&] *3*	75/2+
18756[i] *3*	77/2+
19670[a] *3*	79/2−
19773[&] *3*	79/2+
20523[i] *3*	81/2+
21514[a] *3*	83/2−
21688[&] *3*	83/2+
22419[i] *4*	85/2+
23498[a] *4*	87/2−
23561 *4*	87/2−
23764[&] *4*	87/2+
24459[i] *4*	89/2+
25743[a] *4*	91/2−
26005[&] *4*	91/2+
26660[i] *4*	93/2+
28185[a] *5*	(95/2−)[§]
28432[&] *5*	95/2+
29039[i] *4*	97/2+
31013[&] *5*	(99/2)+
31621[i] *5*	(101/2)+
x[c]	(53/2−)
11.9+x *15*	
992+x[b] *3*	(57/2−)
1098.0+x[c] *10*	(57/2−)
2176+x[b] *3*	(61/2−)
2218.8+x[c] *15*	(61/2−)
3392.5+x[c] *18*	(65/2−)
3433+x[b] *3*	(65/2−)
3518.7+x *18*	
4737.3+x[c] *20*	(69/2−)
4773.8+x[b] *24*	(69/2−)
4913.3+x *20*	
6184.8+x[c] *22*	(73/2−)
6230.6+x[b] *22*	(73/2−)
6344.7+x *23*	
7778.2+x[c] *25*	(77/2−)
7857.7+x[b] *25*	(77/2−)
9537+x[c] *3*	(81/2−)
9644+x[b] *3*	(81/2−)
11540+x[c] *3*	(85/2−)
11615+x[b] *3*	(85/2−)
13772+x[b] *4*	(89/2−)
13837+x[c] *4*	(89/2−)
13903+x *4*	(89/2−)
y[d]	(59/2−)
1235.5+y[d] *10*	(63/2−)
2579.5+y[d] *15*	(67/2−)
4032.9+y[d] *18*	(71/2−)
5624.1+y[d] *20*	(75/2−)
7355.6+y[d] *23*	(79/2−)
9261.4+y[d] *25*	(83/2−)
11310+y *4*	(87/2−)
11375+y[d] *4*	(87/2−)
z[e]	(53/2+)
19.0+z *15*	
45.5+z *15*	
1258.0+z[e] *10*	(57/2+)
2553.1+z[e] *15*	(61/2+)
3933.8+z[e] *18*	(65/2+)
5438.3+z[e] *20*	(69/2+)
7101.0+z[e] *23*	(73/2+)
8970.8+z[e] *25*	(77/2+)
11090+z[e] *4*	(81/2+)
u[f]	(63/2−)
1543.7+u[f] *10*	(67/2−)
3173.4+u[f] *15*	(71/2−)
4915.6+u[f] *18*	(75/2−)
6782.5+u[f] *20*	(79/2−)
8822+u[f] *3*	(83/2−)
11025+u[f] *4*	(87/2−)
v[g]	(55/2+)
1360.6+v[g] *10*	(59/2+)
2839.0+v[g] *15*	(63/2+)
4418.2+v[g] *18*	(67/2+)
6102.5+v[g] *20*	(71/2+)
7873.5+v[g] *23*	(75/2+)
9817.5+v[g] *25*	(79/2+)
11930+v[g] *4*	(83/2+)
w[h]	(77/2−)
1680.5+w[h] *10*	(81/2−)
3458.7+w[h] *15*	(85/2−)
5329.3+w[h] *18*	(89/2−)
7301.4+w[h] *20*	(93/2−)
9403+w[h] *3*	(97/2−)
11659+w[h] *4*	(101/2−)
14092+w[h] *4*	(105/2−)

† Assignments for several bands are based on theoretical calculations.
‡ From least-squares fit to Eγ's (by evaluators).
§ From figure 1 of 2001St16.
\# (A): α=+1/2, based on 5/2+, ΔJ=2, [10,0].
@ (B): α=−1/2, based on 11/2+, ΔJ=2, [10,0].
& (C): α=−1/2, based on 35/2+, ΔJ=2, [22,4].
a (D): α=+1/2, based on 31/2−, ΔJ=2, [22,3].
b (E): Based on (57/2−), ΔJ=2, [22,3].
c (F): Based on (53/2−), ΔJ=2,[22,3].
d (G): Based on (59/2−), ΔJ=2, [22,3].
e (H): Based on (53/2+), ΔJ=2, [21,3].
f (I): Based on (63/2−), ΔJ=2, [21,4].
g (J): Based on (55/2+), ΔJ=2, [21,3].
h (K): Based on (77/2−), ΔJ=2, [22,3(01)].
i (L): Based on 25/2+, ΔJ=2, [22,4].
j (M): Based on 11/2−, ΔJ=2, [01,0].
k (N): Based on 31/2−, ΔJ=2, [01,2].
l (O): Based on 7/2+, ΔJ=2, [00,0].

^{58}Ni(^{58}Ni,3pγ) 2001St16,2003Pe10 (continued)

γ(^{113}I)

E(level)	Eγ	Iγ	Mult.	Comments
63.6	63.6			Eγ: from level energy difference.
629.4	565.7 5	31.7 2	M1,E2	DCO=0.9 1.
	629.2 5	47.6 10	E2	Iγ: uncertainty of 0.1 given by 2001St16 seems too low; increased to 1.0 by compilers. DCO=1.0 1.
753.9	690.4 5	20.0 2	E2	DCO=0.98 4.
838.2	774.3 10	1.7 2	M1,E2	
	838.0 10	1.6 2	E2	
909.3	846.0 5	2.7 2	M1,E2	
	909.4 5	1.6 2	E2	
1017.9	179.8 5	4.7 5	E1	DCO=0.65 6. B(E1)(W.u.)=1.4×10^{-5} 4.
	263.9 5	23.9 9	E1	DCO=1.3 2. B(E1)(W.u.)=2.3×10^{-5} 6.
	388.4 5	75 3	E1	DCO=0.53 5, 0.65 3. B(E1)(W.u.)=2.2×10^{-5} 6.
1269.1	360.0 5	8.4 6	M1,E2	DCO=0.74 6.
1548.7	530.8 5	100 3	E2	B(E2)(W.u.)=83 5.
1614.4	345.4 5	6.6 4	M1,E2	DCO=0.73 6.
	705.4 8	0.7 2	E2	
	775.0 10	1.1 2	E2	
	984.5 10	0.5 2	E2	
1616.7	862.8 5	19.5 14	E2	DCO=1.09 6.
1986.6	372.0 10	4.1 12	M1,E2	DCO=0.75 5.
	717.6 5	3.1 3	E2	
2186.4	637.7 5	95 3	E2	DCO=0.97 8, 0.99 5. B(E2)(W.u.)=103 11.
2358.7	372.4 10	2.8 12	M1,E2	DCO=0.75 5.
	744.0 10	2.7 5	E2	DCO=0.95 8 for 744.0+744.4+747.0.
2684.9	1068.3 5	20.1 9	E2	DCO=1.03 6.
2731.2	373.0 10	2.9 11	M1,E2	DCO=0.75 5 for six lines from 372.0 to 375.4.
	744.4 10	2.8 6	E2	DCO=0.95 8 for 744.0+744.4+747.0.
2870.3	683.6 5	78.7 25	E2	DCO=0.94 10, 0.97 5. B(E2)(W.u.)=63 11.
3035.6	165.1 5	2.2 2	M1,E2	DCO=0.86 8.
	848.6 5	10.4 10	E2	DCO=1.01 6.
3106.2	375.0 10	2.7 11	M1,E2	DCO=0.75 5 for six lines from 372.0 to 375.4.
	747.0 10	2.7 4	E2	DCO=0.95 8 for 744.0+744.4+747.0.
3306.6	271.0 6	0.5 1	M1,E2	
	1120.1 9	2.0 2	E2	
3480.9	374.0 10	2.3 11	M1,E2	DCO=0.75 5 for six lines from 372.0 to 375.4.
	750.0 10	2.4 5	E2	
3568.9	884.0 5	7.5 4	E2	
3696.2	825.7 5	61.8 20	E2	DCO=0.92 12, 1.05 10. B(E2)(W.u.)=70 30.
3741.1	705.6 5	12.9 9	E2	DCO=1.02 6.
	870.9 6	2.2 5	E2	
3766.8	1081.7 5	2.3 4	E2	
3792.0	1107.3 5	1.2 4	E2	
3861.1	380.0 10	3.3 3	M1,E2	
	755.0 10	1.4 5	E2	
4113.3	806.6 6	2.6 4	E2	
4236.4	375.4 10	2.2 11	M1+E2	DCO=0.75 5 for six lines from 372.0 to 375.4.
	755.4 10	2.4 7	E2	
4396.1	604.3 5	1.2 2	E2	
	629.1 5	2.1 3	E2	
4497.0	756.0 5	10.7 7	E2	B(E2)(W.u.)=13 4.
	800.6 5	42.7 14	E2	DCO=0.97 12, 1.04 9. B(E2)(W.u.)=39 11.
4630.0	516.6 5	2.5 2	E2	
	889.1 5	3.9 2	E2	
	933.9 5	13.4 7	E2	DCO=0.92 18, 1.00 8.
4630.4	394.0 5	3.2 2	M1,E2	

Continued on next page (footnotes at end of table)

$^{58}Ni(^{58}Ni,3p\gamma)$ 2001St16,2003Pe10 (continued)

$\gamma(^{113}I)$ (continued)

E(level)	Eγ	Iγ	Mult.	Comments
4630.4	769.0 *10*	1.3 *2*	E2	
4798.6	670.7 *10*	0.8 *2*	E2	
5015.4	385.0 *5*	1.7 *2*	M1,E2	
	779.0 *10*	2.4 *2*	E2	
5081.6	685.6 *5*	2.4 *6*	E2	DCO=1.0 *2*.
5211.8	582.0 *5*	19.8 *8*	E2	DCO=0.91 *15*, 1.02 *8*. B(E2)(W.u.)=76 *24*.
	714.5 *5*	32.4 *12*	E2	DCO=1.09 *12*, 0.97 *9*. B(E2)(W.u.)=45 *14*.
5364.3	867.2 *5*	10.1 *5*	E2	DCO=0.93 *9*.
5423.5	408.0 *5*	1.9 *2*	M1,E2	
	793.0 *10*	1.3 *2*	E2	
5535.4	736.8 *10*	0.8 *6*	E2	
5838.6	415.0 *5*	2.1 *2*	M1,E2	
	823.0 *10*	1.4 *4*	E2	
5846.4	423.3 *10*	0.3 *2*	M1,E2	
	764.8 *5*	2.3 *4*	E2	DCO=1.0 *2*.
	831.3 *10*	0.4 *1*	E2	
5947.3	735.5 *5*	52.7 *17*	E2	DCO=0.94 *12*, 1.01 *8*.
6266.2	901.9 *5*	6.7 *3*	E2	
6278.3	439.6 *5*	1.6 *2*	M1,E2	
	854.6 *10*	1.3 *1*	E2	
6354.0	818.6 *10*	0.8 *2*	E2	
6688.0	841.9 *5*	2.2 *2*	E2	
	849.1 *10*	0.5 *2*	E2	
6712.1	764.8 *5*	41.8 *13*	E2	DCO=0.93 *14*, 1.03 *10*.
6741.4	463.0 *5*	1.7 *2*	M1,E2	
	902.6 *10*	0.7 *2*	E2	DCO=0.97 *9*.
7214.6	473.0 *10*	1.2 *1*	M1,E2	
	936.0 *10*	1.1 *1*	E2	
7247.1	505.8 *10*	0.3 *2*	M1,E2	
	893.1 *5*	0.9 *2*	E2	
7249.2	983.0 *5*	5.8 *3*	E2	DCO=0.98 *9*.
7610.0	922.1 *5*	3.1 *2*	E2	
7680.7	968.6 *5*	32.3 *10*	E2	DCO=0.97 *14*, 1.08 *10*.
7699.5	485.0 *10*	0.7 *1*	M1,E2	
	958.0 *10*	0.3 *2*	E2	
8198.4	589.2 *10*	0.4 *1*	M1,E2	
	951.3 *5*	1.1 *1*	E2	
	983.0 *10*	0.2 *1*	E2	
8213.6	514.0 *10*	0.3 *2*	M1,E2	
	999.0 *10*	1.0 *2*	E2	
8296.2	1046.9 *5*	3.0 *2*	E2	
8347.6	1098.5 *5*	3.2 *2*	E2	
8586.3	905.6 *5*	21.1 *7*	E2	DCO=0.96 *10*.
8613.6	1003.6 *5*	3.1 *2*	E2	DCO=1.0 *2*.
8738.6	525.0 *10*	0.3 *2*	M1,E2	
	1039.0 *10*	0.5 *2*	E2	
9229.7	616.0 *10*	0.2 *1*	M1,E2	
	1031.3 *5*	1.6 *2*	E2	
9279.6	541.0 *10*	0.2 *2*	M1,E2	
	1066.0 *10*	0.3 *2*	E2	
9496.6	1149.1 *3*	2.4 *2*	E2	
	1200.4 *5*	1.9 *1*	E2	
9611.0	1024.7 *5*	12.0 *4*	E2	DCO=1.09 *10*.
9686.6	1073.0 *5*	2.8 *2*	E2	
10332.7	1103.0 *5*	1.6 *2*	E2	
10767.2	1270.5 *5*	1.9 *1*	E2	
10834.3	1147.7 *5*	2.2 *2*	E2	
11066.9	1455.9 *10*	11.1 *11*	E2	
11510.1	1177.4 *10*	1.8 *2*	E2	
12083.4	1249.1 *10*	0.5 *1*	E2	
12120.1	1352.9 *10*	1.5 *2*	E2	

Continued on next page (footnotes at end of table)

$^{58}Ni(^{58}Ni,3p\gamma)$ 2001St16,2003Pe10 (continued)

$\gamma(^{113}I)$ (continued)

E(level)	Eγ	Iγ	Mult.
12769.5	1259.4 *10*	1.7 *2*	E2
12990.5	1923.6 *10*	2.1 *3*	E2
13414.8	1331.4 *10*	0.6 *1*	E2
13554.5	1434.4 *15*	1.3 *2*	E2
14117.4	1347.9 *10*	1.6 *2*	E2
14841.4	1426.6 *10*	0.5 *1*	E2
14993	1438.5 *15*	1.3 *2*	E2
15559.3	1441.9 *10*	1.3 *2*	E2
16366.9	1525.5 *10*	0.4 *1*	E2
16436	1443.0 *15*	0.8 *2*	E2
17104	1544.8 *10*	1.2 *2*	E2
17990	1554.0 *10*	0.8 *2*	E2
18005	1638.2 *10*	0.4 *1*	E2
18756	1651.8 *10*	1.1 *2*	E2
19670	1680.4 *10*	0.7 *2*	E2
19773	1767.7 *10*	0.4 *1*	E2
20523	1766.9 *10*	0.9 *2*	E2
21514	1844.2 *10*	0.4 *1*	E2
21688	1915.3 *10*	0.3 *1*	E2
22419	1895.8 *10*	0.6 *2*	E2
23498	1984.1 *10*	0.2 *1*	E2
23561	2046.6 *20*	0.2 *1*	E2
23764	2075.8 *10*	0.2 *1*	E2
24459	2039.9 *10*	0.4 *1*	E2
25743	2181.6 *20*	0.1 *1*	E2
	2244.5 *20*	0.1 *1*	E2
26005	2241.2 *20*	0.2 *1*	E2
26660	2201.0 *10*	0.2 *1*	E2
28185	2442.2† *20*	0.1 *1*	E2
28432	2426.6 *20*	0.1 *1*	E2
29039	2379.5 *20*	0.2 *1*	E2
31013	2581.1† *20*	0.1 *1*	E2
31621	2582.0† *20*	0.2 *1*	E2
1098.0+x	1086.1 *10*	1.2 *2*	E2
	1098.0 *10*	1.1 *2*	E2
2176+x	1184.1 *10*	0.8 *2*	E2
2218.8+x	1120.8 *10*	1.7 *4*	E2
3392.5+x	1173.7 *10*	1.4 *2*	E2
3433+x	1257.4 *10*	0.7 *2*	E2
3518.7+x	1299.9 *10*	0.3 *2*	
4737.3+x	1344.8 *10*	1.3 *2*	E2
4773.8+x	1340.6 *10*	0.6 *1*	E2
4913.3+x	1394.6 *10*	0.3 *2*	
6184.8+x	1410.0 *20*	0.3 *2*	E2
	1447.8 *10*	1.2 *2*	E2
6230.6+x	1457.1 *10*	0.6 *1*	E2
	1493.0 *10*	0.2 *1*	E2
6344.7+x	1431.4 *10*	0.2 *1*	
7778.2+x	1593.3 *10*	0.9 *2*	E2
7857.7+x	1627.1 *10*	0.6 *1*	E2
9537+x	1758.4 *10*	0.5 *1*	E2
9644+x	1786.4 *10*	0.4 *1*	E2
11540+x	2003.2 *10*	0.2 *1*	E2
11615+x	1970.8 *10*	0.3 *1*	E2
13772+x	2156.9 *20*	0.2 *2*	E2
13837+x	2296.9 *20*	0.1 *1*	E2
13903+x	2363.0 *20*	0.1 *1*	E2
1235.5+y	1235.5 *10*	0.5 *2*	E2
2579.5+y	1344.0 *10*	0.6 *2*	E2
4032.9+y	1453.4 *10*	0.5 *1*	E2
5624.1+y	1591.2 *10*	0.5 *1*	E2
7355.6+y	1731.4 *10*	0.4 *1*	E2
9261.4+y	1905.8 *10*	0.3 *1*	E2
11310+y	2049.0 *20*	0.1 *1*	E2
11375+y	2113.1 *20*	0.1 *1*	E2
1258.0+z	1212.5 *10*	0.5 *1*	E2
	1239.0 *10*	0.3 *1*	E2
	1258.0 *10*	0.3 *1*	E2
2553.1+z	1295.1 *10*	1.0 *1*	E2
3933.8+z	1380.7 *10*	1.0 *1*	E2
5438.3+z	1504.5 *10*	0.9 *1*	E2
7101.0+z	1662.7 *10*	0.5 *1*	E2
8970.8+z	1869.7 *10*	0.3 *1*	E2
11090+z	2118.9 *20*	0.2 *1*	E2
1543.7+u	1543.7 *10*	0.3 *1*	E2
3173.4+u	1629.6 *10*	0.3 *1*	E2
4915.6+u	1742.2 *10*	0.3 *1*	E2
6782.5+u	1866.9 *10*	0.3 *1*	E2
8822+u	2039.4 *20*	0.3 *1*	E2
11025+u	2202.9 *20*	0.2 *1*	E2
1360.6+v	1360.6 *10*	0.2 *1*	E2
2839.0+v	1478.4 *10*	0.3 *1*	E2
4418.2+v	1579.2 *10*	0.4 *1*	E2
6102.5+v	1684.3 *10*	0.3 *1*	E2
7873.5+v	1770.9 *10*	0.3 *1*	E2
9817.5+v	1944.0 *10*	0.2 *1*	E2
11930+v	2112.3 *20*	0.1 *1*	E2
1680.5+w	1680.5 *10*	0.2 *1*	E2
3458.7+w	1778.1 *10*	0.3 *1*	E2
5329.3+w	1870.6 *10*	0.4 *1*	E2
7301.4+w	1972.1 *10*	0.4 *1*	E2
9403+w	2101.2 *20*	0.3 *1*	E2
11659+w	2256.7 *20*	0.2 *1*	E2
14092+w	2432.7 *20*	0.1 *1*	E2

† Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Q(β⁻)=–10390 *130*; S(n)=10200 *130*; S(p)=2290 *SY*; Q(α)=3090 *50* 2003Au03.
Production and identification: 290–MeV ^{58}Ni on ^{58}Ni. Chemical and mass separation (1978Ro19,1979Sc22). 600–MeV p on cerium. Chemical and mass separation (1973Ha37). p on lanthanum, 290–MeV ^{58}Ni on ^{58}Ni. Chemical and mass separation (1979Ew02).

^{113}Xe Levels

Cross Reference (XREF) Flags

A ^{58}Ni(^{58}Ni,2pnγ)

E(level)[†§]	Jπ[‡]	XREF	$T_{1/2}$	Comments
0.0[c]	(5/2+)	A	2.74 s *8*	%ε+%β⁺≈100; %α≈0.011; %εp=7 *4*; %β⁺α≈0.007 *4*. %α: from 1985Ti02, based on estimated limit for the reduced width. εp and β+α derived from εp/α=500–1500 in 1985Ti02. Other: εp=4.2 (1978Ro19). E(level): tentative g.s. assignment for 2.8–s activity (1973Ha37), the proton–to–α intensity in β–delayed particle is 830 *50* (1979Ew02). $T_{1/2}$: from 1985Ti02. Other: 2.8 s *2* (1973Ha37). Jπ: tentative Jπ from syst.
125.91[d] *18*	7/2+	A		
146.19[c] *18*	5/2+	A		
404.8[&] *4*	11/2−	A		
549.09[c] *20*	9/2+	A		
711.14[d] *23*	11/2+	A		
820.0[&] *4*	15/2−	A		
1242.17[c] *23*	13/2+	A		
1472.34[d] *25*	15/2+	A		
1476.3[&] *3*	19/2−	A		
2023.2[c] *3*	17/2+	A		
2141.8[a] *3*	17/2+	A		
2285.1[e] *3*	19/2+	A		
2301.9[&] *4*	23/2−	A		
2378.6[d] *3*	19/2+	A		
2393.3 *11*		A		
2542.1[a] *3*	21/2+	A		
2787.6[c] *4*	21/2+	A		
2968.1[d] *3*	23/2+	A		
3022.4[e] *4*	23/2+	A		
3067.6[a] *4*	25/2+	A		
3242.5[&] *5*	27/2−	A		
3288.5[c] *4*	25/2+	A		
3288.6 *5*	25/2−	A		
3584.6[e] *4*	27/2+	A		
3587.2[a] *4*	29/2+	A		
3604.9[d] *4*	27/2+	A		
4241.7[#] *5*	31/2−	A		
4263.5[a] *5*	33/2+	A		
4277.1[e] *5*	31/2+	A		
4277.6[&] *5*	31/2−	A		
4315.2[d] *4*	31/2+	A		
5028.2[b] *5*	(33/2+)	A		
5069.4[#] *5*	35/2−	A		
5092.4[a] *5*	37/2+	A		
5097.8[e] *5*	35/2+	A		
5149.8 *5*	35/2+	A		
5166.5 *5*	35/2−	A		
5389.6[&] *5*	(35/2−)	A		
5610.6[b] *5*	(37/2+)	A		
6040.6[#] *6*	39/2−	A		
6077.1[a] *6*	(41/2+)	A		
6218.5[b] *5*	(41/2+)	A		
6646.5 *6*		A		
6661.6[&] *6*	(39/2−)	A		
6957.5[b] *6*	(45/2+)	A		
7109.2[#] *6*	43/2−	A		
7243.4[a] *6*	(45/2+)	A		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{113}Xe Levels (continued)

E(level)[†§]	Jπ[‡]	XREF
7832.4[b] *6*	(49/2+)	A
7845.6[@] *6*	(43/2−)	A
8098.6[&] *6*	(43/2−)	A
8341.3[#] *21*	(47/2−)	A
8566.4[a] *21*	(49/2+)	A
8896.1[b] *6*	(53/2+)	A
9189.6[@] *7*	(47/2−)	A
9711.3[#] *21*	(51/2−)	A
10084.1[b] *7*	(57/2+)	A
10694.6[@] *7*	(51/2−)	A
11513.1[b] *7*	(61/2+)	A
12473.6[@] *7*	(55/2−)	A
13218.1[b] *7*	(65/2+)	A

[†] From least–squares fit to Γ energies.
[‡] From the deduced transitions multipolarities and band assignments.
[§] From least–squares fit to Eγ's.
[#] (A): Band based on 31/2−.
[@] (B): Band based on (43/2−).
[&] (C): ν3/2[541] band, α=−1/2.
[a] (D): Band based on 17/2+.
[b] (E): Band based on (33/2+).
[c] (F): ν5/2[413] band, α=+1/2.
[d] (G): ν5/2[413] band, α=−1/2.
[e] (H): Band based on 19/2+.

γ(^{113}Xe)

E(level)	Eγ	Iγ	Mult.[†]	Comments
125.91	126.0 *2*	100	M1,E2	
146.19	146.1 *2*	100	M1,E2	
549.09	402.8 *2*	40	E2	
	423.3 *2*	100	M1,E2	
711.14	585.2 *2*	100	E2	
820.0	415.2 *2*	100	E2	
1242.17	530.8 *2*	45		
	693.1 *2*	100	E2	
1472.34	230.0 *2*	19	M1,E2	
	761.4 *2*	100	E2	
1476.3	656.7 *2*	100	E2	
2023.2	551.0 *2*	8	M1,E2	
	780.8 *2*	100	E2	
2141.8	899.8 *2*	100	E2	
	1321.3 *2*	20	E1	
2285.1	812.8 *2*	100	E2	
2301.9	825.6 *2*	100	E2	
2378.6	355.6 *2*	41	M1+E2	
	906.1 *2*	100	E2	
2393.3	917			
2542.1	163.7 *2*	31	M1,E2	
	256.9 *2*	9	M1,E2	
	400.1 *2*	56	E2	
	518.6 *2*	51	E2	
	1066.3 *2*	100	E1	
2787.6	764.4 *2*	100	E2	
2968.1	589.3 *2*	31	E2	
	683.7 *2*	100	E2	Eγ: level–energy difference=683.2.
3022.4	736.7 *2*	100	E2	
3067.6	525.5 *2*	100	E2	
3242.5	940.6 *2*	100	E2	
3288.5	500.9 *2*	100	E2	
3288.6	986.7 *2*	100		
3584.6	562.2 *2*	100	E2	
3587.2	519.6 *2*	100	E2	
3604.9	581.9 *2*	20	E2	
	637.4 *2*	100	E2	
4241.7	999.2 *2*	100	E2	
4263.5	676.3 *2*	100	E2	
4277.1	692.5 *2*	100	E2	

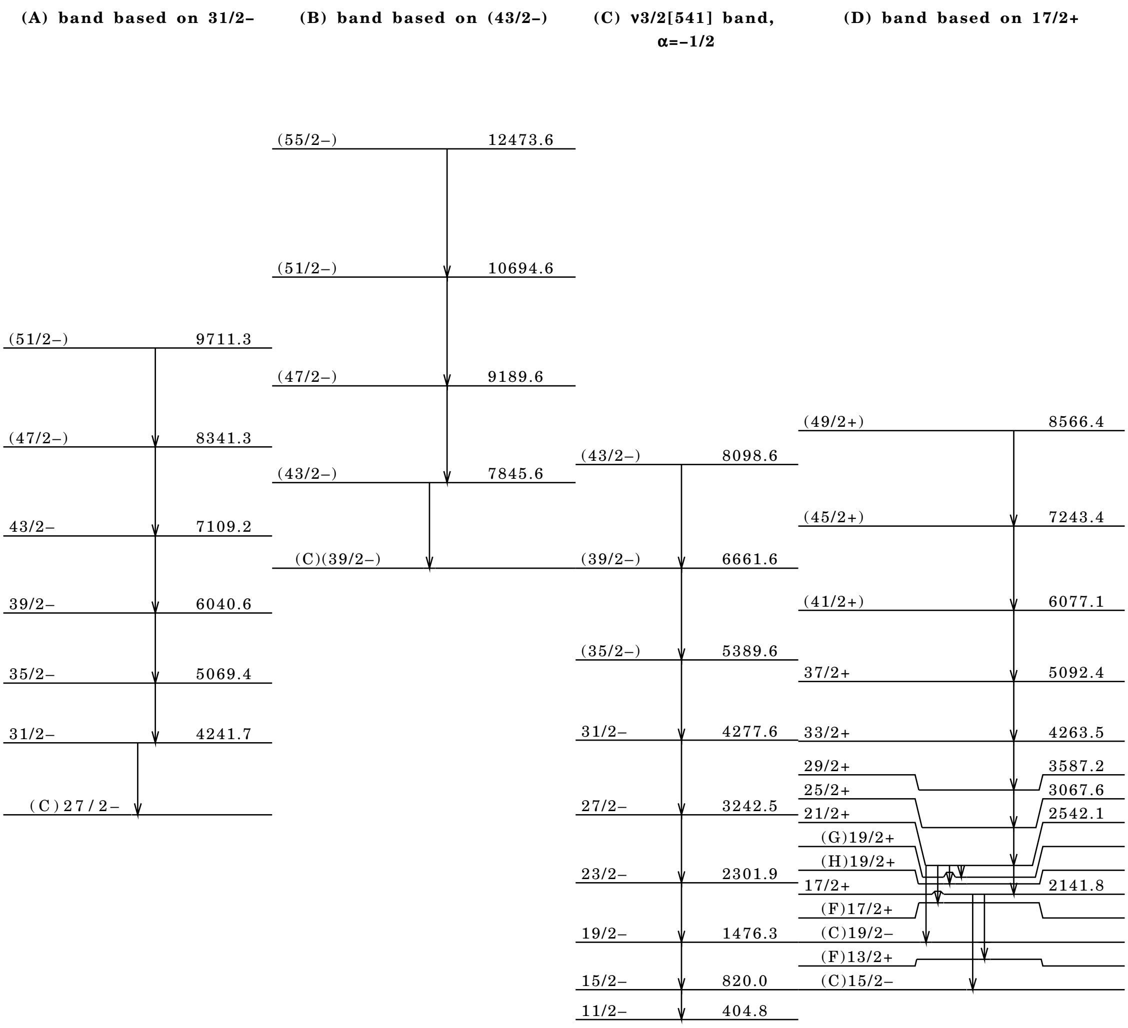
Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

γ(^{113}Xe) (continued)

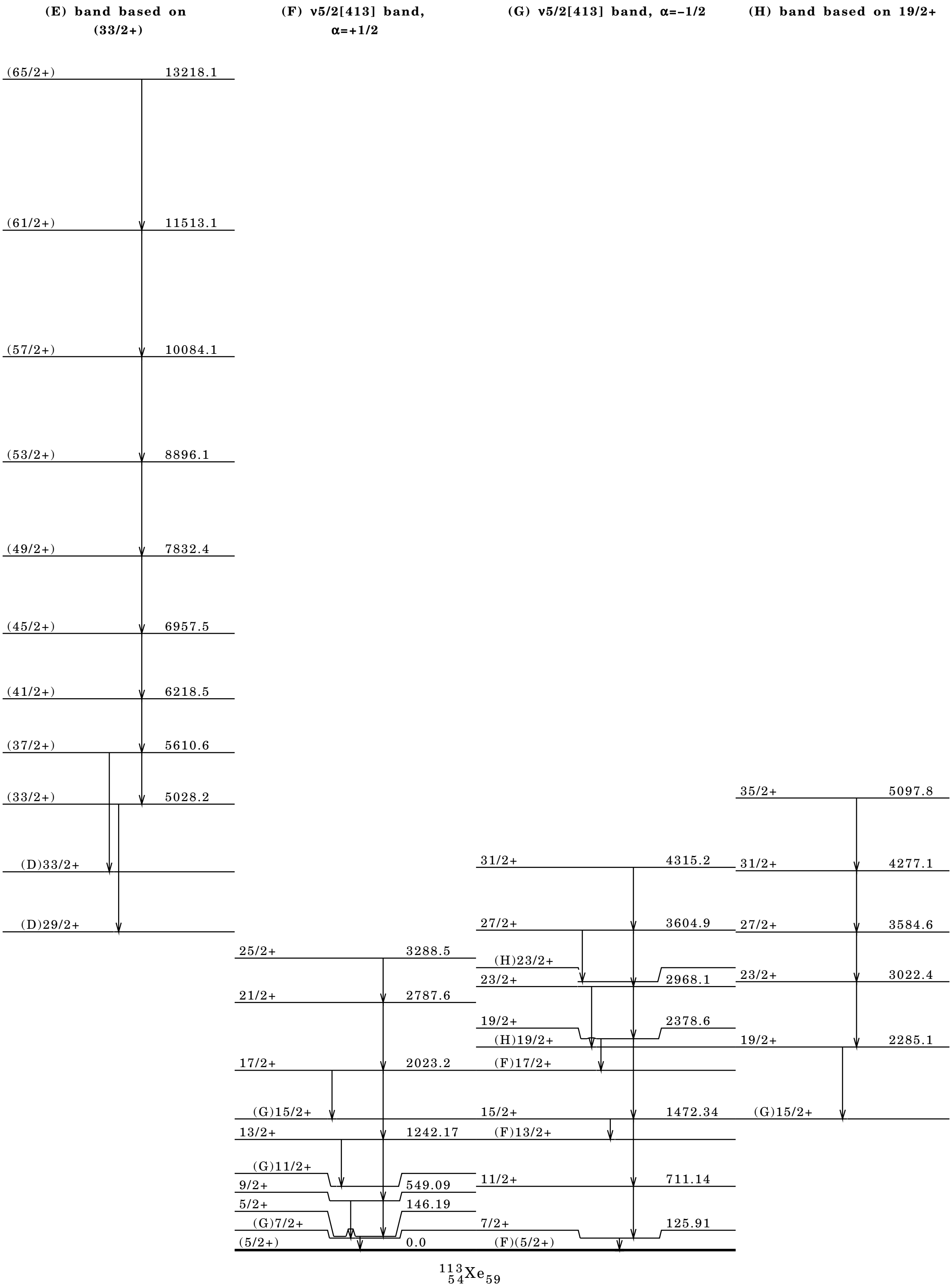
E(level)	Eγ	Iγ	Mult.†
4277.6	1035.1 2	100	E2
4315.2	710.3 2	100	E2
5028.2	1441.0 2		
5069.4	827.7 2	100	E2
5092.4	828.9 2	100	E2
5097.8	820.7 2	100	E2
5149.8	872.7 2	100	E2
5166.5	924.8 2	100	E2
5389.6	1112.0 2	100	
5610.6	582.4 2		E2
	1347.0 2		
6040.6	971.2 2	100	E2
6077.1	984.6 2	100	E2
6218.5	607.9 2	100	E2
6646.5	605.9 2	100	
6661.6	1272.0 2		
6957.5	739.0 2	100	E2
7109.2	1068.6 2		
7243.4	1166.3 2	100	E1
7832.4	874.9 2	100	E2
7845.6	1184.0 2	100	
8098.6	1437.0 2	100	
8341.3	1232 2	100	
8566.4	1323 2	100	E1
8896.1	1063.7 2	100	
9189.6	1344.0 2	100	
9711.3	1370.0 2	100	
10084.1	1188.0 2	100	
10694.6	1505.0 2	100	
11513.1	1429.0 2	100	
12473.6	1779.0 2	100	
13218.1	1705.0 2	100	

† From DCO Measurements.



$^{113}_{54}Xe_{59}$

Adopted Levels, Gammas (continued)



^{58}Ni(^{58}Ni,2pnγ) 2000Sc23

E=210 and 250 MeV. At a beam energy of 210, measured Eγ, Iγ, γγ, and γγ(θ)(R) using the JUROSPHERE spectrometer equipped with 7 TESSA–type, 5 NORDBALL–type and 14–EUROGRAM type HPGe detectors. At beam energy of 250 MeV, measured Eγ, Iγ, γγ and γγ(θ)(R) using GAMMASPHERE spectrometer consisting of 83 HPGe detectors, used in conjunction with MICROBALL and neutron detector.

Preliminary data was given by 1995Pa01. They show Band C up to 35/2–.

^{113}Xe Levels

E(level)[†]	Jπ	E(level)[†]	Jπ	E(level)[†]	Jπ
0.0[a]	5/2+	3242.5[#] *5*	27/2–	6218.5[&] *5*	(41/2+)
125.91[b] *18*	7/2+	3288.5[a] *4*	25/2+	6646.5 *6*	
146.19[a] *18*	5/2+	3288.6 *5*	25/2–	6661.6[#] *6*	(39/2–)
404.8[#] *4*	11/2–	3584.6[c] *4*	27/2+	6957.5[&] *6*	(45/2+)
549.09[a] *20*	9/2+	3587.2[@] *4*	29/2+	7109.2[‡] *6*	43/2–
711.14[b] *23*	11/2+	3604.9[b] *4*	27/2+	7243.4[@] *6*	(45/2+)
820.0[#] *4*	15/2–	4241.7[‡] *5*	31/2–	7832.4[&] *6*	(49/2+)
1242.17[a] *23*	13/2+	4263.5[@] *5*	33/2+	7845.6[§] *6*	(43/2–)
1472.34[b] *25*	15/2+	4277.1[c] *5*	31/2+	8098.6[#] *6*	(43/2–)
1476.3[#] *3*	19/2–	4277.6[#] *5*	31/2–	8341.3[‡] *21*	(47/2–)
2023.2[a] *3*	17/2+	4315.2[b] *4*	31/2+	8566.4[@] *21*	(49/2+)
2141.8[@] *3*	17/2+	5028.2[&] *5*	(33/2+)	8896.1[&] *6*	(53/2+)
2285.1[c] *3*	19/2+	5069.4[‡] *5*	35/2–	9189.6[§] *7*	(47/2–)
2301.9[#] *4*	23/2–	5092.4[@] *5*	37/2+	9711.3[‡] *21*	(51/2–)
2378.6[b] *3*	19/2+	5097.8[c] *5*	35/2+	10084.1[&] *7*	(57/2+)
2393.3 *11*		5149.8 *5*	35/2+	10694.6[§] *7*	(51/2–)
2542.1[@] *3*	21/2+	5166.5 *5*	35/2–	11513.1[&] *7*	(61/2+)
2787.6[a] *4*	21/2+	5389.6[#] *5*	(35/2–)	12473.6[§] *7*	(55/2–)
2968.1[b] *3*	23/2+	5610.6[&] *5*	(37/2+)	13218.1[&] *7*	(65/2+)
3022.4[c] *4*	23/2+	6040.6[‡] *6*	39/2–		
3067.6[@] *4*	25/2+	6077.1[@] *6*	(41/2+)		

[†] From least–squares fit to Eγ's.
[‡] (A): Band based on 31/2–.
[§] (B): Band based on (43/2–).
[#] (C): ν3/2[541] band, α=–1/2.
[@] (D): Band based on 17/2+.
[&] (E): Band based on (33/2+).
[a] (F): ν5/2[413] band, α=+1/2.
[b] (G): ν5/2[413] band, α=–1/2.
[c] (H): Band based on 19/2+.

γ(^{113}Xe)

R=Angular intensity ratio (from several spectra gated by low–spin quadrupole transitions).

E(level)	Eγ	Iγ[†]	Mult.	Comments
125.91	126.0 *2*	51	M1,E2	R=0.72 *3*.
146.19	146.1 *2*	8.9	M1,E2	R=0.62 *4*.
549.09	402.8 *2*	9.0	E2	R=1.12 *16*.
	423.3 *2*	22.4	M1,E2	R=0.52 *2*.
711.14	585.2 *2*	50	E2	R=1.13 *5*.
820.0	415.2 *2*	100	E2	R=1.02 *3*.
1242.17	530.8 *2*	6.9		
	693.1 *2*	15.3	E2	R=0.97 *3*.
1472.34	230.0 *2*	4.4	M1,E2	R=0.64 *8*.
	761.4 *2*	23.0	E2	R=1.02 *6*.
1476.3	656.7 *2*	62.6	E2	R=1.02 *4*.
2023.2	551.0 *2*	1.2	M1,E2	R=0.65 *1*.
	780.8 *2*	14.5	E2	R=1.03 *5*.
2141.8	899.8 *2*	4.9	E2	R=1.13 *9*.
	1321.3 *2*	1.0	E1	Dc0=0.67 *8*.
2285.1	812.8 *2*	15.9	E2	R=1.12 *6*.
2301.9	825.6 *2*	53.0	E2	R=1.25 *3*.
2378.6	355.6 *2*	2.6	M1,E2	R=0.72 *8*.
	906.1 *2*	6.3	E2	R=0.98 *7*.

Continued on next page (footnotes at end of table)

^{58}Ni(^{58}Ni,2pnγ) 2000Sc23 (continued)

γ(^{113}Xe) (continued)

E(level)	Eγ	Iγ†	Mult.	Comments
2393.3	917			
2542.1	163.7 2	5.1	M1,E2	R=0.56 3.
	256.9 2	1.5	M1,E2	R=0.79 8.
	400.1 2	9.2	E2	R=0.95 4.
	518.6 2	8.3	E2	R=0.97 3.
	1066.3 2	16.4	E1	R=0.60 4.
2787.6	764.4 2	10.6	E2	R=1.06 5.
2968.1	589.3 2	3.8	E2	R=1.03 10.
	683.7 2	12.4	E2	Eγ: level–energy difference=683.2. R=1.09 4.
3022.4	736.7 2	11.9	E2	R=0.92 5.
3067.6	525.5 2	43.6	E2	R=1.02 4.
3242.5	940.6 2	10.5	E2	R=1.19 7.
3288.5	500.9 2	2.4	E2	R=1.19 9.
3288.6	986.7 2	7.0		R=0.64 5.
3584.6	562.2 2	6.2	E2	R=1.01 8.
3587.2	519.6 2	34.3	E2	R=1.03 4.
3604.9	581.9 2	7.1	E2	R=0.89 10.
	637.4 2	35.4	E2	R=1.22 4.
4241.7	999.2 2	7.8	E2	R=1.10 13.
4263.5	676.3 2	21.9	E2	R=1.1] 3.
4277.1	692.5 2	10.6	E2	R=1.20 14.
4277.6	1035.1 2	1.6	E2	R=1.10 8.
4315.2	710.3 2	3.5	E2	R=0.92 14.
5028.2	1441.0 2			
5069.4	827.7 2	8.4	E2	R=1.15 8.
5092.4	828.9 2	12.2	E2	R=0.92 4.
5097.8	820.7 2	3.0	E2	R=0.89 9.
5149.8	872.7 2	2.1	E2	R=0.96 5.
5166.5	924.8 2	1.2	E2	R=0.90 8.
5389.6	1112.0 2			
5610.6	582.4 2	2.3	E2	R=0.92 7.
	1347.0 2			
6040.6	971.2 2	6.9	E2	R=0.89 6.
6077.1	984.6 2	4.9	E2	R=1.15 6.
6218.5	607.9 2	4.9	E2	R=1.40 12.
6646.5	605.9 2	2.6		R=0.86 4.
6661.6	1272.0 2			
6957.5	739.0 2	1.2	E2	R=0.83 8.
7109.2	1068.6 2			
7243.4	1166.3 2	16.4	E1	R=0.60 4.
7832.4	874.9 2	1.2	E2	R=1.19 14.
7845.6	1184.0 2			
8098.6	1437.0 2			
8341.3	1232 2			
8566.4	1323 2	1.0	E1	R=0.67 8.
8896.1	1063.7 2			
9189.6	1344.0 2			
9711.3	1370.0 2			
10084.1	1188.0 2			
10694.6	1505.0 2			
11513.1	1429.0 2			
12473.6	1779.0 2			
13218.1	1705.0 2			

† Uncertainties are less than 5%.

Adopted Levels

S(n)=13480 *SY*; S(p)=−974 *3*; Q(α)=3484 *7* 2003Au03.
Production and identification:
250 MeV ^{58}Ni on ^{58}Ni (1987Gi02).
Analyzed by a gas−detector system in a backward position during the beam pause.
The identification is based on the fact that the ^{116}Ba compound nucleus with low excitation energy allows only 2 channels: p2n giving ^{113}Cs and αp2n giving ^{109}I. The proton line of ^{109}I has another energy. It can be produced by ^{54}Fe(^{58}Ni,p2n).
Preliminary $T_{1/2}$ measurement of 1 μs (1984Fa04) was not confirmed in the last experiment (1987Gi02) with better statistics and new results of 1994Pa12.

^{113}Cs Levels

E(level)	Jπ	$T_{1/2}$	Comments
0.0	(3/2+)	16.7 μs *7*	%p=100; %α=0. %α from 1994Pa12. $T_{1/2}$: from 1998Ba13. Others: 17 μs *2* (1994Pa12), 28 μs *7* (1995Ho26). Jπ: from 2000Bb02. However, a 1/2+ assignment is also possible (1998Ma42). E(p)=960 keV 3, Q(p)=978 keV 3 (1995Ho26), B(p)=1, $T_{1/2}$(p)=16.7 μs *7*. Other E(p)=959 *6* (1994Pa12). σ≈30 μb (1987Gi02). Jπ: from shell model (1987Gi02).

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