Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. W. Reich	NDS 110, 2257 (2009)	1-May-2008

S(n)=13441 (syst) *424*; S(p)=1586 (syst) *335*; Q(α)=3543 (syst) *424* 2017Wa10
Q(ε)=7045 (syst) *358*; S(2p)=978 (syst) *335*; Q(εp)=7249 (syst) *358* 2017Wa10
Additional information 1.
Additional information 2.
The data on the excited states are all from the study of the ^{154}Hf IT decay (1993Mc03,1989Mc07).

^{154}Hf Levels

Cross Reference (XREF) Flags

- A ^{154}Hf IT decay (9 μs)
- B ^{155}Ta p decay
- C ^{158}W α decay (1.25 ms)
- D ^{158}W α decay (0.143 ms)

E(level)†	Jπ‡	$T_{1/2}$	XREF	Comments
0	0^+	2 s *1*	ABCD	%ε+%$β^+$≈100; %α≈0 $T_{1/2}$: from growth and decay characteristics of its daughter, ^{154}Yb, in α decay studies (1981Ho10). %ε+%$β^+$: estimated by evaluators from failure to observe α decay (1981Ho10) and the agreement of deduced half-life of 2 s with the estimate for ε+$β^+$ decay of 1-3 s (1973Ta30). α systematics suggest %α≈2×10^{-11}. From theoretical calculations, 1997Mo25 estimate $T_{1/2}$=0.479 s.
1513	(2^+)		A	
2011	(3^-)		A	
2146	(5^-)		A	
2457	(7^-)		A	
2671	(8^+)#		A	
2671+x	(10^+)@	9 μs *4*	A	%IT=100

† The ordering of the γ's and thus the level energies are based on the systematics of the levels in the lighter-mass N=82 nuclides ^{148}Dy, ^{150}Er and ^{154}Yb (see the ^{154}Hf IT decay data set).
‡ Based on the systematics of the lighter-mass doubly even N=82 nuclides.
# Configuration=$(\pi\ h_{11/2})^6(\pi\ h_{11/2})^2_{8+}$, seniority=2.
@ Configuration=$(\pi\ h_{11/2})^6(\pi\ h_{11/2})^2_{10+}$, seniority=2.

γ(^{154}Hf)

E_i(level)	J^π_i	E_γ	E_f	J^π_f	Mult.	Comments
1513	(2^+)	1513	0	0^+		
2011	(3^-)	498	1513	(2^+)		
2146	(5^-)	135	2011	(3^-)		
2457	(7^-)	311	2146	(5^-)		
2671	(8^+)	214	2457	(7^-)		
2671+x	(10^+)	x	2671	(8^+)	[E2]	B(E2)(W.u.)=0.051 *+42−15* E_γ: x=42 *28* from 1989Mc07 and based on systematics.

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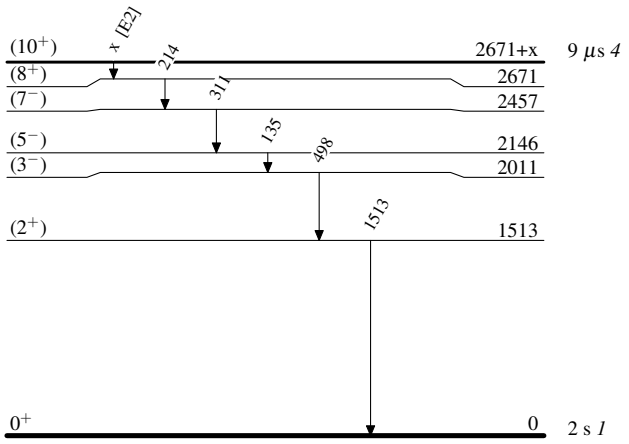
Adopted Levels, Gammas (continued)

$\gamma(^{154}Hf)$ (continued)

E_i(level)	E_γ	Comments
		value.

Adopted Levels, Gammas

Level Scheme



$^{154}_{72}Hf_{82}$

Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Update	Balraj Singh	ENSDF	31-Mar-2015

Q(β^-)=−5070 *40*; S(n)=9040 *40*; S(p)=5861 *25*; Q(α)=2754 *25* 2012Wa38
S(2n)=16290 *40*, S(2p)=10215 *25* (2012Wa38).

Additional information 1.

Cross section data for ^{176}Yb(α,xnγ): 1992Ro24 (E=threshold−84.3 MeV), 1983Ma32 (E=50-120 MeV).

Nuclear structure calculations: 1994Ze07, 1994Ze06, 1994Sa13, 1994Ja03, 1992Wu05, 1992Sa16, 1991Su08, 1991Ha11, 1991Ha09, 1991Ch49, 1989Hu05, 1988Ku21, 1987Ku24, 1987Ba82, 1984El04, 1981Mi07, 1980Xu01, 1980Ku01, 1980Du05, 1980An13, 1979Li04, 1979Ha44, 1978Ab07, 1977Mo03, 1976Ra04, 1976Mo31, 1974St06, 1972Wa14, 1972Sk04, 1972Pr17, 1971Gu20, 1971Fr02, 1964Ha44.

^{172}Hf Levels

g factor=+0.14 *4* (1975Sk01) for levels above 8^+, 1037 and $T_{1/2}\approx$0.5 ps. Technique: IMPAC.

While the triaxiality in SD bands is not ruled out, it remains unclear whether the SD bands observed in ^{172}Hf should be associated with a triaxial SD minimum as suggested by UC (ultimate cranker code) calculations or with a near-prolate SD minimum suggested by the CRMF calculations in ^{175}Hf.

Cross Reference (XREF) Flags

A	^{172}Hf IT decay (163 ns)	D	^{181}Ta(π^-,9nγ)
B	^{172}Ta ε decay (36.8 min)	E	Yb(α,xnγ)
C	^{128}Te(^{48}Ca,4nγ):SD	F	(HI,xnγ)

E(level)†	Jπ‡	$T_{1/2}$	XREF	Comments
0.0#	0^+	1.87 y *3*	AB DEF	%ε=100 $T_{1/2}$: from 1971Ch57. Others:1.90 y *30* (1973Or02), ≈5 y (1960Na11,1951Wi08). $\Delta<r^2>(^{172}Hf-^{178}Hf)=-0.242$ fm^2 *16* (isotope-shift measurement,1992Ri04).
95.22# *4*	2^+	1.55 ns *10*	AB DEF	μ=0.50 *10* (2009Be42) g=0.25 *5* (2009Be42) μ: from g factor=0.25 *5*, weighted average of 0.23 *6* and 0.28 *8* at two different magnetic fields (2009Be42), perturbed angular correlation in a magnetic field. Jπ: E2 γ to g.s. $T_{1/2}$: (95γ)(214γ)(t) (1967Ab06).
309.24# *5*	4^+		AB DEF	Jπ: ΔJ=2, E2 γ to 2^+.
628.33# *7*	6^+		AB DEF	Jπ: ΔJ=2, E2 γ to 4^+.
871.30@ *12*	0^+		B	Jπ: E0 transition to g.s.
952.43@ *8*	2^+		B	Jπ: E0+M1+E2 γ to 2^+.
1031.06 *18*	(4^+,5,6^+)		B	Jπ: γ's to 4^+ and 6^+.
1037.47# *8*	8^+		A DEF	μ=1.1 *3* (1989Ra17) Jπ: ΔJ=2, E2 γ to 6^+. μ: Transient magnetic field IMPAC, average value for prerotational states above 1037-keV 8^+ level.
1075.29& *8*	$(2)^+$		B	Jπ: M1,E2 γ to g.s. Possible γ-band bandhead.
1129.52@ *10*	4^+		B E	Jπ: E0+M1+E2 γ to 4^+.
1180.87& *8*	(3^+)		B	Jπ: (E2) γ to 2^+, γ to 4^+ and E1 γ from (4^-).
1295.6 *4*	0^+		B	Jπ: E0 transition to g.s.

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Adopted Levels, Gammas (continued)

^{172}Hf Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$	XREF	Comments
1304.66[&] *9*	(4+)		AB F	Jπ: γ's to 2+ and 4+, γ from (6+).
1335.66[a] *11*	0+		B	Jπ: E0 transition to g.s.
1359.33 *14*	(2+,3,4+)		B	Jπ: γ's to 2+ and 4+.
1372.85? *7*			B	Jπ: possible 2− state similar to that in ^{176}Hf and ^{178}W (1973Ca10).
1394.0 *3*			E	
1397.48[a] *7*	2+		B	Jπ: E0+M1+E2 γ's to 2+.
1418.55[b] *7*	(4−)	≈1 ns	B EF	Jπ: ΔJ=(0), (E1) γ to 4+. $T_{1/2}$: from γ(t) (1977HaXK).
1462.88[&] *13*	(5+)		AB F	Jπ: γ's to 4+ and 6+. Possible band member.
1471.73 *8*	(4+,5)		B	Jπ: γ's to 4+ and 6+. Possible ε feeding from (3−).
1482.27 *7*	(2+,3,4+)		B	Jπ: γ's to 2+ and 4+.
1495.78 *7*	(2 to 5)		B	Jπ: γ's to 4+. Possible γ to (2)+ disfavors J=5,6. Possible ε feeding from (3−).
1503.51[c] *7*	(5−)		AB EF	Jπ: ΔJ=1 γ to 4+, γ to 6+.
1521.22[#] *10*	10+		DEF	Jπ: ΔJ=2, E2 γ to 8+.
1534.3?[a] *4*	(4+)		B	Jπ: (E0+M1+E2) γ to 4+.
1574.9 *2*	(2+,3,4+)		B	Jπ: γ's to 2+ and 4+.
1597.62[b] *9*	(6−)		A EF	Jπ: ΔJ=(2) γ to (4−), γ to (5−).
1600.63 *8*	4+		B	Jπ: E0+M1+E2 γ to 4+.
1621.5[&] *2*	(6+)		A F	
1639.69 *7*	(3−)		B	Jπ: M1+E2 γ to (4−), γ to 2+.
1677.0 *3*	(6,7,8+)		E	Jπ: γ to 6+.
1684.46 *7*	(2 to 5)		B	Jπ: γ to 4+. Possible ε feeding from (3−) suggests 2,3,4,5+.
1684.73[d] *9*	(6+)	4.8 ns *4*	A EF	μ=+5.6 *6* (1989Ra17,1980Wa23) The γ-ray branching ratios suggest that there are two separate levels within ≈0.2 keV near this energy, one populated in ^{172}Ta ε decay and the other in (HI,xnγ) and (α,xnγ). Jπ: γ's to 4+ and 8+. A 2-quasiparticle isomer with $J^\pi=6^+$ is observed from ^{170}Hf to ^{182}Hf (1977Wa16). Possible configuration=((π 7/2[404])(π 5/2[402])). $T_{1/2}$: from γ(t) (1980Wa23). Others: 4.5 ns *10* (1976HaXB), ≤16 ns (1977Wa16). $T_{1/2}$>200 ns (1973Re16) corresponds to that of the 2006 level. μ: from γ(θ,H,t) (1980Wa23).
1722.8? *3*	(6,7,8+)		F	Jπ: γ to 6+.
1727.49[c] *11*	(7−)		A EF	Jπ: ΔJ=(1) γ to 6+, γ to 8+.
1738.9 *3*	(8,9,10+)		E	Jπ: γ to 8+.
1791.04 *19*	(2+,3,4+)		B	Jπ: γ's to 2+ and 4+.
1852.48[b] *11*	(8−)		EF	Jπ: ΔJ=(2) γ to (6−), γ to (7−).
1856.78[f] *12*	(6−)	<16 ns	A EF	Jπ: γ's to (6+) and (5−). γ from (8−). Possible 2-quasineutron with configuration=((ν 7/2[633])(ν 5/2[512])) (1994Wa07). $T_{1/2}$: from γ(t) (1977Wa16).
1878.16[d] *12*	(7+,8+,9+)		A EF	Jπ: (E1) γ from (8−).
1965.15[f] *15*			EF	
1968.09[c] *13*	(9−)		EF	Jπ: ΔJ=1 γ to 8+, γ to 10+ and possible ΔJ=(2) γ to (7−).
2005.84[e] *11*	(8−)	163 ns *3*	A EF	μ=+7.95 *7* (1989Ra17,1980Wa23) Jπ: γ's to 8+, (6+) and (6−). A 2-quasiparticle isomer with $J^\pi=8^-$ is observed from ^{170}Hf to ^{182}Hf (1977Wa16). Possible configuration=((π 7/2[404])(π 9/2[514])). $T_{1/2}$: from γ(t) (1980Wa23). Others: 155 ns *20* from γγ(t) in (α,xnγ) (1976HaXC); 163 ns *6* in (HI,xnγ) (1977Wa16). μ: γ(θ,H,t) in (α,xnγ)(1980Wa23). The corrections for diamagnetism and

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Adopted Levels, Gammas (continued)

^{172}Hf Levels (continued)

E(level)[†]	Jπ[‡]	XREF	Comments
			Knight shift are not included.
2034.4[g] *3*	(8,9,10$^+$)	E	Jπ: γ to 8$^+$.
2064.67[#] *13*	12$^+$	DEF	Jπ: ΔJ=2, E2 γ to 10$^+$.
2093.68[d] *19*	(8$^+$)	F	
2095.5[f] *2*		EF	
2155.5 *4*		E	Jπ: γ to 10$^+$.
2186.28[b] *14*	(10$^-$)	EF	Jπ: ΔJ=(2) γ to (8$^-$).
2235.94[e] *14*		EF	
2246.5[f] *2*		F	
2329.83[d] *24*	(9$^+$)	F	
2336.94[c] *13*	(11$^-$)	EF	Jπ: ΔJ=(2), (E2) γ to (9$^-$) and ΔJ=1 γ to 10$^+$.
2416.40[f] *23*		EF	
2426.36[g] *23*		EF	
2450.80 *22*	(2$^+$,3,4$^+$)	B	Jπ: γ's to 2$^+$ and 4$^+$.
2488.20[e] *16*		EF	
2584.6[d] *4*	(10$^+$)	F	
2598.26[b] *17*	(12$^-$)	EF	
2607.7 *10*		E	
2611.91[f] *25*		EF	
2654.11[#] *16*	14$^+$	DEF	Jπ: ΔJ=2, E2 γ to 12$^+$.
2760.25[e] *18*		EF	
2777.50[c] *20*	(13$^-$)	EF	Jπ: ΔJ=(2) γ to (11$^-$) and ΔJ=1 γ to 12$^+$.
2823.1[f] *3*		F	
2855.2[d] *5*	(11$^+$)	F	
2900.4[g] *4*		EF	
3050.23[e] *21*		EF	
3060.0[f] *3*		F	
3085.50[b] *23*	(14$^-$)	EF	
3277.20[#] *19*	(16$^+$)	DEF	Jπ: ΔJ=2, (E2) γ to 14$^+$.
3285.7[c] *3*	(15$^-$)	EF	Jπ: ΔJ=(2) γ to (13$^-$).
3305.1[f] *4*		F	
3355.75[e] *23*		F	
3449.0[g] *6*		EF	
3643.1[b] *3*	(16$^-$)	EF	
3673.0[e] *3*		F	
3858.1[c] *4*	(17$^-$)	EF	Jπ: ΔJ=2, (E2) γ to (15$^-$).
3919.4[#] *3*	(18$^+$)	EF	Jπ: ΔJ=2, E2 γ to (16$^+$).
3997.4[e] *4*		F	
4061.8[g] *7*		F	
4264.2[b] *5*	(18$^-$)	EF	
4492.3[c] *5*	(19$^-$)	F	Jπ: ΔJ=2, (E2) γ to (17$^-$).
4575.9[#] *6*	(20$^+$)	EF	Jπ: ΔJ=2, (E2) γ to (18$^+$).
4730.8[g] *12*		F	
4942.1[b] *5*	(20$^-$)	F	
5183.9[c] *5*	(21$^-$)	F	Jπ: ΔJ=(2) γ to (19$^-$).
5274.3[#] *6*	(22$^+$)	F	Jπ: ΔJ=2, (E2) γ to (20$^+$).
5670.2[b] *7*	(22$^-$)	F	
5931.0[c] *7*	(23$^-$)	F	Jπ: ΔJ=(2) γ to (21$^-$).

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Adopted Levels, Gammas (continued)

^{172}Hf Levels (continued)

E(level)[†]	Jπ[‡]	XREF	Comments
6032.3[#] *8*	(24+)	F	Jπ: ΔJ=(2) γ to (22+).
6445.2?[b] *13*	(24−)	F	
6724.9[c] *9*	(25−)	F	
6849.0[#] *9*	(26+)	F	Jπ: ΔJ=(2) γ to (24+).
7275.2[b] *16*	(26−)	F	
7312.1[c] *10*	(27−)	F	
7724.7[#] *11*	(28+)	F	Jπ: ΔJ=(2) γ to (26+).
8106.4[c] *10*	(29−)	F	
8149.2[b] *19*	(28−)	F	
8642.7[#] *15*	(30+)	F	
8954.3[c] *10*	(31−)	F	
9070.2[b] *22*	(30−)	F	
9600.7[#] *18*	(32+)	F	
9860.0[c] *11*	(33−)	F	
10594.7[#] *20*	(34+)	F	
10823.0[c] *15*	(35−)	F	
11611.7[#] *23*	(36+)	F	
11841.0[c] *18*	(37−)	F	
12643.7[#] *25*	(38+)	F	
x[h]	J	A	
776+x[h]	J+2	A	
1589+x[h]	J+4	A	
2447+x[h]	J+6	A	
3356+x[h]	J+8	A	
4317+x[h]	J+10	A	
5335+x[h]	J+12	A	
6414+x[h]	J+14	A	
7553+x[h]	J+16	A	
8756+x[h]	J+18	A	
10024+x[h]	J+20	A	
11356+x[h]	J+22	A	
12753+x[h]	J+24	A	
14212+x[h]	J+26	A	
y[i]	J1	A	
793+y[i]	J1+2	A	
1633+y[i]	J1+4	A	
2519+y[i]	J1+6	A	
3451+y[i]	J1+8	A	
4433+y[i]	J1+10	A	
5470+y[i]	J1+12	A	
6563+y[i]	J1+14	A	
7712+y[i]	J1+16	A	
8914+y[i]	J1+18	A	
10156+y[i]	J1+20	A	
11443+y[i]	J1+22	A	
z[j]	J2	A	
877+z[j]	J2+2	A	

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Adopted Levels, Gammas (continued)

^{172}Hf Levels (continued)

E(level)†	Jπ‡	XREF	E(level)†	Jπ‡	XREF	E(level)†	Jπ‡	XREF
1809+z[j]	J2+4	A	4936+z[j]	J2+10	A	8603+z[j]	J2+16	A
2795+z[j]	J2+6	A	6097+z[j]	J2+12	A	9951+z[j]	J2+18	A
3833+z[j]	J2+8	A	7319+z[j]	J2+14	A	11364+z[j]	J2+20	A

† From least-squares fit to Eγ data, 0.2 or 1 keV uncertainty on Eγ values when not given.
‡ For levels populated in (HI,xnγ) and/or (α,xnγ), ascending spins are assumed as the excitation energy increases. When no γ(θ) or γγ(θ) data are available, J^{π}'s are tentative and are based on probable band assignments to levels observed in a cascade of γ-ray transitions. In such cases no J^{π} arguments are given.
# Band(A): (π=+,α=0) g.s. band.
@ Band(B): $K^{\pi}=0^{+}$ band.
& Band(C): $K^{\pi}=2^{+}$ γ band.
a Band(D): $K^{\pi}=0^{+}$ band.
b Band(E): (π=−,α=0) band.
c Band(F): (π=−,α=1) band.
d Band(G): ΔJ=(1), $K^{\pi}=(6^{+})$ band.
e Band(H): ΔJ=(1), $K^{\pi}=(8^{-})$ band.
f Band(I): band 1, ΔJ=(1).
g Band(J): band 2, ΔJ=(2).
h Band(K): SD-1 band. Q(transition)=13.6 *9* (2011Mu02) from DSAM measurements. Percent population=0.7 *2* (2007Zh46).
i Band(L): SD-2 band. Q(transition)=11.6 *10* (2011Mu02) from DSAM measurements. Percent population=0.5 *1* (2007Zh46).
j Band(M): SD-3 band. F(τ) curve was obtained for four members of this band, but due to low intensity it could not be fitted well to obtain quadrupole moment. Percent population=0.4 *1* (2007Zh46).

Adopted Levels, Gammas (continued)

$\gamma(^{172}Hf)$

No linking transitions between SD bands were found, thus no indication of wobbling mode in these bands.

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	α[&]	$I_{(\gamma+ce)}$	Comments
95.22	2^+	95.23 *4*	100	0.0	0^+	E2[†‡]	4.34		B(E2)(W.u.)=154 *11*
309.24	4^+	214.02 *4*	100	95.22	2^+	E2[†]	0.232		
628.33	6^+	319.09 *4*	100	309.24	4^+	E2[†‡]	0.067		
871.30	0^+	776.08 *11*	100 *2*	95.22	2^+	(E2)[‡]			
		871.5 *10*		0.0	0^+	E0[‡]		2.8 *4*	X(E0/E2)=0.121 *18* (1973Ca10).
952.43	2^+	643.26 *13*	52 *2*	309.24	4^+				
		857.21 *10*	100 *3*	95.22	2^+	E0+M1+E2[‡]	0.058 *3*		X(E0/E2)=0.156 *21* (1973Ca10).
		952.25 *17*	44 *2*	0.0	0^+				
1031.06	$(4^+,5,6^+)$	402.0 *8*	63 *9*	628.33	6^+				
		721.90 *20*	100 *12*	309.24	4^+				
1037.47	8^+	409.16 *4*	100	628.33	6^+	E2[†]			
1075.29	$(2)^+$	980.01 *10*	100.0 *14*	95.22	2^+				
		1075.30 *12*	94.2 *23*	0.0	0^+	M1,E2[‡]			
1129.52	4^+	500.7 *10*	24 *4*	628.33	6^+				
		820.44 *13*	100 *4*	309.24	4^+	E0+M1+E2[‡]	0.062 *3*		X(E0/E2)=0.154 *32* (1973Ca10).
		1034.39 *21*	64 *3*	95.22	2^+				
1180.87	(3^+)	872.1 *7*	18 *7*	309.24	4^+				
		1085.58 *9*	100 *3*	95.22	2^+	(E2)[‡]			
1295.6	0^+	424.7 *5*		871.30	0^+	E0[‡]		22 *4*	
		1199.8 *5*	100 *15*	95.22	2^+				
		1296.2 *10*		0.0	0^+	E0[‡]		74 *7*	X(E0/E2)=19 *4* (1973Ca10).
1304.66	(4^+)	995.50 *15*	100 *6*	309.24	4^+				
		1209.9 *5*	73 *30*	95.22	2^+				
1335.66	0^+	260.6[a] *10*	7 *7*	1075.29	$(2)^+$	[E2]	0.123		
		382.6 *4*	19 *2*	952.43	2^+				
		464.1 *5*		871.30	0^+	E0[‡]		7.2 *3*	
		1240.49 *10*	100 *5*	95.22	2^+				
		1334.5 *12*		0.0	0^+	E0[‡]		20.8 *13*	X(E0/E2)=6.0 *7* (1973Ca10).
1359.33	$(2^+,3,4^+)$	1050.06 *14*	100 *3*	309.24	4^+				
		1264.2 *4*	89 *6*	95.22	2^+				
1372.85?		1277.62[a] *5*	100	95.22	2^+				
1394.0		765.7	100	628.33	6^+				
1397.48	2^+	445.0 *4*	23 *4*	952.43	2^+	E0+M1+E2[‡]	0.20 *3*		
		1302.25 *5*	100 *3*	95.22	2^+	E0+M1+E2[‡]	0.098 *3*		
		1398.0[a] *5*	3 *3*	0.0	0^+				

Adopted Levels, Gammas (continued)

γ(^{172}Hf) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	δ	α[&]	Comments
1418.55	(4⁻)	113.9[a] *7*	1.5 *15*	1304.66	(4⁺)	[E1]		0.26	B(E1)(W.u.)≈1.74×10⁻⁶
		237.63 *11*	13.4 *3*	1180.87	(3⁺)	E1[‡]		0.038	B(E1)(W.u.)≈1.71×10⁻⁶
		289.29 *15*	11.4 *3*	1129.52	4⁺	[E1]			B(E1)(W.u.)≈8.06×10⁻⁷
		790.8[a] *6*	0.6 *6*	628.33	6⁺	[M2]			B(M2)(W.u.)≈0.015
		1109.27 *9*	100 *4*	309.24	4⁺	(E1)[‡]			B(E1)(W.u.)≈1.25×10⁻⁷
1462.88	(5⁺)	834.3 *2*	62 *25*	628.33	6⁺				
		1153.67 *18*	100 *7*	309.24	4⁺				
1471.73	(4⁺,5)	843.8 *3*	84 *6*	628.33	6⁺				
		1162.47 *6*	100 *11*	309.24	4⁺				
1482.27	(2⁺,3,4⁺)	1172.8 *4*	21 *3*	309.24	4⁺				
		1387.04 *5*	100 *6*	95.22	2⁺				
1495.78	(2 to 5)	366.1 *4*	12.1 *8*	1129.52	4⁺				
		419.7 *9*	≤5	1075.29	(2)⁺				
		1186.54 *5*	100 *4*	309.24	4⁺				
1503.51	(5⁻)	875.5[@] *3*	85[@] *11*	628.33	6⁺				
		1194.25 *5*	100 *7*	309.24	4⁺	D[†]			
		1408.9[a] *10*	4 *4*	95.22	2⁺				E_γ: from ^{172}Ta ε decay only. ΔJ^π requires mult=[E3].
1521.22	10⁺	483.79 *7*	100	1037.47	8⁺	E2[†]			
1534.3?	(4⁺)	1225.1[a] *4*	100	309.24	4⁺	(E0+M1+E2)[‡]		≤0.09	
1574.9	(2⁺,3,4⁺)	1266.0 *5*	100 *6*	309.24	4⁺				
		1479.57 *25*	92 *5*	95.22	2⁺				
1597.62	(6⁻)	94.15 *10*	24 *12*	1503.51	(5⁻)	[M1]			
		179.16 *10*	100 *60*	1418.55	(4⁻)	[E2][#]		0.42	
1600.63	4⁺	1291.39 *6*	100	309.24	4⁺	E0+M1+E2[‡]		0.049 *18*	
1621.5	(6⁺)	993.1	100	628.33	6⁺				
1639.69	(3⁻)	221.13 *15*	16.5 *7*	1418.55	(4⁻)	M1+E2[‡]	0.6 *3*	0.38 *4*	δ: from ce data.
		280.0[a] *6*	2 *2*	1359.33	(2⁺,3,4⁺)				
		335.2 *4*	8.6 *7*	1304.66	(4⁺)				
		458.7 *3*	6.9 *5*	1180.87	(3⁺)				
		564.19 *24*	7.8 *5*	1075.29	(2)⁺				
		1330.41 *6*	100 *4*	309.24	4⁺				
		1544.60 *10*	81 *4*	95.22	2⁺				
1677.0	(6,7,8⁺)	1048.4	100	628.33	6⁺				
1684.46	(2 to 5)	379.79 *20*	43 *3*	1304.66	(4⁺)				
		503.0 *5*	64 *6*	1180.87	(3⁺)				
		653.6[a] *6*	24 *24*	1031.06	(4⁺,5,6⁺)				
		1375.22 *5*	100 *6*	309.24	4⁺				
1684.73	(6⁺)	63.2	≈0.5	1621.5	(6⁺)	[M1]		2.62	B(M1)(W.u.)≈2.5×10⁻⁵
		87.5	4.4 *15*	1597.62	(6⁻)	[E1]		0.51	B(E1)(W.u.)=3.0×10⁻⁶ *11*
		180.9	4.6 *7*	1503.51	(5⁻)	[E1]		0.077	B(E1)(W.u.)=3.5×10⁻⁷ *7*

$^{172}_{72}Hf_{100}$-7

Adopted Levels, Gammas (continued)

γ(^{172}Hf) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	δ	α[&]	Comments
1684.73	(6$^+$)	221.6	1.9 *5*	1462.88	(5$^+$)	[M1]		0.44	B(M1)(W.u.)=8.0×10^{-6} *23*
		380.0	2.7 *6*	1304.66	(4$^+$)	[E2]		0.040	B(E2)(W.u.)=0.0071 *17*
		647.4	4.0 *9*	1037.47	8$^+$				B(E2)(W.u.)=0.00073 *18*
		1056.26 *16*	100 *5*	628.33	6$^+$	D+Q[†]			If M1, B(M1)(W.u.)=3.9×10^{-6} *4*. If E2, B(E2)(W.u.)=0.0016 *2*.
		1375.5 *3*	54 *4*	309.24	4$^+$				B(E2)(W.u.)=0.00023 *3*
1722.8?	(6,7,8$^+$)	1094.46 *25*	100	628.33	6$^+$				
1727.49	(7$^-$)	690.3 *4*	35 *8*	1037.47	8$^+$				
		1099.05 *15*	100 *12*	628.33	6$^+$	D[†]			
1738.9	(8,9,10$^+$)	701.4	100	1037.47	8$^+$				
1791.04	(2$^+$,3,4$^+$)	839.0 *3*	49 *8*	952.43	2$^+$				
		1481.6 *8*	41 *6*	309.24	4$^+$				
		1695.58 *24*	100 *13*	95.22	2$^+$				
1852.48	(8$^-$)	124.98 *10*	25 *7*	1727.49	(7$^-$)	[M1]		2.17	
		175.4 *3*		1677.0	(6,7,8$^+$)				E_γ: from (α,xnγ) only.
		254.86 *10*	100 *50*	1597.62	(6$^-$)	[E2][#]		0.132	
1856.78	(6$^-$)	171.92 *20*	37 *10*	1684.73	(6$^+$)	[E1]		0.087	B(E1)(W.u.)>6.5×10^{-7}
		353.32 *15*	100 *28*	1503.51	(5$^-$)	[M1]		0.123	B(M1)(W.u.)>2.0×10^{-5}
1878.16	(7$^+$,8$^+$,9$^+$)	193.41 *10*	100	1684.73	(6$^+$)	[M1]		0.63	
1965.15		108.27 *10*	100	1856.78	(6$^-$)				
1968.09	(9$^-$)	242.0 *10*	<28	1727.49	(7$^-$)	[E2][#]		0.156	
		447.5 *4*	51 *18*	1521.22	10$^+$				
		930.65 *15*	100 *8*	1037.47	8$^+$	D(+Q)[†]	<0.14		
2005.84	(8$^-$)	127.67 *10*	100	1878.16	(7$^+$,8$^+$,9$^+$)	(E1)[†]		0.19	B(E1)(W.u.)=4.9×10^{-7} *1* Mult.: from α(exp) deduced from delayed γ-ray intensities in (HI,xnγ).
		149.4	0.6 *3*	1856.78	(6$^-$)	[E2]		0.80	B(E2)(W.u.)=0.0038 *19*
		278.2	2.0 *5*	1727.49	(7$^-$)	[M1]		0.23	B(M1)(W.u.)=9.6×10^{-8} *24*
		321.0	2.3 *6*	1684.73	(6$^+$)	[M2]		0.61	B(M2)(W.u.)=0.032 *9*
		408.4	3.3 *11*	1597.62	(6$^-$)	[E2]		0.033	B(E2)(W.u.)=0.00014 *5*
		968.2	1.3 *4*	1037.47	8$^+$	[E1]			B(E1)(W.u.)=1.5×10^{-11} *5*
2034.4	(8,9,10$^+$)	996.9	100	1037.47	8$^+$				
2064.67	12$^+$	543.43 *9*	100	1521.22	10$^+$	E2[†]			
2093.68	(8$^+$)	215.52 *15*	100	1878.16	(7$^+$,8$^+$,9$^+$)				
2095.5		128.3[a]		1968.09	(9$^-$)				E_γ: from (α,xnγ) only.
		130.03 *15*	100 *44*	1965.15					
2155.5		634.3	100	1521.22	10$^+$				
2186.28	(10$^-$)	218.25 *20*	9 *3*	1968.09	(9$^-$)				
		333.79 *10*	100 *4*	1852.48	(8$^-$)	[E2][#]		0.058	
2235.94		230.08 *10*	100	2005.84	(8$^-$)				
2246.5		150.84 *14*	100	2095.5					
		281.8		1965.15					E_γ: from (α,xnγ) only.

$^{172}_{72}Hf_{100}$-8

Adopted Levels, Gammas (continued)

γ(^{172}Hf) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	δ	α[&]	Comments
2329.83	(9$^+$)	236.16 *15*	100	2093.68	(8$^+$)				
2336.94	(11$^-$)	368.7 *2*	75 *3*	1968.09	(9$^-$)	(E2)[†]		0.044	
		815.76 *9*	100 *7*	1521.22	10$^+$	D(+Q)[†]	≈−0.07		
2416.40		169.90 *10*	100	2246.5					
2426.36		391.9		2034.4	(8,9,10$^+$)				E_γ: from (α,xnγ) only.
		905.20 *25*	100	1521.22	10$^+$				
2450.80	(2$^+$,3,4$^+$)	988.9 *10*	42 *9*	1462.88	(5$^+$)				
		1147.2 *5*	36 *9*	1304.66	(4$^+$)				
		1419.8 *4*	93 *75*	1031.06	(4$^+$,5,6$^+$)				
		2141.2 *8*	49 *16*	309.24	4$^+$				
		2355.1 *3*	100 *14*	95.22	2$^+$				
2488.20		252.26 *10*	100 *25*	2235.94					
		482.42 *20*	20 *10*	2005.84	(8$^-$)				
2584.6	(10$^+$)	254.8 *3*	100	2329.83	(9$^+$)				
2598.26	(12$^-$)	411.98 *10*	100	2186.28	(10$^-$)				
2607.7		543[a]	100	2064.67	12$^+$				
2611.91		195.49 *10*	100 *46*	2416.40					
		365.8 *3*	69 *15*	2246.5					
2654.11	14$^+$	589.42 *9*	100	2064.67	12$^+$	E2[†]			
2760.25		272.04 *10*	100 *25*	2488.20					
		524.26 *25*	19 *13*	2235.94					
2777.50	(13$^-$)	440.65 *20*	100 *5*	2336.94	(11$^-$)	[#]			
		712.68 *25*	23 *6*	2064.67	12$^+$	D(+Q)[†]	<0.14		
2823.1		211.23 *15*	100 *50*	2611.91					
		406.5 *3*	70 *30*	2416.40					
2855.2	(11$^+$)	270.6 *3*	100	2584.6	(10$^+$)				
2900.4		474.1 *4*	100 *22*	2426.36		(E2)[†]			
		835.8 *5*	71 *36*	2064.67	12$^+$				
3050.23		289.87 *15*	100 *27*	2760.25					
		562.13 *25*	27 *18*	2488.20					
3060.0		237.02 *20*	86 *43*	2823.1					
		448.0 *3*	100 *43*	2611.91					
3085.50	(14$^-$)	487.24 *15*	100	2598.26	(12$^-$)	[#]			
3277.20	(16$^+$)	623.09 *10*	100	2654.11	14$^+$	(E2)[†]			
3285.7	(15$^-$)	508.2 *2*	100	2777.50	(13$^-$)	[#]			
3305.1		245.2 *3*	44 *22*	3060.0					
		482.0 *3*	100 *44*	2823.1					
3355.75		305.47 *20*	100 *33*	3050.23					
		595.62 *20*	67 *22*	2760.25					
3449.0		548.9 *5*		2900.4					
		794		2654.11	14$^+$				

$^{172}_{72}Hf_{100}$-9

Adopted Levels, Gammas (continued)

γ(^{172}Hf) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.
3643.1	(16$^-$)	557.6 *2*	100	3085.50	(14$^-$)	(E2)†
3673.0		317.62 *25*	100 *40*	3355.75		
		622.6 *3*	100 *40*	3050.23		
3858.1	(17$^-$)	572.4 *3*	100	3285.7	(15$^-$)	(E2)†
3919.4	(18$^+$)	642.2 *2*	100	3277.20	(16$^+$)	E2†
3997.4		324.9 *4*	100 *60*	3673.0		
		641.2 *4*	80 *40*	3355.75		
4061.8		612.8 *4*	100	3449.0		
4264.2	(18$^-$)	621.1 *3*	100	3643.1	(16$^-$)	
4492.3	(19$^-$)	634.2 *2*	100	3858.1	(17$^-$)	(E2)†
4575.9	(20$^+$)	656.5 *5*	100	3919.4	(18$^+$)	(E2)†
4730.8		669	100	4061.8		
4942.1	(20$^-$)	677.9 *2*	100	4264.2	(18$^-$)	#
5183.9	(21$^-$)	691.6 *2*	100	4492.3	(19$^-$)	#
5274.3	(22$^+$)	698.4 *2*	100	4575.9	(20$^+$)	(E2)†
5670.2	(22$^-$)	728.1 *5*	100	4942.1	(20$^-$)	
5931.0	(23$^-$)	747.1 *5*	100	5183.9	(21$^-$)	#
6032.3	(24$^+$)	758.0 *4*	100	5274.3	(22$^+$)	#
6445.2?	(24$^-$)	775.0 *10*	100	5670.2	(22$^-$)	#
6724.9	(25$^-$)	793.9 *5*	100	5931.0	(23$^-$)	
6849.0	(26$^+$)	816.7 *5*	100	6032.3	(24$^+$)	#
7275.2	(26$^-$)	830		6445.2?	(24$^-$)	
7312.1	(27$^-$)	587.2		6724.9	(25$^-$)	
7724.7	(28$^+$)	875.7 *5*	100	6849.0	(26$^+$)	#
8106.4	(29$^-$)	794.3		7312.1	(27$^-$)	
8149.2	(28$^-$)	874		7275.2	(26$^-$)	
8642.7	(30$^+$)	918.0 *10*	100	7724.7	(28$^+$)	
8954.3	(31$^-$)	847.9		8106.4	(29$^-$)	
9070.2	(30$^-$)	921[a]		8149.2	(28$^-$)	
9600.7	(32$^+$)	958		8642.7	(30$^+$)	
9860.0	(33$^-$)	905.7		8954.3	(31$^-$)	
10594.7	(34$^+$)	994		9600.7	(32$^+$)	
10823.0	(35$^-$)	963[a]		9860.0	(33$^-$)	
11611.7	(36$^+$)	1017[a]		10594.7	(34$^+$)	
11841.0	(37$^-$)	1018[a]		10823.0	(35$^-$)	
12643.7	(38$^+$)	1032[a]		11611.7	(36$^+$)	
776+x	J+2	776		x	J	
1589+x	J+4	813		776+x	J+2	
2447+x	J+6	858		1589+x	J+4	
3356+x	J+8	909		2447+x	J+6	
4317+x	J+10	961		3356+x	J+8	
5335+x	J+12	1018		4317+x	J+10	
6414+x	J+14	1079		5335+x	J+12	
7553+x	J+16	1139		6414+x	J+14	
8756+x	J+18	1203		7553+x	J+16	
10024+x	J+20	1268		8756+x	J+18	
11356+x	J+22	1332		10024+x	J+20	
12753+x	J+24	1397		11356+x	J+22	
14212+x	J+26	1459		12753+x	J+24	
793+y	J1+2	793		y	J1	
1633+y	J1+4	840		793+y	J1+2	
2519+y	J1+6	886		1633+y	J1+4	
3451+y	J1+8	932		2519+y	J1+6	
4433+y	J1+10	982		3451+y	J1+8	
5470+y	J1+12	1037		4433+y	J1+10	
6563+y	J1+14	1093		5470+y	J1+12	
7712+y	J1+16	1149		6563+y	J1+14	
8914+y	J1+18	1202		7712+y	J1+16	
10156+y	J1+20	1242[a]		8914+y	J1+18	
11443+y	J1+22	1287[a]		10156+y	J1+20	
877+z	J2+2	877		z	J2	
1809+z	J2+4	932		877+z	J2+2	
2795+z	J2+6	986		1809+z	J2+4	
3833+z	J2+8	1038		2795+z	J2+6	
4936+z	J2+10	1103		3833+z	J2+8	
6097+z	J2+12	1161		4936+z	J2+10	
7319+z	J2+14	1222		6097+z	J2+12	
8603+z	J2+16	1284		7319+z	J2+14	
9951+z	J2+18	1348		8603+z	J2+16	
11364+z	J2+20	1413		9951+z	J2+18	

† From γ(θ) and/or γγ(θ) (DCO) in (HI,xnγ). ΔJ=2 transitions are assigned E2 from RUL (for E2 and M2), assuming timing resolution of a few nanoseconds in γγ coin.

$^{172}_{72}Hf_{100}$-10

Adopted Levels, Gammas (continued)

$\gamma(^{172}Hf)$ (continued)

‡ From ce data in ^{172}Ta ε decay.
# $I\gamma(30°)/I\gamma(90°)$ relative to that of 214γ (assumed E2) is consistent with $\Delta J=2$ transition.
@ From (HI,xnγ). In ^{172}Ta ε decay, the 871.2 γ-ray peak was seen as a wide structure and was interpreted (1973Ca10) as mixed with an impurity. It is possible that the broadening was partly due to 875γ. It is assumed that the 1503 level is the same in the two studies (^{172}Ta ε decay and (HI,xnγ)).
& Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[a] Placement of transition in the level scheme is uncertain.

$^{172}_{72}Hf_{100}$-11

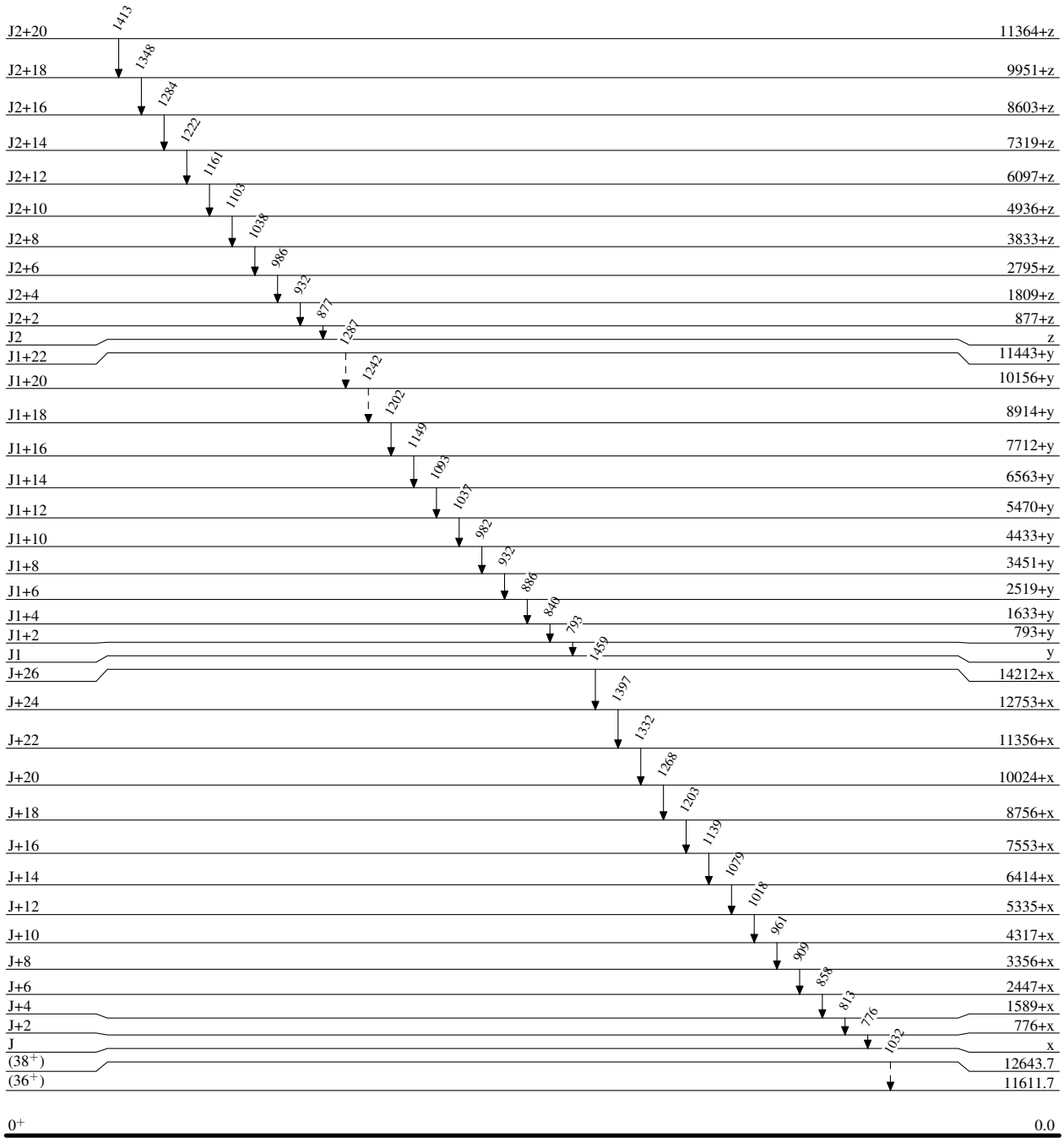
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)



$^{172}_{72}Hf_{100}$

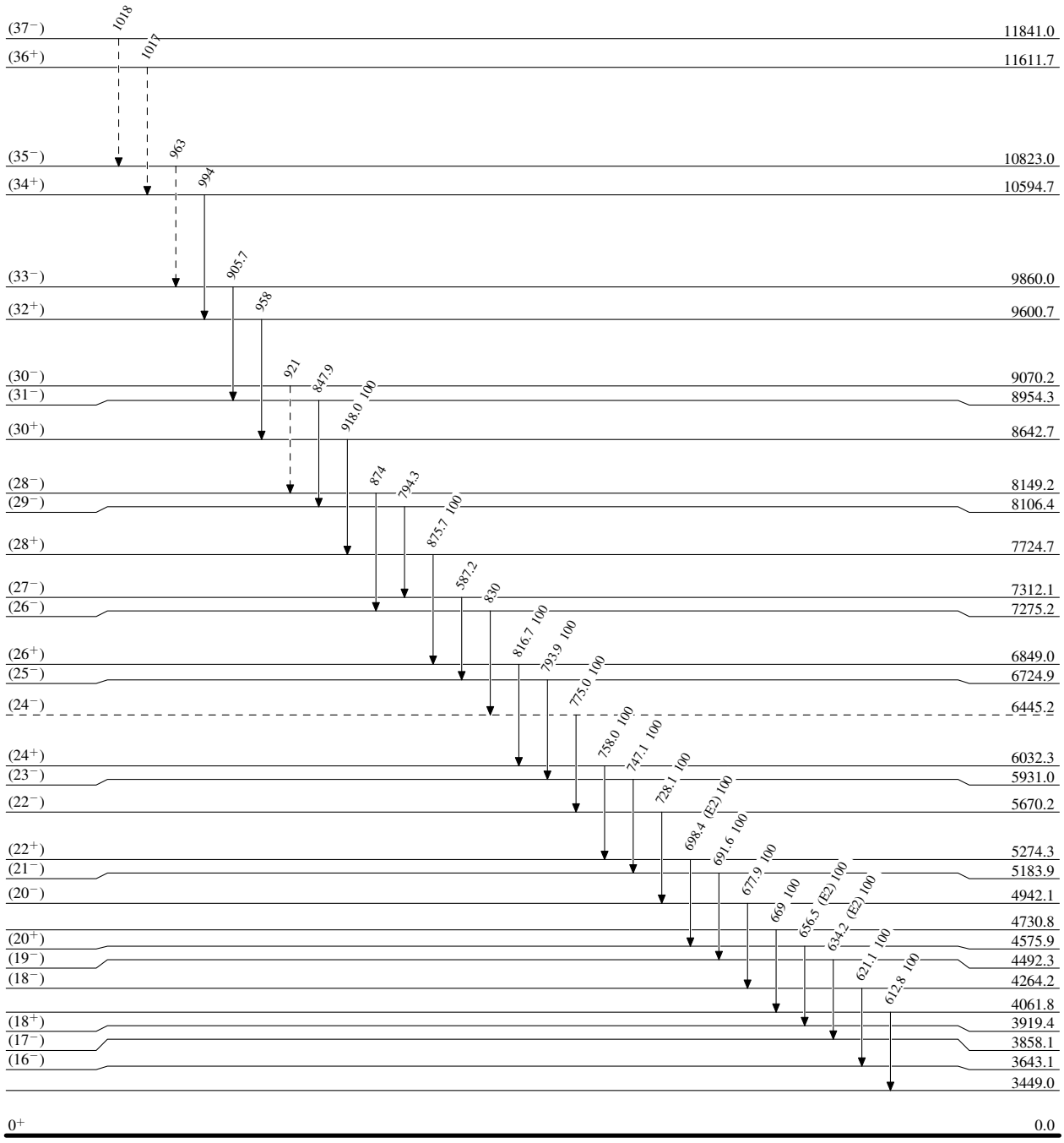
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)



$^{172}_{72}Hf_{100}$

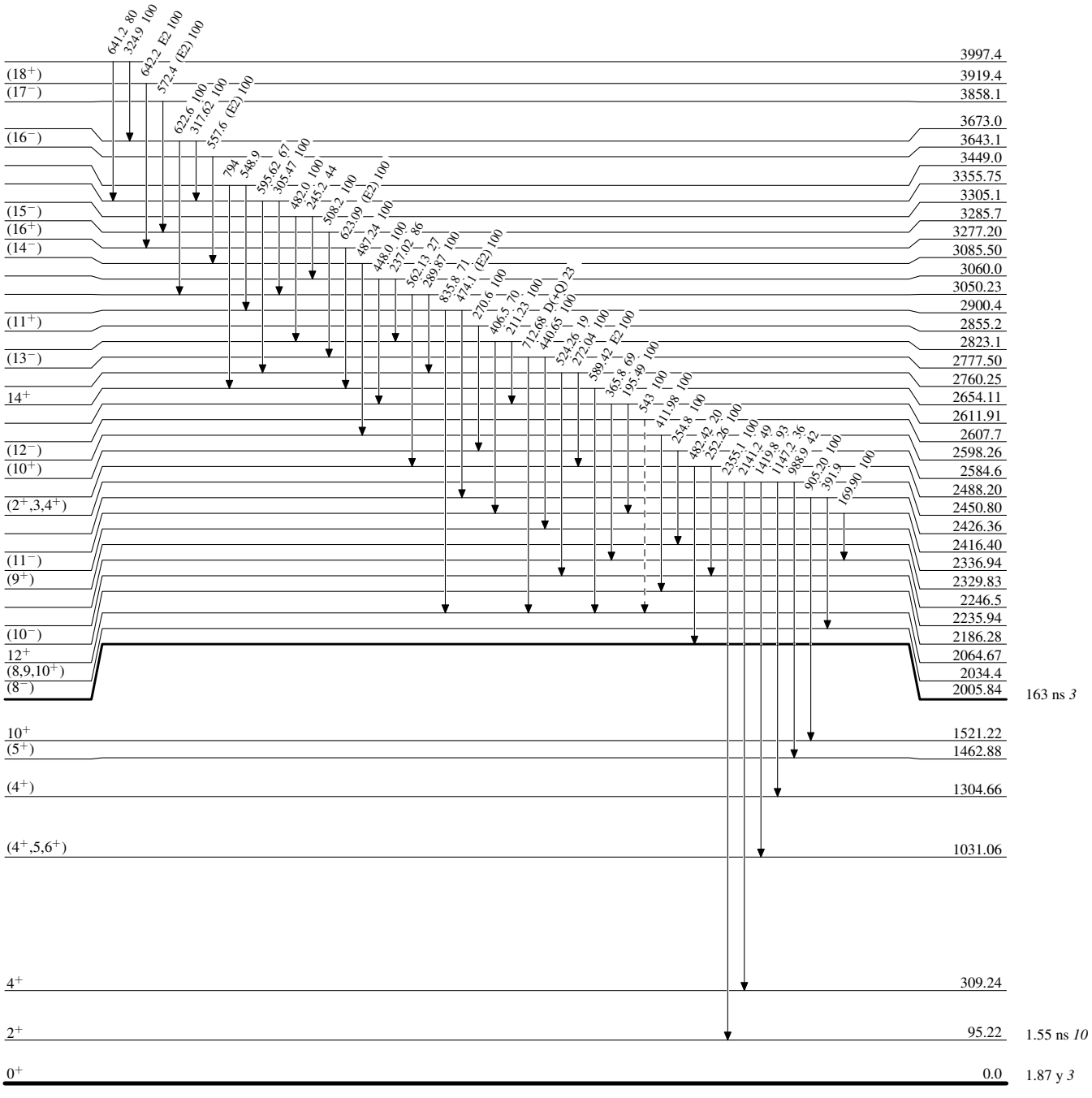
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{172}_{72}Hf_{100}$

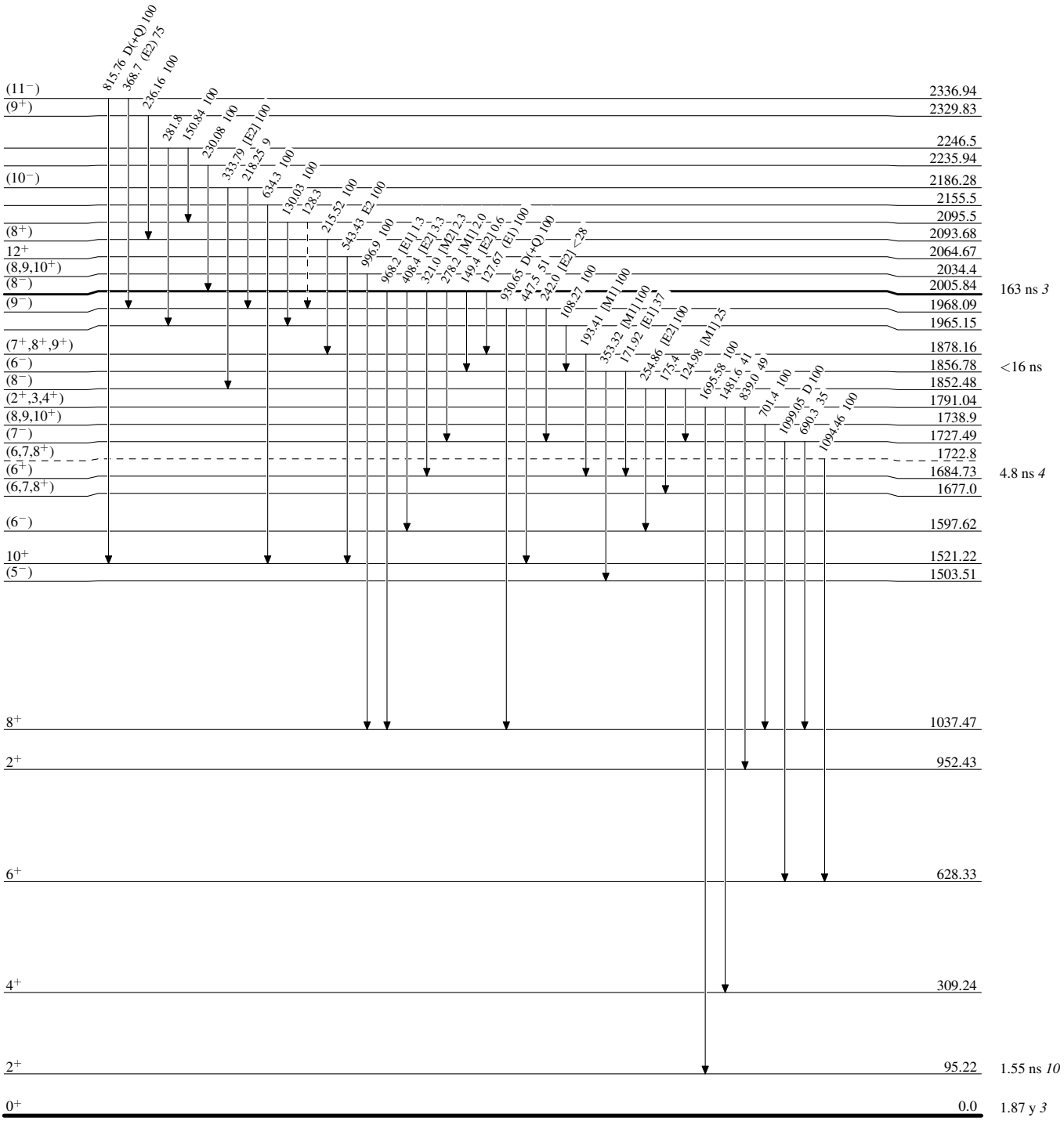
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{172}_{72}Hf_{100}$

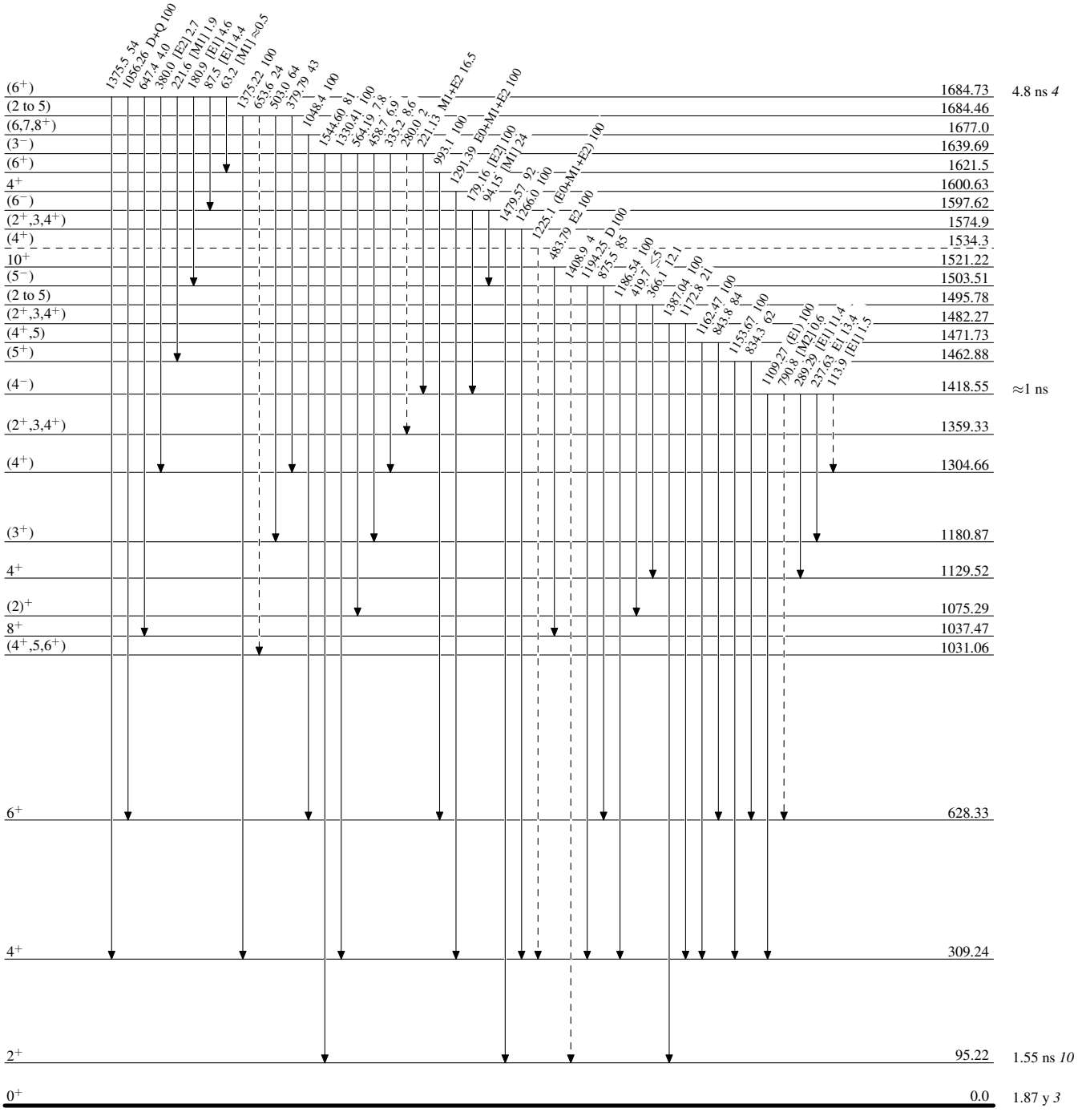
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{172}_{72}Hf_{100}$

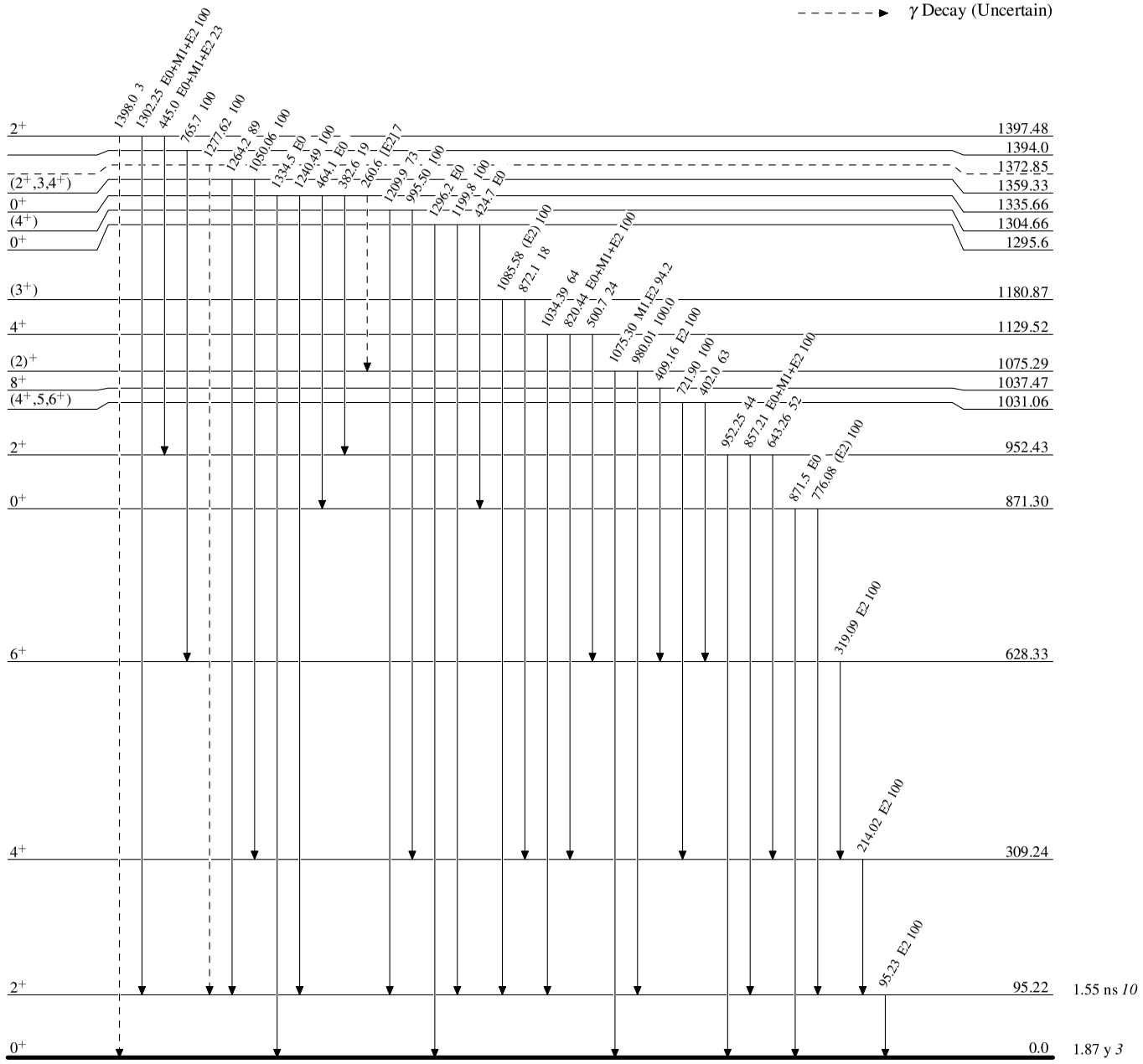
Adopted Levels, Gammas

Legend

Level Scheme (continued)

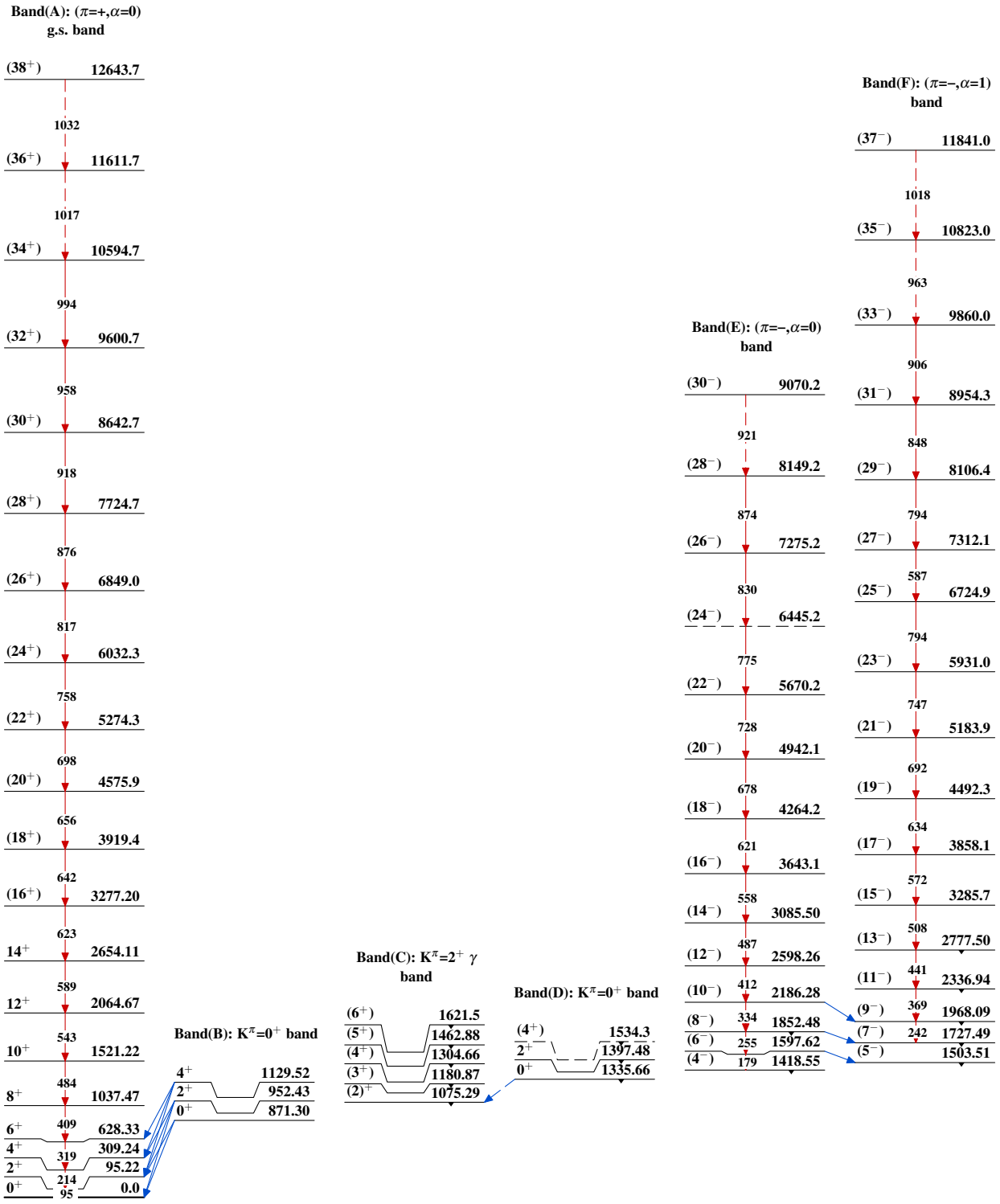
Intensities: Relative photon branching from each level

γ Decay (Uncertain)



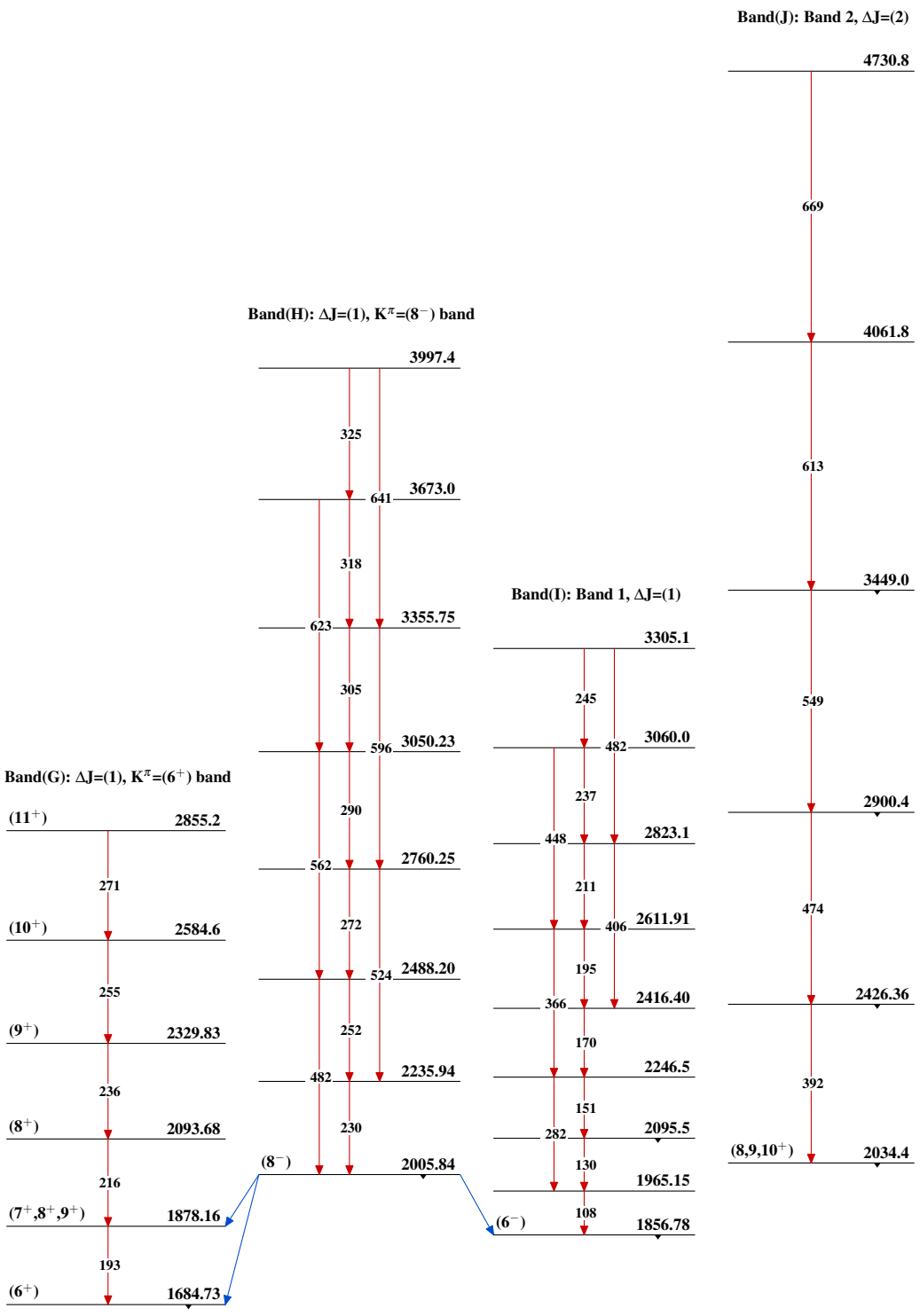
$^{172}_{72}Hf_{100}$

Adopted Levels, Gammas



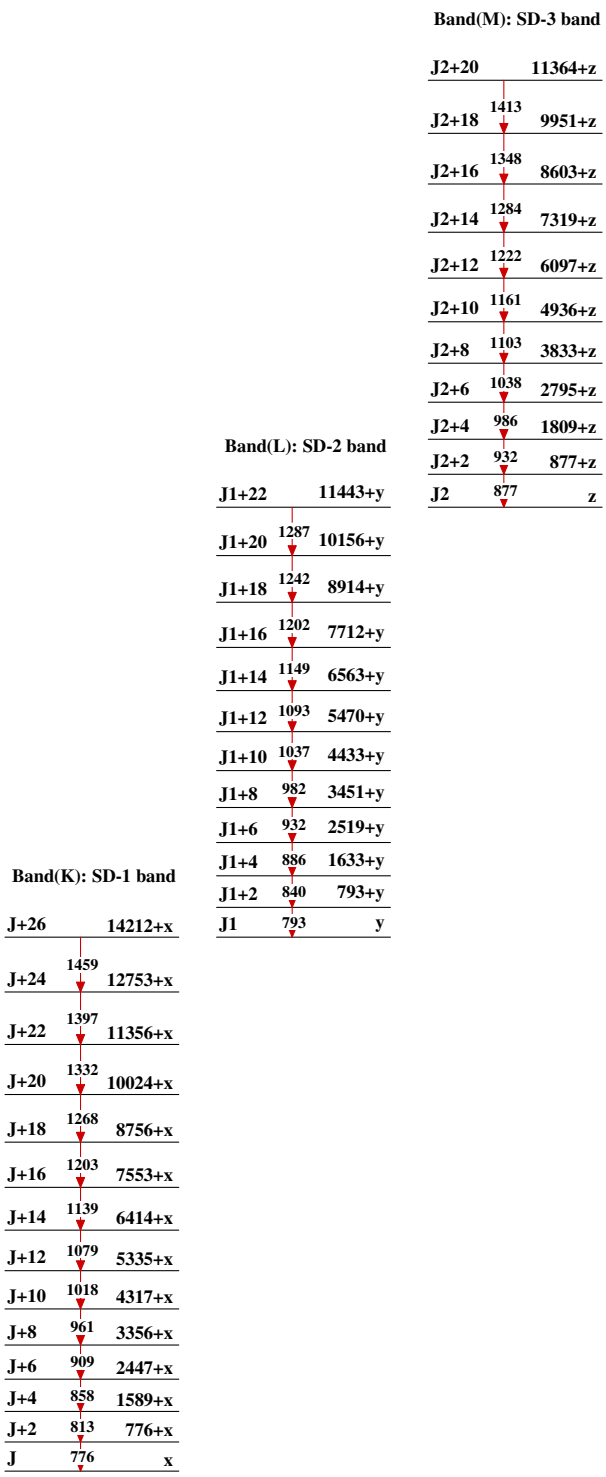
$^{172}_{72}Hf_{100}$

Adopted Levels, Gammas (continued)



$^{172}_{72}Hf_{100}$

Adopted Levels, Gammas (continued)



$^{172}_{72}Hf_{100}$

Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Update	Balraj Singh		26-Jul-2005

Q(β^-)=−4.11×10^3 *3*; S(n)=8.51×10^3 *3*; S(p)=6253.0 *22*; Q(α)=2493.1 *24* 2012Wa38
Note: Current evaluation has used the following Q record −3844 808640 SY6252.0 222494.8 *25* 1995Au04.
Q(β^-): from Eβ+=2525 *80* to 297 level from ^{174}Ta ε+β^+ decay (1971Ch26).
Additional information 1.
Isotope shift: 1999Le11, 1995Ga38, 1994Zi04, 1994Ji07, 1994BoZR, 1994An14, 1994An09, 1992Be07.

^{174}Hf Levels

Cross Reference (XREF) Flags

A	^{174}Ta ε decay	E	^{130}Te(^{48}Ca,4nγ):SD
B	^{172}Yb(α,2nγ),^{160}Gd(^{18}O,4nγ)	F	Coulomb excitation
C	^{175}Lu(p,2nγ),(d,3nγ)	G	^{174}Hf(d,d′)
D	^{130}Te(^{48}Ca,4nγ)		

E(level)[#]	J$^\pi$[‡]	T$_{1/2}$	XREF	Comments
0.0[@]	0$^+$	2.0×10^{15} y *4*	ABCD F	%α=100 T$_{1/2}$: from 1961Ma05, value recommended by 1990Ho28. Other value: 4.3×10^{15} y (1959Ri34).
90.985[@] *19*	2$^+$	1.66 ns *7*	ABCD F	T$_{1/2}$: weighted average of 1.68 ns *8* (1971Ch26) and 1.64 ns *10* (1965Ab02,1967Ab06) from ^{174}Ta ε decay. Other value: 1.38 ns *9*, Coul. ex. (1971Ej01,1963Bj04). J$^\pi$: 91.00 E2 γ to 0$^+$.
297.38[@] *4*	4$^+$		ABCD F	J$^\pi$: 206.5 E2 γ to 2$^+$.
608.26[@] *5*	6$^+$		ABCD F	J$^\pi$: 310.9 E2 γ to 4$^+$.
828.13[&] *24*	0$^+$		ABCD G	J$^\pi$: 828.0 E0 transition to 0$^+$.
900.24[&] *4*	2$^+$	2.2 ps *5*	ABCD FG	T$_{1/2}$: from Coul. ex. (1971Ej01). J$^\pi$: 809.33 E0+M1+E2 γ to 2$^+$.
1009.6[@]	8$^+$		BCD F	J$^\pi$: 401.0 stretched E2 γ to 6$^+$.
1062.17[&] *4*	4$^+$		ABCD G	J$^\pi$: 764.8 E0+M1+E2 γ to 4$^+$.
1226.77[a] *7*	2$^+$	0.36 ps *6*	A FG	T$_{1/2}$: from Coul. ex. (1971Ej01). J$^\pi$: 1227.0γ to 0$^+$. Observed in Coul. ex.
1303.36[b] *8*	(3$^+$)		AB D	J$^\pi$: 1006.2γ to 4$^+$, 1212.3γ to 2$^+$. State is possibly mixed with K^π=2$^+$ γ-vibrational band.
1307.4[&]	6$^+$		BCD	J$^\pi$: 699 M1+E2 γ to 6$^+$, 245γ to 4$^+$, 298γ to 8$^+$.
1308.69[c] *10*	(2$^-$)		A G	
1319.40[d] *5*	2$^+$	≤5 ns	A	J$^\pi$: 419.0γ and 1228.3γ to 2$^+$ are E0+M1+E2. T$_{1/2}$: from ^{174}Ta ε decay, $\gamma\gamma$(t) (1975Ca11).
1321[c]	(3$^-$)		G	
1336.48[a] *7*	(3)$^+$		A	J$^\pi$: 1245.5 M1+E2 γ to 2$^+$, 1038.9γ to 4$^+$.
1394.60[b] *8*	(4)$^+$		AB D G	J$^\pi$: 1097.3 M1+E2 γ to 4$^+$, 1303.5γ to 2$^+$.
1425.24[c] *8*	(4)$^-$		AB D	J$^\pi$: 1127.8 (E1) γ to 4$^+$, 996.6 M1+E2 γ from 3$^-$.
1442.66[c] *11*	(5$^-$)		A G	XREF: G(1443). J$^\pi$: 1145.2γ to 4$^+$, 834.3γ to 6$^+$, 979.3γ from 3$^-$.
1448.85[a] *6*	4$^+$		A D G	XREF: G(1449). J$^\pi$: 840.8γ to 6$^+$, 1151.4γ (E2) to 4$^+$, 1357.9γ to 2$^+$.
1485.9[@]	(10$^+$)		BCD	J$^\pi$: 476.4γ to 8$^+$.
1496.36 *11*	2$^+$		A	J$^\pi$: 1496.5γ to 0$^+$, 1198.9γ to 4$^+$.

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Adopted Levels, Gammas (continued)

^{174}Hf Levels (continued)

E(level)[#]	Jπ[‡]	$T_{1/2}$	XREF	Comments
1503.29[d] *5*	$(4)^+$	≤5 ns	A	$T_{1/2}$: from ^{174}Ta ε decay (1975Ca11). Jπ: 1205.9 M1+E2 γ to 4^+, 1412.5γ to 2^+.
1508.2[b]	(5^+)		B	Jπ: 900.0γ to 6^+, 1210.8γ to 4^+.
1549.3[e]	(6^+)	138 ns *4*	BC	μ=+5.42 *5* $T_{1/2}$: from (α,2nγ) (1980Wa23). Other value: 133 ns (1983Wa21,1976KhZR). Jπ: 941.1γ to 6^+, 1251.8γ to 4^+. μ: From g-factor=0.892 *8*, does not include a Knight-shift correction (1989Ra17,1980Wa23).
1561.72[m] *14*	4^-		D	
1626.0 *3*	4^+		A	Jπ: 1534.7γ to 2^+, 1018.5γ to 6^+.
1627.4[m] *3*	5^-		D	Jπ: 1019.3γ to 6^+, 1330.0γ to 4^+.
1630.5[&]	(8^+)		BCD	Jπ: 323.1γ to 6^+, 620.9γ to 8^+.
1634.4[c]	(6^-)		B D	Jπ: 1026.2γ to 6^+.
1642.15[b] *9*	6^+		D	
1648.33[h] *18*	4^-		A D	
1650.6[c]	(7^-)		B D	Jπ: 1042.4γ to 6^+.
1658.41[a] *7*	(5^+)		A	Jπ: 1361.0γ to 4^+, 1050.2γ to 6^+. $J^\pi=(5^+)$ assignment is not consistent with log *ft*=7.45 from ^{174}Ta ($J^\pi=3^{(+)}$) ε+β+ decay.
1713.5[i]	(6^-)	0.45 ns *10*	B	Jπ: 164.3γ and 1105.1γ to 6^+ states. $T_{1/2}$: from γ(t) in (α,2nγ) (1987AnZR).
1722.43[m] *19*	6^-		D	
1737.4[e]	(7^+)		B D	Jπ: 188.1γ to (6^+).
1767.66[h] *11*	5^-		D	
1779.9 *2*	$(2^+,3,4^+)^\dagger$		A	
1797.5[f]	(8^-)	2.39 μs *4*	B D F	$T_{1/2}$: from ^{172}Yb(α,2nγ), ^{160}Gd(^{18}O,4nγ) (1974KhZW). Other: 2.5 μs *6* (2002Pf01). Consistent with Weisskopf estimate of $T_{1/2}$ (1 μs) for 248 (M2) γ. Competition between 60.1 (E1) γ and 248 (M2) γ is possible because of the additional ΔK=2 hindrance for the 60.1 (E1) γ. Jπ: 60.1 (E1) γ to (7^+), 248.2 (M2) γ to (6^+).
1798.0[b]	(7^+)		B D	Jπ: 289.8γ to (5^+).
1827.4[i]	(7^-)		B D	Jπ: 113.9γ to (6^-).
1838.14[m] *17*	7^-		D	
1861.78 *15*	$(2^+,3,4^+)^\dagger$		A	
1904.4 *3*	(6^+)		A	Jπ: 1295.3γ to 6^+, 1607.2γ to 4^+.
1910.0[k] *3*	(6^-)		D	
1928.4[c]	(8^-)		B D	Jπ: 918.8γ to 8^+.
1937.46[h] *14*	6^-		D	
1943.9[c]	(9^-)		B D	Jπ: 934.3γ to 8^+.
1948.1[e]	(8^+)		B D	Jπ: 210.7γ to (7^+), 399.4γ to (6^+).
1963.4[i]	(8^-)		B D	Jπ: 136.1γ to (7^-).
1972.06[b] *10*	8^+		D	
1981.50[m] *21*	8^-		D	
2016.7 *3*	6^-		D	
2020.5[@]	(12^+)		BCD	Jπ: 534.6 stretched (E2) γ to (10^+).
2026.3[&]	(10^+)		BCD	XREF: B(2026.3). Jπ: 395.9γ to (8^+), 540.3γ to (10^+).
2028.0[f]	(9^-)	0.5 ps *3*	B D F	Coulomb excitation of ^{174}Hf($J^\pi=(8^-)$, 2.39 μs). $T_{1/2}$: deduced by evaluator from B(E2)↑(8^- to 9^-)=2 *1*.

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Adopted Levels, Gammas (continued)

^{174}Hf Levels (continued)

E(level)[#]	Jπ[‡]	XREF	Comments
			Jπ: 230.5γ to (8⁻).
2030.25 *15*	4(+)	A	Jπ: 1939.2γ to 2⁺, 1732.9γ to 4⁺, 1421.9γ to 6⁺.
2084.35[h] *9*	7⁻	D	
2119.0[i]	(9⁻)	B D	Jπ: 155.6γ to (8⁻), 292.4γ to (7⁻).
2124.56[k] *20*	(8⁻)	D	
2135.43[m] *25*	9⁻	D	
2167.1[b]	(9⁺)	B D	Jπ: 369.1γ to (7⁺).
2180.0[e]	(9⁺)	B D	Jπ: 231.9γ to (8⁺), 442.4γ to (7⁺).
2276.87[h] *9*	8⁻	D	
2279.2[f]	(10⁻)	B D	Jπ: 251.4γ to (9⁻), 481γ to (8⁻).
2295.7[i]	(10⁻)	B D	Jπ: 176.7γ to (9⁻), 332.2γ to (8⁻).
2299.4[c]	(10⁻)	B D	Jπ: 371.0γ to (8⁻).
2319.2[c]	(11⁻)	B D	Jπ: 375.2γ to (9⁻).
2331.5[m] *4*	10⁻	D	
2338.51 *13*	(2⁺,3,4⁺)†	A	
2353.99 *25*	(3,4⁺)†	A	
2379.22[b] *10*	10⁺	D	
2402.80 *7*	2⁺	A	Jπ: 1083.3 E0+M1+E2 γ to 2⁺.
2421.98 *10*	(3)⁻	A	Jπ: 996.6 M1+E2 γ to (4)⁻, 2331.5γ to 2⁺.
2429.6[k] *3*	(10⁻)	D	
2431.2[e]	(10⁺)	B D	Jπ: 251.0γ to (9⁺), 483.4γ to (8⁺).
2441.85 *23*	(2⁺,3,4⁺)†	A	
2447.41[h] *14*	9⁻	D	
2486.1 *4*	2(+)	A	Jπ: 2486.8γ to 0⁺, 2189.2γ to 4⁺.
2487.73[i] *10*	11⁻	B D	J 192.0γ to (10⁻), 368.9γ to (9⁻).
2489.35[&] *8*	12⁺	B D	Jπ: 462.8γ to (10⁺), 468.6γ to (12⁺).
2491.7 *3*	(2⁺,3,4⁺)†	A	
2505.25 *15*	2(+)	A	Jπ: 2505.4γ to 0⁺, 2208.1γ to 4⁺.
2515.6[m] *3*	11⁻	D	
2529.97 *17*	2⁺	A	Jπ: 1210.9 E0+M1+E2 γ to 2⁺.
2554.6[f]	(11⁻)	B D	Jπ: 275.4γ to (10⁻), 527γ to (9⁻).
2592.21 *20*	(3,4⁺)†	A	
2597.5[@]	(14⁺)	B D	Jπ: 577.0γ to (12⁺).
2609.5[b]	(11⁺)	B	Jπ: 442.4γ to (9⁺).
2641.0 *4*	4(+)	A	Jπ: 2549.5γ to 2⁺, 2031.9γ to 6⁺.
2653.82[h] *8*	10⁻	D	
2684.85[l] *9*	(12⁺)	D	
2700.3[e]	(11⁺)	B D	Jπ: 269.1γ to (10⁺), 520.2γ to (9⁺).
2700.8[i]	(12⁻)	B	XREF: B(2700.8). Jπ: 212.8γ to (11⁻), 404.7γ to (10⁻).
2729.84 *12*		A	
2744.2[c]	(12⁻)	B D	Jπ: 444.8γ to (10⁻).
2767.9[m] *5*	12⁻	D	
2772.0[c]	(13⁻)	B D	Jπ: 452.0γ to (11⁻), 751.5γ to (12⁺).
2791.42 *17*	(2⁺,3,4⁺)†	A	
2792.98[n] *8*	10⁻	D	
2823.6[k] *4*	(12⁻)	D	
2847.4[f]	(12⁻)	B D	Jπ: 292.4γ to (11⁻), 568γ to (10⁻).

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Adopted Levels, Gammas (continued)

^{174}Hf Levels (continued)

E(level)[#]	Jπ[‡]	$T_{1/2}$	XREF	Comments
2854.35[b] *10*	12^+		D	
2859.21[h] *16*	11^-		D	
2931.76 *25*	$2^{(+)}$		A	Jπ: 2931.8γ to 0^+, 2632.6γ to 4^+.
2932.7[i]	(13^-)		B D	Jπ: 232.5γ to (12^-), 445.0γ to (11^-).
2958.72 *7*	(11^-)		D	Other $K^\pi=(11^-)$ band head, see 1995Gj01.
2972.4[m] *3*	13^-		D	
2983.3[e]	(12^+)		B D	Jπ: 282.9γ to (11^+), 552.1γ to (10^+).
2992.5[&]	(14^+)		B D	Jπ: 503.6γ to (12^+), 394.8γ to (14^+).
3046.24[j] *11*	(11^-)		D	
3087.9 *3*	$4^{(+)}$		A	Jπ: 2999.7γ to 2^+, 2479.2γ to 6^+.
3090.16[o] *7*	12^-		D	
3106.0 *5*	$(2,3,4)^\dagger$		A	
3117.4[b]	(13^+)		B	Jπ: 507.9γ to (11^+).
3157.02[f] *11*	(13^-)		D	
3180.7[i]	(14^-)		B	Jπ: 247.3γ to (13^-), 479.7γ to (12^-).
3191.1 *5*	$(2,3,4)^\dagger$		A	
3208.9[@]	(16^+)		B D	Jπ: 611.4γ to (14^+).
3230.06[j] *16*	12^-		D	
3248.01 *16*			A	
3260.2[c]	(14^-)		B D	Jπ: 516.0γ to (12^-).
3269.0[e]	(13^+)		B D	Jπ: 285.7γ to (12^+), 568.4γ to (11^+).
3280.2[m] *4*	14^-		D	
3296.3[c]	(15^-)		B D	Jπ: 524.3γ to (13^-), 698.4γ to (14^+).
3300.24[o] *13*	13^-		D	
3301.8[k] *5*	(14^-)		D	
3311.7[g]	(14^+)	3.7 μs *2*	B D	$T_{1/2}$: from ^{172}Yb(α,2nγ), ^{160}Gd(^{18}O,4nγ) (1974KhZW). Jπ: 328.3γ to (12^+).
3449.7[i]	(15^-)		B	Jπ: 267.7γ to (14^-), 514.4γ to (13^-).
3500.4[&]	(16^+)		B D	Jπ: 507.9γ to (14^+).
3545.5[g]	(15^+)		B	Jπ: 233.8γ to (14^+).
3680.5[b]	(15^+)		B	Jπ: 563.1γ to (13^+).
3795.6[g]	(16^+)		B	Jπ: 250.1γ to (15^+).
3857.3[@]	(18^+)		B D	Jπ: 648.3γ to (16^+).
3885.9[c]	(17^-)		B	Jπ: 589.6γ to (15^-).
4048[&]	(18^+)		D	
4065.7[g]	(17^+)		B	Jπ: 269.5γ to (16^+).
4358.1[g]	(18^+)		B	Jπ: 293.0γ to (17^+).
4550.8[@]	(20^+)		B D	Jπ: 693.5γ to (18^+).
4656[&]	(20^+)		D	
5291[@]	(22^+)		D	
5359[&]	(22^+)		D	
6062.7[@] *15*	(24^+)		D	
6164.7[&] *15*	(24^+)		D	
6890?[@]	(26^+)		D	
7027?[&]	(26^+)		D	
x[p]	J>23		E	
726+x[p]	J+2		E	
1490+x[p]	J+4		E	

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Adopted Levels, Gammas (continued)

^{174}Hf Levels (continued)

E(level)[#]	Jπ[‡]	XREF	E(level)[#]	Jπ[‡]	XREF	E(level)[#]	Jπ[‡]	XREF
2310+x[p]	J+6	E	6960+z[r]	J2+16	E	1661+w[u]	J5+4	E
3177+x[p]	J+8	E	8065+z[r]	J2+18	E	2550+w[u]	J5+6	E
4095+x[p]	J+10	E	9291+z[r]	J2+20	E	3491+w[u]	J5+8	E
5065+x[p]	J+12	E	10578+z[r]	J2+22	E	4493+w[u]	J5+10	E
6090+x[p]	J+14	E	11927+z[r]	J2+24	E	5558+w[u]	J5+12	E
7172+x[p]	J+16	E	13339+z[r]	J2+26	E	6684+w[u]	J5+14	E
8313+x[p]	J+18	E	14814+z?[r]	J2+28	E	7884+w[u]	J5+16	E
9515+x[p]	J+20	E	u[s]	J3>28	E	9146+w[u]	J5+18	E
10779+x[p]	J+22	E	855+u[s]	J3+2	E	10476+w[u]	J5+20	E
12105+x?[p]	J+24	E	1759+u[s]	J3+4	E	11871+w[u]	J5+22	E
13495+x[p]	J+26	E	2708+u[s]	J3+6	E	13331+w?[u]	J5+24	E
14948+x[p]	J+28	E	3703+u[s]	J3+8	E	s[v]	J6	E
16460+x?[p]	J+30	E	4748+u[s]	J3+10	E	810+s[v]	J6+2	E
y[q]	J1>24	E	5846+u[s]	J3+12	E	1650+s[v]	J6+4	E
755+y[q]	J1+2	E	7001+u[s]	J3+14	E	2543+s[v]	J6+6	E
1548+y[q]	J1+4	E	8217+u[s]	J3+16	E	3489+s[v]	J6+8	E
2394+y[q]	J1+6	E	9495+u[s]	J3+18	E	4491+s[v]	J6+10	E
3293+y[q]	J1+8	E	10839+u[s]	J3+20	E	5549+s[v]	J6+12	E
4248+y[q]	J1+10	E	12250+u[s]	J3+22	E	6666+s[v]	J6+14	E
5263+y[q]	J1+12	E	13728+u?[s]	J3+24	E	7844+s[v]	J6+16	E
6340+y[q]	J1+14	E	v[t]	J4	E	9086+s[v]	J6+18	E
7480+y[q]	J1+16	E	723+v[t]	J4+2	E	10389+s[v]	J6+20	E
8684+y[q]	J1+18	E	1492+v[t]	J4+4	E	11755+s[v]	J6+22	E
9953+y[q]	J1+20	E	2309+v[t]	J4+6	E	t[w]	J7	E
11288+y[q]	J1+22	E	3177+v[t]	J4+8	E	818+t[w]	J7+2	E
12688+y[q]	J1+24	E	4096+v[t]	J4+10	E	1672+t[w]	J7+4	E
14154+y[q]	J1+26	E	5069+v[t]	J4+12	E	2570+t[w]	J7+6	E
15684+y[q]	J1+28	E	6099+v[t]	J4+14	E	3512+t[w]	J7+8	E
z[r]	J2>22	E	7186+v[t]	J4+16	E	4502+t[w]	J7+10	E
702+z?[r]	J2+2	E	8333+v[t]	J4+18	E	5550+t[w]	J7+12	E
1456+z[r]	J2+4	E	9542+v[t]	J4+20	E	6660+t[w]	J7+14	E
2237+z[r]	J2+6	E	10810+v[t]	J4+22	E	7837+t[w]	J7+16	E
3078+z[r]	J2+8	E	12150+v[t]	J4+24	E	9079+t[w]	J7+18	E
3968+z[r]	J2+10	E	13541+v[t]	J4+26	E	10387+t[w]	J7+20	E
4909+z[r]	J2+12	E	w[u]	J5	E	11740+t[w]	J7+22	E
5905+z[r]	J2+14	E	802+w[u]	J5+2	E			

† From γ-ray decay pattern in ^{174}Ta ε+β$^+$ decay.

‡ Assignment of levels to different bands is based on level spacings and rotational parameters. Specific arguments are given with individual levels. Values of the rotational parameters shown for each band have been obtained from least-squares fit to the adopted experimental energies. γ rays from ^{174}Ta ε decay used for spin-parity assignments have been assumed to be M1, E1, or E2, unless otherwise specified. Limiting spins for bandheads in SD bands are based on comparison of relative alignments for the sequences with respect to the normal-deformed structures in ^{174}Hf, the SD bands in ^{168}Hf and 163Lu.

From ^{174}Ta ε decay. Energies of levels not observed in ^{174}Ta ε decay are from in-beam reaction data.

@ Band(A): g.s. band. Rotational parameters: A=15.0, B=−14.0. Spin members of the band used in the fit: 0 to 10.

& Band(B): β-vibrational band. Rotational parameters: A=11.7, B=−7.2. Spin members of the band used in the fit: 0 to 10.

a Band(C): K$^\pi$=2$^+$, γ-vibrational band.

b Band(D): K$^\pi$=(3$^+$) band. Probable configuration=(ν 1/2[521])+(ν 5/2[512]). Rotational parameters: A=11.5, B=−4.3. Spin members of the band used in the fit: 3 to 15.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{174}Hf Levels (continued)

[c] Band(E): $K^{\pi}=(1^{-})$, octupole band.
[d] Band(F): $K^{\pi}=(0^{+})$ band.
[e] Band(G): $K^{\pi}=(6^{+})$ band. Probable configuration=(π 7/2[404])+(π 5/2[402]). Rotational parameters: A=14.3, B=−8.5. Spin members of the band used in the fit: 6 to 12.
[f] Band(H): $K^{\pi}=(8^{-})$ band. Probable configuration=(π 9/2[514])+(π 7/2[404]). Rotational parameters: A=13.5, B=−4.3. Spin members of the band used in the fit: 8 to 12.
[g] Band(I): $K^{\pi}=(14^{+})$ band. Rotational parameters: A=7.0, B=1.8. Spin members of the band used in the fit: 14 to 18.
[h] Band(J): $K^{\pi}=(2^{-})$ band.
[i] Band(K): $K^{\pi}=(6^{-})$ band. Probable configuration=(ν 7/2[633])+(ν 5/2[512]). Rotational parameters: A=8.4, B=1.4. Spin members of the band used in the fit: 6 to 15.
[j] Band(L): $K^{\pi}=(11^{-})$ band.
[k] Band(M): $K^{\pi}=(6^{-})$ band.
[l] Band(N): $K^{\pi}=(12^{+})$ band.
[m] Band(O): $K^{\pi}=4^{-}$ band.
[n] Band(P): $K^{\pi}=10^{-}$ band.
[o] Band(Q): $K^{\pi}=12^{-}$ band.
[p] Band(R): Triaxial (?) SD-1 band (2005Ha05,2003Dj01). Q(transition)=13.8 *+3−4* (2005Ha05). Band intensity=1.1 *3* of the total population of ^{174}Hf channel (2003Dj01). The transitions in this band are in coincidence with g.s. band transitions up to 12^{+}.
[q] Band(S): Triaxial (?) SD-2 band (2005Ha05,2003Dj01). Q(transition)=13.5 *+2−3* (2005Ha05). SD-2 and SD-3 bands have a combined intensity of 0.9 *4* of the total population of ^{174}Hf channel (2003Dj01). The transitions in this band are in coincidence with g.s. band transitions up to 12^{+}.
[r] Band(T): Triaxial (?) SD-3 band (2005Ha05,2003Dj01). Q(transition)=13.0 *+8−4* (2005Ha05). SD-2 and SD-3 bands have a combined intensity of 0.9 *4* of the total population of ^{174}Hf channel (2003Dj01). The transitions in this band are in coincidence with g.s. band transitions up to 12^{+}.
[s] Band(U): Triaxial (?) SD-4 band (2005Ha05,2003Dj01). Q(transition)=12.6 *8* (2005Ha05). Band intensity=0.3 *2* of the total population of ^{174}Hf channel (2003Dj01). Due to the low intensity and contamination in the coincidence gates, this band was tentatively assigned to ^{174}Hf by 2003Dj01. Higher statistics from the experiments in 2005Ha05 confirm the assignment of SD-4 band to this nucleus. The transitions in this band are in coincidence with the yrast sequence of transitions up to spin 18.
[t] Band(V): Triaxial (?) SD-5 band (2005Ha05).
[u] Band(W): Triaxial (?) SD-6 band (2005Ha05).
[v] Band(X): Triaxial (?) SD-7 band (2005Ha05).
[w] Band(Y): Triaxial (?) SD-8 band (2005Ha05).

Adopted Levels, Gammas (continued)

γ(^{174}Hf)

E_i(level)	J_i^π	E_γ [†]	I_γ [†]	E_f	J_f^π	Mult.[#]	δ	α[c]	$I_{(\gamma+ce)}$	Comments
90.985	2^+	91.00 *2*	100	0.0	0^+	E2		5.21		B(E2)(W.u.)=152 *8*
297.38	4^+	206.50 *4*	100	90.985	2^+	E2		0.261		
608.26	6^+	310.90 *4*	100	297.38	4^+	E2		0.0718		
828.13	0^+	737.25 *36*	100	90.985	2^+					
		828.0[a] *10*	[a]	0.0	0^+	E0			≈2.5	Mult.: from ce data, ^{174}Ta ε decay. $I_{(\gamma+ce)}$: from ^{172}Yb(α,2nγ) (1971Ej01).
900.24	2^+	602.91 *7*	59 *6*	297.38	4^+	E2		0.01238		B(E2)(W.u.)=13 *4*
		809.33 *6*	100 *6*	90.985	2^+	E0+M1+E2	−2 +2−2	0.09[@]		δ: from γ(θ).
		900.15 *5*	73 *7*	0.0	0^+	[E2]				B(E2)(W.u.)=2.1 *6*
1009.6	8^+	401.05[‡] *20*	100	608.26	6^+	(E2)				Mult.: from γ(θ).
1062.17	4^+	163[‡] *1*	40 *13*	900.24	2^+					
		454.07 *9*	17 *3*	608.26	6^+					
		764.79 *5*	100 *5*	297.38	4^+	E0+M1+E2	−2.9 *10*	0.10[@] *1*		δ: from γ(θ).
		971.06 *5*	87 *7*	90.985	2^+					
1226.77	2^+	1135.81 *7*	100 *8*	90.985	2^+	(E2)				B(E2)(W.u.)=7.4 *15*
		1227.0 *10*	97 *44*	0.0	0^+	[E2]				B(E2)(W.u.)=4.8 *22*
1303.36	(3^+)	1006.21 *13*	11 *5*	297.38	4^+					
		1212.29 *9*	100 *50*	90.985	2^+					
1307.4	6^+	245[‡] *1*	18 *4*	1062.17	4^+					
		298[‡] *1*	10 *6*	1009.6	8^+					
		699[‡] *1*	100	608.26	6^+	D+Q	−0.92 *18*			Mult.,δ: from γ(θ).
		1010[‡] *1*	54 *14*	297.38	4^+					
1308.69	(2^-)	408.37 *54*	11 *4*	900.24	2^+					
		1217.67 *13*	100 *13*	90.985	2^+					
1319.40	2^+	418.99 *12*	12.0 *17*	900.24	2^+	E0+M1+E2		0.17[@]		
		491.16 *36*	2.8 *8*	828.13	0^+					
		1022.07 *6*	58 *5*	297.38	4^+	E2		0.00395		B(E2)(W.u.)>0.00038
		1228.33 *7*	100 *25*	90.985	2^+	E0+M1+E2		0.03[@]		
		1319.33 *32*	90.8 *13*	0.0	0^+					
1336.48	$(3)^+$	1038.93 *18*	25 *4*	297.38	4^+					
		1245.54 *8*	100 *9*	90.985	2^+	M1+E2				
1394.60	$(4)^+$	1097.26 *9*	100 *7*	297.38	4^+	M1+E2				
		1303.53 *12*	71 *24*	90.985	2^+					
1425.24	$(4)^-$	362.95 *34*	7.9 *20*	1062.17	4^+					
		1127.81 *8*	100 *9*	297.38	4^+	(E1)				
1442.66	(5^-)	834.35 *20*	72 *13*	608.26	6^+					
		1145.20 *15*	100 *13*	297.38	4^+					
1448.85	4^+	222.80[d] *50*	≤1.7[d]	1226.77	2^+					

$^{174}_{72}Hf_{102}$-7

Adopted Levels, Gammas (continued)

γ(^{174}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]
1448.85	4^+	840.79 *34*	7 *3*	608.26	6^+	
		1151.41 *6*	100 *11*	297.38	4^+	(E2)
		1357.94 *8*	78 *14*	90.985	2^+	
1485.9	(10^+)	476.4[‡] *4*	100	1009.6	8^+	
1496.36	2^+	596.19[d] *12*	≤85[d]	900.24	2^+	
		1198.94 *35*	100 *20*	297.38	4^+	
		1405.23 *51*	31 *10*	90.985	2^+	
		1496.50 *89*	47 *17*	0.0	0^+	
1503.29	$(4)^+$	440.88 *12*	4.3 *5*	1062.17	4^+	
		1205.92 *4*	100 *5*	297.38	4^+	M1+E2
		1412.55 *24*	4.4 *8*	90.985	2^+	
1508.2	(5^+)	113.8[a] *5*	100[a] *32*	1394.60	$(4)^+$	
		204.2[a] *9*	24[a] *13*	1303.36	(3^+)	
		900.1[a] *20*	11[a] *11*	608.26	6^+	
		1210.88[a] *19*	61[a] *3*	297.38	4^+	
1549.3	(6^+)	100.10[a] *22*	2.5[a] *13*	1448.85	4^+	
		154.71[a] *13*	3.4[a] *13*	1394.60	$(4)^+$	
		241.97[a] *19*	1.08[a] *21*	1307.4	6^+	
		486.61[a] *25*	0.6[a] *4*	1062.17	4^+	
		539.67[a] *25*	2.20[a] *14*	1009.6	8^+	
		941.02[a] *5*	100.0[a] *8*	608.26	6^+	
		1251.81[a] *7*	71.8[a] *11*	297.38	4^+	
1561.72	4^-	1264.28[a] *21*	100[a]	297.38	4^+	
1626.0	4^+	1018.5 *10*	100	608.26	6^+	
		1328.95 *50*	48 *13*	297.38	4^+	
		1534.71 *39*	100 *19*	90.985	2^+	
1627.4	5^-	1019.3 *4*	85 *13*	608.26	6^+	
		1330.0 *3*	100 *15*	297.38	4^+	
1630.5	(8^+)	323.1[‡]		1307.4	6^+	
		620.9[‡]	36 *13*	1009.6	8^+	
		1022.1[‡]	100	608.26	6^+	
1634.4	(6^-)	209[a] *5*	10[a] *5*	1425.24	$(4)^-$	
		1025.97[a] *16*	100[a] *9*	608.26	6^+	
1642.15	6^+	133.9[a] *3*	1.0×10^{2}[a] *10*	1508.2	(5^+)	
		247.7[a] *4*	100[a] *40*	1394.60	$(4)^+$	
		1034.0[a] *3*	30[a] *10*	608.26	6^+	
		1344.77[a] *18*	37[a] *17*	297.38	4^+	
1648.33	4^-	222.80[d] *50*	≤10[d]	1425.24	$(4)^-$	

$^{174}_{72}Hf_{102}$-8

Adopted Levels, Gammas (continued)

$\gamma(^{174}Hf)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π
1648.33	4^-	1351.17 *28*	100 *17*	297.38	4^+
1650.6	(7^-)	1042.4[‡]	100	608.26	6^+
1658.41	(5^+)	596.19[d] *12*	≤16[d]	1062.17	4^+
		1050.18 *28*	19 *4*	608.26	6^+
		1361.04 *8*	100 *9*	297.38	4^+
1713.5	(6^-)	151.8[a] *4*	19[a] *9*	1561.72	4^-
		164.22[a] *16*	100[a] *4*	1549.3	(6^+)
		1105.24[a] *12*	86[a] *7*	608.26	6^+
1722.43	6^-	160.7[a] *19*	9[a] *9*	1561.72	4^-
		1114.2[a] *3*	100[a] *16*	608.26	6^+
1737.4	(7^+)	188.1[‡]	100	1549.3	(6^+)
1767.66	5^-	705[a] *4*	10[a] *10*	1062.17	4^+
		1159.42[a] *18*	100[a] *30*	608.26	6^+
1779.9	$(2^+,3,4^+)$	471.10 *37*	32 *8*	1308.69	(2^-)
		1482.51 *29*	100 *25*	297.38	4^+
		1689.66 *65*	55 *20*	90.985	2^+
1797.5	(8^-)	60.18[a] *13*	100[a] *4*	1737.4	(7^+)
		248.3[a] *5*	14[a] *2*	1549.3	(6^+)
		788.0[a] *12*	0.13[a] *6*	1009.6	8^+
1798.0	(7^+)	155.8[‡] *4*		1642.15	6^+
		289.70[‡] *16*		1508.2	(5^+)
1827.4	(7^-)	114.14[a] *22*	100[a] *19*	1713.5	(6^-)
		818.0[a] *4*	7[a] *2*	1009.6	8^+
		1219.4[a] *11*	5[a] *1*	608.26	6^+
1838.14	7^-	210.7[a] *6*	100[a] *30*	1627.4	5^-
		828.6[a] *6*	27[a] *6*	1009.6	8^+
		1229.9[a] *3*	45[a] *15*	608.26	6^+
1861.78	$(2^+,3,4^+)$	366.2 *14*	6 *4*	1496.36	2^+
		1564.40 *32*	82 *14*	297.38	4^+
		1770.95 *30*	100 *18*	90.985	2^+
1904.4	(6^+)	1295.27 *75*	39 *6*	608.26	6^+
		1607.15 *28*	100 *20*	297.38	4^+
1910.0	(6^-)	261.2[a] *10*	31[a] *8*	1648.33	4^-
		1301.7[a] *5*	100[a] *8*	608.26	6^+
1928.4	(8^-)	293.9[‡]		1634.4	(6^-)
		918.8[‡]		1009.6	8^+
1937.46	6^-	288.7[a] *4*	100[a] *23*	1648.33	4^-
		1329.2[a] *3*	87[a] *8*	608.26	6^+

$^{174}_{72}Hf_{102}$-9

Adopted Levels, Gammas (continued)

$\gamma(^{174}Hf)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	Comments
1943.9	(9^-)	293.2[‡] *5*		1650.6	(7^-)		
		934.3[‡]		1009.6	8^+		
1948.1	(8^+)	210.7[‡]		1737.4	(7^+)		
		399.4[‡]		1549.3	(6^+)		
1963.4	(8^-)	135.87[a] *19*	100[a] *11*	1827.4	(7^-)		
		250.0[a] *3*	29[a] *2*	1713.5	(6^-)		
1972.06	8^+	174.1[a] *3*	20[a] *8*	1798.0	(7^+)		
		329.91[a] *15*	100[a] *25*	1642.15	6^+		
1981.50	8^-	259.1[a] *3*	100[a] *50*	1722.43	6^-		
		971.9[a] *4*	78[a] *17*	1009.6	8^+		
2016.7	6^-	367.9[a] *13*	100[a] *20*	1648.33	4^-		
		1408.5[a] *6*	100[a] *40*	608.26	6^+		
2020.5	(12^+)	534.6[‡]	100	1485.9	(10^+)	(E2)	Mult.: stretched Q $\gamma(\theta)$.
2026.3	(10^+)	395.9[‡]		1630.5	(8^+)		
		540.3[‡]		1485.9	(10^+)		
2028.0	(9^-)	230.5[‡]	100	1797.5	(8^-)		
2030.25	$4^{(+)}$	371.68 *65*	8 *3*	1658.41	(5^+)		
		1421.9[d] *12*	≤8.3[d]	608.26	6^+		
		1732.87 *19*	100 *13*	297.38	4^+		
		1939.25[d] *25*	≤83[d]	90.985	2^+		
2084.35	7^-	316.71[a] *18*	100[a] *40*	1767.66	5^-		
		777.1[a] *4*	40[a] *40*	1307.4	6^+		
		1074.79[a] *16*	100[a] *50*	1009.6	8^+		
		1476.1[a] *4*	21[a] *8*	608.26	6^+		
2119.0	(9^-)	155.6[‡]		1963.4	(8^-)		E_γ: from in-beam reaction data.
		292.4		1827.4	(7^-)		
2124.56	(8^-)	214.6[a] *5*	90[a] *60*	1910.0	(6^-)		
		1115.0[a] *3*	1.0×10^{2}[a] *10*	1009.6	8^+		
2135.43	9^-	297.3[a] *4*	100[a] *23*	1838.14	7^-		
		1125.9[a] *9*	11[a] *4*	1009.6	8^+		
2167.1	(9^+)	195.0[a] *5*	19[a] *10*	1972.06	8^+		
		369.08[a] *15*	100[a] *33*	1798.0	(7^+)		
2180.0	(9^+)	231.9[‡]		1948.1	(8^+)		
		442.4		1737.4	(7^+)		E_γ: from in-beam reaction data.
2276.87	8^-	192.5[a] *3*	42[a] *12*	2084.35	7^-		
		260.2[a] *5*	15[a] *4*	2016.7	6^-		

$^{174}_{72}Hf_{102}$-10

Adopted Levels, Gammas (continued)

γ(^{174}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	α[c]
2276.87	8⁻	339.4[a] *3*	100[a] *19*	1937.46	6⁻		
		348.6[a] *4*	45[a] *9*	1928.4	(8⁻)		
		367[a] *3*	3.3[a] *17*	1910.0	(6⁻)		
		625.8[a] *5*	20[a] *5*	1650.6	(7⁻)		
		1267.3[a] *4*	58[a] *10*	1009.6	8⁺		
2279.2	(10⁻)	160.0[a] *3*	3.6[a] *7*	2119.0	(9⁻)		
		250.93[a] *5*	100[a] *4*	2028.0	(9⁻)		
		481.35[a] *21*	8.9[a] *10*	1797.5	(8⁻)		
2295.7	(10⁻)	176.78[a] *15*	65[a] *7*	2119.0	(9⁻)		
		267.70[a] *17*	100[a] *10*	2028.0	(9⁻)		
		332.2[a] *3*	24[a] *5*	1963.4	(8⁻)		
2299.4	(10⁻)	371.0[‡]	100	1928.4	(8⁻)		
2319.2	(11⁻)	375.2[‡]		1943.9	(9⁻)		
		833.4[‡]		1485.9	(10⁺)		
2331.5	10⁻	350.0[a] *5*	100[a]	1981.50	8⁻		
2338.51	(2⁺,3,4⁺)	835.16 *20*	100 *18*	1503.29	(4)⁺		
		1029.81 *14*	10 *7*	1308.69	(2⁻)		
		1112.2 *14*	13 *6*	1226.77	2⁺		
		2040.53 *77*	100 *40*	297.38	4⁺		
		2248.21 *95*	48 *15*	90.985	2⁺		
2353.99	(3,4⁺)	574.14 *23*	77 *14*	1779.9	(2⁺,3,4⁺)		
		929.08[d] *87*	≤29[d]	1425.24	(4)⁻		
		1291.54 *49*	100 *24*	1062.17	4⁺		
		2056.6 *13*	59 *24*	297.38	4⁺		
		2262.76 *91*	41 *12*	90.985	2⁺		
2379.22	10⁺	212.2[a] *4*	39[a] *14*	2167.1	(9⁺)		
		407.16[a] *12*	100[a] *20*	1972.06	8⁺		
2402.80	2⁺	1066.37 *9*	42 *8*	1336.48	(3)⁺	E2	
		1083.30 *8*	50 *9*	1319.40	2⁺	E0+M1+E2	0.010[@] *5*
		1176.05 *10*	100 *9*	1226.77	2⁺	(E2)	
		1502.96[d] *30*	≤19[d]	900.24	2⁺		
2421.98	(3)⁻	560.28 *18*	32 *5*	1861.78	(2⁺,3,4⁺)		
		979.25 *13*	63 *9*	1442.66	(5⁻)		
		996.61 *17*	100 *12*	1425.24	(4)⁻	M1+E2	
		1102.06 *36*	12.9 *23*	1319.40	2⁺		
		2124.95 *20*	48 *6*	297.38	4⁺		
		2331.51 *76*	4.6 *14*	90.985	2⁺		
2429.6	(10⁻)	305.07[a] *25*	100[a]	2124.56	(8⁻)		

$^{174}_{72}Hf_{102}$-11

Adopted Levels, Gammas (continued)

γ(^{174}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	α[c]
2431.2	(10$^+$)	251.0[‡]		2180.0	(9$^+$)		
		483.4[‡]		1948.1	(8$^+$)		
		945[‡] *6*		1485.9	(10$^+$)		
2441.85	(2$^+$,3,4$^+$)	1104.99 *36*	26 *6*	1336.48	(3)$^+$		
		1139.14 *36*	43 *8*	1303.36	(3$^+$)		
		2143.43 *51*	100 *23*	297.38	4$^+$		
		2352.09 *82*	66 *14*	90.985	2$^+$		
2447.41	9$^-$	363.08[a] *21*	100[a] *28*	2084.35	7$^-$		
		816.9[a] *5*	29[a] *15*	1630.5	(8$^+$)		
2486.1	2$^{(+)}$	1166.55[d] *36*	≤64[d]	1319.40	2$^+$		
		2189.19 *72*	100 *50*	297.38	4$^+$		
		2486.8 *17*	90 *50*	0.0	0$^+$		
2487.73	11$^-$	192.01[a] *23*	100[a] *8*	2295.7	(10$^-$)		
		368.79[a] *18*	70[a] *16*	2119.0	(9$^-$)		
2489.35	12$^+$	462.85[a] *19*	66[a] *7*	2026.3	(10$^+$)		
		468.62[a] *15*	100[a] *7*	2020.5	(12$^+$)		
2491.7	(2$^+$,3,4$^+$)	1429.62[d] *73*	≤16[d]	1062.17	4$^+$		
		1591.59[d] *54*	≤19[d]	900.24	2$^+$		
		2194.21 *57*	100 *14*	297.38	4$^+$		
		2400.86 *69*	72 *12*	90.985	2$^+$		
2505.25	2$^{(+)}$	1185.84 *14*	100 *10*	1319.40	2$^+$		
		2208.1 *15*	15 *3*	297.38	4$^+$		
		2414.2 *12*	7.1 *21*	90.985	2$^+$		
		2505.4 *21*	12 *5*	0.0	0$^+$		
2515.6	11$^-$	380.2[a] *3*	100[a]	2135.43	9$^-$		
2529.97	2$^+$	1210.91 *30*	67 *11*	1319.40	2$^+$	E0+M1+E2	0.20[@]
		1221.18 *36*	14 *3*	1308.69	(2$^-$)		
		1629.53 *28*	78 *14*	900.24	2$^+$		
		2232.37 *66*	56 *8*	297.38	4$^+$		
		2438.78 *59*	100 *14*	90.985	2$^+$		
		2530.2 *15*	10 *3*	0.0	0$^+$		
2554.6	(11$^-$)	259.0[a] *3*	7[a] *2*	2295.7	(10$^-$)		
		275.74[a] *23*	100[a] *5*	2279.2	(10$^-$)		
		526.67[a] *20*	22[a] *2*	2028.0	(9$^-$)		
2592.21	(3,4$^+$)	933.62 *92*	≤19	1658.41	(5$^+$)		
		1166.55[d] *36*	≤26[d]	1425.24	(4)$^-$		
		1289.03 *36*	18 *6*	1303.36	(3$^+$)		
		2294.81 *88*	68 *18*	297.38	4$^+$		

$^{174}_{72}Hf_{102}$-12

Adopted Levels, Gammas (continued)

γ(^{174}Hf) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π
2592.21	(3,4$^+$)	2500.98 *60*	100	90.985	2$^+$
2597.5	(14$^+$)	577.0‡	100	2020.5	(12$^+$)
2609.5	(11$^+$)	229.9[a] *4*	76[a] *45*	2379.22	10$^+$
		442.12[a] *19*	100[a] *3*	2167.1	(9$^+$)
2641.0	4$^{(+)}$	301.62 *70*	26 *7*	2338.51	(2$^+$,3,4$^+$)
		1192.66 *50*	100 *30*	1448.85	4$^+$
		2031.9[d] *14*	≤83[d]	608.26	6$^+$
		2344.5 *10*	40 *13*	297.38	4$^+$
		2549.5 *11*	25 *5*	90.985	2$^+$
2653.82	10$^-$	206.4[a] *12*	30.2[a] *23*	2447.41	9$^-$
		354.4[a] *3*	11[a] *4*	2299.4	(10$^-$)
		376.95[a] *11*	100[a] *8*	2276.87	8$^-$
		709.5[a] *3*	11[a] *4*	1943.9	(9$^-$)
		1167.7[a] *4*	5[a] *6*	1485.9	(10$^+$)
2684.85	(12$^+$)	195.5[a] *5*	20[a] *7*	2489.35	12$^+$
		664.10[a] *18*	100[a] *11*	2020.5	(12$^+$)
2700.3	(11$^+$)	269.1‡		2431.2	(10$^+$)
		520.2‡		2180.0	(9$^+$)
2700.8	(12$^-$)	212.8‡		2487.73	11$^-$
		404.7‡		2295.7	(10$^-$)
2729.84		1233.59 *21*	61 *5*	1496.36	2$^+$
		1421.9[d] *12*	≤6.4[d]	1308.69	(2$^-$)
		1502.96[d] *30*	≤34[d]	1226.77	2$^+$
		1829.54 *14*	100 *10*	900.24	2$^+$
2744.2	(12$^-$)	444.8‡	100	2299.4	(10$^-$)
2767.9	12$^-$	436.4[a] *7*	100[a]	2331.5	10$^-$
2772.0	(13$^-$)	452.0‡		2319.2	(11$^-$)
		751.5‡		2020.5	(12$^+$)
2791.42	(2$^+$,3,4$^+$)	929.08[d] *87*	≤58[d]	1861.78	(2$^+$,3,4$^+$)
		2494.2 *16*	75 *13*	297.38	4$^+$
		2699.2 *12*	100 *30*	90.985	2$^+$
2792.98	10$^-$	238.3[a] *5*	4.7[a] *13*	2554.6	(11$^-$)
		497.3[a] *3*	10.1[a] *11*	2295.7	(10$^-$)
		514.04[a] *15*	92[a] *5*	2279.2	(10$^-$)
		764.97[a] *14*	100[a] *7*	2028.0	(9$^-$)
		995.4[a] *4*	69[a] *8*	1797.5	(8$^-$)
2823.6	(12$^-$)	394.0[a] *3*	100[a]	2429.6	(10$^-$)

$^{174}_{72}Hf_{102}$-13

Adopted Levels, Gammas (continued)

γ(^{174}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Comments
2847.4	(12$^-$)	292.32[a] *19*	100[a] *10*	2554.6	(11$^-$)	E_γ: from in-beam reaction data.
		568.1[a] *6*	52[a] *16*	2279.2	(10$^-$)	
2854.35	12$^+$	245.2[a] *8*	17[a] *10*	2609.5	(11$^+$)	
		475.11[a] *12*	100[a] *25*	2379.22	10$^+$	
2859.21	11$^-$	411.8[a] *3*	100[a] *22*	2447.41	9$^-$	
		832.7[a] *3*	90[a] *30*	2026.3	(10$^+$)	
2931.76	2$^{(+)}$	339.33 *29*	100 *14*	2592.21	(3,4$^+$)	
		1435.86 *51*	44 *11*	1496.36	2$^+$	
		2031.9[d] *14*	≤53[d]	900.24	2$^+$	
		2104.28 *63*	23 *6*	828.13	0$^+$	
		2632.6 *14*	16 *3*	297.38	4$^+$	
		2840.7 *14*	22 *6*	90.985	2$^+$	
		2931.8 *12*	36 *8*	0.0	0$^+$	
2932.7	(13$^-$)	232.5[‡]		2700.3	(11$^+$)	
		445.0[‡]		2487.73	11$^-$	
2958.72	(11$^-$)	165.75[a] *13*	100[a] *5*	2792.98	10$^-$	
		404.05[a] *10*	50.0[a] *21*	2554.6	(11$^-$)	
		663.02[a] *16*	12.9[a] *12*	2295.7	(10$^-$)	
		679.79[a] *9*	67[a] *3*	2279.2	(10$^-$)	
		932.12[a] *22*	3.0[a] *10*	2026.3	(10$^+$)	
		1472.6[a] *5*	0.46[a] *16*	1485.9	(10$^+$)	
2972.4	13$^-$	456.80[a] *24*	100[a]	2515.6	11$^-$	
2983.3	(12$^+$)	283.04[a] *4*	100[a] *2*	2700.3	(11$^+$)	
		552.14[a] *6*	80[a] *1*	2431.2	(10$^+$)	
		962.96[a] *25*	0.7[a] *3*	2020.5	(12$^+$)	
2992.5	(14$^+$)	394.8[‡]		2597.5	(14$^+$)	
		503.6[‡]		2489.35	12$^+$	
3046.24	(11$^-$)	87.6[a] *4*	100[a] *40*	2958.72	(11$^-$)	
		726.7[a] *3*	7.9[a] *18*	2319.2	(11$^-$)	
		1019.71[a] *17*	16[a] *4*	2026.3	(10$^+$)	
		1102.0[a] *4*	3.3[a] *25*	1943.9	(9$^-$)	
		1560.2[a] *4*	1.3[a] *4*	1485.9	(10$^+$)	
3087.9	4$^{(+)}$	1429.62[d] *73*	≤30[d]	1658.41	(5$^+$)	
		1439.37 *49*	81 *25*	1648.33	4$^-$	
		1591.59[d] *54*	≤36[d]	1496.36	2$^+$	
		1785.6[d] *14*	≤23[d]	1303.36	(3$^+$)	
		2479.22 *75*	100 *23*	608.26	6$^+$	

$^{174}_{72}Hf_{102}$-14

Adopted Levels, Gammas (continued)

γ(^{174}Hf) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π
3087.9	$4^{(+)}$	2790.2 *19*	30 *4*	297.38	4^+
		2999.7 *18*	10 *4*	90.985	2^+
3090.16	12^-	131.46[a] *10*	100[a] *5*	2958.72	(11^-)
		230.9[a] *5*	1.55[a] *19*	2859.21	11^-
		243.2[a] *5*	3.9[a] *6*	2847.4	(12^-)
		297.2[a] *4*	1.9[a] *5*	2792.98	10^-
		346.1[a] *4*	0.59[a] *16*	2744.2	(12^-)
		436.33[a] *8*	12.4[a] *10*	2653.82	10^-
		535.51[a] *22*	9.7[a] *8*	2554.6	(11^-)
		770.6[a] *4*	0.50[a] *19*	2319.2	(11^-)
		811.25[a] *25*	2.5[a] *6*	2279.2	(10^-)
3106.0	(2,3,4)	614.82 *91*	60 *22*	2491.7	$(2^+,3,4^+)$
		703.16 *73*	64 *18*	2402.80	2^+
		1785.6[d] *14*	≤45[d]	1319.40	2^+
		2808.6 *17*	100 *30*	297.38	4^+
		3014.0 *22*	23 *8*	90.985	2^+
3117.4	(13^+)	262.9[a] *7*	19[a] *14*	2854.35	12^+
		508.0[a] *3*	100[a] *67*	2609.5	(11^+)
3157.02	(13^-)	310.1[a] *3*	100[a] *11*	2847.4	(12^-)
		602.4[a] *3*	49[a] *10*	2554.6	(11^-)
3180.7	(14^-)	247.3‡		2932.7	(13^-)
		479.7‡		2700.8	(12^-)
3191.1	(2,3,4)	259.36 *82*	48 *9*	2931.76	$2^{(+)}$
		1742.49 *73*	100 *23*	1448.85	4^+
		1886.8 *11*	59 *23*	1303.36	(3^+)
		2893.8 *12*	45 *12*	297.38	4^+
		3100.0 *18*	15 *5*	90.985	2^+
3208.9	(16^+)	611.4‡	100	2597.5	(14^+)
3230.06	12^-	183.8[a] *3*	100[a] *18*	3046.24	(11^-)
		271.4[a] *7*	52[a] *11*	2958.72	(11^-)
3248.01		1599.79 *21*	68 *11*	1648.33	4^-
		1853.27 *56*	29 *7*	1394.60	$(4)^+$
		1927.9 *20*	32 *11*	1319.40	2^+
		1939.25[d] *25*	≤100[d]	1308.69	(2^-)
		1944.53 *24*	100 *14*	1303.36	(3^+)
		2022.6 *15*	10 *3*	1226.77	2^+
3260.2	(14^-)	516.0‡	100	2744.2	(12^-)
3269.0	(13^+)	285.7‡		2983.3	(12^+)
3269.0	(13^+)	568.4‡		2700.3	(11^+)
3280.2	14^-	512.4[a] *12*	100[a]	2767.9	12^-
3296.3	(15^-)	524.3‡		2772.0	(13^-)
		698.4‡		2597.5	(14^+)
3300.24	13^-	210.10[a] *22*	100[a]	3090.16	12^-
3301.8	(14^-)	478.2[a] *7*	100[a]	2823.6	(12^-)
3311.7	(14^+)	10.3[a] *10*	0.14[a] *9*	3301.8	(14^-)
		11.87[a] *25*	33.0[a] *13*	3300.24	13^-
		15.7[a] *7*	0.27[a] *13*	3296.3	(15^-)
		31.9[a] *5*	0.14[a] *8*	3280.2	14^-
		42.69[a] *14*	100.0[a] *11*	3269.0	(13^+)
		54[a] *5*	0.14[a] *15*	3260.2	(14^-)
		82.0[a] *3*	0.14[a] *9*	3230.06	12^-
		132.4[a] *14*	0.63[a] *17*	3180.7	(14^-)
		155.09[a] *16*	2.33[a] *24*	3157.02	(13^-)
		194.8[a] *12*	0.05[a] *6*	3117.4	(13^+)
		221.97[a] *22*	44.6[a] *18*	3090.16	12^-
		318.8[a] *3*	0.4[a] *5*	2992.5	(14^+)
		328.36[a] *5*	64.9[a] *9*	2983.3	(12^+)
		339.7[a] *5*	0.18[a] *18*	2972.4	13^-
		379.38[a] *12*	5.6[a] *4*	2932.7	(13^-)
		457.70[a] *14*	1.4[a] *4*	2854.35	12^+
		539.3[a] *6*	0.23[a] *9*	2772.0	(13^-)
		627.22[a] *14*	1.27[a] *15*	2684.85	(12^+)
		714.2[a] *3*	1.86[a] *11*	2597.5	(14^+)
		822.70[a] *15*	1.1[a] *3*	2489.35	12^+
		1291.32[a] *24*	0.48[a] *22*	2020.5	(12^+)
3449.7	(15^-)	267.7‡		3180.7	(14^-)
		514.4‡		2932.7	(13^-)
3500.4	(16^+)	507.9‡	100	2992.5	(14^+)
3545.5	(15^+)	233.8‡	100	3311.7	(14^+)
3680.5	(15^+)	563.1‡	100	3117.4	(13^+)
3795.6	(16^+)	250.1‡	100	3545.5	(15^+)
3857.3	(18^+)	648.3‡	100	3208.9	(16^+)
3885.9	(17^-)	589.6‡	100	3296.3	(15^-)
4048	(18^+)	547	100	3500.4	(16^+)
4065.7	(17^+)	269.5‡		3795.6	(16^+)
		519.7‡		3545.5	(15^+)

$^{174}_{72}Hf_{102}$-15

Adopted Levels, Gammas (continued)

γ(^{174}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π
4358.1	(18$^+$)	293.0[‡]	100	4065.7	(17$^+$)
4550.8	(20$^+$)	693.5[‡]	100	3857.3	(18$^+$)
4656	(20$^+$)	608[&]	100	4048	(18$^+$)
5291	(22$^+$)	741[&]	100	4550.8	(20$^+$)
5359	(22$^+$)	703[‡]		4656	(20$^+$)
		809[‡]		4550.8	(20$^+$)
6062.7	(24$^+$)	771[&]	100	5291	(22$^+$)
6164.7	(24$^+$)	805[&]	100	5359	(22$^+$)
6890?	(26$^+$)	828[&e]	100	6062.7	(24$^+$)
7027?	(26$^+$)	863[&e]	100	6164.7	(24$^+$)
726+x	J+2	726[b]	0.45[b] *10*	x	J>23
1490+x	J+4	764[b]	0.67[b] *10*	726+x	J+2
2310+x	J+6	820[b]	1.00[b] *10*	1490+x	J+4
3177+x	J+8	867[b]	0.85[b] *10*	2310+x	J+6
4095+x	J+10	918[b]	1.00[b] *20*	3177+x	J+8
5065+x	J+12	970[b]	0.87[b] *10*	4095+x	J+10
6090+x	J+14	1025[b]	0.92[b] *10*	5065+x	J+12
7172+x	J+16	1082[b]	0.73[b] *10*	6090+x	J+14
8313+x	J+18	1141[b]	0.62[b] *15*	7172+x	J+16
9515+x	J+20	1202[b]	0.40[b] *15*	8313+x	J+18
10779+x	J+22	1264[b]	0.28[b] *15*	9515+x	J+20
12105+x?	J+24	1326[be]	0.17[b] *17*	10779+x	J+22
13495+x	J+26	1390		12105+x?	J+24
14948+x	J+28	1453		13495+x	J+26
16460+x?	J+30	1512[e]		14948+x	J+28
755+y	J1+2	755[b]	0.60[b] *10*	y	J1>24
1548+y	J1+4	793[b]	0.75[b] *10*	755+y	J1+2
2394+y	J1+6	846[b]	0.85[b] *20*	1548+y	J1+4
3293+y	J1+8	899[b]	0.90[b] *10*	2394+y	J1+6
4248+y	J1+10	955[b]	0.95[b] *10*	3293+y	J1+8
5263+y	J1+12	1015[b]	1.00[b] *10*	4248+y	J1+10
6340+y	J1+14	1077[b]	0.77[b] *10*	5263+y	J1+12
7480+y	J1+16	1140[b]	0.55[b] *15*	6340+y	J1+14
8684+y	J1+18	1204[b]	0.50[b] *15*	7480+y	J1+16
9953+y	J1+20	1269[b]	0.30[b] *20*	8684+y	J1+18
11288+y	J1+22	1335	0.20 *20*	9953+y	J1+20
12688+y	J1+24	1400		11288+y	J1+22
14154+y	J1+26	1466		12688+y	J1+24
15684+y	J1+28	1530		14154+y	J1+26
702+z?	J2+2	702[be]	0.30[b] *20*	z	J2>22
1456+z	J2+4	754[b]	0.52[b] *15*	702+z?	J2+2
2237+z	J2+6	781[b]	0.60[b] *15*	1456+z	J2+4
3078+z	J2+8	841[b]	1.00[b] *10*	2237+z	J2+6
3968+z	J2+10	890[b]	0.90[b] *10*	3078+z	J2+8
4909+z	J2+12	941[b]	0.80[b] *10*	3968+z	J2+10
5905+z	J2+14	996[b]	0.80[b] *10*	4909+z	J2+12
6960+z	J2+16	1055[b]	0.50[b] *15*	5905+z	J2+14
8065+z	J2+18	1105[b]	0.27[b] *20*	6960+z	J2+16
9291+z	J2+20	1226		8065+z	J2+18
10578+z	J2+22	1287		9291+z	J2+20
11927+z	J2+24	1349		10578+z	J2+22
13339+z	J2+26	1412		11927+z	J2+24
14814+z?	J2+28	1475[e]		13339+z	J2+26
855+u	J3+2	855[b]	0.60[b] *20*	u	J3>28
1759+u	J3+4	904[b]	0.85[b] *15*	855+u	J3+2
2708+u	J3+6	949[b]	0.75[b] *15*	1759+u	J3+4
3703+u	J3+8	995[b]	1.00[b] *15*	2708+u	J3+6
4748+u	J3+10	1045[b]	0.70[b] *15*	3703+u	J3+8
5846+u	J3+12	1098[b]	0.75[b] *15*	4748+u	J3+10
7001+u	J3+14	1155[b]	0.45[b] *20*	5846+u	J3+12
8217+u	J3+16	1216[b]	0.25[b] *20*	7001+u	J3+14
9495+u	J3+18	1278		8217+u	J3+16
10839+u	J3+20	1344		9495+u	J3+18
12250+u	J3+22	1411		10839+u	J3+20
13728+u?	J3+24	1478[e]		12250+u	J3+22
723+v	J4+2	723		v	J4

$^{174}_{72}Hf_{102}$-16

Adopted Levels, Gammas (continued)

γ(^{174}Hf) (continued)

E_i(level)	J_i^π	E_γ †	E_f	J_f^π	E_i(level)	J_i^π	E_γ †	E_f	J_f^π	E_i(level)	J_i^π	E_γ †	E_f	J_f^π
1492+v	J4+4	769	723+v	J4+2	4493+w	J5+10	1002	3491+w	J5+8	9086+s	J6+18	1242	7844+s	J6+16
2309+v	J4+6	817	1492+v	J4+4	5558+w	J5+12	1065	4493+w	J5+10	10389+s	J6+20	1303	9086+s	J6+18
3177+v	J4+8	868	2309+v	J4+6	6684+w	J5+14	1126	5558+w	J5+12	11755+s	J6+22	1366	10389+s	J6+20
4096+v	J4+10	919	3177+v	J4+8	7884+w	J5+16	1200	6684+w	J5+14	818+t	J7+2	818	t	J7
5069+v	J4+12	973	4096+v	J4+10	9146+w	J5+18	1262	7884+w	J5+16	1672+t	J7+4	854	818+t	J7+2
6099+v	J4+14	1030	5069+v	J4+12	10476+w	J5+20	1330	9146+w	J5+18	2570+t	J7+6	898	1672+t	J7+4
7186+v	J4+16	1087	6099+v	J4+14	11871+w	J5+22	1395	10476+w	J5+20	3512+t	J7+8	942	2570+t	J7+6
8333+v	J4+18	1147	7186+v	J4+16	13331+w?	J5+24	1460[e]	11871+w	J5+22	4502+t	J7+10	990	3512+t	J7+8
9542+v	J4+20	1209	8333+v	J4+18	810+s	J6+2	810	s	J6	5550+t	J7+12	1048	4502+t	J7+10
10810+v	J4+22	1268	9542+v	J4+20	1650+s	J6+4	840	810+s	J6+2	6660+t	J7+14	1110	5550+t	J7+12
12150+v	J4+24	1340	10810+v	J4+22	2543+s	J6+6	893	1650+s	J6+4	7837+t	J7+16	1177	6660+t	J7+14
13541+v	J4+26	1391	12150+v	J4+24	3489+s	J6+8	946	2543+s	J6+6	9079+t	J7+18	1242	7837+t	J7+16
802+w	J5+2	802	w	J5	4491+s	J6+10	1002	3489+s	J6+8	10387+t	J7+20	1308	9079+t	J7+18
1661+w	J5+4	859	802+w	J5+2	5549+s	J6+12	1058	4491+s	J6+10	11740+t	J7+22	1353	10387+t	J7+20
2550+w	J5+6	889	1661+w	J5+4	6666+s	J6+14	1117	5549+s	J6+12					
3491+w	J5+8	941	2550+w	J5+6	7844+s	J6+16	1178	6666+s	J6+14					

† From ^{174}Ta ε decay, unless otherwise specified. Intensities for SD bands are relative intensities within each band. All other intensities are relative photon branchings.
‡ From in-beam reaction data.
# From α(K)exp, ^{174}Ta ε decay, except where noted otherwise.
@ Experimental value from ^{174}Ta ε decay.
& From ^{130}Te(^{48}Ca,4nγ) (1986Wa07).
[a] Eγ, Iγ(1+α) from 1995Gj01.
[b] From ^{130}Te(^{48}Ca,4nγ):SD.
[c] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[d] Multiply placed with undivided intensity.
[e] Placement of transition in the level scheme is uncertain.

$^{174}_{72}Hf_{102}$-17

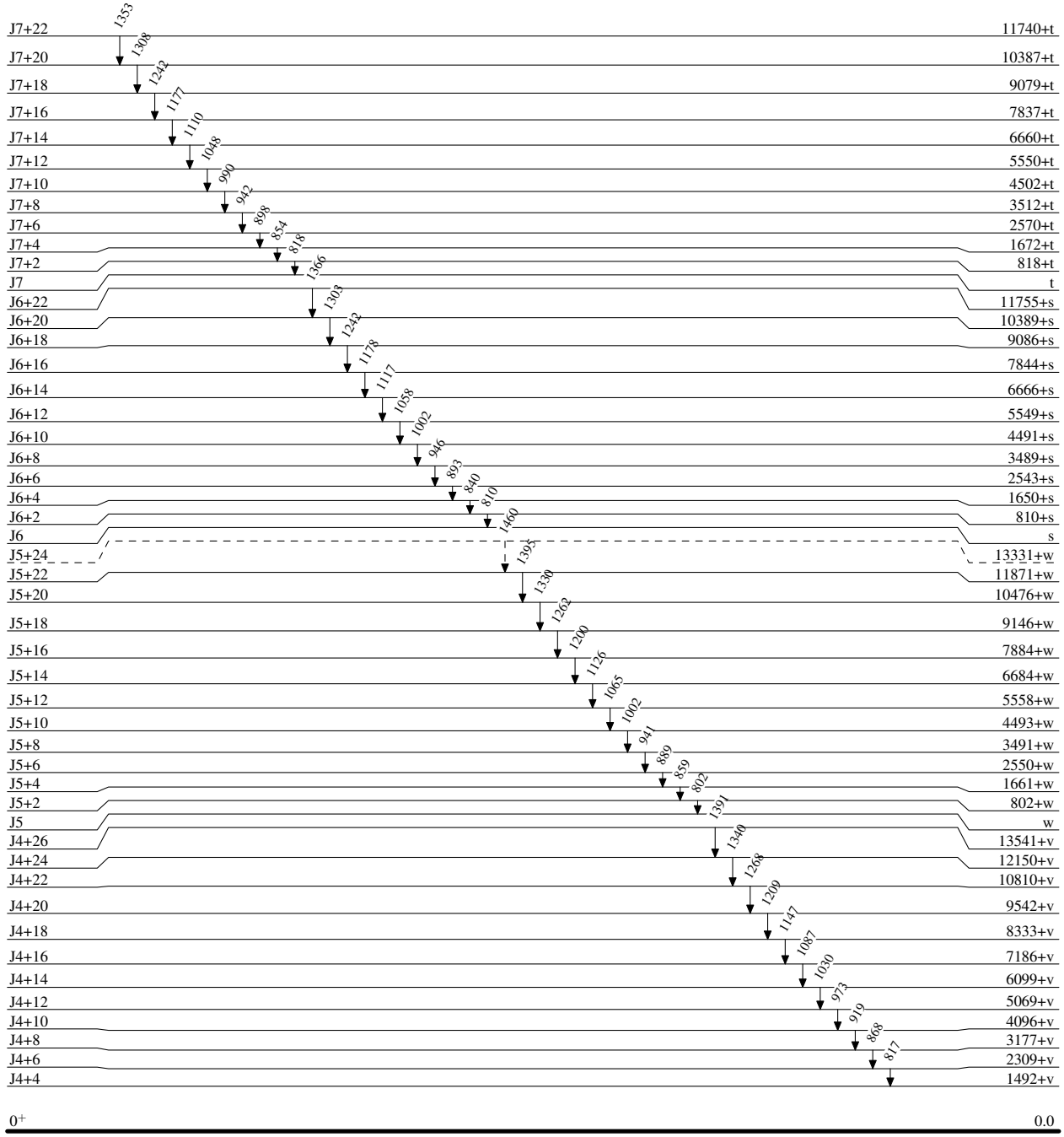
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{174}_{72}Hf_{102}$

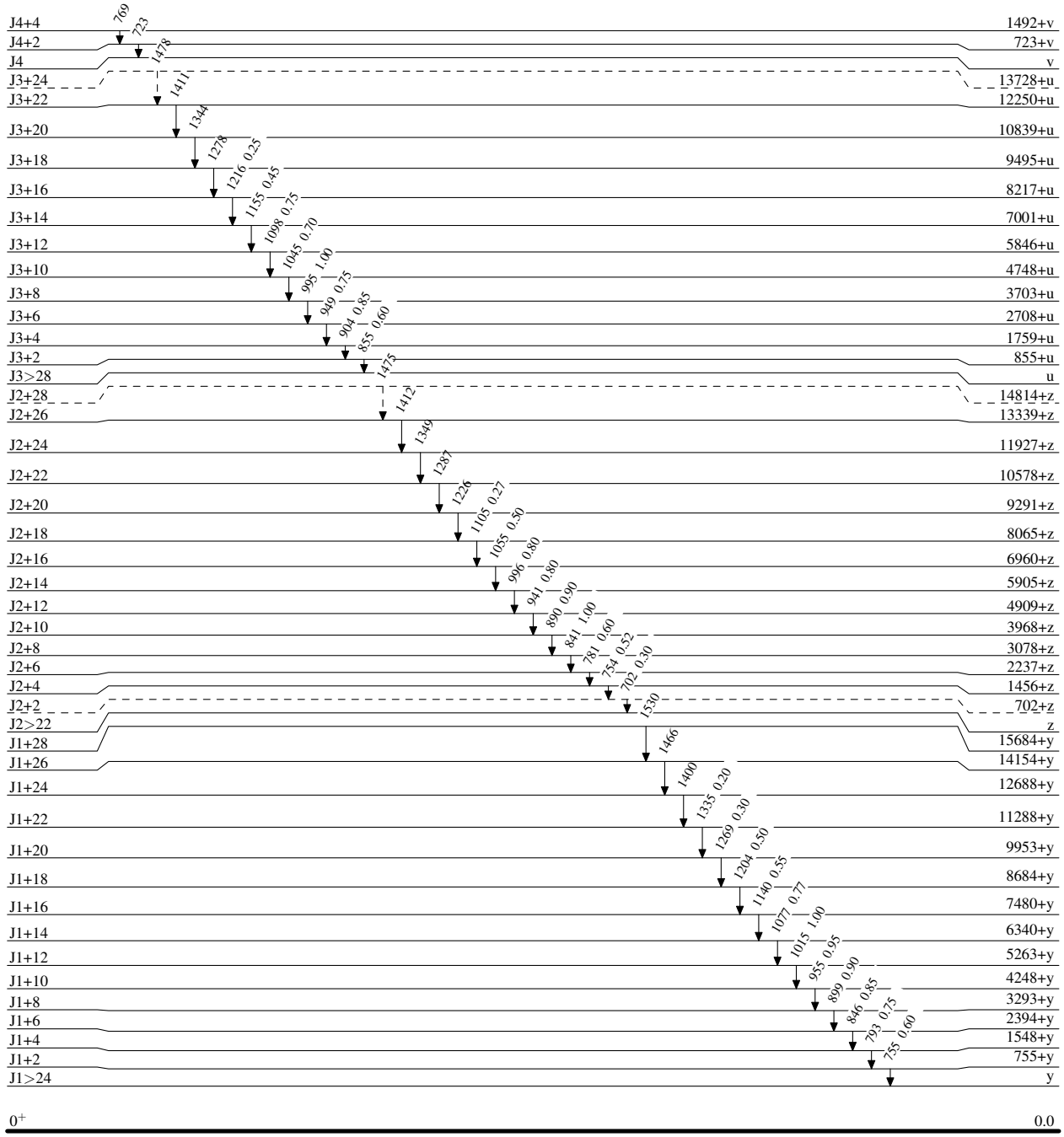
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{174}_{72}Hf_{102}$

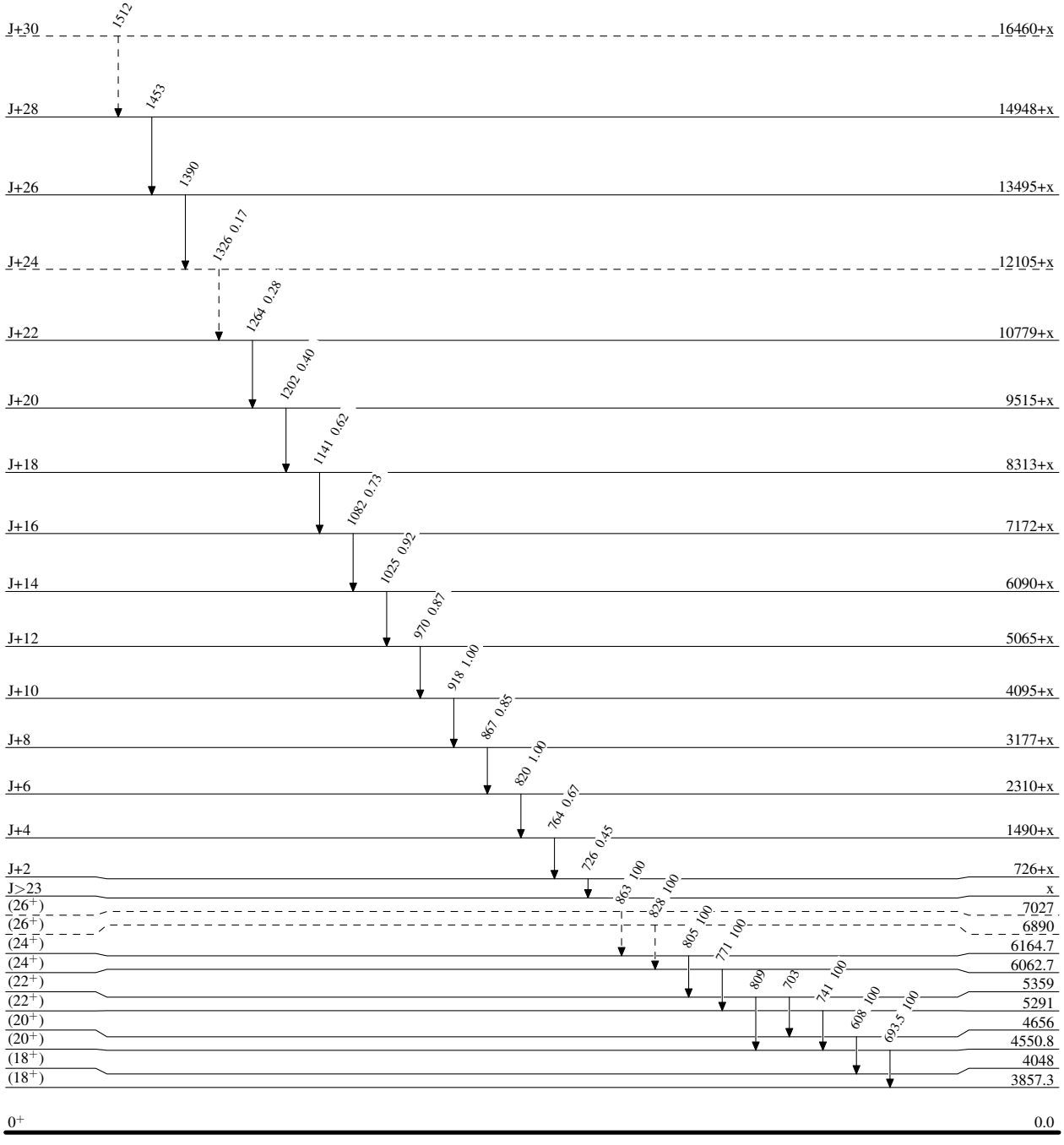
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

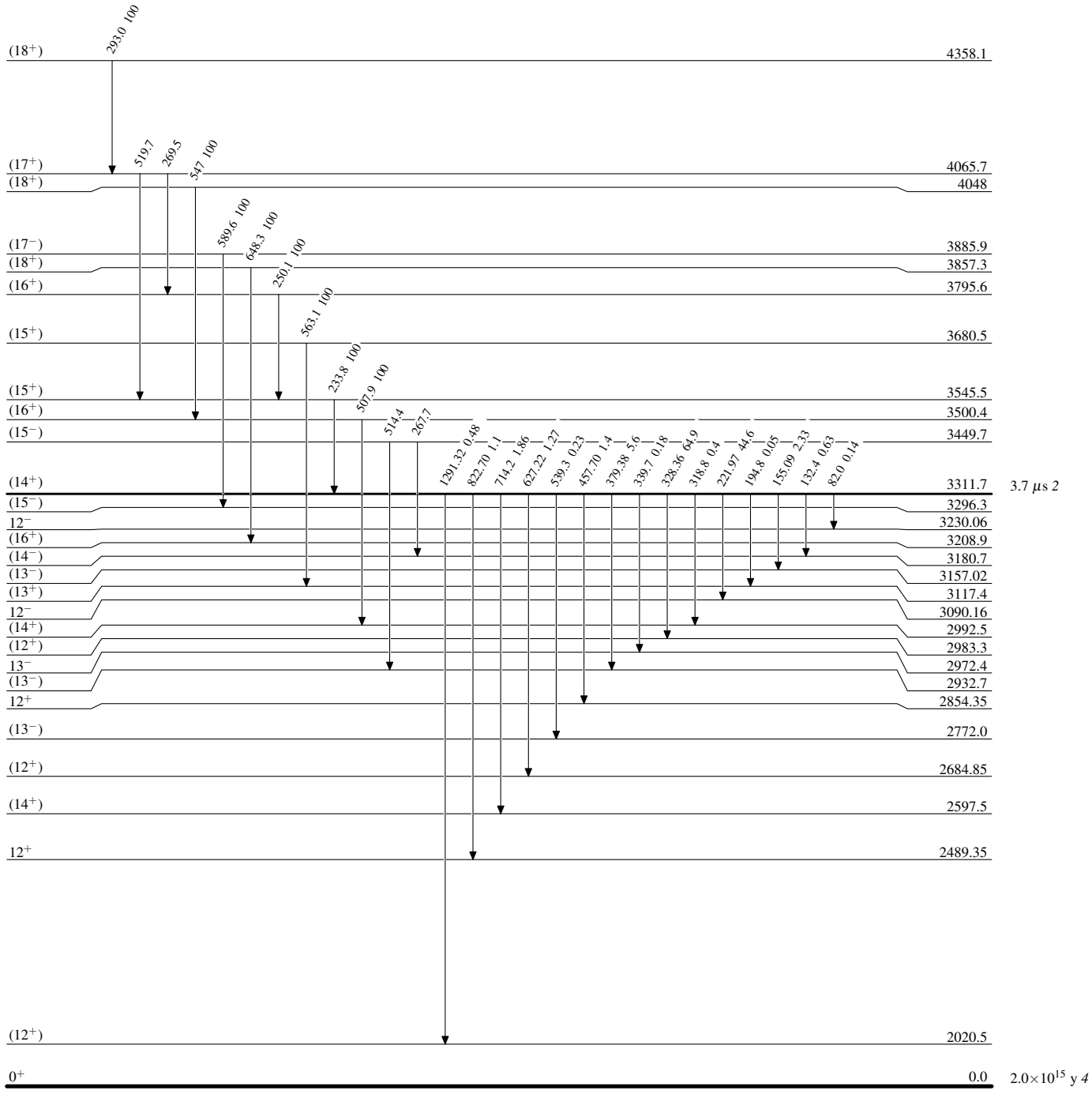


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

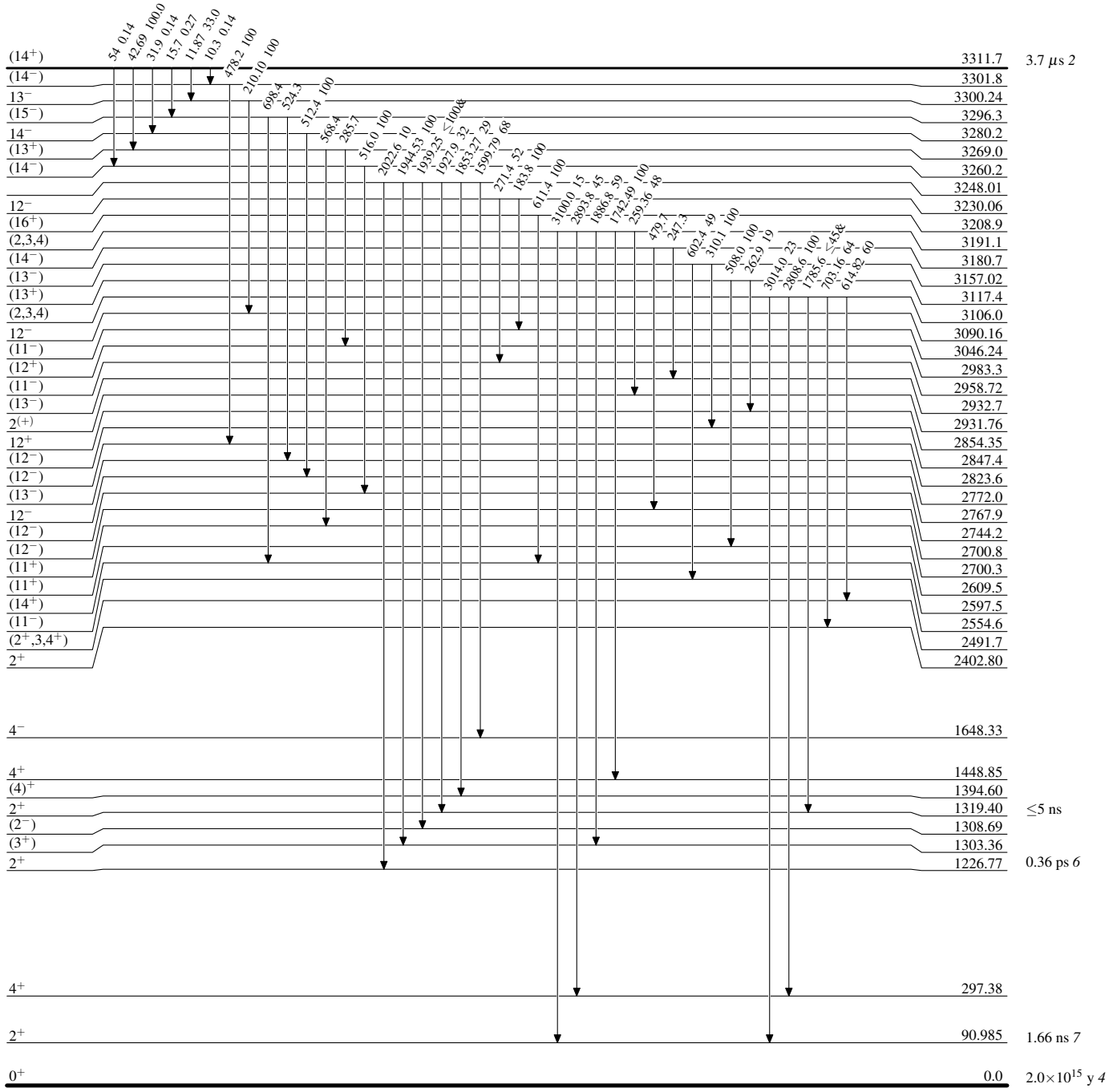


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

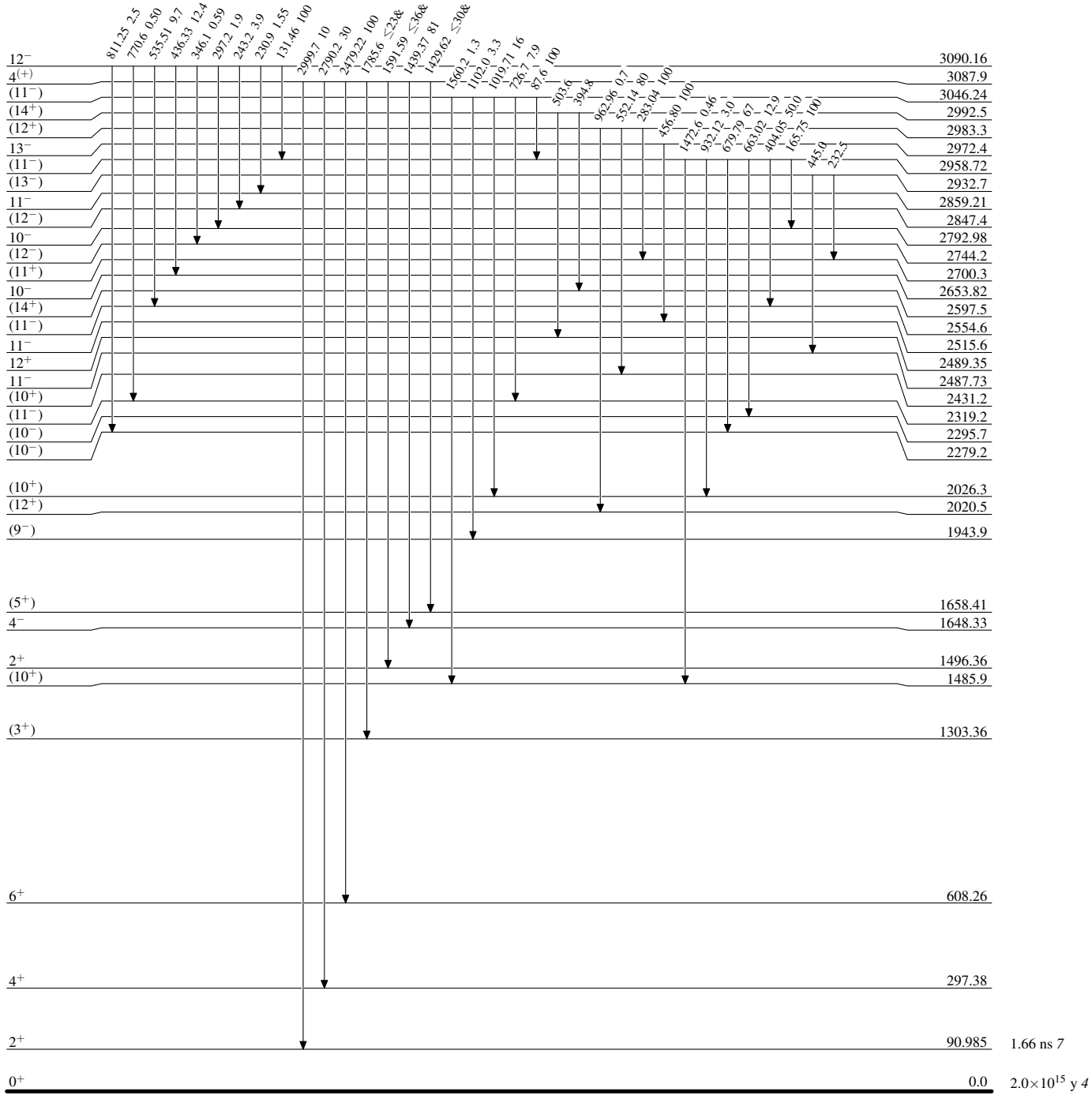


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

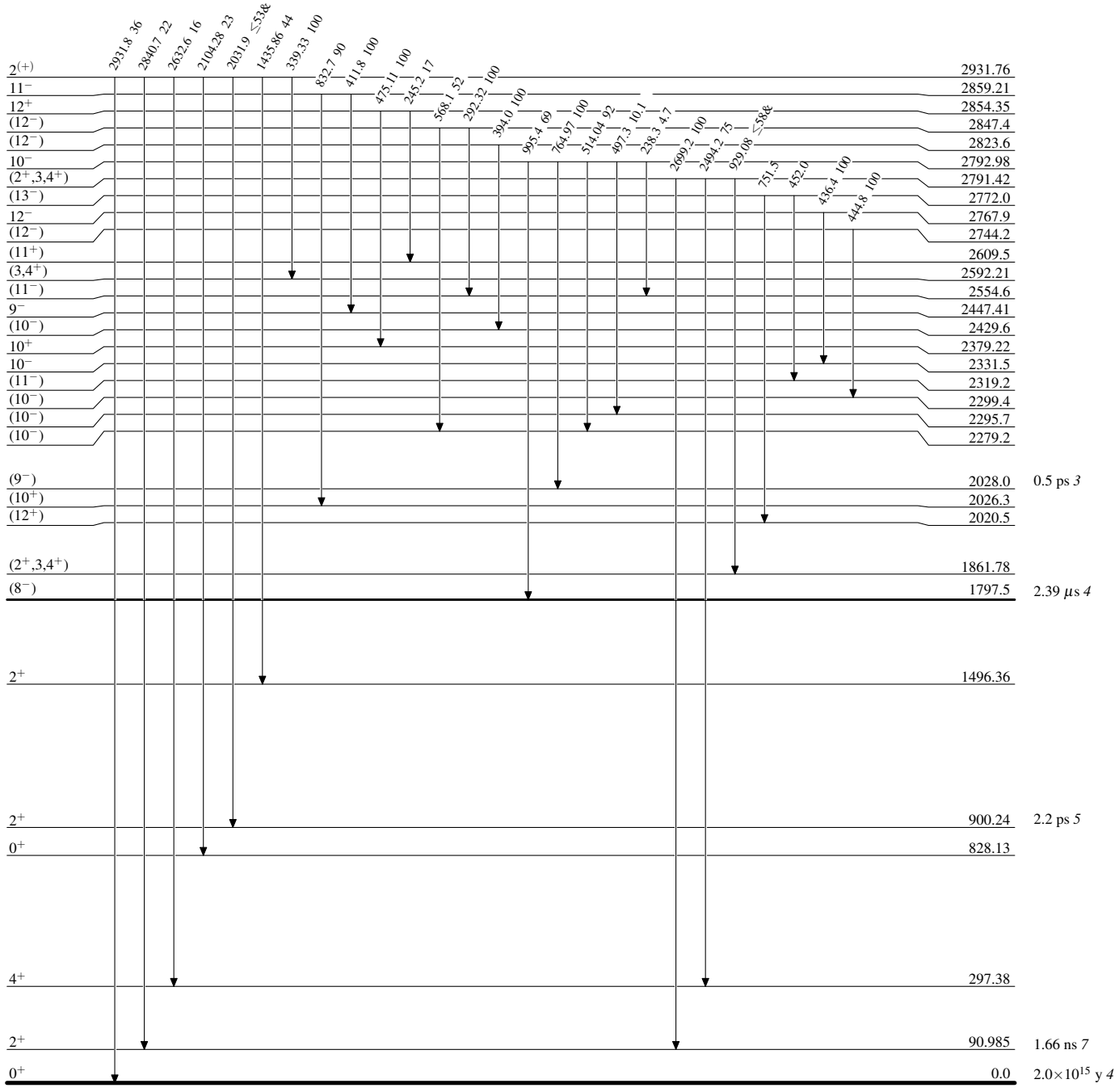


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

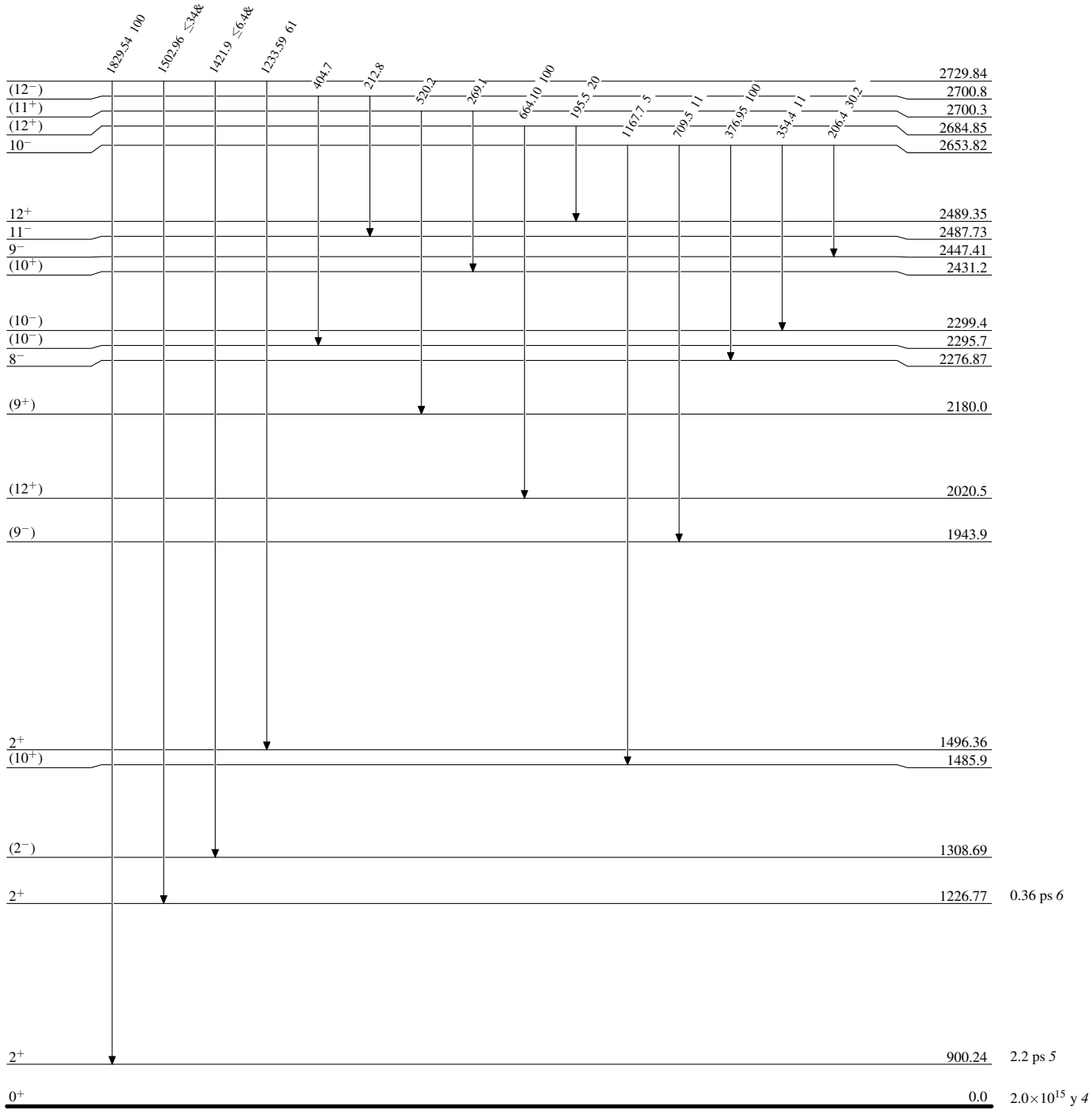


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

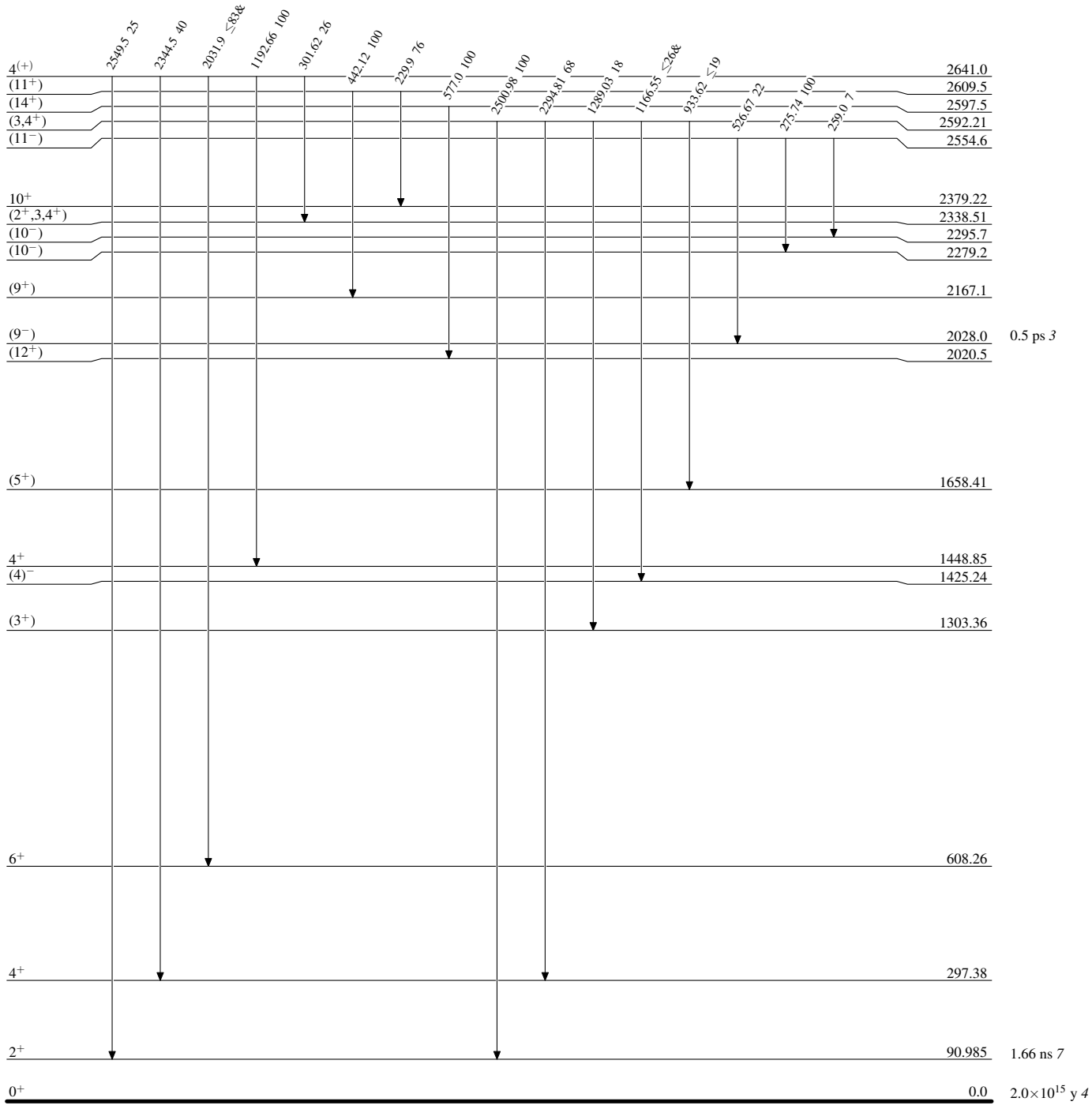


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

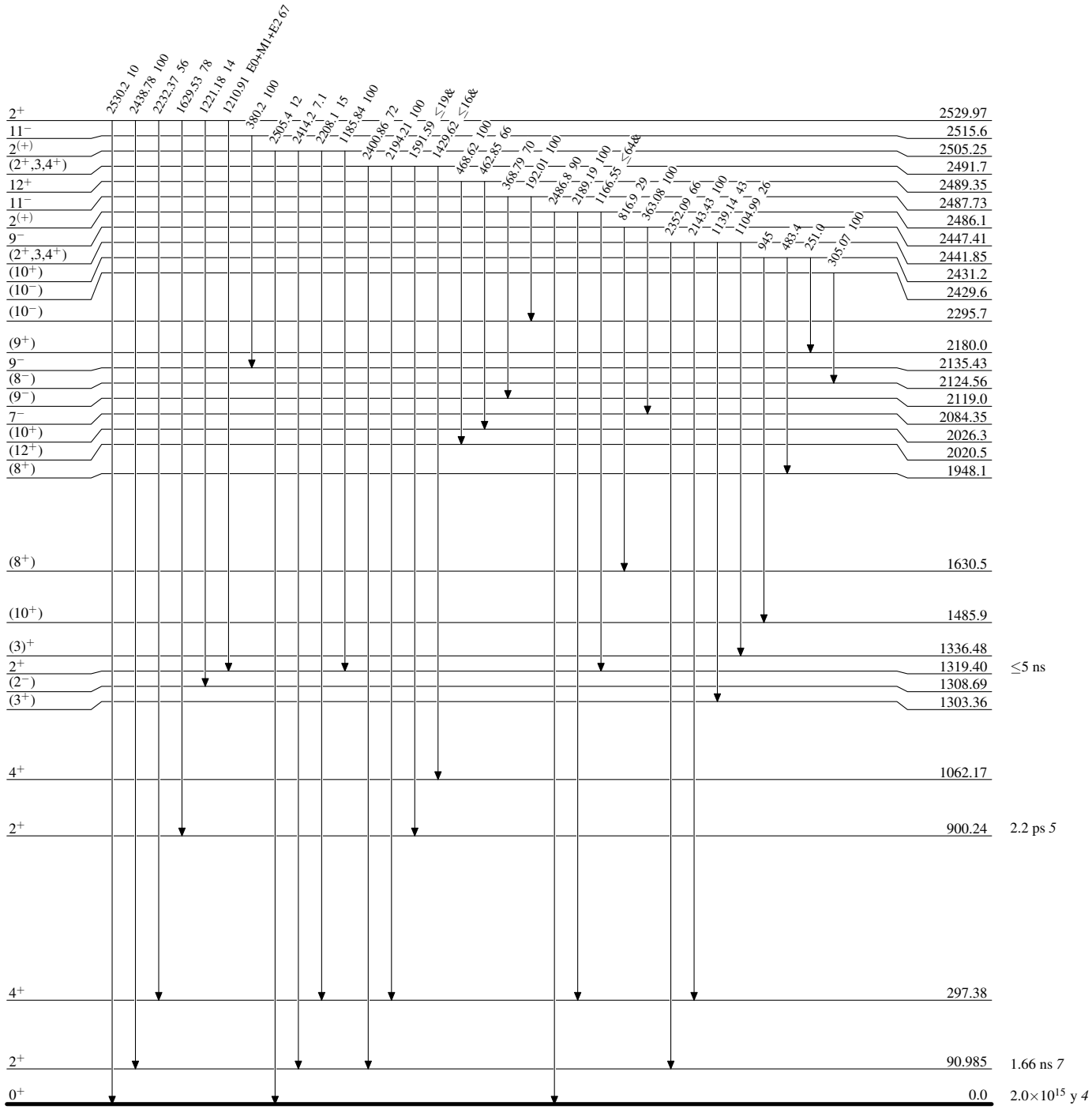


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

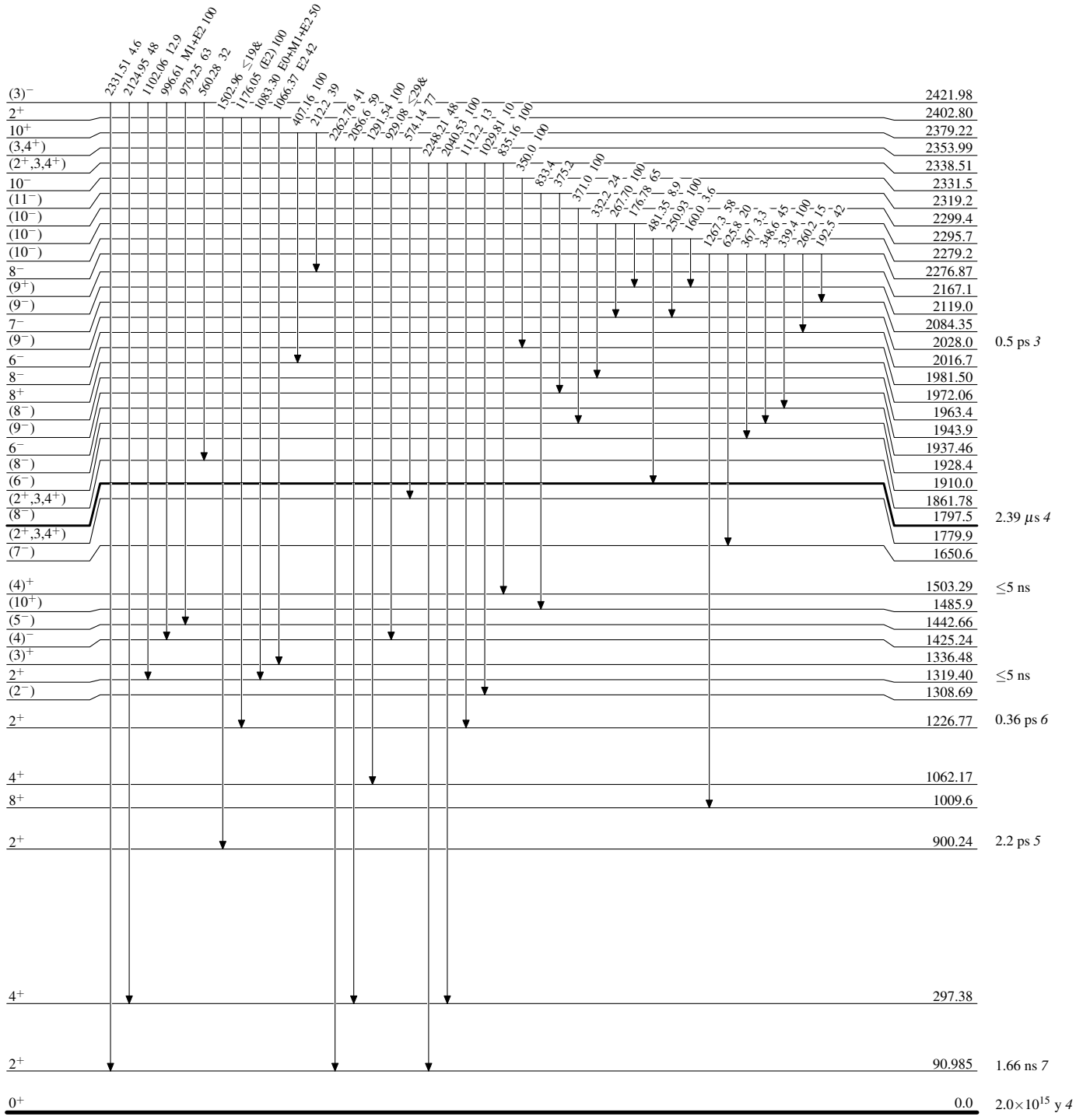


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

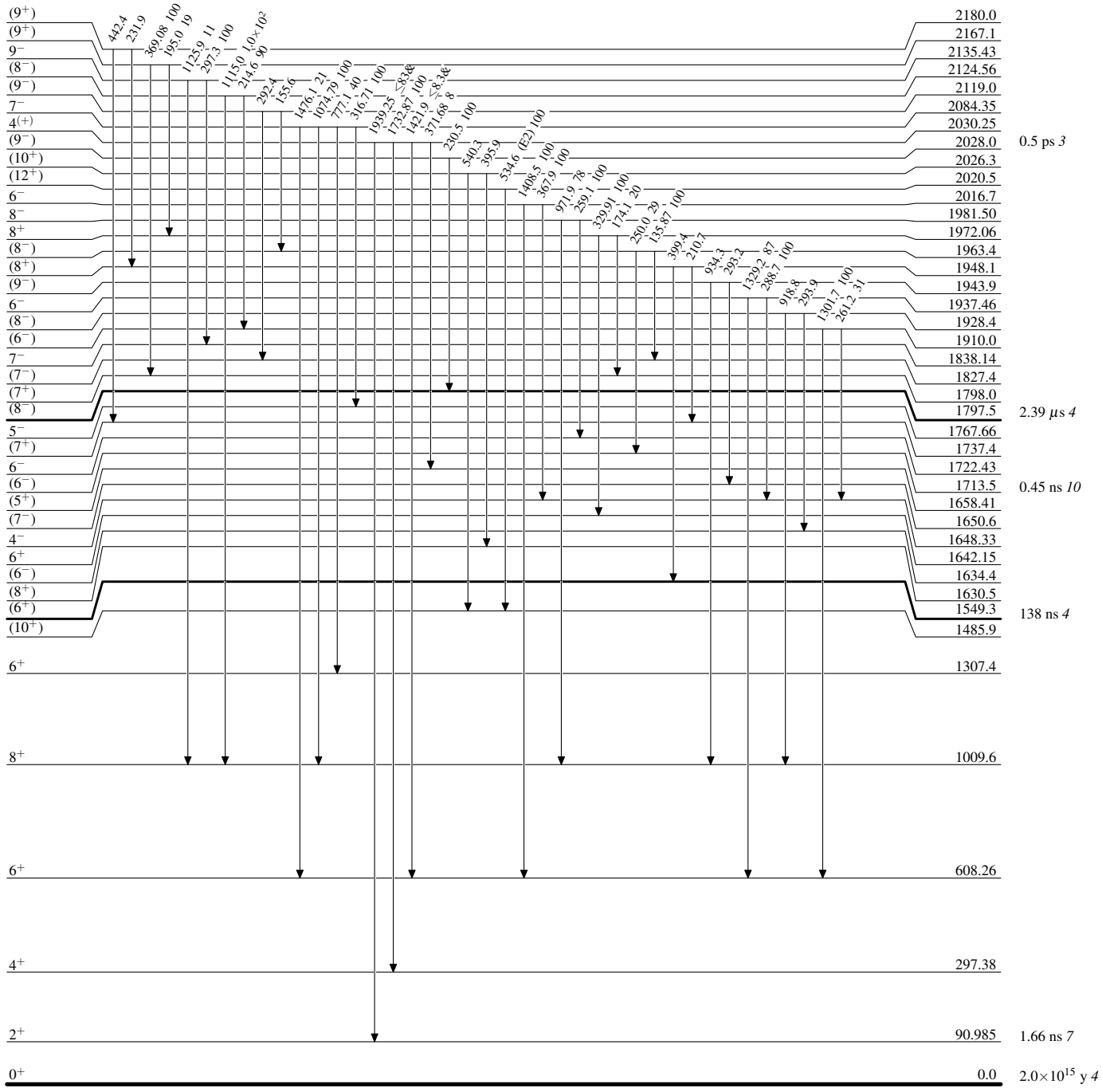


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

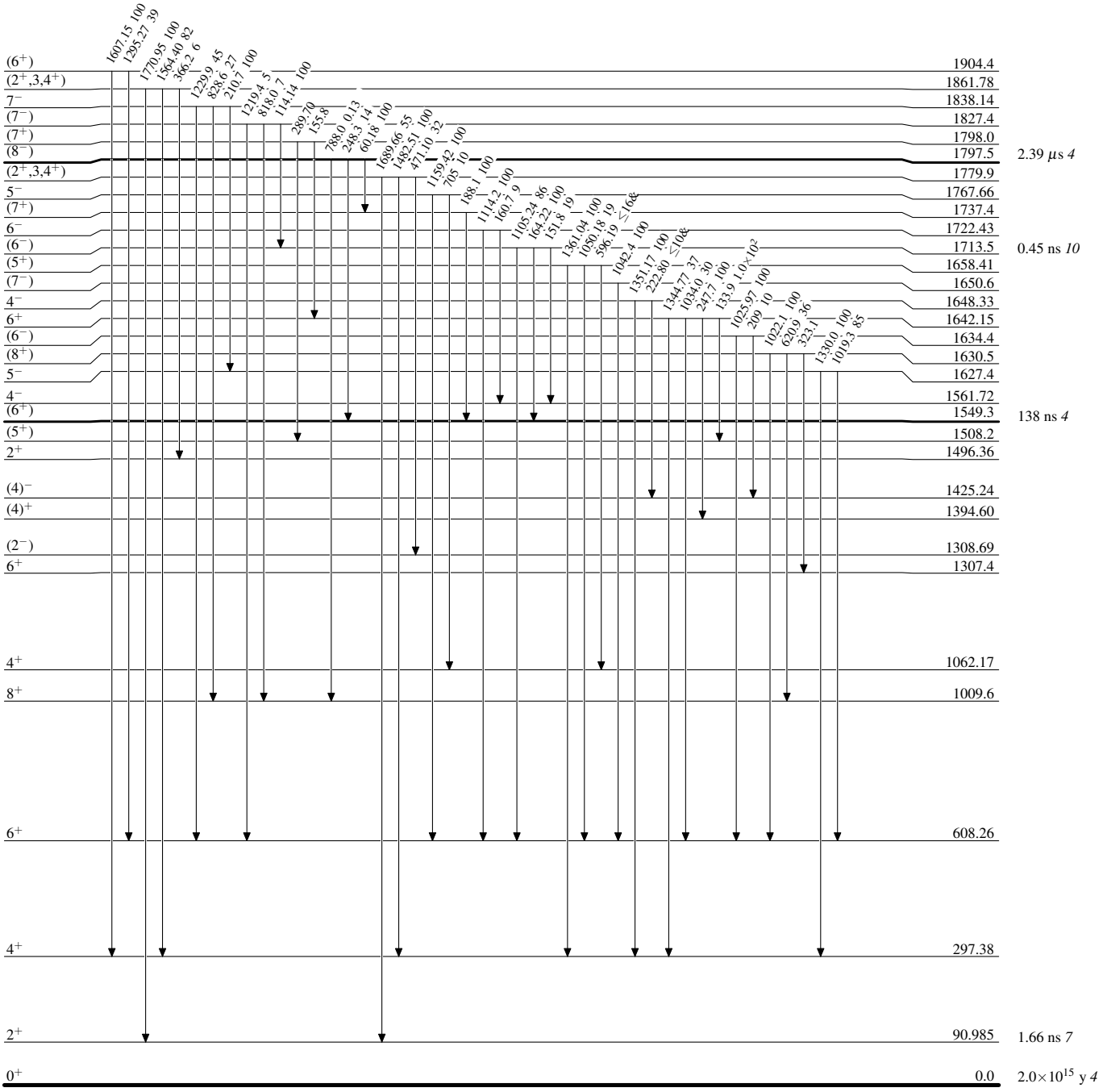


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

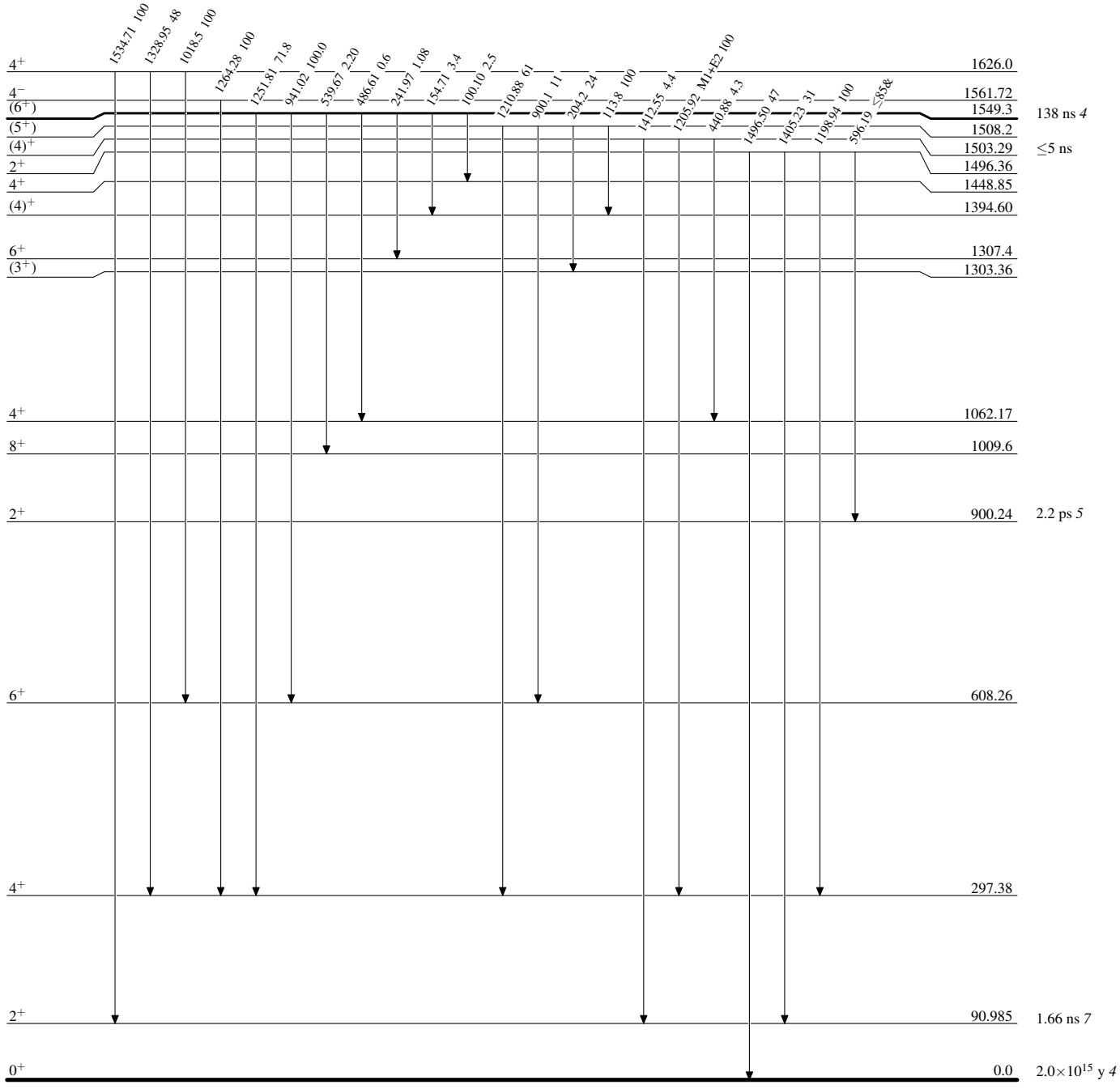


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

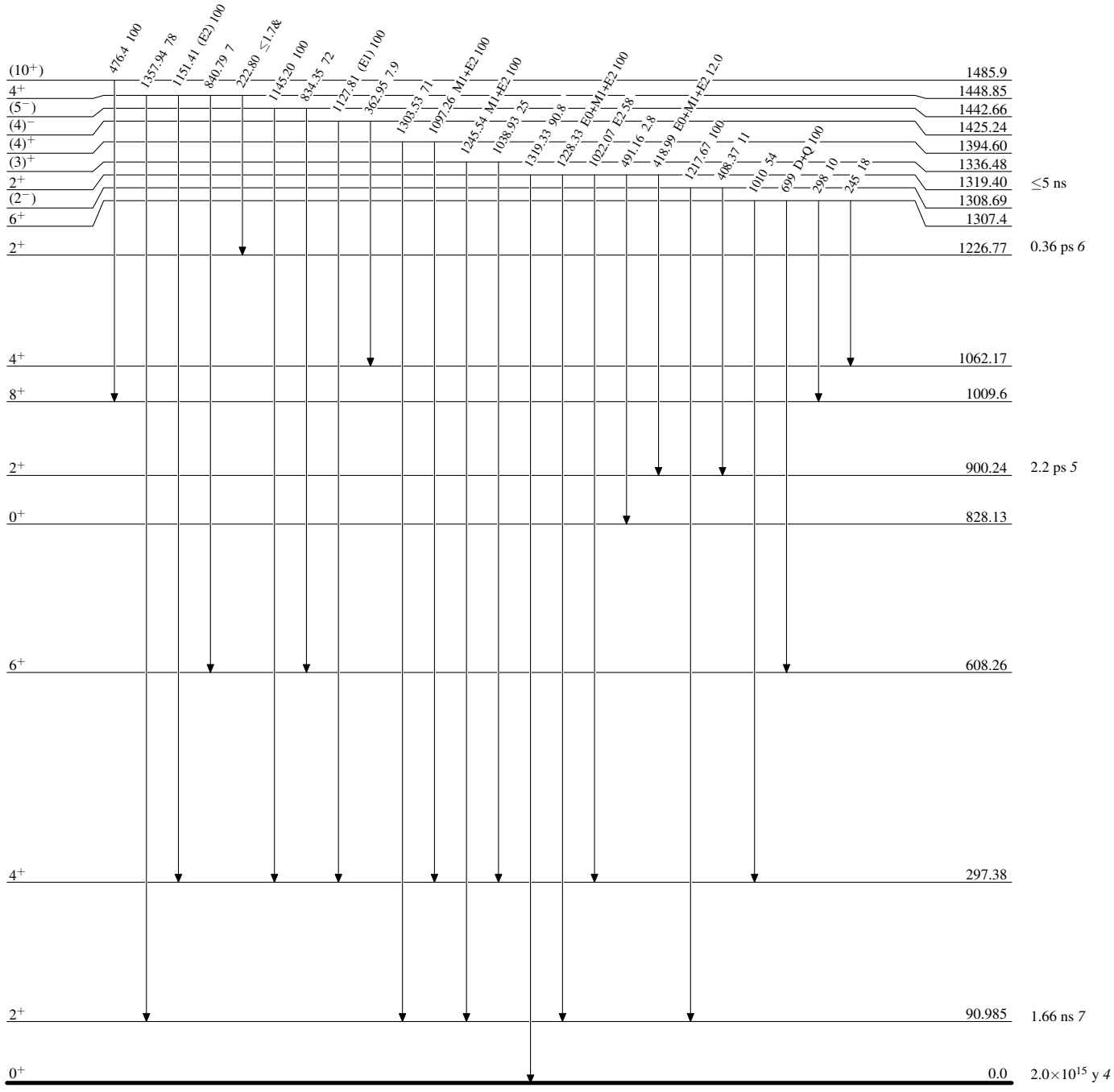


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

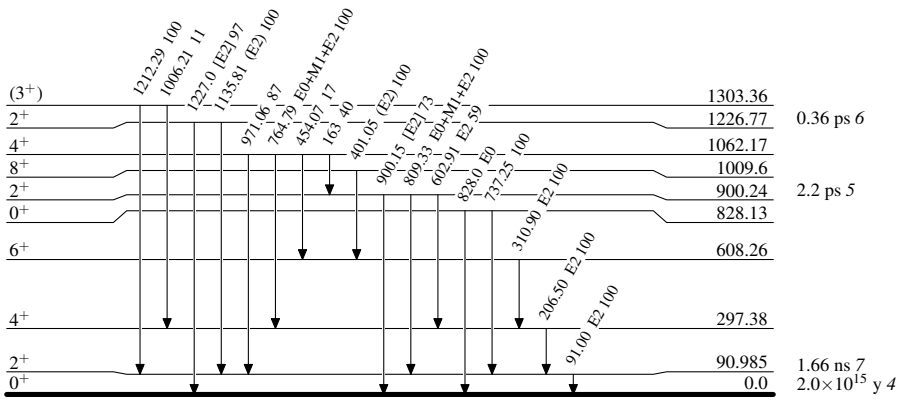


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

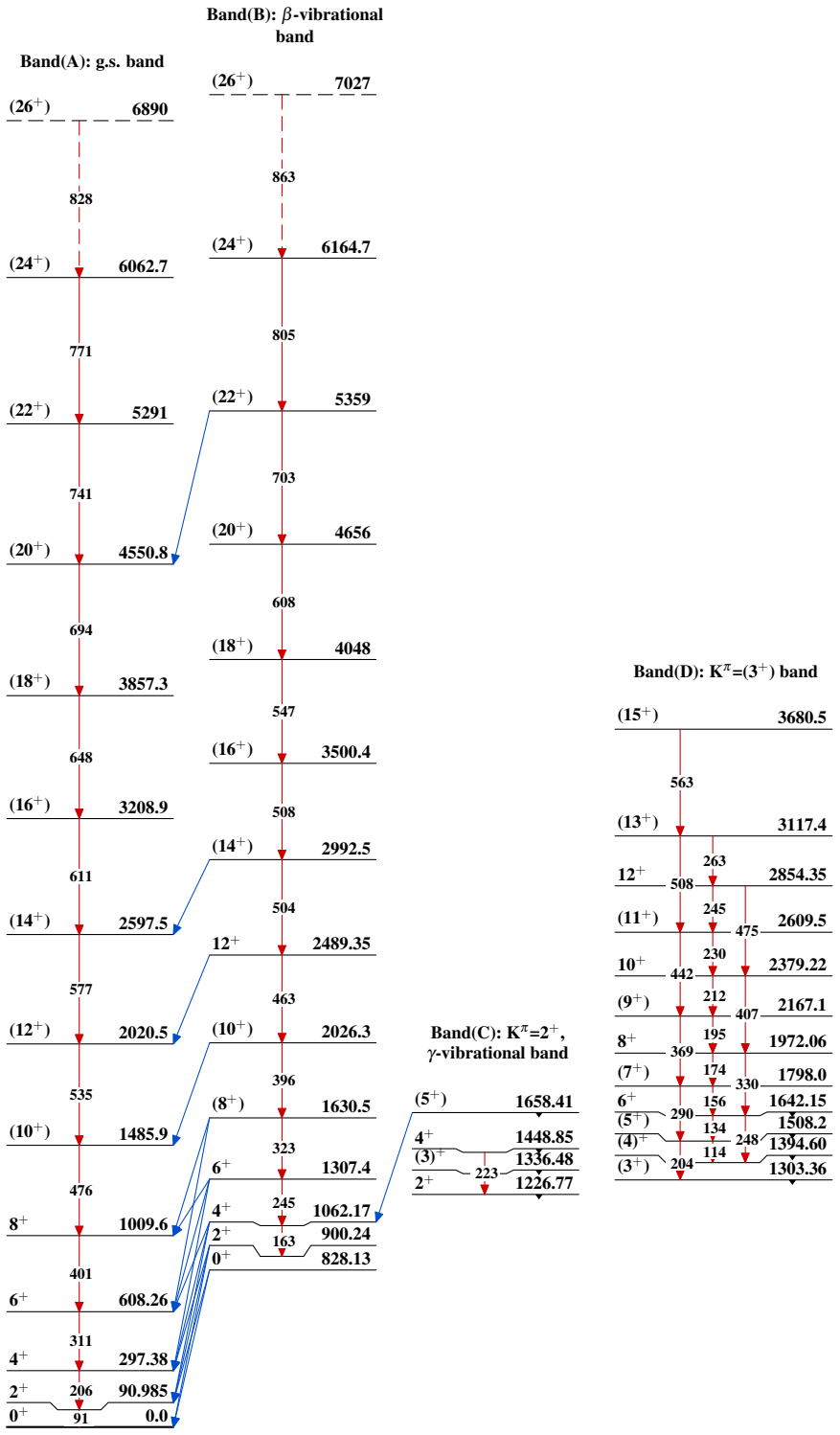
Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



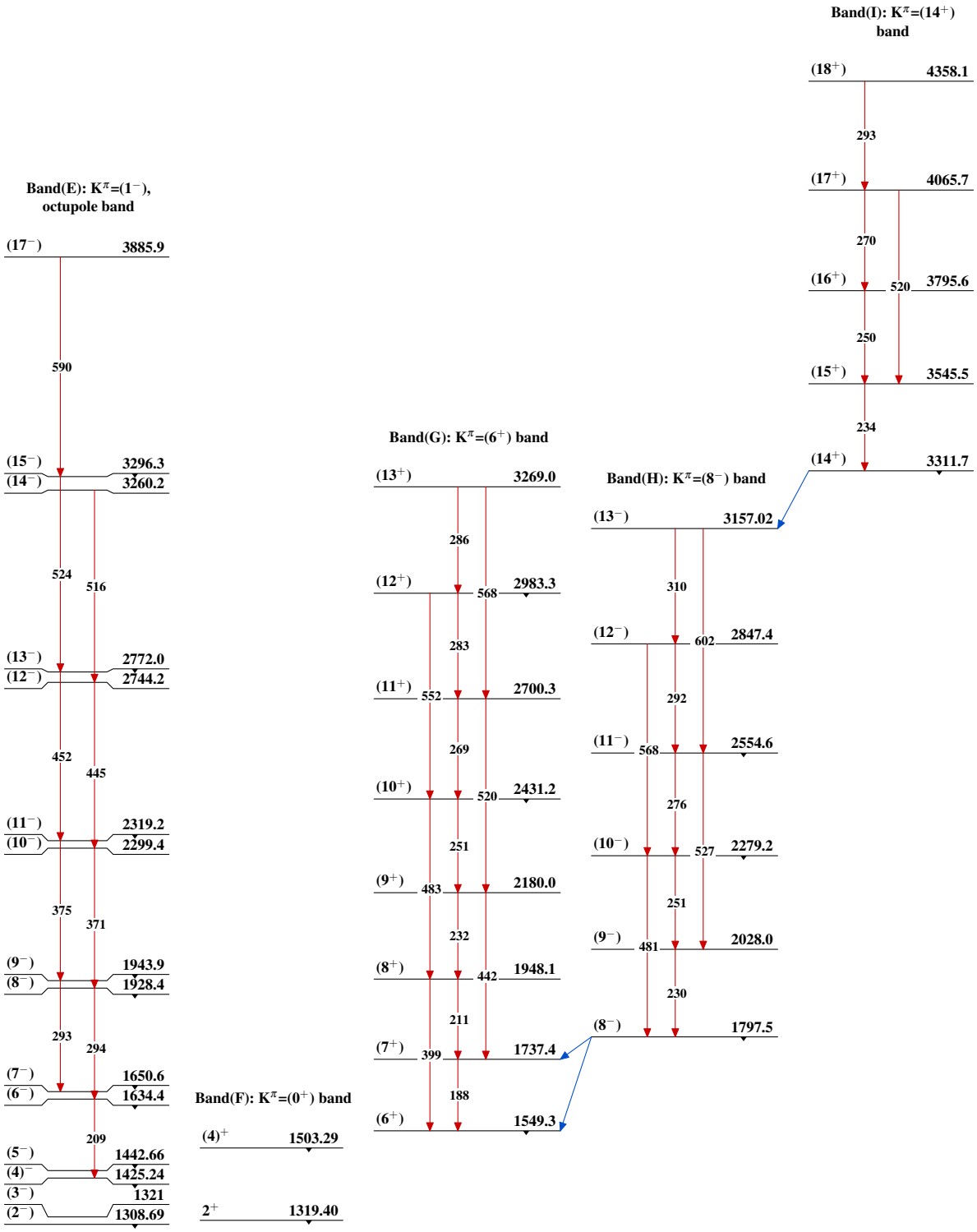
$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas



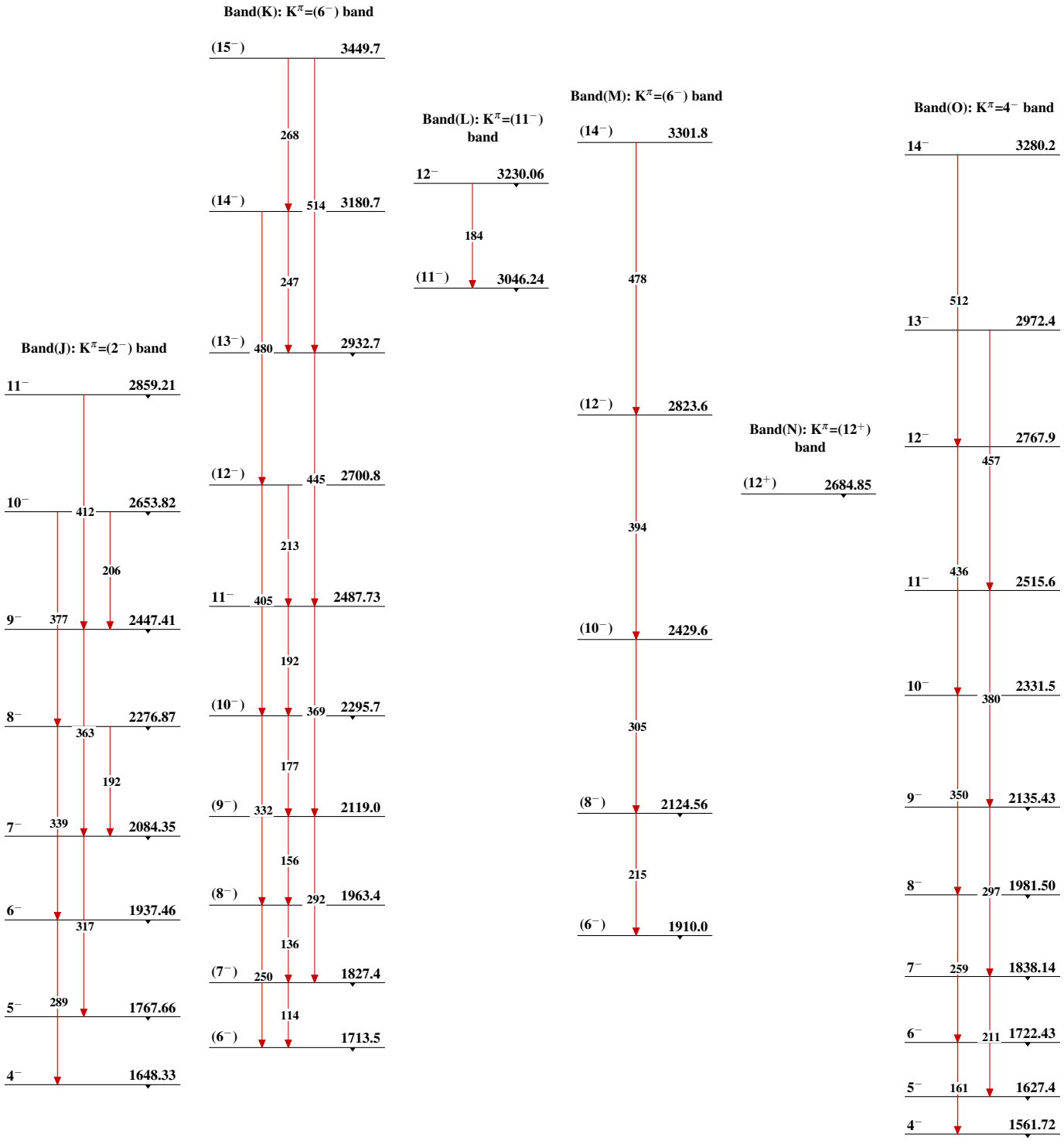
$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas (continued)

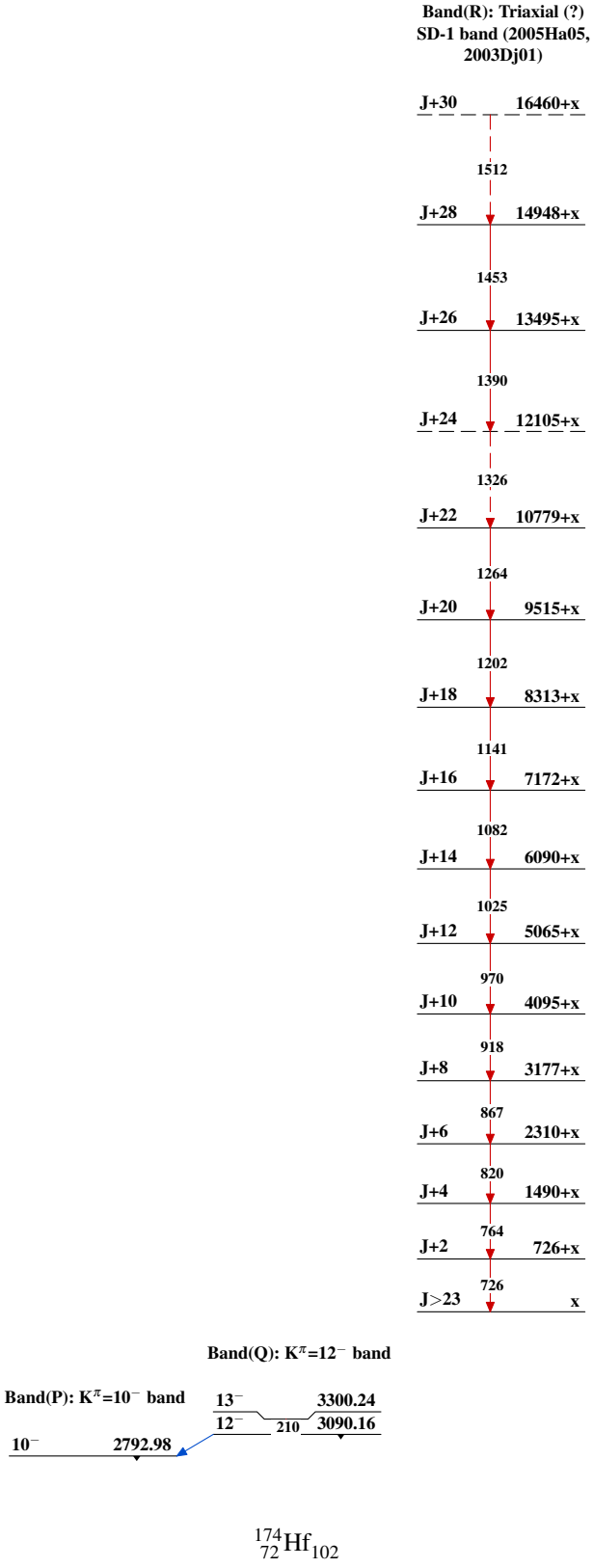


$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas (continued)

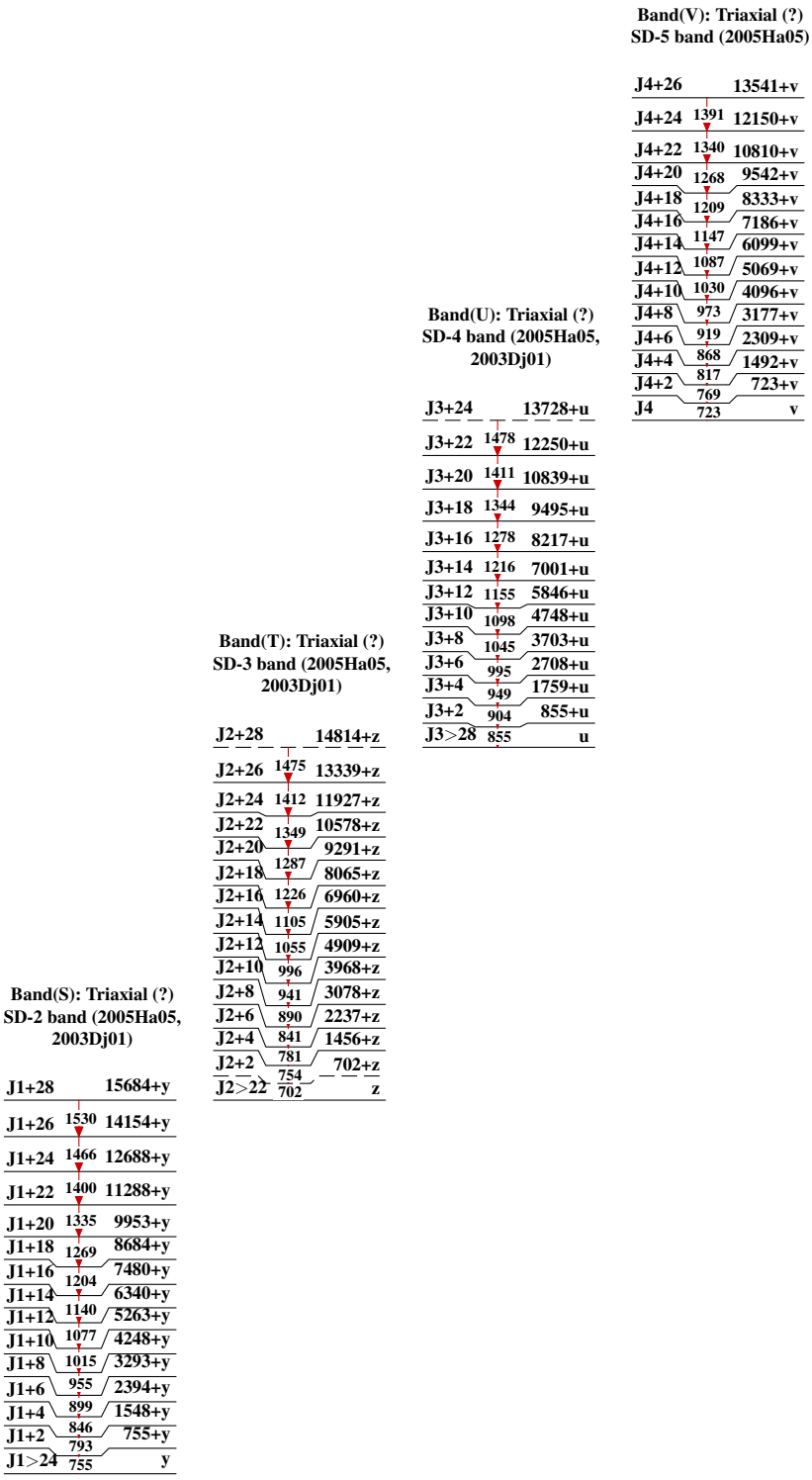


Adopted Levels, Gammas (continued)



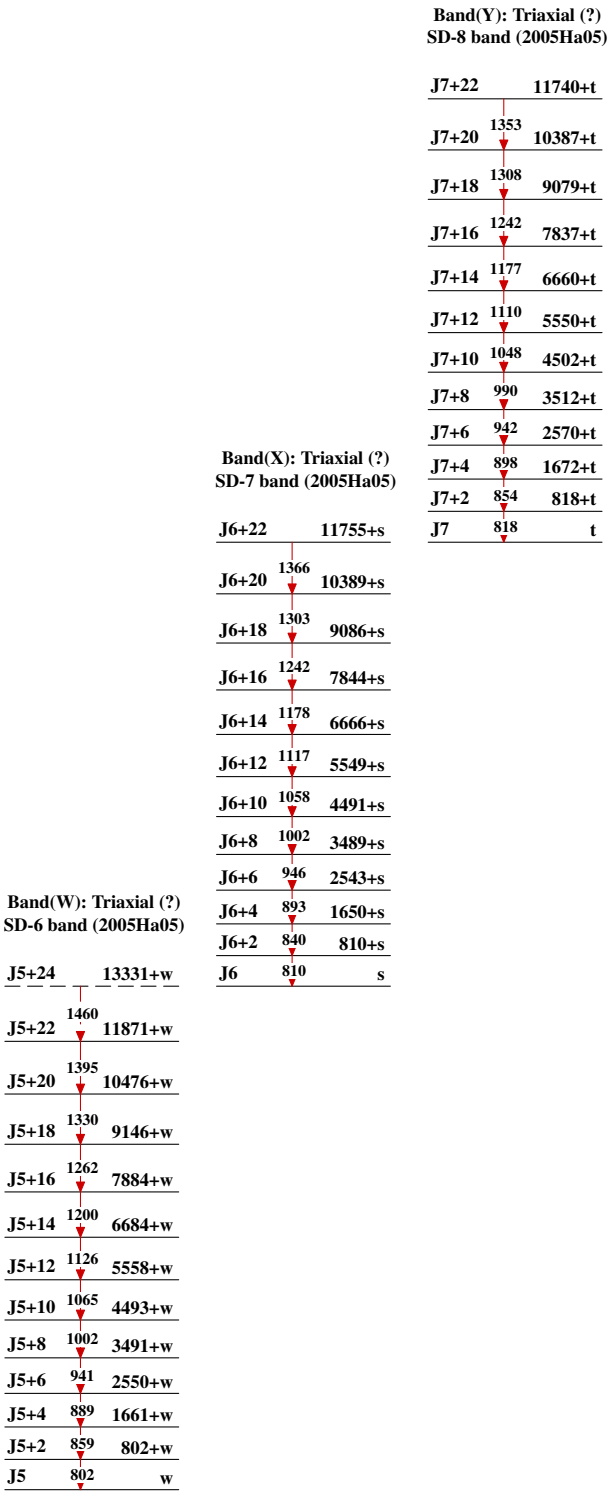
$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas (continued)



$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas (continued)



$^{174}_{72}Hf_{102}$

Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia	NDS 107,791 (2006)	15-Sep-2005

Q(β^-)=−3.21×10^3 *3*; S(n)=8165.9 *18*; S(p)=6699.9 *9*; Q(α)=2252.8 *16* 2012Wa38
Note: Current evaluation has used the following Q record −3.21E+03 308165.0 *186695*.8 82257.9 *15* 2003Au03.
Isotope shifts: 2000Bo03, 1999Le11, 1994BoZR, 1994An14, 1994An09, 1992Ri04, 1992Be07, 1992An17, 1987Au07, 1970Ca10.
Giant dipole resonance: 1994Zi04, 1994Ji07, 1994Ca11, 1993Br09.

^{176}Hf Levels

Cross Reference (XREF) Flags

A	^{176}Ta ε decay	G	^{176}Hf(n,n′γ)	M	^{178}Hf(p,t):^{178}Hf(31 y)
B	^{176}Lu β^- decay	H	^{181}Ta(π^-,5nγ)	N	^{176}Hf(γ,γ')
C	^{176}Lu β^- decay (3.664 h)	I	^{176}Lu(p,nγ)	O	^{186}W(n,2p9nγ)
D	^{174}Yb(α,2nγ)	J	^{178}Hf(p,t)	P	^{130}Te(^{48}Ca,2nγ)
E	^{176}Yb(α,4nγ)	K	^{175}Lu(α,t), (^{3}He,d),		
F	Coulomb excitation	L	^{177}Hf(d,t)		

E(level)†	Jπ‡	$T_{1/2}$	XREF	Comments
0.0[f]	0+	stable	ABCDEFGHIJ L NO	Jπ: L=0 in (p,t). Δ<r²>(^{176}Hf)=−0.084 *2* fm² (1999Le11), charge radii normalized to Δ<r²>(^{178}Hf,^{180}Hf)=0.098 fm² (1994Zi04), a 10% systematic normalization error is not included. Other: 2002Ca47.
88.349[f] *24*	2+	1.43 ns *4*	ABCDEFGHIJ L NO	μ=+0.539 *41*; Q=−2.10 *2* $T_{1/2}$: weighted average of 1.39 ns *4* from β^- ce(t) (1963Fo02) and 1.47 ns *4* Coul. ex. Jπ: 88.3γ E2 to 0+ state. μ: Coul. ex. (1968Be04,1989Ra17). μ: μ=+0.63 *6*, integral perturbed angular correlations (1996Al20). Q: Meson hfs (1984Ta10,1989Ra17).
290.18[f] *3*	4+		ABCDEFGHIJ L NO	μ=1.34 *15* Jπ: 201.8γ E2 to 2+ state. μ: Integral perturbed angular correlations (1996Al20).
596.82[f] *5*	6+		B DE GHIJ L NO	Jπ: 306.8γ E2 to 4+ state.
997.73[f] *6*	8+		B DE GH O	Jπ: 401.0γ E2 to 6+ state.
1149.94[g] *6*	0+		A CD G J	Jπ: 1150γ E0 to 0+ state. L=0 in (p,t).
1226.63[g] *5*	2+	0.8 ps *1*	A CD FG J	$T_{1/2}$: from Coulomb excitation. Jπ: 1138γ E0+E2 to 2+ state.
1247.70[h] *4*	2−#	4.66 ns *17*	A CD G L	$T_{1/2}$: from ^{176}Ta ε decay. Jπ: 1247γ M2 to 0+ state.
1293.12[j] *8*	0+		A CD G J	Jπ: 1293γ E0 to 0+ state. L=0 in (p,t).
1313.31[h] *4*	3−#		A D FG J	Jπ: 1023γ E1 to 4+ state, 1225γ E1 to 2+ state.
1333.07[p] *7*	6+ab	9.6 μs *3*	DE G I KL N	Jπ: 1043γ E2 to 4+ state. $T_{1/2}$: weighted average of 9.5 μs *2* from (α,2nγ) (1973Kh02), and 10.5 μs *7* from (γ,n) (1964Br27). Other value: 13.0 μs *5* from (p,nγ) (1967Bo08).
1341.31[i] *4*	2+	0.29 ps *3*	A D FG J N	$T_{1/2}$: from Coulomb excitation. Jπ: 1341γ E2 to 0+ state.
1362 *10*			J	
1379.38[j] *5*	2+		A D G J	XREF: J(1387). Jπ: 1291γ (E2+E0) to 2+ state.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{176}Hf Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$	XREF	Comments
1390.19[g] *14*	4^+		D G	Jπ: 1100γ E0+E2(+M1) to 4^+ state.
1404.56[h] *4*	$4^{-\#}$		A D G	Jπ: 157γ E2 to 2^- state, 1115γ E1 to 4^+ state.
1412.93 *8*			A	
1445.79[i] *5*	3^+		A D G	Jπ: 1155.5γ M1 to 4^+ state, 1357.5 M1+E2 to 2^+ state.
1481.06[f] *8*	10^+		DE H O	Jπ: 483.3γ E2 to 8^+ state.
1505.81[p] *8*	7^{+a}		DE KL	Jπ: 172.7γ (M1+E2) to 6^+ state. 53.5γ (E1) from 8^- state.
1508.61[h] *7*	$5^{-\#}$		D G J	Jπ: 912γ E1 to 6^+ state.
1532.6 *5*			D	
1540.3[i] *4*	(4^+)		D G J	Jπ: 1250γ (M1+E2) to 4^+ state.
1559.31[q] *9*	8^{-b}	9.9 μs *2*	DE I K	Jπ: 226.2γ M2 to 6^+ state. $T_{1/2}$: weighted average of 9.8 μs *2* from (α,2nγ) (1973Kh02), and 10.3 μs *5* from (γ,n) (1967Bo08).
1577.61[k] *5*	$(3^+)^@$		A D G L	
1591.51[j] *5*	(4^+)		A D G	Jπ: 1301.1γ (E2) to 4^+ state.
1609.3			D J	
1628.55[g] *14*	6^+		D	Jπ: 1031.7γ E0+E2(+M1) to 6^+ state.
1643.43[l] *5*	1^-		A D G N	Jπ: 1555γ E1 to 2^+ state, 1643γ E1 to 0^+ state.
1653.11[h] *6*	$(6)^{-\#}$		D	Jπ: 248.6γ E2 to $(4)^-$ state, 1056γ to 6^+ state.
1672.34[m] *4*	$(1)^+$		A G	Jπ: 1584γ M1+E2 to 2^+ state.
1675.96[k] *16*	(4^+)		D G J L	Jπ: 1385.7γ (E2) to 4^+ state. Band assignment.
1692.0 *10*	$(2^+)^e$		N	
1699.92 *8*	(8^+)		D	Jπ: 194γ (M1) to (7^+) state.
1704.60[m] *6*	(2^+)		A D G L N	Jπ: 1616γ (M1) to 2^+ state, 1705γ (E2) to 0^+ state.
1710.44[l] *5*	(3^-)		A D G	Jπ: 1420γ (E1) to 4^+ state.
1722.05 *5*	1^-		A G L N	Jπ: 1722γ E1 to 0^+ state.
1727.80[i] *19*	(5^+)		D L	Jπ: Band assignment.
1732.46 *10*	$(5^+,6^+,7^+)$		D	Jπ: 399.4γ (M1) to 6^+ state.
1749 *10*	0^+		J	Jπ: L=0 in (p,t).
1761.47[s] *10*	$(6^+)^a$		D K	Jπ: 428γ (M1) to 6^+ state. Band assignment.
1766.89 *21*	$(3,4,5)^+$		D L	Jπ: 1476.7γ M1+E2 to 4^+ state.
1767.52 *7*	$2^-,3^-$		A	Jπ: 679γ E1 to 2^+ state, 362.7γ to $(4)^-$ state.
1783.79[h] *9*	$(7)^{-\#}$		D	Jπ: 1188γ E1 to 6^+ state, 787γ E1 to 8^+ state.
1785.09[q] *12*	9^-		DE K	XREF: D(1785.15). Jπ: L=4,5 in (^{3}He,d), 226γ (M1) to 8^- state.
1786.11 *9*			A J	
1793.61 *5*			A J	
1797.99[t] *9*	$(7)^-$		D	XREF: D(1798.05). Jπ: 464.9γ (E1) to 6^+ state. Band assignment.
1798.5[k] *6*	$(5^+)^@$		D L	XREF: D(1798.4).
1815.2 *5*			D	
1818.92[l] *6*	$(0)^-$		A	Jπ: 175.5γ M1 to 1^- state.
1830.4	5		D L	XREF: L(1828).
1853.96 *7*	$(3^+,4^+,5^+)$		A D J L	Jπ: 1563γ (M1+E2) to 4^+ state.
1856.99[l] *5*	$(2)^-$		A J	Jπ: 213γ M1(+E2) to 1^- state, 146.7γ M1(+E2) to (3^-) state.
1860.08[r] *11*	$(8)^-$		DE K	XREF: K(1860). Jπ: 300.8γ (M1) to 8^- state.
1862.0[i] *5*	(6^+)		D	Jπ: 1571.6γ (E2) to 4^+ state. Band assignment.
1862.80[n] *4*	1^+		A JK	XREF: K(1860). Jπ: 1862.7γ M1(+E2) to 0^+ state, 1774.6γ M1(+E2) to 2^+ state.
1866.6 *5*			D J	
1878? *1*	$(5^+,6^+,7^+)$		D	Jπ: 1281γ (M1+E2) to 6^+ state.

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Adopted Levels, Gammas (continued)

^{176}Hf Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	XREF	Comments
1886 *3*		L	
1902.28 *9*	(3$^-$,4$^-$,5$^-$)	D	J$^{\pi}$: 1614.2γ (E1) to 4$^+$ state.
1912.02[n] *4*	2$^+$	A	J$^{\pi}$: 239.6γ M1 to (1)$^+$ state, 1823.7γ M1 to 2$^+$ state.
1914.13 *9*	(9$^+$)	D	J$^{\pi}$: 214γ (M1+E2) to (8$^+$) state.
1924.56 *5*	(2,3)$^-$	A D L	J$^{\pi}$: 611γ M1 to 3$^-$ state, 1836γ (E1) to 2$^+$ state.
1926.68[s] *11*	(7$^+$)[a]	D K	J$^{\pi}$: 421γ (M1) to (7$^+$) state. Band assignment.
1930.78[t] *9*	(8$^-$)	D	J$^{\pi}$: 425γ (E1) to (7$^+$) state. Band assignment.
1932.7[g] *3*	(8)$^+$	D	J$^{\pi}$: 934.8γ E0+E2(+M1) to 8$^+$ state.
1944.48[k] *16*	(6$^+$)	D L	XREF: L(1938). J$^{\pi}$: 1347.4γ (M1+E2) to 6$^+$ state. Band assignment.
1949.71 *5*		A J	
1958.18 *5*	2$^-$	A J L	J$^{\pi}$: 236γ M1(+E2) to 1$^-$ state, 644.9γ M1 to 3$^-$ state. Possible member of a K^{π}=2− band.
1964.2 *3*	(5,6,7)$^-$	D J L	J$^{\pi}$: 311γ M1 to (6)$^-$ state.
1977.0? *6*		D	
1978.0 *10*	(1)[e]	N	
1984 *3*	(6$^+$)	L	J$^{\pi}$: From theoretical and experimental cross section comparison and rotational structure in (d,t).
1992.70[h] *10*	(8)$^-$[#]	D	J$^{\pi}$: 339.6γ E2 to (6)$^-$ state.
2014.27[r] *13*	(9)$^-$	DE K	J$^{\pi}$: 229γ (M1) to (9)$^-$ state.
2023.92 *21*	(+)	D L	XREF: L(2018). J$^{\pi}$: 1427γ (M1+E2) to 6$^+$ state.
2031.05[q] *12*	10$^-$	DE	J$^{\pi}$: 246γ (M1) to (9)$^-$ state.
2034.66[f] *13*	(12$^+$)	DE H O	J$^{\pi}$: Band assignment.
2044.78 *6*	(1$^+$)	A J N	J$^{\pi}$: 1956.5γ (M1,E2) to 2$^+$ state, 2045γ (M1,E2) to 0$^+$ state.
2048.48 *8*	(2,3,4$^-$)	D J	J$^{\pi}$: 337γ (M1+E2) to (3$^-$) state.
2066.25 *7*	(1,2,3)$^+$	A J	XREF: J(2069). J$^{\pi}$: 1978γ (M1,E2) to 2$^+$ state.
2085.68[t] *10*	(9$^-$)	D	J$^{\pi}$: Band assignment.
2085.83 *20*	(5,6,7)$^+$	D J	XREF: D(2086.01)J(2089). J$^{\pi}$: 1489γ M1+E2 to 6$^+$ state.
2096.8 *5*	(5,6,7)$^+$	D J L	XREF: J(2089). J$^{\pi}$: 1500γ (M1) to 6$^+$ state.
2106.5[i] *5*	(7)$^+$	D L	J$^{\pi}$: Band assignment.
2112.89[s] *20*	(8$^+$)[a]	D	J$^{\pi}$: Band assignment.
2116.8[k] *3*	(7$^+$)	D	J$^{\pi}$: Band assignment.
2136.42[h] *24*	(9)$^-$[#]	D J l	XREF: l(2142). J$^{\pi}$: 1139.4γ E1 to 8$^+$ state, 655.3γ to (10)$^+$ state.
2147.62 *11*	(10$^+$)	D l	XREF: l(2142). J$^{\pi}$: 233.5γ (M1+E2) to (9$^+$) state.
2160.5 *6*		D	
2172.9? *6*		D	
2173.8 *8*	(7$^+$)	D l	XREF: l(2175). J$^{\pi}$: From theoretical and experimental cross section comparison and rotational structure in (d,t).
2194.02[r] *20*	(10$^-$)	DE K	J$^{\pi}$: 409γ (M1) to (9)$^-$ state.
2258.7 *5*	(6$^-$,7$^-$,8$^-$)	D	J$^{\pi}$: 460.7γ to (7)$^-$ state.
2261.55[t] *12*	(10$^-$)	D	J$^{\pi}$: 330γ (E2) to (8$^-$) state. Band assignment.
2265.27 *5*	(2)$^-$	A D	J$^{\pi}$: 924γ E1 to 2$^+$ state, 543γ to 1$^-$, 861γ to (4)$^-$ state.
2280.83 *10*	(2)[e]	A J L N	XREF: J(2286).
2284.8[i] *5*	(8$^+$)	D	J$^{\pi}$: Band assignment.
2293.85[q] *14*	11$^-$	DE	J$^{\pi}$: 263γ (M1) to 10$^-$ state. Band assignment.
2294.8[g] *3*	(10)$^+$	D	XREF: D(2295.0).

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Adopted Levels, Gammas (continued)

^{176}Hf Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$	XREF	Comments
				J^π: 813.8γ E0+E2(+M1) to $(10)^+$ state.
2304.7[k] 8	(8^+)		D	Band assignment.
2307.76 6			A J	XREF: J(2304).
2308.34 5	$1^-,2^-,3^-$		A	J^π: 350γ M1(+E2) to 2^- state.
2318.7[s] 5	(9^+)[a]		D	J^π: Band assignment.
2361.0 10	(1)[e]		D J N	XREF: J(2348).
2389 10			J	E(level): possible doublet in (p,t).
2398.97 13	(11^+)		D	XREF: D(2399.03).
2399.01[r] 19	(11^-)		DE	XREF: D(2399.06).
2405.35 7	1[e]		A N	
2415 10			J	
2432.34 7	–		A D	J^π: 508γ M1 to $(2,3)^-$ state.
2446.9 6			D j	XREF: j(2448).
2452.47 10			A j	XREF: j(2448).
2470.84 5	2^-		A	J^π: 1223γ E2+M1+E0 to 2^- state.
2482.87 6	(1)[e]		A N	XREF: N(2484).
2514.0 7	$1^{(+)}$[e]		N	
2530.0 7	1[e]		N	
2540.9?[s] 5	(10^+)[a]		D	J^π: Band assignment.
2548.0 7	1[e]		N	
2563.54[q] 22	12^-		DE	XREF: D(2563.60).
				J^π: Band assignment.
2568.45 22			D	
2602.16 9			A	
2638.1[r] 5	(12^-)		DE	J^π: Band assignment.
2646.6[f] 4	(14^+)		DE H	J^π: Band assignment.
2690.0 7	1[e]		N	
2722.0 7	$1^{(+)}$[e]		N	
2762.51 8			A	
2791.62 7			A	
2817.55 5	$(2)^+$		A	J^π: 1476γ E2 to 2^+ state, log *ft*=6.4 from ^{176}Ta (J^π=1^-).
2827.0[q] 5	13^-		DE	J^π: Band assignment.
2831.0 10	1[e]		N	
2865.8[u] 7	14^-[c]	401 μs 6	E P	J^π: Band assignment. 38.7γ (M1) to 13^- state.
				$T_{1/2}$: from (α,4nγ) (1975Kh04).
2878.21 7			A	
2885.52 7	$1^{(+)}$[e]		A N	
2905.67 7			A	
2912.26[o] 6	$(0)^-$&		A	J^π: 1190γ M1 to 1^- state.
2920.26[o] 7	1^-&		A	J^π: 2920γ E1 to 0^+ state.
2921.03 8	$1^+,2^+$		A	J^π: 1580γ M1+E2 to 2^+ state, log *ft*=5.9 from ^{176}Ta (J^π=1^-).
2940.0 7	$1^{(+)}$[e]		N	
2944.17 5	2^-		A	J^π: 1630γ M1 to 3^- state, 1696γ M1 to 2^- state. log *ft*≤6.2 from ^{176}Ta (J^π=1^-) ε decay. Possible member of a K^π=2^- band.
2969.07[o] 6	(2^-)&		A	
2994.0 7	$1^{(+)}$[e]		N	
3044.0 7	$1^{(-)}$[e]		N	
3059.0 10	1[e]		N	
3080.2 12	15^+	0.20 ns +12−8	E P	$T_{1/2}$: Measured in (α,2nγ) (1982Ko08).
				J^π: 214γ E1 to 14^-. Level energy agrees with predicted

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{176}Hf Levels (continued)

E(level)†	Jπ‡	XREF	Comments
			value of 3190 keV for $K^{\pi}=15^{+}$, configuration=((π 7/2[404])(π 9/2[514]) (ν 9/2[624])(ν 5/2[512])) (1976Kh03).
3098.0 *10*	(1)[e]	N	
3107.0 *7*	1(+)[e]	N	
3115.0 *7*	1(−)[e]	N	
3159.0 *7*	1(+)[e]	N	
3160.5[u] *10*	15−[c]	E N P	Jπ: Band assignment. 294.7γ (M1+E2) to 14− state.
3200.0 *10*	1[e]	N	
3218.0 *10*	1[e]	N	
3222.0 *7*	1(+)[e]	N	
3232.0 *7*	1(+)[e]	N	
3261.0 *7*	1(+)[e]	N	
3266.2[v] *14*	16+[d]	E M P	Jπ: L=0 in ^{178}Hf(31 y, $J^{\pi}=16^{+}$)(p,t). 186.0γ M1 to (15^{+}) state in (α,4nγ).
3306.0 *10*	(1)[e]	N	
3307.7[f] *11*	(16+)	E	Jπ: 661γ E2 to (14^{+}) state. Band assignment.
3322.0 *10*	1[e]	N	
3343.0 *7*	1[e]	N	
3361.0 *7*	1(−)[e]	N	
3372.0 *7*	1(−)[e]	N	
3385.0 *7*	1[e]	N	
3406.0 *10*	(1)[e]	N	
3438.0 *10*	1[e]	N	
3454.0 *10*	1[e]	N	
3467.4[u] *10*	16−[c]	E N P	Jπ: Band assignment.
3485.0 *7*	1[e]	N	
3490.0 *10*	1[e]	N	
3519.0 *10*	(1)[e]	N	
3540.1[v] *16*	17+[d]	E N P	Jπ: 274γ M1+E2 to 16^{+} state.
3550.0 *7*	1(+)[e]	N	
3580.0 *10*	(1)[e]	N	
3602.0 *7*	1[e]	N	
3608.0 *10*	1[e]	N	
3627.0 *7*	1(+)[e]	N	
3662.0 *7*	1(+)[e]	N	
3671.0 *7*	1(+)[e]	N	
3689.0 *10*	(1)[e]	N	
3695.0 *10*	(2)[e]	N	
3722.0 *10*	(1)[e]	N	
3746.0 *7*	1[e]	N	
3767.0 *7*	1(+)[e]	N	
3774.0 *10*	1[e]	N	
3787.1[u] *12*	17−[c]	E N P	Jπ: Band assignment. 319.7γ (M1+E2) to 16− state.
3805.0 *7*	1(+)[e]	N	
3816.0 *7*	1(+)[e]	N	
3824.0 *10*	(1)[e]	N	
3838.0 *7*	1(−)[e]	N	
3844.0 *10*	(1)[e]	N	
3847.4[v] *16*	18+[d]	E N P	Jπ: Band assignment. 307.2γ (M1+E2) to 17^{+} state.
3856.0 *10*	(1)[e]	N	
3916.0 *10*	(1)[e]	N	

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Adopted Levels, Gammas (continued)

^{176}Hf Levels (continued)

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	XREF		Comments
4010.5[f] *15*	(18$^+$)		E		J$^\pi$: 702.8γ E2 to (16$^+$) state. Band assignment.
4120.3[u] *14*	18$^-$[c]		E	P	J$^\pi$: Band assignment. 333.2γ (M1+E2) to 17$^-$ state.
4179.3[v] *17*	19$^+$[d]		E	P	J$^\pi$: 331.8γ (M1+E2) to 18$^+$ state. Band assignment.
4376.6 *16*	(19)$^+$	34 ns	E	P	$T_{1/2}$: From (α,4nγ) (1976Kh03). E(level): K^π=19$^+$ in (^{48}Ca,2nγ) [2001Ch89]. J$^\pi$: 529.1γ (M1) to (18)$^+$ state. $T_{1/2}$=34 ns suggests K forbiddenness. Possible K^π=19$^+$ six-quasiparticle configuration=((π 7/2[404])(π 9/2[514]) (ν 7/2[514])(ν 9/2[624])(ν 5/2[512])(ν 1/2[521])) is predicted at ≈4600 keV (1976Kh03).
4466.6[u] *16*	(19$^-$)[c]		E	P	J$^\pi$: Band assignment.
4532.2[v] *20*	20$^+$[d]		E	P	J$^\pi$: Band assignment.
4766.4 *16*	(20)$^-$		E	P	E(level): K^π=20$^-$ in (^{48}Ca,2nγ) [2001Ch89]. J$^\pi$: 389.8γ E1 decay through 4376.7 (J^π=K^π=(19)$^+$) level, instead of through the energetically favored 4179.4 (J^π=(19)$^+$, K^π=16$^+$) level, is consistent with a K^π=(20)$^-$ assignment. A possible K^π=20$^-$ six-quasiparticle configuration=((π 7/2[404])(π 9/2[514])(ν 7/2[514]) (ν 9/2[624])(ν 7/2[633])(ν 1/2[521])) is predicted at ≈5000 keV (1976Kh03).
4826.4[u] *15*	(20$^-$)[c]		E	P	J$^\pi$: Band assignment.
4863.5 *16*	(22)$^-$	43 μs	E	P	$T_{1/2}$: from (α,4nγ) (1976Kh03). E(level): K^π=22$^-$ in (^{48}Ca,2nγ) [2001Ch89]. J$^\pi$: 97.1γ E2 to (20)$^-$. Possible K^π=22$^-$ six-quasiparticle configuration=((π 7/2[404])(π 9/2[514]) (ν 7/2[514])(ν 9/2[624])(ν 7/2[633])(ν 5/2[512])). $T_{1/2}$=43 μs may be explained in terms of the 97-keV ν 5/2[512] to ν 1/2[521] single-particle E2 transition, which has been observed to be slow in neighboring odd-A hafnium nuclei.

[†] Deduced by evaluator from a least-squares fit to adopted γ-ray energies.

[‡] J, K, and π assignments are mostly based on rotational band structure, and on γ-ray multipolarities and decay patterns. This includes comparisons of experimental branching ratios with theoretical values predicted by Alaga rules. Specific arguments, as well as quasiparticle configuration assignments, are given with individual levels.

[#] Member of a K^π=2$^-$ octupole-vibrational band. Assignment was based on a comparison between experimental and theoretical B(E1) values for the transitions to the g.s. (K^π=0$^+$) rotational band (1973Kh03).

[@] Assignment based on a comparison between experimental and theoretical cross sections in ^{177}Hf(d,t).

[&] Assignment agrees with Alaga rules for log *ft* values from ^{176}Ta ε decay to the J^π=0, 1, and 2 members of this band.

[a] Intraband transitions between the bands built on 1333 keV and 1761 keV suggest configuration mixing. The following admixtures were deduced from particle transfer reactions and γ-ray decay rates: 61% proton configuration and 39% neutron configuration for the band built on 1333 keV; 39% proton configuration and 61% neutron configuration for the band built on 1761 keV.

[b] J^π=6$^+$ and 8$^-$ for the 1333- and 1559-keV levels, respectively, are based on (^{3}He,d) transfers of L=2 for the 1333-keV level, and L=5,(4) for the 1559-keV level, and on the 226γ M2 between these levels.

[c] Deduced intrinsic g-factor of 0.57 *4* agrees with configuration assignment (1976Kh03).

[d] Deduced intrinsic g-factor of 0.54 *5* agrees with configuration assignment (1976Kh03). Members of this band up to J=20 become yrast.

[e] From angular distribution in ^{176}Hf(γ,γ').

[f] Band(A): K$^\pi$=0$^+$ g.s. rotational band. Rotational parameters: A=14.4, B=−8.7. Spin members of the band used in the fit: 0 to 14.

[g] Band(B): K$^\pi$=0$^+$ β-vibrational band. Rotational parameters: A=11.8, B=−13.5. Spin members of the band used in the fit: 0 to 10.

[h] Band(C): K$^\pi$=2$^-$ octupole-vibrational band.

[i] Band(D): K$^\pi$=2$^+$ mixed γ-vibrational band.

[j] Band(E): K$^\pi$=0$^+$ band. Rotational parameters: A=14.1, B=40.7. Spin members of the band used in the fit: 0 to 4.

[k] Band(F): K$^\pi$=(3$^+$) band. Rotational parameters: A=12.5, B=−4.6. Spin members of the band used in the fit: 3 to 8.

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Adopted Levels, Gammas (continued)

^{176}Hf Levels (continued)

[l] Band(G): $K^{\pi}=(0^-)$ band: Possible configuration=ν7/2[633]-ν7/2[514] 93% wave function (2005Gr21).
[m] Band(H): $K^{\pi}=1^+$ band.
[n] Band(I): $K^{\pi}=(1^+)$ band.
[o] Band(J): $K^{\pi}=(0^-)$ band: Possible Configuration=(π7/2[404]-ν5/2[512])- (π9/2[514]-ν7/2[514]) (2005Gr21).
[p] Band(K): $K^{\pi}=6^+$ band. configuration=61%((p,7/2[404])(p,5/2[402])+39%(n,7/2[514])(n,5/2[512])). Rotational parameters: A=12.9, B=−6.3. Spin members of the band used in the fit: 6 to 11.
[q] Band(L): $K^{\pi}=8^-$ Coriolis-mixed band. configuration=98-38%((p,7/2[404])(p,9/2[514])+ 2−62%(n,7/2[514])(n,9/2[624])). Rotational parameters: A=15.1, B=−13.8. Spin members of the band used in the fit: 8 to 13.
[r] Band(M): $K^{\pi}=7^-,8^-$ Coriolis-mixed band. Configuration=((π 7/2[404])(π 9/2[514])+ (ν 7/2[514]) (ν 7/2[633])+(ν 7/2[514])(ν 9/2[624])). 20-50% mixture of the $K^{\pi}=7^-$ mixture to $K^{\pi}=8^-$. Rotational parameters: A=6.8, B=10.7. Spin members of the band used in the fit: 8 to 12.
[s] Band(N): $K^{\pi}=6^+$ band. configuration=39%((p,7/2[404])(p,5/2[402])+61%(n,7/2[514])(n,5/2[512])). Rotational parameters: A=12.4, B=−5.8. Spin members of the band used in the fit: 6 to 9.
[t] Band(O): $K^{\pi}=6^-,7^-$ band. Configuration=((ν 7/2[633])(ν 5/2[512])+(ν 9/2[624])(ν 5/2[512])). Rotational parameters: A=7.1, B=9.5. Spin members of the band used in the fit: 7 to 9.
[u] Band(P): $K^{\pi}=(14^-)$ band. Configuration=((π 7/2[404])(π 9/2[514])(ν 7/2[514])(ν 5/2[512])).
[v] Band(Q): $K^{\pi}=(16^+)$ band. Configuration=((π 7/2[404])(π 9/2[514])(ν 7/2[514])(ν 9/2[624])).

Adopted Levels, Gammas (continued)

γ(^{176}Hf)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	δ[k]	α[i]	$I_{(\gamma+ce)}$	Comments
88.349	2+	88.34[‡] *3*	100	0.0	0+	E2[f]		5.86		B(E2)(W.u.)=183 *7*
290.18	4+	201.83[‡] *3*	100	88.349	2+	E2[f]		0.282		
596.82	6+	306.78[‡] *4*	100	290.18	4+	E2[g]		0.0747		
997.73	8+	400.99[‡] *4*	100	596.82	6+	E2[g]		0.0347		
1149.94	0+	1061.61[‡] *9*	100	88.349	2+	E2[f]				
		1150.00[‡] *10*		0.0	0+	E0[f]			0.9 *2*	I_γ: not reported.
1226.63	2+	936.41[‡] *8*	82 *7*	290.18	4+	E2[f]				B(E2)(W.u.)=5.7 *10*
		1138.26[‡] *8*	100 *8*	88.349	2+	E0+E2[f]		≈0.037		α: experimental value from ^{176}Ta ε decay.
		1226.89[‡] *24*	54 *7*	0.0	0+	(E2)[g]				B(E2)(W.u.)=0.98 *19*
1247.70	2−	957.40[‡] *8*	2.31 *18*	290.18	4+	M2+E3[f]	≥1.87	0.0115 *16*		B(M2)(W.u.)<0.0014; B(E3)(W.u.)>2.9 δ: from 1972Lo03. Additional information 1.
		1159.28[‡] *9*	100 *8*	88.349	2+	E1+M2+E3[f]		0.0034		B(E1)(W.u.)=2.01×10^{-8} *16*; B(M2)(W.u.)=0.0088 *19*; B(E3)(W.u.)=9.6 *20* α: experimental value from ^{176}Ta ε decay. Mult.: δ(M2/E1)=0.36 *5*, δ(E3/E1)=0.53 *7* (1972Lo03).
		1247.68[‡] *15*	1.86 *20*	0.0	0+	M2[f]		0.0119		B(M2)(W.u.)=0.00124 *17* ΔJ=0,1 transitions from members of the octupole band (K^π=2−) to those of the g.s. rotational band (K^π=0+) are expected to have a significant E3 multipolarity component (1972Lo03).
1293.12	0+	1204.85[‡] *10*	100 *8*	88.349	2+					
		1292.9[‡] *3*		0.0	0+	E0[f]			30 *5*	I_γ: not reported.
1313.31	3−	1023.05[‡] *7*	47 *4*	290.18	4+	E1[f]				
		1224.93[‡] *7*	100 *8*	88.349	2+	E1[f]				
1333.07	6+	736.20[&] *7*	100[&]	596.82	6+	E2[g]				B(E2)(W.u.)=2.82×10^{-6} *9*
		1043.0[&] *1*	64[&]	290.18	4+	E2[g]				B(E2)(W.u.)=3.16×10^{-7} *10*
1341.31	2+	1051.03[‡] *11*	3.2 *3*	290.18	4+					
		1252.87[‡] *10*	93 *7*	88.349	2+	M1+E2[f]				I_γ: From (γ,γ′), 95 in ε decay.
		1341.33[‡] *10*	100 *8*	0.0	0+	E2[f]				B(E2)(W.u.)=3.9 *6* Mult.: ce data allow some M1 admixture, but level scheme requires pure E2.
1379.38	2+	1089.06 *10*	14.8 *12*	290.18	4+					
		1290.97[‡] *9*	100 *8*	88.349	2+	(E2+E0)[f]		0.022		α: experimental value from ^{176}Ta ε decay.
		1379.29 *15*	4.0 *12*	0.0	0+					
1390.19	4+	793.5[&] *3*	36[&]	596.82	6+					

$^{176}_{72}Hf_{104}$-8

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	α[i]	Comments
1390.19	4$^+$	1099.9[&] *3*	100[&]	290.18	4$^+$	E0+E2(+M1)[g]	≈0.03	α: experimental value from ^{174}Yb(α,2nγ).
		1301.8 *3*	81	88.349	2$^+$	(E2)[g]		
1404.56	4$^-$	91.19[‡] *25*	17 *1*	1313.31	3$^-$	E2(+M1)[f]	5.27 *11*	
		156.83[‡] *3*	100 *8*	1247.70	2$^-$	E2[f]	0.671	
		1114.2[m‡] *1*	85[m] *7*	290.18	4$^+$	E1[g]		I_γ: from ^{174}Yb(α,2nγ). Doublet in ^{176}Ta ε decay.
1412.93		1122.80 *9*	100 *16*	290.18	4$^+$			
		1412.84[l] *11*	≤111[l]	0.0	0$^+$			
1445.79	3$^+$	198.07 *12*	1.9 *4*	1247.70	2$^-$			
		1155.52[‡] *18*	32 *4*	290.18	4$^+$	M1[g]		
		1357.52[‡] *10*	100 *8*	88.349	2$^+$	M1+E2[g]		
1481.06	10$^+$	483.33[@] *5*	100	997.73	8$^+$	E2[g]	0.0212	
1505.81	7$^+$	172.73[@] *4*	100	1333.07	6$^+$	(M1+E2)[g]	0.67 *20*	
1508.61	5$^-$	196.0[&] *5*	≈4[&]	1313.31	3$^-$			
		911.8[&] *3*	36[&]	596.82	6$^+$	E1[g]		
		1218.4[&] *1*	100[&]	290.18	4$^+$			
1532.6		935.8[@] *5*	100	596.82	6$^+$			
1540.3	(4$^+$)	1250.1[@] *4*	100	290.18	4$^+$	(M1+E2)[g]		
1559.31	8$^-$	53.49[&] *7*	100[&]	1505.81	7$^+$	(E1)[g]		B(E1)(W.u.)=6.2×10^{-8} *5*
		226.25[&] *6*	31[&] *6*	1333.07	6$^+$	M2[g]	1.99	B(M2)(W.u.)=0.023 *5*
1577.61	(3$^+$)	173.00 *7*	2.1 *3*	1404.56	4$^-$			
		264.08[‡] *24*	10.4 *8*	1313.31	3$^-$			
		1287.38[m] *12*	13[me] *1*	290.18	4$^+$			
		1489.30[‡] *10*	100 *8*	88.349	2$^+$	(E2)[f]		
1591.51	(4$^+$)	1301.2[‡] *5*	100	290.18	4$^+$	(E2)[g]		
1609.3		611.4[@n] *4*	100	997.73	8$^+$			
1628.55	6$^+$	238.36[&] *7*	18[&]	1390.19	4$^+$			
		630.7[&] *3*	11.1[&]	997.73	8$^+$			
		1031.7[&] *3*	78[&]	596.82	6$^+$	E0+E2(+M1)[g]	0.04	α: experimental value from ^{174}Yb(α,2nγ).
		1338.6[&] *4*	100[&]	290.18	4$^+$	(E2)[g]		
1643.43	1$^-$	1555.08[‡] *13*	100 *8*	88.349	2$^+$	E1[f]		
		1643.43[‡] *10*	59 *5*	0.0	0$^+$	E1[f]		I_γ: 68.6 in (γ,γ') deduced from R_{exp}.
1653.11	(6)$^-$	144.45[&] *7*	4.5[&]	1508.61	5$^-$			
		248.58[&] *4*	100[&]	1404.56	4$^-$	E2[g]	0.143	
		1055.8[&] *5*	8.1[&]	596.82	6$^+$			

$^{176}_{72}Hf_{104}$-9

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	α[i]	Comments
1672.34	$(1)^+$	292.88 *10*	0.75 *7*	1379.38	2^+			
		424.48 *15*	0.94 *10*	1247.70	2^-			
		445.52[l] *8*	≤1.0[l]	1226.63	2^+			
		1584.02 *10*	100 *8*	88.349	2^+	M1+E2[f]		
		1672.32 *12*	22.5 *18*	0.0	0^+			
1675.96	(4^+)	271.8[&] *3*	4.3[&]	1404.56	4^-			
		1385.7[&] *3*	100[&]	290.18	4^+	(E2)[g]		Mult.: measured (E1,E2) multipolarity. Level scheme requires (E2).
		1588.3[&] *5*	28[&]	88.349	2^+			
1692.0	(2^+)	1692[#]	100	0.0	0^+			
1699.92	(8^+)	194.09[&] *4*	100[&]	1505.81	7^+	(M1)[g]	0.629	
		366.87[&] *5*	50[&]	1333.07	6^+			
1704.60	(2^+)	1616.18 *10*	92 *7*	88.349	2^+	(M1)[f]		
		1704.70 *12*	100 *8*	0.0	0^+	(E2)[f]		
1710.44	(3^-)	118.93 *2*	2.6 *5*	1591.51	(4^+)			
		1420.04 *10*	100 *8*	290.18	4^+	(E1)[g]		
		1621.87[m] *10*	80[m] *21*	88.349	2^+			
1722.05	1^-	428.85 *20*	0.44 *7*	1293.12	0^+			
		1633.74 *10*	89.6 *7*	88.349	2^+	E1[f]		
		1722.04 *13*	100 *8*	0.0	0^+	E1[f]		
1727.80	(5^+)	1130.4[&] *5*	31[&]	596.82	6^+			
		1437.7[&] *2*	100[&]	290.18	4^+	(M1+E2)[g]		Mult.: Reported as (E2) from conversion electron measurement in ^{174}Yb(α,2nγ), level scheme requires (M1+E2). M.
1732.46	$(5^+,6^+,7^+)$	226.9[&] *5*	13[&]	1505.81	7^+			
		399.38[&] *7*	100[&]	1333.07	6^+	(M1)[g]	0.089	
1761.47	(6^+)	428.40[@] *7*	100	1333.07	6^+	(M1)[g]	0.0740	
1766.89	$(3,4,5)^+$	1476.7[@] *2*	100	290.18	4^+	M1+E2[g]		
1767.52	$2^-,3^-$	362.7 *3*	1.7 *4*	1404.56	4^-			
		388.06 *20*	2.55 *22*	1379.38	2^+			
		1679.18 *11*	100 *8*	88.349	2^+	E1[f]		
1783.79	$(7)^-$	276.4[&] *3*	3.5[&]	1508.61	5^-			
		787.14[&] *15*	25[&]	997.73	8^+	E1,E2[g]		Mult.: level scheme requires E1.
		1188.1[&] *2*	100[&]	596.82	6^+	E1[g]		
1785.09	9^-	225.74[@] *10*	100	1559.31	8^-	(M1)[g]	0.414	
1786.11		1495.85 *15*	58 *5*	290.18	4^+			

$^{176}_{72}Hf_{104}$-10

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	δ[k]	α[i]	Comments
1786.11		1697.8 *2*	100 *3*	88.349	2^+				
1793.61		216.00 *7*	100 *8*	1577.61	(3^+)				
		414.34 *15*	64 *5*	1379.38	2^+				
		452.18[l] *10*	<20.5[l]	1341.31	2^+				
		1503.7	≤91	290.18	4^+				
		≈1705.4	≤136	88.349	2^+				
1797.99	$(7)^-$	464.92[@] *7*	100	1333.07	6^+	(E1)[g]			
1798.5	(5^+)	289.6[&n]	5.5[&]	1508.61	5^-				
		1201.8[&] *7*	20[&]	596.82	6^+				
		1508[&] *1*	100[&]	290.18	4^+				
1815.2		1218.4[&] *8*	100[&]	596.82	6^+				
		1525.0[&] *5*	80[&]	290.18	4^+				
1818.92	$(0)^-$	175.50 *7*	100 *8*	1643.43	1^-	M1[f]		0.833	Measured M1(+E2) multipolarity. Level scheme requires M1.
		571.30 *9*	63 *5*	1247.70	2^-				
1830.4	5	1540.2[@n] *5*	100	290.18	4^+				E_γ: from (α,2nγ).
1853.96	$(3^+,4^+,5^+)$	474.64[l] *8*	<18.2[l]	1379.38	2^+				
		1563.53 *13*	41 *7*	290.18	4^+	(M1+E2)[g]			
		1765.75 *15*	100 *8*	88.349	2^+				
1856.99	$(2)^-$	146.74 *5*	50 *4*	1710.44	(3^-)	M1(+E2)[f]	0.74	1.19	
		213.50 *6*	100 *19*	1643.43	1^-	M1(+E2)[f]	0.87	0.376	
		452.18[l] *10*	<5.8[l]	1404.56	4^-				
		609.25 *9*	18 *3*	1247.70	2^-				
1860.08	$(8)^-$	300.78[@] *6*	100	1559.31	8^-	(M1)[g]		0.189	
1862.0	(6^+)	1265.2[&] *5*	75[&]	596.82	6^+				
		1571.6[&] *8*	100[&]	290.18	4^+	(E2)[g]			
1862.80	1^+	158.19 *7*	5.7 *4*	1704.60	(2^+)	M1[f]		1.12	
		190.36 *7*	10.3 *8*	1672.34	$(1)^+$	M1+E2[f]	0.72	0.554	
		483.28 *9*	0.68 *8*	1379.38	2^+				
		521.6 *1*	≈61	1341.31	2^+				
		569.77 *11*	2.8 *4*	1293.12	0^+				
		615.22 *9*	2.6 *4*	1247.70	2^-				
		1774.56 *15*	39 *3*	88.349	2^+	M1(+E2)[f]			
		1862.74 *15*	100 *8*	0.0	0^+	M1[f]			Measured M1(+E2) multipolarity. Level scheme requires M1.
1866.6		462.0[@] *5*	100	1404.56	4^-				
1878?	$(5^+,6^+,7^+)$	1281[@n] *1*	100	596.82	6^+	(M1+E2)[g]			
1902.28	$(3^-,4^-,5^-)$	1306.8[&] *2*	100[&]	596.82	6^+	E1,E2[g]			

$^{176}_{72}Hf_{104}$-11

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	α[i]
1902.28	(3⁻,4⁻,5⁻)	1614.2[&n] *3*	77[&]	290.18	4⁺	(E1)[g]	
1912.02	2⁺	125.4 *10*	≤4.8	1786.11			
		207.5	≤1.8	1704.60	(2⁺)		
		239.62 *6*	12.0 *10*	1672.34	(1)⁺	M1[f]	0.352
		466.16 *7*	24.7 *20*	1445.79	3⁺	M1[f]	0.0593
		532.54 *11*	5.4 *8*	1379.38	2⁺		
		570.76[l] *10*	<10[l]	1341.31	2⁺		
		598.6 *2*	0.55 *10*	1313.31	3⁻		
		685.55 *8*	2.64 *21*	1226.63	2⁺	M1[f]	0.0221
		1621.87[m] *10*	5[m] *2*	290.18	4⁺		
		1823.70 *15*	100 *8*	88.349	2⁺	M1[f]	
		1911.6 *3*	0.29 *6*	0.0	0⁺		
1914.13	(9⁺)	214.22[&] *4*	83[&]	1699.92	(8⁺)	(M1+E2)[g]	0.35 *13*
		408.3[&] *2*	100[&]	1505.81	7⁺		
1924.56	(2,3)⁻	131.0[l] *15*	<1.7[l]	1793.61			
		346.9 *2*	8.9 *7*	1577.61	(3⁺)		
		519.7 *2*	26 *2*	1404.56	4⁻		
		583.5 *2*	1.03 *17*	1341.31	2⁺		
		611.16 *8*	100 *8*	1313.31	3⁻	M1[f]	0.0296
		677.09[l] *8*	<25.2[l]	1247.70	2⁻		
		1836.34 *16*	17.1 *13*	88.349	2⁺	(E1)[f]	
1926.68	(7⁺)	420.86[&] *8*	100[&]	1505.81	7⁺	(M1)[g]	0.0775
		594[&] *1*	23[&]	1333.07	6⁺		
1930.78	(8⁻)	132.80[&] *7*	11.4[&]	1797.99	(7)⁻		
		424.96[&] *6*	100[&]	1505.81	7⁺	(E1)[g]	
1932.7	(8)⁺	934.8[&] *5*	55[&]	997.73	8⁺	E0+E2(+M1)[g]	*j*
		1335.9[&] *4*	100[&]	596.82	6⁺	(E2)[g]	
1944.48	(6⁺)	268.61[&] *12*	15[&]	1675.96	(4⁺)		
		1347.4[&] *2*	100[&]	596.82	6⁺	(M1+E2)[g]	
1949.71		131.0[l] *15*	<8.3[l]	1818.92	(0)⁻		
		636.6[l] *1*	<19.8[l]	1313.31	3⁻		
		701.96 *9*	27.1 *22*	1247.70	2⁻		
		723.10 *8*	50 *4*	1226.63	2⁺		
		1861.15 *25*	100 *25*	88.349	2⁺		
		1949.80 *17*	50 *10*	0.0	0⁺		

$^{176}_{72}Hf_{104}$-12

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	δ[k]	α[i]	Comments
1958.18	2⁻	236.19 *7*	1.5 *1*	1722.05	1⁻	M1(+E2)[f]	0.87	0.281	
		380.48 *20*	2.4 *2*	1577.61	(3⁺)	E1(+M2)[f]		0.18 *18*	
		512.3 *2*	7.4 *7*	1445.79	3⁺				
		553.5 *2*	0.40 *6*	1404.56	4⁻				
		579.08 *15*	1.10 *9*	1379.38	2⁺				
		616.79 *8*	19 *2*	1341.31	2⁺	E1[f]			
		644.86 *8*	18 *1*	1313.31	3⁻	M1[f]		0.0258	
		710.50 *8*	100 *8*	1247.70	2⁻	M1[f]		0.0202	
		1869.78 *16*	1.5 *1*	88.349	2⁺				
1964.2	(5,6,7)⁻	311.1[@] *3*	100	1653.11	(6)⁻	M1[g]		0.173	
1977.0?		191.6[@n] *5*	100	1785.09	9⁻				
1978.0	(1)	1978[#]	100	0.0	0⁺				
1992.70	(8)⁻	339.59[@] *8*	100	1653.11	(6)⁻	E2[g]		0.0554	
2014.27	(9)⁻	155.0[l&] *5*	<14[l&]	1860.08	(8)⁻				
		229.15[&] *7*	100[&]	1785.09	9⁻	(M1)[g]		0.397	
		455.1[&] *2*	60[&]	1559.31	8⁻				
2023.92	(⁺)	1427.1[@] *2*	100	596.82	6⁺	(M1+E2)[g]			
2031.05	10⁻	245.97[&] *4*	100[&]	1785.09	9⁻	(M1)[g]		0.327	
		471.6[&] *2*	13[&]	1559.31	8⁻				
2034.66	(12⁺)	553.6[&] *1*	100[&]	1481.06	10⁺				
2044.78	(1⁺)	401.44 *20*	1.44 *16*	1643.43	1⁻				
		1956.48 *15*	64 *4*	88.349	2⁺	(M1,E2)[f]			I_γ: 58 *7* in (γ,γ′) deduced from R_{exp}.
		2044.87 *15*	100 *8*	0.0	0⁺	(M1,E2)[f]			
2048.48	(2,3,4⁻)	146.28[&] *5*	39[&]	1902.28	(3⁻,4⁻,5⁻)				
		265.15[&] *7*	65[&]	1783.79	(7)⁻				
		337.23[&] *8*	100[&]	1710.44	(3⁻)	(M1+E2)[g]		0.10 *5*	
2066.25	(1,2,3)⁺	361.76 *20*	3.9 *6*	1704.60	(2⁺)				
		474.64[l] *8*	10.0[l] *6*	1591.51	(4⁺)				
		1977.85 *15*	100 *6*	88.349	2⁺	(M1,E2)[f]			
		2066.28 *16*	≤8.1	0.0	0⁺				
2085.68	(9⁻)	155.0[l&] *5*	≤91[l&]	1930.78	(8⁻)				
		287.69[&] *2*	≤182[&]	1797.99	(7)⁻				
		386.3[&] *6*	100[&]	1699.92	(8⁺)				
2085.83	(5,6,7)⁺	1088.1[&] *2*	45[&]	997.73	8⁺				

$^{176}_{72}Hf_{104}$-13

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	α[i]	Comments
2085.83	(5,6,7)$^+$	1489.0[&] *5*	100[&]	596.82	6$^+$	M1+E2[g]		
2096.8	(5,6,7)$^+$	1100[&] *1*	30[&]	997.73	8$^+$			
		1499.8[&] *5*	100[&]	596.82	6$^+$	(M1)[g]		
2106.5	(7)$^+$	1108.7[&] *5*	42[&]	997.73	8$^+$	[g]		Mult.: E1,E2 in (α,2nγ). Level scheme requires (M1+E2).
		1509.7[&] *8*	100[&]	596.82	6$^+$	(M1+E2)[g]		
2112.89	(8$^+$)	412.9[&] *2*	100[&]	1699.92	(8$^+$)			
		607.5[&] *5*	87[&]	1505.81	7$^+$			
2116.8	(7$^+$)	1520.0[@] *3*	100	596.82	6$^+$			Mult.: E1 deduced in (α,2nγ) is not consistent with J^π=(7$^+$) for 2116.8 level.
2136.42	(9)$^-$	352.4[&] *3*	≈18[&]	1783.79	(7)$^-$			
		655.3[&] *5*	≈14[&]	1481.06	10$^+$			
		1139.4[&] *5*	100[&] *20*	997.73	8$^+$	E1[g]		
2147.62	(10$^+$)	233.54[&] *10*	40[&]	1914.13	(9$^+$)	(M1+E2)[g]	0.28 *11*	
		447.66[&] *9*	100[&]	1699.92	(8$^+$)	(E2)[g]	0.0258	
2160.5		196.3[@] *5*	100	1964.2	(5,6,7)$^-$			
2172.9?		667.1[n] *5*	100	1505.81	7$^+$			
2173.8	(7$^+$)	1577.0[@] *8*	100	596.82	6$^+$			
2194.02	(10$^-$)	163.0[&] *2*	20[&]	2031.05	10$^-$	(M1+E2)[g]	0.81 *22*	
		180[&] *1*	12.0[&]	2014.27	(9)$^-$			
		334.3[&] *5*	20[&]	1860.08	(8)$^-$			
		408.7[&] *3*	100[&]	1785.09	9$^-$	(M1)[g]	0.084	
2258.7	(6$^-$,7$^-$,8$^-$)	460.7[@] *5*	100	1797.99	(7)$^-$	(M1)[g]	0.0612	
2261.55	(10$^-$)	330.77[@] *8*	100	1930.78	(8$^-$)	(E2)[g]	0.0598	
2265.27	(2)$^-$	315.50 *15*	10.7 *14*	1949.71				
		467.4[@n] *3*		1797.99	(7)$^-$			
		479.14 *10*	3.9 *5*	1786.11				
		543.18 *11*	10.7 *7*	1722.05	1$^-$			
		555.2 *2*	1.9 *4*	1710.44	(3$^-$)			
		819.49 *10*	34 *3*	1445.79	3$^+$			
		861[l] *1*	≤5.4[l]	1404.56	4$^-$			
		923.94 *8*	100 *7*	1341.31	2$^+$	E1[f]		
		951.86 *10*	9.3 *14*	1313.31	3$^-$			
		1017.58 *11*	15.7 *21*	1247.70	2$^-$			
2280.83	(2)	2192.33 *20*	100 *8*	88.349	2$^+$			I_γ: 69 *25* in (γ,γ') deduced from R_{exp}.
		2280.6 *2*	79 *6*	0.0	0$^+$			

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	δ[k]	α[i]	Comments
2284.8	(8$^+$)	1287.1[m@] 5	100[me]	997.73	8$^+$				
2293.85	11$^-$	100[a]	0.9[a]	2194.02	(10$^-$)				
		262.78[&] 6	100[&]	2031.05	10$^-$	(M1)[g]		0.273	
		508.9[&] 5	39[&]	1785.09	9$^-$				
2294.8	(10)$^+$	361.9[&] 8	20[&]	1932.7	(8)$^+$				
		813.8[&] 3	60[&]	1481.06	10$^+$	E0+E2(+M1)[g]		[j]	
		1297.2[&] 8	100[&]	997.73	8$^+$				
2304.7	(8$^+$)	1307.0[@] 8	100	997.73	8$^+$	[g]			Mult.: Reported (E1,E2) in (α,2nγ). Level scheme requires (E2).
2307.76		450.94 13	5.7 9	1856.99	(2)$^-$				
		540.27 13	20 4	1767.52	2$^-$,3$^-$				
		994.46[l] 12	≤18.5[l]	1313.31	3$^-$				
		2219.49 20	100 8	88.349	2$^+$				
		2307.7 2	69 6	0.0	0$^+$				
2308.34	1$^-$,2$^-$,3$^-$	350.18 20	63 5	1958.18	2$^-$	M1(+E2)[f]	0.56	0.108	
		358.72 20	75 6	1949.71					
		383.6 2	40 4	1924.56	(2,3)$^-$				
		445.52[l] 8	<42[l]	1862.80	1$^+$				
		665.01 12	46 13	1643.43	1$^-$				
		730.7 1	25 3	1577.61	(3$^+$)				
		967.06 9	100 13	1341.31	2$^+$				
2318.7	(9$^+$)	404.7[&] 6	80[&]	1914.13	(9$^+$)				
		618.5[&] 8	100[&]	1699.92	(8$^+$)				
2361.0	(1)	2361[#@]	100	0.0	0$^+$				
2398.97	(11$^+$)	251.36[&] 10	53[&]	2147.62	(10$^+$)				
		484.8[&] 2	100[&]	1914.13	(9$^+$)				
2399.01	(11$^-$)	105.0[&] 2	25[&]	2293.85	11$^-$				
		368.1[&] 2	100[&]	2031.05	10$^-$				
		385.1[a]	9.9[a]	2014.27	(9)$^-$				
2405.35	1	480.83 9	5.9 8	1924.56	(2,3)$^-$				
		551.4 2	3.8 7	1853.96	(3$^+$,4$^+$,5$^+$)				
		1178.5 2	7.7 13	1226.63	2$^+$				
		2317.0 2	51 4	88.349	2$^+$				
		2405.2 2	100 8	0.0	0$^+$				
2432.34	$^-$	507.79 15	100 8	1924.56	(2,3)$^-$	M1[f]		0.0477	
		638.83 8	13.9 11	1793.61					

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	α[i]	Comments
2432.34	–	647.0[@ n] *8*		1785.09	9^-			
		1052.7 *2*	3.7 *4*	1379.38	2^+			
		1090.94 *13*	5.2 *7*	1341.31	2^+			
		1184.55 *13*	7.5 *11*	1247.70	2^-			
2446.9		1448.0[@ n] *6*	100	997.73	8^+			
2452.47		861.0[l] *1*	<104[l]	1591.51	(4^+)			
		2162.1 *2*	100 *11*	290.18	4^+			
2470.84	2^-	521.3 *1*	8 *4*	1949.71				
		546.53 *10*	15.6 *13*	1924.56	$(2,3)^-$	(M1)[f]	0.0395	
		677.09[l] *8*	<9.4[l]	1793.61				
		760.4 *2*	0.49 *8*	1710.44	(3^-)			
		798.5 *2*	1.38 *24*	1672.34	$(1)^+$			
		893.3 *2*	0.76 *19*	1577.61	(3^+)			
		1066.20 *9*	18.9 *15*	1404.56	4^-			
		1157.41 *10*	100 *8*	1313.31	3^-	M1[f]		
		1222.95 *10*	59 *5*	1247.70	2^-	E2+M1+E0[f]	0.042	α: experimental value from ^{176}Ta ε decay.
2482.87	(1)	533.23 *16*	52 *17*	1949.71				
		570.76[l] *10*	<370[l]	1912.02	2^+			
		626.1 *2*	13 *2*	1856.99	$(2)^-$			
		664.07 *10*	70 *9*	1818.92	$(0)^-$			
		1333.1 *2*	30 *8*	1149.94	0^+			
		2394.6 *2*	100 *8*	88.349	2^+			
		2482.8 *2*	70 *6*	0.0	0^+			
2514.0	$1^{(+)}$	2425.6[c]	33[c] *8*	88.349	2^+			
		2514[c]	100[c]	0.0	0^+			
2530.0	1	2441.6[c]	84[c] *19*	88.349	2^+			
		2530[c]	100[c]	0.0	0^+			
2540.9?	(10^+)	626.8[@] *5*	100	1914.13	(9^+)			I_γ: complex.
2548.0	1	2459.6[c]	100[c] *24*	88.349	2^+			
		2548[c]	88[c]	0.0	0^+			
2563.54	12^-	164.3[a]	16[a]	2399.01	(11^-)			
		269.64[&] *18*	100[&]	2293.85	11^-			
		369.9[a]	8.5[a]	2194.02	(10^-)			
		533.1[&] *7*	91[&]	2031.05	10^-			
2568.45		537.4[&] *2*	100[&]	2031.05	10^-			
		554.3[&] *5*	100[&]	2014.27	$(9)^-$			
		783[&] *1*	57[&]	1785.09	9^-			
2602.16		196.82 *14*	3.7 *10*	2405.35	1			

$^{176}_{72}Hf_{104}$-16

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	α[i]	Comments
2602.16		2513.82 *20*	100 *8*	88.349	2^+			
		2602.15 *20*	52 *6*	0.0	0^+			
2638.1	(12^-)	238.8[a]	5.3[a]	2399.01	(11^-)			
		344.3[@] *5*	100	2293.85	11^-			
		444.4[a]	14.9[a]	2194.02	(10^-)			
		607.1[a]	18.4[a]	2031.05	10^-			
2646.6	(14^+)	611.9[@] *3*	100	2034.66	(12^+)			
2690.0	1	2601.6[c]	94[c] *14*	88.349	2^+			
		2690[c]	100[c]	0.0	0^+			
2722.0	$1^{(+)}$	2633.6[c]	41[c] *5*	88.349	2^+			
		2722[c]	100[c]	0.0	0^+			
2762.51		454.63 *9*	9.4 *15*	2307.76				
		1612.63 *12*	94 *8*	1149.94	0^+			
		2674.2 *2*	100 *8*	88.349	2^+			
		2762.8 *2*	26 *4*	0.0	0^+			
2791.62		386.1 *2*	6.7 *7*	2405.35	1			
		833.5[l] *1*	<20.9[l]	1958.18	2^-			
		841.5 *2*	12 *3*	1949.71				
		1148.3 *2*	12.7 *22*	1643.43	1^-			
		1346.08 *25*	19 *4*	1445.79	3^+			
		1450.4 *1*	100 *8*	1341.31	2^+			
		1543.73 *15*	70 *6*	1247.70	2^-			
2817.55	$(2)^+$	960.77 *12*	10.0 *14*	1856.99	$(2)^-$			
		1112.9 *2*	6.7 *7*	1704.60	(2^+)			
		1174.17 *10*	27.1 *22*	1643.43	1^-			
		1239.86[l] *12*	<15.0[l]	1577.61	(3^+)			
		1371.75 *12*	20.0 *16*	1445.79	3^+			
		1412.84[l] *11*	<15.0[l]	1404.56	4^-			
		1438.1 *3*	3.9 *9*	1379.38	2^+			
		1476.18 *10*	63 *5*	1341.31	2^+	E2[f]		
		1504.24 *10*	100 *14*	1313.31	3^-			
2827.0	13^-	189.0[a] *calc*	18.2[a]	2638.1	(12^-)			
		263.4[a] *calc*	7.2[a]	2563.54	12^-			
		427.7[a] *calc*	33[a]	2399.01	(11^-)			
		533.1[a] *7*	100[a]	2293.85	11^-			
2831.0	1	2831[#]		0.0	0^+			
2865.8	14^-	38.7[a]	11.4[a]	2827.0	13^-	(M1)[h]		B(M1)(W.u.)=6.1×10^{-8} *6*
		227.9[a]	22.2[a]	2638.1	(12^-)	(E2)[h]	0.189	B(E2)(W.u.)=4.97×10^{-6} *18*

$^{176}_{72}Hf_{104}$-17

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	α[i]	Comments
2865.8	14⁻	302.2[a]	100[a]	2563.54	12⁻	(E2)[h]	0.0781	B(E2)(W.u.)=5.33×10^{-7} *17*
2878.21		833.5[l] *1*	≤18.4[l]	2044.78	(1⁺)			
		1021.0 *5*	9 *4*	1856.99	(2)⁻			
		1432.56 *11*	21.1 *17*	1445.79	3⁺			
		1536.62 *11*	93 *8*	1341.31	2⁺			
		1564.95 *11*	100 *8*	1313.31	3⁻			
2885.52	1(+)	577.3 *1*	31 *3*	2308.34	1⁻,2⁻,3⁻			
		604.6[l] *1*	≤17.8[l]	2280.83	(2)			
		1213.20 *11*	100 *8*	1672.34	(1)⁺			
		1637.60 *18*	56 *11*	1247.70	2⁻			
		2797.14 *20*	44 *4*	88.349	2⁺			I_γ: 72 *13* in (γ,γ′) deduced from R_{exp}.
		2885.55 *22*	74 *6*	0.0	0⁺			
2905.67		303.55 *15*	32 *3*	2602.16				
		434.85 *10*	68 *7*	2470.84	2⁻			
		839.25 *11*	100 *15*	2066.25	(1,2,3)⁺			
		861.0[l] *1*	<58[l]	2044.78	(1⁺)			
		981.0 *3*	71 *27*	1924.56	(2,3)⁻			
		2817.0 *4*	65 *9*	88.349	2⁺			
		2905.7 *4*	31 *5*	0.0	0⁺			
2912.26	(0)⁻	604.6[l] *1*	<0.57[l]	2307.76				
		867.4 *1*	0.75 *10*	2044.78	(1⁺)			
		962.74[l] *14*	<1.19[l]	1949.71				
		1190.22 *10*	100 *8*	1722.05	1⁻	M1[f]		
		1239.86[l] *12*	<2.50[l]	1672.34	(1)⁺			
		1268.78 *10*	29.3 *23*	1643.43	1⁻	M1[f]		Measured E2+M1 multipolarity. Level scheme requires M1.
		2823.6 *4*	1.19 *24*	88.349	2⁺			
2920.26	1⁻	1198.15 *11*	1.49 *25*	1722.05	1⁻			
		1540.82 *11*	8.1 *6*	1379.38	2⁺			
		1693.7 *2*	11.9 *9*	1226.63	2⁺			
		2832.0 *2*	100 *8*	88.349	2⁺	E1[f]		
		2920.41 *20*	50 *4*	0.0	0⁺	E1[f]		
2921.03	1⁺,2⁺	318.8 *3*	2.5 *5*	2602.16				
		962.74[l] *14*	≤12.0[l]	1958.18	2⁻			
		1064.03 *12*	19.3 *24*	1856.99	(2)⁻			
		1579.9 *2*	63 *6*	1341.31	2⁺	M1+E2[f]		
		1673.40 *16*	100 *24*	1247.70	2⁻			
2940.0	1(+)	2851.6[c]	37[c] *6*	88.349	2⁺			
		2940[c]	100[c]	0.0	0⁺			

$^{176}_{72}Hf_{104}$-18

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	α[i]	Comments
2944.17	2⁻	461.41 *8*	1.28 *23*	2482.87	(1)			
		473.21 *7*	5.9 *5*	2470.84	2⁻			
		636.6[l] *1*	<1.10[l]	2307.76				
		678.85 *8*	4.4 *4*	2265.27	(2)⁻	M1[f]	0.0226	
		994.46[l] *12*	<1.17[l]	1949.71				
		1366.49 *11*	4.7 *4*	1577.61	(3⁺)			
		1630.83 *10*	38 *3*	1313.31	3⁻	M1[f]		
		1696.55 *13*	100 *8*	1247.70	2⁻	M1[f]		
		2856.1 *5*	0.26 *10*	88.349	2⁺			
2969.07	(2⁻)	660.67 *8*	33 *3*	2308.34	1⁻,2⁻,3⁻			
		1011.1 *3*	9 *3*	1958.18	2⁻			
		1115.0[m] *9*	<137[m]	1853.96	(3⁺,4⁺,5⁺)			I_γ: deduced by evaluator from Iγ(1115γ)/Iγ(156.8γ)=0.85 from the 1404 level in ^{174}Yb(α,2nγ), and Iγ(1115γ)=9.2 *7* for the doublet in ^{176}Ta ε decay.
		1201.48 *10*	100 *7*	1767.52	2⁻,3⁻			
		1258.75 *11*	52 *7*	1710.44	(3⁻)			
		1325.67 *13*	22 *3*	1643.43	1⁻			
		1721.3		1247.70	2⁻			
2994.0	1(+)	2905.6[c]	62[c] *11*	88.349	2⁺			
		2994[c]	100[c]	0.0	0⁺			
3044.0	1(−)	2955.6[c]	100[c] *15*	88.349	2⁺			
		3044[c]	46[c]	0.0	0⁺			
3059.0	1	3059[#]	100	0.0	0⁺			
3080.2	15⁺	214.4[b]	100	2865.8	14⁻	E1[h]	0.0496	B(E1)(W.u.)=0.00010 +*5*−*7*
3098.0	(1)	3098[#]	100	0.0	0⁺			
3107.0	1(+)	3018.6[c]	49[c] *8*	88.349	2⁺			
		3107[c]	100[c]	0.0	0⁺			
3115.0	1(−)	3026.6[c]	100[c] *12*	88.349	2⁺			
		3115[c]	56[c]	0.0	0⁺			
3159.0	1(+)	3070.6[c]	51[c] *8*	88.349	2⁺			
		3159[c]	100[c]	0.0	0⁺			
3160.5	15⁻	294.7[b]	100	2865.8	14⁻	(M1+E2)[h]	0.14 *6*	
3200.0	1	3200[#]	100	0.0	0⁺			
3218.0	1	3218[#]	100	0.0	0⁺			
3222.0	1(+)	3133.6[c]	61[c] *17*	88.349	2⁺			
		3222[c]	100[c]	0.0	0⁺			
3232.0	1(+)	3143.6[c]	59[c] *16*	88.349	2⁺			

$^{176}_{72}Hf_{104}$-19

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	α[i]
3232.0	1(+)	3232[c]	100[c]	0.0	0+		
3261.0	1(+)	3172.6[c]	71[c] 8	88.349	2+		
		3261[c]	100[c]	0.0	0+		
3266.2	16+	186.0[b]	100	3080.2	15+	M1[h]	0.708
3306.0	(1)	3306[#]	100	0.0	0+		
3307.7	(16+)	661.1[b]	100	2646.6	(14+)	E2[h]	0.0100
3322.0	1	3322[#]	100	0.0	0+		
3343.0	1	3254.6[c]	100[c] 20	88.349	2+		
		3343[c]	98[c]	0.0	0+		
3361.0	1(−)	3272.6[c]	100[c] 16	88.349	2+		
		3361[c]	54[c]	0.0	0+		
3372.0	1(−)	3283.6[c]	100[c] 21	88.349	2+		
		3372[c]	61[c]	0.0	0+		
3385.0	1	3296.6[c]	74[c] 18	88.349	2+		
		3385[c]	100[c]	0.0	0+		
3406.0	(1)	3406[#]	100	0.0	0+		
3438.0	1	3438[#]	100	0.0	0+		
3454.0	1	3454[#]	100	0.0	0+		
3467.4	16−	307.0[b]		3160.5	15−		
		601.6[b]		2865.8	14−		
3485.0	1	3396.6[c]	100[c] 22	88.349	2+		
		3485[c]	77[c]	0.0	0+		
3490.0	1	3490[#]	100	0.0	0+		
3519.0	(1)	3519[#]	100	0.0	0+		
3540.1	17+	274.0[b]	100	3266.2	16+	M1+E2[h]	0.17 7
3550.0	1(+)	3461.6[c]	44[c] 7	88.349	2+		
		3550[c]	100[c]	0.0	0+		
3580.0	(1)	3580[#]	100	0.0	0+		
3602.0	1	3513.6[c]	71[c] 18	88.349	2+		
		3602[c]	100[c]	0.0	0+		
3608.0	1	3608[#]	100	0.0	0+		
3627.0	1(+)	3538.6[c]	57[c] 14	88.349	2+		
		3627[c]	100[c]	0.0	0+		
3662.0	1(+)	3573.6[c]	30[c] 6	88.349	2+		
		3662[c]	100[c]	0.0	0+		
3671.0	1(+)	3582.6[c]	41[c] 9	88.349	2+		

$^{176}_{72}Hf_{104}$-20

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	α[i]
3671.0	$1^{(+)}$	3671[c]	100[c]	0.0	0^+		
3689.0	(1)	3689[#]	100	0.0	0^+		
3695.0	(2)	3695[#]		0.0	0^+		
3722.0	(1)	3722[#]	100	0.0	0^+		
3746.0	1	3657.6[c]	78[c] *21*	88.349	2^+		
		3746[c]	100[c]	0.0	0^+		
3767.0	$1^{(+)}$	3678.6[c]	55[c] *9*	88.349	2^+		
		3767[c]	100[c]	0.0	0^+		
3774.0	1	3774[#]	100	0.0	0^+		
3787.1	17^-	319.7[b]		3467.4	16^-	(M1+E2)[h]	0.11 *5*
		626.6[b]		3160.5	15^-		
3805.0	$1^{(+)}$	3716.6[c]	48[c] *11*	88.349	2^+		
		3805[c]	100[c]	0.0	0^+		
3816.0	$1^{(+)}$	3727.6[c]	36[c] *7*	88.349	2^+		
		3816[c]	100[c]	0.0	0^+		
3824.0	(1)	3824[#]	100	0.0	0^+		
3838.0	$1^{(-)}$	3749.6[c]	100[c] *21*	88.349	2^+		
		3838[c]	66.6[c]	0.0	0^+		
3844.0	(1)	3844[#]	100	0.0	0^+		
3847.4	18^+	307.2[b]		3540.1	17^+	(M1+E2)[h]	0.13 *6*
		581.2[b]		3266.2	16^+		
3856.0	(1)	3856[#]	100	0.0	0^+		
3916.0	(1)	3916[#]	100	0.0	0^+		
4010.5	(18^+)	702.8[b]	100	3307.7	(16^+)	E2[h]	
4120.3	18^-	333.2[b]		3787.1	17^-	(M1+E2)[h]	0.10 *5*
		653.0[bn]		3467.4	16^-		
4179.3	19^+	331.8[b]		3847.4	18^+	(M1+E2)[h]	0.10 *5*
		639.2[b]		3540.1	17^+		
4376.6	$(19)^+$	529.1[b]		3847.4	18^+	(M1)[h]	0.0429
		836.5[b]		3540.1	17^+		
4466.6	(19^-)	346.4[b]		4120.3	18^-		
		679.7[bn]		3787.1	17^-		
4532.2	20^+	352.9[b]	100	4179.3	19^+		
4766.4	$(20)^-$	389.8[b]	100	4376.6	$(19)^+$	E1[h]	0.0115

$^{176}_{72}Hf_{104}$-21

Adopted Levels, Gammas (continued)

γ(^{176}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	α[i]	Comments
4826.4	(20$^-$)	360.0[b]	100	4466.6	(19$^-$)			
		706[d]		4120.3	18$^-$			I_γ: not reported.
4863.5	(22)$^-$	37[d]	100	4826.4	(20$^-$)	[E2]		B(E2)(W.u.)=1.44 *20* I_γ: From (^{48}Ca,2nγ) [2001Ch89].
		97.1[b]	25	4766.4	(20)$^-$	E2[h]	4.02	B(E2)(W.u.)=0.00289 *17* I_γ: From (^{48}Ca,2nγ) [2001Ch89].

† From ^{176}Ta ε decay, except otherwise noted.
‡ Weighted averages from ^{176}Ta ε decay and ^{174}Yb(α,2nγ).
# From ^{176}Hf(γ,γ′).
@ From ^{174}Yb(α,2nγ).
& From ^{174}Yb(α,2nγ).
[a] From ^{176}Yb(α,4nγ).
[b] From ^{176}Yb(α,4nγ).
[c] From ^{176}Hf(γ,γ′), Iγ deduced from R_{exp}.
[d] From ^{130}Te(^{48}Ca,2nγ).
[e] Doublet in ^{174}Yb(α,2nγ). Iγ from ^{176}Ta ε decay suggests that most of the intensity deexcites the 1577 level.
[f] From conversion electron data measured in ^{176}Ta ε decay.
[g] From conversion electron data measured in ^{174}Yb(α,2nγ).
[h] From directly measured conversion electron data, conversion coefficients deduced from transition intensity balances, and γ(θ) in ^{176}Yb(α,4nγ).
[i] Conversion coefficients for γ-rays with mixed multipolarities and no δ given are average values for the individual multipolarities, unless otherwise specified.
[j] Experimental value from ^{174}Yb(α,2nγ).
[k] Estimated by evaluator from the deduced α(K)exp in ^{176}Ta ε decay.
[l] Multiply placed with undivided intensity.
[m] Multiply placed with intensity suitably divided.
[n] Placement of transition in the level scheme is uncertain.

$^{176}_{72}Hf_{104}$-22

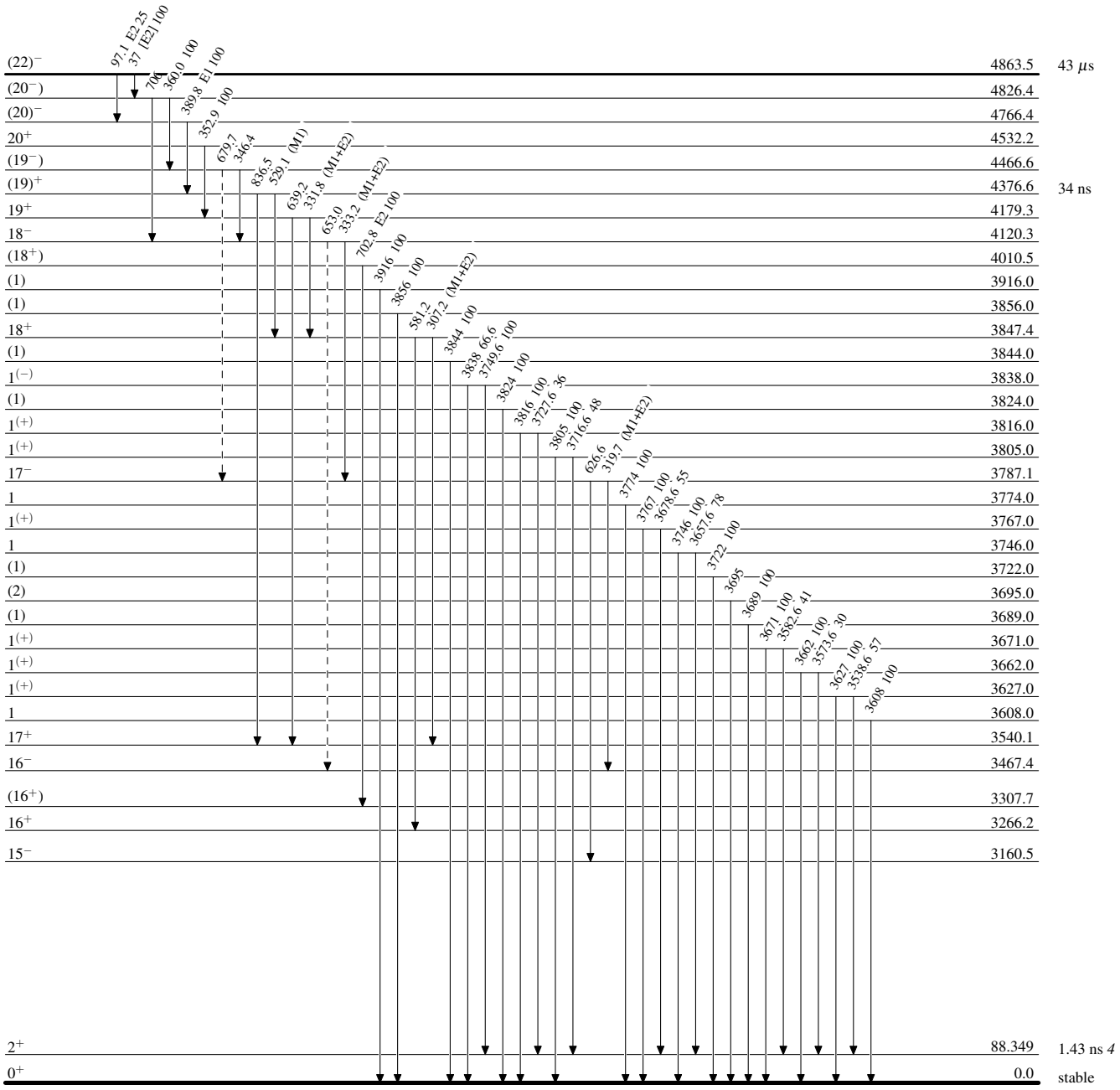
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

– – – – – – ► γ Decay (Uncertain)

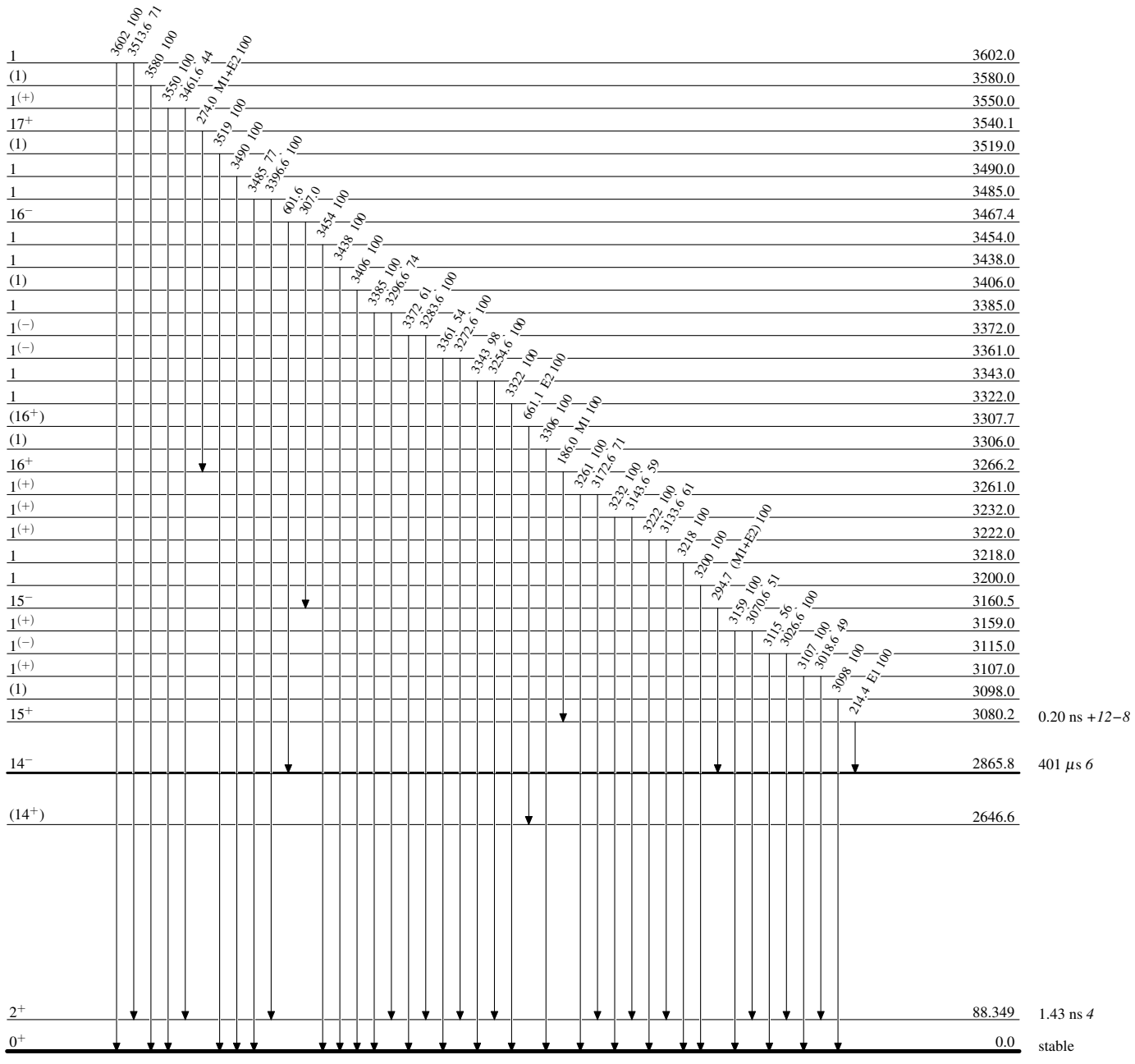


$^{176}_{72}Hf_{104}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

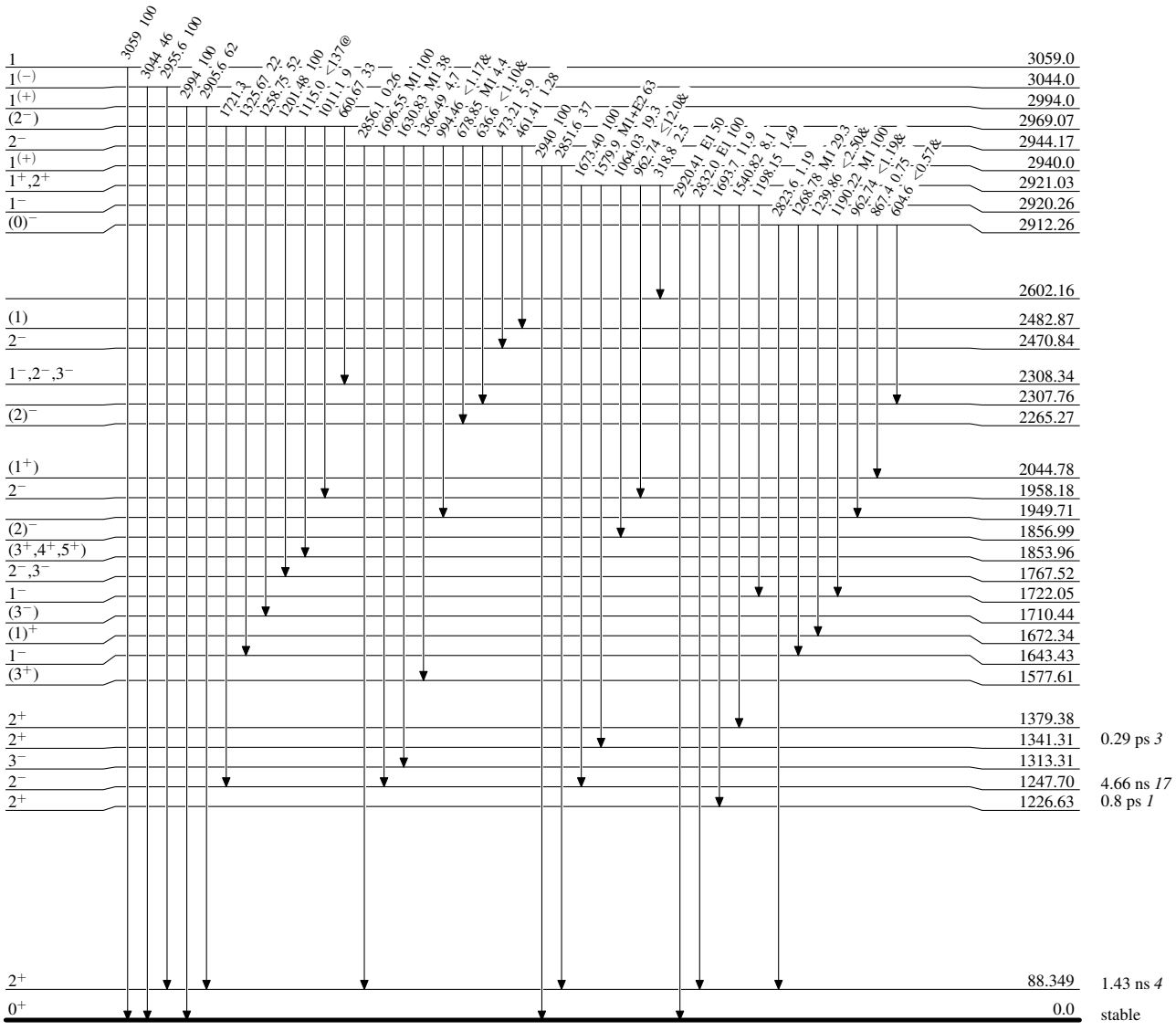


$^{176}_{72}Hf_{104}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

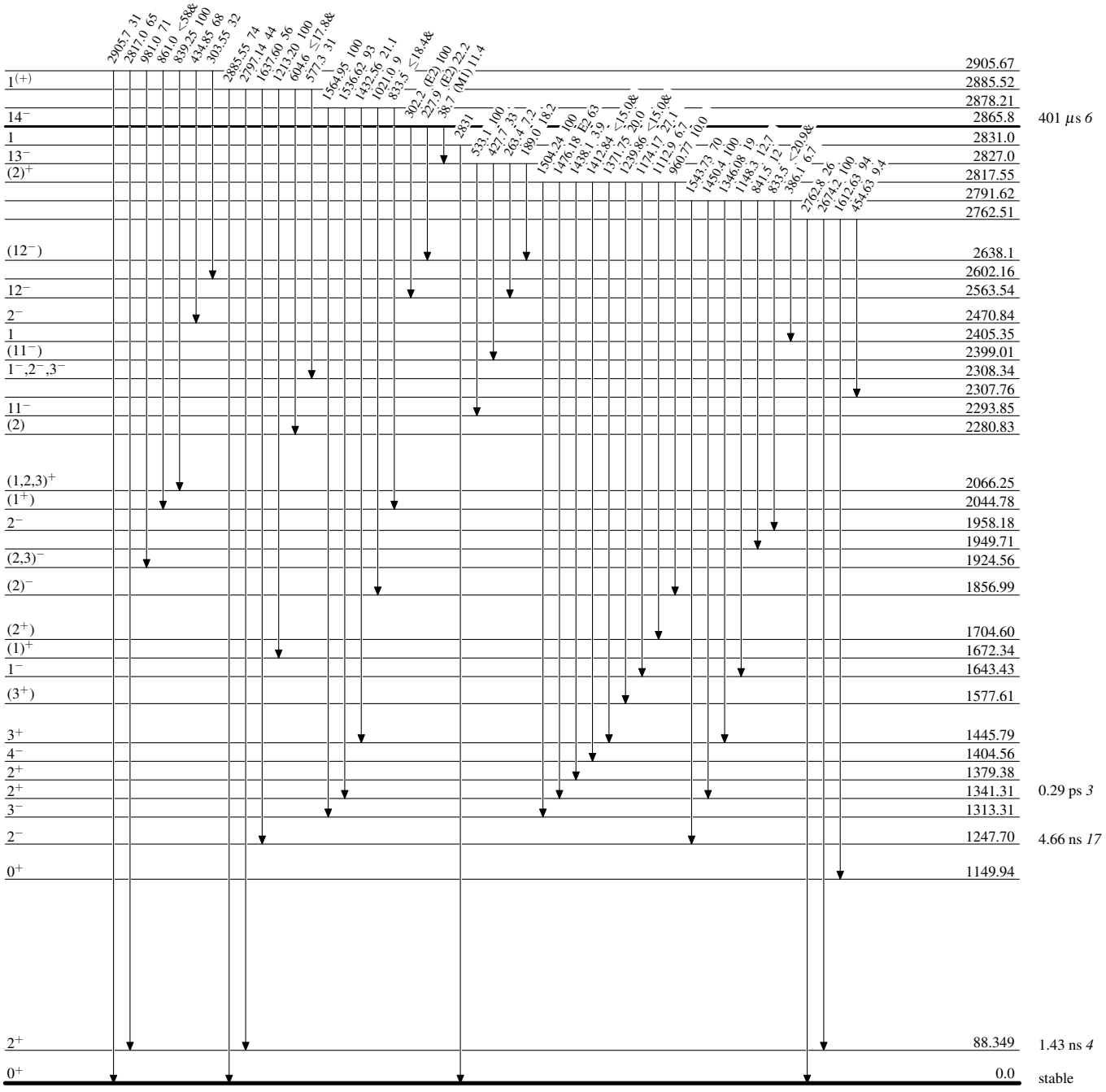


$^{176}_{72}Hf_{104}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

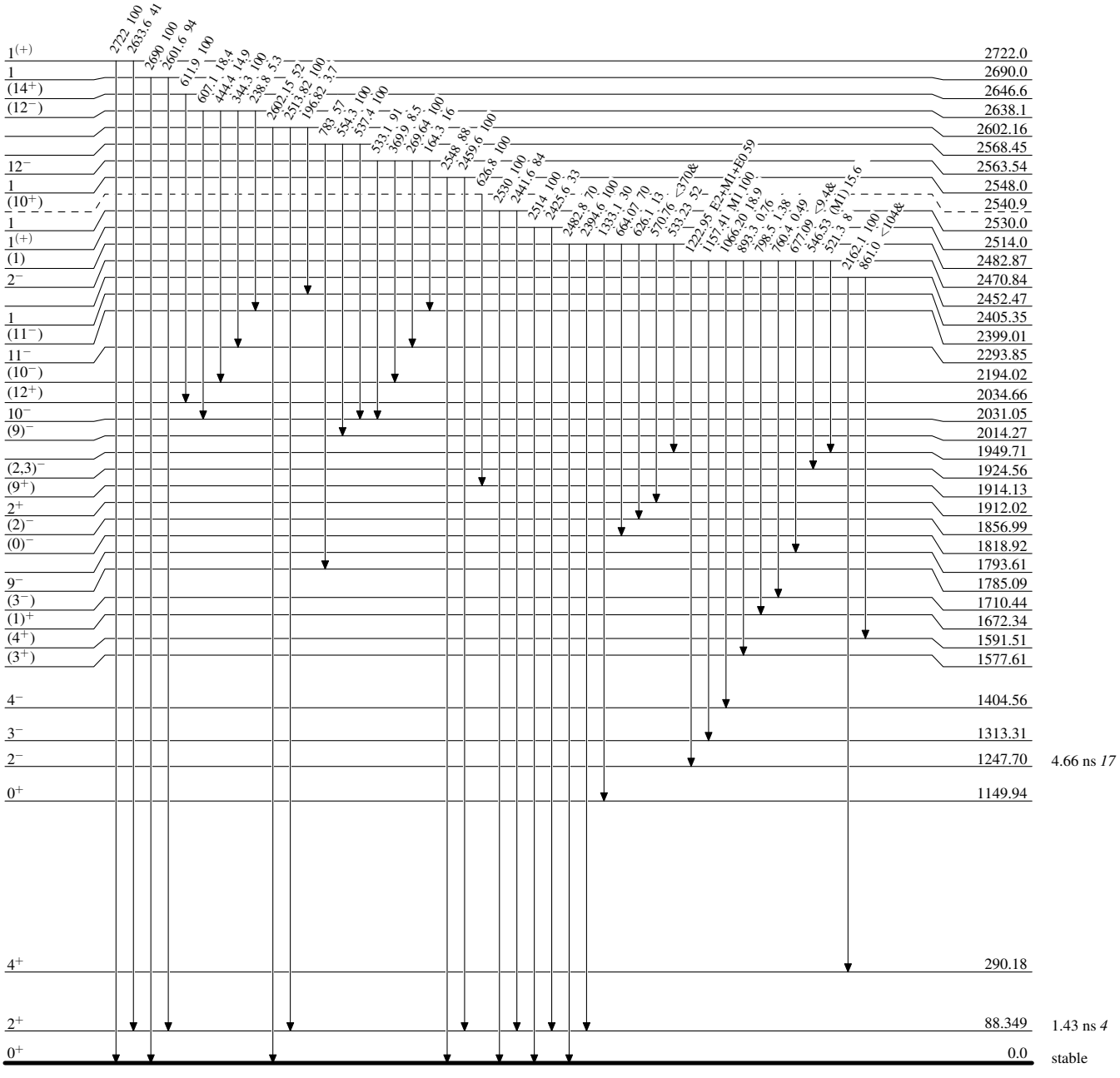


$^{176}_{72}Hf_{104}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



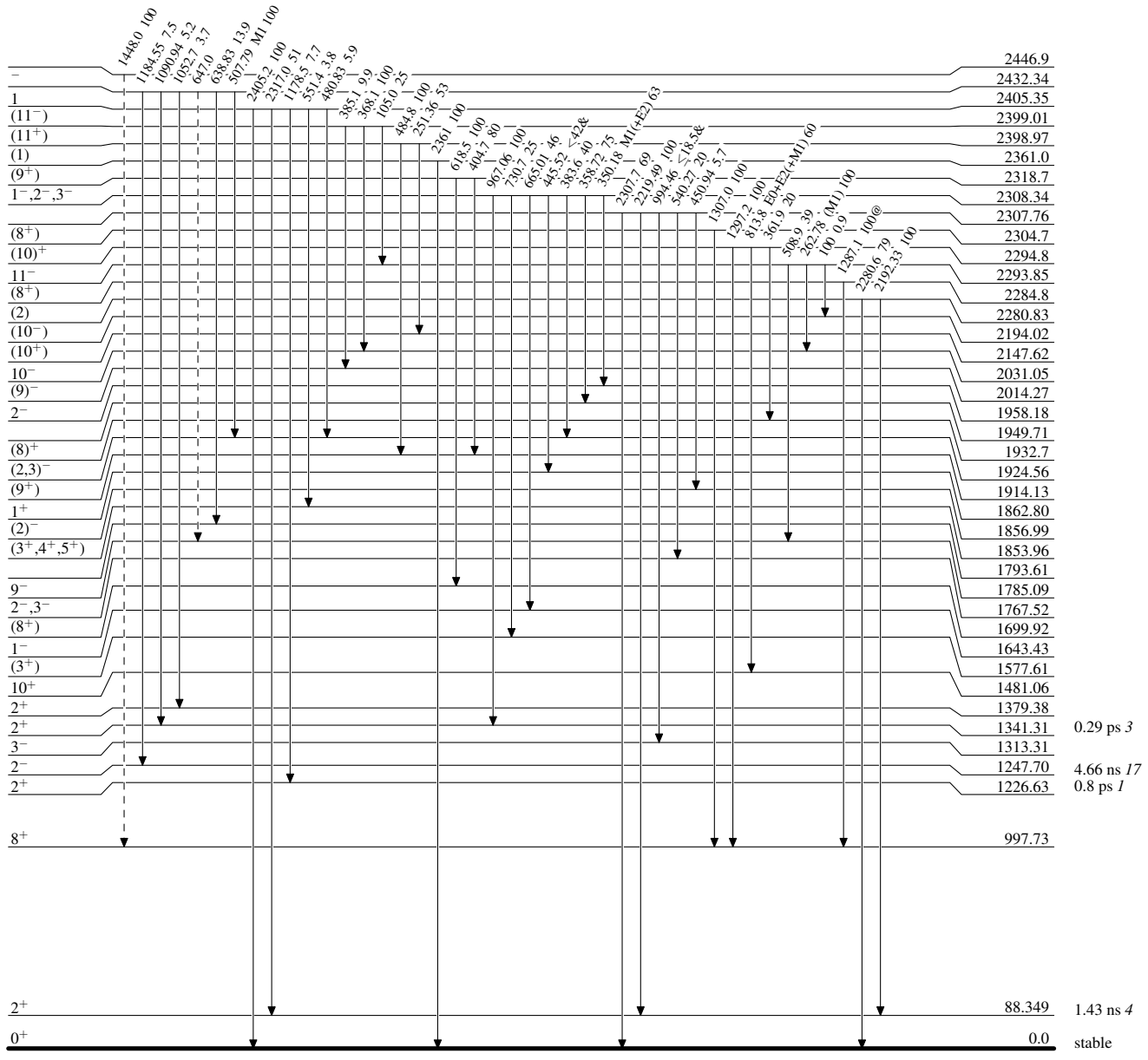
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend

- - - - - - ► γ Decay (Uncertain)



$^{176}_{72}Hf_{104}$

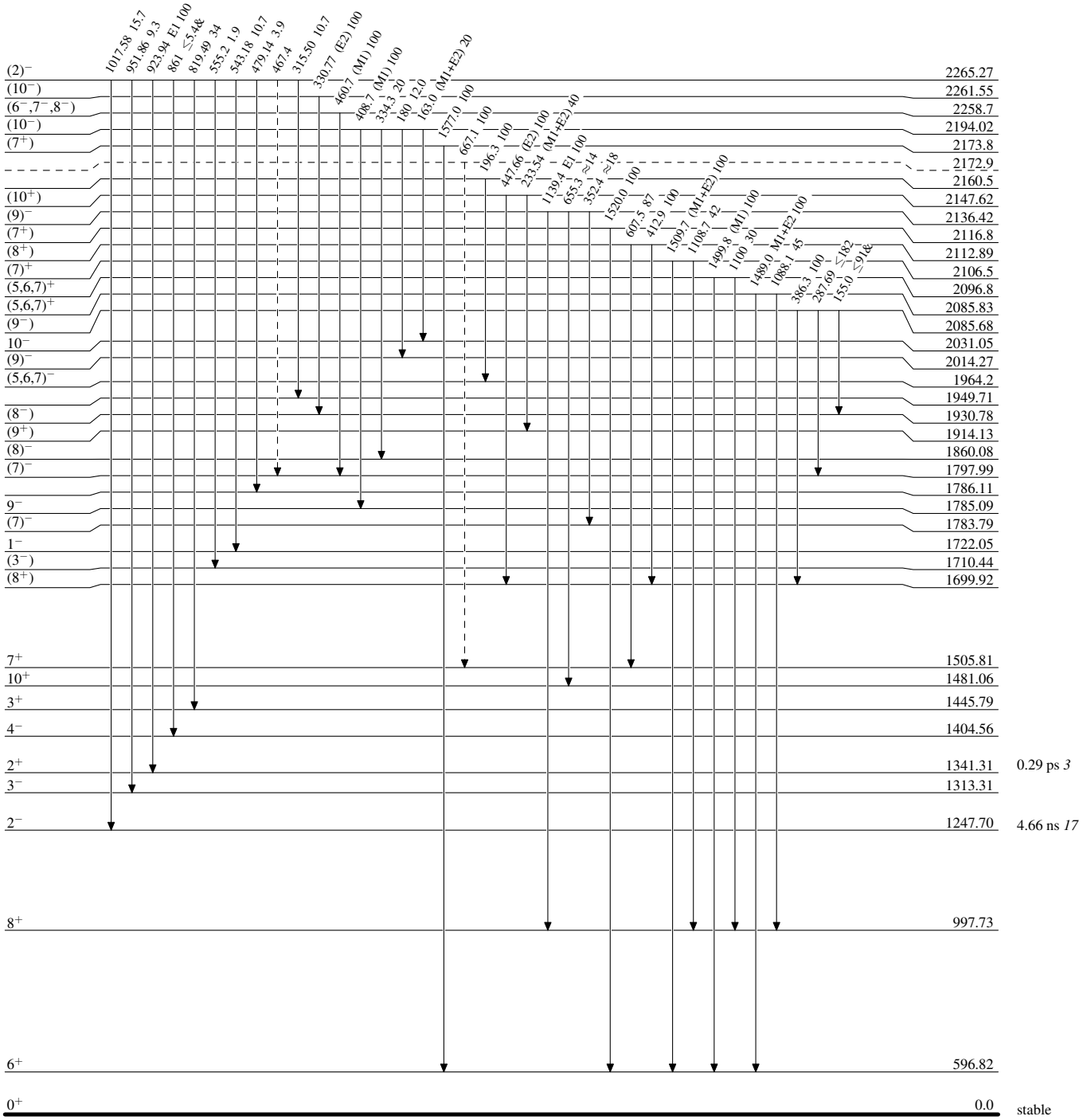
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend

- - - - - - ► γ Decay (Uncertain)



$^{176}_{72}Hf_{104}$

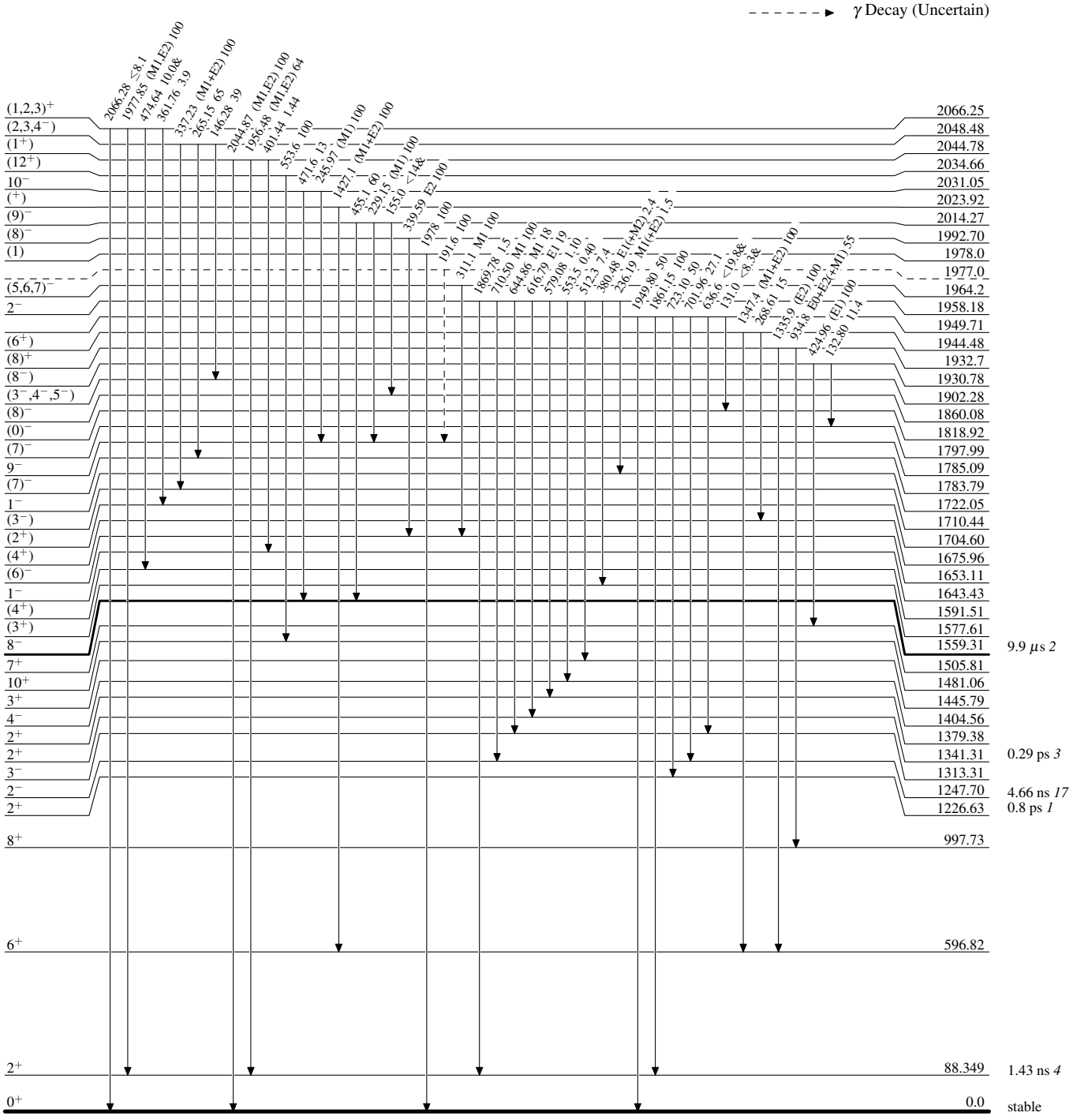
Adopted Levels, Gammas

Level Scheme (continued)

Legend

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

γ Decay (Uncertain)



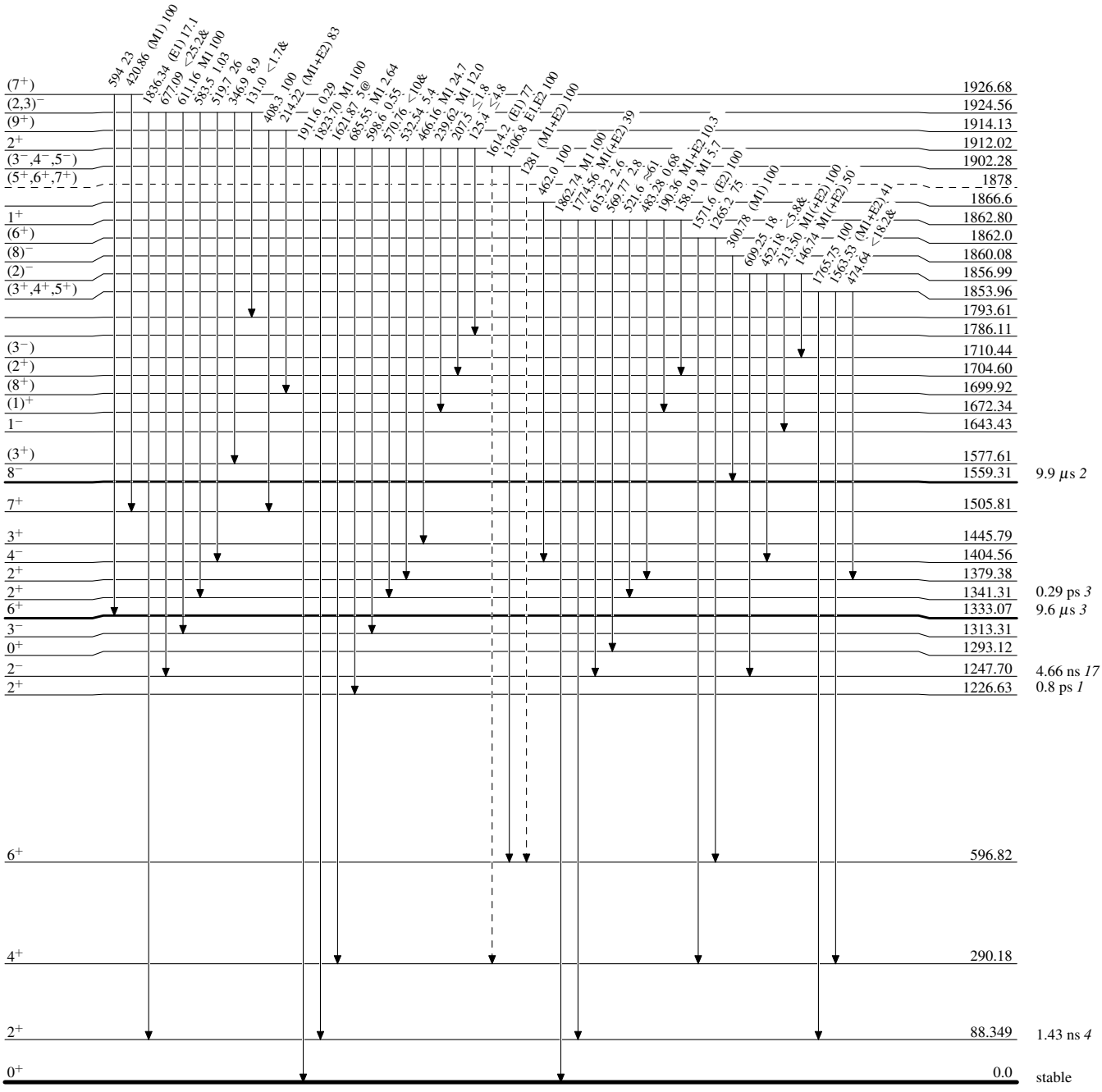
$^{176}_{72}Hf_{104}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend
γ Decay (Uncertain)



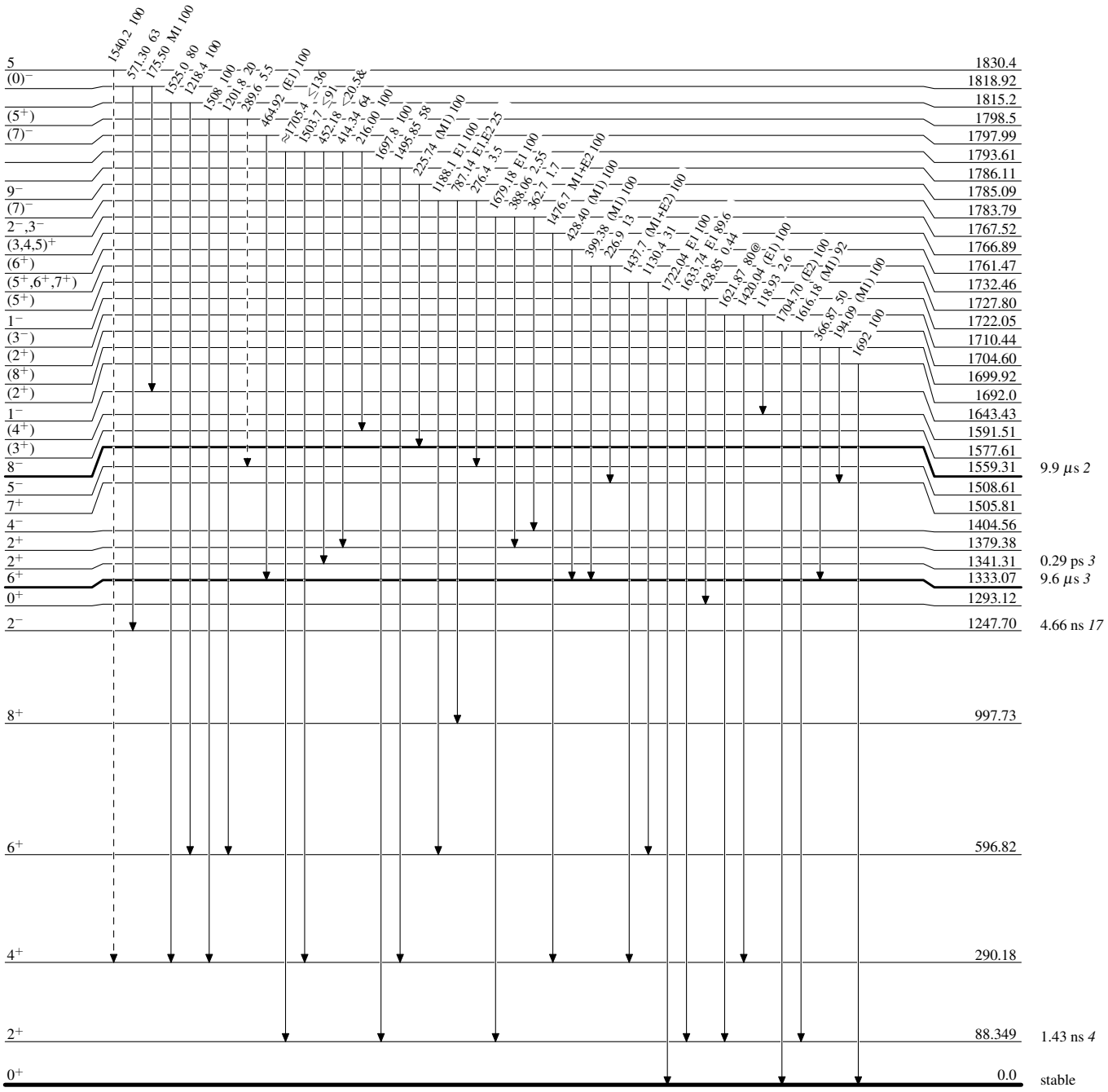
$^{176}_{72}Hf_{104}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend
- - - - - - ► γ Decay (Uncertain)



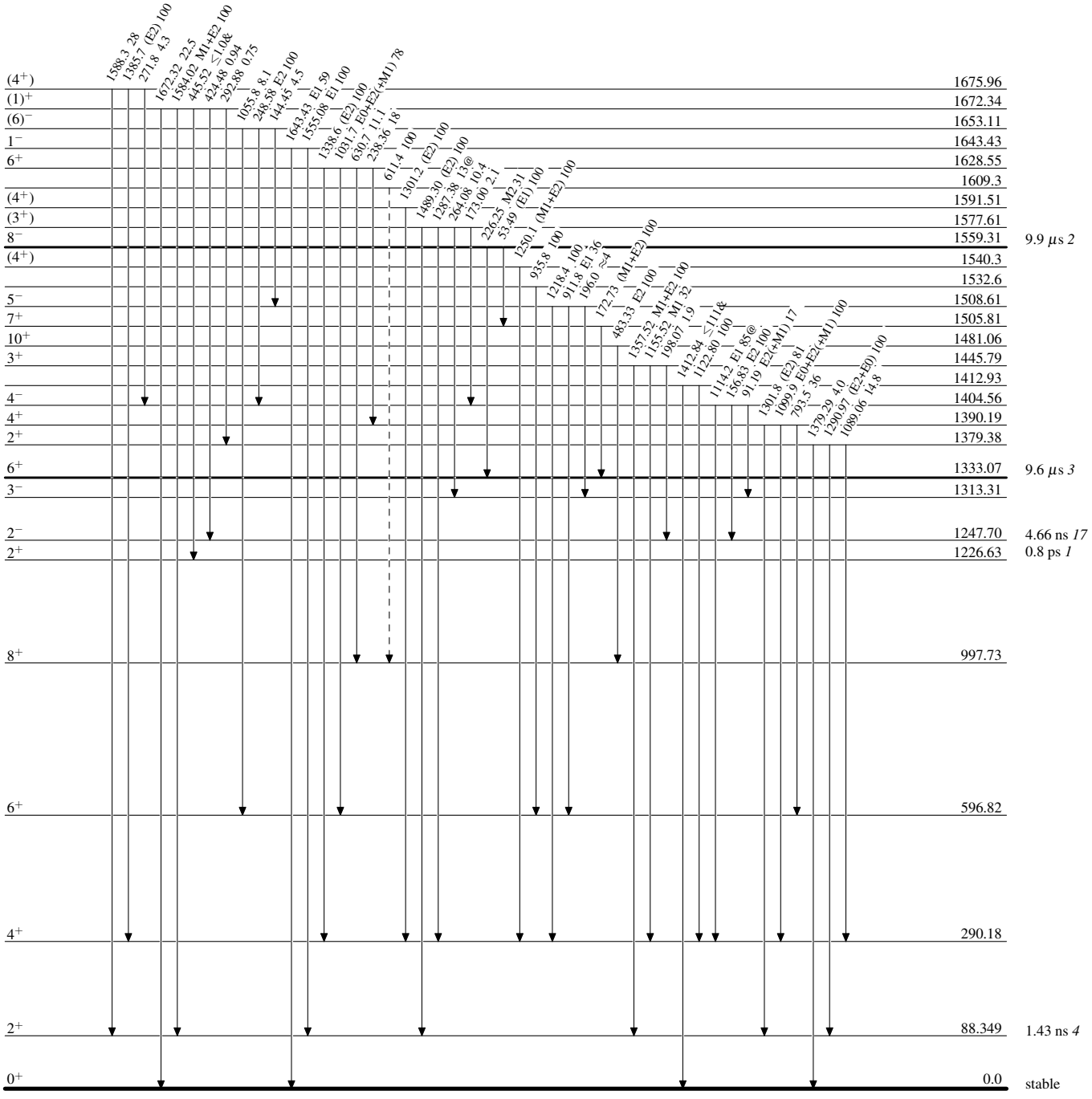
$^{176}_{72}Hf_{104}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend: ------► γ Decay (Uncertain)

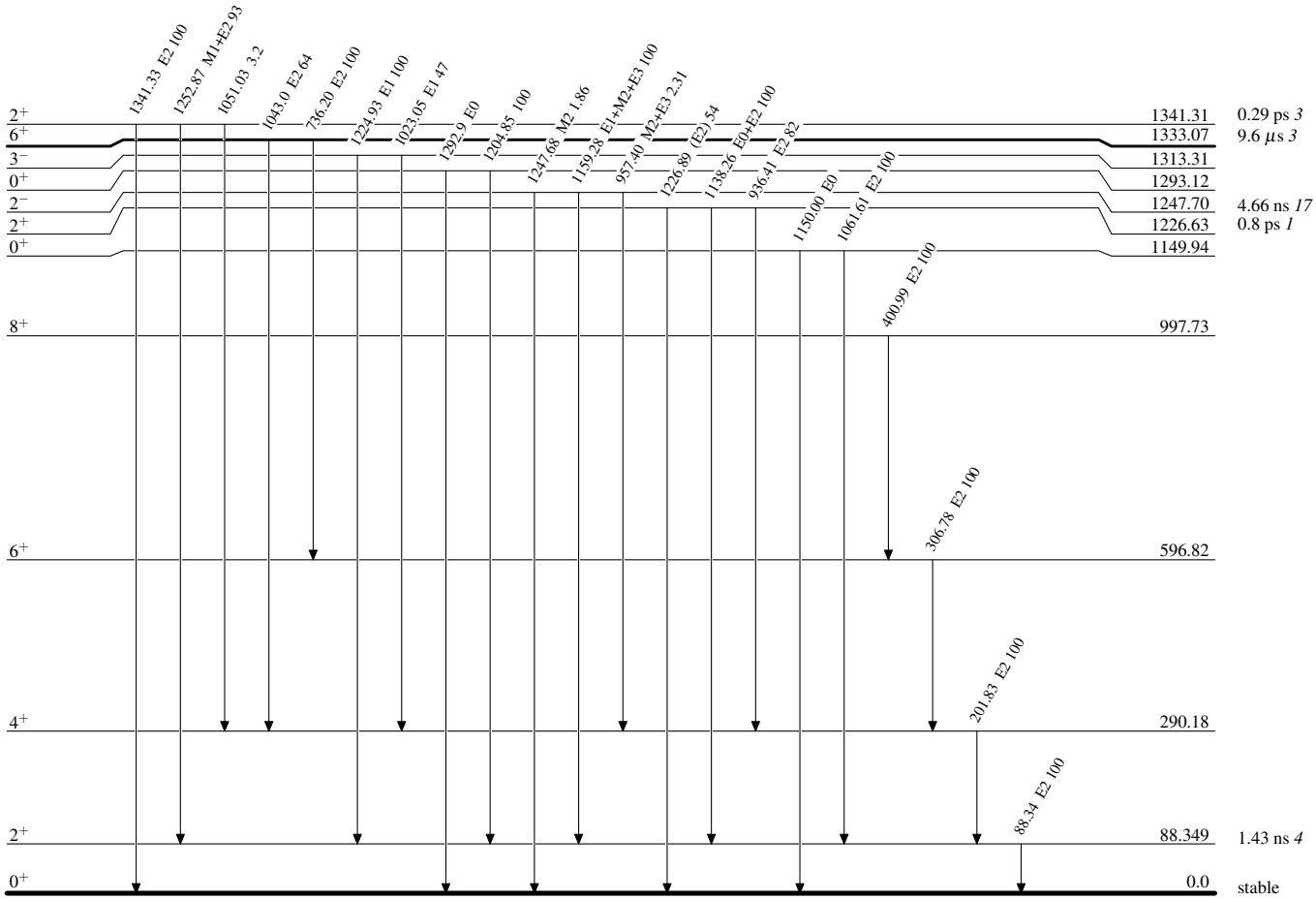


$^{176}_{72}Hf_{104}$

Adopted Levels, Gammas

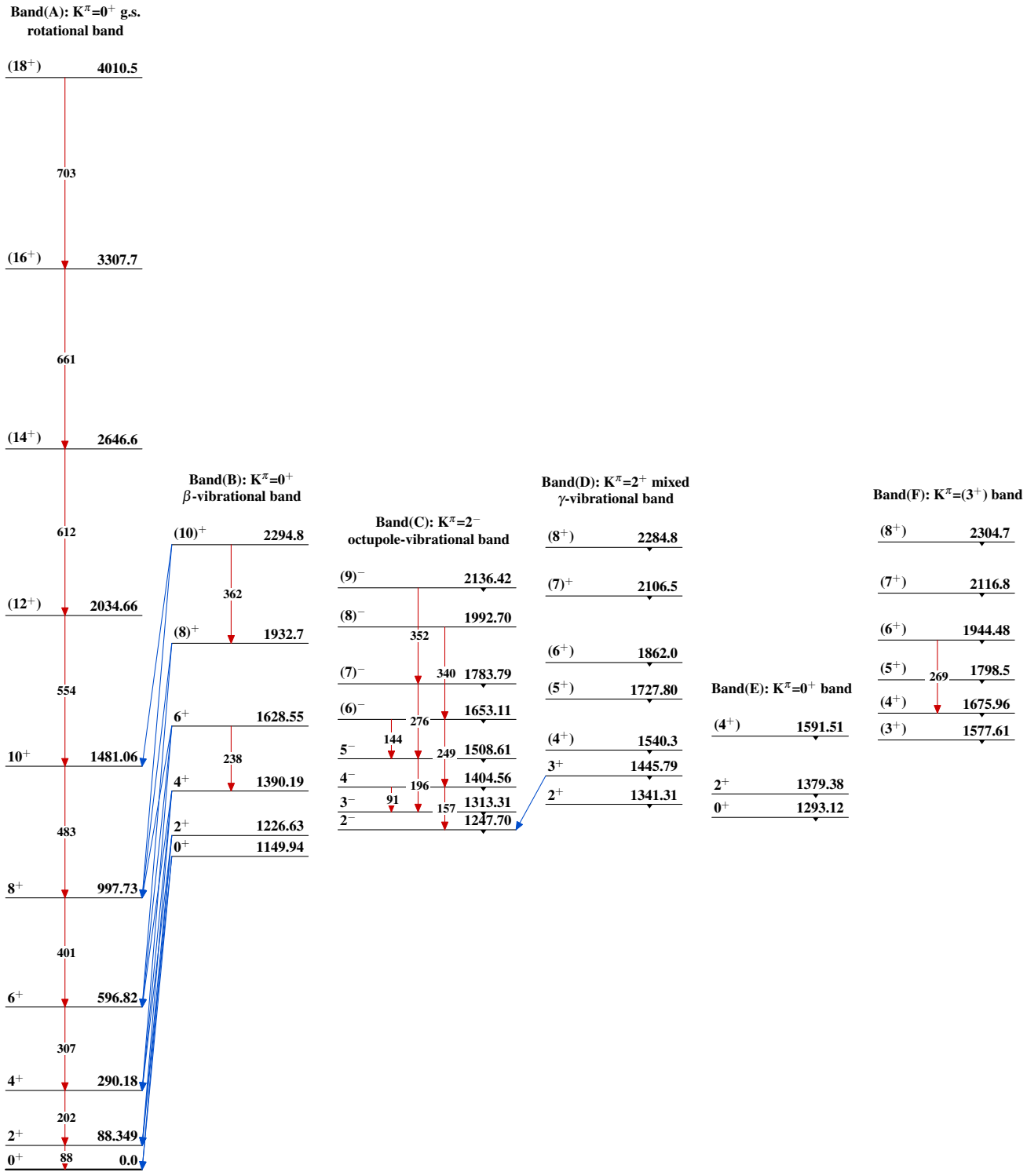
Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



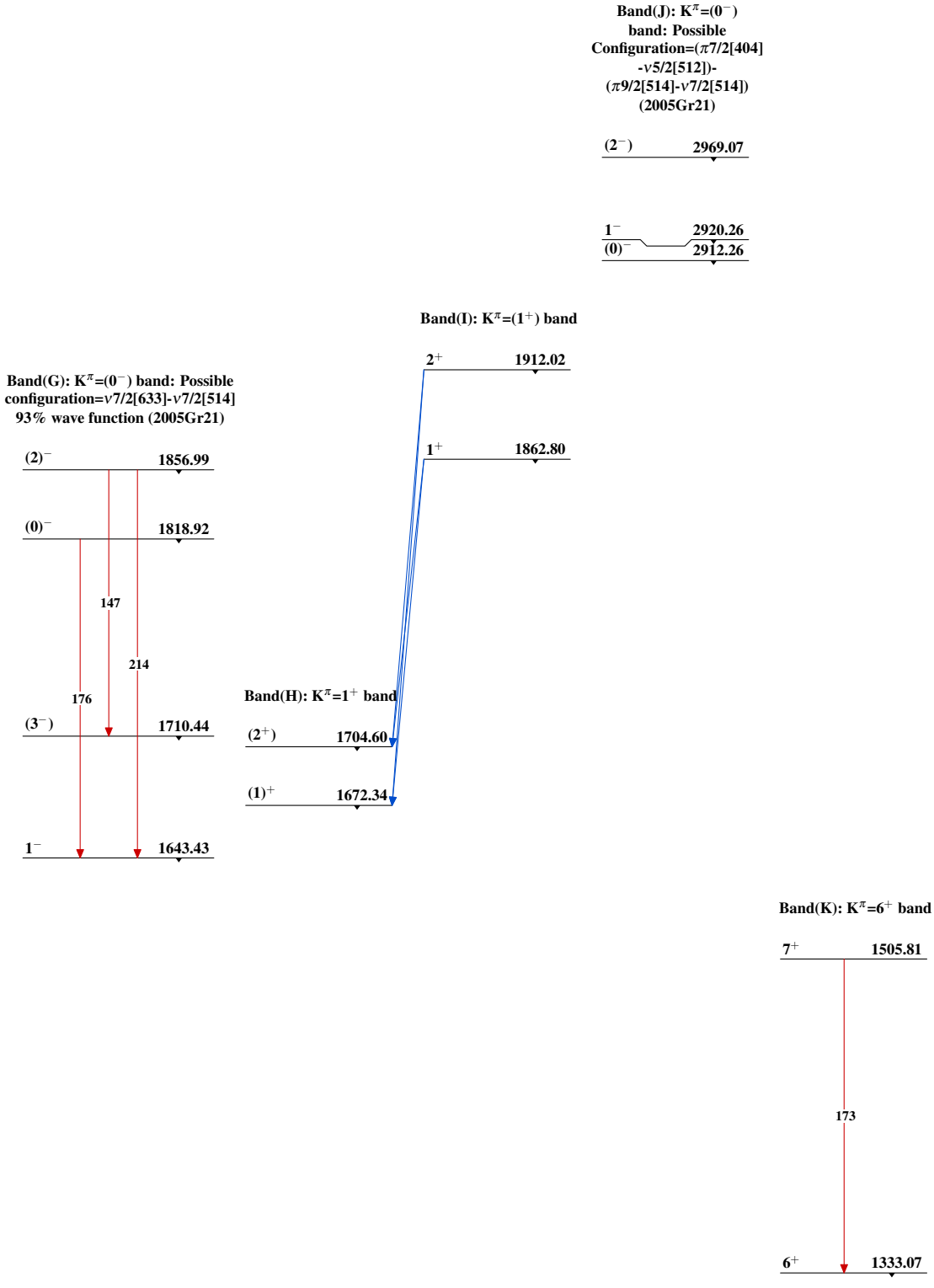
$^{176}_{72}Hf_{104}$

Adopted Levels, Gammas

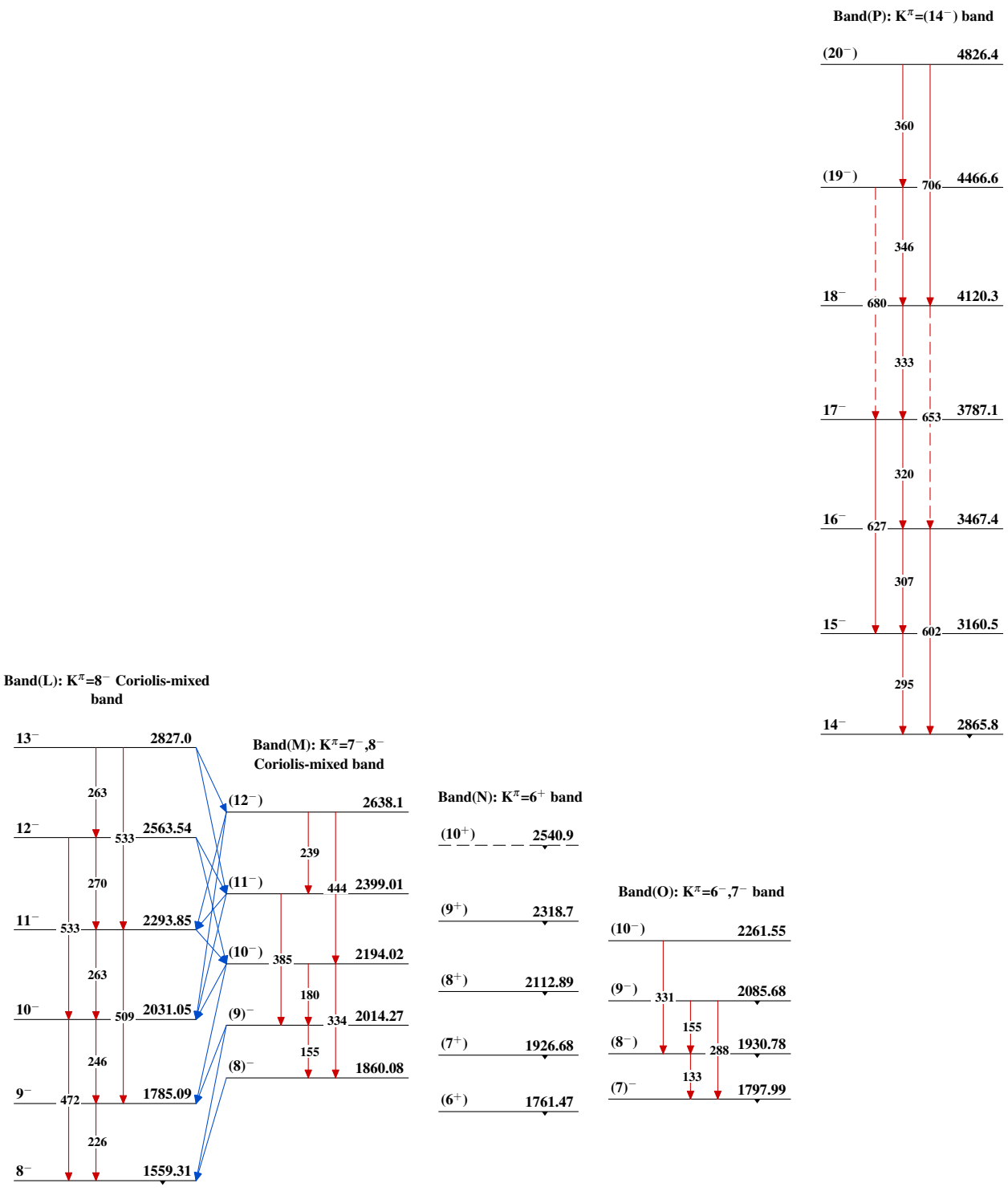


$^{176}_{72}Hf_{104}$

Adopted Levels, Gammas (continued)

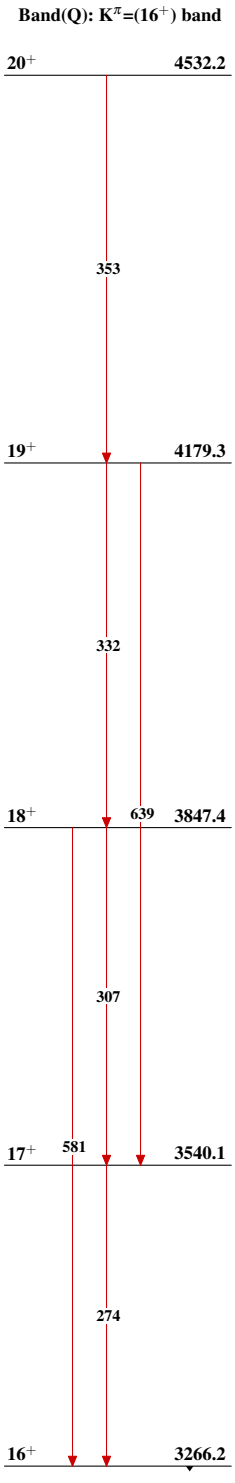


Adopted Levels, Gammas (continued)



$^{176}_{72}Hf_{104}$

Adopted Levels, Gammas (continued)



$^{176}_{72}Hf_{104}$

Adopted Levels, Gammas

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Achterberg, O. A. Capurro, G. V. Marti	NDS 110,1473 (2009)	31-May-2008

Q(β^-)=−1.84×10^3 *syst*; S(n)=7625.95 *18*; S(p)=7340.9 *8*; Q(α)=2082.9 *15* 2012Wa38
Note: Current evaluation has used the following Q record −1937 15 *7625*.9618 *7344*.2 *7* 2080.4 *15* 2003Au03.

^{178}Hf Levels

Cross Reference (XREF) Flags

A	^{178}Lu β^- decay (28.4 min)	G	^{176}Yb(α,2nγ)	M	^{177}Hf(d,p)
B	^{178}Lu β^- decay (23.1 min)	H	^{176}Yb(^{9}Be,α3nγ)	N	^{178}Hf(n,n′γ)
C	^{178}Hf IT decay (4.0 s)	I	^{177}Hf(n,γ) E=thermal	O	^{178}Hf(pol p,p′) E=65 MeV
D	^{178}Hf IT decay (31 y)	J	^{177}Hf(n,γ) E=1-163 eV res	P	^{180}Hf(p,t)
E	^{178}Ta ε decay (2.36 h)	K	^{177}Hf(n,γ) E=2, 24 keV res:av	Q	^{181}Ta(p,α)
F	^{178}Ta ε decay (9.31 min)	L	Coulomb excitation	R	^{178}Hf(γ,γ′)

E(level)†	Jπ‡	T$_{1/2}$#	XREF	Comments
0.0@	0$^+$	stable	ABCDEFGHIJKLMNOPQR	Isotope shift: Δ<r^2>=0.106 *7* fm^2 relative to ^{180}Hf (1984Ta10, muonic x-rays). RMS charge radius: <r^2>=5.338 *11* (1984Ta10, from muonic x-ray data). Q$_0$=6.86 *17* (1967Ab06). β=0.266 (1967Ab06).
93.1803@ *10*	2$^+$	1.494 ns *23*	ABCDEFGHIJKL NOPQ	μ=+0.48 *3* Q=−2.02 *2* Jπ: 93γ E2 to 0$^+$; rotational band. Isomer shift: Δ<r^2>=0.0031 *18* fm^2 relative to the ^{178}Hf g.s. (1984Ta10, muonic x-rays). T$_{1/2}$: weighted average of values from ^{178}Ta ε decay (9.31 min): 1.49 ns *5* (1963Bo13), 1.50 ns *3* (1962Ka14); ^{178}Ta ε decay (2.36 h): 1.47 ns *6* (1963Fo02); Coulomb excitation: 1.52 ns *12* (1961Ha21; 1.50 ns *10* (1967Ab06). Other: 1.25 ns *8* (1961Ga05, ^{178}Ta ε decay (9.31 min); 1.87 ns *10* (1959Bi10, Coulomb excitation). μ: Integral perturbed angular distribution of γ rays following Coulomb excitation (1968Be04,1989Ra17). Other values: +0.60 *4* (1962Ka14), +0.73 *7* (1962Bo13). Q: Hyperfine structure of muonic x rays (1984Ta10,1989Ra17). Q(^{178}Hf)/Q(^{180}Hf)=1.07 *3* (1968GeZY, using quadrupole hyperfine splitting in Mossbauer experiments), other value: 1.05 *3* (1973BoVM, Mossbauer quadrupole interaction measurements). g=+0.29 *2* (1962Ka14).
306.6182@ *22*	4$^+$		ABCDEFGHIJKL NOPQ	Jπ: 213γ E2 to 2$^+$; rotational band.
632.178@ *4*	6$^+$	11.2 ps *6*	BCDE GHIJ L NOPQ	Jπ: 326γ E2 to 4$^+$; populated in Coulomb excitation; rotational band.
1058.550@ *6*	8$^+$	2.77 ps *6*	BCDE GHIJ L N	Jπ: 426γ E2 to 6$^+$; populated in Coulomb excitation; rotational band.
1147.416& *6*	8$^-$	4.0 s *2*	BCDE G I L N Q	%IT=100 Jπ: 89γ E1 to 8$^+$; $\gamma\gamma(\theta)$ in ^{178}Hf IT decay (4.0 s) (1960De26). g$_K$=0.37 *1* (1997Mu05).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{178}Hf Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	XREF	Comments
				$T_{1/2}$: From ^{178}Hf IT decay (4.0 s). μ=1.4 to 5.3, brute force nuclear orientation (1989Ra17).
1174.630[a] *4*	2^+	0.62 ps *2*	A F IJKLMN P R	Jπ: $\gamma\gamma(\theta)$ (1972Li03), Coulomb excitation (1982Ha25,1977Ro08).
1199.385[b] *11*	0^+		A F I N Q	Jπ: 1199γ E0 to 0^+.
1260.248[c] *4*	2^-		A IJK N	
1268.537[a] *4*	3^+		IJKLMN P	
1276.692[b] *4*	2^+	0.49 ps *+15–10*	A F IJKL N Q	Jπ: 1276γ E2 to 0^+. 1183γ E0+E2+M1 to 2^+; $\gamma\gamma(\theta)$ (1972Li03).
1310.068[d] *4*	1^-		A F IJ N R	Jπ: 1216γ E1 to 2^+, 1310γ E1 to 0^+.
1322.463[c] *4*	3^-		A IJKL N P	Jπ: 1229γ E1 to 2^+, 1016γ E1 to 4^+.
1362.551[d] *4*	2^-		A F IJ N	Jπ: $\gamma\gamma(\theta)$ (1972Li03); 52γ M1+E2 to 1^-.
1364.078[&] *9*	9^-		B DE G L Q	E(level): from ^{178}Hf IT decay (31 y).
1384.461[a] *4*	4^+		IJKLMN P	Jπ: 1078γ E2 to 4^+; 1291γ E2 to 2^+; reduced Iγ in ^{177}Hf(n,γ) E=2, 24 keV res:av.
1409.439[c] *4*	4^-		IJK N	Jπ: 1102γ E1 to 4^+, 141γ E1 to 3^+; reduced Iγ in ^{177}Hf(n,γ) E=2, 24 keV res:av.
1433.623[d] *4*	$(3)^-$		IJK N	Additional information 1.
1434.230[e] *20*	0^+		A F I N	Jπ: 1434γ E0 to 0^+.
1443.934[f] *10*	0^+		A F I N	Jπ: 1443γ E0 to 0^+.
1450.363[b] *5*	4^+	1.0 ps *9*	IJK N PQ	Jπ: 1144γ E0+M1+E2 to 4^+.
1479.025[r] *7*	8^-		B E G N Q	Jπ: 332γ M1 to 8^-; log *ft*=4.7 from ^{178}Ta (J^π=$(7)^-$) ε decay.
1496.449[e] *17*	2^+	0.9 ps *2*	A F IJKL N	Jπ: $\gamma\gamma(\theta)$ (1968Ni03); 1496γ E2 to 0^+.
1512.592[c] *4*	$(5)^-$		IJK N	
1513.607[f] *9*	2^+		IJ N P	Jπ: 1514γ E2 to 0^+.
1513.68 *7*			A F	Level identified from ^{178}Lu β^- (28 min) decay and ^{178}Ta ε (9.3 min) decay. It is not reported in any other dataset. This state is almost certainly a multiplet (see discussion in the ^{178}Lu β^- (28 min) decay dataset). The placement of the 1420 and 1513 keV transitions for this state is uncertain, and furthermore they may themselves be unresolved doublets.
1513.831[g] *4*	4^+	62 ps	G IJ LMN	Jπ: 1207γ M1+E2 to 4^+.
1533.153[a] *5*	5^+		IJKL N	Jπ: 1226γ M1+E2 to 4^+.
1538.790[d] *4*	4^-		I K	Jπ: 216γ M1+E2 to 3^-, 1232γ E1 to 4^+.
1553.997[h] *4*	6^+	77.5 ns *7*	G IJ L	μ=+5.84 *5* Jπ: 922γ E2 to 6^+, 407γ (M2) to 8^-. $T_{1/2}$: from ^{176}Yb(α,2nγ) studies: weighted average of 78 ns *1* (1977Kh01) and 77 ns *1* (1980Wa23), g=0.959 *8*, from 1980Wa23 in ^{176}Yb(α,2nγ) studies. μ: Differential perturbed angular distribution of γ rays following nuclear reactions. Uncorrected for diamagnetism and Knight shift (1980Wa23,1989Ra17). g_K=1.03 *4* (1997Mu05).
1561.540[i] *5*	2^+		A F IJK N P	Jπ: 1468γ E0+M1+E2 to 2^+, 1561γ E2 to 0^+.
1566.668[j] *4*	2^-		A F I K N	Jπ: 257γ M1+E2 to 1^-, 204γ M1 to 2^-.
1570.3[@] *8*	10^+	1.03 ps *3*	GH L	
1601.484[&] *10*	10^-		B D G L Q	Jπ: 237γ M1+E2 to 9^-. E(level): from ^{178}Hf IT decay (31 y).
1635.603[e] *5*	4^+		IJK N	Jπ: 1542γ E2 to 2^+, 185γ M1+E2 to 4^+.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{178}Hf Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	XREF	Comments
1636.727[k] 4	5⁻	0.4 ns 1	G I	Jπ: 1330γ E1 to 4⁺, 82.7γ E1 to 6⁺. $T_{1/2}$: from ^{176}Yb(α,2nγ) (1982Ko08).
1639.758[j] 4	3⁻		I Q	Jπ: 277γ M1+E2 to 2⁻, 101γ (M1) to 4⁻.
1640.452[g] 4	5⁺		IJKLMN P	Jπ: 126γ M1+E2 to 4⁺, 1008γ E2 to 6⁺.
1648.838[c] 5	(6)⁻		I	Jπ: 1017γ E1 to 6⁺.
1651.459[d] 4	(5)⁻		I K	Jπ: 242γ M1+E2 to 4⁻.
1654.3[f] 6	(4⁺)		N	Level seen only in ^{178}Hf(n,n′γ).
1691.083[a] 11	6⁺		IJ L N	Jπ: 1059γ M1+E2 to 6⁺.
1697.5[r] 10	(9⁻)		G	From ^{176}Yb(α,2nγ).
1731.064[b] 4	(6)⁺		I	Jπ: 1099γ M1 to 6⁺.
1741.7[h] 8	(7⁺)		G L	From ^{176}Yb(α,2nγ).
1747.102[j] 4	4⁻		I K	Jπ: 337γ M1 to 4⁻, 425γ M1+E2 to 3⁻.
1758.143[l] 4	3⁺		IJK	Jπ: 498γ E1 to 2⁻, 490γ M1 to 3⁺.
1772.15[m] 7	0⁺		A F I N P	Jπ: 1772γ E0 to 0⁺.
1781.264[k] 4	(6)⁻		G I	Jπ: 144γ E2 to 5⁻.
1788.598[g] 4	6⁺		IJ LMN	Jπ: 1156γ E2 to 6⁺, 1482γ E2 to 4⁺.
1803.389[n] 4	3⁻		I K	Jπ: 289γ E1 to 4⁺, 543γ M1+E2 to 2⁻.
1808.275[o] 4	(2)⁺		IJK	Additional information 2. Jπ: 1715γ M1(+E2) to 2⁺.
1818.286[m] 7	2⁺	0.50 ps 23	A IJK N P	Jπ: 1725γ E0+M1+E2 to 2⁺.
1857.151[p] 5	(2)⁻		I	Jπ: 597γ M1+E2 to 2⁻, 535γ M1+E2 to 3⁻.
1859.118[&] 12	(11)⁻		D G L N	Jπ: 258γ M1+E2 to 10⁻. From ^{178}Hf IT decay (31 y).
1862.207[q] 4	3⁺		IJK M	See comment regarding this level in the footnote for the $K^{\pi}=2^{+}$ band based on the level at 1808 keV, and in the ^{177}Hf(n,γ thermal) dataset. Jπ: 688γ M1 to 2⁺, 348γ M1 to 4⁺.
1863.712[j] 4	(5)⁻		I	Jπ: 454γ M1 to 4⁻, 351γ M1+E2 to 5⁻.
1869.840[l] 4	4⁺		I K PQ	Jπ: 547γ E1 to 3⁻, 1776γ E2 to 2⁺.
1890.0[a] 9	7⁺		L	
1891.304 8	2⁺		I K	Jπ: 716γ M1+E2 to 2⁺, 622γ M1+E2 to 3⁺.
1913.617[n] 4	4⁻		I K	Jπ: 273γ E1 to 5⁺, 645γ E1 to 3⁺.
1917.436[p] 4	3⁻		I K	Jπ: 404γ E1 to 4⁺, 595γ M1+E2 to 3⁻.
1939.1[r] 7	(10⁻)		G L Q	g_K=0.62 7 from ^{176}Yb(^{9}Be,α3nγ).
1942.007 5	1⁺,2⁺,3⁺		IJK	Jπ: 1848γ M1 to 2⁺.
1947.951[k] 4	(7)⁻		G I K P	Jπ: 311γ E2 to 5⁻.
1952.0[h] 8	(8⁺)		G L	From ^{176}Yb(α,2nγ).
1953.132[q] 5	4⁺		IJK M	Jπ: 1646γ E0+M1+E2 to 4⁺.
1953.682[g] 5	7⁺		I L	Jπ: 895γ M1 to 8⁺.
1956.423[m] 5	4⁺		IJK	Jπ: 1650γ E0+M1+E2 to 4⁺.
1986.450 4	1⁺,2⁺,3⁺		IJ	Jπ: 536γ M1 to 4⁺ suggests $J^{\pi}=3^{+},4^{+},5^{+}$; 1893γ M1+E2(+E0) to 2⁺ suggests $J^{\pi}=1^{+},2^{+},3^{+}$; reduced Iγ in ^{177}Hf(n,γ) E=1-163 eV res suggests $J^{\pi}=2^{+}$.
1997.466 8	3⁺		IJ	Jπ: 179γ M1 to 2⁺, 1690γ M1 to 4⁺.
2007.566 4	4⁺,3⁺		I	Jπ: 138γ M1+E2 to 4⁺, 249γ M1+E2 to 3⁺.
2013.551 5	3⁺,4⁺,5⁺		I	Jπ: 378γ M1 to 4⁺.
2021.181 4	1⁺,2⁺,3⁺		A I	Jπ: 1928γ M1 to 2⁺.
2024	(0⁺)		PQ	Jπ: L=(0) in ^{180}Hf(p,t).
2025.8 7	0⁺		I	Jπ: L=0 in (p,t).
2027.565[p] 5	4⁻		I	Jπ: 705γ M1+E2 to 3⁻, 515γ M1+E2 to (5)⁻.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{178}Hf Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	XREF	Comments
2050.489 *10*	3^+		IJ	Jπ: 1957γ M1 to 2^+, 1744γ M1 to 4^+.
2056	(2^+)		P	Jπ: L=(2) in ^{180}Hf(p,t).
2068.035[q] *5*	5^+		I M	Jπ: 279γ M1+E2 to 6^+, 115γ M1 to 4^+.
2082.2[a] *6*	8^+		L	
2099.874 *5*	$3^+,4^+$		I	Jπ: 777γ E1 to 3^-, 649γ M1+E2 to 4^+.
2118.6 *6*			I	
2136.522[&] *16*	$(12)^-$		D G L	Jπ: 535γ E2 to 10^-. From ^{178}Hf IT decay (31 y).
2137.4[k] *10*	(8^-)		G	
2149.6[@] *10*	12^+	0.56 ps *2*	GH L	
2154.1[g] *7*	8^+		L	
2155.7 *7*			I	
2183.4[h] *10*	(9^+)		G L	
2202.51[r] *6*	(11^-)		D G L	
2203 *10*			PQ	
2227 *10*			M P	
2247.8 *10*	1		R	
2255 *1*			Q	
2272.6 *6*			I	
2310 *1*			Q	
2315.8[a] *9*	9^+		L	
2316 *10*	(0^+)		P	Jπ: L=(0) in ^{180}Hf(p,t).
2334.4 *10*	1		R	
2349.7[g] *10*	9^+		L	
2354 *1*			Q	
2365.5 *7*	(2^+)		I P	Jπ: L=(2) in ^{180}Hf(p,t).
2393 *10*			P	
2432.5 *10*	(1,2)		R	
2433.334[&] *17*	$(13)^-$		D G L	Jπ: 574γ E2 to $(11)^-$, 297γ E2 to (8^-).
2433.7[h] *11*	(10^+)		G L	
2435 *10*			P	
2438.8 *10*	1		R	
2440.2[s] *11*	(10^+)		L	
2446.09[t] *8*	16^+	31 y *1*	D GH L	%IT=100 Jπ: 309γ M4 to $(12)^-$, 12.7γ E3 to $(13)^-$. $T_{1/2}$: from ^{178}Hf IT decay (31 y). No β^- (<0.3%); no ε (<1%); no α (<5×10^{-6}%) (1980Va04). μ=7.26 to 7.46 brute force nuclear orientation (1989Ra17).
2463 *1*			Q	
2474.8 *7*			I P	
2485.2[r] *7*	(12^-)		G L	
2508 *1*			Q	
2537.8[a] *9*	10^+		L Q	
2552.8 *7*			I	
2557.9 *7*			I	
2572.4[u] *3*	14^-	68 μs *2*	GH P	Jπ: 140γ M1 to $(13)^-$. $T_{1/2}$: From ^{176}Yb(α,2nγ).
2604.2[g] *9*	10^+		L	
2612.7 *10*	1		R	
2631.4 *7*			I	
2668 *10*	(2^+)		P	Jπ: L=(2) in ^{180}Hf(p,t).
2700.7[h] *12*	(11^+)		G L	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{178}Hf Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$#	XREF	Comments
2707 *10*			P	
2737.6 *7*			I	
2749.1& *10*	(14−)		G L	
2776.6@ *12*	14+	0.33 ps *7*	GH L	Jπ: from Coulomb excitation.
2785.3r *10*	(13−)		G	
2797.8a *13*	11+		L	
2803.5t *3*	17+		H L	
2827.5 *10*	1		R	
2827.7g *15*	11+		L	
2839.6 *10*	1		R	
2865.9 *7*			I	
2894.1 *10*	1		R	
2898.8 *7*			I	
2909.1 *9*	(15−)		H	
2915.7 *10*	1		R	
2942.0s *10*	(12+)		L	
2957.7 *7*			I	
2987.2h *13*	(12+)		L	
3018.8 *10*	1		R	
3052.7a *11*	(12+)		L	
3084.3& *10*	15−		L	
3100.5 *6*			I	
3100.6r *7*	(14−)		L	
3112.8 *7*			I	
3135.2g *14*	12+		L	
3144.4 *10*	1		R	
3180.9t *7*	18+		H L	
3263.7 *9*	16−		H	
3283.8h *13*	13+		L	
3293.4 *10*	1		R	
3335.8a *17*	13+		L	
3379.7g *18*	13+		L	
3410.0 *10*	1		R	
3435.0@ *14*	16+		H L	Jπ: from Coulomb excitation.
3452.7 *10*	1		R	
3521.8s *11*	(14+)		L	
3546.0 *10*	1		R	
3572.5 *10*	1		R	
3577.7 *10*	1		R	
3578.4t *8*	19+		H L	
3589.3 *10*	1		R	
3595.5h *14*	14+		L	
3609.9 *10*	1		R	
3624.7a *15*	14+		L	
3625.6 *10*	(1,2)		R	
3710.8 *10*	1		R	
3741.2g *17*	14+		L	
3773.2 *10*	1		R	
3823.9 *10*	1		R	
3890.0 *10*	1,2		R	
3902?h	15+		L	
3909.5 *7*			I	
3925.2 *10*	1		R	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{178}Hf Levels (continued)

E(level)[†]	Jπ[‡]	XREF	Comments
3927.8[a] *20*	15^+	L	
3932.2 *10*	1	R	
3995.5[t] *9*	20^+	H L	
3997?[g]	15^+	H L	
4119.4[@] *17*	18^+	H L	Jπ: from Coulomb excitation.
4178.8[s] *13*	(16^+)	L	
4210.5 *7*		I	
4325.2 *7*		I	
4378.0 *7*		I	
4417.2[g] *20*	16^+	L	Jπ: from Coulomb excitation.
4431.7[t] *10*	21^+	H	
4593.1 *7*		I	
4781.9 *7*		I	
4837.4[@] *20*	20^+	H L	Jπ: from Coulomb excitation.
4873.7 *7*		I	
4886.1[t] *12*	(22^+)	H	Jπ: from ^{176}Yb(^{9}Be,α3nγ).
4914.7 *7*		I	
5010.1 *7*		I	
5283.0 *7*		I	
5388.6 *6*		I	

[†] From a least-squares fit to adopted γ-ray energies.
[‡] Assignments are based on rotational band structure, on γ-ray multipolarities and decay patterns, and on (n,γ) population from average neutron capture resonance at 2 and 24 keV. Where needed, specific arguments are given with individual levels.
[#] From Coulomb excitation unless otherwise specified.
[@] Band(A): $K^\pi=0^+$. g.s. rotational band.
[&] Band(B): $K^\pi=8^-$. 4.0 s isomeric band based on the 1147-keV state.
[a] Band(C): $K^\pi=2^+$. γ vibrational band based on the 1174-keV state.
[b] Band(D): $K^\pi=0^+$. Band based on the 1199-keV level.
[c] Band(E): $K^\pi=2^-$. Band based on the 1260-keV level.
[d] Band(F): $K^\pi=1^-$. Band based on the 1310-keV level.
[e] Band(G): $K^\pi=0^+$. Band based on the 1434-keV level.
[f] Band(H): $K^\pi=0^+$. Band based on the 1444-keV level.
[g] Band(I): $K^\pi=4^+$. Band based on the 1514-keV level.
[h] Band(J): $K^\pi=6^+$. 77 ns isomeric band based on the 1554-keV level.
[i] Band(K): $K^\pi=(2^+)$. Band based on the 1561-keV level.
[j] Band(L): $K^\pi=2^-$. Band based on the 1566-keV level.
[k] Band(M): $K^\pi=5^-$. Band based on the 1636-keV level.
[l] Band(N): $K^\pi=3^+$. Band based on the 1758-keV level.
[m] Band(O): $K^\pi=0^+$. Band based on the 1772-keV level.
[n] Band(P): $K^\pi=3^-$. Band based on the 1803-keV level.
[o] Band(Q): $K^\pi=2^+$. Band based on the 1808-keV level. This state has been adopted as the bandhead of a $K^\pi=2^+$ band in 1986Ha22, with excited levels at 1862 (3^+), 1953 (4^+) and 2068 (5^+) keV. In 1993Sh15 it is claimed, however, that this level is not part of that band, and instead propose a new $K^\pi=3^+$ band, based on 1862 keV.
[p] Band(R): $K^\pi=2^-$. Band based on the 1857-keV level.
[q] Band(S): $K^\pi=3^+$. Band based on the 1862-keV level. This band is proposed on the basis of the data and discussion in 1993Sh15.
[r] Band(T): 2nd $K^\pi=8^-$. Band based on the 1479-keV level.
[s] Band(U): Band "A". From (2007Ha05) based on the 2440-keV level.
[t] Band(V): $K^\pi=16^+$. 31 y isomeric band based on the 2446-keV level.
[u] Band(W): $K^\pi=14^-$. 68 ms isomeric band based on the 2573-keV level.

Adopted Levels, Gammas (continued)

γ(^{178}Hf)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[g]	α[i]	Comments
93.1803	2+	93.1803[a] *10*	100	0.0	0+	E2		4.66	B(E2)(W.u.)=160 *3* B(E2)=4.91 *10*.
306.6182	4+	213.4378[a] *21*	100	93.1803	2+	E2		0.232	
632.178	6+	325.560[b] *3*	100	306.6182	4+	E2		0.0622	B(E2)(W.u.)=219 *12*
1058.550	8+	426.369[b] *7*	100	632.178	6+	E2		0.0292	B(E2)(W.u.)=237 *6*
1147.416	8−	88.8667[b] *10*	100	1058.550	8+	E1		0.487	B(E1)(W.u.)=5.1×10^{-14} *3*
1174.630	2+	867.990 *16*	1.47 *9*	306.6182	4+	(E2)		0.00547	B(E2)(W.u.)=0.259 *23*
		1081.448 *16*	75.0 *7*	93.1803	2+	E2		0.00349	B(E2)(W.u.)=4.4 *3* I_γ: Iγ(1082γ)/Iγ(1175γ)=1.08 *5* (1971Va06). δ(Q/D)=−32, from Coulomb excitation (1971Va06).
		1174.668 *23*	100 *9*	0.0	0+	(E2)		0.00297	B(E2)(W.u.)=3.9 *5*
1199.385	0+	1106.201 *18*	100 *3*	93.1803	2+	E2		0.00334	
		1199.28 *5*		0.0	0+	E0			
1260.248	2−	85.621 *11*	7.7 *5*	1174.630	2+	E1		0.536	
		1167.060 *17*	100.0 *10*	93.1803	2+	E1		1.25×10^{-3}	
1268.537	3+	961.915 *14*	19.2 *8*	306.6182	4+	E2		0.00442	
		1175.31 *5*	100 *11*	93.1803	2+	E2		0.00297	
1276.692	2+	970.105 *14*	29.2[&] *15*	306.6182	4+	(E2)		0.00435	B(E2)(W.u.)=4.4 *+10−14*
		1183.535 *17*	100[&] *1*	93.1803	2+	E0+M1+E2		0.0042 *13*	B(M1)(W.u.)=0.0008 *3*
		1276.682 *19*	18.8[&] *7*	0.0	0+	E2		0.00254	B(E2)(W.u.)=0.72 *+15−23*
1310.068	1−	1216.856 *18*	17.3[&] *16*	93.1803	2+	E1		1.17×10^{-3}	
		1310.059 *19*	100[&] *2*	0.0	0+	E1		1.08×10^{-3}	
1322.463	3−	147.836 *2*	5.85 *18*	1174.630	2+				
		1015.79 *5*	3.8 *6*	306.6182	4+	E1		1.59×10^{-3}	
		1229.30 *9*	100 *1*	93.1803	2+	E1		1.16×10^{-3}	
1362.551	2−	52.482 *1*	1.08 *18*	1310.068	1−	M1+E2	0.24 *+8−6*	7.2 *20*	
		102.307 *2*	0.37 *4*	1260.248	2−				
		187.919 *3*	0.41 *4*	1174.630	2+				
		1269.351 *19*	100 *3*	93.1803	2+	E1		1.11×10^{-3}	
1364.078	9−	216.668[‡] *7*	100	1147.416	8−	E2+M1	1.63[h] *+22−18*	0.284 *12*	
1384.461	4+	209.828 *3*	0.61 *3*	1174.630	2+				
		1077.819 *16*	100.0 *10*	306.6182	4+	E2		0.00352	
		1291.274 *19*	45.5 *10*	93.1803	2+	E2		0.00249	
1409.439	4−	140.906 *3*	9.2 *4*	1268.537	3+	E1		0.1463	
		149.193 *3*	5.97 *17*	1260.248	2−	(E2)		0.791	
		1102.832 *16*	100.0 *10*	306.6182	4+	E1		1.37×10^{-3}	

$^{178}_{72}Hf_{106}$-7

Adopted Levels, Gammas (continued)

γ(^{178}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[g]	α[i]	Comments
1433.623	(3)$^-$	111.160 *2*	0.40 *5*	1322.463	3$^-$	(M1)		2.96	
		123.565 *4*	0.40 *3*	1310.068	1$^-$				
		156.920 *4*	0.22 *3*	1276.692	2$^+$				
		173.374 *3*	2.97 *9*	1260.248	2$^-$	M1+E2	1.8 *2*	0.555 *19*	
		1126.995 *16*	7.37 *22*	306.6182	4$^+$				
		1340.460 *21*	100 *3*	93.1803	2$^+$	E1		1.05×10^{-3}	
1434.230	0$^+$	1340.84 *9*	100 *3*	93.1803	2$^+$	E2		0.00232	
		1434.25 *18*		0.0	0$^+$	E0			$I_{(\gamma+ce)}$: 0.00116 *5*, from ^{178}Ta ε decay (9.31 min).
1443.934	0$^+$	269.4 *1*	1.6 *4*	1174.630	2$^+$	E2		0.1100	
		1350.68[&] *3*	100 *3*	93.1803	2$^+$	E2		0.00229	
		1443.80 *5*		0.0	0$^+$	E0			
1450.363	4$^+$	173.673 *2*	0.95 *8*	1276.692	2$^+$				
		818.190 *13*	7.9 *4*	632.178	6$^+$	E2		0.00620	B(E2)(W.u.)=1.8 *16*
		1143.762 *17*	100.0 *11*	306.6182	4$^+$	E0+M1+E2		0.0046 *15*	
		1357.12 *6*	6.39 *19*	93.1803	2$^+$	E2		0.00227	B(E2)(W.u.)=0.11 *11*
1479.025	8$^-$	331.608 *4*	100	1147.416	8$^-$	M1		0.1418	E_γ,Mult.: from ^{178}Ta ε decay (2.36 h).
1496.449	2$^+$	62.215 *12*	1.8 *4*	1434.230	0$^+$	(E2)		24.4	B(E2) for this transition significantly exceeds the RUL, with B(E2)(W.u.)=1.0×10^5 *4*. This suggests a problem with either the $T_{1/2}$ of the level or the Iγ of the 62.2γ.
		1189.49 *10*	5.4 *5*	306.6182	4$^+$	E2		0.00290	B(E2)(W.u.)=0.11 *3* E_γ: from ^{178}Ta ε decay (9.31 min).
		1403.260 *21*	100[&] *2*	93.1803	2$^+$	E0+M1+E2		0.0029 *8*	
		1496.21[&] *15*	57 *4*	0.0	0$^+$	E2		0.00194	B(E2)(W.u.)=0.39 *10*
1512.592	(5)$^-$	103.152 *2*	0.59 *5*	1409.439	4$^-$				
		190.13[j] *3*	9.2[j] *4*	1322.463	3$^-$				
		1205.957 *18*	100 *4*	306.6182	4$^+$	E1		1.19×10^{-3}	
1513.607	2$^+$	69.670 *5*	13 *6*	1443.934	0$^+$				
		1513.72 *7*	100 *6*	0.0	0$^+$	E2		0.00190	
1513.68		151.2[d] *3*	46[d] *18*	1362.551	2$^-$	(E0+M1+E2)		0.99 *24*	
		203.6[d] *3*	100[d] *10*	1310.068	1$^-$				
		1420.53[ek] *10*	54[e] *4*	93.1803	2$^+$				
		1513.62[fk] *10*	58[f] *3*	0.0	0$^+$				
1513.831	4$^+$	129.365[j] *3*	1.71[j] *5*	1384.461	4$^+$				
		245.298 *3*	19.5 *12*	1268.537	3$^+$	E2		0.1476	B(E2)(W.u.)=14.6
		339.198 *5*	47.8 *19*	1174.630	2$^+$	E2		0.0552	B(E2)(W.u.)=7.1
		881.664 *18*	4.7 *5*	632.178	6$^+$				

$^{178}_{72}Hf_{106}$-8

Adopted Levels, Gammas (continued)

γ(^{178}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[g]	α[i]	Comments
1513.831	4+	1207.204 *18*	100 *4*	306.6182	4+	M1+E2	2.1 *+13−5*	0.0033 *3*	B(M1)(W.u.)=1.6×10^{-5} *+17−16*; B(E2)(W.u.)=0.021 *5*
		1420.653 *21*	51.8 *16*	93.1803	2+	E2		0.00210	B(E2)(W.u.)=0.0060
1533.153	5+	264.613 *4*	2.04 *15*	1268.537	3+				
		900.986 *13*	19.2 *12*	632.178	6+	E2		0.00506	
		1226.53 *3*	100 *2*	306.6182	4+	M1+E2	2.2 *+10−5*	0.00313 *21*	
1538.790	4−	105.164 *6*	10.22 *11*	1433.623	(3)−	(M1)		3.47	
		129.365[j] *3*	4.65[j] *14*	1409.439	4−			1.92	
		154.346 *9*	0.35 *8*	1384.461	4+				
		176.239 *2*	6.5 *3*	1362.551	2−	(E2)		0.441	
		216.329 *3*	15.2 *8*	1322.463	3−	M1+E2	0.64 *24*	0.39 *4*	
		1232.156 *18*	100.0 *19*	306.6182	4+	E1		1.16×10^{-3}	
1553.997	6+	40[@] *1*		1513.831	4+	[E2]		2.1×10^2 *3*	
		169.537 *2*	7.2 *3*	1384.461	4+	E2		0.505	B(E2)(W.u.)=0.0376 *20*
		406.579 *6*	3.97 *17*	1147.416	8−	(M2)		0.282	B(M2)(W.u.)=0.0269 *15*
		921.827 *13*	100 *5*	632.178	6+	E2		0.00483	B(E2)(W.u.)=0.000110 *7*
		1247.391 *18*	51.5 *13*	306.6182	4+	(E2)		0.00265	B(E2)(W.u.)=1.25×10^{-5} *6*
1561.540	2+	292.993 *4*	1.13 *7*	1268.537	3+				
		386.938 *21*	1.3 *4*	1174.630	2+				
		1254.921 *19*	100 *3*	306.6182	4+	E2		0.00262	
		1468.406 *22*	30.1 *15*	93.1803	2+	E0+M1+E2		0.0027 *7*	
		1561.63 *5*	27.2 *16*	0.0	0+	E2		0.00181	
1566.668	2−	133.043 *2*	26 *1*	1433.623	(3)−	M1+E2	1.1 *+3−2*	1.46 *7*	
		204.121 *3*	32 *1*	1362.551	2−	M1		0.532	
		244.2[k] *3*		1322.463	3−				E_γ,I_γ: observed in ^{178}Lu β^- decay (28.4 min) only. Relative intensity: Iγ(244)=0.3 *2* relative to Iγ(204)=3.9 *9* (1973Or03).
		256.602 *18*	100 *4*	1310.068	1−	M1+E2	0.58 *17*	0.244 *18*	
		306.409[j] *4*	28.5[j] *20*	1260.248	2−				
		1473.462 *22*	65 *4*	93.1803	2+	E1		9.95×10^{-4}	
1570.3	10+	512.4	100	1058.550	8+	[E2]		0.0182	B(E2)(W.u.)=257 *8* E_γ: from Coulomb excitation, ^{176}Yb(α,2nγ).
1601.484	10−	237.430[‡] *10*	56 *1*	1364.078	9−	M1+E2	1.57[h] *+31−24*	0.218 *14*	
		454.048[‡] *12*	100 *2*	1147.416	8−	E2		0.0248	
1635.603	4+	185.276 *10*	1.52 *11*	1450.363	4+	M1+E2	1.1 *+8−4*	0.52 *8*	
		367.079 *6*	1.20 *22*	1268.537	3+				
		1542.436 *23*	100 *4*	93.1803	2+	E2		0.00185	
1636.727	5−	82.731 *2*	15.4 *6*	1553.997	6+	E1		0.586	B(E1)(W.u.)=6.8×10^{-5} *18*

$^{178}_{72}Hf_{106}$-9

Adopted Levels, Gammas (continued)

γ(^{178}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[g]	α[i]	Comments
1636.727	5⁻	97.937 *3*	3.31 *8*	1538.790	4⁻	(M1)		4.25	B(M1)(W.u.)=0.00091 *23*
		122.897 *1*	27.5 *8*	1513.831	4⁺	E1		0.209	B(E1)(W.u.)=3.7×10^{-5} *10*
		124.130 *3*	1.30 *4*	1512.592	(5)⁻	M1		2.16	B(M1)(W.u.)=0.00018 *5*
		203.107 *3*	6.16 *24*	1433.623	(3)⁻	(E2)		0.273	B(E2)(W.u.)=2.0 *5*
		227.286 *3*	13.7 *13*	1409.439	4⁻	E2(+M1)		0.29 *11*	
		1004.13 *24*	8.1 *6*	632.178	6⁺	E1		1.62×10^{-3}	B(E1)(W.u.)=2.0×10^{-8} *6*
		1329.98 *7*	100 *4*	306.6182	4⁺	E1		1.06×10^{-3}	B(E1)(W.u.)=1.1×10^{-7} *3*
1639.758	3⁻	73.087 *2*	13.2 *7*	1566.668	2⁻	(M1+E2)		11.3 *14*	
		100.973 *2*	4.31 *17*	1538.790	4⁻	(M1)		3.89	
		206.141 *3*	15.1 *6*	1433.623	(3)⁻	E2		0.260	
		230.321 *3*	17.5 *9*	1409.439	4⁻	E2(+M1)		0.28 *10*	
		277.209 *4*	100 *6*	1362.551	2⁻	M1+E2	0.7 *2*	0.187 *17*	
		371.212 *5*	3.53 *17*	1268.537	3⁺				
		379.505 *5*	39.3 *16*	1260.248	2⁻	M1+E2	0.92 *17*	0.072 *6*	
1640.452	5⁺	107.331[j] *15*	10.68[j] *22*	1533.153	5⁺				
		126.625 *11*	21.1 *4*	1513.831	4⁺	M1+E2	0.65 *8*	1.86 *4*	
		190.13[j] *3*	8.6[j] *4*	1450.363	4⁺				
		231.018 *10*	0.28 *4*	1409.439	4⁻				
		256.001 *16*	20.4 *7*	1384.461	4⁺				
		371.932[j] *23*	1.44[j] *7*	1268.537	3⁺				
		1008.255 *15*	20.6 *4*	632.178	6⁺	E2		0.00402	
		1333.796 *20*	100 *3*	306.6182	4⁺	M1+E2	2.7 *6*	0.00256 *12*	
1648.838	(6)⁻	136.26 *4*	5.88 *20*	1512.592	(5)⁻	E2		1.097	
		239.397 *3*	60 *4*	1409.439	4⁻	E2		0.1595	
		1016.605 *23*	100 *5*	632.178	6⁺	E1		1.59×10^{-3}	
1651.459	(5)⁻	112.669 *3*	8.2 *3*	1538.790	4⁻	M1		2.84	
		138.869 *3*	1.47 *12*	1512.592	(5)⁻				
		217.834 *3*	11.7 *5*	1433.623	(3)⁻	(E2)		0.217	
		242.019 *3*	21.3 *10*	1409.439	4⁻	M1+E2	0.44 *13*	0.304 *16*	
		1344.86 *7*	100 *3*	306.6182	4⁺	(E1)		1.05×10^{-3}	
1654.3	(4⁺)	331 *1*	≤59	1322.463	3⁻				
		378 *1*	47 *18*	1276.692	2⁺				
		1348 *1*	100 *25*	306.6182	4⁺				
		1561[k] *1*	≤35	93.1803	2⁺				
1691.083	6⁺	157.920 *11*	17.0 *3*	1533.153	5⁺				
		306.68 *3*	5.9 *8*	1384.461	4⁺				
		1059.03 *9*	100 *3*	632.178	6⁺	M1+E2	2.6 *+14−6*	0.0041 *3*	
		1384.46 *3*	59.2 *24*	306.6182	4⁺	E2		0.00220	
1697.5	(9⁻)	333.4[@]	100	1364.078	9⁻				

$^{178}_{72}Hf_{106}$-10

Adopted Levels, Gammas (continued)

γ(^{178}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[g]	α[i]	Comments
1731.064	(6)$^+$	280.710[j] *22*	100[j] *7*	1450.363	4$^+$				
		672.46 *4*	3.7 *4*	1058.550	8$^+$				
		1098.79 *7*	27.2 *13*	632.178	6$^+$	M1		0.00659	
1741.7	(7$^+$)	187.7[@]	100	1553.997	6$^+$				
1747.102	4$^-$	107.331[j] *15*	81.3[j] *17*	1639.758	3$^-$				
		180.435 *3*	16.3 *7*	1566.668	2$^-$	(E2)		0.407	
		208.318 *3*	7.8 *3*	1538.790	4$^-$				
		313.474 *4*	100 *5*	1433.623	(3)$^-$	M1+E2	0.61 *17*	0.139 *11*	
		337.657 *5*	51 *4*	1409.439	4$^-$	M1		0.1352	
		424.635 *6*	98 *7*	1322.463	3$^-$	M1+E2	0.40 *+16−20*	0.068 *5*	
		1440.56 *5*	49 *4*	306.6182	4$^+$				
1758.143	3$^+$	244.311 *3*	52 *3*	1513.831	4$^+$	M1+E2	0.35 *11*	0.305 *13*	
		435.684 *6*	13.9 *4*	1322.463	3$^-$	E1		0.00891	
		489.611 *10*	1.57 *11*	1268.537	3$^+$	M1		0.0508	
		497.888 *7*	100.0 *11*	1260.248	2$^-$	E1		0.00663	
		583.511 *8*	4.1 *5*	1174.630	2$^+$	(E2)		0.01326	
1772.15	0$^+$	1678.82[&] *12*	100 *11*	93.1803	2$^+$	E2		1.64×10^{-3}	E_γ: from ^{178}Lu β^- decay (28.4 min), ^{178}Ta ε decay (9.31 min), and ^{178}Hf(n,n′γ).
		1772.21 *8*		0.0	0$^+$	E0			$I_{(\gamma+ce)}$: 0.024 *6*.
1781.264	(6)$^-$	140.806 *5*	4.9 *3*	1640.452	5$^+$				
		144.542 *2*	100.0 *23*	1636.727	5$^-$	E2		0.886	
		242.483 *6*	2.15 *15*	1538.790	4$^-$				
		268.667 *4*	4.31 *23*	1512.592	(5)$^-$				
1788.598	6$^+$	57.534 *1*	5.9 *6*	1731.064	(6)$^+$	M1		3.35	
		148.148[j] *3*	22.8[j] *11*	1640.452	5$^+$				
		234.595 *9*	47 *6*	1553.997	6$^+$	M1+E2	1.7 *+6−3*	0.220 *20*	
		274.761 *4*	25 *6*	1513.831	4$^+$	E2		0.1035	
		1156.33 *6*	100 *2*	632.178	6$^+$	M1+E2	0.9 *+11−5*	0.0046 *10*	
		1482.03 *4*	23.4 *12*	306.6182	4$^+$	E2		0.00196	
1803.389	3$^-$	289.556 *4*	100 *5*	1513.831	4$^+$	E1		0.0233	
		393.954[j] *6*	1.09[j] *8*	1409.439	4$^-$				
		440.840 *10*	0.60 *8*	1362.551	2$^-$				
		543.136 *23*	10.7 *3*	1260.248	2$^-$	M1+E2	3.6 *11*	0.0174 *16*	
		628.765 *9*	21.8 *5*	1174.630	2$^+$	E1		0.00404	
1808.275	(2)$^+$	311.76 *3*	8.0 *7*	1496.449	2$^+$				
		531.71 *6*	7.1 *7*	1276.692	2$^+$	E2(+M1)	>0.6	0.026 *9*	
		539.66 *3*	7.8 *5*	1268.537	3$^+$				
		1501.1		306.6182	4$^+$				
		1715.06 *4*	100 *12*	93.1803	2$^+$	M1(+E2)	<1.7	0.0021 *4*	
1818.286	2$^+$	455.76 *4*	0.35 *14*	1362.551	2$^-$				

$^{178}_{72}Hf_{106}$-11

Adopted Levels, Gammas (continued)

γ(^{178}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[g]	α[i]	Comments
1818.286	2+	541.593 *8*	6.7 *4*	1276.692	2+	M1+E2	1.0 *2*	0.027 *3*	B(M1)(W.u.)<0.013; B(E2)(W.u.)>2.6
		618.95 *3*	1.4 *4*	1199.385	0+				
		1511.74 *5*	41 *4*	306.6182	4+	E2		0.00190	B(E2)(W.u.)=0.7 *4*
		1725.13 *4*	100 *9*	93.1803	2+	E0+M1+E2		0.0020 *5*	B(M1)(W.u.)<0.0063
1857.151	(2)−	48.877 *2*	1.1 *3*	1808.275	(2)+				
		290.58[j] *5*	1.9[j] *3*	1566.668	2−				
		494.580 *8*	33.6 *7*	1362.551	2−	M1+E2	1.9 *+11−5*	0.026 *4*	
		534.699 *8*	18.9 *13*	1322.463	3−	M1+E2	1.1 *+3−2*	0.027 *3*	
		596.886 *8*	100 *3*	1260.248	2−	M1		0.0305	
		682.512 *10*	52.4 *16*	1174.630	2+	E1		0.00342	
1859.118	(11)−	257.645[‡] *10*	23.5 *5*	1601.484	10−	E2+M1	4.3[h] *+26−12*	0.134 *7*	
		495.013[‡] *15*	100 *3*	1364.078	9−	E2		0.0198	
1862.207	3+	53.931 *1*	2.4 *3*	1808.275	(2)+	(E2)		48.8	
		221.752 *9*	0.38 *10*	1640.452	5+				
		300.625 *22*	0.91 *10*	1561.540	2+				
		348.372 *5*	100 *3*	1513.831	4+	M1		0.1243	
		477.712 *13*	0.96 *10*	1384.461	4+				
		585.534 *8*	2.92 *24*	1276.692	2+	M1		0.0320	
		687.602 *10*	10.8 *5*	1174.630	2+	M1		0.0212	
1863.712	(5)−	116.610[j] *1*	64.5[j] *14*	1747.102	4−				
		223.955 *3*	26.5 *16*	1639.758	3−				
		324.919 *4*	62 *7*	1538.790	4−	M1		0.1498	
		351.118 *5*	44.4 *18*	1512.592	(5)−	M1+E2	0.64 *14*	0.101 *7*	
		454.265 *6*	100 *4*	1409.439	4−	M1+E2	0.35 *+11−15*	0.058 *3*	
1869.840	4+	111.697 *1*	25.7 *3*	1758.143	3+	M1+E2	0.58 *24*	2.76 *10*	
		229.391 *3*	44.0 *18*	1640.452	5+	M1(+E2)		0.28 *11*	
		330.99 *3*	1.3 *4*	1538.790	4−				
		336.667 *13*	2.4 *12*	1533.153	5+				
		436.214 *6*	10.1 *4*	1433.623	(3)−				
		547.378 *8*	100.0 *22*	1322.463	3−	E1		0.00540	
		601.31 *3*	2.8 *5*	1268.537	3+				
		1562.1		306.6182	4+				
		1776.59 *4*	30 *6*	93.1803	2+	E2		1.53×10^{-3}	
1890.0	7+	357[#]		1533.153	5+				
1891.304	2+	329.789 *18*	7.2 *5*	1561.540	2+				
		614.58 *3*	16.8 *19*	1276.692	2+				
		622.82 *3*	23.9 *7*	1268.537	3+	E2+M1	2.5 *+15−6*	0.0136 *13*	
		631.062 *10*	13.3 *5*	1260.248	2−				
		691.902 *13*	11.3 *16*	1199.385	0+				
		716.650 *15*	100 *4*	1174.630	2+	M1+E2	1.36 *+37−26*	0.0121 *12*	

$^{178}_{72}Hf_{106}$-12

Adopted Levels, Gammas (continued)

γ(^{178}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[g]	α[i]
1891.304	2+	1798.14 *4*	81 *9*	93.1803	2+	M1		0.00224
1913.617	4−	110.229 *1*	3.88 *19*	1803.389	3−			
		155.470 *4*	2.14 *19*	1758.143	3+			
		273.161 *4*	100 *5*	1640.452	5+	E1		0.0269
		399.787 *5*	66.3 *19*	1513.831	4+	E1		0.01083
		401.035 *6*	4.6 *3*	1512.592	(5)−			
		504.157 *7*	22.8 *14*	1409.439	4−	M1+E2	0.78 *+44−35*	0.036 *7*
		591.148 *13*	7.7 *5*	1322.463	3−			
		645.081 *9*	55 *3*	1268.537	3+	E1		0.00383
		1607.17 *10*	9.9 *15*	306.6182	4+			
1917.436	3−	114.049 *2*	3.8 *5*	1803.389	3−	E2		2.13
		159.289 *3*	5.36 *18*	1758.143	3+			
		277.689 *4*	14.8 *11*	1639.758	3−	M1+E2	1.3 *+6−3*	0.148 *20*
		280.710[j] *22*	82[j] *5*	1636.727	5−			
		403.605 *6*	100 *3*	1513.831	4+	E1		0.01060
		594.942 *9*	37.0 *7*	1322.463	3−	M1+E2	1.6 *2*	0.0177 *11*
		648.885 *9*	80 *11*	1268.537	3+	E1		0.00379
		657.177 *9*	58.2 *18*	1260.248	2−	E2		0.01005
1939.1	(10−)	337.7[@]	71	1601.484	10−			
		575.0[@]	100	1364.078	9−			
1942.007	1+,2+,3+	138.601 *6*	1.6 *5*	1803.389	3−			
		290.58[j] *5*	1.69[j] *25*	1651.459	(5)−			
		301.553 *6*	1.61 *25*	1640.452	5+			
		306.409[j] *4*	34.7[j] *25*	1635.603	4+			
		557.593 *22*	2.29 *17*	1384.461	4+			
		665.322 *19*	8.7 *4*	1276.692	2+	E2		0.00977
		1634.7		306.6182	4+			
		1848.80 *7*	100 *9*	93.1803	2+	M1		0.00214
1947.951	(7)−	166.694 *3*	40.5 *18*	1781.264	(6)−	(E2)		0.535
		299.104 *6*	22.1 *12*	1648.838	(6)−			
		311.212 *4*	100 *6*	1636.727	5−	E2		0.0710
		393.954[j] *6*	17.8[j] *12*	1553.997	6+			
		1315.78 *7*	77 *7*	632.178	6+			
1952.0	(8+)	210.3[@]	100	1741.7	(7+)			
		398[#]		1553.997	6+			
1953.132	4+	312.680 *4*	19.1 *11*	1640.452	5+	M1+E2	0.39 *+16−21*	0.153 *10*
		439.296 *18*	17.1 *7*	1513.831	4+	M1		0.0674
		502.728 *22*	5.0 *4*	1450.363	4+	M1+E2	1.1 *+11−5*	0.032 *8*
		630.64 *5*	3.4 *10*	1322.463	3−			

$^{178}_{72}Hf_{106}$-13

Adopted Levels, Gammas (continued)

γ(^{178}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[g]	α[i]	Comments
1953.132	4+	1646.46 *3*	100 *6*	306.6182	4+	E0+M1+E2		0.0022 *5*	
1953.682	7+	165.083 *3*	7.1 *6*	1788.598	6+				
		311[#]		1640.452	5+				Additional information 3.
		895.148 *21*	31.4 *21*	1058.550	8+	M1		0.01095	
		1321.54 *3*	100 *5*	632.178	6+				
1956.423	4+	148.148[j] *3*	14.9[j] *7*	1808.275	(2)+				
		320.818 *4*	2.26 *24*	1635.603	4+				
		442.809 *8*	1.77 *8*	1513.607	2+				
		506.090 *14*	21.0 *15*	1450.363	4+	E2		0.0188	
		1324.16 *7*	18.5 *15*	632.178	6+	E2		0.00238	
		1649.76 *3*	100 *6*	306.6182	4+	E0+M1+E2		0.0021 *5*	
1986.450	1+,2+,3+	116.610[j] *1*	36.2[j] *8*	1869.840	4+				
		424.921 *17*	7.7 *6*	1561.540	2+				
		536.100 *8*	8.6 *4*	1450.363	4+	M1		0.0401	
		1893.17 *7*	100 *6*	93.1803	2+	E0+M1+E2		0.0018 *4*	
1997.466	3+	179.181 *4*	3.9 *4*	1818.286	2+	M1		0.765	
		612.989 *12*	17.0 *18*	1384.461	4+	E2		0.01180	
		1690.89 *4*	100 *14*	306.6182	4+	M1		0.00250	
		1905.3		93.1803	2+				
2007.566	4+,3+	137.730 *2*	72.2 *22*	1869.840	4+	M1+E2	1.0 *1*	1.33 *4*	
		218.964 *3*	45.7 *19*	1788.598	6+				
		249.418 *3*	100 *4*	1758.143	3+	E2+M1		0.22 *9*	
		371.932[j] *23*	20.4[j] *9*	1635.603	4+				
		738.982 *20*	85.5 *19*	1268.537	3+	M1+E2	1.6 *+3−2*	0.0105 *7*	
2013.551	3+,4+,5+	151.343[j] *2*	34.6[j] *11*	1862.207	3+				
		377.960 *5*	3.06 *24*	1635.603	4+	M1		0.1001	
		744.964 *24*	52 *7*	1268.537	3+				
		1705.7		306.6182	4+				
		1920.46 *15*	100 *9*	93.1803	2+	M1		0.00202	
2021.181	1+,2+,3+	151.343[j] *2*	43.2[j] *13*	1869.840	4+				
		459.625 *6*	19.3 *6*	1561.540	2+	M1+E2	1.0 *+27−8*	0.042 *17*	
		744.55 *3*	56 *3*	1276.692	2+	M1+E2	2.1 *+12−5*	0.0094 *10*	
		846.50 *3*	46 *4*	1174.630	2+	M1+E2	2.1 *+16−6*	0.0070 *9*	
		1927.98 *8*	100 *9*	93.1803	2+	M1		0.00201	
2025.8	0+	850.7		1174.630	2+				
		1933.1		93.1803	2+				
2027.565	4−	376.109 *5*	8.1 *5*	1651.459	(5)−	M1		0.1014	
		387.811 *5*	9.0 *8*	1639.758	3−	M1		0.0935	
		488.768 *7*	22.7 *6*	1538.790	4−	M1		0.0510	
		515.015 *18*	19.9 *23*	1512.592	(5)−	M1+E2	1.6 *+6−4*	0.025 *4*	

$^{178}_{72}Hf_{106}$-14

Adopted Levels, Gammas (continued)

γ(^{178}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[g]	α[i]	Comments
2027.565	4⁻	593.917 *15*	13.6 *6*	1433.623	(3)⁻	M1+E2	0.65 *33*	0.025 *4*	
		618.129 *9*	100 *3*	1409.439	4⁻	M1		0.0278	
		643.076 *9*	22.4 *9*	1384.461	4⁺				
		705.106 *10*	59 *8*	1322.463	3⁻	M1+E2	1.3 *7*	0.013 *5*	
2050.489	3⁺	53.025 *6*	2.0 *8*	1997.466	3⁺	E2+M1	≈1	≈28.6	
		773.75 *4*	4.8 *4*	1276.692	2⁺	M1		0.01576	
		1743.80 *7*	68 *6*	306.6182	4⁺	M1		0.00236	
		1957.28 *4*	100 *9*	93.1803	2⁺	M1		0.00197	
2068.035	5⁺	114.900 *4*	6.9 *11*	1953.132	4⁺	M1		2.69	
		279.439 *4*	49 *3*	1788.598	6⁺	M1+E2	1.06 *17*	0.158 *12*	
		427.590 *6*	100 *8*	1640.452	5⁺	M1		0.0723	
		554.187 *8*	27.8 *18*	1513.831	4⁺				
2082.2	8⁺	292[#]		1788.598	6⁺				
		392[#]		1691.083	6⁺				
		1024[#]		1058.550	8⁺				
2099.874	3⁺,4⁺	296.481 *4*	7.7 *10*	1803.389	3⁻				
		649.42 *4*	23.8 *24*	1450.363	4⁺	M1+E2	1.4 *+9–4*	0.015 *3*	
		715.47 *3*	19.0 *7*	1384.461	4⁺	(E2)		0.00830	
		777.438 *11*	100 *5*	1322.463	3⁻	E1		0.00264	
		1793.27 *4*	77 *14*	306.6182	4⁺	E2		1.52×10^{-3}	
2118.6		841.6		1276.692	2⁺				
		2027.0		93.1803	2⁺				
		2117.3		0.0	0⁺				
2136.522	(12)⁻	277.402[‡] *18*	14.7 *7*	1859.118	(11)⁻	(M1+E2)	>1.13[h]	0.13 *3*	
		535.036[‡] *18*	100 *4*	1601.484	10⁻	E2		0.01635	
2137.4	(8⁻)	356.1[@]	100	1781.264	(6)⁻				
2149.6	12⁺	579.7[#]	100	1570.3	10⁺	[E2]		0.01347	B(E2)(W.u.)<1.2×10^2
2154.1	8⁺	364[#]		1788.598	6⁺				
		1097[#]		1058.550	8⁺				
2155.7		1849.7		306.6182	4⁺				
		2061.8		93.1803	2⁺				
2183.4	(9⁺)	231.4[@]	100	1952.0	(8⁺)				
		441.8[@]	67	1741.7	(7⁺)				
2202.51	(11⁻)	343.3[‡] *1*	62	1859.118	(11)⁻				
		601.1[‡] *1*	100	1601.484	10⁻				
2272.6		1098.4		1174.630	2⁺				
		1965.4		306.6182	4⁺				
		2179.5		93.1803	2⁺				

$^{178}_{72}Hf_{106}$-15

Adopted Levels, Gammas (continued)

γ(^{178}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[g]	α[i]	Comments
2315.8	9$^+$	426[#]		1890.0	7$^+$				
		1257[#]		1058.550	8$^+$				
2349.7	9$^+$	396[#]		1953.682	7$^+$				
2365.5	(2$^+$)	2058.2		306.6182	4$^+$				
		2273.0		93.1803	2$^+$				
2433.334	(13)$^-$	230.8 *1*		2202.51	(11$^-$)				E_γ: from ^{178}Hf IT decay (31 y).
		296.812 *10*	11.0 *2*	2136.522	(12)$^-$	M1+E2	−3.8[h] *+12−28*	0.089 *8*	
		574.219 *21*	100 *3*	1859.118	(11)$^-$	E2		0.01378	
2433.7	(10$^+$)	250.6[@]	91	2183.4	(9$^+$)				
		481.6[@]	100	1952.0	(8$^+$)				
2440.2	(10$^+$)	870[#]		1570.3	10$^+$				
		1382[#k]		1058.550	8$^+$				
2446.09	16$^+$	12.7[‡] *2*	7.2×10^{-6}	2433.334	(13)$^-$	[E3]		1.47×10^7 *15*	B(E3)(W.u.)=8.1×10^{-11} *10* E_γ: unobserved transition, energy from adjusted level energy differences in ^{178}Hf IT decay (31 y). I_γ: from evaluator estimate in ^{178}Hf IT decay (31 y).
		309.50[‡] *15*	100[‡]	2136.522	(12)$^-$	M4(+E5)	0.12 *10*	8.42 *13*	B(M4)(W.u.)=(2.35×10^{-5} *11*); B(E5)(W.u.)=(0.005 *+8−5*) δ: from ^{178}Hf IT decay (31 y).
		587.0[‡] *1*	41[‡] *3*	1859.118	(11)$^-$	E5		0.284	B(E5)(W.u.)=0.000122 *10*
2474.8		1844.4		632.178	6$^+$				
		2379.9		93.1803	2$^+$				
2485.2	(12$^-$)	348.5[@]	37	2136.522	(12)$^-$				
		626.2[@]	100	1859.118	(11)$^-$				
2537.8	10$^+$	455[#]		2082.2	8$^+$				
		967[#]		1570.3	10$^+$				
		1479[#k]		1058.550	8$^+$				
2552.8		1283.3		1268.537	3$^+$				
		2553.7		0.0	0$^+$				
2557.9		2251.1		306.6182	4$^+$				
		2464.8		93.1803	2$^+$				
2572.4	14$^-$	126.1[@] *3*	21	2446.09	16$^+$	[M2]		15.5 *3*	B(M2)(W.u.)=0.0142 *6*
		140.3[@]	100	2433.334	(13)$^-$	M1		1.523	B(M1)(W.u.)=1.76×10^{-8} *7*
		437.0[@]	67	2136.522	(12)$^-$	[E2]		0.0274	B(E2)(W.u.)=8.8×10^{-7} *3*

Adopted Levels, Gammas (continued)

γ(^{178}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	α[i]	Comments
2604.2	10^+	450[#]		2154.1	8^+			
		1034[#]		1570.3	10^+			
2631.4		2325.8		306.6182	4^+			
		2537.2		93.1803	2^+			
2700.7	(11^+)	266.6[@]	74	2433.7	(10^+)			
		517.1[@]	100	2183.4	(9^+)			
2737.6		2429.9		306.6182	4^+			
		2645.4		93.1803	2^+			
2749.1	(14^-)	612.6[@]	100	2136.522	$(12)^-$			
2776.6	14^+	626.9[#]	100	2149.6	12^+	[E2]	0.01120	B(E2)(W.u.)=290 *70*
2785.3	(13^-)	648.8[@]	100	2136.522	$(12)^-$			
2797.8	11^+	482[#]		2315.8	9^+			
		1227[#k]		1570.3	10^+			
2803.5	17^+	357.4[# *3*]		2446.09	16^+			
2827.7	11^+	478[#]		2349.7	9^+			
2865.9		2560.6		306.6182	4^+			
		2771.3		93.1803	2^+			
2898.8		2591.8		306.6182	4^+			
		2805.9		93.1803	2^+			
2909.1	(15^-)	337[c]		2572.4	14^-			
2942.0	(12^+)	502[#]		2440.2	(10^+)			
		792[#]		2149.6	12^+			
		1372[#]		1570.3	10^+			
2957.7		2865.1		93.1803	2^+			
		2957.1		0.0	0^+			
2987.2	(12^+)	287[#]		2700.7	(11^+)			
		554[#]		2433.7	(10^+)			
3052.7	(12^+)	514[#]		2537.8	10^+			
		904[#]		2149.6	12^+			
		1481[#k]		1570.3	10^+			
3084.3	15^-	651[#]		2433.334	$(13)^-$			
3100.5		2794.3		306.6182	4^+			
		3007.0		93.1803	2^+			
3100.6	(14^-)	666[#k]		2433.334	$(13)^-$			
3112.8		2806.0		306.6182	4^+			
		3019.8		93.1803	2^+			

$^{178}_{72}Hf_{106}$-17

Adopted Levels, Gammas (continued)

γ(^{178}Hf) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π
3135.2	12^+	531#		2604.2	10^+
3180.9	18^+	377[c]		2803.5	17^+
		735[c]		2446.09	16^+
3263.7	16^-	355[c]		2909.1	(15^-)
		691[c]		2572.4	14^-
3283.8	13^+	296#		2987.2	(12^+)
		582#		2700.7	(11^+)
3335.8	13^+	538#		2797.8	11^+
3379.7	13^+	552#		2827.7	11^+
3435.0	16^+	658.6#	100	2776.6	14^+
3521.8	(14^+)	580#		2942.0	(12^+)
		745#		2776.6	14^+
		1372#		2149.6	12^+
3578.4	19^+	397[c]		3180.9	18^+
		775[c]		2803.5	17^+
3595.5	14^+	310#		3283.8	13^+
		610#		2987.2	(12^+)
3624.7	14^+	572#		3052.7	(12^+)
		1475#[k]		2149.6	12^+
3741.2	14^+	606#		3135.2	12^+
3902?	15^+	307#[k]		3595.5	14^+
		618#[k]		3283.8	13^+
3909.5		2736.5		1174.630	2^+
		3601.2		306.6182	4^+
3927.8	15^+	592#		3335.8	13^+
3995.5	20^+	417[c]		3578.4	19^+
		815[c]		3180.9	18^+
3997?	15^+	618#[k]		3379.7	13^+
4119.4	18^+	684.4#		3435.0	16^+
4178.8	(16^+)	657#		3521.8	(14^+)
4178.8	(16^+)	744#		3435.0	16^+
		1402#		2776.6	14^+
4210.5		3904.2		306.6182	4^+
		4117.0		93.1803	2^+
4325.2		3064.7		1260.248	2^-
		4232.1		93.1803	2^+
4378.0		3109.0		1268.537	3^+
		4071.7		306.6182	4^+
4417.2	16^+	676#		3741.2	14^+
4431.7	21^+	436		3995.5	20^+
		853		3578.4	19^+
4593.1		3317.3		1276.692	2^+
		4592.2		0.0	0^+
4781.9		3514.9		1268.537	3^+
		4687.0		93.1803	2^+
4837.4	20^+	718#		4119.4	18^+
4873.7		4567.0		306.6182	4^+
		4780.4		93.1803	2^+
4886.1	(22^+)	454[c]		4431.7	21^+
		891[c]		3995.5	20^+
4914.7		3739.1		1174.630	2^+
		4609.0		306.6182	4^+
5010.1		4702.1		306.6182	4^+
		4918.2		93.1803	2^+
5283.0		4652.7		632.178	6^+
		4974.3		306.6182	4^+
5388.6		4119.3		1268.537	3^+
		5083.3		306.6182	4^+
		5294.8		93.1803	2^+

† From ^{177}Hf(n,γ) E=thermal, unless otherwise specified.
‡ From ^{178}Hf IT decay (31 y).
# From Coulomb excitation.

$^{178}_{72}Hf_{106}$-18

Adopted Levels, Gammas (continued)

$\gamma(^{178}Hf)$ (continued)

@ From $^{176}Yb(\alpha,2n\gamma)$.
& Weighted average of data from $^{177}Hf(n,\gamma)$ E=thermal, ^{178}Lu β^- decay (28.4 min), and ^{178}Ta ε decay (9.31 min).
a Weighted average from $^{177}Hf(n,\gamma)$ E=thermal, ^{178}Hf IT decay (31 y), ^{178}Hf IT decay (4.0 s), ^{178}Lu β^- decay (28.4 min), and ^{178}Ta ε decay (2.36 h).
b Weighted average from $^{177}Hf(n,\gamma)$ E=thermal, ^{178}Hf IT decay (31 y), ^{178}Hf IT decay (4.0 s), and ^{178}Ta ε decay (2.36 h).
c From $^{176}Yb(^9Be,\alpha3n\gamma)$.
d Seen only in ^{178}Ta ε decay (9.31 min) and ^{178}Lu β- decay (28.4 min).
e From ^{178}Ta ε decay (9.31 min) and ^{178}Lu β- decay (28.4 min). Probable doublet, other transition with similar energy from 1513.83 keV 4^+ level.
f From ^{178}Ta ε decay (9.31 min) and ^{178}Lu β- decay (28.4 min). Probable doublet, other transition with similar energy from 1513.61 keV 2^+ level.
g From conversion electron data in $^{177}Hf(n,\gamma)$ E=thermal (1986Ha22), except as indicated.
h From ^{178}Hf IT decay (31 y).
i Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
j Multiply placed with undivided intensity.
k Placement of transition in the level scheme is uncertain.

$^{178}_{72}Hf_{106}$-19

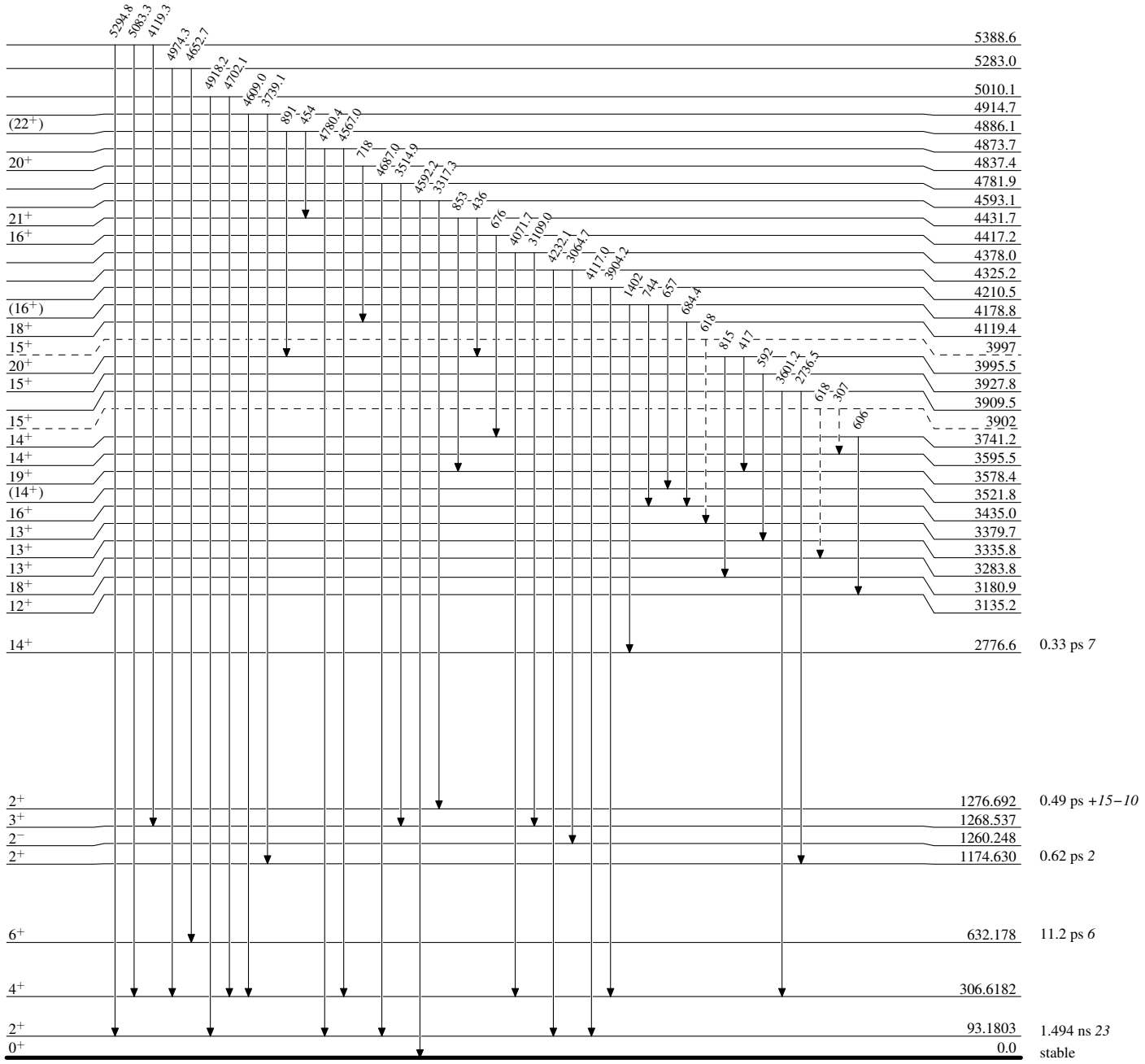
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{178}_{72}Hf_{106}$

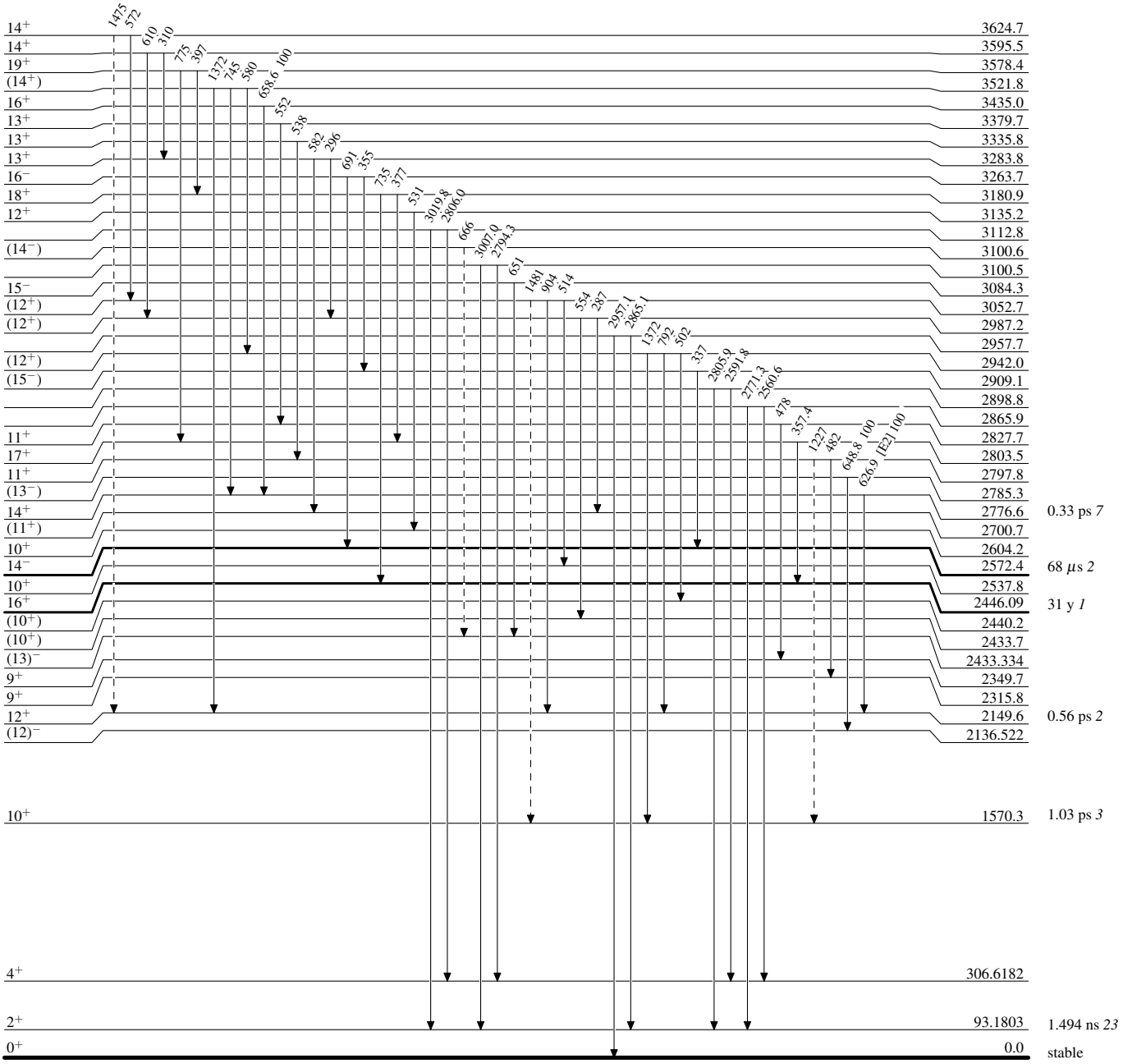
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{178}_{72}Hf_{106}$

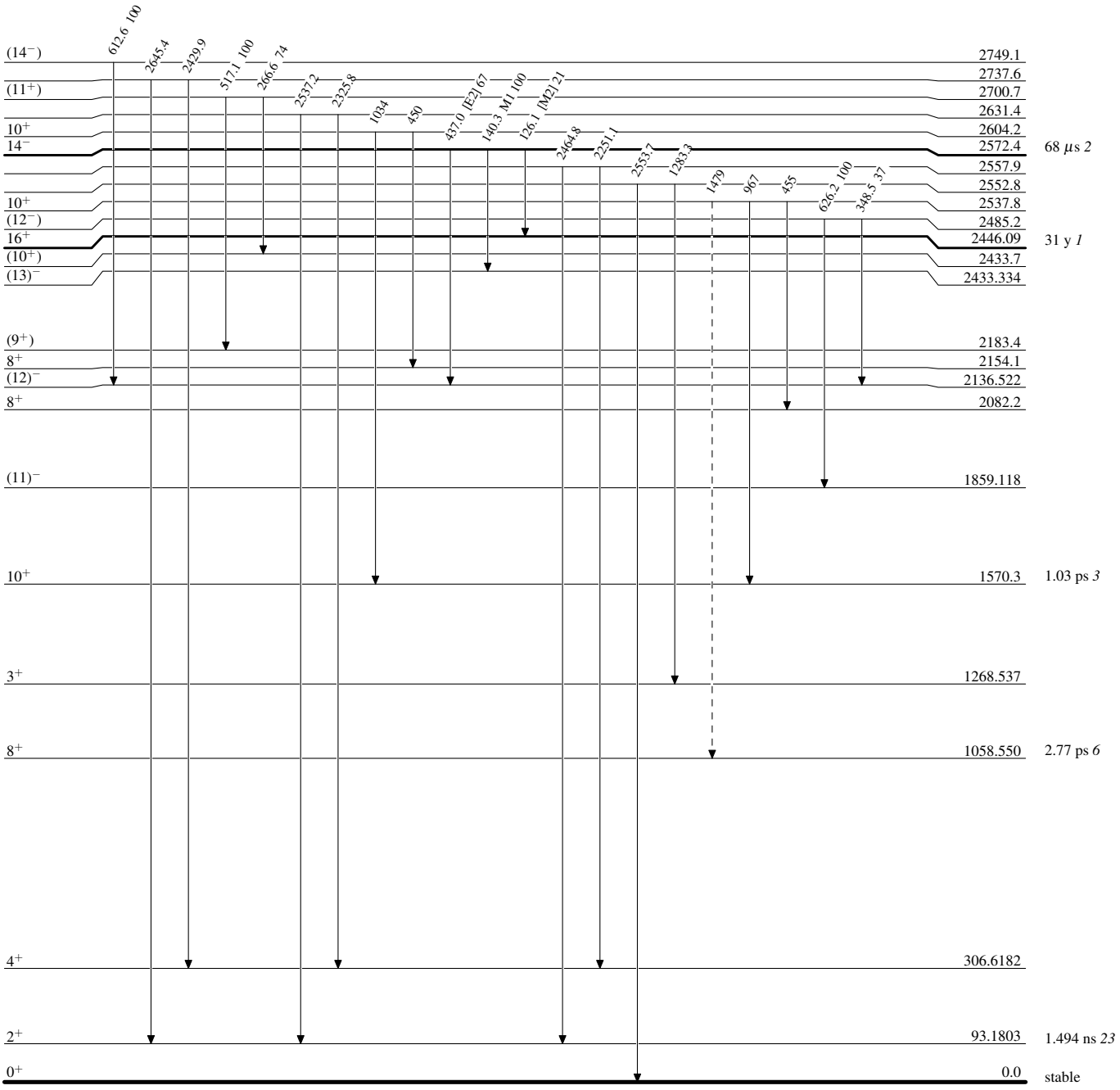
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{178}_{72}Hf_{106}$

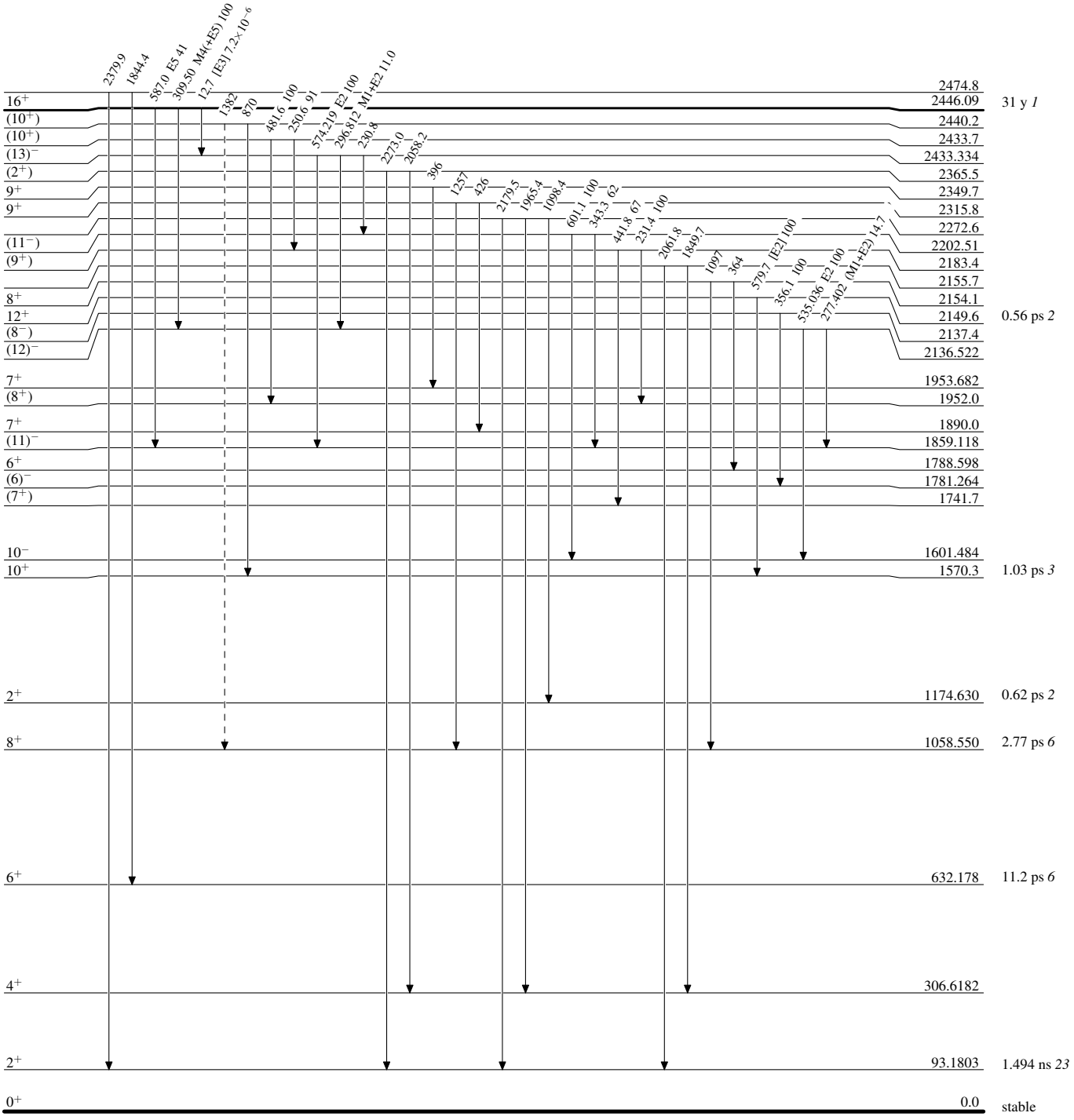
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

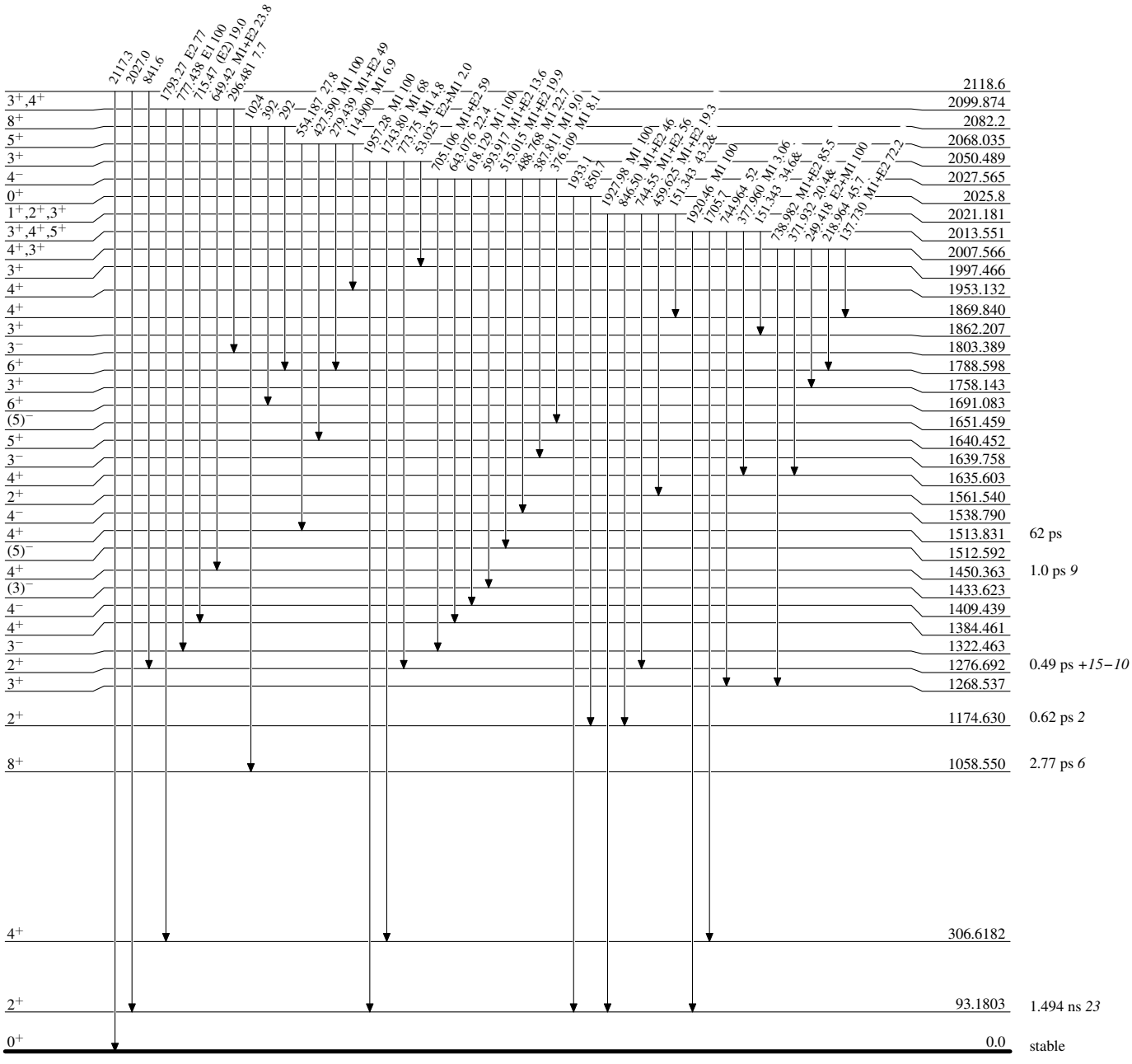


$^{178}_{72}Hf_{106}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

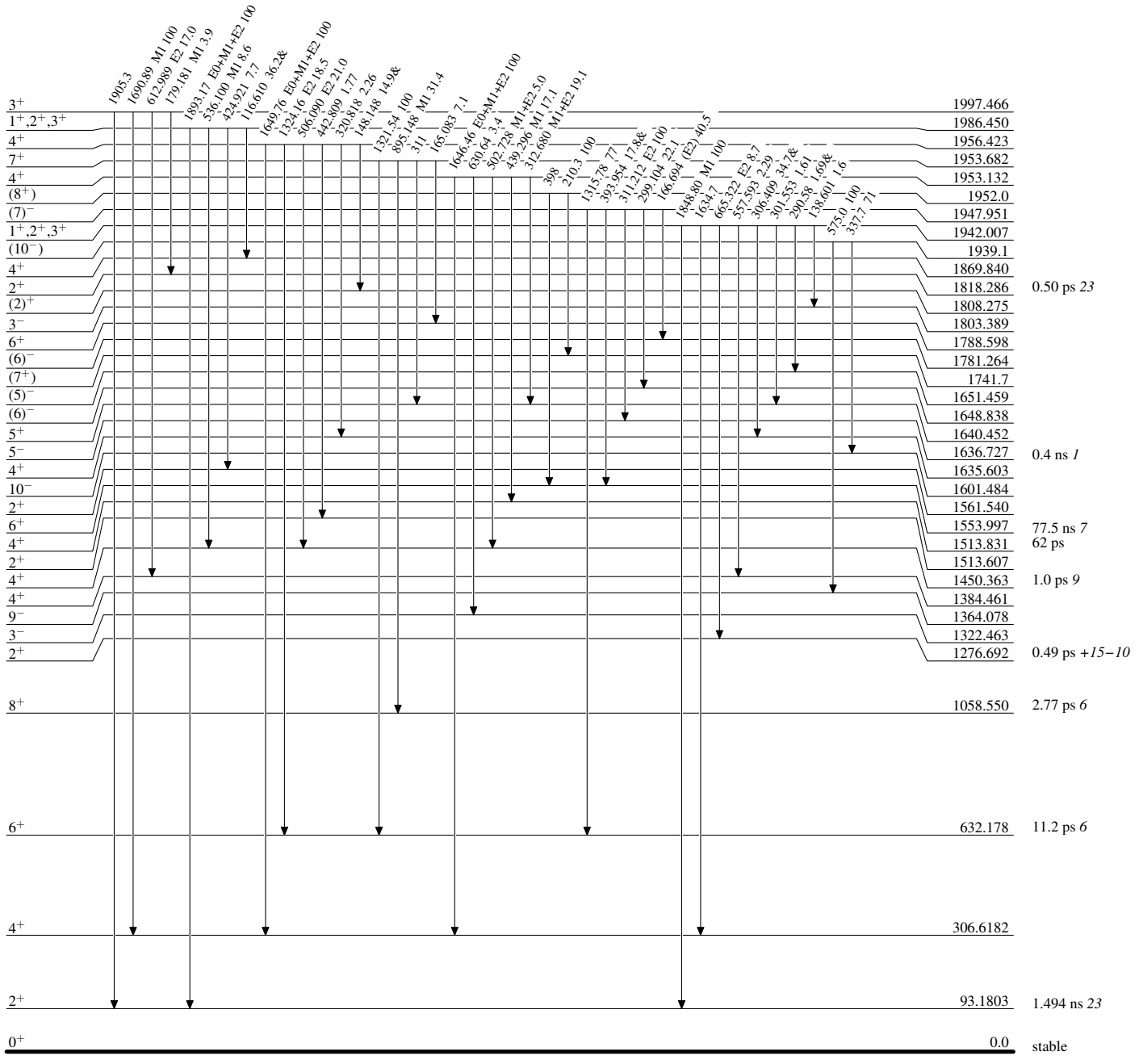


$^{178}_{72}Hf_{106}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

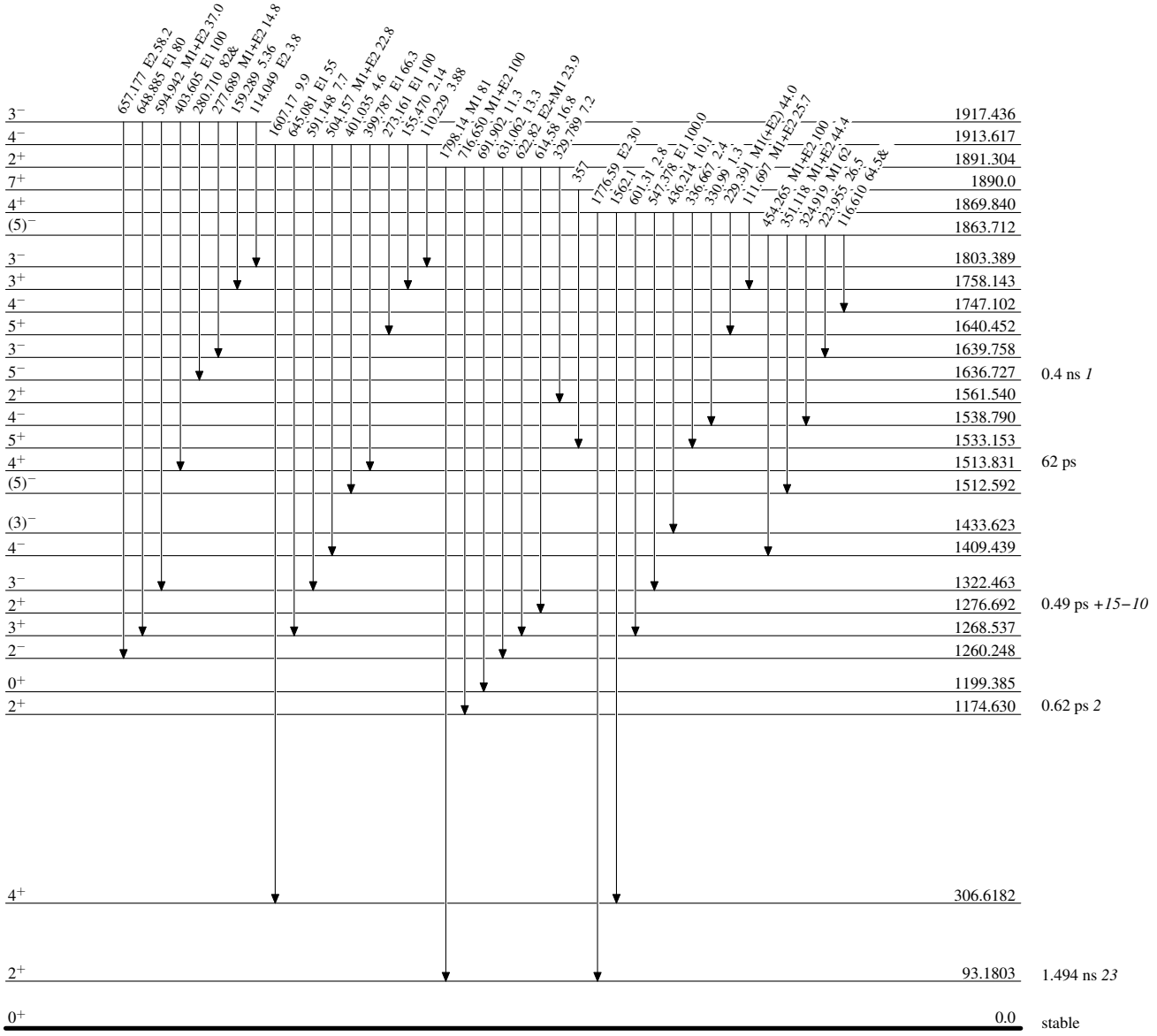


$^{178}_{72}Hf_{106}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

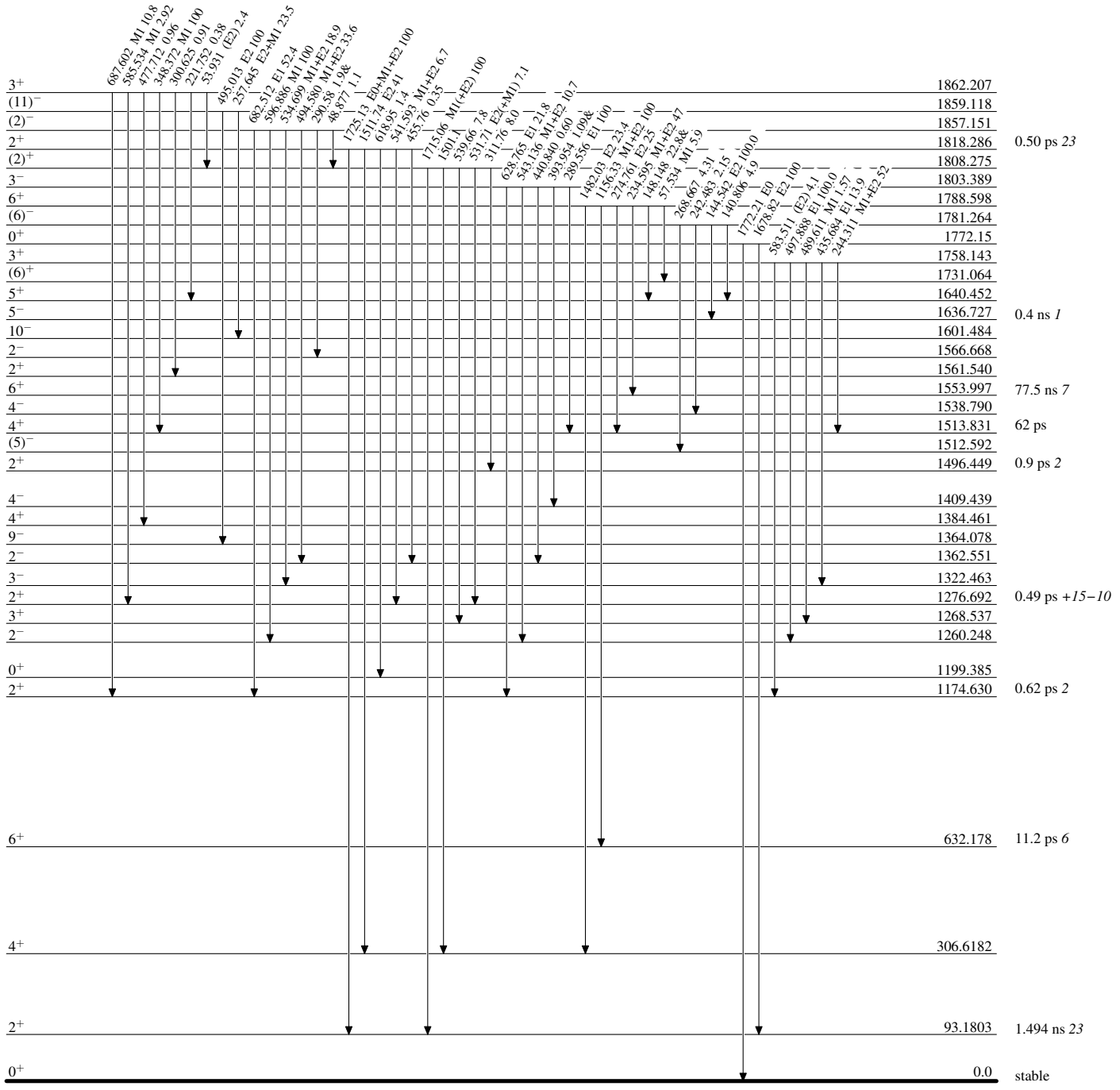


$^{178}_{72}Hf_{106}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



$^{178}_{72}Hf_{106}$

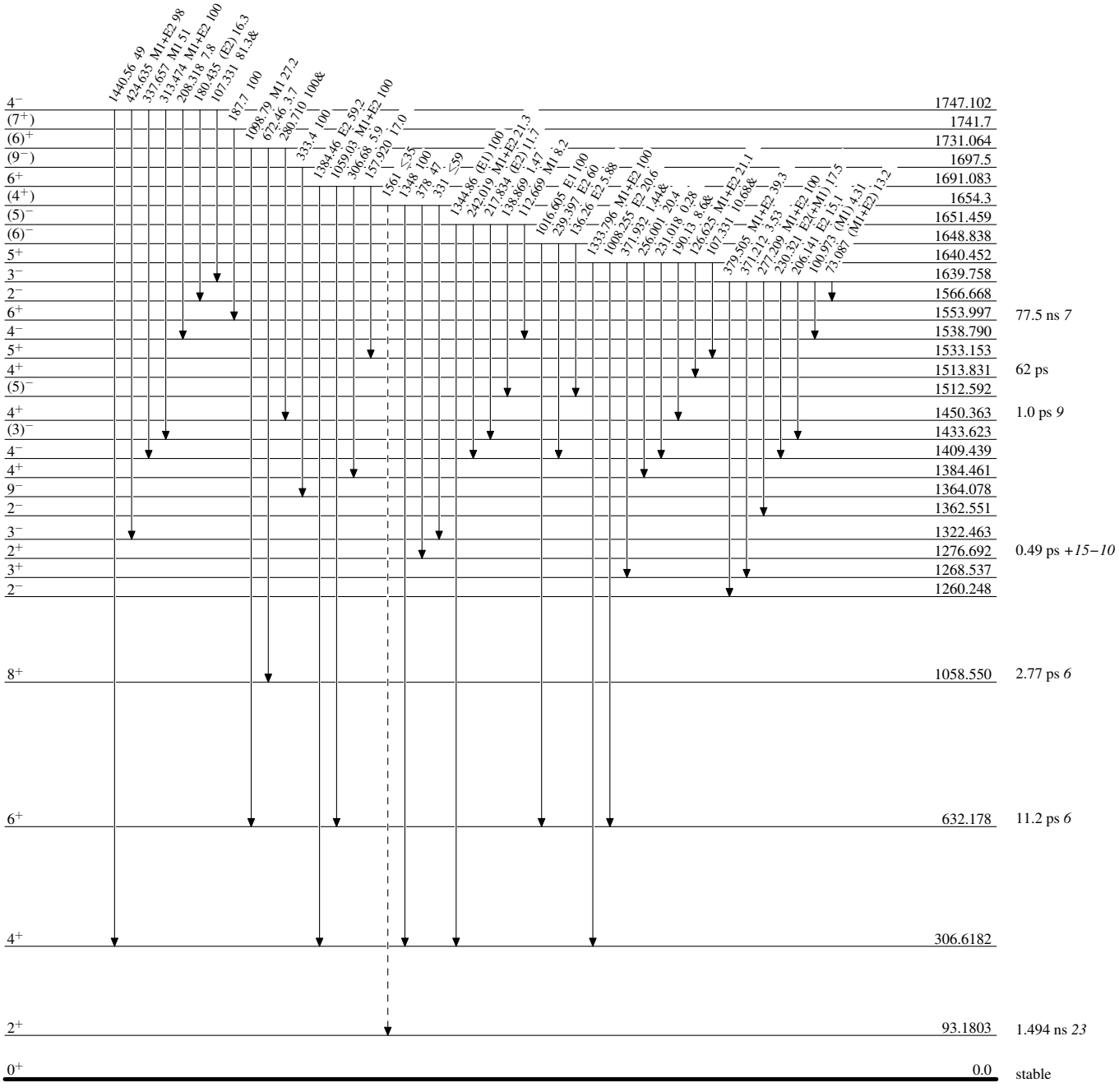
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

γ Decay (Uncertain)



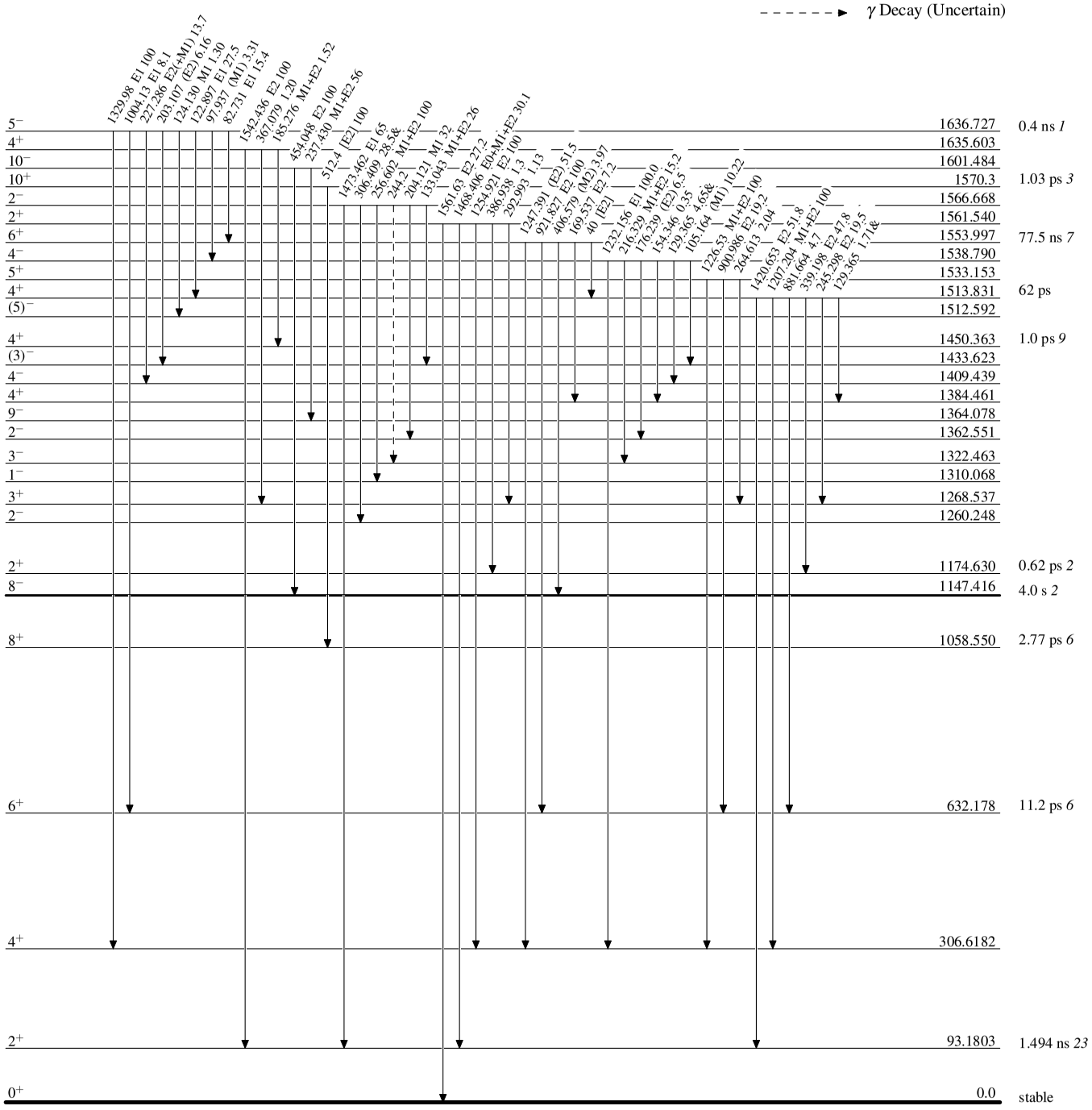
$^{178}_{72}Hf_{106}$

Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



$^{178}_{72}Hf_{106}$

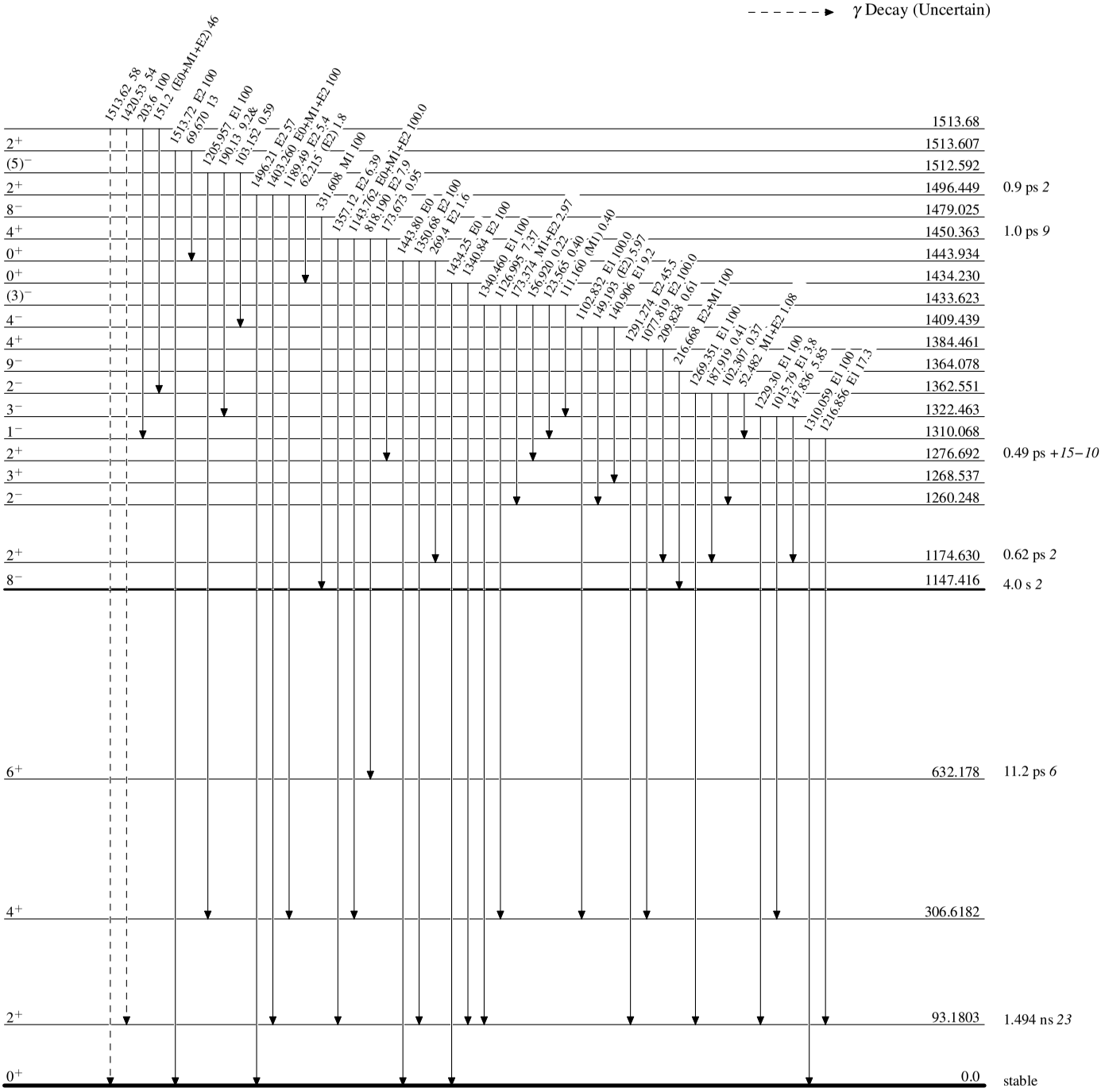
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

- - - - - - ► γ Decay (Uncertain)

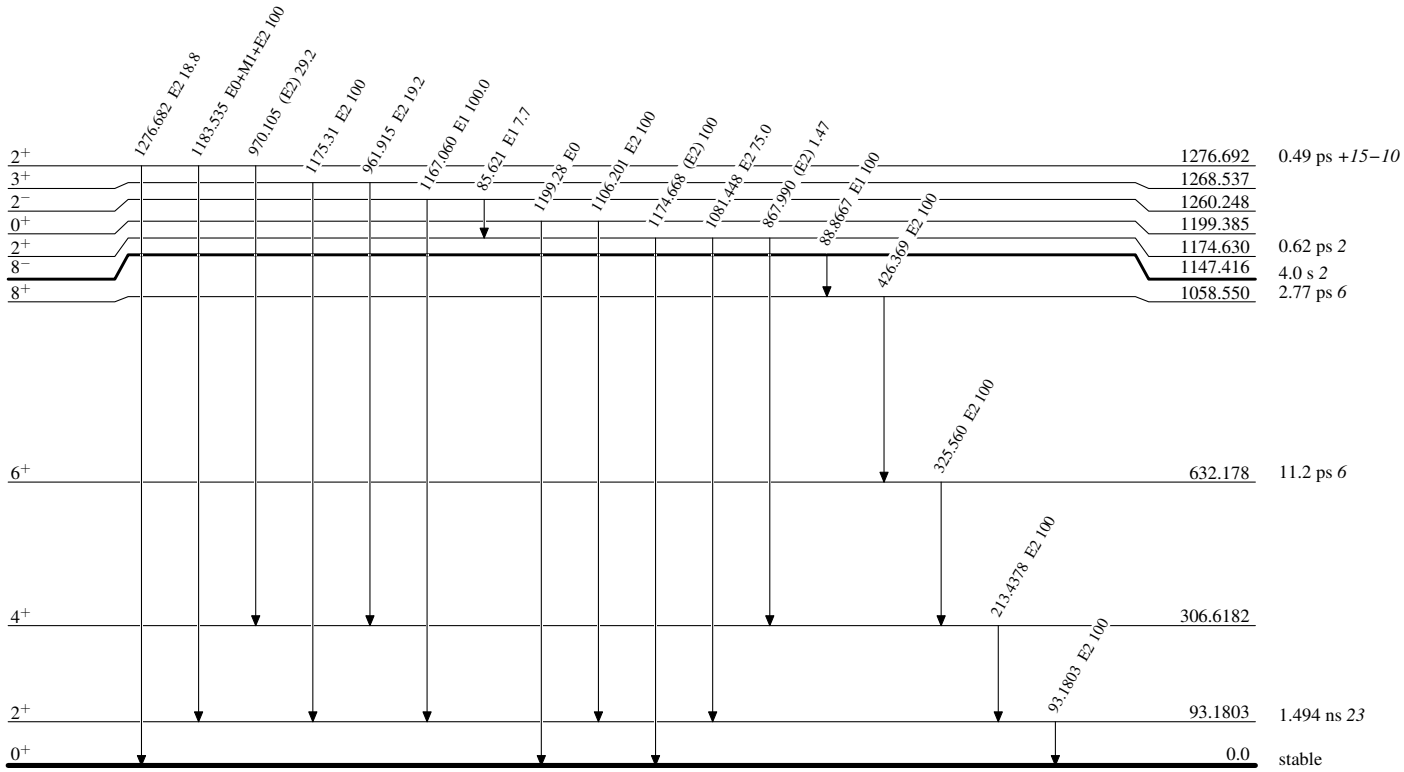


$^{178}_{72}Hf_{106}$

Adopted Levels, Gammas

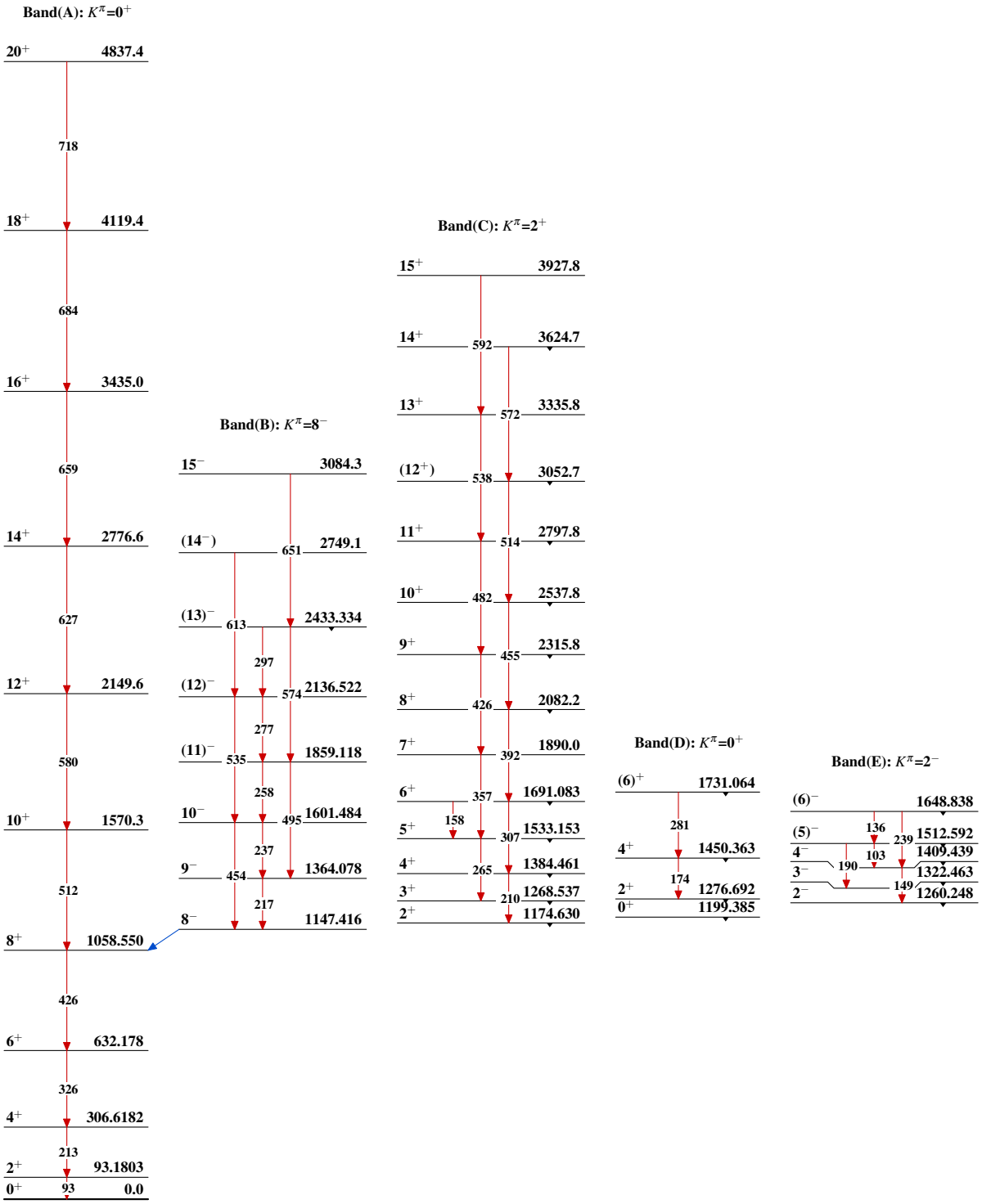
Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



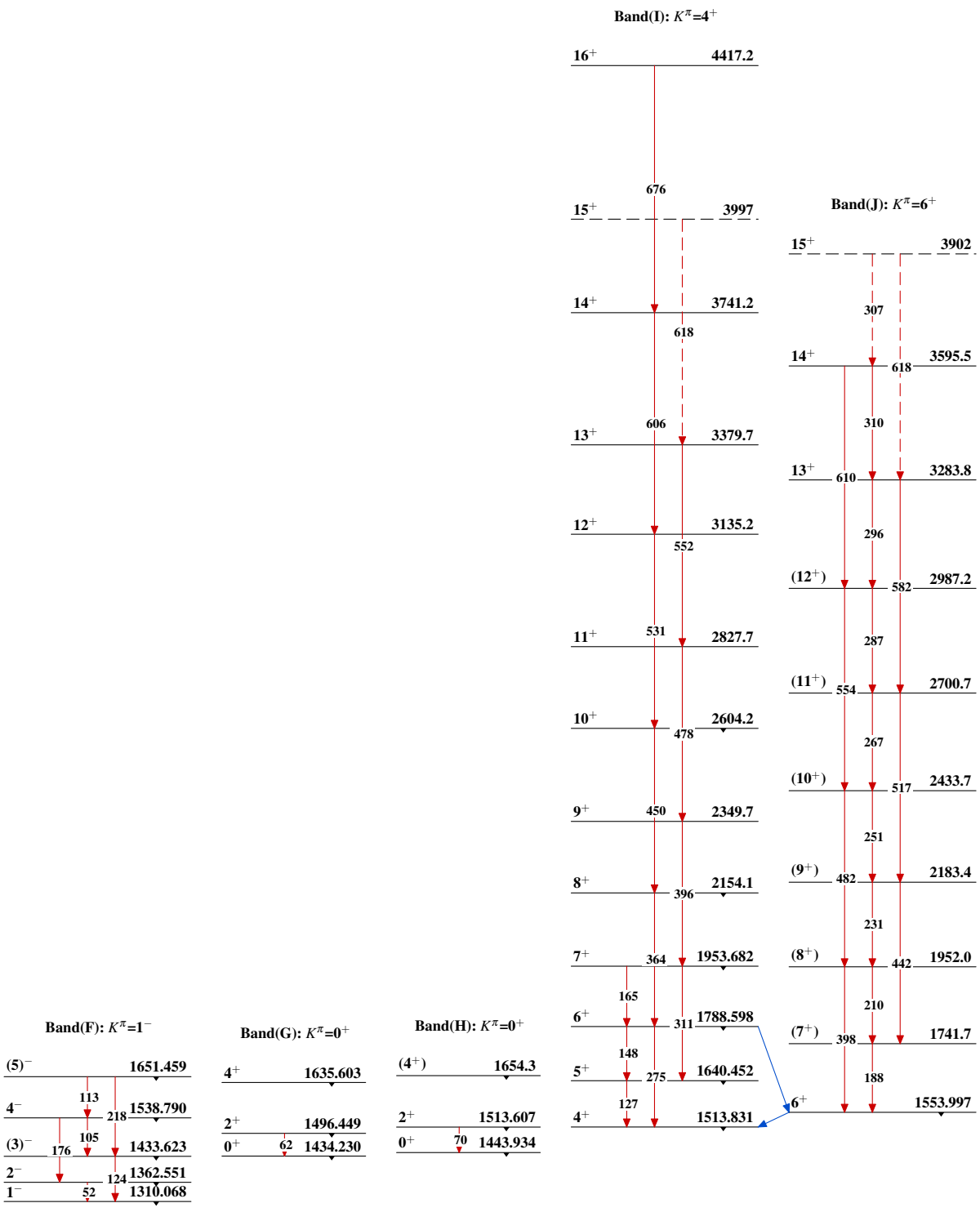
$^{178}_{72}Hf_{106}$

Adopted Levels, Gammas



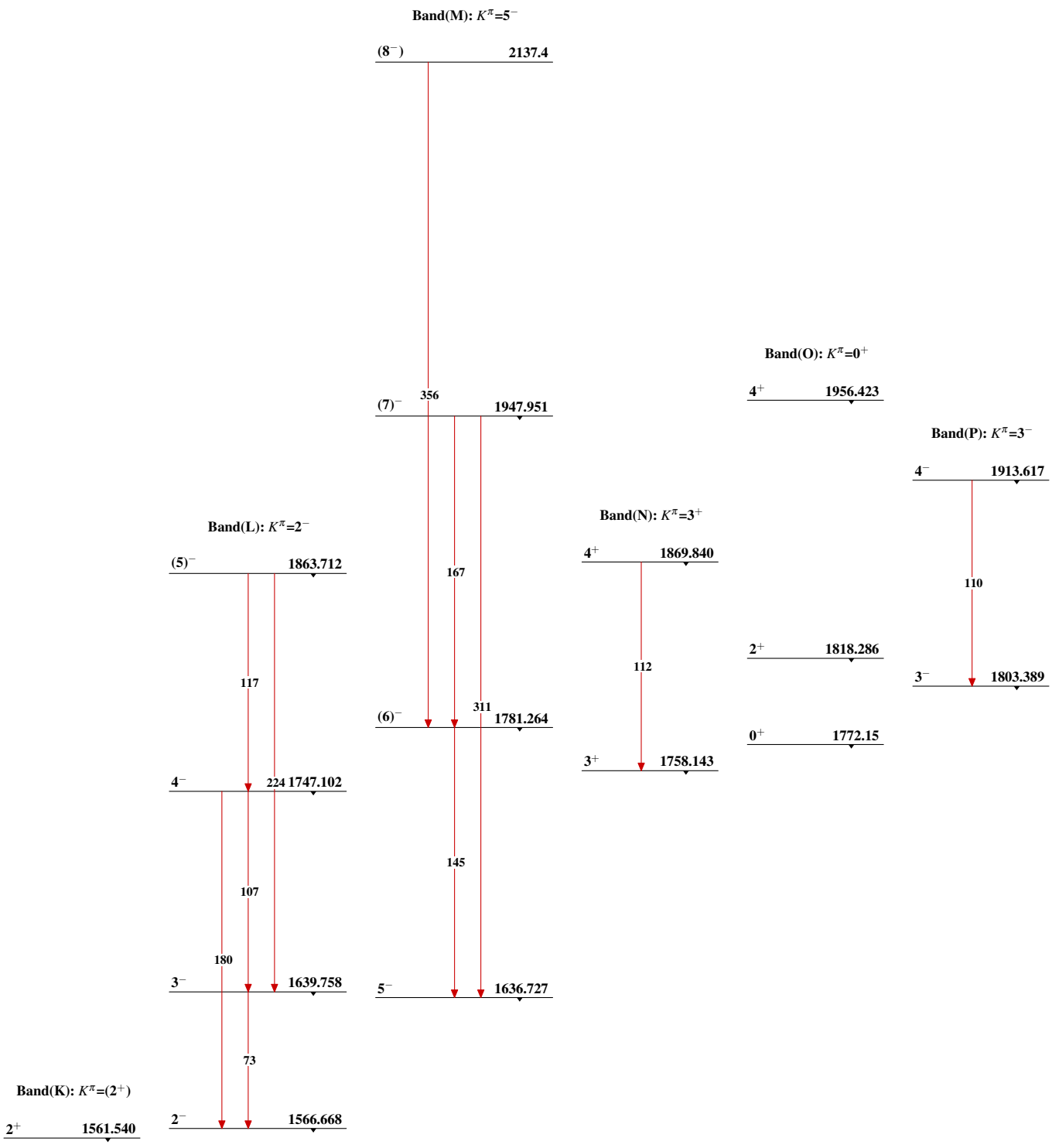
$^{178}_{72}Hf_{106}$

Adopted Levels, Gammas (continued)



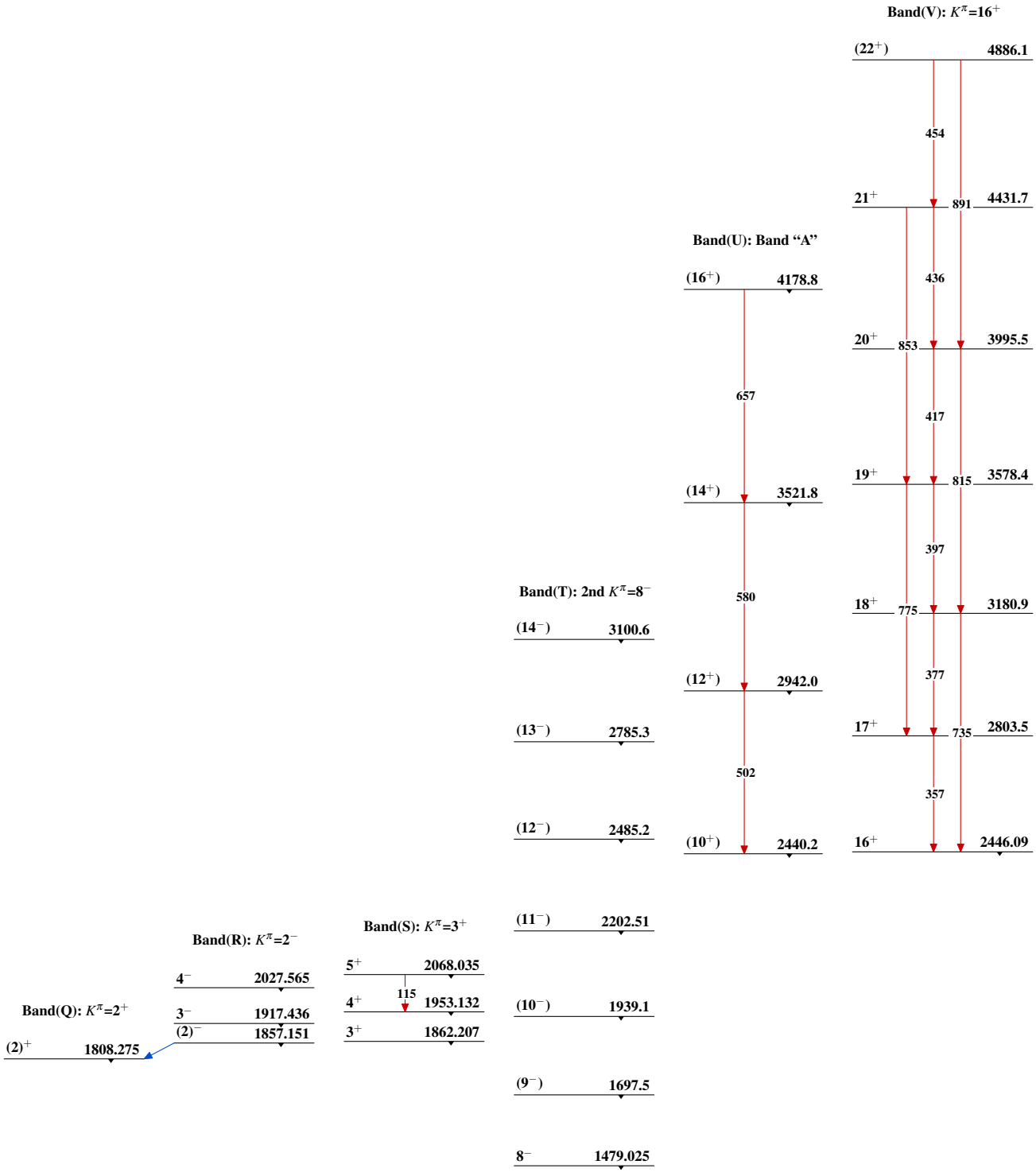
$^{178}_{72}Hf_{106}$

Adopted Levels, Gammas (continued)



$^{178}_{72}Hf_{106}$

Adopted Levels, Gammas (continued)



$^{178}_{72}Hf_{106}$

Adopted Levels, Gammas (continued)

Band(W): $K^{\pi}=14^{-}$

14^{-} 2572.4

$^{178}_{72}Hf_{106}$

Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	E. A. Mccutchan	NDS 126, 151 (2015)	1-Feb-2015

Q(β^-)=−846 *3*; S(n)=7387.76 *15*; S(p)=8010 *5*; Q(α)=1283.0 *18* 2012Wa38
S(2n)=13486.75 *17*; S(2p)=14666 *10* (2012Wa38).
Other reactions:
^{174}Yb(^{18}O,^{12}C): 2001Sa29.
^{180}Hf(γ,γ'); Mossbauer: 1966Ge08, 1968Sn02, 1970Ch27, 1972BoYJ, 1971Ko29, 1973Ka31, 1973PeZE, 1973Zi02, 1980Da12.
^{180}Hf(e,e′): 1988Ma47.
^{180}Hf(p,p′γ): 1966Ha48, 2011Ta22.
^{180}Hf(pol p,p): 1998Do16.
^{180}Hf(p,γ), IAR: 1968Ca17.
^{180}Hf(^{16}O,^{16}O′γ): 1973Kl08.
^{181}Ta(γ,p): 1973DaYV, 1974AlYH, 1974Da08, 1987Da29, 2000Gr12, 2012Is03, 2012KaZV.
^{181}Ta(e,e′p): 1972ShYD, 1972ShYE, 1972SuZT, 1973SuZW, 1976Su01, 1976Su02, 1989Ge04, 1992Ga02, 1992Pa03.
^{181}Ta(μ^-,γ): 1971KeZQ.
^{181}Hf(pol n,np): 1991WhZZ, 1992WhZY.
^{181}Ta(n,d): 2000Be62, 2002BeZR, 2007Sh15, 2008SeZT, 2009Lu09.
^{181}Ta(d,^{3}He): 1996Fa06, 2009He15.
^{181}Ta(^{12}C,^{13}N), ^{181}Ta(^{14}N,^{15}O): 1967Vo01.
^{183}W(n,α): 1975Qa01, 2006Av01.
α: Additional information 1.

^{180}Hf Levels

Cross Reference (XREF) Flags

A	^{180}Lu β^- decay	F	^{179}Hf(n,γ) E=thermal	K	^{180}Hf(pol p,p′)
B	^{180}Ta ε decay	G	^{179}Hf(d,p)	L	^{180}Hf(^{136}Xe,^{136}Xe′γ)
C	^{180}Hf IT decay (5.53 h)	H	^{180}Hf(γ,γ')	M	^{180}Hf(^{238}U,^{238}U′γ)
D	^{178}Hf(t,p)	I	^{180}Hf(n,n′γ)		
E	^{179}Hf(n,γ) E=res: av	J	Coulomb excitation		

E(level)[†]	J$^\pi$	T$_{1/2}$[‡]	XREF	Comments
0.0[@]	0$^+$	stable	ABCDEFGHIJKLM	
93.3240[@] *20*	2$^+$	1.519 ns *10*	ABCDEFGHIJKLM	Q=−2.00 *2*; μ=+0.61 *3*; B(E2)↑=4.73 *3* J$^\pi$: E2 93.3γ to 0$^+$. T$_{1/2}$: weighted average of 1.524 ns *10* from ^{180}Hf IT decay (5.53 h) and 1.50 ns *2* from Coulomb excitation. μ: integral perturbed angular correlation (1996Al20). Others: μ=+0.53 *3*, Coulomb excitation integral perturbed angular distributions (1968Be04); μ=+0.51 *8*, Mossbauer effect (1972JhZZ); μ=+0.77 *7*, integral perturbed angular correlations (1961Bo25). Δ<r^2>^{178,180}=0.072 fm^2 *4* (1992An17). Other: 1992Be07. B(E2)↑: from 1977Ro08. Q: hyperfine structure of muonic x-rays (1984Ta10). Other: 1970Ch27.
308.576[@] *3*	4$^+$	71 ps *10*	A CDEFG IJKLM	μ=+1.44 *16*; B(E2)↑=2.1 J$^\pi$: E2 215.3γ to 2$^+$, $\gamma\gamma(\theta)$ in ^{180}Hf IT decay (5.53 h). μ: Integral perturbed angular correlations (1996Al20). Other: μ==+2.0 *4*, Integral perturbed angular correlations (recalculated for consistency with adopted half-life) (1961Bo25,2011StZZ). Isotope shifts (1987Au07,1991Au02).

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Adopted Levels, Gammas (continued)

^{180}Hf Levels (continued)

E(level)†	Jπ	$T_{1/2}$‡	XREF	Comments
				$T_{1/2}$: from centroid shift in ^{180}Hf IT decay (5.53 h). Other: 86 ps from Coulomb excitation. B(E2)↑: from 1964Al25.
640.849@ *11*	6^+	10.0 ps *7*	CDEFG IJKLM	μ=+2.0 *4* Jπ: E2 332.3γ to 4^+, $\gamma\gamma(\theta)$ in ^{180}Hf IT decay (5.53 h). $T_{1/2}$: from DSAM and yield measurements in Coulomb excitation. μ: Integral perturbed angular correlation (1996Al20).
1084.006@ *15*	8^+	2.18 ps *11*	C FG IJKLM	Jπ: E2 443γ to 6^+, $\gamma\gamma(\theta)$ in ^{180}Hf IT decay (5.53 h). $T_{1/2}$: from DSAM and yield measurements in Coulomb excitation.
1101.9d *5*	0^+		D F I	XREF: D(?)F(1107). Jπ: E2 1009γ to 2^+, $\gamma(\theta)$ in ^{180}Hf(n,n′γ). E(level): a 0^+ level at 1107 keV was observed in ^{179}Hf(n,γ), E=thermal. Subsequent ^{180}Hf(n,n′γ) studies found no evidence for an 1107-keV level, instead identified a 0^+ level at 1102 keV. The evaluator assumes these correspond to the same level and adopts the level energy from ^{179}Hf(n,γ), E=thermal.
1141.552b *15*	8^-	5.53 h *2*	C FG LM	%IT=99.69 *8*; %β^-=0.31 *8* Q=+4.6 *3*; μ=+8.7 *10* Jπ: E1 57.5γ to 8^+, $\gamma\gamma(\theta)$ in ^{180}Hf IT decay (5.53 h). $T_{1/2}$: from ^{180}Hf IT decay (5.53 h). %β^-=0.023 *3* to 177 (J^π=8^+) level in ^{180}Ta (1985Ke02). %β^-=0.29 *5* (additional systematic uncertainty=0.06) to 77.1 (J^π=9^-) level in ^{180}Ta (1992Ke04). See 1992Ke04 for discussions on the relevance of this decay branch to the nucleosynthesis of ^{180}Ta (>1.2×10^{15} y) in stellar matter. μ: Mossbauer (1971Ko29). Others: 9.0 *9*, low temperature nuclear orientation (1976Kr11), 8.3 *18*, NMR on oriented nuclei (2014Mu03). Q: low temperature nuclear orientation (1973Ka31). Configuration=π7/2[404]⊗π9/2[514].
1164.11 *5*			F	
1183.36d *13*	2^+		A I kL	Jπ: M1(+E2) 1090γ to 2^+, 1183γ to 0^+, 875γ to 4^+.
1192.60 *6*	(6^+)		EF	Jπ: 3^+,6^+ based on population intensity in ^{179}Hf(n,γ), E=res:Av; 552γ to 6^+ favors J^π=6^+ assignment.
1199.72f *5*	2^+	0.51 ps *5*	A DEFG IJkL	B(E2)↑=0.113 *7* Jπ: L(t,p)=2. $T_{1/2}$: deduced from measured B(E2) in Coulomb excitation and adopted γ-ray branching ratios.
1260.70 *5*	(2^+)		EF	Jπ: 952γ to 4^+, 1261γ to 0^+.
1291.15f *5*	3^+		A EF I L	Jπ: M1+E2 982γ to 4^+, M1+E2 1198γ to 2^+, band assignment. J^π=4^+,5^+ from population intensity in ^{179}Hf(n,γ),E=res:Av is inconsistent.
1300.37 *6*	(2^+)		EF I K	XREF: K(1289). Jπ: population by 6088γ (E2) in ^{179}Hf(n,γ) E=res:Av and population in (pol p,p′) suggests J^π=(2^+). Tentatively (E1) multipolarity decomposed for 1300γ triplet from $\gamma(\theta)$ in ^{180}Hf(n,n′γ) suggests J^π=(1^-).
1315.7e *5*	0^+		D I	Jπ: L(t,p)=0.
1354.1? *3*	$(1^-,2^-,3^-)$		I	Jπ: (E1) 1261γ to 2^+.
1369.65d *8*	(4^+)		EF I KL	Jπ: 728γ to 6^+, 1276γ to 2^+.
1374.36& *4*	(4^-)	0.57 μs *2*	A EFG I LM	Jπ: from ^{179}Hf(d,p) and $\gamma(\theta)$ in ^{180}Hf(n,n′γ); configuration=9/2[624] − 1/2[510]. However, J^π=3^- in

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Adopted Levels, Gammas (continued)

^{180}Hf Levels (continued)

E(level)†	Jπ	$T_{1/2}$‡	XREF	Comments
				^{179}Hf(n,γ), E=thermal.
				$T_{1/2}$: from ^{179}Hf(n,γ), E=thermal.
1381.58 *5*	(3+,2+,4+)		EF	Jπ: 1073γ to 4+, 1289γ to 2+.
1384.6[b] *4*	9−		LM	
1409.26[f] *7*	(4+)		A EFg I L	Jπ: (E2) 1316γ to 2+, 768γ to 6+.
1409.36[e] *19*	(2+)		D g I	Jπ: L(t,p)=(2), 1101γ to 4+, 1409γ to 0+.
1420.6 *10*			F	
1429.82 *5*	(3−)		EF I	Jπ: 3−,6− from weak population by primary E1 5957γ in ^{179}Hf(n,γ), E=res:Av, 1337γ to 2+.
1444 *6*	(5−)		K	Jπ: from (pol p,p′).
1472.40 *6*	(6+)		EF	Jπ: 388γ to 8+, 1164γ to 4+.
1482.67[&] *4*	(5−)		DEFG I LM	Jπ: from ^{179}Hf(d,p), M1+E2 108γ to 4−, and band assignment.
1484.48 *6*			EF I	
1508 *2*			G I	
1525 *4*			G	
1539.29 *5*	(3−)		EF I	Jπ: 3−,6− from weak population by primary E1 in ^{179}Hf(n,γ), E=res:Av, 1447γ to 2+.
1557.33[f] *22*	(5+)		EF I L	Jπ: 266γ to 3+, 916γ to 6+, 1249γ to 4+, band assignment.
1559.29 *4*	(4+)		F K	Jπ: D 77γ to (5−), 259γ to (2+,1−).
1597.53 *11*	(4+,5+)		EF I	Jπ: 306γ to 3+, 956γ to 6+,
1607.67 *5*	(4)+		A D F I	Jπ: L(t,p)=(4), 408γ E2 to 2+.
1609.38 *4*	(3−)		A EFg I	Jπ: M1+E2 235γ to (4−), 410γ to 2+.
1613.09[&] *4*	(6−)		EFg I LM	Jπ: 130γ to (5−), 238γ to (4−), band assignment.
1631.0[@] *3*	10+	0.79 ps *4*	J LM	Jπ: E2 547γ to 8+. $T_{1/2}$: from DSAM and yield measurements in Coulomb excitation.
1633.43 *17*	(2+,3,4+)		I	Jπ: 434γ to 2+, 224γ to (4+).
1637.33 *14*	(2+)		EF I	Jπ: 1328γ to 4+, 1637γ to 0+.
1650 *4*	(3−)		G K	Jπ: from (pol p,p′). E(level): from (d,p).
1652.7[b] *4*	(10−)		LM	Jπ: 511γ to 8−, 268γ to 9−, band assignment.
1657.98[d] *10*	(6+)		F L	Jπ: 288γ to (4+), (D+Q) 1017γ to 6+, band assignment.
1686.9 *8*			G I	XREF: G(1689). Jπ: 1593γ to 2+ observed in (n,n′γ) is inconsistent with spin assignment of $J^{\pi}=(6^-)$ in (d,p). Possibly two distinct levels.
1700.84[a] *4*	(6+)	<5 ns	EF I LM	Jπ: 1391γ to 4+, 1061γ to 6+, band assignment. $T_{1/2}$: from comparison of γ-ray intensities across the bandhead for varying widths of coincidence time window in ^{180}Hf(^{136}Xe,^{136}Xe′γ).
1709.1 *5*	(5−)		DEF K	XREF: D(1716). Jπ: from (pol p,p′).
1724.47[f] *25*	(6+)		I L	Jπ: (E2) 1417γ to 4+, (M1) 1083γ to 6+, band assignment.
1724.88 *9*	(2+,3+,4+)		EF I	Jπ: M1+E2 434γ to 3+.
1738.8 *10*			F	
1742.67 *15*	(5)+		A I k	Jπ: (M1) 135γ to (4)+.
1743.38 *7*	(2+)		F I k	Jπ: 452γ to 3+, 313.5γ to (3−), 1743γ to 0+.
1756			D	
1765.1[&] *3*	(7−)		LM	Jπ: 282γ to (5−), 152γ to (6−), band assignment.
1787.7 *10*	(6−)		FG	Jπ: from (d,p).
1813.91 *8*	(3−)		EF K	XREF: K(1804). Jπ: from (pol p,p′).
1818.60 *4*	(5−)		EF	Jπ: M1 205.5γ to (6−), 1510γ to 4+.
1820.97 *17*	(3−)		d g I	Jπ: 447γ to (4−), 621γ to 2+.
1828.4 *10*			F	

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Adopted Levels, Gammas (continued)

^{180}Hf Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$[‡]	XREF	Comments
1839 *6*	3^-		K	Jπ: from (pol p,p′).
1862.4 *10*			G I	
1889 *3*			G	
1892.7[a] *4*	(7^+)		LM	Jπ: 192γ to (6^+), band assignment.
1901.9[g] *8*			L	
1904.0[h] *7*			L	
1904.2 *6*	$(1,2^+)$		d I	Jπ: 1811γ to 2^+, 1904γ to 0^+.
1909.72 *9*	$(4^+,3)$		dEFG	Jπ: 302γ to $(4)^+$, 710γ to 2^+, 536γ to (4^-). $J^\pi=(7^-)$ for 1908 *5* level is inconsistent with decay pattern and could correspond to a different level.
1926.4 *8*	3^-		G I K	Jπ: from (pol p,p′).
1928.7[f] *4*	(7^+)		L	Jπ: D 1288γ to 6^+, 845γ to 8^+, 371γ to (5^+), band assignment.
1931.9 *10*			F	
1937.2 *10*			D F	
1938.2[&] *4*	(8^-)		LM	
1945.23 *13*	(2^+)		F	Jπ: 1637γ to 4^+, 1947γ to 0^+.
1945.7[b] *5*	(11^-)		LM	Jπ: 561γ to 9^-, 293γ to (10^-), band assignment.
1948.6 *8*			I	
1971 *3*			G	
2022.6 *10*			FG	E(level): 1714γ to 4^+ is inconsistent with $J^\pi=(1^-)$ in (d,p); possibly two distinct levels.
2034.43 *7*			EF	
2046.9[d] *4*	(8^+)		L	Jπ: 388γ to (6^+), 963γ to 8^+, band assignment.
2059.0 *10*			F	
2075.3 *8*			G I k	$J^\pi=4^+$ for 2067 level in (pol p,p′).
2078.34 *12*			F k	$J^\pi=4^+$ for 2067 level in (pol p,p′).
2110.9[a] *4*	(8^+)		LM	Jπ: 410γ to (6^+), 218γ to (7^+), band assignment.
2120.1? *10*	1,2[#]	0.46 ps *22*	D H K	XREF: D(2115)K(2125).
2133.6[f] *4*	(8^+)		L	Jπ: stretched (E2) 1493γ to 6^+, (M1) 1050γ to 8^+.
2134.2[&] *4*	(9^-)		LM	Jπ: 409γ to (7^-), 196γ to (8^-), band assignment.
2147.1 *10*			FG	XREF: G(2143).
2151.48 *6*			EF	
2174.0 *3*	3^-		FG K	Jπ: from (pol p,p′).
2183.1 *3*			A	
2196.91 *22*			A	
2201.0 *10*			F K	XREF: K(2205).
2215.9 *10*			FG	
2242.6 *10*			FG	XREF: G(2238).
2246.1 *10*			F	
2252.9 *10*			F k	Jπ: 4^+ from (pol p,p′) for level at 2257 *6*.
2261.8 *7*			F k	Jπ: 4^+ from (pol p,p′) for level at 2257 *6*.
2262.3[b] *5*	(12^-)		LM	Jπ: 610γ to (10^-), 317γ to (11^-).
2271 *3*			G	
2273.0[g] *8*			L	
2274.3[@] *4*	12^+	0.37 ps *3*	J L	Jπ: E2 642γ to 10^+ and band structure observed in Coulomb excitation. $T_{1/2}$: from DSAM and yield measurements in Coulomb excitation.
2276.4 *10*			F	
2293.0 *10*			F K	
2300.9[h] *7*			L	
2303			D	
2316.71 *10*	$(4^-,5^-)$		EF	Jπ: 703γ to (6^-), 707γ to (3^-), 2008γ to 4^+.
2320.8 *7*			F	
2334.98 *21*			F	
2341.4 *10*			F	

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Adopted Levels, Gammas (continued)

^{180}Hf Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$[‡]	XREF	Comments
2348			D	
2350.4[&] *5*	(10⁻)		LM	Jπ: 412γ to (8⁻), 216γ to (9⁻), band assignment.
2351.8[a] *5*	(9⁺)		LM	Jπ: 459γ to (7⁺), 241γ to (8⁺), band assignment.
2369.0 *10*			F	
2377.7 *10*	1[#]	0.29 ps *7*	H	
2389.0 *6*	(1,2⁺)		I	Jπ: 2296γ to 2⁺, 2389γ to 0⁺.
2391 *6*	4⁺		K	Jπ: from (pol p,p′).
2398.9[f] *5*	(9⁺)		L	Jπ: (M1) 1315γ to 8⁺, 767γ to 10⁺, 470γ to (7⁺), band assignment.
2413.5 *10*			F	
2425.2 *12*	(10⁺)	<2 ns	M	K^{π}=(10⁺). Configuration=ν9/2[624]⊗ν11/2[615]. $T_{1/2}$: from γ(t) in ^{180}Hf(^{238}U,^{238}U′γ).
2447 *6*	5⁻		K	Jπ: from (pol p,p′).
2465.7 *10*			F	
2472.4 *7*			F	
2477.11 *10*	(4,5)		F	Jπ: 864γ to (6⁻), 938γ to (3⁻), 1186γ to 3⁺, 1835γ to 6⁺.
2482 *6*	3⁻		K	Jπ: from (pol p,p′).
2485.5[c] *5*	12⁺	0.94 μs *11*	M	K^{π}=12⁺. Configuration=π²8⁻⊗ν9/2[624]⊗ν1/2[510]. Jπ: 539.5γ to (11⁻), 832γ to (10⁻), 1101γ to 9⁻. $T_{1/2}$: from γ(t) in ^{180}Hf(^{238}U,^{238}U′γ). Other: 9.6 μs from 2000Wh04.
2493.5 *7*	1[#]	62 fs *13*	H	
2504.8 *10*			F	
2532.8[d] *4*	(10⁺)		L	Jπ: 485γ to (8⁺); band assignment.
2533 *20*	3⁻		K	Jπ: from (pol p,p′).
2537.4 *10*	(14⁺)	>10 μs	M	$T_{1/2}$: >>10 μs from ^{180}Hf(^{238}U,^{238}Uγ′). K^{π}=(14⁺). Configuration=π²8⁻⊗ν9/2[624]⊗ν3/2[512]. Jπ: 52γ to 12⁺.
2549.4 *10*			F	
2561.2 *7*			F	
2582.5 *7*	1[#]	10 fs *3*	H	
2588.0[&] *7*	(11⁻)		LM	Jπ: 454γ to (9⁻); band assignment.
2591 *20*	4⁺		K	Jπ: from (pol p,p′).
2603.1[b] *6*	(13⁻)		L	Jπ: 341γ to (12⁻), 657.5γ to (11⁻); band assignment.
2613.9[f] *4*	(10⁺)		L	Jπ: (E2) 1530γ to 8⁺; band assignment.
2614.8[a] *6*	(10⁺)		LM	Jπ: 504γ to (8⁺); band assignment.
2617.2 *7*	1[#]	9.5 fs *8*	H	
2623.6[c] *8*	(13⁺)		M	Jπ: 138γ to 12⁺; band assignment.
2680.04 *14*	4⁺,5⁻		F	Jπ: 980γ to (6⁺), 1141γ to (3⁻).
2682.4 *7*			F	
2706.2 *10*			F	
2712.5 *7*	1[#]	12.4 fs *24*	H	
2730.7[g] *4*			L	
2741.5 *5*			F	
2771.9 *10*			F	
2784.0 *10*			F	
2796.0[h] *7*			L	
2797.1 *6*			F	
2806.0 *10*			F	
2807.0[c] *6*	(14⁺)		M	Jπ: 183γ to (13⁺), 321.5γ to 12⁺; band assignment.
2812.4 *10*	1[#]	0.16 ps *3*	H	
2839.2 *5*			F	
2848.4[&] *7*	(12⁻)		LM	Jπ: 498γ to (10⁻); band assignment.

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Adopted Levels, Gammas (continued)

^{180}Hf Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$[‡]	XREF	Comments
2850.3 *6*			F	
2858.7 *7*			F	
2873.4 *10*			F	
2879.8 *10*	1,2[#]	0.25 ps *7*	H	
2892.3 *7*	1[#]	20.0 fs *21*	H	
2896.9[a] *6*	(11$^+$)		LM	Jπ: 545γ to (9$^+$); band assignment.
2913.6 *10*			F	
2948.0 *7*	1[#]	13.0 fs *9*	H	
2960.7[f] *6*	(11$^+$)		L	Jπ: 562γ to (9$^+$), 1330γ to 10$^+$; band assignment.
2965.4[b] *6*	(14$^-$)		L	Jπ: 703γ to (12$^-$); band assignment.
2993.1 *10*	1[#]	47 fs *5*	H	
3000.1 *10*			F	
3005.4[@] *5*	14$^+$		L	Jπ: (E2) 731γ to 12$^+$; band assignment.
3011.3 *7*	1[#]	30 fs *6*	H	
3022.6 *6*			F	
3049.7 *6*			F	
3058.6 *10*			F	
3068.8 *7*	1[#]	14.1 fs *13*	H	
3081.5 *10*	1[#]	0.17 ps *5*	H	
3083.6 *10*			F	
3086.0 *10*	1[#]	0.14 ps *3*	H	
3089.8 *7*			F	
3100.8 *10*			F	
3100.8[c] *9*	(15$^+$)		M	Jπ: 294γ to (14$^+$); band assignment.
3110.6[d] *5*	(12$^+$)		L	Jπ: 578γ to (10$^+$); band assignment.
3123.4[&] *8*	(13$^-$)		LM	Jπ: 535γ to (11$^-$); band assignment.
3124.1 *10*			F	
3125.6 *7*	1[#]	29 fs *3*	H	
3129.2[f] *5*	(12$^+$)		L	Jπ: (E2) 1498γ to 10$^+$; band assignment.
3131.7 *7*			F	
3150.7 *7*	1[#]	10 fs *4*	H	
3153.1 *10*			F	
3163.2 *10*			F	
3174.4 *10*			F	
3184.0 *7*			F	
3191.4[a] *7*	(12$^+$)		LM	Jπ: 577γ to (10$^+$); band assignment.
3200.4 *10*			F	
3215.3 *10*			F	
3253.1 *10*			F	
3254.3 *7*	1[#]	32 fs *8*	H	
3257.7 *10*			F	
3300.4[g] *5*			L	
3303.7 *10*			F	
3317.0 *5*			F	
3330.1 *10*	1[#]	95 fs *20*	H	
3330.3 *7*			F	
3338.7 *10*			F	
3350.2[b] *7*	(15$^-$)		L	Jπ: 747γ to (13$^-$); band assignment.
3384.0[h] *9*			L	
3417.2 *5*			F	
3428.7 *10*			F	

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Adopted Levels, Gammas (continued)

^{180}Hf Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$[‡]	XREF	Comments
3432.1[&] *9*	(14⁻)		L	Jπ: 584γ to (12⁻); band assignment.
3442.9 *10*			F	
3446.9[c] *9*	(16⁺)		M	Jπ: 639γ to (14⁺); band assignment.
3468.6 *10*			F	
3483.4 *10*			F	
3489.2 *10*			F	
3499.9 *10*			F	
3506.8 *10*	1,2[#]	77 fs *16*	H	
3515.7 *10*			F	
3526.7 *10*			F	
3528.9 *13*			M	
3559.6 *7*	1[#]	12.8 fs *23*	H	
3569.5 *7*	1[#]	30 fs *6*	H	
3584.2 *7*	1[#]	7.3 fs *19*	H	
3592.5 *7*	1[#]	16 fs *4*	H	
3596.5 *10*			F	
3597.5 *10*	(18⁻)	90 μs *10*	M	K^{π}=(18⁻). Configuration=$\pi^2 8^- \otimes \nu 9/2[624] \otimes \nu 11/2[615]$. Jπ: M2 151γ to (16⁺). $T_{1/2}$: from γ(t) in ^{180}Hf(^{238}U,^{238}U′γ).
3606.5[f] *7*	(13⁺)		L	Jπ: 646γ to (11⁺); band assignment.
3615.1 *7*	1[#]	13.0 fs *13*	H	
3625.4 *10*			F	
3627.1 *10*	1[#]	51 fs *12*	H	
3640.7 *10*			F	
3653.8 *10*			F	
3672.2 *7*			F	
3678.1[f] *6*	(14⁺)		L	Jπ: 549γ to (12⁺); band assignment.
3681.2 *10*			F	
3734.0[&] *10*	(15⁻)		L	Jπ: 611γ to (13⁻); band assignment.
3751.3 *7*			F	
3755.4[b] *7*	(16⁻)		L	Jπ: 790γ to (14⁻); band assignment.
3766.6 *7*	1[#]	10.0 fs *14*	H	
3774.3 *7*	1[#]	4.7 fs *19*	H	
3781.5[d] *6*	(14⁺)		L	Jπ: 671γ to (12⁺); band assignment.
3786.2 *7*	1[#]	8.6 fs *18*	H	
3804.1 *7*	1[#]	16 fs *3*	H	
3813.5[@] *7*	16⁺		L	Jπ: (E2) 808γ to 14⁺; band assignment.
3818.0 *10*	1[#]	40 fs *8*	H	
3829.6 *10*	1[#]	25 fs *5*	H	
3836.5 *7*	1[#]	14.7 fs *24*	H	
3848.3 *6*			F	
3851.7 *7*	1[#]	7.0 fs *14*	H	
3855.6 *10*			F	
3862.2 *10*	1,2[#]	69 fs *22*	H	
3869.2 *7*			F	
3880.3 *10*			F	
3889.4 *10*	1[#]	12.6 fs *16*	H	
3908.5 *10*			F	
3926.5 *7*			F	
3928.0 *10*	1[#]	22 fs *4*	H	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{180}Hf Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$[‡]	XREF	Comments
3948.1 *10*	1[#]	25 fs *6*	H	
3957.6 *7*			F	
3967.8 *10*	1[#]	18 fs *4*	H	
3971.3[g] *6*			L	
3975.3 *7*			F	
3978.4 *7*	1[#]	1.8 fs *9*	H	
3987.6 *10*			F	
3992.3 *10*			F	
4003.1 *7*			F	
4091.3[&] *10*	(16$^-$)		L	Jπ: 659γ to (14$^-$); band assignment.
4137.7 *10*			F	
4180.1[b] *8*	(17$^-$)		L	Jπ: 830γ to (15$^-$); band assignment.
4270.2[f] *7*	(16$^+$)		L	Jπ: 592γ to (14$^+$); band assignment.
4323.5[f] *12*	(15$^+$)		L	Jπ: 717γ to (13$^+$); band assignment.
4331.9 *10*			F	
4356.0 *10*			F	
4413.1[&] *11*	(17$^-$)		L	Jπ: 679γ to (15$^-$); band assignment.
4423.1 *7*			F	
4682.0[@] *9*	18$^+$		L	Jπ: 868.5γ to 16$^+$; band assignment.
4808.5 *7*			F	
4852.8 *7*			F	
4916.3 *5*			F	
4924.2[f] *12*	(18$^+$)		L	Jπ: 654γ to (16$^+$).
4965.4 *6*			F	
5048.3 *7*			F	
5057.6 *6*			F	
5554.0[@] *13*	20$^+$		L	Jπ: 872γ to 18$^+$; band assignment.
5629.2[f] *16*	(20$^+$)		L	Jπ: 705γ to (18$^+$); band assignment.
5666.0 *13*	(20$^+$)		L	Jπ: 984γ to 18$^+$.

[†] From least-squares fit to Eγ, by evaluator.
[‡] From ^{180}Hf(γ,γ′), except where noted.
[#] From γ(θ) in ^{180}Hf(γ,γ′).
[@] Band(A): $K^\pi=0^+$ g.s. rotational band.
[&] Band(B): 2 quasiparticle band on 1374 keV (4$^-$).
[a] Band(C): 2 quasiparticle band on 1703 keV (6$^+$).
[b] Band(D): 2 quasiparticle 8$^-$ band.
[c] Band(E): 4 quasiparticle 12$^+$ band.
[d] Band(F): $K^\pi=0^+$ rotational band.
[e] Band(G): $K^\pi=0^+$ rotational band.
[f] Band(H): $K^\pi=2^+$ γ vibrational band.
[g] Band(I): Low-K γ vibrational band. Suggested as even spin and positive parity by 2008Ta28.
[h] Band(J): Low-K γ vibrational band. Suggested as odd spin by 2008Ta28.

Adopted Levels, Gammas (continued)

γ(^{180}Hf)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α	Comments
93.3240	2+	93.324 *2*	100	0.0	0+	E2		4.63	α(K)=1.081 *16*; α(L)=2.70 *4*; α(M)=0.675 *10*; α(N+..)=0.1760 *25* B(E2)(W.u.)=154.8 *21* Mult.: from ce data in ^{180}Hf IT decay (5.53 h) and ^{179}Hf(n,γ), E=thermal.
308.576	4+	215.252 *2*	100	93.3240	2+	E2		0.225	α(K)=0.1364 *19*; α(L)=0.0678 *10*; α(M)=0.01659 *24*; α(N+..)=0.00438 *7* B(E2)(W.u.)=2.3×10^2 *4* Mult.: from ce data in ^{180}Hf IT decay (5.53 h) and ^{179}Hf(n,γ), E=thermal.
640.849	6+	332.271 *10*	100	308.576	4+	E2		0.0586	α(K)=0.0418 *6*; α(L)=0.01286 *18*; α(M)=0.00308 *5*; α(N+..)=0.000823 *12* B(E2)(W.u.)=219 *16* Mult.: from ce data in ^{180}Hf IT decay (5.53 h) and ^{179}Hf(n,γ), E=thermal.
1084.006	8+	443.162 *15*	100	640.849	6+	E2		0.0264	α(K)=0.0201 *3*; α(L)=0.00486 *7*; α(M)=0.001146 *16*; α(N+..)=0.000309 *5* B(E2)(W.u.)=245 *13* E_γ: from ^{180}Hf IT decay (5.53 h). Mult.: from ce data in ^{180}Hf IT decay (5.53 h) and ^{179}Hf(n,γ), E=thermal.
1101.9	0+	1008.6[@] *5*	100	93.3240	2+	E2		0.00402 *6*	α(K)=0.00332 *5*; α(L)=0.000539 *8*; α(M)=0.0001224 *18*; α(N+..)=3.36×10^{-5} *5*
1141.552	8−	57.538 *17*	100.0 *20*	1084.006	8+	E1		0.296	α(L)=0.230 *4*; α(M)=0.0523 *8*; α(N+..)=0.01377 *20* B(E1)(W.u.)=3.46×10^{-17} *10* α: experimental value from ^{180}Hf IT decay (5.53 h) (1986BeZE). E_γ,I_γ: from ^{180}Hf IT decay (5.53 h). Mult.: K forbidden E1 transition. Multipolarity from ce data in ^{180}Hf IT decay (5.53 h).
		500.697 *15*	29.6 *8*	640.849	6+	M2+E3	−5.3 *2*	0.0610	α(K)=0.0406 *6*; α(L)=0.01555 *22*; α(M)=0.00379 *6*; α(N+..)=0.001018 *15* B(E3)(W.u.)=7.11×10^{-10} *23*; B(M2)(W.u.)=9.8×10^{-15} *8* E_γ,I_γ: from ^{180}Hf IT decay (5.53 h). Mult.: from ce data in ^{180}Hf IT decay (5.53 h). δ: from γγ(θ) in ^{180}Hf IT decay (5.53 h).
1164.11		1070.7 *5*	100	93.3240	2+				
1183.36	2+	875.3[#] *3*	19[#] *4*	308.576	4+				
		1089.9[#] *2*	100[#] *7*	93.3240	2+	M1(+E2)	−0.3 *4*	0.0065 *9*	α(K)=0.0054 *7*; α(L)=0.00080 *10*; α(M)=0.000179 *21*; α(N+..)=5.0×10^{-5} *6*
		1183.2[@] *8*	3.3[@] *8*	0.0	0+				

$^{180}_{72}Hf_{108}$-9

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α	Comments
1192.60	(6$^+$)	551.75[f] *6*	<240[f]	640.849	6$^+$				
		884.7 *7*	100 *70*	308.576	4$^+$				
1199.72	2$^+$	890.9 *4*	3.0 *3*	308.576	4$^+$	[E2]		0.00518 *8*	α(K)=0.00426 *6*; α(L)=0.000717 *10*; α(M)=0.0001636 *23*; α(N+..)=4.48×10^{-5} *7* B(E2)(W.u.)=0.50 *8* I_γ: from ^{180}Lu β^- decay. Other: <10 for multiply placed 891γ in ^{179}Hf(n,γ), E=thermal.
		1106.00 *15*	94 *4*	93.3240	2$^+$	M1+E2	9.6 *+22−58*	0.00338 *18*	α(K)=0.00280 *15*; α(L)=0.000444 *21*; α(M)=0.000100 *5*; α(N+..)=2.79×10^{-5} *13* B(E2)(W.u.)=5.2 *6*; B(M1)(W.u.)=0.00016 *8* I_γ: weighted average of 98 *4* in ^{180}Lu β^- decay and 90 *4* in ^{179}Hf(n,γ), E=thermal. Mult.,δ: from Coulomb excitation (1974Va09). δ: Others: −0.45 *25* or <−10 (1983Gr30) and 2.2 *13* (1991Gr19); both from γ(θ) in ^{180}Hf(n,n′γ).
		1199.7[#] *2*	100[#] *7*	0.0	0$^+$	(E2)		0.00285 *4*	α(K)=0.00237 *4*; α(L)=0.000369 *6*; α(M)=8.34×10^{-5} *12*; α(N+..)=2.76×10^{-5} *4* B(E2)(W.u.)=3.7 *5*
1260.70	(2$^+$)	96.589 *10*	0.45 *13*	1164.11					
		952.2[f] *7*	<1.3[f]	308.576	4$^+$				
		1167.0[g] *10*	<3.7	93.3240	2$^+$				
		1260.8 *3*	100 *13*	0.0	0$^+$				
1291.15	3$^+$	982.1 *3*	19.9 *12*	308.576	4$^+$	M1+E2	−5.0 *+20−15*	0.0044 *3*	α(K)=0.00365 *24*; α(L)=0.00059 *4*; α(M)=0.000134 *8*; α(N+..)=3.69×10^{-5} *20*
		1197.8 *3*	100 *7*	93.3240	2$^+$	M1+E2		0.0041 *13*	α(K)=0.0034 *11*; α(L)=0.00051 *15*; α(M)=0.00012 *4*; α(N+..)=3.7×10^{-5} *10* δ: <−10 or 0.18 *5* (1991Gr19) and >3 (1983Gr30); both from γ(θ) in ^{180}Hf(n,n′γ).
1300.37	(2$^+$)	1300.5 *4*	100	0.0	0$^+$				
1315.7	0$^+$	1222.4[@] *5*	100	93.3240	2$^+$	E2		0.00275 *4*	α(K)=0.00229 *4*; α(L)=0.000355 *5*; α(M)=8.01×10^{-5} *12*; α(N+..)=2.91×10^{-5} *4*
1354.1?	(1$^-$,2$^-$,3$^-$)	1260.8[f@g] *3*	100[f]	93.3240	2$^+$	(E1)		0.001123 *16*	α=0.001123 *16*; α(K)=0.000916 *13*; α(L)=0.0001264 *18*; α(M)=2.81×10^{-5} *4*; α(N+..)=5.27×10^{-5}
1369.65	(4$^+$)	186.6[&] *5*		1183.36	2$^+$				
		728.1 *3*	4[@] *2*	640.849	6$^+$				
		1061.0 *3*	100[@] *20*	308.576	4$^+$				
		1276.5 *4*	6[@] *2*	93.3240	2$^+$				
1374.36	(4$^-$)	113.66 *2*	0.21 *4*	1260.70	(2$^+$)	[M2]		22.8	α(K)=16.46 *23*; α(L)=4.85 *7*; α(M)=1.180 *17*;

$^{180}_{72}Hf_{108}$-10

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α	Comments
									α(N+..)=0.327 *5* B(M2)(W.u.)=0.17 *4*
1374.36	(4⁻)	1065.77 *5*	100 *1*	308.576	4⁺	E1(+M2)	−0.12 *30*	0.0017 *22*	α(K)=0.0014 *18*; α(L)=0.0002 *3*; α(M)=5.E−5 *7*; α(N+..)=1.2×10^{-5} *19* B(E1)(W.u.)=2.85×10^{-10} *11*
		1281.7 *2*	4.42 *21*	93.3240	2⁺	[M2]		0.01080	α(K)=0.00898 *13*; α(L)=0.001402 *20*; α(M)=0.000317 *5*; α(N+..)=9.32×10^{-5} *13* B(M2)(W.u.)=1.99×10^{-5} *12* Iγ=24 *12* from ^{180}Lu β$^-$ decay disagrees with value from (n,γ).
1381.58	(3⁺,2⁺,4⁺)	81.21 *2*	100 *7*	1300.37	(2⁺)				
		1072.6 *5*	93 *67*	308.576	4⁺				
		1288.7[f] *5*	<215[f]	93.3240	2⁺				
1384.6	9⁻	242.9[&] *5*	100[&]	1141.552	8⁻				
1409.26	(4⁺)	209.51 *7*	1.6 *12*	1199.72	2⁺				
		768.1 *6*	4.9 *16*	640.849	6⁺				
		1100.60 *15*	100 *5*	308.576	4⁺	M1+E2		0.0050 *16*	α(K)=0.0042 *14*; α(L)=0.00063 *19*; α(M)=0.00014 *4*; α(N+..)=3.9×10^{-5} *12*
		1316.4 *3*	70.0 *21*	93.3240	2⁺	(E2)		0.00240 *4*	α(K)=0.00199 *3*; α(L)=0.000303 *5*; α(M)=6.84×10^{-5} *10*; α(N+..)=3.98×10^{-5} *6*
1409.36	(2⁺)	1100.7[@] *5*	100[@] *50*	308.576	4⁺	(E2)		0.00337 *5*	α(K)=0.00280 *4*; α(L)=0.000444 *7*; α(M)=0.0001006 *15*; α(N+..)=2.79×10^{-5} *4*
		1316.1[@] *8*	29[@] *15*	93.3240	2⁺	(E2)		0.00240 *4*	α(K)=0.00199 *3*; α(L)=0.000304 *5*; α(M)=6.84×10^{-5} *10*; α(N+..)=3.97×10^{-5} *6*
		1409.3[@]	12[@] *3*	0.0	0⁺				
1420.6		1112[c]	100	308.576	4⁺				
1429.82	(3⁻)	55.449[g] *3*	47 *11*	1374.36	(4⁻)				
		1121.7 *5*	100 *17*	308.576	4⁺				
		1336.8 *10*	61 *25*	93.3240	2⁺				
1472.40	(6⁺)	181.26[g] *4*	24 *12*	1291.15	3⁺				Eγ: questionable placement as level scheme would require M3 or E4 multipolarity for the transition.
		388.45 *14*	100 *16*	1084.006	8⁺				
		830.8 *4*	72 *20*	640.849	6⁺				
		1163.9 *10*	52 *28*	308.576	4⁺				
1482.67	(5⁻)	108.308 *2*	100 *4*	1374.36	(4⁻)	M1+E2[a]	0.80[a] *12*	2.95 *6*	α(K)=1.93 *14*; α(L)=0.78 *7*; α(M)=0.189 *19*; α(N+..)=0.050 *5*
		1389.0 *7*	8 *3*	93.3240	2⁺				
1484.48		223.76 *6*	100 *70*	1260.70	(2⁺)				
		1391.1[f] *10*	<130[f]	93.3240	2⁺				
1508		1416.6[e@g] *4*	100	93.3240	2⁺				
1539.29	(3⁻)	109.476 *3*	100 *10*	1429.82	(3⁻)				

$^{180}_{72}Hf_{108}$-11

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult. ‡	δ ‡	α	Comments
1539.29	(3⁻)	900.5 cg		640.849	6⁺				E_γ: questionable placement as level scheme would require E3 or M4 multipolarity for the transition.
		1231.9 5	55 10	308.576	4⁺				
		1446.9 10	<21	93.3240	2⁺				
1557.33	(5⁺)	266.1 @ 7	7 3	1291.15	3⁺				
		915.8 4	21 3	640.849	6⁺				I_γ: other: 13.3 12 in ^{180}Hf(^{136}Xe,^{136}Xe′γ).
		1249.1 3	100 3	308.576	4⁺				
1559.29	(4⁺)	76.624 3	100 10	1482.67	(5⁻)	D a			
		177.71 3	35 6	1381.58	(3⁺,2⁺,4⁺)				
		258.90 f g 3	<21 f	1300.37	(2⁺)				
1597.53	(4⁺,5⁺)	125.26 3	22 13	1472.40	(6⁺)				
		306.40 10	47 6	1291.15	3⁺				
		956.3 5	50 25	640.849	6⁺				
		1288.7 f	100 f 25	308.576	4⁺				
1607.67	(4)⁺	177.86 3	12 3	1429.82	(3⁻)				
		198.3 # 2	2.57 # 13	1409.36	(2⁺)	[E2]		0.296	α(K)=0.1712 25; α(L)=0.0950 14; α(M)=0.0233 4; α(N+..)=0.00615 9
		233.33 8	14 3	1374.36	(4⁻)				
		316.50 # 3	30.0 # 9	1291.15	3⁺	E2 a		0.0675	α(K)=0.0476 7; α(L)=0.01532 22; α(M)=0.00368 6; α(N+..)=0.000982 14
		407.94 2	100.0 19	1199.72	2⁺	E2 a		0.0329	α(K)=0.0247 4; α(L)=0.00636 9; α(M)=0.001506 21; α(N+..)=0.000405 6
		424.4 # 2	2.8 # 4	1183.36	2⁺	E2		0.0296	α(K)=0.0223 4; α(L)=0.00559 8; α(M)=0.001320 19; α(N+..)=0.000355 5
		1299.3 # 2	31.3 # 13	308.576	4⁺	(E2)		0.00246 4	α(K)=0.00204 3; α(L)=0.000312 5; α(M)=7.03×10⁻⁵ 10; α(N+..)=3.72×10⁻⁵ 6
		1514.4 # 2	20.0 # 20	93.3240	2⁺	[E2]		0.00190 3	α(K)=0.001532 22; α(L)=0.000228 4; α(M)=5.13×10⁻⁵ 8; α(N+..)=8.86×10⁻⁵ 13
1609.38	(3⁻)	235.024 6	100.0 25	1374.36	(4⁻)	M1+E2 a	0.4 a 3	0.33 4	α(K)=0.27 4; α(L)=0.0465 7; α(M)=0.0106 3; α(N+..)=0.00292 6 δ: others: −0.4 1 or >25 (1983Gr30) and +0.09 3 or −15 +10−5 (1991Gr19) both from γ(θ) in ^{180}Hf(n,n′γ).
		409.61 8	4.0 7	1199.72	2⁺				
		1300.3 @	50 @ 7	308.576	4⁺	(E1)		0.001085 16	α=0.001085 16; α(K)=0.000868 13; α(L)=0.0001196 17; α(M)=2.66×10⁻⁵ 4; α(N+..)=7.03×10⁻⁵
		1516.5 4	4.7 13	93.3240	2⁺				
1613.09	(6⁻)	53.800 1	41 4	1559.29	(4⁺)				
		129.7 & 5	58 & 3	1482.67	(5⁻)				E_γ: an unplaced M1 130.26γ observed in

$^{180}_{72}Hf_{108}$-12

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α	Comments
									^{179}Hf(n,γ), E=thermal could correspond to this placement.
1613.09	(6$^-$)	238.1 *5*	100 *8*	1374.36	(4$^-$)				
		243.40 *10*	13 *6*	1369.65	(4$^+$)				I_γ: other: 100 *3* in ^{180}Hf(^{136}Xe,^{136}Xe′γ).
1631.0	10$^+$	547.3[&] *5*	100[&]	1084.006	8$^+$	E2		0.01547	α(K)=0.01215 *18*; α(L)=0.00256 *4*; α(M)=0.000596 *9*; α(N+..)=0.0001616 *23* B(E2)(W.u.)=238 *12* Mult.: stretched Q from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′γ).
1633.43	(2$^+$,3,4$^+$)	224.1[@] *8*	45 *20*	1409.26	(4$^+$)				
		342.3[@] *3*	100 *25*	1291.15	3$^+$				
		433.7[f@] *2*	<225[f]	1199.72	2$^+$	M1+E2	+0.4 *3*	0.064 *8*	α(K)=0.053 *8*; α(L)=0.0083 *7*; α(M)=0.00188 *15*; α(N+..)=0.00052 *5*
1637.33	(2$^+$)	255.34[g] *3*	22 *3*	1381.58	(3$^+$,2$^+$,4$^+$)				
		346.25 *14*	100 *24*	1291.15	3$^+$				
		1328.4 *10*	62 *14*	308.576	4$^+$				
		1543.8 *5*	27 *14*	93.3240	2$^+$				
		1636.8[f] *5*	<38[f]	0.0	0$^+$				
1652.7	(10$^-$)	268.1[&] *5*	100.0 *16*	1384.6	9$^-$				
		511.2[&] *5*	10.5 *16*	1141.552	8$^-$				
1657.98	(6$^+$)	288.4[&] *5*		1369.65	(4$^+$)				
		1017.1 *1*		640.849	6$^+$	(D+Q)			Mult.: stretched Q or unstretched D+Q from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′γ). (D+Q) from assumed band assignment.
		1350[&] *1*		308.576	4$^+$				
1686.9		1593.6[@] *8*	100	93.3240	2$^+$				
1700.84	(6$^+$)	141.55 *1*		1559.29	(4$^+$)				Mult.,δ: M1+E2 with δ=1.2 *+16−6* from ce data in ^{180}Hf(n,n′γ) is inconsistent with ΔJ=2 from level scheme.
		1061.0[f] *3*	78[f&] *5*	640.849	6$^+$				
		1391.1[f] *10*	100[f&] *13*	308.576	4$^+$				
1709.1	(5$^-$)	1400.5 *5*	100	308.576	4$^+$				
1724.47	(6$^+$)	314.8[&] *5*	38[&] *4*	1409.26	(4$^+$)				
		1082.8[@] *5*	97.1[&] *21*	640.849	6$^+$	(M1)		0.00684 *10*	α(K)=0.00575 *8*; α(L)=0.000844 *12*; α(M)=0.000189 *3*; α(N+..)=5.24×10^{-5} *8* Mult.: D from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′γ), Δπ=no from level scheme.
		1416.6[@] *4*	100.0[&] *14*	308.576	4$^+$	(E2)		0.00211 *3*	α(K)=0.001733 *25*; α(L)=0.000261 *4*; α(M)=5.87×10^{-5} *9*; α(N+..)=6.09×10^{-5} *9*

$^{180}_{72}Hf_{108}$-13

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α	Comments
								Mult.: stretched Q from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′γ).
1724.88	(2$^+$,3$^+$,4$^+$)	355.2 *1*	20 *6*	1369.65	(4$^+$)			
		433.71 *12*	67 *6*	1291.15	3$^+$	M1+E2	0.049 *21*	α(K)=0.040 *19*; α(L)=0.0070 *19*; α(M)=0.0016 *4*; α(N+..)=0.00044 *11*
		1416.7 *3*	100 *12*	308.576	4$^+$			
		1631.4 *7*	24 *10*	93.3240	2$^+$			
1738.8		256.1[c]	100	1482.67	(5$^-$)			
1742.67	(5)$^+$	135.0[#] *2*	90[#] *13*	1607.67	(4)$^+$	(M1)[a]	1.700	α(K)=1.416 *21*; α(L)=0.220 *4*; α(M)=0.0497 *8*; α(N+..)=0.01375 *21* Mult.: from unplaced 135.09γ seen in ^{179}Hf(n,γ), E=thermal.
		333.0[#] *5*	60[#] *7*	1409.26	(4$^+$)			
		451.6[#] *2*	45.8[#] *21*	1291.15	3$^+$			
		1434.1[#g] *2*	100[#] *10*	308.576	4$^+$			
1743.38	(2$^+$)	258.90[f] *3*	48[f] *5*	1484.48				
		313.50 *10*	62 *5*	1429.82	(3$^-$)			
		452.53 *16*	76 *14*	1291.15	3$^+$			
		1650.2 *7*	67 *33*	93.3240	2$^+$			
		1743.2 *2*	100 *29*	0.0	0$^+$			
1765.1	(7$^-$)	152.2[&] *5*	28[&] *4*	1613.09	(6$^-$)			
		282.3[&] *5*	100[&] *4*	1482.67	(5$^-$)			
1787.7	(6$^-$)	303.2[c]	100	1484.48				
1813.91	(3$^-$)	207.0[c]		1607.67	(4)$^+$			
		254.61 *9*	100 *5*	1559.29	(4$^+$)			
		274.6 *1*	84 *11*	1539.29	(3$^-$)			
		331.1[c]		1482.67	(5$^-$)			
		1721.0 *7*	37 *32*	93.3240	2$^+$			
1818.60	(5$^-$)	205.51 *1*	100 *4*	1613.09	(6$^-$)	M1[a]	0.523	α(K)=0.436 *7*; α(L)=0.0673 *10*; α(M)=0.01519 *22*; α(N+..)=0.00420 *6*
		1510.5 *7*	8 *4*	308.576	4$^+$			
1820.97	(3$^-$)	208.5[@g] *3*	75 *30*	1613.09	(6$^-$)			E_γ: questionable placement as level scheme would require M3 or E4 multipolarity for the transition.
		446.8[@] *3*	100 *25*	1374.36	(4$^-$)			
		451[g]	<10	1369.65	(4$^+$)			
		529.0[@] *3*	75 *20*	1291.15	3$^+$			
		621.3[@] *5*	90 *25*	1199.72	2$^+$			
1828.4		1519.8[c]	100	308.576	4$^+$			
1862.4		1553.8 *10*	100	308.576	4$^+$			
1892.7	(7$^+$)	192.0[&] *5*	100[&]	1700.84	(6$^+$)			
1901.9		1261[&] *1*	100[&]	640.849	6$^+$			
1904.0		1263 *1*	100	640.849	6$^+$			
1904.2	(1,2$^+$)	1810.9[@] *8*	100 *43*	93.3240	2$^+$			

$^{180}_{72}Hf_{108}$-14

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α	Comments
1904.2	(1,2$^+$)	1904.1[@] *8*	57 *29*	0.0	0$^+$			
1909.72	(4$^+$,3)	302.06 *8*	100 *30*	1607.67	(4)$^+$			
		536.2[c]		1374.36	(4$^-$)			
		709.8 *4*	70 *35*	1199.72	2$^+$			
1926.4	3$^-$	1926.4[@] *8*	100	0.0	0$^+$			
1928.7	(7$^+$)	371.2[&] *5*	51[&] *3*	1557.33	(5$^+$)			
		844.9[&] *5*	7.0[&] *10*	1084.006	8$^+$			
		1288[&] *1*	100[&] *5*	640.849	6$^+$	M1	0.00449 *7*	α(K)=0.00376 *6*; α(L)=0.000549 *8*; α(M)=0.0001232 *18*; α(N+..)=5.54×10^{-5} *8* Mult.: D from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′γ), Δπ=no from level scheme.
1931.9		322.5[c]	100	1609.38	(3$^-$)			
1937.2		329.5[c]	100	1607.67	(4)$^+$			
1938.2	(8$^-$)	173.0[&] *5*	26[&] *4*	1765.1	(7$^-$)			
		325.3[&] *5*	100[&] *7*	1613.09	(6$^-$)			
1945.23	(2$^+$)	385.84 *14*	43 *9*	1559.29	(4$^+$)			
		654.9 *6*	30 *5*	1291.15	3$^+$			
		745.4 *4*	32 *14*	1199.72	2$^+$			
		1636.8[f] *5*	<32[f]	308.576	4$^+$			
		1853.0[g] *7*	18 *16*	93.3240	2$^+$			
		1946.5 *7*	100 *11*	0.0	0$^+$			
1945.7	(11$^-$)	293.0[&] *5*	100.0[&] *17*	1652.7	(10$^-$)			
		560.9[&] *5*	14[&] *3*	1384.6	9$^-$			
1948.6		1948.6[@] *8*	100	0.0	0$^+$			
2022.6		1714.0[c]	100	308.576	4$^+$			
2034.43		551.75[f] *6*	100[f] *17*	1482.67	(5$^-$)			
		743.4 *2*	<100	1291.15	3$^+$			
		1941.0 *7*	42 *25*	93.3240	2$^+$			
2046.9	(8$^+$)	388.1[&] *5*	100[&] *9*	1657.98	(6$^+$)			
		962.9[&] *5*	53[&] *6*	1084.006	8$^+$			
2059.0		576.3[c]		1482.67	(5$^-$)			
2075.3		1982.0[@] *8*	100	93.3240	2$^+$			
2078.34		465.25[c] *11*	100 *9*	1613.09	(6$^-$)			
		703.3[cg] *5*	31 *15*	1374.36	(4$^-$)			
		1767.6[c] *2*	100 *25*	308.576	4$^+$			E_γ: poor energy fit, excluded from least-squares fitting. E from level energy difference is 1769.8.
		1986.7[c]		93.3240	2$^+$			
2110.9	(8$^+$)	218.3[&] *5*	100[&] *4*	1892.7	(7$^+$)			

$^{180}_{72}Hf_{108}$-15

Adopted Levels, Gammas (continued)

$\gamma(^{180}Hf)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α	Comments
2110.9	(8^+)	409.9[&] *5*	17[&] *4*	1700.84	(6^+)			
2120.1?	1,2	2120.1	100	0.0	0^+	(D+Q)[b]		
2133.6	(8^+)	409.0[&] *5*	76[&] *4*	1724.47	(6^+)			
		1050[&] *1*	65.9[&] *15*	1084.006	8^+	(M1)	0.00738 *11*	α(K)=0.00620 *9*; α(L)=0.000911 *13*; α(M)=0.000205 *3*; α(N+..)=5.66×10^{-5} *8* Mult.: D from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′γ), $\Delta\pi$=no from level scheme.
		1493[&] *1*	100.0[&] *15*	640.849	6^+	(E2)	0.00194 *3*	α(K)=0.001572 *22*; α(L)=0.000235 *4*; α(M)=5.28×10^{-5} *8*; α(N+..)=8.20×10^{-5} *12* Mult.: stretched Q from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′γ), E2 from assumed band structure.
2134.2	(9^-)	196.2[&] *5*	16[&] *4*	1938.2	(8^-)			
		369.1[&] *5*	100[&] *16*	1765.1	(7^-)			
2147.1		1838.5[c]	100	308.576	4^+			
2151.48		538.39 *4*	100 *6*	1613.09	(6^-)			
		890.9[f] *4*	<43[f]	1260.70	(2^+)			
		952.2[f] *7*	<8[f]	1199.72	2^+			
		2058.3 *17*	15 *9*	93.3240	2^+			
2174.0	3^-	799.9[c] *3*	100 *21*	1374.36	(4^-)			
		1864.8[c] *5*	26 *16*	308.576	4^+			
2183.1		1874.5[#] *3*	100[#]	308.576	4^+			
2196.91		997.1[#] *3*	15[#] *5*	1199.72	2^+			
		1888.4[#] *3*	100[#] *17*	308.576	4^+			
2201.0		826.6[c]	100	1374.36	(4^-)			
2215.9		1575.0[c]	100	640.849	6^+			
2242.6		868.2[c]	100	1374.36	(4^-)			
2246.1		1937.5[c]	100	308.576	4^+			
2252.9		643.5[c]	100	1609.38	(3^-)			
2261.8		1620.5[c]		640.849	6^+			
		1953.6[c]		308.576	4^+			
2262.3	(12^-)	316.9[&] *5*	100[&] *4*	1945.7	(11^-)			
		610.0[&] *5*	37[&] *4*	1652.7	(10^-)			
2273.0		371.1[&] *5*	11[&] *3*	1901.9				
		1189[&] *1*	100[&] *6*	1084.006	8^+			
2274.3	12^+	643.4[&] *5*	100[&]	1631.0	10^+	(E2)	0.01055	α(K)=0.00844 *12*; α(L)=0.001627 *23*; α(M)=0.000376 *6*; α(N+..)=0.0001023 *15* B(E2)(W.u.)=227 *19* Mult.: stretched Q from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′γ), E2 from assumed band structure.

$^{180}_{72}Hf_{108}$-16

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α	Comments
2276.4		667.0[c]	100	1609.38	(3⁻)			
2293.0		1984.4[c]	100	308.576	4⁺			
2300.9		396.8[&] *5*		1904.0				
		1217[&] *1*		1084.006	8⁺			
2316.71	(4⁻,5⁻)	282.28 *8*	100 *14*	2034.43				
		703.3 *5*	26 *14*	1613.09	(6⁻)			
		707.3 *5*	21 *12*	1609.38	(3⁻)			
		2008.3 *17*	36 *14*	308.576	4⁺			
2320.8		946.6[c]		1374.36	(4⁻)			
		2012.1[c]		308.576	4⁺			
2334.98		725.6[c] *2*	100	1609.38	(3⁻)			
2341.4		2032.8[c]	100	308.576	4⁺			
2350.4	(10⁻)	216.2[&] *5*		2134.2	(9⁻)			
		412.2[&] *5*		1938.2	(8⁻)			
2351.8	(9⁺)	241.0[&] *5*	100[&] *5*	2110.9	(8⁺)			
		459.0[&] *5*	42[&] *5*	1892.7	(7⁺)			
2369.0		759.6[c]	100	1609.38	(3⁻)			
2377.7	1	2377.7[b]	100[b]	0.0	0⁺	D[b]		
2389.0	(1,2⁺)	2295.2[@] *8*	100 *67*	93.3240	2⁺			
		2389.4[@] *8*	100 *67*	0.0	0⁺			
2398.9	(9⁺)	470.4[&] *5*	48[&] *5*	1928.7	(7⁺)			
		767[&] *1*	[&]	1631.0	10⁺			
		1315[e] *1*	100 *5*	1084.006	8⁺	(M1)	0.00428 *6*	α(K)=0.00358 *5*; α(L)=0.000522 *8*; α(M)=0.0001170 *17*; α(N+..)=5.98×10⁻⁵ *9* Mult.: D from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′γ), Δπ=no from level scheme.
2413.5		2104.9[c]	100	308.576	4⁺			
2425.2	(10⁺)	481[d] *3*	≈10[d]	1945.7	(11⁻)	[E1]	0.00715 *14*	α(K)=0.00602 *12*; α(L)=0.000877 *18*; α(M)=0.000196 *4*; α(N+..)=5.38×10⁻⁵ *11* B(E1)(W.u.)>7.2×10⁻⁸
		771.7[d] *22*	≈100[d]	1652.7	(10⁻)	[E1]	0.00268 *4*	α(K)=0.00227 *4*; α(L)=0.000320 *5*; α(M)=7.15×10⁻⁵ *11*; α(N+..)=1.97×10⁻⁵ *3* B(E1)(W.u.)>1.8×10⁻⁷
		1040.8[d] *15*	≈20[d]	1384.6	9⁻	[E1]	0.001521 *22*	α=0.001521 *22*; α(K)=0.001290 *19*; α(L)=0.000180 *3*; α(M)=4.00×10⁻⁵ *6* α(N+..)=1.101×10⁻⁵ *1* B(E1)(W.u.)>1.4×10⁻⁸
2465.7		856.3[c]	100	1609.38	(3⁻)			

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult.‡	α	Comments
2472.4		865.2[c]		1607.67	$(4)^+$			
		2163.4[c]		308.576	4^+			
2477.11	(4,5)	160.40 *3*	48 *12*	2316.71	$(4^-,5^-)$			
		864.2 *3*	56 *16*	1613.09	(6^-)			
		917.4 *5*	100 *32*	1559.29	(4^+)			
		937.8 *5*	64 *32*	1539.29	(3^-)			
		1185.8 *6*	48 *24*	1291.15	3^+			
		1835.8 *10*	28 *24*	640.849	6^+			
2485.5	12^+	223.3[d] *2*	2.8[d] *3*	2262.3	(12^-)	[E1]	0.0445	α(K)=0.0372 *6*; α(L)=0.00572 *9*; α(M)=0.001288 *19*; α(N+..)=0.000350 *5* B(E1)(W.u.)=4.0×10^{-10} *7*
		539.5[d] *3*	100[d] *5*	1945.7	(11^-)	[E1]	0.00557 *8*	α(K)=0.00470 *7*; α(L)=0.000679 *10*; α(M)=0.0001520 *22*; α(N+..)=4.17×10^{-5} *6* B(E1)(W.u.)=1.01×10^{-9} *14*
		832.4[d] *15*	1.3[d] *5*	1652.7	(10^-)	[M2]	0.0342	α(K)=0.0282 *5*; α(L)=0.00465 *7*; α(M)=0.001059 *16*; α(N+..)=0.000293 *5* B(M2)(W.u.)=2.4×10^{-5} *10*
		1101.1[d] *7*	37[d] *3*	1384.6	9^-	[E3]	0.00723 *11*	α(K)=0.00578 *9*; α(L)=0.001122 *16*; α(M)=0.000260 *4*; α(N+..)=7.12×10^{-5} *10* B(E3)(W.u.)=0.089 *14*
2493.5	1	2400.3[b]	100[b]	93.3240	2^+			
		2493.3[b]	35[b] *17*	0.0	0^+	D[b]		
2504.8		2196.2[c]	100	308.576	4^+			
2532.8	(10^+)	485.2[&] *5*	100[&] *21*	2046.9	(8^+)			
		902.4[&] *5*	71[&] *7*	1631.0	10^+			
2537.4	(14^+)	52	100	2485.5	12^+	[E2]	58.3	α(L)=44.4 *7*; α(M)=11.07 *16*; α(N+..)=2.88 *4* B(E2)(W.u.)<0.046
2549.4		1175.0[c]	100	1374.36	(4^-)			
2561.2		1079.4[c]		1482.67	(5^-)			
		1185.9[c]		1374.36	(4^-)			
2582.5	1	2489.3[b]	61[b] *27*	93.3240	2^+			
		2582.3[b]	100[b]	0.0	0^+	D[b]		
2588.0	(11^-)	453.8[&] *5*	100[&]	2134.2	(9^-)			
2603.1	(13^-)	340.6[&] *5*	100[&] *7*	2262.3	(12^-)			
		657.5[&] *5*	43[&] *7*	1945.7	(11^-)			
2613.9	(10^+)	480.3[&] *5*	100[&] *8*	2133.6	(8^+)			
		983.0[&] *5*	34[&] *6*	1631.0	10^+			
		1530[&] *1*	89[&] *8*	1084.006	8^+	(E2)	0.00187 *3*	α(K)=0.001503 *22*; α(L)=0.000223 *4*; α(M)=5.02×10^{-5} *7*;

$^{180}_{72}Hf_{108}$-18

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	Comments
							α(N+..)=9.35×10^{-5} *14* Mult.: stretched Q from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′γ), assumed E2.
2614.8	(10$^+$)	263.0[&] *5*	100[&] *9*	2351.8	(9$^+$)		
		504.0[&] *5*	64[&] *9*	2110.9	(8$^+$)		
2617.2	1	2523.9[b]	100[b]	93.3240	2$^+$		
		2617.2[b]	49[b] *7*	0.0	0$^+$	D[b]	
2623.6	(13$^+$)	138	100	2485.5	12$^+$		
2680.04	4$^+$,5$^-$	363.32 *10*	76 *14*	2316.71	(4$^-$,5$^-$)		
		979.7 *7*	<104	1700.84	(6$^+$)		
		1140.8 *8*	100 *29*	1539.29	(3$^-$)		
		1488.0 *10*	29 *24*	1192.60	(6$^+$)		
2682.4		1073.3[c]		1609.38	(3$^-$)		
		1199.4[c]		1482.67	(5$^-$)		
2706.2		2397.6[c]	100	308.576	4$^+$		
2712.5	1	2619.3[b]	56[b] *11*	93.3240	2$^+$		
		2712.3[b]	100[b]	0.0	0$^+$	D[b]	
2730.7		456.7[&] *5*	47[&] *3*	2273.0			
		596.7[&] *5*	19[&] *3*	2133.6	(8$^+$)		
		1098[&] *1*	100[&] *7*	1631.0	10$^+$	(D+Q)	Mult.: from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′γ).
2741.5		1131.0[c]		1609.38	(3$^-$)		
		1262.0[c]		1482.67	(5$^-$)		E_γ: poor energy fit, excluded from least-squares fitting. E from level energy difference is 1258.8.
		1367.7[c]		1374.36	(4$^-$)		
		2430.1[c]		308.576	4$^+$		
2771.9		1397.5[c]	100	1374.36	(4$^-$)		
2784.0		1301.3[c]	100	1482.67	(5$^-$)		
2796.0		495.1[&] *5*		2300.9			
		1165[&] *1*		1631.0	10$^+$		
2797.1		1316.9[c]		1482.67	(5$^-$)		
		1419.4[c]		1374.36	(4$^-$)		E_γ: poor energy fit, excluded from least-squares fitting. E from level energy difference is 1422.7.
		2489.4[c]		308.576	4$^+$		
2806.0		1431.6[c]	100	1374.36	(4$^-$)		
2807.0	(14$^+$)	183.4[d] *6*	57[d] *11*	2623.6	(13$^+$)		
		270.0[d] *20*	41[d] *23*	2537.4	(14$^+$)		
		321.5[d] *3*	100[d] *16*	2485.5	12$^+$		
2812.4	1	2812.4	100	0.0	0$^+$		
2839.2		1231.6[c]		1607.67	(4)$^+$		

$^{180}_{72}Hf_{108}$-19

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α	Comments
2839.2		1356.4[c]		1482.67	(5⁻)			
		1469.6[c] *7*		1369.65	(4⁺)			
2848.4	(12⁻)	498.0[&] *5*	100[&]	2350.4	(10⁻)			
2850.3		1239.7[c]		1609.38	(3⁻)			
		1365.4[c]		1484.48				
		2543.2[c]		308.576	4⁺			
2858.7		1249.3[c]		1609.38	(3⁻)			
		2550.2[c]		308.576	4⁺			
2873.4		2564.8[c]	100	308.576	4⁺			
2879.8	1,2	2879.8[b]	100[b]	0.0	0⁺	(D+Q)[b]		
2892.3	1	2799.1[b]	100[b]	93.3240	2⁺			
		2892.1[b]	47[b] *11*	0.0	0⁺	D[b]		
2896.9	(11⁺)	282.0[&] *5*	80[&] *20*	2614.8	(10⁺)			
		545.0[&] *5*	100[&] *20*	2351.8	(9⁺)			
2913.6		2272.7[c]	100	640.849	6⁺			
2948.0	1	2854.8[b]	100[b]	93.3240	2⁺			
		2947.8[b]	40[b] *5*	0.0	0⁺	D[b]		
2960.7	(11⁺)	561.7[&] *5*	48[&] *5*	2398.9	(9⁺)			
		1330[&] *1*	100[&] *10*	1631.0	10⁺			
2965.4	(14⁻)	362.3[&] *5*	100[&] *17*	2603.1	(13⁻)			
		703.0[&] *5*	83[&] *17*	2262.3	(12⁻)			
2993.1	1	2993.1[b]	100[b]	0.0	0⁺	D[b]		
3000.1		2691.5[c]	100	308.576	4⁺			
3005.4	14⁺	730.9[&] *5*	100[&]	2274.3	12⁺	(E2)	0.00792 *12*	α(K)=0.00641 *9*; α(L)=0.001165 *17*; α(M)=0.000268 *4*; α(N+..)=7.30×10^{-5} *11* Mult.: stretched Q from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′), E2 from assumed band structure.
3011.3	1	2918.1[b]	100[b]	93.3240	2⁺			
		3011.1[b]	80[b] *26*	0.0	0⁺	D[b]		
3022.6		1540.5[c]		1482.67	(5⁻)			
		2711.5[c]		308.576	4⁺			
		2931.1[c]		93.3240	2⁺			
3049.7		1437.4[c]		1613.09	(6⁻)			
		2406.9[c]		640.849	6⁺			
		2742.1[c]		308.576	4⁺			
3058.6		2750.0[c]	100	308.576	4⁺			
3068.8	1	2975.6[b]	100[b]	93.3240	2⁺			

$^{180}_{72}Hf_{108}$-20

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [†]	E_f	J_f^π	Mult.[‡]	α	Comments
3068.8	1	3068.6[b]	77[b] *12*	0.0	0^+	D[b]		
3081.5	1	3081.5[b]	100[b]	0.0	0^+	D[b]		
3083.6		2442.7[c]	100	640.849	6^+			
3086.0	1	3086.0[b]	100[b]	0.0	0^+	D[b]		
3089.8		1715.4[c]		1374.36	(4^-)			
		2781.2[c]		308.576	4^+			
3100.8		2792.2[c]	100	308.576	4^+			
3100.8	(15^+)	293.9[d] *8*	100[d]	2807.0	(14^+)			
3110.6	(12^+)	577.8[&] *5*	60[&] *30*	2532.8	(10^+)			
		836.3[&] *5*	100[&] *14*	2274.3	12^+			
3123.4	(13^-)	535.4[&] *5*	100[&]	2588.0	(11^-)			
3124.1		2815.5[c]	100	308.576	4^+			
3125.6	1	3032.4[b]	100[b]	93.3240	2^+			
		3125.4[b]	33[b] *9*	0.0	0^+	D[b]		
3129.2	(12^+)	515.4[&] *5*	61[&] *7*	2613.9	(10^+)			
		1498[&] *1*	100[&] *7*	1631.0	10^+	(E2)	0.00193 *3*	α(K)=0.001563 *22*; α(L)=0.000233 *4*; α(M)=5.24×10^{-5} *8*; α(N+..)=8.35×10^{-5} *12* Mult.: stretched Q from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′γ), assumed E2.
3131.7		1521.7[c]		1609.38	(3^-)			
		2823.8[c]		308.576	4^+			
3150.7	1	3057.5[b]	33[b] *12*	93.3240	2^+			
		3150.5[b]	100[b]	0.0	0^+	D[b]		
3153.1		1670.4[c]	100	1482.67	(5^-)			
3163.2		2854.6[c]	100	308.576	4^+			
3174.4		3081.0[c]	100	93.3240	2^+			
3184.0		1809.9[c]		1374.36	(4^-)			
		2542.9[c]		640.849	6^+			
3191.4	(12^+)	294.5[&] *5*	[&]	2896.9	(11^+)			
		576.7[&] *5*	[&]	2614.8	(10^+)			
3200.4		2891.8[c]	100	308.576	4^+			
3215.3		2906.7[c]	100	308.576	4^+			
3253.1		3159.7[c]	100	93.3240	2^+			
3254.3	1	3161.1[b]	100[b]	93.3240	2^+			
		3254.1[b]	91[b] *35*	0.0	0^+	D[b]		
3257.7		2616.8[c]	100	640.849	6^+			
3300.4		569.8[&] *5*	100[&] *11*	2730.7				
		686.8[&] *5*	50[&] *11*	2613.9	(10^+)			

$^{180}_{72}Hf_{108}$-21

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult. ‡	Comments
3300.4		1026& *1*	&	2274.3	12^+		
		1669& *1*	&	1631.0	10^+		
3303.7		1694.3[c]	100	1609.38	(3^-)		
3317.0		1836.6[c]		1482.67	(5^-)		
		1947.1[c]		1369.65	(4^+)		
		2672.9[c]		640.849	6^+		E_γ: poor energy fit, excluded from least-squares fitting. E from level energy difference is 2676.4.
		3009.6[c]		308.576	4^+		
3330.1	1	3330.1[b]	100[b]	0.0	0^+	D[b]	
3330.3		1956.6[c]		1374.36	(4^-)		
		3021.0[c]		308.576	4^+		
3338.7		1729.3[c]	100	1609.38	(3^-)		
3350.2	(15^-)	384.8& *5*	100& *30*	2965.4	(14^-)		
		747.2& *5*	≈100&	2603.1	(13^-)		
3384.0		588.0& *5*		2796.0			
		1110&g *1*		2274.3	12^+		
3417.2		1804.2[c]		1613.09	(6^-)		
		1936.3[c]		1482.67	(5^-)		
		2775.9[c]		640.849	6^+		
		3107.2[c]		308.576	4^+		
3428.7		1946.0[c]	100	1482.67	(5^-)		
3432.1	(14^-)	583.7& *5*		2848.4	(12^-)		
3442.9		3134.3[c]	100	308.576	4^+		
3446.9	(16^+)	346.1[d] *1*	100[d] *40*	3100.8	(15^+)		
		639.4[d] *15*	80[d] *30*	2807.0	(14^+)		
3468.6		2827.7[c]	100	640.849	6^+		
3483.4		2109.0[c]	100	1374.36	(4^-)		
3489.2		3180.6[c]	100	308.576	4^+		
3499.9		3191.3[c]	100	308.576	4^+		
3506.8	1,2	3506.8[b]	100[b]	0.0	0^+	(D+Q)[b]	
3515.7		3207.1[c]	100	308.576	4^+		
3526.7		3218.1[c]	100	308.576	4^+		
3528.9		427.9[d] *16*		3100.8			
		722.0[d] *15*		2807.0	(14^+)		
3559.6	1	3466.4[b]	100[b]	93.3240	2^+		
		3559.4[b]	95[b] *29*	0.0	0^+	D[b]	
3569.5	1	3476.3[b]	100[b]	93.3240	2^+		

$^{180}_{72}Hf_{108}$-22

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult. ‡	α	Comments
3569.5	1	3569.3 b	39 b 19	0.0	0+	D b		
3584.2	1	3491.0 b	66 b 18	93.3240	2+			
		3584.0 b	100 b	0.0	0+	D b		
3592.5	1	3499.3 b	100 b	93.3240	2+			
		3592.3 b	101 b 44	0.0	0+	D b		
3596.5		2222.1 c	100	1374.36	(4−)			
3597.5	(18−)	150.6 d 5	100 d	3446.9	(16+)	(M2)	8.13 15	α(K)=6.08 11; α(L)=1.57 3; α(M)=0.378 8; α(N+..)=0.1047 21 B(M2)(W.u.)=0.0153 18 Mult.: M2 or E3 from α(exp) in ^{180}Hf(^{238}U,^{238}U′γ); M2 assuming lowest multipole dominates.
3606.5	(13+)	645.8 & 5	83 & 17	2960.7	(11+)			
		1332 & 1	100 & 17	2274.3	12+			
3615.1	1	3521.9 b	100 b	93.3240	2+			
		3614.9 b	16 b 6	0.0	0+	D b		
3625.4		3316.8 c	100	308.576	4+			
3627.1	1	3627.1 b	100 b	0.0	0+	D b		
3640.7		3332.1 c	100	308.576	4+			
3653.8		3560.4 c	100	93.3240	2+			
3672.2		3363.4 c		308.576	4+			
		3579.0 c		93.3240	2+			
3678.1	(14+)	548.9 & 5		3129.2	(12+)			
		673 &		3005.4	14+			
		1404 & 1		2274.3	12+			
3681.2		3372.6 c	100	308.576	4+			
3734.0	(15−)	610.6 & 5	100 &	3123.4	(13−)			
3751.3		3442.4 c		308.576	4+			
		3658.3 c		93.3240	2+			
3755.4	(16−)	405.4 & 5		3350.2	(15−)			
		790.0 & 5		2965.4	(14−)			
3766.6	1	3673.4 b	100 b	93.3240	2+			
		3766.4 b	43 b 13	0.0	0+	D b		
3774.3	1	3681.1 b	35 b 14	93.3240	2+			
		3774.1 b	100 b	0.0	0+	D b		
3781.5	(14+)	670.8 & 5		3110.6	(12+)			
		776.1 & 5		3005.4	14+			
3786.2	1	3693.0 b	100 b	93.3240	2+			

$^{180}_{72}Hf_{108}$-23

Adopted Levels, Gammas (continued)

γ(^{180}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α	Comments
3786.2	1	3786.0[b]	99[b] *35*	0.0	0^+	D[b]		
3804.1	1	3710.9[b]	100[b]	93.3240	2^+			
		3803.9[b]	41[b] *16*	0.0	0^+	D[b]		
3813.5	16^+	807.9[&] *5*	100[&]	3005.4	14^+	(E2)	0.00637 *9*	α(K)=0.00520 *8*; α(L)=0.000907 *13*; α(M)=0.000208 *3*; α(N+..)=5.67×10^{-5} *8* Mult.: stretched Q from R(DCO) in ^{180}Hf(^{136}Xe,^{136}Xe′γ), E2 from assumed band structure.
3818.0	1	3818.0[b]	[b]	0.0	0^+	D[b]		
3829.6	1	3829.6[b]	[b]	0.0	0^+	D[b]		
3836.5	1	3743.3[b]	100[b]	93.3240	2^+			
		3836.3[b]	27[b] *8*	0.0	0^+	D[b]		
3848.3		3208.6[c]		640.849	6^+			
		3539.7[c]		308.576	4^+			
		3753.6[c]		93.3240	2^+			
3851.7	1	3758.5[b]	100[b]	93.3240	2^+			
		3851.5[b]	85[b] *30*	0.0	0^+	D[b]		
3855.6		2246.2[c]	100	1609.38	(3^-)			
3862.2	1,2	3862.2[b]	100[b]	0.0	0^+	(D+Q)[b]		
3869.2		2388.0[c]		1482.67	(5^-)			
		3226.9[c]		640.849	6^+			
3880.3		3239.4[c]	100	640.849	6^+			
3889.4	1	3889.4[b]	100[b]	0.0	0^+	D[b]		
3908.5		3267.6[c]	100	640.849	6^+			
3926.5		2317.7[c]		1609.38	(3^-)			
		3617.2[c]		308.576	4^+			
3928.0	1	3928.0[b]	100[b]	0.0	0^+	D[b]		
3948.1	1	3948.1[b]	100[b]	0.0	0^+	D[b]		
3957.6		3648.6[c]		308.576	4^+			
		3864.6[c]		93.3240	2^+			
3967.8	1	3967.8[b]	100[b]	0.0	0^+	D[b]		
3971.3		671.0[&] *5*		3300.4				
		965.7 *5*		3005.4	14^+			
3975.3		2489.5[c]		1484.48				
		3667.9[c]		308.576	4^+			
3978.4	1	3885.2[b]	28[b] *14*	93.3240	2^+			
		3978.2[b]	100[b]	0.0	0^+	D[b]		
3987.6		2504.9[c]	100	1482.67	(5^-)			
3992.3		2382.9[c]	100	1609.38	(3^-)			

$^{180}_{72}Hf_{108}$-24

Adopted Levels, Gammas (continued)

$\gamma(^{180}Hf)$ (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Comments
4003.1		2627.9[c]		1374.36	(4⁻)	
		3695.4[c]		308.576	4⁺	
4091.3	(16⁻)	659.2[&] *5*	100	3432.1	(14⁻)	
4137.7		2763.3[c]	100	1374.36	(4⁻)	
4180.1	(17⁻)	424.8[&] *5*		3755.4	(16⁻)	
		829.8[&] *5*		3350.2	(15⁻)	
4270.2	(16⁺)	456[&]		3813.5	16⁺	
		592.3[&] *5*		3678.1	(14⁺)	
		1265[&]		3005.4	14⁺	
4323.5	(15⁺)	717[&]	100[&]	3606.5	(13⁺)	
4331.9		2722.5[c]	100	1609.38	(3⁻)	
4356.0		2746.6[c]	100	1609.38	(3⁻)	
4413.1	(17⁻)	679.1[&] *5*	100[&]	3734.0	(15⁻)	
4423.1		2813.9[c]		1609.38	(3⁻)	
		4329.6[c]		93.3240	2⁺	
4682.0	18⁺	868.5[&] *5*	100[&]	3813.5	16⁺	
4808.5		3201.2[c]		1607.67	(4)⁺	
		4499.5[c]		308.576	4⁺	
4852.8		3245.2[c]		1607.67	(4)⁺	
		4759.3[c]		93.3240	2⁺	
4916.3		3437.3[c]		1482.67	(5⁻)	E_γ: poor energy fit, excluded from least-squares fitting. E from level energy difference is 3433.6.
		3541.9[c]		1374.36	(4⁻)	
		4272.8[c]		640.849	6⁺	
		4606.5[c]		308.576	4⁺	
4924.2	(18⁺)	654[&]	100[&]	4270.2	(16⁺)	
4965.4		3479.3[c]		1484.48		
		3590.4[c]		1374.36	(4⁻)	
		4659.0[c]		308.576	4⁺	
5048.3		3566.6[c]		1482.67	(5⁻)	
		4953.8[c]		93.3240	2⁺	
5057.6		3576.0[c]		1482.67	(5⁻)	
		4748.5[c] *6*		308.576	4⁺	
5554.0	20⁺	872[&]	100[&]	4682.0	18⁺	
5629.2	(20⁺)	705[&]	100[&]	4924.2	(18⁺)	
5666.0	(20⁺)	984[&]	100[&]	4682.0	18⁺	

$^{180}_{72}Hf_{108}$-25

Adopted Levels, Gammas (continued)

$\gamma(^{180}Hf)$ (continued)

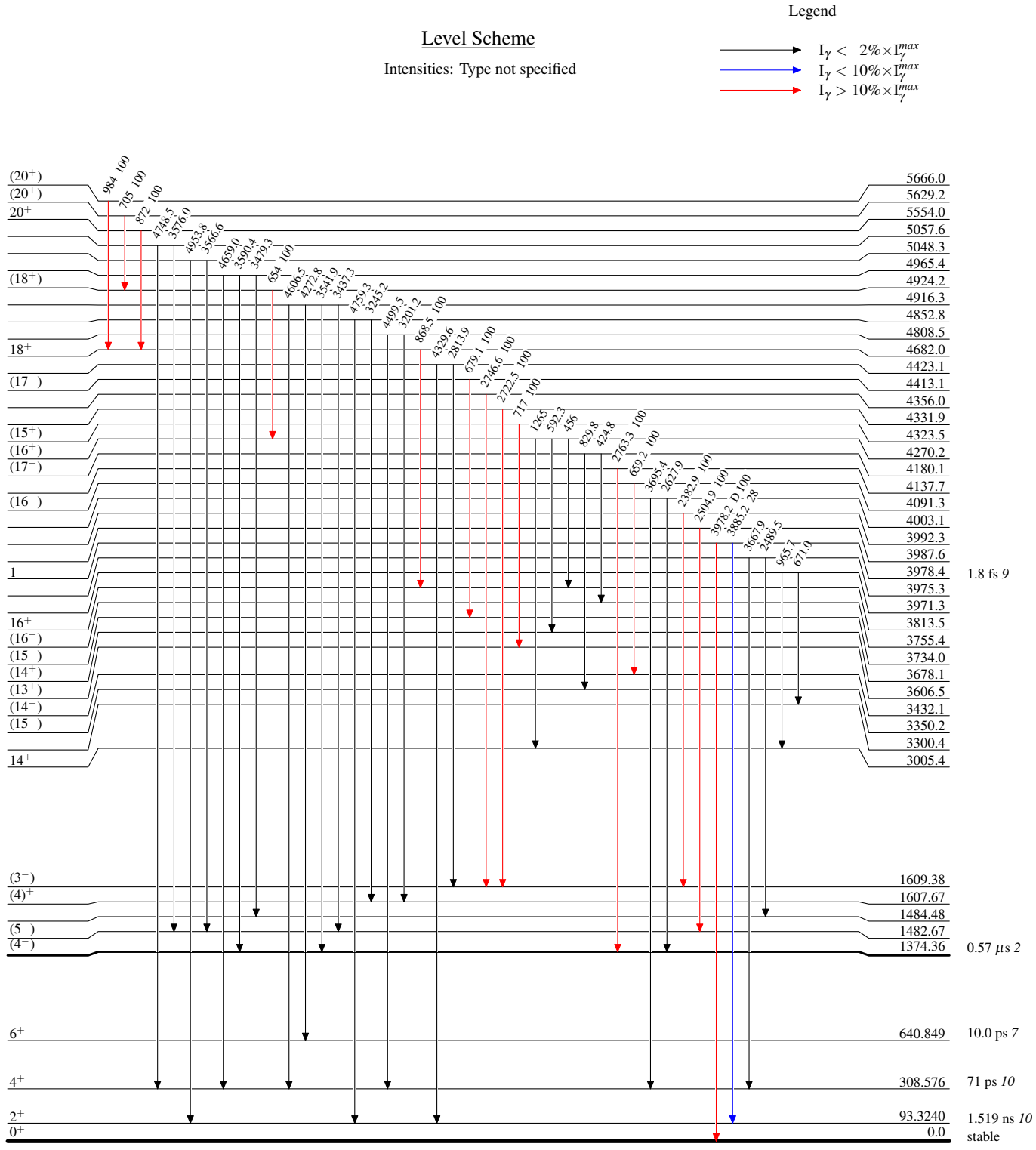
† From $^{179}Hf(n,\gamma)$ E=thermal, except where noted.
‡ From $^{180}Hf(n,n'\gamma)$, unless otherwise specified.
# From ^{180}Lu β^- decay.
@ From $^{180}Hf(n,n'\gamma)$.
& From $^{180}Hf(^{136}Xe,^{136}Xe'\gamma)$.
[a] From ce data in $^{179}Hf(n,\gamma)$ E=thermal (1986RoZM).
[b] From $^{180}Hf(\gamma,\gamma')$.
[c] From $\gamma\gamma$ coin with fixed energy sum in $^{179}Hf(n,\gamma)$ E=thermal (1990Bo52).
[d] From $^{180}Hf(^{238}U,^{238}U'\gamma)$.
[e] Multiply placed.
[f] Multiply placed with undivided intensity.
[g] Placement of transition in the level scheme is uncertain.

$^{180}_{72}Hf_{108}$-26

Adopted Levels, Gammas

Level Scheme

Intensities: Type not specified

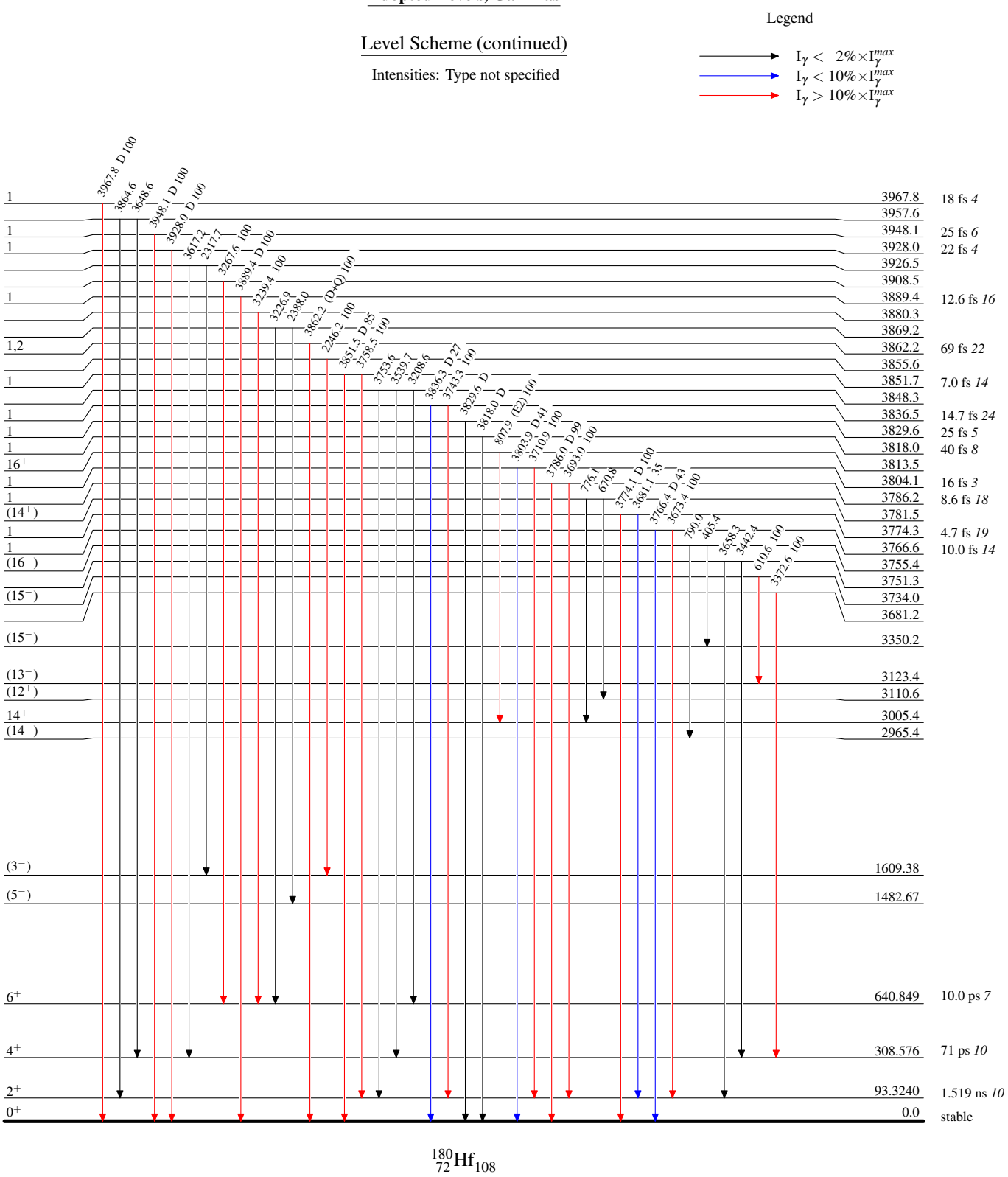


$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified



$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas

Level Scheme (continued)

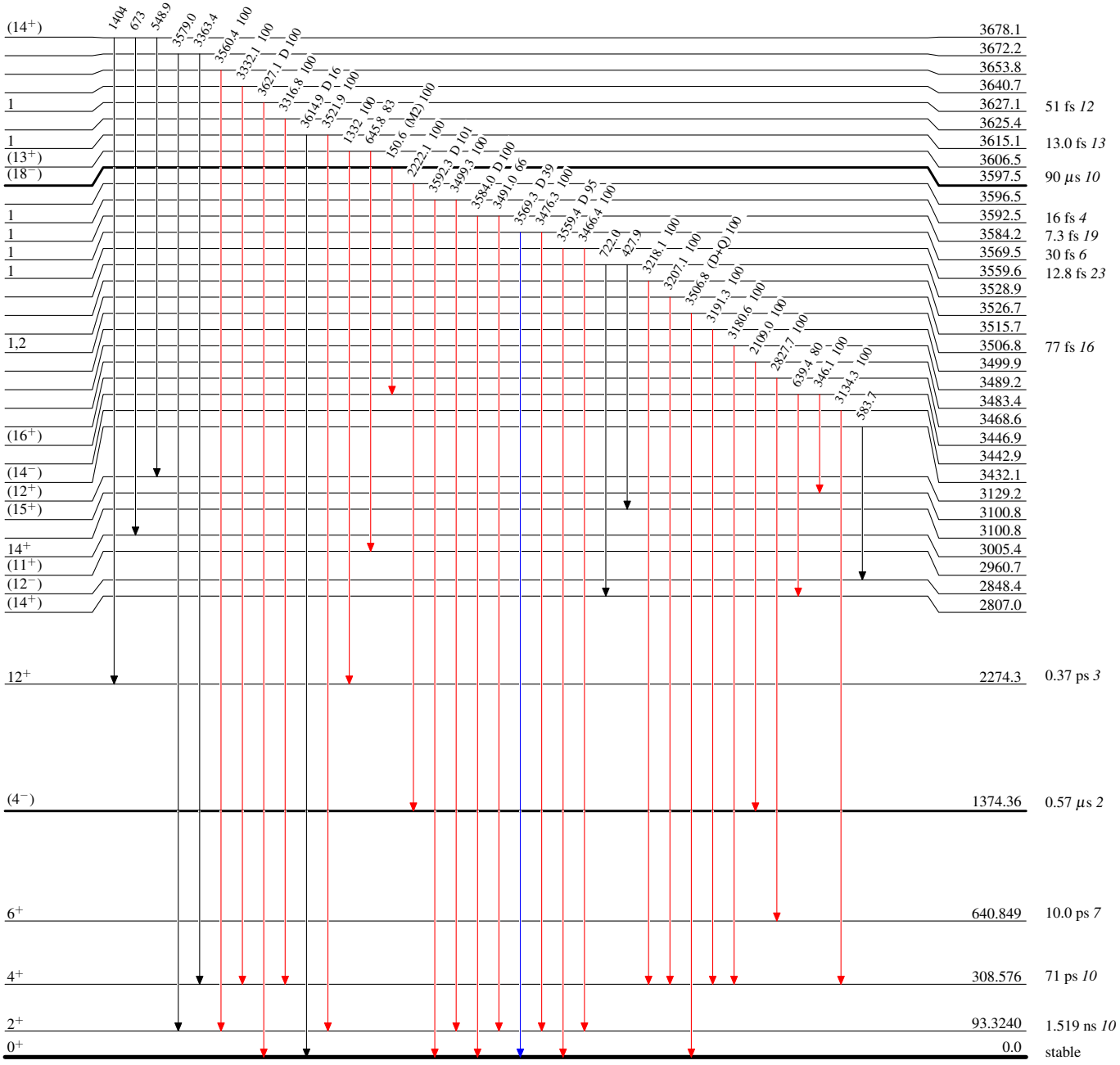
Intensities: Type not specified

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$



$^{180}_{72}Hf_{108}$

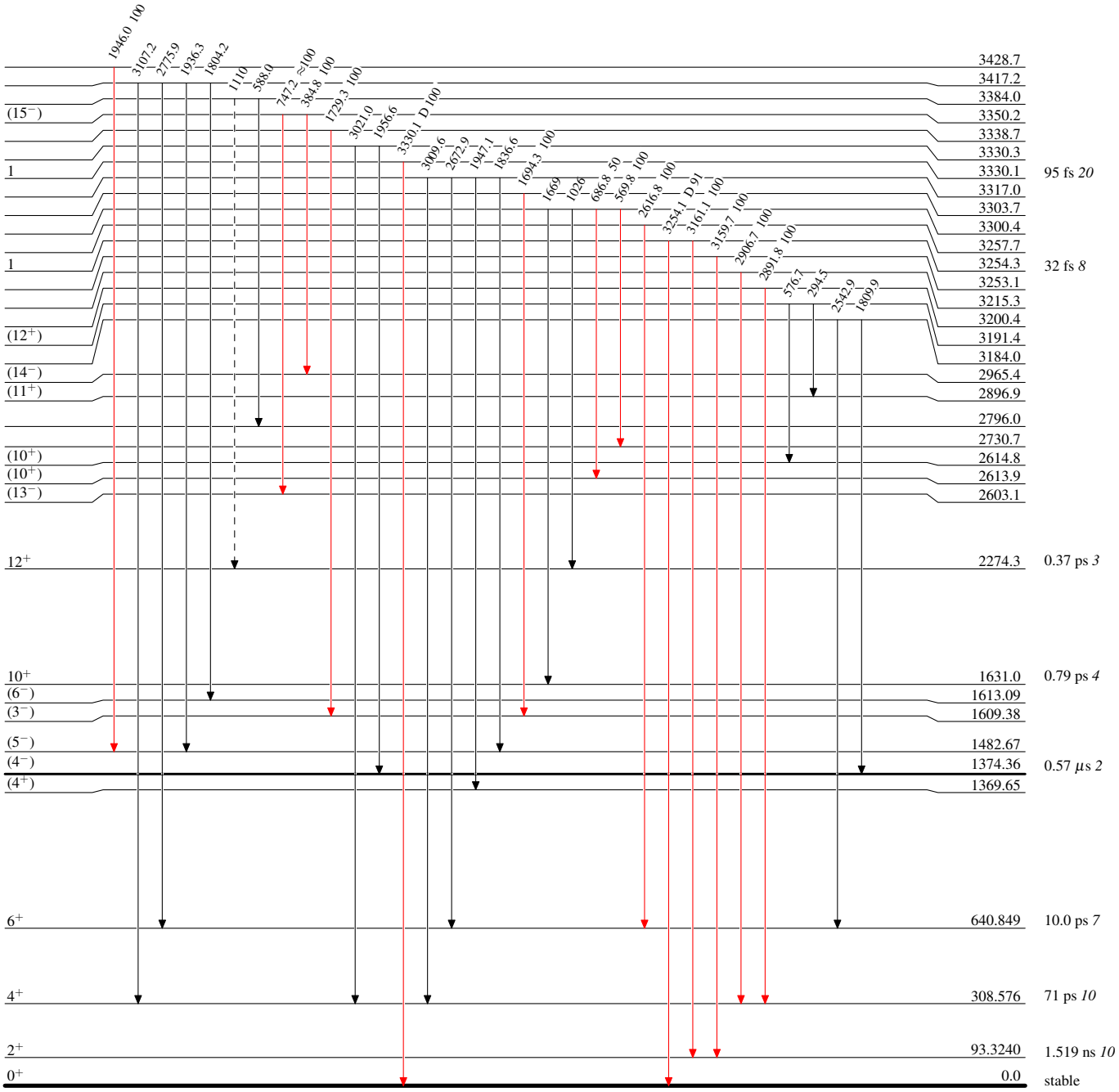
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)

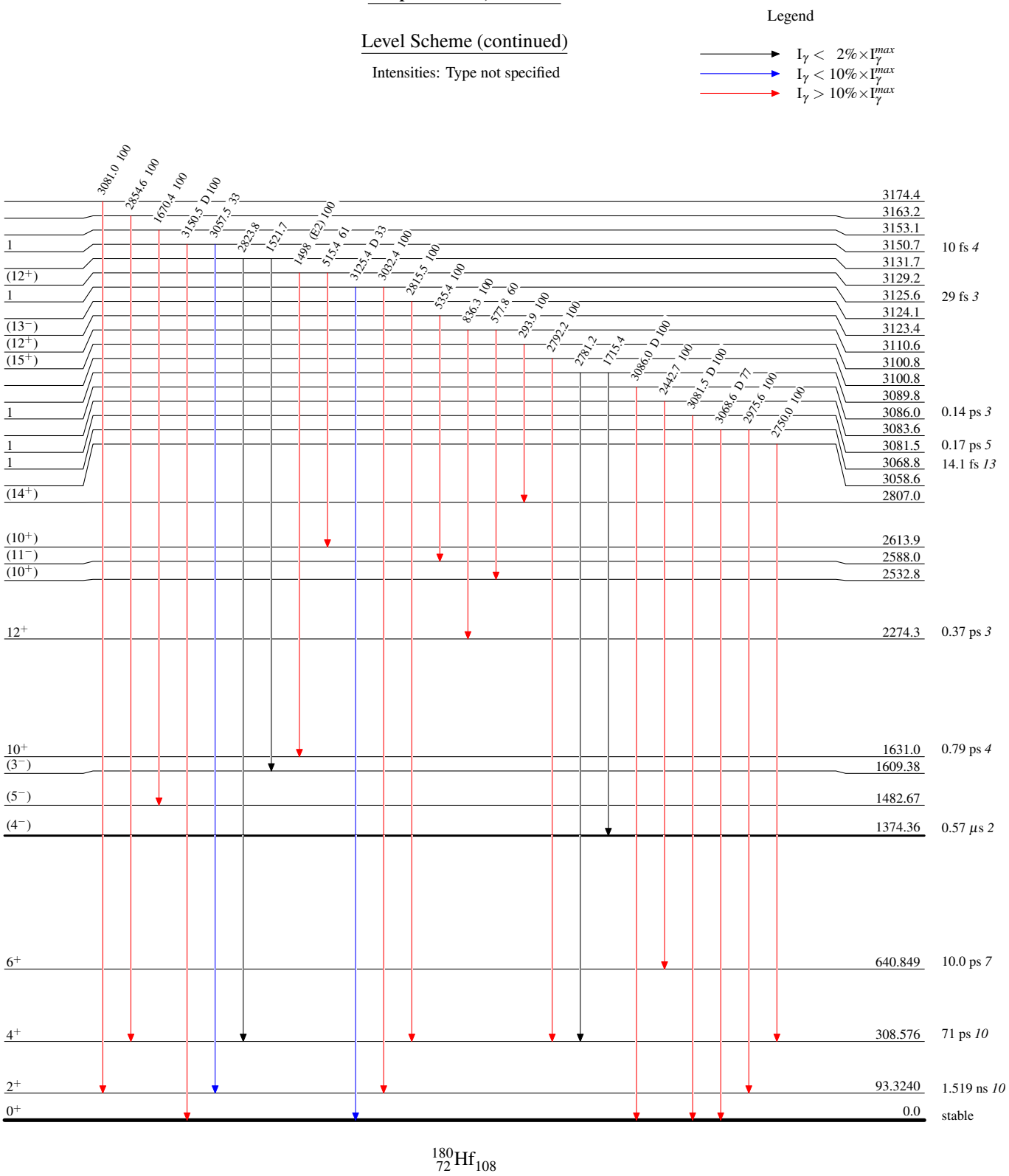


$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

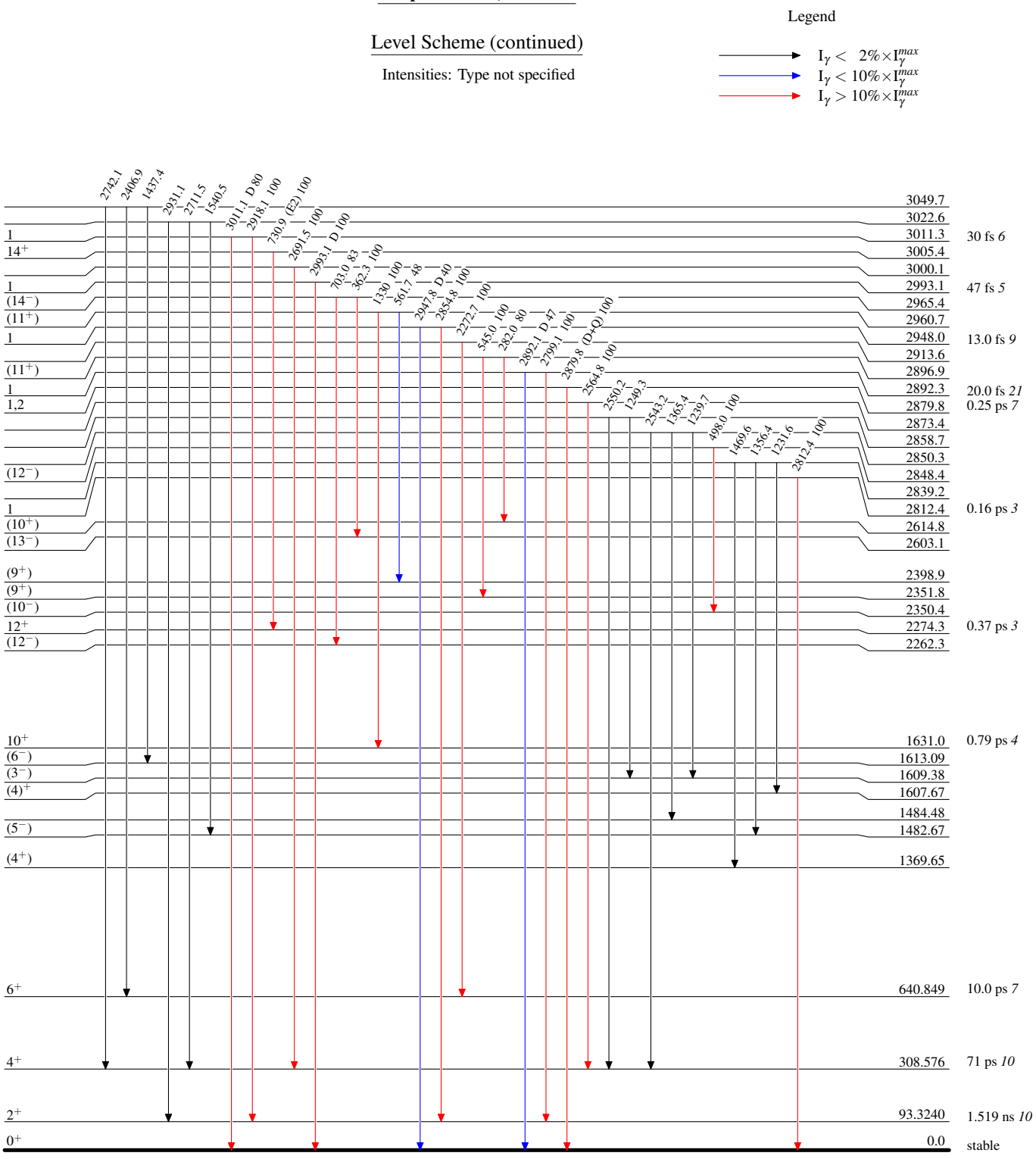


$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

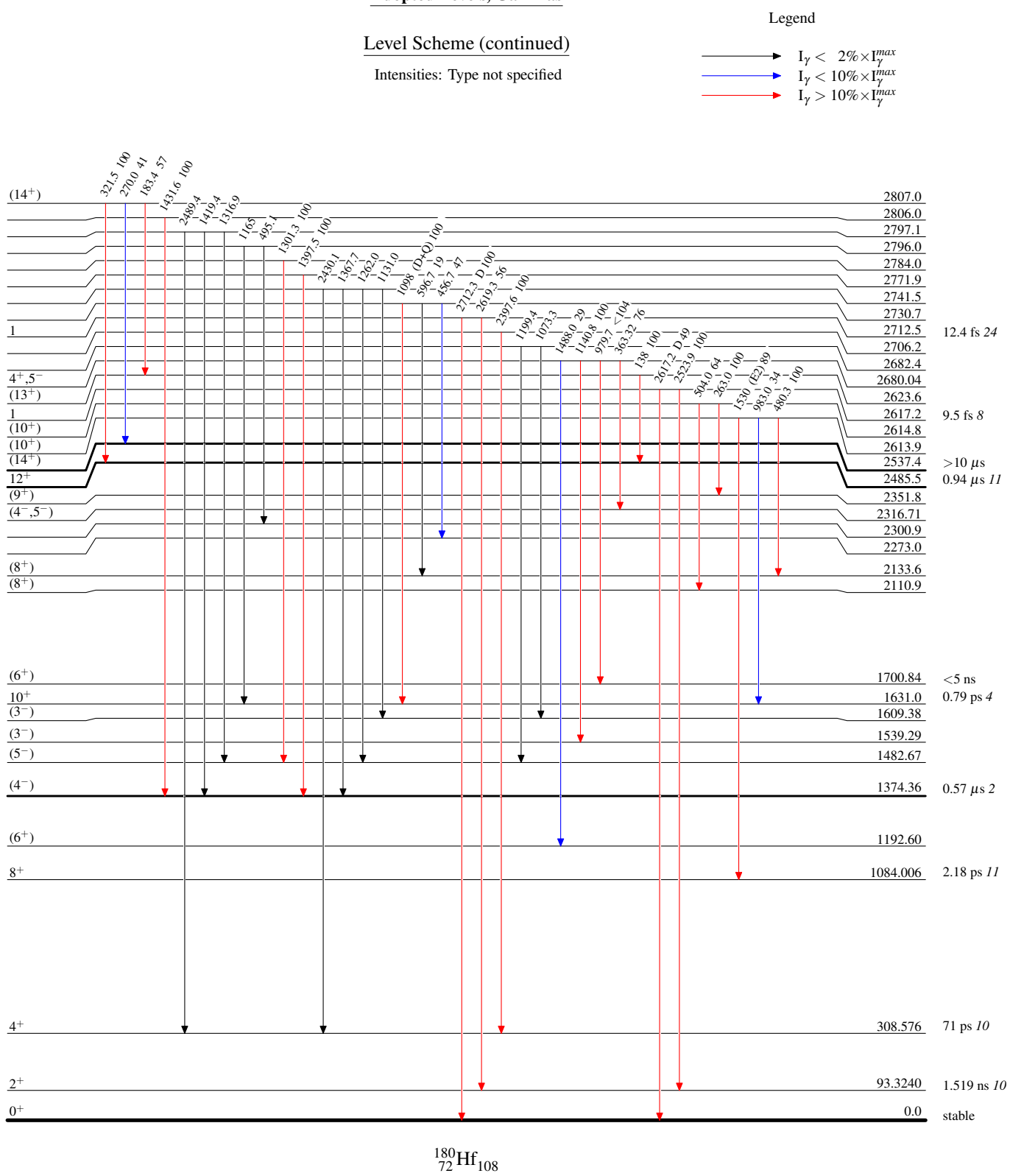


$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

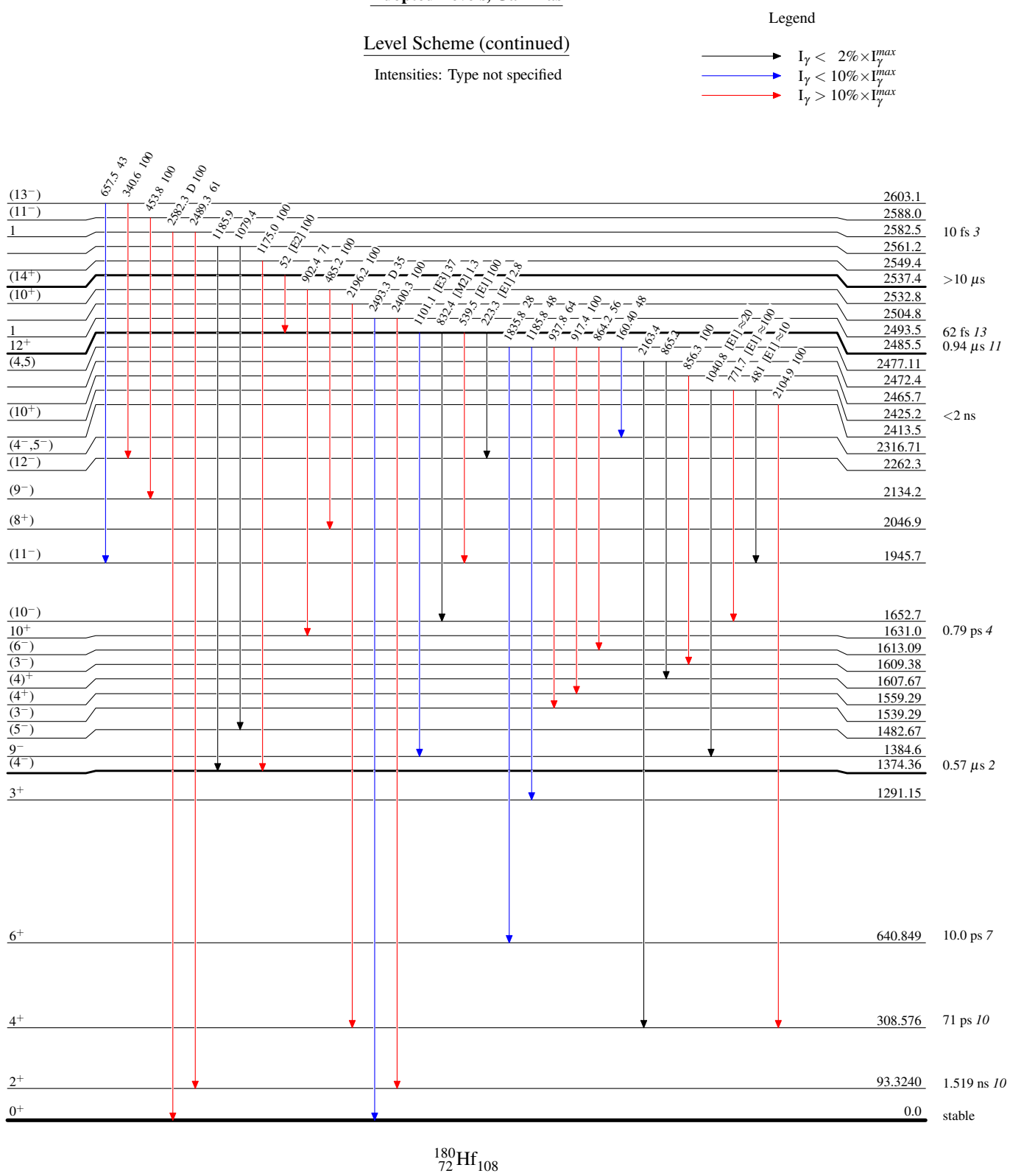


$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

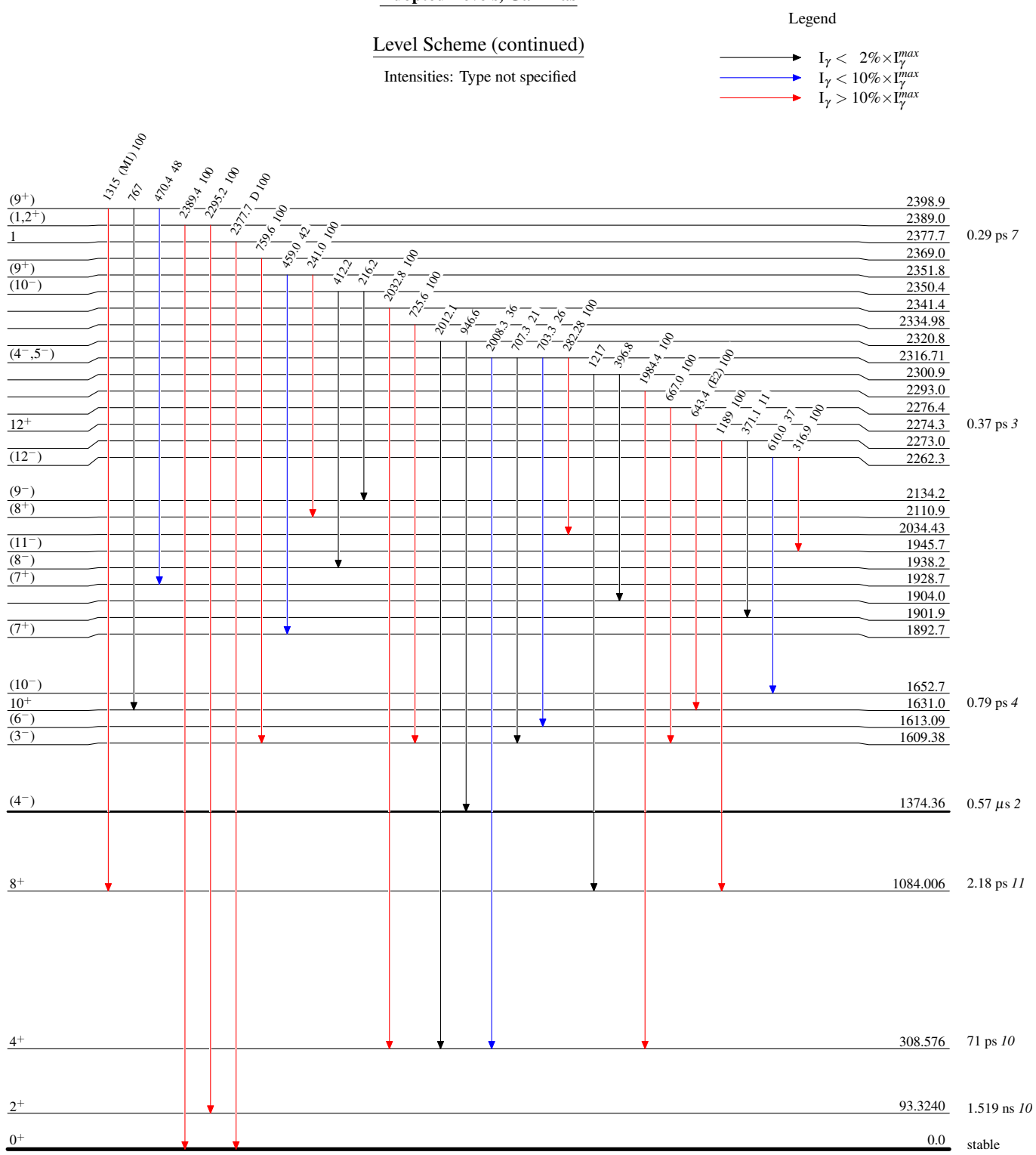


$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified



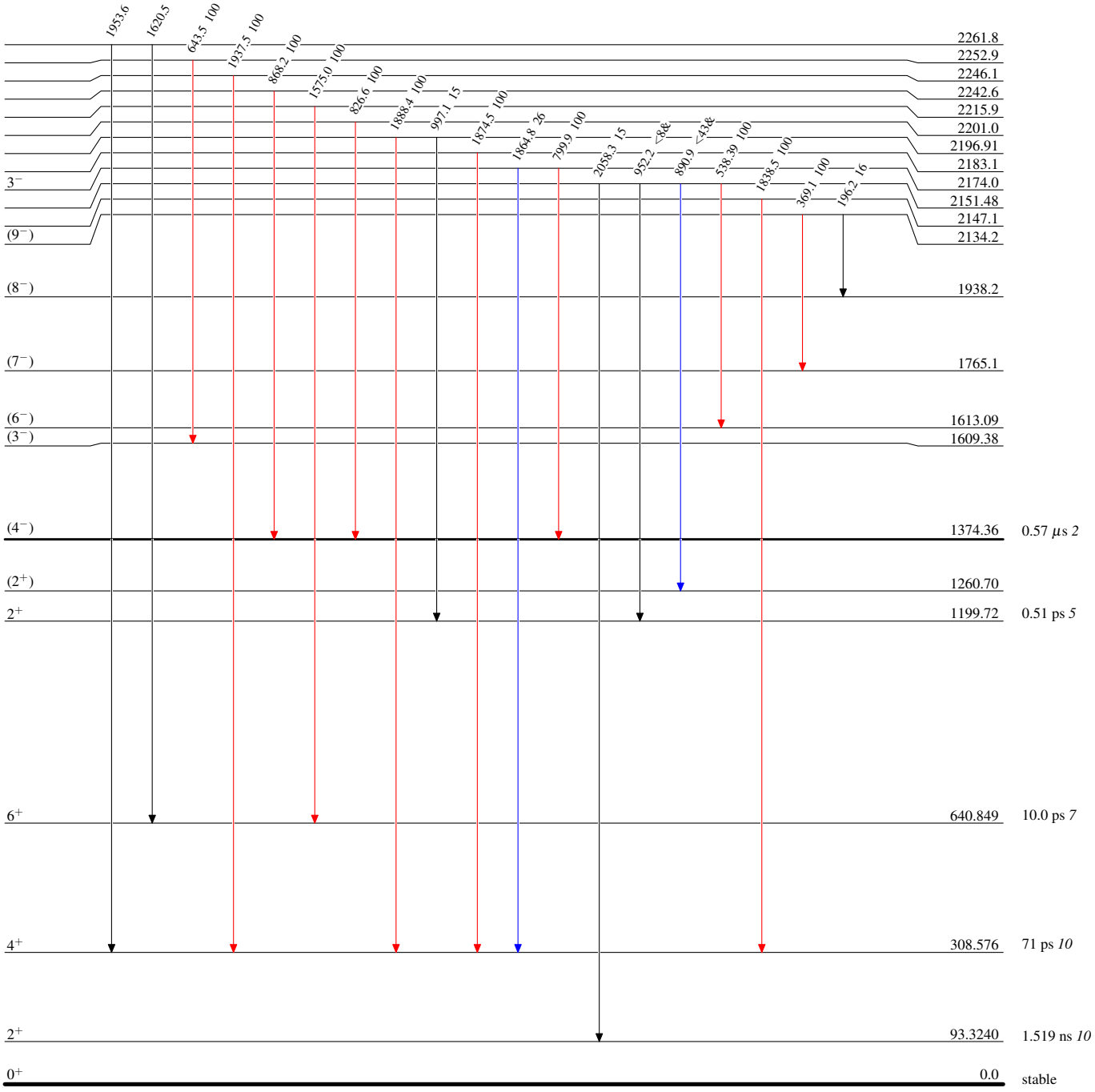
$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$

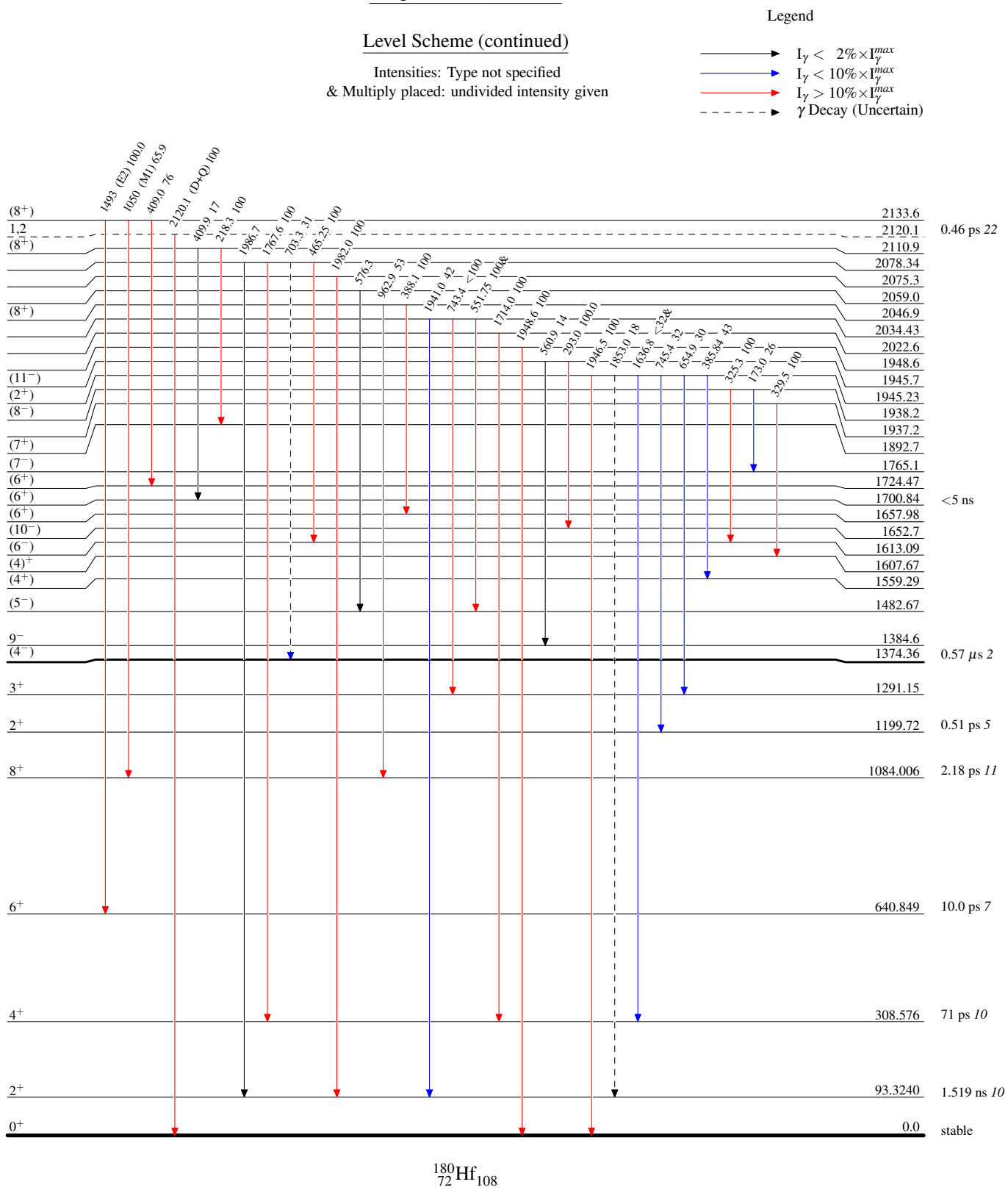


$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified
& Multiply placed: undivided intensity given



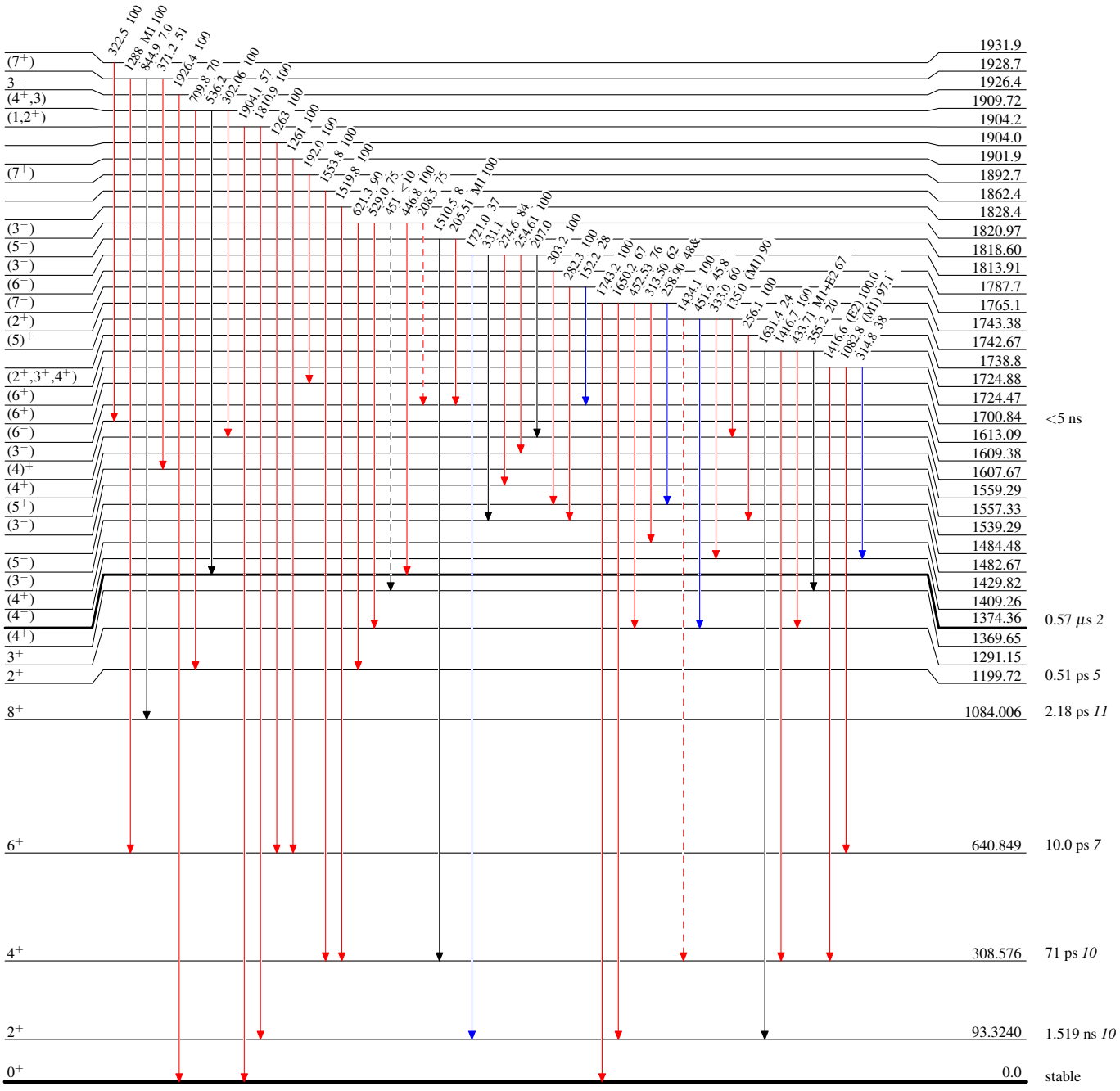
$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)



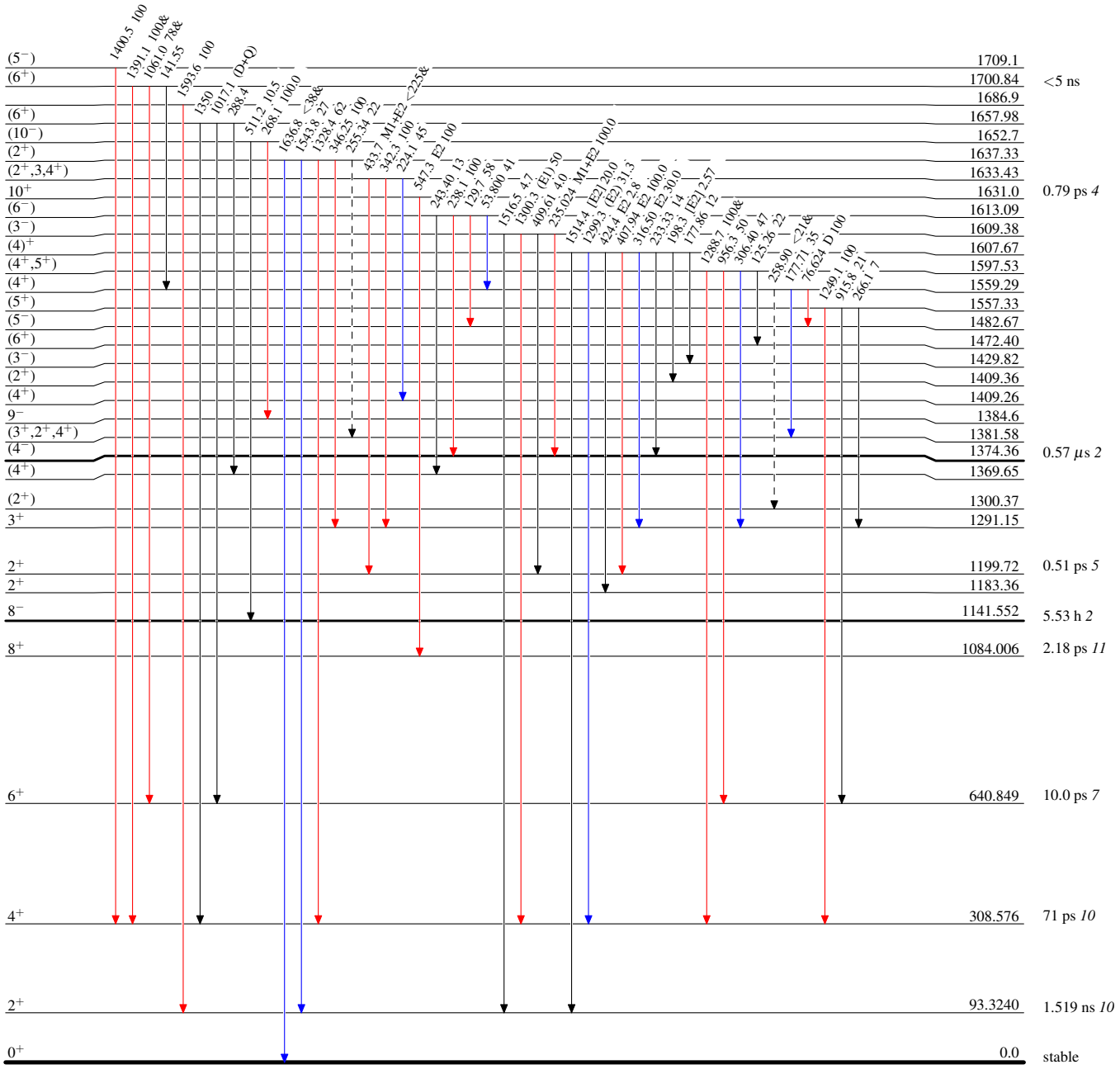
$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)



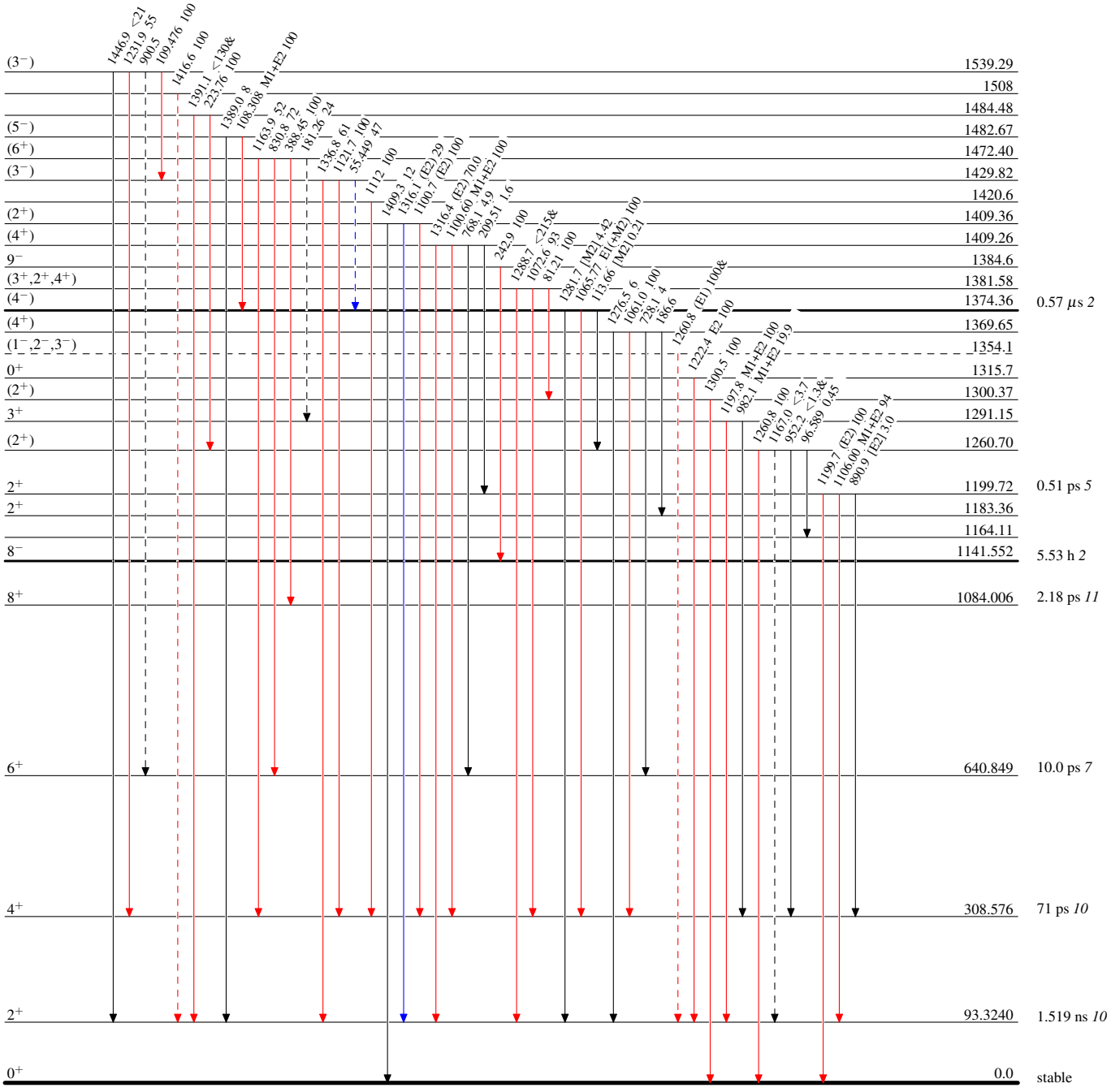
$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)

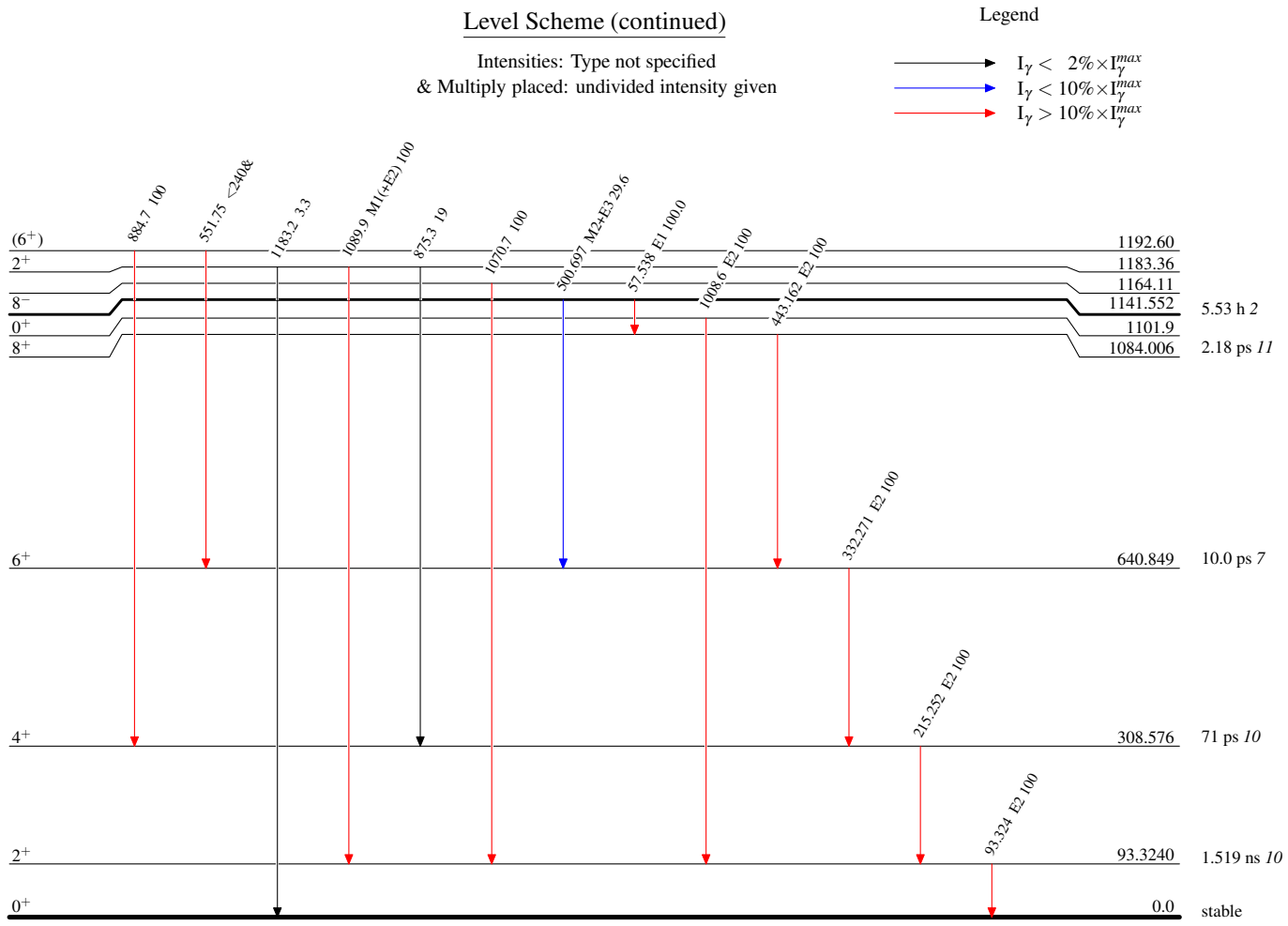


$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas

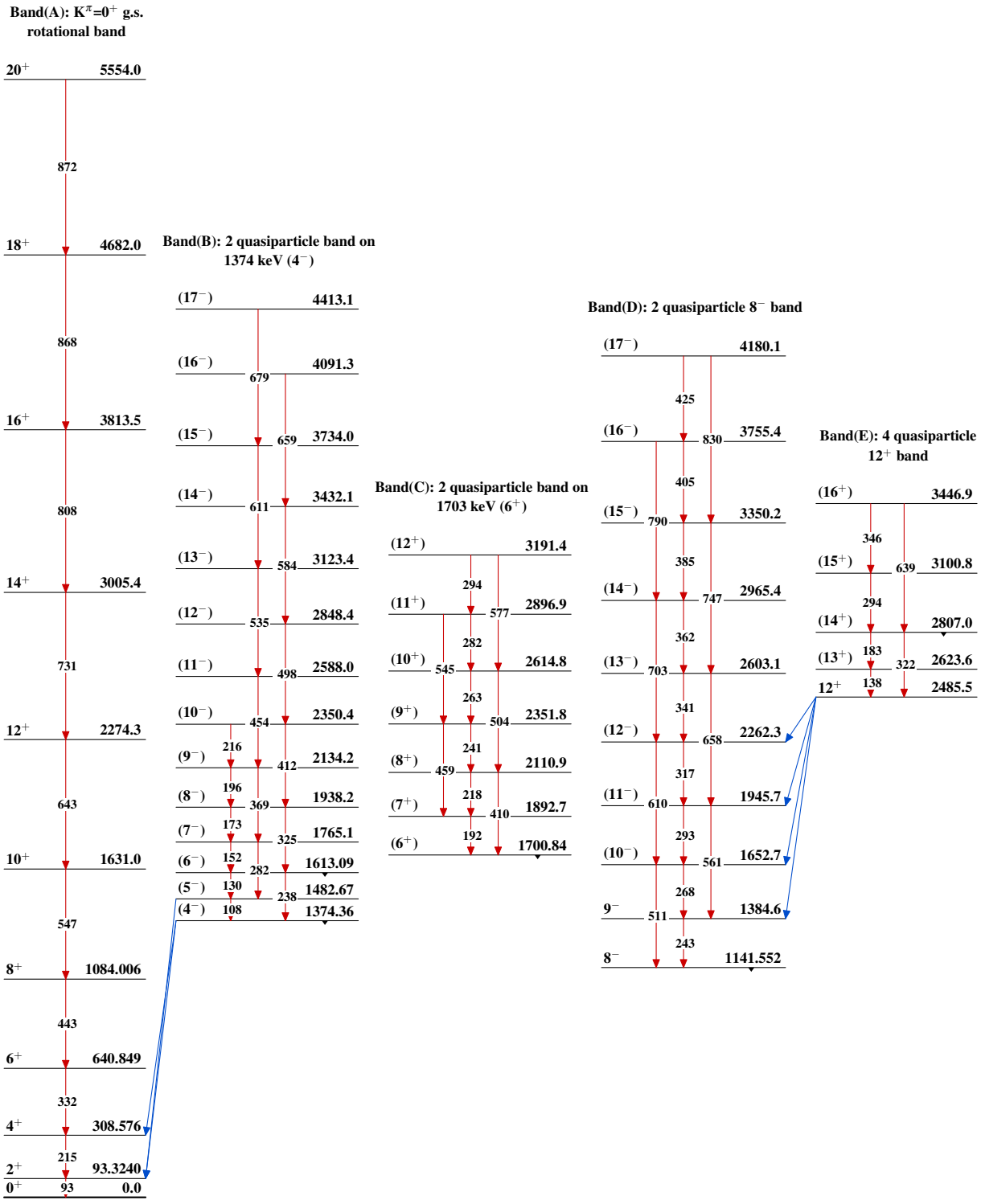
Level Scheme (continued)

Intensities: Type not specified
& Multiply placed: undivided intensity given



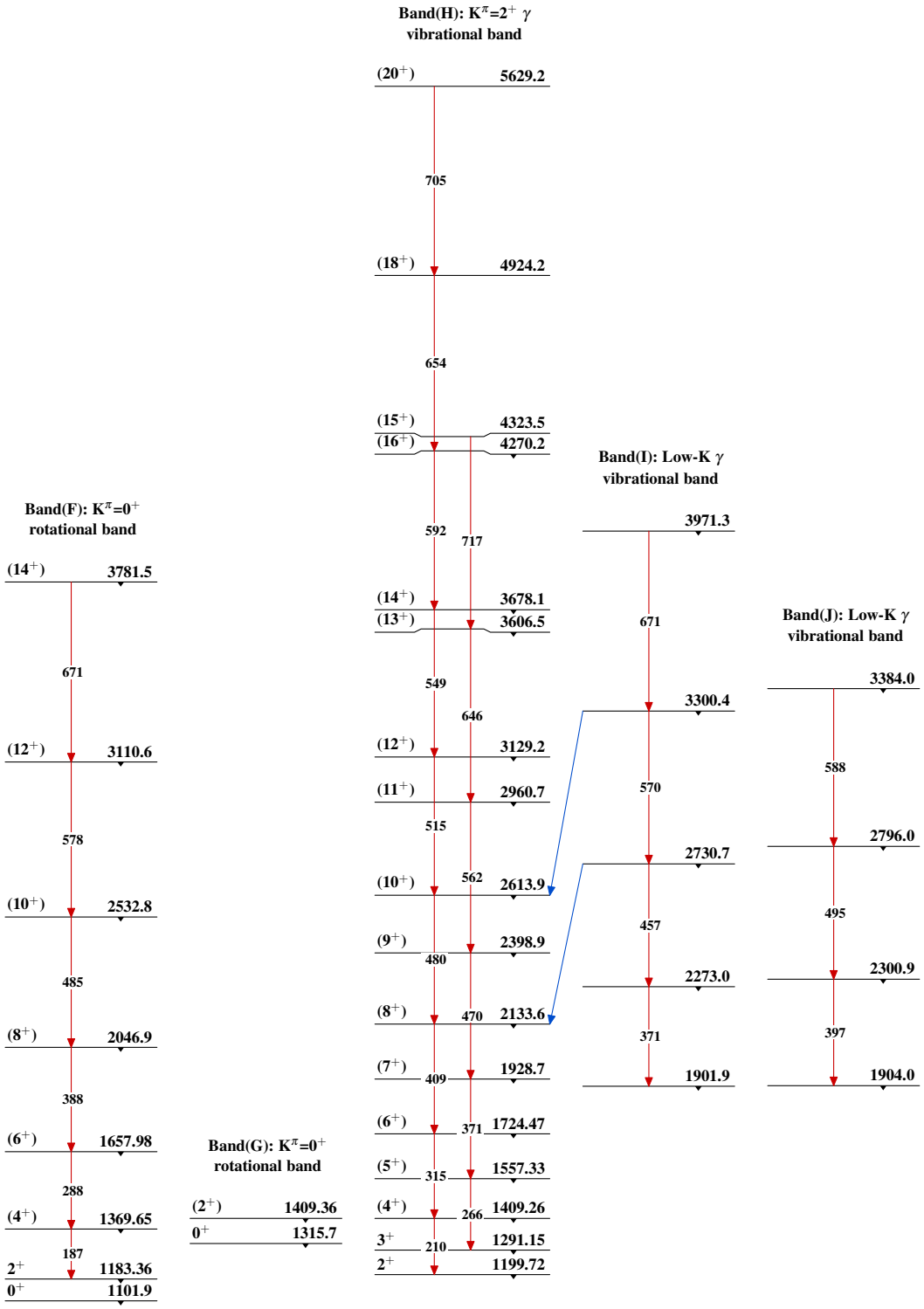
$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas



$^{180}_{72}Hf_{108}$

Adopted Levels, Gammas (continued)



$^{180}_{72}Hf_{108}$