^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 110, 265 (2009)	15-Nov-2008

σ_n=84 *4* (2006MuZX). % abundance (^{178}Hf)=27.28 *7*.

Others: 2007ChZX, 2006Sz05 (partial σ and k_0 for ^{179}Hf(18.7 s)), 2001De25 (σ_n=59.1 *5* for ^{179}Hf(18.67 s)), 1999Bo14, 1999Va07 (k_0 for ^{179}Hf(18.67 s)), 1991Bo51, 1988Bo19, 1988Bo44, 1985Ri09, 1974An11, 1973Be63, 1972Al19, 1967Ma24, 1967Na07, 1967Ma02, 1966Na03, 1966Kr07.

2007ChZX (supersedes 2003ChZS): evaluation of (n,γ) E=thermal data; includes Eγ and partial radiative cross section measurements At Budapest for 90 secondary and 19 primary transitions using natural Hf target and Compton-suppressed Ge detector.

1989Ri03: target: 92.4% enriched ^{178}Hf. Measured Eγ, Iγ, Ice of primary and secondary γ rays. Detectors: bent-crystal spectrometer (secondary γ rays), Ge(Li) pair spectrometer (primary γ rays, FWHM≈4.4 keV at 5.5 MeV), magnetic spectrometer (E(ce)=18-1400 keV); deduced S(n)=6099.06 keV *10*. See also 1985Ri09.

1988Bo44: measured sum coin spectra; Ge(Li) detectors; determined relative 2-quantum γ cascade photon intensities for strongest transitions to low-lying excited states.

1976Be23: target: 89.1% enriched ^{178}Hf. Measured Eγ, Iγ, Ice of secondary γ rays. Detectors: bent crystal, magnetic spectrograph.

^{179}Hf Levels

E(level)[†]	J$^\pi$[#]	$T_{1/2}$[‡]	Comments
0.0[&]	9/2$^+$		
122.7909[&] *24*	11/2$^+$		
214.3406[a] *22*	7/2$^-$	1.82 ns *10*	
337.7183[a] *23*	9/2$^-$		
375.037[b] *3*	1/2$^-$	18.67 s *4*	$T_{1/2}$: from Adopted Levels.
420.895[b] *3*	3/2$^-$		
476.336[b] *3*	5/2$^-$		
487.710[a] *5*	(11/2$^-$)		
518.3301[c] *24*	5/2$^-$	<0.2 ns	
582.231[b] *3*	7/2$^-$		
614.205[d] *3*	1/2$^-$	0.50 ns *15*	
616.757[c] *3*	7/2$^-$		
679.518[d] *3*	3/2$^-$		
681.037[b] *3*	9/2$^-$		
701.056[d] *3*	5/2$^-$		
720.614[e] *3*	3/2$^-$	≤0.3 ns	
742.711[c] *3*	9/2$^-$		
788.186[e] *3*	5/2$^-$		
849.202[d] *3*	7/2$^-$		
870.225[f] *8*	7/2$^-$		
935.645[e] *3*	7/2$^-$		
1003.650[g] *4*	5/2$^+$		
1073.563 *13*	7/2$^-$		
1078.349[g] *10*	(7/2)$^+$		
1120.78[i] *3*	9/2$^+$		
1150.410[j] *5*	1/2$^+$		
1168.96[h] *3*	(9/2$^+$)		
1185.847[j] *5*	3/2$^+$		
1199.34 *15*	(7/2$^+$)		E(level): based on Eγ for 1077γ doublet.
1235.440[j] *4*	5/2$^+$		

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^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23 (continued)

^{179}Hf Levels (continued)

E(level)[†]	J$^{\pi}$[#]	Comments
1249.552[k] *6*	3/2$^-$	
1269.445[l] *6*	3/2$^-$	
1313.499[k] *13*	5/2$^-$	
1433.187 *11*	3/2$^-$	
1436.352 *6*	7/2$^-$	
1458.997[m] *9*	3/2$^-$	
1482.030[o] *5*	3/2$^+$	1482-level doublet proposed by 1991Bo51 not adopted; see comment on 1005γ from 1726 level.
1532.275[o] *5*	5/2$^+$	
1572.56 *3*	3/2$^-$	
1614.124 *13*	1/2$^-$,3/2$^-$	
1668.955 *6*	3/2$^+$	
1687.13 *4*	(3/2)$^-$	
1706.066[n] *10*	(3/2)$^-$	
1715.934 *5*	1/2$^+$,3/2$^+$,5/2$^+$	
1725.787 *12*	3/2$^-$	
1731.438 *11*	3/2$^-$	
1755.346 *17*	3/2$^-$	
1755.84 *11*	3/2$^-$	Level proposed by 1991Bo51 to reconcile two-photon cascade data of 1988Bo44 with Eγ from 1989Ri03.
1757.72 *11*	(3/2$^-$,5/2$^+$)	Proposed by 1991Bo51 to reconcile two-photon cascade data of 1988Bo44 with Eγ from 1989Ri03.
1762.91 *4*	(3/2)$^-$	
1783.14[@] *13*	1/2,3/2,5/2$^+$	
1796.5[@] *4*	1/2,3/2,5/2$^+$	
1800.51 *7*	3/2$^-$	
1811.50 *7*	3/2$^-$	
1821.19[@] *7*	(1/2$^-$,3/2)	E(level): 1820.94 *3* from Eγ for primary γ (1989Ri03).
1846.3[@] *3*	(3/2$^-$)	
1851.502 *12*	3/2$^+$,5/2$^+$	
1861.235 *7*	5/2$^+$	
1893.9[@] *5*	1/2,3/2,5/2$^+$	
1899.66[@] *24*	1/2,3/2,5/2$^+$	
1913.469 *13*	3/2$^-$	
1928.845 *9*	1/2$^+$,3/2$^+$	
1945.865 *14*	(1/2,3/2)	
1957.58[@] *9*	1/2,3/2,5/2$^+$	
2035.5?		Proposed by 1991Bo51 only; not adopted.
2047.0 *3*	(1/2,3/2)	E(level): from E(1672γ). E=2046.8 *15* from 1988Bo44.
2052.6 *15*	1/2,3/2,5/2$^+$	
2070.7 *15*	(1/2,3/2)	
2082.8 *15*	(1/2,3/2)	
2088.4 *15*	(1/2,3/2)	
2120.8?		Proposed by 1991Bo51 only; not adopted.
2146.1 *15*	(1/2,3/2)	
2150.3 *15*	1/2$^{(-)}$,3/2,5/2$^+$	
2168.2 *10*	1/2,3/2,5/2$^+$	E(level): from primary Eγ (1972Al19).
2183.1 *15*	1/2,3/2,5/2$^+$	
2214.3 *3*	(1/2,3/2)	E(level): from E(1600γ). other: 2215.6 *15* from 1988Bo44.
2228.1 *4*	1/2,3/2,5/2$^+$	
2249.87 *23*	(3/2$^-$)	E(level): from E(2035γ). other: 2249.6 *16* from 1988Bo44.
2254.2 *15*	1/2$^{(-)}$,3/2,5/2$^+$	
2309.2 *15*	1/2,3/2,5/2$^+$	
2366.9 *15*	(1/2$^-$,3/2)	

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^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23 (continued)

^{179}Hf Levels (continued)

E(level)[†]	J$^{\pi}$[#]	Comments
2394.2 *15*	1/2$^{(-)}$,3/2,5/2^{+}	
2415.3 *3*	(1/2^{-},3/2)	
2425.3 *15*	(1/2^{-},3/2)	
2451.31 *23*	(3/2^{-})	E(level): from E(2237γ). other: 2541.0 *15* from 1988Bo44.
2460.3 *15*	(1/2,3/2)	
2475.5 *15*	(3/2^{-})	
2509.5 *15*	(1/2,3/2)	
2522.7 *15*	(1/2^{-},3/2)	
2601.2 *3*	(1/2^{-},3/2)	
2610.9 *4*	(1/2^{-},3/2)	E(level): weighted average of 2610.8 *3* from E(1918γ), 2610.55 *19* from E(2190γ) and 2612.0 *3* from E(primary γ).
2638.8 *3*	(1/2,3/2)	E(level): from E(1918γ). 2638.3 *15* from 1988Bo44.
2654.13 *24*	(1/2^{-},3/2)	E(level): from E(1866γ). E=2653.1 *15* from 1988Bo44.
2702.9 *15*	(1/2^{-},3/2)	
2743.72 *21*	(1/2^{-},3/2)	E(level): from E(2127γ). E=2742.8 *15* from 1988Bo44.
2905.2 *15*	(1/2,3/2)	
2983.3 *15*	1/2$^{(-)}$,3/2,5/2^{+}	
3076.2 *3*	(1/2^{-},3/2)	E(level): from E(primary γ). E(level)=2078.0 *5* from E(2560γ).
3148.8 *5*	(1/2^{-},3/2)	E(level): from E(2448γ). 3149.1 *15* from 1988Bo44.
3177.9 *3*	1/2$^{(-)}$,3/2,5/2^{+}	
3345.4 *3*	1/2$^{(-)}$,3/2,5/2^{+}	E(level): from Eγ=2644.3 *3* to 701 level. other: 3345.2 *15* (1988Bo44).
3347.2 *4*	(1/2,3/2)	
3409.4 *15*	(1/2,3/2)	
6099.06 *10*	1/2^{+}	E(level): from 1989Ri03 (cf. 6098.99 *8* from 2003Au03). J$^{\pi}$: s-wave neutron capture by 0^{+} target g.s.

[†] For E<2000: from a least-squares fit to Eγ from 1989Ri03 for singly-placed secondary γ rays, except as noted. For E≥2000: from S(n)=6099.0 and Eγ(primary transition), except as noted; for E(primary γ) from 1988Bo44, authors estimate ΔE≤1.5 keV, so evaluator has assigned ΔE=1.5 keV In such cases.

[‡] From centroid shift between background-corrected time distribution for delayed transition and time distribution for (prompt) background radiation at similar energy (1974An11).

[#] From Adopted Levels. Assignments are based on γ-ray multipolarities and decay patterns, on rotational structure, and on the assumption that only levels with J$^{\pi}$=1/2, 3/2 or 5/2^{+} are fed from the capture state (J$^{\pi}$=1/2^{+}) by primary γ rays. Spin assignments for many π=− states were supported by the agreement between calculated level energies and γ-ray transition probabilities (Coriolis interaction included) and experimental values (1976Be23). See 1985Ri09 for a discussion of an unusual 182.2γ between an octupole vibration at 1185.8 and a quadrupole vibration at 1003.7, each built on a different single-particle state.

[@] Based on Eγ for primary transition feeding this level.

[&] Band(A): 9/2[624] g.s. band.

[a] Band(B): 7/2[514] band.

[b] Band(C): 1/2[510] band.

[c] Band(D): 5/2[512] band.

[d] Band(E): 1/2[521] band.

[e] Band(F): 3/2[512] band.

[f] Band(G): 7/2[503] band.

[g] Band(H): K$^{\pi}$=5/2^{+} g.s. γ-vibrational band.

[h] Band(I): 7/2[633] band.

[i] Band(J): K$^{\pi}$=9/2^{+} g.s. β-vibrational band.

[j] Band(K): K$^{\pi}$=1/2^{+} band.

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^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23 (continued)

^{179}Hf Levels (continued)

[k] Band(L): $K^{\pi}=3/2^{-}$ band.
[l] Band(M): 3/2[521] band.
[m] Band(N): 3/2[501] band.
[n] Band(O): 1/2[501] band.
[o] Band(P): $K^{\pi}=3/2^{+}$ band.

γ(^{179}Hf)

Iγ normalization: secondary gammas: Iγ normalization=0.085 *4* if Σ (I(γ+ce) to g.s.)=100. Alternatively, based on partial elemental cross sections of 20.6 b *4* and 4.29 b *9* (2007ChZX; Budapest data) for the strongest secondary γ′s (214γ, 304γ), Iγ normalization=0.090 *4*, 0.102 *3* respectively; it should Be noted, however, that the same procedure yields a broad range of Iγ normalization values (0.045 *12* to 4.4 *20*) when applied to weaker secondary gammas so the value obtained from Σ (I(γ+ce) to g.s.)=100 May Be the most reliable. Primary gammas: based on partial elemental cross sections (2007ChZX; Budapest data) for the 11 primary lines that do not appear to Be complex, the weighted average Iγ normalization=0.103 *3*. this is considerably smaller than the value of 0.246 *4* obtained from an assumption that Σ Iγ(primary)=100, and consistent with the expectation that significant primary γ intensity will have been overlooked In the very complex γ spectrum from a natural Hf target.

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[@]	α[j]	Comments
^{x}38.939 *3*	0.17 *15*								
^{x}41.2720 *20*	0.23 *11*								
^{x}41.3950 *20*	0.16 *9*								
41.9960 *10*	0.47 *10*	518.3301	5/2⁻	476.336	5/2⁻	M1(+E2)	0.13 *+6−11*	11 *3*	α(L)exp=8.5 *19* (1989Ri03).
^{x}42.1480 *20*	0.23 *12*								Additional information 1.
^{x}42.463 *3*	0.17 *12*								α(L)exp=1.8 *13* (1989Ri03). Mult.: α(L)exp is intermediate between α(L)(E1)=0.64 and α(L)(M1)=6.55; however, 1989Ri03 assign (M1+E2), so evaluator suspects that α(L)exp is misprinted in 1989Ri03.
^{x}43.187 *3*	0.22 *13*					M1(+E2)	≤0.4	17 *10*	α(L)exp=13 *7* (1989Ri03). Mult.: 1989Ri03 assign (E2), inconsistent with α(L)exp.
^{x}44.0580 *20*	0.23 *12*								α(L)exp=0.5 *3* (1989Ri03). Mult.: E1 from α(L)exp; however, 1989Ri03 assign (M1+E2), so evaluator suspects that α(L)exp is misprinted in 1989Ri03.
^{x}45.2680 *20*	0.26 *13*								Additional information 2.
45.8610 *10*	74 *4*	420.895	3/2⁻	375.037	1/2⁻	M1+E2	0.117 *+22−26*	7.9 *6*	α(L)exp=6.1 *4* (1989Ri03); L1:L2:M1:M2:N=240 *40*:28 *8*:70 *18*:8 *2*:23 *3* (1976Be23). δ: 0.117 *+22−26* from α(L)exp, 0.05 *8* from subshell ratios. 1989Ri03 deduce δ=0.23.
^{x}47.283 *4*	0.23 *16*								
^{x}49.589 *3*	0.26 *13*					M1		5.19	α(L)exp=2.7 *14* (1989Ri03). Eγ fits a 1235-1186 placement. Additional information 3.
^{x}51.512 *4*	0.16 *7*					M1(+E2)	0.29 *+13−20*	9 *4*	α(L)exp=7 *3* (1989Ri03).
^{x}51.578 *3*	0.17 *7*								Additional information 4.
55.4420 *10*	30.7 *3*	476.336	5/2⁻	420.895	3/2⁻	M1		3.74	α(L)exp=2.45 *5* (1989Ri03); L1:L2:M1=65 *10*:5 *2*:12 *4* (1976Be23). 1989Ri03 deduce mult=M1+E2 with δ=0.14; however, α(L)exp<α(L)(M1) (2.90) and δ(M1,E2)<0.085 from L1/L2.
^{x}70.300 *4*	0.48 *17*					E1		0.885	α(L)exp=0.29 *12* (1989Ri03).
^{x}70.408 *7*	0.30 *13*					(E1)		0.882	α(L)exp=0.47 *24* (1989Ri03). Mult.: α(L)exp is high for an E1 transition (α(L)(E1)=0.133); possibly a contaminant is present. Additional information 5.

From ENSDF

^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23 (continued)

γ(^{179}Hf) (continued)

E_γ †	I_γ ‡	E_i(level)	J^π_i	E_f	J^π_f	Mult. #	δ @	α j	Comments
x83.334 *10*	0.22 *16*								α(K)exp=1.3 *9* (1989Ri03). α(K)exp allows E2(+M1) (with δ≥2.0) or E1; however, ce(K) lies at lower limit of spectrometer range, so evaluator cannot rule out the possibility that 1989Ri03 quote α(L)exp (in which case, mult=M1(+E2), δ≤0.73). Additional information 6.
84.2970 *10*	2.00 *12*	701.056	5/2−	616.757	7/2−	M1+E2	2.6 *3*	6.93	α(K)exp=1.81 *11* (1989Ri03). δ: 1989Ri03 deduce δ=0.23. If authors′ datum were α(L)exp, δ would be 0.61 *5*.
x86.204 *4*	0.51 *12*								α(K)exp=0.15 *7* (1989Ri03). Mult.: α(K)exp is lower than α(K)(E1)=0.435; however, 1989Ri03 assign (M1+E2), so evaluator suspects that α(K)exp is misprinted in 1989Ri03.
86.857 *5*	0.83 *11*	701.056	5/2−	614.205	1/2−	E2		6.18	α(K)exp=1.29 *17* (1989Ri03). Mult.: α(K)exp does not preclude a small M1 or M3 admixture; placement requires ΔJ=2.
87.127 *13*	0.18 *8*	788.186	5/2−	701.056	5/2−				other: Eγ=87.13 *11*, Iγ=8.8 *12* (2007ChZX; Budapest data). Evaluator suspects γ is complex In 2007ChZX.
x88.065 *10*	0.29 *18*								α(K)exp=0.4 *3* (1989Ri03). Mult.: E1 from α(K)exp; however, 1989Ri03 assign M1+E2, possibly indicating that α(K)exp is misprinted in 1989Ri03. Additional information 7.
x89.61 *4*	0.42 *12*					M1+E2	1.4 +*12*−*5*	5.46	α(K)exp=2.3 *7* (1989Ri03).
x91.796 *10*	0.31 *10*					E1		0.448	α(K)exp=0.39 *24* (1989Ri03). Additional information 8.
97.4350 *20*	1.63 *7*	518.3301	5/2−	420.895	3/2−	M1+E2	0.28 +*10*−*14*	4.29 *7*	α(K)exp=3.40 *14* (1989Ri03). δ: 1989Ri03 deduce δ=0.27.
98.4330 *20*	8.60 *9*	616.757	7/2−	518.3301	5/2−	M1+E2	0.35 *4*	4.14	α(K)exp=3.21 *6* (1989Ri03). α(L1)exp=0.9 *4* (1976Be23). δ: 1989Ri03 deduce δ=0.35. other Iγ: 4.4 *12* (2007ChZX; Budapest data).
98.808 *12*	0.27 *7*	681.037	9/2−	582.231	7/2−				
101.2980 *10*	27.7 *14*	476.336	5/2−	375.037	1/2−	E2		3.35	α(K)exp=0.98 *6* (1989Ri03). K:L1:L2:L3:M2:M3=15 *5*:3.0 *15*:23 *3*:16 *3*:8 *3*:7 *3* (1976Be23). Mult.: δ(M1,E2)>4.4 from α(K)exp; M1 component inconsistent with placement.
x103.9350 *20*	0.21 *5*					M1+E2	1.1 +*9*−*4*	3.28 *15*	α(K)exp=1.8 *5* (1989Ri03). Additional information 9.
105.899 *3*	20.5 *4*	582.231	7/2−	476.336	5/2−	M1		3.40	α(K)exp=2.91 *9* (1989Ri03); K:L1:M1=38 *7*:4.5 *10*:2 *1* (1976Be23).
106.4090 *10*	1.05 *6*	720.614	3/2−	614.205	1/2−	M1(+E2)	<0.37	3.32 *6*	α(K)exp=2.71 *16* (1989Ri03).
106.4920 *10*	0.42 *5*	849.202	7/2−	742.711	9/2−	M1+E2	1.0 +*4*−*3*	3.05 *11*	α(K)exp=1.8 *3* (1989Ri03).
108.678 *4*	0.25 *4*	788.186	5/2−	679.518	3/2−				
x113.303 *23*	0.14 *5*								Eγ fits 1283 to 1169 transition. Additional information 10.

From ENSDF

γ(^{179}Hf) (continued)

E_γ †	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	δ@	α j	Comments
118.8260 *10*	15.1 *5*	701.056	5/2⁻	582.231	7/2⁻	M1+E2	0.36 *8*	2.37 *5*	α(K)exp=1.88 *6* (1989Ri03). K:L1:M=21 *3*:2.5 *6*:0.6 *2* (1976Be23).
122.793 *3*	6.8 *3*	122.7909	11/2⁺	0.0	9/2⁺	M1+E2	0.70 *+12−11*	2.02 *6*	α(K)exp=1.44 *9* (1989Ri03), α(L1)exp=0.2 *1* (1976Be23).
123.3790 *20*	8.2 *3*	337.7183	9/2⁻	214.3406	7/2⁻	E2		1.582	α(K)exp=0.61 *3* (1989Ri03). K:L1:L2:L3=3 *1*:0.3 *2*:1.5 *5*:1.0 *5* (1976Be23). α(K)exp implies δ(M1,E2)>5.4.
125.9570 *10*	1.15 *10*	742.711	9/2⁻	616.757	7/2⁻	M1+E2	0.67 *+20−19*	1.88 *8*	α(K)exp=1.37 *14* (1989Ri03).
137.8730 *20*	0.49 *3*	614.205	1/2⁻	476.336	5/2⁻	E2		1.051	α(K)exp=0.34 *7* (1989Ri03).
140.4260 *20*	0.93 *6*	616.757	7/2⁻	476.336	5/2⁻	M1+E2	0.40 *+15−19*	1.45 *6*	α(K)exp=1.15 *8* (1989Ri03). other: Eγ=139.78 *21*, Iγ=2.7 *8* (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
143.301 *9*	0.20 *5*	518.3301	5/2⁻	375.037	1/2⁻	(E2)		0.914	α(K)exp=0.17 *12* (1989Ri03). Mult.: (E1,E2) from α(K)exp; E1 inconsistent with level scheme.
ˣ146.217 *4*	0.22 *7*					(E2)		0.850	α(K)exp=0.36 *22* (1989Ri03). Eγ close to that for known 268 to 123 M1+E2 transition, but α(K)exp≈1.0 expected for that transition. See also comment on 268.416γ. Additional information 11.
147.458 *3*	0.41 *6*	935.645	7/2⁻	788.186	5/2⁻	M1		1.324	Mult from α(K)exp=1.1 *5* (1976Be23).
148.148 *4*	0.23 *5*	849.202	7/2⁻	701.056	5/2⁻	M1		1.306	Mult from α(K)exp=1.0 *5* (1976Be23).
150.019 *15*	0.20 *4*	487.710	(11/2⁻)	337.7183	9/2⁻				
158.94 *6*	0.09 *4*	1731.438	3/2⁻	1572.56	3/2⁻				
160.6960 *20*	27.8 *6*	375.037	1/2⁻	214.3406	7/2⁻	M3		34.1	α(K)exp=17.1 *5* (1989Ri03), 17.3 *17* (1976Be23). K:L1:L2:L3:(M1+M2):M3:N=505 *40*:158 *20*:29 *9*:100 *14*:48 *8*:29 *5*:18 *4* (1976Be23). Iγ=43 *4* for 161γ triplet In 2007ChZX (Budapest data) is somewhat lower than summed Iγ=66.6 for components resolved by 1989Ri03.
161.1910 *20*	34.9 *10*	679.518	3/2⁻	518.3301	5/2⁻	M1		1.030	α(K)exp=0.86 *5* (1989Ri03). see comment on Iγ for 160.7γ.
161.3390 *20*	3.90 *16*	582.231	7/2⁻	420.895	3/2⁻	(E2)&		0.600	α(K)exp=0.69 *15* (1989Ri03). Mult.: E2+M1 (δ=0.7 *5*) from α(K)exp but α(K)exp may be overestimated due to possible ce contaminant; M1 component inconsistent with placement.
168.1620 *20*	0.470 *24*	849.202	7/2⁻	681.037	9/2⁻				
169.675 *4*	0.51 *3*	849.202	7/2⁻	679.518	3/2⁻	E2		0.503	α(K)exp=0.23 *4* (1989Ri03).
ˣ170.153 *9*	0.137 *25*								
171.4320 *20*	7.00 *7*	788.186	5/2⁻	616.757	7/2⁻	M1+E2	0.67 *4*	0.748 *15*	α(K)exp=0.577 *12* (1989Ri03). other Iγ: 3.6 *9* from 2007ChZX (Budapest data).
ˣ171.920 *12*	0.10 *3*								
ˣ172.38 *6*	0.12 *3*					M1		0.853	Mult.: from α(K)exp=1.2 *7* (1976Be23). Additional information 12.

$^{179}_{72}$Hf$_{107}$-7

γ(^{179}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[@]	α[j]	Comments
173.977 *3*	0.348 *24*	788.186	5/2⁻	614.205	1/2⁻	E2		0.461	α(K)exp=0.31 *7* (1989Ri03). Mult.: E2(+M1), δ≥1.5 from α(K)exp; placement requires ΔJ=2.
^{x}177.35 *8*	0.20 *9*								Eγ fits 665 to 488 transition.
^{x}178.457 *11*	0.20 *3*					M1		0.774	α(K)exp=0.70 *15* (1989Ri03).
^{x}179.910 *5*	0.47 *4*								
180.6130 *20*	1.44 *7*	518.3301	5/2⁻	337.7183	9/2⁻	E2		0.406	α(K)exp=0.21 *3* (1989Ri03).
182.178 *11*	0.161 *21*	1185.847	3/2⁺	1003.650	5/2⁺				
182.7350 *20*	3.80 *8*	701.056	5/2⁻	518.3301	5/2⁻	M1+E2	0.67 *6*	0.621 *16*	α(K)exp=0.483 *14* (1989Ri03); K:L1=2.0 *5*:0.5 *2* (1976Be23).
183.661 *3*	0.365 *18*	1715.934	1/2⁺,3/2⁺,5/2⁺	1532.275	5/2⁺				
^{x}185.203 *4*	0.25 *3*					M1+E2	1.4 +*14*−*5*	0.48 *8*	α(K)exp=0.34 *9* (1989Ri03). Additional information 13.
190.513 *21*	0.09 *6*	1945.865	(1/2,3/2)	1755.346	3/2⁻				
192.933 *3*	0.54 *5*	935.645	7/2⁻	742.711	9/2⁻				
193.3100 *20*	67.8 *14*	614.205	1/2⁻	420.895	3/2⁻	M1+E2	0.59 *4*	0.543 *11*	α(K)exp=0.431 *9* (1989Ri03). K:L1:L2:M=30 *5*:4.5 *10*:0.4 *2*:1.2 *5* (1976Be23). δ: 1989Ri03 deduce δ≤0.23. other Iγ: 52.9 *19* (2007ChZX; Budapest data).
195.861 *6*	0.176 *21*	616.757	7/2⁻	420.895	3/2⁻				
202.283 *3*	39.8 *8*	720.614	3/2⁻	518.3301	5/2⁻	M1+E2	0.57 *4*	0.480 *10*	α(K)exp=0.383 *8* (1989Ri03); K:L1=15 *2*:2.0 *7* (1976Be23).
203.182 *3*	5.83 *12*	679.518	3/2⁻	476.336	5/2⁻	M1+E2	0.70 *6*	0.452 *12*	α(K)exp=0.354 *11* (1989Ri03); K:L1=1.7 *6*:0.3 *2* (1976Be23).
204.696 *3*	1.79 *4*	681.037	9/2⁻	476.336	5/2⁻	E2		0.266	α(K)exp=0.140 *8* (1989Ri03).
205.950 *3*	3.73 *7*	788.186	5/2⁻	582.231	7/2⁻	M1+E2	0.84 *6*	0.412 *11*	α(K)exp=0.318 *10* (1989Ri03).
^{x}211.226 *6*	0.42 *3*								Additional information 14.
214.335 *3*	1000 *40*	214.3406	7/2⁻	0.0	9/2⁺	E1		0.063 *4*	α(K)exp=0.050 *3* (1989Ri03). K:L1:L2:L3:M:N=51 *7*:9.5 *25*:1.2 *4*:1.0 *5*:1.2 *4*:0.5 *3* (1976Be23). α(exp): from α(K)exp (1989Ri03) and subshell ratios (1976Be23). Anomalous E1 transition; α(E1 theory)=0.0494.
214.930 *3*	6.4 *3*	337.7183	9/2⁻	122.7909	11/2⁺	[E1]		0.0494	
^{x}217.374 *11*	0.16 *4*								
^{x}217.76 *9*	0.08 *3*								
^{x}218.782 *24*	0.082 *24*								
^{x}219.569 *18*	0.12 *3*								
220.080 *9*	0.102 *23*	1945.865	(1/2,3/2)	1725.787	3/2⁻				
^{x}221.083 *23*	0.12 *6*								
^{x}222.329 *15*	0.21 *3*								Additional information 15.
224.367 *4*	0.269 *22*	742.711	9/2⁻	518.3301	5/2⁻				

γ(^{179}Hf) (continued)

E_γ †	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	δ@	α j	Comments
224.715 *3*	0.98 *10*	701.056	5/2⁻	476.336	5/2⁻	M1(+E0)&			α(K)exp=0.47 *7* (1989Ri03). Mult.: M1+E0 from α(K)exp but α(K)exp may be overestimated due to possible ce contaminant.
ˣ231.541 *11*	0.21 *8*								Additional information 16.
231.809 *6*	0.333 *23*	1235.440	5/2⁺	1003.650	5/2⁺				
232.439 *3*	1.62 *6*	849.202	7/2⁻	616.757	7/2⁻	M1+E2	1.04 *+14−12*	0.270 *13*	α(K)exp=0.206 *12* (1989Ri03).
233.900 *4*	0.628 *19*	1715.934	1/2⁺,3/2⁺,5/2⁺	1482.030	3/2⁺	M1+E2	1.1 *+4−3*	0.26 *3*	α(K)exp=0.20 *3* (1989Ri03).
ˣ237.243 *13*	0.12 *5*								Additional information 17.
239.165 *3*	11.1 *8*	614.205	1/2⁻	375.037	1/2⁻	M1		0.344	α(K)exp=0.295 *24* (1989Ri03). K:L1=3.5 *10*:0.3 *1* (1976Me23). α(K)exp consistent with pure M1 (δ(M1,E2)<0.32); however, 1989Ri03 assign mult=M1+E2 with δ=0.37 (inconsistent with 1/2⁻ to 1/2⁻ placement). other: Eγ=239.17 *7*, Iγ=18.3 *11* (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
244.278 *8*	4.2 *4*	720.614	3/2⁻	476.336	5/2⁻	M1(+E2)	<0.7	0.30 *3*	Mult from α(K)exp=0.26 *5* (1976Be23).
247.069 *4*	0.47 *3*	1706.066	(3/2)⁻	1458.997	3/2⁻	M1+E2	1.2 *+18−6*	0.21 *6*	α(K)exp=0.16 *5* (1989Ri03).
ˣ251.577 *21*	0.17 *4*								
ˣ253.541 *12*	0.20 *3*								Additional information 18.
ˣ254.945 *5*	0.71 *3*					M1+E2	1.6 *+7−4*	0.175 *21*	α(K)exp=0.131 *20* (1989Ri03).
258.615 *3*	26.1 *16*	679.518	3/2⁻	420.895	3/2⁻	M1+E2	0.53 *13*	0.244 *14*	α(K)exp=0.199 *12* (1989Ri03); K:L=6 *1*:1.0 *3* (1976Be23). δ: 1989Ri03 deduce δ=0.40.
259.889 *7*	0.58 *3*	1928.845	1/2⁺,3/2⁺	1668.955	3/2⁺				α(K)exp<0.5 (1976Be23).
ˣ260.663 *9*	0.24 *3*								
262.02 *3*	0.067 *19*	476.336	5/2⁻	214.3406	7/2⁻				
ˣ262.798 *6*	0.187 *17*								
ˣ263.581 *8*	0.209 *15*								Additional information 19.
ˣ265.563 *9*	0.200 *16*								
ˣ266.069 *4*	0.62 *3*					M1+E2	0.9 *+4−3*	0.19 *3*	α(K)exp=0.154 *23* (1989Ri03).
266.974 *4*	1.22 *6*	849.202	7/2⁻	582.231	7/2⁻	M1(+E2)		0.18 *7*	Mult from α(K)exp=0.25 *13* (1976Be23).
ˣ268.416ᵐ *16*	0.13 *4*								Placed from 269 level by 1989Ri03. However, Eγ lower than that of known 269 to g.s. transition and inconsistent with Eγ for stronger 146γ (unplaced in (n,γ)) known to accompany the 268γ in ^{179}Hf IT decay (25.05 d). I(146γ)/I(268γ)=1.7 *6* here, cf. 2.40 *17* in ^{179}Hf IT decay (25.05 d). Additional information 20.

$^{179}_{72}$Hf$_{107}$-9

γ(^{179}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[@]	α[j]	Comments
269.857 4	6.6 5	788.186	5/2⁻	518.3301	5/2⁻	M1+E0			α(K)exp=0.255 20 (1989Ri03).
^{x}271.847 12	0.159 21								Additional information 21.
273.368 4	0.66 3	487.710	(11/2⁻)	214.3406	7/2⁻				
^{x}275.259 22	0.16 3								
^{x}276.32 3	0.086 22								Additional information 22.
^{x}277.93 4	0.250 22								Iγ=0.25 22 in table 2 of 1989Ri03 is presumed by the evaluator to be a misprint. Additional information 23.
279.029 4	6.53 7	616.757	7/2⁻	337.7183	9/2⁻	M1+E2	0.69 +12−11	0.185 10	α(K)exp=0.149 9 (1989Ri03).
280.154 4	0.728 22	701.056	5/2⁻	420.895	3/2⁻	M1+E2	0.5 +3−4	0.198 25	α(K)exp=0.159 24 (1989Ri03).
^{x}287.62 3	0.091 25								
^{x}288.567 8	0.223 18					M1		0.206	α(K)exp=0.16 6 (1989Ri03).
^{x}289.100 23	0.110 14								
^{x}290.12 5	0.09 3								
295.104 14	0.42 6	1731.438	3/2⁻	1436.352	7/2⁻	(E2)		0.0832	α(K)exp=0.06 4 (1989Ri03). Other: 0.4 2 (1976Be23). Mult.: E2 or possibly E1 from α(K)exp of 1989Ri03.
^{x}295.928 12	0.26 3								Additional information 24.
^{x}297.371 7	0.196 20								
^{x}299.013 15	0.19 3								Additional information 25.
299.716 4	15.4 3	720.614	3/2⁻	420.895	3/2⁻	M1+E2	1.53 6	0.1114 24	α(K)exp=0.0852 17 (1989Ri03).
303.977 4	183 4	518.3301	5/2⁻	214.3406	7/2⁻	M1+E2	0.62 +7−6	0.151 5	δ: 1989Ri03 deduce δ=0.33. α(K)exp=0.123 4 (1989Ri03). other Iγ: 208 4 (2007ChZX; Budapest data).
304.465 7	2.54 23	679.518	3/2⁻	375.037	1/2⁻	M1[&]		0.1785	α(K)exp=0.20 7 (1989Ri03).
311.844 4	1.50 6	788.186	5/2⁻	476.336	5/2⁻	M1(+E2)	≤0.43	0.160 8	α(K)exp=0.135 9 (1989Ri03).
^{x}314.784 4	1.596 16					M1		0.1632	α(K)exp=0.137 8 (1989Ri03). Additional information 26.
315.49 8	0.09 3	1436.352	7/2⁻	1120.78	9/2⁺				
^{x}316.455 15	0.18 3								
318.887 4	1.26 3	935.645	7/2⁻	616.757	7/2⁻	M1+E2	0.71 +20−18	0.127 11	α(K)exp=0.103 10 (1989Ri03). other: Eγ=318.45 19, Iγ=4.6 10 (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
319.216 13	0.557 22	1851.502	3/2⁺,5/2⁺	1532.275	5/2⁺	M1(+E2)[c]		0.11 5	α(K)exp=0.11 3 (1989Ri03).
^{x}319.429 17	0.119 18								
^{x}320.002 11	0.186 17					M1,E2[&]		0.11 5	α(K)exp=0.14 11 (1989Ri03).
^{x}324.450 11	0.180 23								
326.010 14	5.38 22	701.056	5/2⁻	375.037	1/2⁻	E2[c]		0.0619	α(K)exp=0.0457 18 (1989Ri03).
^{x}326.28 3	0.34 4					E2(+M1)[c]		0.10 5	α(K)exp=0.142 23 (1989Ri03). Additional information 27.
328.955 5	0.38 3	1861.235	5/2⁺	1532.275	5/2⁺	M1+E0[&]			α(K)exp=0.170 17 (1989Ri03).

$^{179}_{72}$Hf$_{107}$-10

$\gamma(^{179}$Hf) (continued)

E_γ†	I_γ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	δ@	αj	Comments
330.856 9	0.359 18	849.202	7/2⁻	518.3301	5/2⁻				
x333.476 13	0.09 3								
x334.676 17	0.096 22								Additional information 28.
337.713 5	1.74 7	337.7183	9/2⁻	0.0	9/2⁺	E1		0.01607	α(K)exp=0.0191 23 (1989Ri03).
x344.990 20	0.144 23								Additional information 29.
345.575 5	3.82 4	720.614	3/2⁻	375.037	1/2⁻	M1+E2	0.64 4	0.1054 25	α(K)exp=0.0862 17 (1989Ri03).
x346.068 6	0.430 22					M1+E2	1.1 +4−3	0.086 12	α(K)exp=0.068 9 (1989Ri03).
x346.90 3	0.081 20								Additional information 30.
x352.84 5	0.22 3								
353.425 6	0.96 5	935.645	7/2⁻	582.231	7/2⁻	M1		0.1197	α(K)exp=0.108 13 (1989Ri03).
x355.047 9	0.258 21								
x355.514 14	0.140 21								Additional information 31.
357.731 11	0.233 19	1078.349	(7/2)⁺	720.614	3/2⁻				
357.999 16	0.38 3	1436.352	7/2⁻	1078.349	(7/2)⁺				
x361.746 10	0.306 24					M1+E2	1.5 +14−5	0.066 14	α(K)exp=0.053 13 (1989Ri03). Additional information 32.
x365.890 17	0.122 17								
x366.71 4	0.15 4								
367.891 17	0.113 18	582.231	7/2⁻	214.3406	7/2⁻				
x369.811 18	0.204 24								
372.853 5	2.428 24	849.202	7/2⁻	476.336	5/2⁻	M1		0.1038	α(K)exp=0.0944 19 (1989Ri03).
x376.65 4	0.33 3								Additional information 33.
x384.35 3	0.075 20								Eγ=384.76 3, Iγ=0.33 10 (1976Be23).
386.244 6	1.57 3	1235.440	5/2⁺	849.202	7/2⁻	(E1)&		0.01173	α(K)exp=0.0207 25 (1989Ri03). Mult.: α(K)exp is low for E2 (α(K)(E2)=0.0283) and may be overestimated due to possible ce contaminant; Δπ=yes from placement.
386.898 9	0.296 21	1003.650	5/2⁺	616.757	7/2⁻	&			α(K)exp=0.048 17 (1989Ri03). Mult.: M1+E2 from α(K)exp but α(K)exp may be overestimated due to possible ce contaminant; Δπ=yes from level scheme.
x387.702 22	0.12 3								Additional information 34.
x389.664 10	0.17 4								
x394.047 9	0.220 15								
x395.463 14	0.140 15								
396.602 25	0.148 18	1928.845	1/2⁺,3/2⁺	1532.275	5/2⁺				
397.67 3	0.094 17	1185.847	3/2⁺	788.186	5/2⁻				
399.17 4	0.177 14	1269.445	3/2⁻	870.225	7/2⁻				
x400.521 23	0.277 19								
402.409 6	3.20 6	616.757	7/2⁻	214.3406	7/2⁻	M1+E2	1.28 8	0.0534 18	α(K)exp=0.0428 13 (1989Ri03).
x405.030 13	0.154 20								
x406.26 3	0.067 15								
x407.388 9	0.238 19					M1+E2	0.6 5	0.069 14	α(K)exp=0.056 12 (1989Ri03). Additional information 35.

$^{179}_{72}$Hf$_{107}$-11

^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23 (continued)

γ(^{179}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[@]	α[j]	Comments
^{x}409.28 *3*	0.078 *18*								
^{x}409.956 *6*	1.78 *4*					M1+E2	0.58 *6*	0.0686 *22*	α(K)exp=0.0567 *17* (1989Ri03).
^{x}410.495 *22*	0.119 *21*								
^{x}412.201 *13*	0.243 *22*					M1+E2	0.7 *+7−5*	0.064 *16*	α(K)exp=0.051 *13* (1989Ri03).
413.132 *7*	3.05 *6*	788.186	5/2$^-$	375.037	1/2$^-$	E2		0.0318	α(K)exp=0.0230 *9* (1989Ri03).
^{x}417.390 *11*	0.321 *22*					M1		0.0771	α(K)exp=0.060 *17* (1989Ri03).
^{x}421.585 *23*	0.148 *22*								Eγ=421.24 *5*, Iγ=0.59 *17* (1976Be23).
^{x}423.12 *3*	0.147 *21*								
^{x}424.258 *11*	0.291 *23*					M1		0.0738	α(K)exp=0.076 *14* (1989Ri03).
428.292 *6*	0.44 *5*	849.202	7/2$^-$	420.895	3/2$^-$	(E2)[c]		0.0289	α(K)exp=0.029 *7* (1989Ri03). Mult.: E2(+M1) (δ(M1,E2)≥1.3) from α(K)exp; M1 component inconsistent with placement.
^{x}428.86 *3*	0.15 *5*					M1[c]		0.0718	α(K)exp=0.09 *4* (1989Ri03).
429.800 *6*	3.5 *3*	1150.410	1/2$^+$	720.614	3/2$^-$	(E1)[c]		0.00919 *13*	α(K)exp=0.0137 *15* (1989Ri03). Mult.: α(K)exp lies between α(K)(E1) and α(K)(E2); $\Delta\pi$=yes from level scheme.
432.701 *6*	0.59 *6*	1436.352	7/2$^-$	1003.650	5/2$^+$	(E1)[c]		0.00905 *13*	α(K)exp=0.013 *5* (1989Ri03). Mult.: α(K)exp lies between α(K)(E1) and α(K)(E2); $\Delta\pi$=yes from level scheme.
433.520 *9*	0.89 *4*	1668.955	3/2$^+$	1235.440	5/2$^+$	M1		0.0698	α(K)exp=0.060 *4* (1989Ri03).
^{x}433.721 *18*	0.40 *6*								Additional information 36.
436.59 *4*	0.19 *6*	1706.066	(3/2)$^-$	1269.445	3/2$^-$				
^{x}443.606 *7*	0.53 *10*					M1		0.0657	α(K)exp=0.055 *12* (1989Ri03). Eγ=443.32 *6*, Iγ=0.72 *12* and Eγ=443.87 *7*, Iγ=0.55 *11* in 1976Be23.
^{x}445.250 *6*	0.609 *24*					M1(+E0)			α(K)exp=0.064 *6* (1989Ri03).
^{x}445.968 *25*	0.10 *3*								
450.47 *3*	0.204 *20*	788.186	5/2$^-$	337.7183	9/2$^-$				
^{x}455.369 *15*	0.40 *4*					E2(+M1)		0.043 *19*	α(K)exp=0.022 *7* (1989Ri03).
456.346 *16*	0.78 *3*	1725.787	3/2$^-$	1269.445	3/2$^-$				
459.287 *9*	0.38 *3*	935.645	7/2$^-$	476.336	5/2$^-$	M1(+E2)		0.042 *18*	α(K)exp=0.043 *9* (1989Ri03).
461.935 *23*	0.46 *3*	1731.438	3/2$^-$	1269.445	3/2$^-$	M1(+E2)		0.041 *18*	α(K)exp=0.043 *6* (1989Ri03).
463.710 *12*	0.323 *23*	1614.124	1/2$^-$,3/2$^-$	1150.410	1/2$^+$				
465.222 *6*	2.54 *13*	1185.847	3/2$^+$	720.614	3/2$^-$	(E1)[&]		0.00769 *11*	α(K)exp=0.0152 *15* (1989Ri03). Mult.: α(K)exp low for E2 (α(K)(E2)=0.0178) and ce line may include contaminant; $\Delta\pi$=yes from level scheme.
466.380 *6*	1.65 *10*	1715.934	1/2$^+$,3/2$^+$,5/2$^+$	1249.552	3/2$^-$	E1		0.00765 *11*	α(K)exp=0.0040 *16* (1989Ri03).
470.891 *7*	10.4 *10*	1150.410	1/2$^+$	679.518	3/2$^-$	E1		0.00749 *11*	α(K)exp=0.0047 *6* (1989Ri03).
^{x}477.24 *3*	0.29 *7*								Eγ=476.48 *12*, Iγ=0.88 *13*; Eγ=477.73 *6*, Iγ=0.91 *25* (1976Be23). Additional information 37.
478.369 *7*	2.39 *19*	1482.030	3/2$^+$	1003.650	5/2$^+$	M1(+E2)		0.038 *17*	α(K)exp=0.043 *4* (1989Ri03). other Iγ: 6.8 *15* (2007ChZX; Budapest data).

γ(^{179}Hf) (continued)

Eγ[†]	Iγ[‡]	Ei(level)	J^π_i	Ef	J^π_f	Mult.[#]	α[j]	Comments
480.268 *20*	0.45 *8*	1913.469	3/2⁻	1433.187	3/2⁻			Eγ=481.0 *3*, Iγ=5.3 *19* (2007ChZX; Budapest data); possibly γ is a multiplet there.
483.106 *7*	3.5 *5*	1668.955	3/2⁺	1185.847	3/2⁺	M1	0.0526	α(K)exp=0.044 *6* (1989Ri03). other: Eγ=483.6 *3*, Iγ=6.8 *15* (2007ChZX; Budapest data).
484.799 *15*	2.40 *24*	1185.847	3/2⁺	701.056	5/2⁻	(E1)	0.00702 *10*	α(K)exp=0.0096 *15* (1989Ri03). Mult.: α(K)exp is intermediate between α(K)(E2)=0.0162 and α(K)(E1)=0.0059 and ce line may include contaminant; Δπ=yes from level scheme.
485.323 *7*	1.5 *3*	1003.650	5/2⁺	518.3301	5/2⁻			α(K)exp=0.013 *4* (1989Ri03). Mult.: α(K)exp overlaps α(K)(E2)=0.0161 (but not α(K)(E1)=0.0059); however, Δπ=yes from level scheme.
486.735 *14*	1.91 *17*	701.056	5/2⁻	214.3406	7/2⁻	M1	0.0516	α(K)exp=0.072 *6* (1989Ri03). Mult.: M1+E0 from α(K)exp; placement requires ΔJ=1. other: Eγ=486.1 *3*, Iγ=6.7 *12* (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
487.704 *11*	0.34 *11*	487.710	(11/2⁻)	0.0	9/2⁺			other: Eγ=488.2 *4*, Iγ=3.7 *12* (2007ChZX; Budapest data). Evaluator suspects γ is complex In 2007ChZX.
[x]499.854 *7*	0.50 *8*					M1(+E0)[c]		α(K)exp=0.060 *11* (1989Ri03).
506.299[l] *20*	1.8[l] *6*	720.614	3/2⁻	214.3406	7/2⁻	(E2)	0.0187	Iγ: from Iγ(doublet)=1.82 *20* and α(K)exp(doublet)=0.015 *3* (1989Ri03), and assuming mult=E2, E1 for components from 721, 1186 levels, respectively (from decay scheme), α(K)(E1)=0.0054 and α(K)(E2)=0.0146, one can deduce Iγ(from 720 level)=1.8 *6* and Iγ(from 1186 level)=0.0 *6*.
506.299[l] *20*	≤0.6[l]	1185.847	3/2⁺	679.518	3/2⁻			Iγ: see comment on 506.3γ from 720 level.
[x]507.351 *7*	1.63 *13*					M1	0.0463	α(K)exp=0.041 *4* (1989Ri03). Additional information 38.
514.827 *10*	0.83 *24*	1235.440	5/2⁺	720.614	3/2⁻	[&]		α(K)exp=0.023 *8* (1989Ri03). Mult.: E2+M1 from α(K)exp but Δπ=yes from level scheme; evaluator attributes this inconsistency to contamination of ce line. other: Eγ=513.8 *5*, Iγ=8 *3* (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
[x]515.89 *5*	0.25 *8*					M1[&]	0.0443	α(K)exp=0.052 *22* (1989Ri03). Additional information 39.
518.544 *9*	5.9 *5*	1668.955	3/2⁺	1150.410	1/2⁺	M1	0.0438	α(K)exp=0.036 *3* (1989Ri03).
[x]521.34 *3*	0.28 *9*							
[x]526.02 *8*	0.18 *4*							
[x]527.44 *4*	0.47 *4*							
528.626 *7*	6.05 *24*	1532.275	5/2⁺	1003.650	5/2⁺	M1	0.0416	α(K)exp=0.0357 *18* (1989Ri03).
[x]530.91 *3*	0.50 *4*					E1	0.00577 *8*	α(K)exp=0.005 *5* (1989Ri03). Additional information 40.
532.49 *4*	0.56 *4*	870.225	7/2⁻	337.7183	9/2⁻	M1	0.0409	α(K)exp=0.047 *6* (1989Ri03). Mult.: M1+E0 from α(K)exp, but ΔJ=1 from placement.
534.394 *12*	0.56 *3*	1235.440	5/2⁺	701.056	5/2⁻			α(K)exp=0.014 *5* (1989Ri03).

From ENSDF

γ(^{179}Hf) (continued)

Eγ[†]	Iγ[‡]	Ei(level)	J^π_i	Ef	J^π_f	Mult.[#]	δ[@]	α[j]	Comments
									Mult.: E2(+M1) from α(K)exp but Δπ=yes from placement in level scheme.
536.195 *10*	0.52 *7*	1150.410	1/2+	614.205	1/2−				
x537.716 *18*	0.35 *12*								
x538.687 *18*	0.23 *7*								
x540.053 *17*	0.43 *7*					E2(+M1)		0.028 *12*	α(K)exp=0.018 *9* (1989Ri03).
547.86 *5*	0.37 *4*	1861.235	5/2+	1313.499	5/2−				
548.508 *15*	0.72 *6*	1249.552	3/2−	701.056	5/2−	M1[c]		0.0379	α(K)exp=0.034 *9* (1989Ri03).
548.858 *21*	2.58 *18*	1269.445	3/2−	720.614	3/2−	M1+E2[c]		0.027 *12*	α(K)exp=0.025 *3* (1989Ri03).
x549.447 *8*	0.89 *5*					M1(+E0)[c]			α(K)exp=0.041 *6* (1989Ri03).
x551.58 *3*	0.18 *3*								
x552.869 *14*	0.42 *5*					M1+E2	1.2 *+17−6*	0.024 *8*	α(K)exp=0.020 *6* (1989Ri03).
555.888 *11*	0.59 *5*	1235.440	5/2+	679.518	3/2−				
x557.55 *3*	0.21 *5*								
x558.032 *11*	0.73 *5*					M1		0.0362	α(K)exp=0.033 *5* (1989Ri03).
x560.30 *3*	0.37 *10*								
x564.544 *10*	1.39 *4*					M1+E0			α(K)exp=0.049 *4* (1989Ri03).
565.51 *4*	0.23 *3*	1715.934	1/2+,3/2+,5/2+	1150.410	1/2+				
566.159 *15*	0.41 *4*	1436.352	7/2−	870.225	7/2−	M1+E0[c]			α(K)exp=0.054 *11* (1989Ri03).
568.382 *8*	1.05 *9*	1269.445	3/2−	701.056	5/2−	M1		0.0345	α(K)exp=0.032 *4* (1989Ri03).
570.036 *8*	1.45 *9*	1249.552	3/2−	679.518	3/2−	M1		0.0343	α(K)exp=0.033 *3* (1989Ri03).
571.653 *14*	7.2 *4*	1185.847	3/2+	614.205	1/2−	E1+M2	0.10 *3*	0.0059 *7*	α(K)exp=0.0050 *5* (1989Ri03). other: Eγ=571.95 *11*, Iγ=13.4 *12* (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
x573.17 *3*	0.69 *10*					M1		0.0338	α(K)exp=0.031 *8* (1989Ri03).
573.825 *22*	2.88 *17*	788.186	5/2−	214.3406	7/2−	M1		0.0337	α(K)exp=0.0323 *23* (1989Ri03).
x576.21 *5*	0.40 *5*								
x578.61 *3*	0.21 *4*								
x580.01 *5*	0.19 *4*								
x581.29 *8*	0.12 *3*					M1(+E0)			α(K)exp=0.12 *4* (1989Ri03).
x582.343 *15*	0.90 *4*					E2(+M1)		0.023 *10*	α(K)exp=0.016 *6* (1989Ri03).
x584.316 *24*	0.26 *10*								
588.774 *8*	3.86 *15*	1458.997	3/2−	870.225	7/2−	E2		0.01298	α(K)exp=0.0127 *9* (1989Ri03). other: Eγ=588.91 *17*, Iγ=8.7 *15* (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
589.923 *8*	2.89 *20*	1269.445	3/2−	679.518	3/2−	M1+E2	0.55 *23*	0.027 *3*	α(K)exp=0.0226 *23* (1989Ri03).
x592.978 *20*	0.27 *4*								
x595.138 *15*	0.55 *4*								Additional information 41.
599.965 *8*	2.41 *5*	1913.469	3/2−	1313.499	5/2−	M1		0.0301	α(K)exp=0.0285 *11* (1989Ri03).
x608.58 *3*	0.38 *7*								
x612.510 *14*	1.16 *8*					M1		0.0285	α(K)exp=0.024 *5* (1989Ri03). Additional information 42.

$^{179}_{72}$Hf$_{107}$-14

γ(^{179}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[@]	α[j]	Comments
[x]615.437 *22*	1.03 *5*					M1(+E0)			α(K)exp=0.032 *4* (1989Ri03).
616.768 *9*	1.97 *16*	616.757	$7/2^-$	0.0	$9/2^+$				
619.90 *5*	0.14 *7*	742.711	$9/2^-$	122.7909	$11/2^+$				
[x]621.98 *3*	0.29 *3*								
[x]622.72 *3*	0.73 *4*					M1(+E2)		0.019 *8*	α(K)exp=0.021 *5* (1989Ri03).
[x]624.72 *3*	0.32 *6*								
[x]625.38 *3*	0.34 *4*								
[x]627.181 *11*	0.69 *6*					M1		0.0268	α(K)exp=0.026 *4* (1989Ri03).
[x]629.05 *6*	0.21 *3*								
[x]633.64 *6*	0.55 *7*								
633.967 *22*	0.62 *6*	1313.499	$5/2^-$	679.518	$3/2^-$	M1+E2[c]		0.019 *8*	α(K)exp=0.017 *4* (1989Ri03). other: Eγ=633.9 *3*, Iγ=6.0 *10* (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
634.94 *4*	3.4 *4*	849.202	$7/2^-$	214.3406	$7/2^-$	M1+E2[c]		0.018 *8*	α(K)exp=0.0150 *24* (1989Ri03).
635.26 *4*	4.47 *22*	1249.552	$3/2^-$	614.205	$1/2^-$	M1(+E2)[c]		0.018 *8*	α(K)exp=0.0204 *18* (1989Ri03). other: Eγ=635.57 *21*, Iγ=6.0 *12* (2007ChZX; Budapest data).
[x]637.08 *7*	0.18 *7*								
[x]640.14 *9*	0.22 *6*								
[x]641.01 *6*	0.31 *7*								
644.09 *5*	0.48 *7*	1913.469	$3/2^-$	1269.445	$3/2^-$	M1		0.0251	α(K)exp=0.017 *6* (1989Ri03).
[x]648.42 *4*	1.20 *8*					M1+E2	0.7 *3*	0.020 *3*	α(K)exp=0.0163 *23* (1989Ri03).
[x]650.48 *4*	0.42 *8*								
653.190 *13*	9.1 *4*	1235.440	$5/2^+$	582.231	$7/2^-$	E1		0.00374 *6*	α(K)exp=0.0034 *3* (1989Ri03).
655.256 *19*	9.1 *4*	1269.445	$3/2^-$	614.205	$1/2^-$	M1+E2	0.70 *+10−9*	0.0194 *9*	α(K)exp=0.0162 *7* (1989Ri03).
655.888 *20*	3.40 *14*	870.225	$7/2^-$	214.3406	$7/2^-$	M1(+E2)		0.017 *7*	α(K)exp=0.0194 *12* (1989Ri03). other: Eγ=655.70 *14*, Iγ=10.9 *11* (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
[x]656.57 *3*	1.98 *14*					M1+E2	1.0 *+5−3*	0.017 *3*	α(K)exp=0.0141 *24* (1989Ri03). Additional information 43.
[x]665.11 *3*	1.36 *9*					(E1)		0.00360 *5*	α(K)exp=0.0032 *18* (1989Ri03). Additional information 44.
[x]666.67 *7*	0.27 *10*								
670.89 *6*	0.90 *7*	1458.997	$3/2^-$	788.186	$5/2^-$	M1+E2	0.7 *+5−4*	0.018 *4*	α(K)exp=0.015 *3* (1989Ri03).
676.13 *18*	0.23 *5*	1945.865	(1/2,3/2)	1269.445	$3/2^-$				Eγ=674.3 *3*, Iγ=3.6 *12* (2007ChZX; Budapest data); possibly γ is a multiplet there.
678.18 *8*	0.28 *3*	1913.469	$3/2^-$	1235.440	$5/2^+$				
[x]680.61[l] *9*	0.27[l] *7*								Iγ: see comment on 681γ from 1199 level.
680.61[l] *9*	0.09[l] *5*	1199.34	$(7/2^+)$	518.3301	$5/2^-$				Eγ is close to that reported in ^{179}Lu β^- decay for 1199 to 122 transition; however, based on I(1076γ)/I(680γ)=15 *8* in ^{179}Lu β^- decay and I(1076γ)=1.4 in (n,γ) E=thermal, I(681γ)=0.09 *5*

From ENSDF

γ(^{179}Hf) (continued)

Eγ[†]	Iγ[‡]	Ei(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[@]	α[j]	Comments
									from 1199 level, leaving I(681γ)=0.27 7 unplaced in (n,γ) E=thermal.
[x]686.22 4	0.49 4								
[x]688.19 15	0.43 7								
[x]690.17 14	0.41 7								
693.89 4	1.35 7	1482.030	3/2+	788.186	5/2−				other Eγ: 694.9 3, Iγ=2.9 9 (2007ChZX; Budapest data).
696.74 5	0.51 4	1313.499	5/2−	616.757	7/2−				other: Eγ=697.68 20, Iγ=3.9 10 (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
699.15 8	0.23 4	1313.499	5/2−	614.205	1/2−				
[x]703.97 11	0.67 6								
709.527 18	1.26 5	1185.847	3/2+	476.336	5/2−				
[x]712.424 12	3.30 13					M1(+E2)		0.014 6	α(K)exp=0.0150 15 (1989Ri03).
[x]722.045 15	1.24 6					M1+E2	1.4 +13−5	0.0117 24	α(K)exp=0.0097 20 (1989Ri03).
[x]724.48 6	0.33 9								
[x]727.406 24	0.59 8					[&]			α(K)exp=0.007 5 (1989Ri03). Mult.: E1 or E2(+M1) from α(K)exp. Additional information 45.
729.517 10	24.3 7	1150.410	1/2+	420.895	3/2−	E1		0.00299 5	α(K)exp=0.00240 19 (1989Ri03). other: Eγ=729.84 8, Iγ=33.0 15 (2007ChZX; Budapest data). possibly γ is complex In 2007ChZX.
731.22[k] 3	2.37[k] 12	1249.552	3/2−	518.3301	5/2−				α(K)exp=0.0115 12 (1989Ri03), mult=M1+E2 for doublet.
731.22[k] 3	2.37[k] 12	1313.499	5/2−	582.231	7/2−				α(K)exp=0.0115 12 (1989Ri03), mult=M1+E2 for doublet.
735.83 5	1.78 9	1073.563	7/2−	337.7183	9/2−	M1+E2	1.1 +9−4	0.012 3	α(K)exp=0.0102 21 (1989Ri03). other: Eγ=736.1 3, Iγ=5.8 15 (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
738.388 22	0.86 6	1458.997	3/2−	720.614	3/2−	M1(+E0)			α(K)exp=0.017 3 (1989Ri03). other: Eγ=738.7 3, Iγ=4.4 15 (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
740.48 4	0.66 7	1861.235	5/2+	1120.78	9/2+	(E2)[&]		0.00769 11	α(K)exp=0.011 6 (1989Ri03). Mult.: E2,M1 from α(K)exp; ΔJ=2 required by placement.
[x]742.50 3	1.10 15								
742.91 6	1.44 9	1928.845	1/2+,3/2+	1185.847	3/2+	M1+E2[c]		0.013 5	α(K)exp=0.0101 18 (1989Ri03).
744.079 15	1.40 7	1532.275	5/2+	788.186	5/2−				
[x]747.09 4	0.86 15					M1(+E2)		0.012 5	α(K)exp=0.012 5 (1989Ri03).
751.14 3	1.07 5	1269.445	3/2−	518.3301	5/2−	M1		0.01699	α(K)exp=0.014 3 (1989Ri03).

γ(^{179}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[@]	α[j]	Comments
753.48 16	0.34 6	1433.187	3/2⁻	679.518	3/2⁻				
759.060 14	2.08 6	1235.440	5/2⁺	476.336	5/2⁻	(E1)[&]		0.00277 4	α(K)exp=0.0061 14 (1989Ri03). Mult.: E2 from α(K)exp, but α(K)exp may be overestimated due to possible contamination of ce line; Δπ=yes from placement. other: Eγ=759.2 3, Iγ=6.8 19 (2007ChZX; Budapest data).
761.413 11	6.63 20	1482.030	3/2⁺	720.614	3/2⁻	E1		0.00275 4	α(K)exp=0.0022 5 (1989Ri03). other Iγ: 10.7 15 (2007ChZX; Budapest data).
764.968 11	12.3 4	1185.847	3/2⁺	420.895	3/2⁻	E1		0.00272 4	α(K)exp=0.00192 19 (1989Ri03).
[x]768.6 3	0.26 9								
773.15 5	0.85 9	1249.552	3/2⁻	476.336	5/2⁻	E2+M1	0.9 +13−7	0.012 4	α(K)exp=0.010 3 (1989Ri03).
775.35 8	0.45 6	1150.410	1/2⁺	375.037	1/2⁻				
778.39 5	1.91 11	1928.845	1/2⁺,3/2⁺	1150.410	1/2⁺	M1+E0[c]			α(K)exp=0.0173 17 (1989Ri03).
779.41 3	1.43 11	1458.997	3/2⁻	679.518	3/2⁻	M1+E2[c]		0.011 5	α(K)exp=0.0104 19 (1989Ri03).
[x]781.21 6	0.44 14								Additional information 46.
782.78 7	0.45 8	1861.235	5/2⁺	1078.349	(7/2)⁺				
783.3[im]		1572.56	3/2⁻	788.186	5/2⁻				No Eγ from 1989Ri03 fits this placement; not adopted. I(783γ):I(1197γ)=3.6:11.6 (1988Bo44).
787.732 23	0.82 6	1861.235	5/2⁺	1073.563	7/2⁻				
789.188[m] 20	1.13 7	1003.650	5/2⁺	214.3406	7/2⁻	(E1)		0.00256 4	α(K)exp=0.0027 25 (1989Ri03). Tentatively placed by evaluator, consistent with branching in ^{179}Lu β^- decay; however, Eγ is 6σ too low.
[x]793.40 6	0.36 6								
795.27 6	0.57 10	1313.499	5/2⁻	518.3301	5/2⁻				
[x]798.18 11	0.30 7								
[x]801.25 6	0.41 9								
[x]805.00 12	0.53 6								
[x]807.20 4	0.64 6					M1(+E0)[&]			α(K)exp=0.018 5 (1989Ri03).
810.831 12	13.5 3	1185.847	3/2⁺	375.037	1/2⁻	E1		0.00243 4	α(K)exp=0.00227 25 (1989Ri03).
811.65 5	0.75 13	1532.275	5/2⁺	720.614	3/2⁻				
816.42[k] 5	0.97[k] 13	1433.187	3/2⁻	616.757	7/2⁻				
816.42[k] 5	0.97[k] 13	1687.13	(3/2)⁻	870.225	7/2⁻				
[x]817.1 4	0.94 23								
[x]818.75 9	0.9 4								
819.66 9	1.96 12	1436.352	7/2⁻	616.757	7/2⁻	M1		0.01365	α(K)exp=0.0110 23 (1989Ri03).
825.98 5	0.60 7	1614.124	1/2⁻,3/2⁻	788.186	5/2⁻				
[x]828.97 6	1.24 5					E1,E2[&]			α(K)exp=0.0051 24 (1989Ri03). Eγ=829.50 24, Iγ=2.4 5 (1976Be23).
831.24 3	1.81 7	1168.96	(9/2⁺)	337.7183	9/2⁻				
[x]833.34 4	0.83 4					M1+E2	1.0 +65−8	0.010 4	α(K)exp=0.008 3 (1989Ri03).

$^{179}_{72}$Hf$_{107}$-17

γ(^{179}Hf) (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [#]	δ [@]	α [j]	Comments
[x]837.07 *3*	1.02 *8*					E2(+M1)		0.009 *4*	α(K)exp=0.007 *3* (1989Ri03).
[x]841.45 *3*	1.03 *6*								
847.877 *20*	2.55 *10*	1851.502	3/2$^+$,5/2$^+$	1003.650	5/2$^+$	M1+E2	0.8 *+5−4*	0.0099 *18*	α(K)exp=0.0083 *14* (1989Ri03).
[x]851.19 *3*	1.99 *6*					E1,E2[&]			α(K)exp=0.0032 *11* (1989Ri03).
852.798 *16*	2.89 *14*	1532.275	5/2$^+$	679.518	3/2$^-$				other: Eγ=851.8 *3*, Iγ=6.8 *15* (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
857.601 *21*	2.66 *11*	1861.235	5/2$^+$	1003.650	5/2$^+$	M1(+E2)		0.009 *4*	α(K)exp=0.0095 *10* (1989Ri03).
859.254 *16*	6.64 *13*	1073.563	7/2$^-$	214.3406	7/2$^-$	M1+E2	0.43 *+11−13*	0.0111 *5*	α(K)exp=0.0093 *4* (1989Ri03). other: Eγ=858.84 *16*, Iγ=15.5 *15* (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
863.98 *15*	0.61 *18*	1078.349	(7/2)$^+$	214.3406	7/2$^-$				
[x]865.40 *5*	0.90 *22*								
867.816 *13*	5.23 *10*	1482.030	3/2$^+$	614.205	1/2$^-$	E1		0.00213 *3*	α(K)exp=0.0011 *6* (1989Ri03). other Iγ: 7.8 *15* (2007ChZX; Budapest data).
870.243 *13*	7.46 *15*	870.225	7/2$^-$	0.0	9/2$^+$	E1		0.00212	α(K)exp=0.0014 *6* (1989Ri03).
[x]873.762 *15*	6.01 *24*					E2		0.00540 *8*	α(K)exp=0.0040 *6* (1989Ri03).
876.56 *7*	0.67 *7*	1725.787	3/2$^-$	849.202	7/2$^-$				
[x]879.77 *6*	0.77 *7*								
[x]884.74 *5*	0.99 *7*								
[x]886.36 *4*	0.46 *12*								
[x]892.00 *10*	0.51 *8*								
892.5[im]		1572.56	3/2$^-$	679.518	3/2$^-$				No Eγ from 1989Ri03 fits this placement; not adopted. I(893γ):I(1197γ)=2.6:11.6 (1988Bo44).
[x]894.266 *16*	1.94 *8*					E2(+M1)[&]		0.008 *3*	α(K)exp=0.0056 *16* (1989Ri03).
906.44 *6*	1.19 *10*	1120.78	9/2$^+$	214.3406	7/2$^-$				
[x]907.3 *3*	0.55 *11*								
[x]912.27 *5*	0.95 *8*								
914.867 *18*	2.85 *11*	1433.187	3/2$^-$	518.3301	5/2$^-$	E2(+M1)		0.008 *3*	α(K)exp=0.0049 *8* (1989Ri03).
918.029 *14*	8.43 *17*	1436.352	7/2$^-$	518.3301	5/2$^-$	M1(+E2)	≤0.32	0.0100 *3*	α(K)exp=0.0085 *3* (1989Ri03).
[x]922.67 *5*	1.43 *21*					M1,E2		0.007 *3*	α(K)exp=0.007 *3* (1989Ri03). Additional information 47.
926.4 *3*	0.32 *11*	1861.235	5/2$^+$	935.645	7/2$^-$				
937.55 *3*	1.34 *11*	1725.787	3/2$^-$	788.186	5/2$^-$	M1		0.00976 *14*	α(K)exp=0.0089 *19* (1989Ri03). I(938γ):I(1112γ)=17.4:68.3 (1988Bo44), consistent with Iγ data from 1989Ri03.
941.17 *13*	0.47 *8*	1811.50	3/2$^-$	870.225	7/2$^-$				
955.82 *3*	6.2 *6*	1572.56	3/2$^-$	616.757	7/2$^-$	E2		0.00448 *7*	α(K)exp=0.0036 *5* (1989Ri03).
956.79 *3*	2.9 *10*	1433.187	3/2$^-$	476.336	5/2$^-$	M1		0.00928 *13*	α(K)exp=0.008 *3* (1989Ri03).
[x]963.78 *3*	1.90 *10*					E1,E2			α(K)exp=0.0026 *12* (1989Ri03).
966.53 *4*	1.97 *8*	1687.13	(3/2)$^-$	720.614	3/2$^-$	M1(+E0)			α(K)exp=0.0092 *17* (1989Ri03).

γ(^{179}Hf) (continued)

Eγ[†]	Iγ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[@]	α[j]	Comments
969.49 11	0.94 9	1757.72	(3/2⁻,5/2⁺)	788.186	5/2⁻				Placement from 1991Bo51. I(969γ):I(1544γ)=19.3:13.9 (1988Bo44). I(969γ)/I(1543γ)=1.4 in 1988Bo44 cf. 0.82 19 in 1989Ri03.
[x]971.51 6	2.32 21					E2(+M1)		0.0066 23	α(K)exp=0.0037 11 (1989Ri03).
[x]973.82 8	0.86 10								
975.72 6	4.14 25	1313.499	5/2⁻	337.7183	9/2⁻	E2		0.00430 6	α(K)exp=0.0028 6 (1989Ri03).
[x]982.98 10	2.60 21								
985.458 25	4.0 3	1706.066	(3/2)⁻	720.614	3/2⁻	M1+E2	1.2 +7−4	0.0060 9	α(K)exp=0.0050 7 (1989Ri03). other: Eγ=984.69 20, Iγ=13.1 24 (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
[x]996.69 5	3.9 7					M1+E2	1.1 +11−5	0.0060 13	α(K)exp=0.0050 10 (1989Ri03).
998.06 10	2.7 4	1120.78	9/2⁺	122.7909	11/2⁺	M1+E2	0.9 +13−6	0.0065 17	α(K)exp=0.0054 15 (1989Ri03). other: Eγ=998.3 3, Iγ=7.3 19 (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
1003.690 23	55 3	1003.650	5/2⁺	0.0	9/2⁺	E2		0.00406 6	α(K)exp=0.00352 21 (1989Ri03).
1005.24 3	4.7 7	1725.787	3/2⁻	720.614	3/2⁻	M1		0.00821 12	α(K)exp=0.0071 11 (1989Ri03). I(1005γ):I(1112γ)=28.4:68.3 (1988Bo44). Evaluator rejects alternative placement (1991Bo51) of γ from an otherwise unsupported 1481.6 level because that two-photon cascade measurement could not differentiate between a 1005.2γ-476.3γ cascade from a 1481.6 level and the 478.4γ-1003.7γ cascade from the established 1482.0 level.
1007.57 7	2.8 4	1687.13	(3/2)⁻	679.518	3/2⁻	M1(+E0)			α(K)exp=0.0081 13 (1989Ri03). other: Eγ=1007.85 11, Iγ=18 3 (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
1012.296 18	7.5 5	1433.187	3/2⁻	420.895	3/2⁻	M1+E2	0.81 +27−23	0.0065 6	α(K)exp=0.0054 5 (1989Ri03).
1014.06 13	2.03 20	1532.275	5/2⁺	518.3301	5/2⁻				
[x]1017.01 5	9.1 6					M1+E2	0.64 +24−23	0.0068 6	α(K)exp=0.0057 5 (1989Ri03). Additional information 48.
1024.71[l] 8	1.5[l]	1706.066	(3/2)⁻	681.037	9/2⁻				Placement from 1988Bo44, where I(1025γ):I(985γ)=8.9:31.0 is almost consistent with Iγ apportionment of presumed doublet in 1989Ri03 as deduced from 1726 level branching. Eγ, however, is 0.3 keV low for this placement. Eγ=1024.3 3 from 2007ChZX (Budapest data) is even further from expected value. I_γ,Mult.: see comments on 1025γ from 1726 level.
1024.71[l] 8	1.5[l]	1725.787	3/2⁻	701.056	5/2⁻				α(K)exp=0.0051 12 (1989Ri03), mult=M1+E2,

γ(^{179}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	α[j]	Comments
								δ=0.9 +12−5 for probable doublet.
								I_γ: 2.99 21 for doublet and I(1025γ):I(1112γ)=21.4:68.3 (1988Bo44) and I(1112γ)=4.8 7 (1989Ri03) imply I(1025γ from 1726 level)=1.5, leaving Iγ=1.5 for 1025γ from 1706 level.
1030.39 4	2.0 4	1731.438	3/2⁻	701.056	5/2⁻	M1(+E2)	0.0058 20	α(K)exp=0.0051 15 (1989Ri03).
								other Iγ: 6.8 15 (2007ChZX; Budapest data).
1035.197 15	15.2 10	1249.552	3/2⁻	214.3406	7/2⁻	E2	0.00381 6	α(K)exp=0.0029 3 (1989Ri03).
								I_γ: corrected for expected small contribution from an unresolved transition; see comment on 1036γ from 1755.8 level.
1036.0[i]	1.0	1755.84	3/2⁻	720.614	3/2⁻			I(1036γ):I(1279γ)=15.5:54.1 (1988Bo44). The 1035.197 15 γ (Iγ=16.2 10), placed from 1250 level by 1989Ri03, could plausibly be a doublet which includes this transition. From branching in 1988Bo44 and I(1279γ)=3.6 3 (1989Ri03), Iγ=1.0, 15.2 for≈1035γ from 1755.8, 1250 levels, respectively.
1038.11 4	2.91 17	1458.997	3/2⁻	420.895	3/2⁻	E2(+M1)	0.0057 19	α(K)exp=0.0025 8 (1989Ri03).
1042.28 7	1.40 15	1762.91	(3/2)⁻	720.614	3/2⁻	M1,E2	0.0056 19	α(K)exp=0.0046 17 (1989Ri03). I(1042γ):I(1388γ)=24.0:63.9 (1988Bo44) cf. 10:64 in 1989Ri03.
1046.16[l] 6	2.7[l]	1168.96	(9/2⁺)	122.7909	11/2⁺			I_γ: see comment on 1046γ from 1726 level.
								α(K)exp=0.0049 6 (1989Ri03) and mult=M1+E2 for doublet.
1046.16[l] 6	1.2[l]	1725.787	3/2⁻	679.518	3/2⁻			α(K)exp=0.0049 6 (1989Ri03) and mult=M1+E2 for doublet. I(1046γ):I(1112γ)=17.1:68.3 (1988Bo44). From Iγ(1046 doublet)=3.90 20 and Iγ(1112)=4.8 7 in 1989Ri03, one expects Iγ(1046 from 1726 level)=1.2, leaving Iγ(1046)=2.7 from 1169 level.
1051.87 4	2.34 19	1731.438	3/2⁻	679.518	3/2⁻	M1+(E2)	0.0055 19	α(K)exp=0.0049 15 (1989Ri03). I(1051γ):I(1117γ)=15.2:47.6 (1988Bo44).
1053.2[i]		1572.56	3/2⁻	518.3301	5/2⁻			Eγ=1054.25 3 (from 1755.3 level in 1989Ri03) fits this placement. I(1054γ):I(1197γ)=12.2:11.6 (1988Bo44); however, see comment on 1054γ from 1755.3 level.
1054.25 3	14.8 7	1755.346	3/2⁻	701.056	5/2⁻	M1+E2[c]	0.0055 19	α(K)exp=0.0059 3 (1989Ri03); corresponds to δ=0.38 +18−16.
								Eγ also consistent with placement from 1573 level. For 1755 level, I(1141γ)/I(1054γ) in 1988Bo44 and I(1141γ) in 1989Ri03 imply that all I(1054γ) of 1989Ri03 belongs here; leaving essentially no Iγ for placement from the 1573 level.
								other: Eγ=1054.44 9, Iγ=17.5 15 (2007ChZX; Budapest data).
1055.06 5	9.9 6	1269.445	3/2⁻	214.3406	7/2⁻	(E2)[c]	0.00367 6	α(K)exp=0.0041 4 (1989Ri03).
								Mult.: E2+M1 from α(K)exp; M1 component inconsistent with placement.
[x]1061.63 5	5.7							I_γ: probable doublet; see comment on 1062γ from 1763 level.
								Additional information 49.
1061.63 5	3.5	1762.91	(3/2)⁻	701.056	5/2⁻	[c]		α(K)exp=0.0040 4 (1989Ri03), mult=M1+E2 for possible doublet.
								I_γ: I(1061γ):I(1388γ)=25.0:63.9 (1988Bo44). Placement from 1988Bo44 and (n,γ) E=7.78 eV res; however, Iγ=9.2 7 in 1989Ri03 suggests 1062γ is a doublet in 1989Ri03 with Iγ=3.5 from 1763 level and the remaining Iγ=5.7 unplaced.

From ENSDF

γ(^{179}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	α[j]	Comments
[x]1069.11 *8*	2.52 *15*					M1(+E0)		α(K)exp=0.0075 *11* (1989Ri03). Additional information 50.
1072.93[k] *9*	0.89[k] *19*	1687.13	(3/2)$^-$	614.205	1/2$^-$			
1072.93[k] *9*	0.89[k] *19*	1861.235	5/2$^+$	788.186	5/2$^-$			
1076.70[l] *20*	1.4[l]	1199.34	(7/2$^+$)	122.7909	11/2$^+$			α(K)exp=0.0038 *10* (1989Ri03), mult=E2(+M1) for doublet. I_γ: see comment on 1077γ from 1755.8 level.
1076.70[l] *20*	1.4[l]	1755.84	3/2$^-$	679.518	3/2$^-$			The 1076.7γ (Iγ=2.8 *3*), placed from 1199 level by 1989Ri03, is a doublet which presumably includes this transition. From I(1077γ):I(1279γ)=20.8:54.1 (1988Bo44) and I(1279γ)=3.6 *3* (1989Ri03), I(1077γ from 1755 level)=1.4 leaving Iγ=1.4 for 1077γ from 1199 level.
1078.37 *8*	8.6 *3*	1078.349	(7/2)$^+$	0.0	9/2$^+$	E2(+M1)[c]	0.0052 *17*	α(K)exp=0.0031 *3* (1989Ri03).
1083.93 *6*	2.93 *15*	1458.997	3/2$^-$	375.037	1/2$^-$	M1	0.00682 *10*	α(K)exp=0.0065 *12* (1989Ri03).
1089.40 *17*	1.09 *23*	1706.066	(3/2)$^-$	616.757	7/2$^-$			
1092.00 *13*	1.49 *22*	1706.066	(3/2)$^-$	614.205	1/2$^-$	M1	0.00670 *10*	α(K)exp=0.0063 *21* (1989Ri03). I(1092γ):I(985γ)=15.4:31.0 (1988Bo44).
1095.2[im]		1572.56	3/2$^-$	476.336	5/2$^-$			E_γ: 1095.77 *8* (from 1614 level in 1989Ri03) does not fit this placement; placement from 1573 level not adopted. I(1095γ):I(1197γ)=9.3:11.6 (1988Bo44).
1095.77 *8*	2.4 *4*	1614.124	1/2$^-$,3/2$^-$	518.3301	5/2$^-$	E2(+M1)	0.0050 *17*	α(K)exp=0.0037 *11* (1989Ri03).
1099.26 *7*	3.8 *5*	1313.499	5/2$^-$	214.3406	7/2$^-$	E2(+M1)	0.0050 *16*	α(K)exp=0.0031 *7* (1989Ri03).
[x]1106.88 *4*	2.91 *12*					E2(+M1)[c]	0.0049 *16*	α(K)exp=0.0037 *12* (1989Ri03). Additional information 51.
1110.38 *10*	5.9 *5*	1811.50	3/2$^-$	701.056	5/2$^-$	M1(+E2)[c]	0.0049 *16*	α(K)exp=0.0049 *6* (1989Ri03). I(1112γ):I(1199γ)=17.9:25.7 (1988Bo44).
1111.55 *7*	4.8 *7*	1725.787	3/2$^-$	614.205	1/2$^-$	M1[c]	0.00641 *9*	α(K)exp=0.0099 *16* (1989Ri03). Mult.: α(K)exp>α(K)(M1) but an E0 component is inconsistent with placement.
1117.23 *3*	3.6 *4*	1731.438	3/2$^-$	614.205	1/2$^-$	(M1)	0.00633 *9*	α(K)exp=0.0108 *16* (1989Ri03). Mult.: M1+E0 from α(K)exp, but E0 component inconsistent with placement; the ce spectrum could conceivably contain an undetected impurity. other Iγ: 7.8 *24* (2007ChZX; Budapest data).
1119.1[h]	1.5	1821.19	(1/2$^-$,3/2)	701.056	5/2$^-$			I_γ: Eγ=1120.83 *2* (Iγ=12.1 *4*), placed elsewhere by 1989Ri03, may include this transition. From I(1119γ):I(1446γ)=5.2:19.5 (1988Bo44) and I(1446γ)=5.8 *7* in 1989Ri03, I(1121γ from 1821 level)=1.5, leaving Iγ=10.6 for 1121γ from 1121 level.
1120.833 *24*	10.6	1120.78	9/2$^+$	0.0	9/2$^+$	M1+E0		α(K)exp=0.0070 *3* (1989Ri03). I_γ: see comment on 1120γ from 1821 level. other Eγ: 1121.27 *18* (2007ChZX; Budapest data).
1131.86 *18*	1.61 *23*	1811.50	3/2$^-$	679.518	3/2$^-$			
1138.03 *16*	1.15 *18*	1614.124	1/2$^-$,3/2$^-$	476.336	5/2$^-$			

$^{179}_{72}$Hf$_{107}$-21

γ(^{179}Hf) (continued)

Eγ[†]	Iγ[‡]	Ei(level)	J^{π}_i	Ef	J^{π}_f	Mult.[#]	α[j]	Comments
1141.16 3	11.3 3	1755.346	3/2⁻	614.205	1/2⁻	M1	0.00601 9	α(K)exp=0.0052 5 (1989Ri03). I(1141γ):I(1054γ)=50.4:80.7 (1988Bo44).
1148.50 16	2.09[f] 17	1762.91	(3/2)⁻	614.205	1/2⁻	M1	0.00592 9	α(K)exp=0.0050 13 (1989Ri03).
1151.63 15	2.26 23	1572.56	3/2⁻	420.895	3/2⁻	M1(+E0)		α(K)exp=0.0062 15 (1989Ri03). α(K)(M1)=0.00494 7.
1187.83 13	6.16 18	1706.066	(3/2)⁻	518.3301	5/2⁻	E2	0.00291 4	α(K)exp=0.0016 6 (1989Ri03). I(1188γ):I(985γ)=38.4:31.0 (1988Bo44).
1192.95 4	4.9 7	1913.469	3/2⁻	720.614	3/2⁻			
1197.46[km] 8	7.6[k] 10	1572.56	3/2⁻	375.037	1/2⁻			Iγ: see comment on 1197γ from 1811 level. α(K)exp=0.0086 13 (1989Ri03) and mult=M1+E0 for doublet. However, mult=E0 component is inconsistent with both placements in level scheme.
1197.46[k] 8	7.6[k] 10	1811.50	3/2⁻	614.205	1/2⁻			Mult.: see comment on 1197γ from 1573 level. Iγ: based on I(1197γ)/I(1110γ) from 1988Bo44, I(1197γ) from 1811 level in 1989Ri03 should be 8.5; this leaves no Iγ for the alternative placement of the 1197γ from the 1573 level.
ˣ1199.16[l] 22	2.3[l]							Iγ: see comment on 1199γ from 1199 level.
1199.16[l] 22	0.8[l]	1199.34	(7/2⁺)	0.0	9/2⁺			α(K)exp=0.0040 10 (1989Ri03), mult=M1 for doublet. Iγ: I(1199γ)/I(1077γ)=0.600 18 in ^{179}Lu β^- decay but 1.02 here, so evaluator concludes that 1199γ (Iγ=3.1 3) is a doublet with Iγ=0.8 placed from the 1199 level, leaving Iγ=2.3 unplaced.
1207.9[im]		1725.787	3/2⁻	518.3301	5/2⁻			γ absent in 1989Ri03; not adopted. I(1208γ):I(1112γ)=18.1:68.3 (1988Bo44).
ˣ1223.25 9	2.23 25							
1232.3[im]		1913.469	3/2⁻	681.037	9/2⁻			Absent in 1989Ri03; not adopted. I(1232γ):I(1193γ)=11.0:21.5 (1988Bo44).
ˣ1237.84[l] 12	4.5[l]							Iγ: see comment on 1238γ from 1755.8 level.
1237.84[l] 12	2.3[l]	1755.84	3/2⁻	518.3301	5/2⁻			Placement from 1991Bo51. I(1237γ):I(1279γ)=34.0:54.1 (1988Bo44), combined with I(1279γ)=3.6 3 (1989Ri03), suggests that 1238γ (Iγ=6.8 3) in 1989Ri03 is a doublet having Iγ=2.3 at this placement and Iγ=4.5 unplaced.
1239.18 23	2.2 8	1614.124	1/2⁻,3/2⁻	375.037	1/2⁻	M1,E2	0.0038 12	α(K)exp=0.0037 19 (1989Ri03). other: Eγ=1238.6 6, Iγ=6.3 15 (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX.
ˣ1240.9 3	2.7 3					E2	0.00268 4	α(K)exp=0.0019 11 (1989Ri03).
1244.73[l] 6	2.6[l]	1458.997	3/2⁻	214.3406	7/2⁻			Iγ: see comment on 1245γ from 1763 level. α(K)exp=0.0021 5 (1989Ri03); mult=E2 for possible doublet.
1244.73[l] 6	3.3[l]	1762.91	(3/2)⁻	518.3301	5/2⁻			α(K)exp=0.0021 5, mult=E2 for doublet. Placement from 1988Bo44; placed from 1459 level by 1989Ri03. Iγ: I(1245γ):I(1388γ)=23.7:63.9 (1988Bo44) and Iγ=5.86 23 in 1989Ri03 imply Iγ=3.3 from 1763 level, leaving Iγ=2.6 from 1459 level.
ˣ1258.8 6	1.22 22							

$^{179}_{72}Hf_{107}$-22

γ(^{179}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[@]	α[j]	Comments
[x]1266.04 *5*	6.6 *6*					M1+E2	1.2 +*13*−*5*	0.0034 *6*	α(K)exp=0.0029 *5* (1989Ri03).
1267.0[i]		1945.865	(1/2,3/2)	679.518	3/2⁻				I(1267γ):I(1332γ)=12.0:15.6 (1988Bo44). Eγ close to unplaced Eγ=1266.04 *5* (Iγ=6.6 *6*) of 1989Ri03, but Eγ from 1989Ri03 implies E(level)=1945.56 *6* which is 5σ low.
1279.45 *11*	3.6 *3*	1755.84	3/2⁻	476.336	5/2⁻	E2(+M1)		0.0035 *11*	Placement from 1991Bo51. α(K)exp=0.0027 *7* (1989Ri03).
1285.4[im]		1706.066	(3/2)⁻	420.895	3/2⁻				No Eγ from 1989Ri03 fits this placement; γ not adopted. I(1285γ):I(985γ)=7.4:31.0 (1988Bo44).
[x]1285.97 *8*	3.2 *3*								
[x]1290.77 *10*	4.6 *3*					E2		0.00249 *4*	α(K)exp=0.0017 *4* (1989Ri03).
1293.49[l] *18*	0.9[l]	1668.955	3/2⁺	375.037	1/2⁻				I_γ: see comment on 1293γ from 1811 level.
1293.49[l] *18*	1.8[l]	1811.50	3/2⁻	518.3301	5/2⁻				I_γ: from I(1293γ):I(1110γ)=5.4:17.9 (1988Bo44), I(1293γ) from 1811 level in 1989Ri03 should be 1.8, leaving Iγ=0.9 for placement from the 1668 level.
[x]1300.65 *12*	1.9 *4*								
1305.3[im]		1725.787	3/2⁻	420.895	3/2⁻				Additional information 52. No Eγ from 1989Ri03 fits this placement; not adopted. I(1305γ):I(1112γ)=12.0:68.3 (1988Bo44).
[x]1305.45 *13*	2.1 *3*								
1310.70 *8*	3.4 *3*	1731.438	3/2⁻	420.895	3/2⁻	(E2)		0.00242 *4*	α(K)exp=0.0010 *8* (1989Ri03). Mult=E1,E2 from α(K)exp, but E1 inconsistent with placement.
[x]1315.89 *19*	2.1 *4*								
[x]1320.95 *25*	3.0 *3*								
1324.36 *13*	2.8 *3*	1800.51	3/2⁻	476.336	5/2⁻	M1(+E2)		0.0033 *10*	α(K)exp=0.0031 *8* (1989Ri03).
1330.95[h] *20*	8.8 *4*	1706.066	(3/2)⁻	375.037	1/2⁻	E2(+M1)		0.0033 *9*	α(K)exp=0.0024 *4* (1989Ri03). I(1330γ):I(985γ)=43.1:31.0 (1988Bo44).
1332.0[ih]		2052.6	1/2,3/2,5/2⁺	720.614	3/2⁻				Eγ=1330.95 *20* is placed from 1706 level by 1989Ri03.
1332.3[ih]		1945.865	(1/2,3/2)	614.205	1/2⁻				
1332.6[hm]		2120.8?		788.186	5/2⁻				From 1991Bo51; not adopted. I(1332.6γ):I(1330.95γ)=14:83 in two-photon cascade data (1991Bo51).
1334.23[h] *8*	10.7 *10*	1755.346	3/2⁻	420.895	3/2⁻	E2		0.00234 *4*	α(K)exp=0.0019 *3* (1989Ri03). I(1334γ):I(1054γ)=82.7:80.7 (1988Bo44).
1334.4[hm]		2035.5?		701.056	5/2⁻				I(1334.4γ):I(1330.95γ)=9:83 in two-photon cascade data (1991Bo51). From 1991Bo51; not adopted.
1336.6[ihm]		1811.50	3/2⁻	476.336	5/2⁻				I(1337γ):I(1199γ)=17.9:25.7 (1988Bo44). Eγ=1335.17 needed to fit this placement.
1342.6 *3*	4.4 *15*	1762.91	(3/2)⁻	420.895	3/2⁻	M1		0.00407 *6*	α(K)exp=0.0036 *13* (1989Ri03). I(1343γ):I(1388γ)=42.9:63.9 (1988Bo44).
1350.1[i]		2070.7	(1/2,3/2)	720.614	3/2⁻				Eγ=1350.75 *9*, placed from 1726 level by 1989Ri03,

$^{179}_{72}$Hf$_{107}$-23

γ(^{179}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[@]	α[j]	Comments
									may be a multiplet including this transition. I(1350γ):I(1650γ)=11.0:12.5 (1988Bo44). Other: 8.3 *19*:28.2 *19* (2007ChZX, Budapest data). other data: Eγ=1350.4 *3*, Iγ=8.3 *19* (2007ChZX, Budapest data), but γ May have more than one placement.
1350.75 *9*	2.3	1725.787	3/2$^-$	375.037	1/2$^-$				Iγ=5.0 *4*, α(K)exp=0.0020 *4*, mult=E2(+M1) (1989Ri03). Iγ I(1351γ):I(1112γ)=31.2:68.3 (1988Bo44) is inconsistent with branching from 1989Ri03; 1351γ is probably a multiplet in 1989Ri03 with Iγ=2.3 deexciting the 1726 level, leaving Iγ=2.7 to deexcite the 2053 and/or 2071 levels.
1351.5[i]		2052.6	1/2,3/2,5/2$^+$	701.056	5/2$^-$				Eγ=1350.75 *9*, placed from 1725 level by 1989Ri03, may be a multiplet including this transition. I(1352γ):I(1332γ)=6.3:9.3 (1988Bo44).
1356.34 *10*	2.40 *22*	1731.438	3/2$^-$	375.037	1/2$^-$	M1		0.00398 *6*	α(K)exp=0.0050 *10* (1989Ri03). I(1356γ):I(1117γ)=34.7:47.6 (1988Bo44). Mult.: α(K)exp does not rule out an E0 component, but ΔJ=1 from level scheme.
^{x}1362.07 *16*	2.88 *20*								α(K)exp=0.0020 *13* (1989Ri03).
^{x}1371.04 *22*	1.5 *3*					M1		0.00388 *6*	α(K)exp=0.0038 *18* (1989Ri03).
1379.43 *13*	5.4 *6*	1800.51	3/2$^-$	420.895	3/2$^-$				
1381.2 *3*	3.5 *8*	1755.84	3/2$^-$	375.037	1/2$^-$	M1		0.00382 *6*	α(K)exp=0.0038 *11* (1989Ri03). I(1381γ):I(1279γ)=44.0:54.1 (1988Bo44), consistent with Iγ in 1989Ri03. Placement is from 1991Bo51 (Eγ misprinted as 1387.84 *6* in 1991Bo51).
1381.7[i]		2082.8	(1/2,3/2)	701.056	5/2$^-$				Additional information 54. May be same as Eγ=1381.2 *3* in 1989Ri03, now placed from 1755 level; if so, Iγ=3.5 *8* in 1989Ri03 will Be for a doublet. I(1382γ):I(1606γ)=6.0:25.7 (1988Bo44).
1387.84 *6*	9.0 *9*	1762.91	(3/2)$^-$	375.037	1/2$^-$	M1+E2	1.0 *+6−4*	0.0030 *4*	α(K)exp=0.0025 *3* (1989Ri03).
1391.09 *17*	2.7[f] *3*	1811.50	3/2$^-$	420.895	3/2$^-$	E2(+M1)		0.0030 *8*	α(K)exp=0.0022 *8* (1989Ri03).
^{x}1400.77 *25*	4.7 *6*								
1403.3[i]		2082.8	(1/2,3/2)	679.518	3/2$^-$				Additional information 55. May be same as unplaced Eγ=1400.77 *25* in 1989Ri03; if so, Iγ (4.7 *6*) in 1989Ri03 implies a doublet. I(1403γ):I(1606γ)=8.1:25.7 (1988Bo44).
^{x}1407.44 *14*	3.6 *3*								
1408.9[i]		2088.4	(1/2,3/2)	679.518	3/2$^-$				Additional information 57. May be same as unplaced Eγ=1407.44 *14* in 1989Ri03. I(1409γ):I(1713γ)=7.4:17.1 (1988Bo44).
1425.49 *9*	2.8 *3*	1800.51	3/2$^-$	375.037	1/2$^-$				

γ(^{179}Hf) (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [#]	α [j]	Comments
1429.7[i]		2150.3	1/2$^{(-)}$,3/2,5/2$^+$	720.614	3/2$^-$			I(1430γ):I(1674γ)=6.2:16.1 (1988Bo44).
^{x}1433.76 *13*	2.04 *18*					M1,E2	0.0028 *8*	α(K)exp=0.0019 *10* (1989Ri03).
1437.9[im]		1811.50	3/2$^-$	375.037	1/2$^-$			γ absent in 1989Ri03; not adopted. I(1437γ):I(1199γ)=7.3:25.7 (1988Bo44).
1445.0[i]		2146.1	(1/2,3/2)	701.056	5/2$^-$			Additional information 58. May be same as Eγ=1446.16 *7*, unplaced in 1989Ri03. I(1445γ):I(1532γ)=5.6:9.9 (1988Bo44) but 5.8:2.0 in 1989Ri03.
1446.16 *7*	5.8 *7*	1821.19	(1/2$^-$,3/2)	375.037	1/2$^-$			Placement from 1988Bo44; however, Eγ is≈3σ too high.
^{x}1456.0 *3*	1.89 *19*							
1456.5[i]		2070.7	(1/2,3/2)	614.205	1/2$^-$			Additional information 53. May be same as unplaced Eγ=1456.0 *3* in 1989Ri03. I(1457γ):I(1650γ)=10.7:12.5 (1988Bo44). absent In 2007ChZX (Budapest data).
1461.4[i]		2249.87	(3/2$^-$)	788.186	5/2$^-$			Additional information 62. May be same as unplaced Eγ=1462.24 *9* in 1989Ri03; however, I(1462.24γ) is higher than expected, and this may indicate a doublet. I(1461γ):I(2035γ)=11.5:27.9 (1988Bo44). absent In 2007ChZX (Budapest data).
^{x}1462.24 *9*	3.4 *4*							
1462.5[i]		2183.1	1/2,3/2,5/2$^+$	720.614	3/2$^-$			Additional information 60. May be same as unplaced Eγ=1462.24 *9* in 1989Ri03.
^{x}1481.2 *5*	0.67 *21*							
1492.6[k] *7*	0.48[k] *21*	1706.066	(3/2)$^-$	214.3406	7/2$^-$			
1492.6[k] *7*	0.48[k] *21*	1913.469	3/2$^-$	420.895	3/2$^-$			
^{x}1497.7 *3*	0.9 *4*							
^{x}1502.33 *9*	3.7 *3*							
1503.6[i]		2183.1	1/2,3/2,5/2$^+$	679.518	3/2$^-$			Additional information 61. May be same as unplaced Eγ=1502.33 *9* in 1989Ri03; however, I(1502.33γ) is higher than expected, and this may indicate a doublet. I(1503γ):I(1462γ)=4.9:6.9 (1988Bo44).
1507.66[km] *18*	1.63[k] *21*	1928.845	1/2$^+$,3/2$^+$	420.895	3/2$^-$			1988Bo44 place γ of similar energy from 2228 level; since Eγ from 1989Ri03 is low for placement from 1929 level, evaluator shows this placement as tentative.
1507.66[k] *18*	1.63[k] *21*	2228.1	1/2,3/2,5/2$^+$	720.614	3/2$^-$			Placement from 1988Bo44; placed from 1929 level by 1989Ri03, but Eγ slightly low for that placement. I(1508γ):I(1807γ)=16.9:21.6 (1988Bo44).
1525.5 *3*	1.27 *22*	1945.865	(1/2,3/2)	420.895	3/2$^-$			
1529.0[i]		2249.87	(3/2$^-$)	720.614	3/2$^-$			Additional information 63. May be same as unplaced Eγ=1530.31 *19* in 1989Ri03. I(1529γ):I(2035γ)=10.1:27.9 (1988Bo44). absent In 2007ChZX (Budapest data).

γ(^{179}Hf) (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J^π_i	E_f	J^π_f	Comments
[x]1530.31 *19*	2.0 *3*					
1531.9[i]		2146.1	(1/2,3/2)	614.205	1/2⁻	Additional information 59. May be same as Eγ=1530.31 *19*, unplaced in 1989Ri03.
[x]1534.6 *3*	1.23 *23*					
1543.7 *3*	1.14 *24*	1757.72	(3/2⁻,5/2⁺)	214.3406	7/2⁻	Placement from 1991Bo51. See comment on 969.49γ.
1548.78[l] *12*	3.1[lf]	1762.91	(3/2)⁻	214.3406	7/2⁻	I_γ: see comment on 1549γ from 2228 level.
1548.78[l] *12*	0.70[l]	2228.1	1/2,3/2,5/2⁺	679.518	3/2⁻	Placement from 1988Bo44; placed from 1763 level by 1989Ri03. I(1549γ):I(1508γ)=7.3:16.9 (1988Bo44); from I(1549γ)=3.8 *3* in 1989Ri03, one expects Iγ=0.70 from 2228 level, leaving Iγ=3.1 from 1763 level.
[x]1552.9 *3*	2.1 *3*					
[x]1557.01 *15*	2.28 *23*					
[x]1565.4 *3*	1.7 *4*					
1571.7 *7*	0.85 *25*	1945.865	(1/2,3/2)	375.037	1/2⁻	
[x]1579.9 *6*	1.3 *5*					
[x]1588.4 *5*	2.8 *4*					
1588.6[i]		2309.2	1/2,3/2,5/2⁺	720.614	3/2⁻	Additional information 64. May be same as unplaced Eγ=1588.4 *5* in 1989Ri03. I(1588γ):I(1888γ)=9.5:10.4 (1988Bo44).
1600.1[b] *3*	3.3[d] *12*	2214.3	(1/2,3/2)	614.205	1/2⁻	other Eγ: 1601.4 (1988Bo44; level energy difference). I(1601γ):I(1841γ)=9.0:10.8 (1988Bo44).
[x]1605.1 *4*	2.3 *7*					
1606.0[i]		2394.2	1/2⁽⁻⁾,3/2,5/2⁺	788.186	5/2⁻	Additional information 65. May be same as unplaced Eγ=1605.1 *4* in 1989Ri03. I(1606γ):I(1973γ)=8.9:41.7 (1988Bo44). absent In 2007ChZX (Budapest data).
1606.5[i]		2082.8	(1/2,3/2)	476.336	5/2⁻	Additional information 56. May be same as unplaced Eγ=1605.1 *4*, Iγ=2.3 *7* in 1989Ri03.
[x]1613.9 *7*	1.5 *6*					
1625.9[i]		2047.0	(1/2,3/2)	420.895	3/2⁻	I(1626γ):I(1672γ)=30.2:39.4 (1988Bo44). absent In 2007ChZX (Budapest data).
1627.7[b] *5*	3.9[d] *15*	2415.3	(1/2⁻,3/2)	788.186	5/2⁻	other Eγ: 1626.7 (1988Bo44; level energy difference). I(1627γ):I(1994γ)=7.8:27.9 (1988Bo44).
1646.3[i]		2366.9	(1/2⁻,3/2)	720.614	3/2⁻	I(1646γ):I(1890γ)=14.1:71.6 (1988Bo44).
1649.8[i]		2070.7	(1/2,3/2)	420.895	3/2⁻	other data: Eγ=1649.78 *10*, Iγ=28.2 *19* (2007ChZX, Budapest data); γ appears to Be too strong relative to 1350γ so it May Be complex.
1661.9[i]		2082.8	(1/2,3/2)	420.895	3/2⁻	I(1662γ):I(1606γ)=25.4:25.7 (1988Bo44).
1672.0[b] *3*	10.2[d] *19*	2047.0	(1/2,3/2)	375.037	1/2⁻	other Eγ: 1671.8 (1988Bo44; level energy difference).
1674.0[i]		2150.3	1/2⁽⁻⁾,3/2,5/2⁺	476.336	5/2⁻	
1687.4[i]		2366.9	(1/2⁻,3/2)	679.518	3/2⁻	I(1687γ):I(1890γ)=8.7:71.6 (1988Bo44).
1695.7[i]		2070.7	(1/2,3/2)	375.037	1/2⁻	I(1696γ):I(1650γ)=9.9:12.5 (1988Bo44).
1707.8[i]		2082.8	(1/2,3/2)	375.037	1/2⁻	I(1708γ):I(1606γ)=12.2:25.7 (1988Bo44).
1713.4[i]		2088.4	(1/2,3/2)	375.037	1/2⁻	

$^{179}_{72}$Hf$_{107}$-26

γ(^{179}Hf) (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J^π_i	E_f	J^π_f	Comments
1714.7[i]		2394.2	$1/2^{(-)},3/2,5/2^+$	679.518	$3/2^-$	I(1715γ):I(1973γ)=7.9:41.7 (1988Bo44). other: Eγ=1714.7 *3*, Iγ=6.8 *15* In 2007ChZX (Budapest data), but stronger branches from same level are not reported there.
1724.2[i]		2425.3	$(1/2^-,3/2)$	701.056	$5/2^-$	I(1724γ):I(1811γ)=9.7:10.5 (1988Bo44).
1729.4[i]		2150.3	$1/2^{(-)},3/2,5/2^+$	420.895	$3/2^-$	I(1729γ):I(1674γ)=14.8:16.1 (1988Bo44).
1735.9[i]		2254.2	$1/2^{(-)},3/2,5/2^+$	518.3301	$5/2^-$	
1752.7[i]		2366.9	$(1/2^-,3/2)$	614.205	$1/2^-$	I(1753γ):I(1890γ)=9.2:71.6 (1988Bo44).
1771.5[i]		2451.31	$(3/2^-)$	679.518	$3/2^-$	I(1771γ):I(2030γ)=7.0:29.9 (1988Bo44).
1774.4[i]		2475.5	$(3/2^-)$	701.056	$5/2^-$	I(1774γ):I(2055γ)=9.0:51.2 (1988Bo44).
1800.7[i]		2415.3	$(1/2^-,3/2)$	614.205	$1/2^-$	I(1801γ):I(1994γ)=21.5:27.9 (1988Bo44). absent In 2007ChZX (Budapest data).
1807.3[i]		2228.1	$1/2,3/2,5/2^+$	420.895	$3/2^-$	
1811.1[i]		2425.3	$(1/2^-,3/2)$	614.205	$1/2^-$	
1830.0[i]		2509.5	$(1/2,3/2)$	679.518	$3/2^-$	I(1830γ):I(2134γ)=10.1:33.2 (1988Bo44).
1833.3[i]		2254.2	$1/2^{(-)},3/2,5/2^+$	420.895	$3/2^-$	I(1833γ):I(1736γ)=11.6:11.7 (1988Bo44).
1836.8[i]		2451.31	$(3/2^-)$	614.205	$1/2^-$	I(1837γ):I(2030γ)=19.2:29.9 (1988Bo44).
1840.6[i]		2214.3	$(1/2,3/2)$	375.037	$1/2^-$	absent In 2007ChZX (Budapest data).
1848.6[i]		2366.9	$(1/2^-,3/2)$	518.3301	$5/2^-$	I(1848γ):I(1890γ)=9.6:71.6 (1988Bo44).
1861.3[i]		2475.5	$(3/2^-)$	614.205	$1/2^-$	I(1861γ):I(2055γ)=17.9:51.2 (1988Bo44).
1865.94[b] *24*	10.2[d] *15*	2654.13	$(1/2^-,3/2)$	788.186	$5/2^-$	other Eγ: 1864.9 (1988Bo44; level energy difference). I(1865γ):I(2278γ)=8.4:8.7 (1988Bo44).
1875.3[b] *4*	6.8[d] *15*	2249.87	$(3/2^-)$	375.037	$1/2^-$	other Eγ: 1874.6 (1988Bo44; level energy difference). I(1874γ):I(2035γ)=26.4:27.9 (1988Bo44).
1888.3[i]		2309.2	$1/2,3/2,5/2^+$	420.895	$3/2^-$	
1890.6[i]		2366.9	$(1/2^-,3/2)$	476.336	$5/2^-$	
1918.2[b] *3*	10.7[d] *19*	2638.8	$(1/2,3/2)$	720.614	$3/2^-$	other Eγ: 1917.7 (1988Bo44; level energy difference). I(1918γ):I(2263γ)=8.7:13.2 (1988Bo44).
1932.5[i]		2654.13	$(1/2^-,3/2)$	720.614	$3/2^-$	I(1932γ):I(2278γ)=6.3:8.7 (1988Bo44).
1938.6[i]		2415.3	$(1/2^-,3/2)$	476.336	$5/2^-$	I(1938γ):I(1994γ)=16.8:27.9 (1988Bo44). absent In 2007ChZX (Budapest data).
1946.0[i]		2366.9	$(1/2^-,3/2)$	420.895	$3/2^-$	I(1946γ):I(1890γ)=16.0:71.6 (1988Bo44).
1973.3[i]		2394.2	$1/2^{(-)},3/2,5/2^+$	420.895	$3/2^-$	absent In 2007ChZX (Budapest data).
1991.9[i]		2366.9	$(1/2^-,3/2)$	375.037	$1/2^-$	I(1992γ):I(1890γ)=19.7:71.6 (1988Bo44).
1994.0[i]		2415.3	$(1/2^-,3/2)$	420.895	$3/2^-$	absent In 2007ChZX (Budapest data).
1996.6[b] *3*	10.2[d] *19*	2610.9	$(1/2^-,3/2)$	614.205	$1/2^-$	other Eγ: 1996.5 (1988Bo44; level energy difference). I(1997γ):I(2236γ)=11.2:52.5 (1988Bo44).
2030.1[i]		2451.31	$(3/2^-)$	420.895	$3/2^-$	
2035.53[b] *23*	11.2[d] *19*	2249.87	$(3/2^-)$	214.3406	$7/2^-$	other Eγ: 2035.3 (1988Bo44; level energy difference).
2039.4[i]		2460.3	$(1/2,3/2)$	420.895	$3/2^-$	

$^{179}_{72}$Hf$_{107}$-27

γ(^{179}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Comments
2041.7[i]		2743.72	(1/2$^-$,3/2)	701.056	5/2$^-$	I(2042γ):I(2322γ)=9.9:16.2 (1988Bo44).

γ(^{179}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Comments
2046.4[i]		2522.7	(1/2⁻,3/2)	476.336	5/2⁻	I(2046γ):I(2148γ)=23.2:30.4 (1988Bo44).
2054.6[i]		2475.5	(3/2⁻)	420.895	3/2⁻	
2085.3[i]		2460.3	(1/2,3/2)	375.037	1/2⁻	I(2085γ):I(2039γ)=13.9:19.0 (1988Bo44).
2088.6[i]		2509.5	(1/2,3/2)	420.895	3/2⁻	I(2089γ):I(2134γ)=28.7:33.2 (1988Bo44).
2092.4[i]		2610.9	(1/2⁻,3/2)	518.3301	5/2⁻	absent In 2007ChZX (Budapest data). I(2092γ):I(2236γ)=10.4:52.5 (1988Bo44).
2100.5[i]		2475.5	(3/2⁻)	375.037	1/2⁻	I(2100γ):I(2055γ)=44.6:51.2 (1988Bo44).
2101.8[i]		2522.7	(1/2⁻,3/2)	420.895	3/2⁻	I(2102γ):I(2148γ)=17.0:30.4 (1988Bo44).
2124.9[i]		2601.2	(1/2⁻,3/2)	476.336	5/2⁻	I(2125γ):I(2226γ)=10.7:37.5 (1988Bo44).
2126.96[b] *21*	13.1[d] *19*	2743.72	(1/2⁻,3/2)	616.757	7/2⁻	other Eγ: 2128.6 (1988Bo44; level energy difference). I(2129γ):I(2322γ)=10.1:16.2 (1988Bo44).
2134.5[i]		2509.5	(1/2,3/2)	375.037	1/2⁻	
2134.8[i]		2654.13	(1/2⁻,3/2)	518.3301	5/2⁻	I(2135γ):I(2278γ)=8.0:8.7 (1988Bo44).
2147.7[i]		2522.7	(1/2⁻,3/2)	375.037	1/2⁻	
2180.3[i]		2601.2	(1/2⁻,3/2)	420.895	3/2⁻	I(2180γ):I(2226γ)=34.8:37.5 (1988Bo44).
2184.5[i]		2905.2	(1/2,3/2)	720.614	3/2⁻	I(2185γ):I(2530γ)=8.6:17.2 (1988Bo44).
2184.6[i]		2702.9	(1/2⁻,3/2)	518.3301	5/2⁻	I(2185γ):I(2328γ)=13.0:21.2 (1988Bo44).
2189.66[b] *19*	10.2 *15*	2610.9	(1/2⁻,3/2)	420.895	3/2⁻	other Eγ: 2189.8 (1988Bo44; level energy difference). I(2190γ):I(2236γ)=15.3:52.5 (1988Bo44).
2225.7[i]		2905.2	(1/2,3/2)	679.518	3/2⁻	I(2226γ):I(2530γ)=7.3:17.2 (1988Bo44).
2226.2[i]		2601.2	(1/2⁻,3/2)	375.037	1/2⁻	
2235.7[i]		2610.9	(1/2⁻,3/2)	375.037	1/2⁻	absent In 2007ChZX (Budapest data).
2236.97[b] *23*	10.7[d] *15*	2451.31	(3/2⁻)	214.3406	7/2⁻	other Eγ: 2236.7 (1988Bo44; level energy difference). I(2237γ):I(2030γ)=7.2:29.9 (1988Bo44).
2261.2[i]		2475.5	(3/2⁻)	214.3406	7/2⁻	I(2261γ):I(2055γ)=6.2:51.2 (1988Bo44).
2263.3[i]		2638.8	(1/2,3/2)	375.037	1/2⁻	
2278.1[i]		2654.13	(1/2⁻,3/2)	375.037	1/2⁻	absent In 2007ChZX (Budapest data).
2303.8[i]		2983.3	1/2$^{(-)}$,3/2,5/2⁺	679.518	3/2⁻	I(2304γ):I(2507γ)=6.3:16.6 (1988Bo44).
2321.9[i]		2743.72	(1/2⁻,3/2)	420.895	3/2⁻	absent In 2007ChZX (Budapest data).
2327.9[i]		2702.9	(1/2⁻,3/2)	375.037	1/2⁻	
2397.7[i]		3076.2	(1/2⁻,3/2)	679.518	3/2⁻	absent In 2007ChZX (Budapest data). I(2398γ):I(2559γ)=7.0:18.4 (1988Bo44).
2447.7[b] *5*	5.8[d] *19*	3148.8	(1/2⁻,3/2)	701.056	5/2⁻	other Eγ: 2448.0 (1988Bo44; level energy difference). I(2448γ):I(2535γ)=7.7:13.9 (1988Bo44).
2459.0[i]		3177.9	1/2$^{(-)}$,3/2,5/2⁺	720.614	3/2⁻	I(2459γ):I(2703γ)=8.7:10.0 (1988Bo44).
2463.0[i]		3076.2	(1/2⁻,3/2)	614.205	1/2⁻	other: Eγ=2462.5 *3*, Iγ=10.2 *19* (2007ChZX; Budapest data). Evaluator suspects γ May Be complex In 2007ChZX. I(2463γ):I(2559γ)=7.7:18.4 (1988Bo44).
2484.3[i]		2905.2	(1/2,3/2)	420.895	3/2⁻	I(2484γ):I(2530γ)=15.8:17.2 (1988Bo44).

$^{179}_{72}$Hf$_{107}$-29

γ(^{179}Hf) (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J^π_i	E_f	J^π_f	Comments
2507.0 [i]		2983.3	$1/2^{(-)}$,3/2,$5/2^+$	476.336	$5/2^-$	

$^{179}_{72}$Hf$_{107}$-30

γ(^{179}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Comments
2530.2[i]		2905.2	(1/2,3/2)	375.037	1/2$^-$	
2534.9[i]		3148.8	(1/2$^-$,3/2)	614.205	1/2$^-$	
2559.7[b] *5*	4.9[d] *15*	3076.2	(1/2$^-$,3/2)	518.3301	5/2$^-$	other Eγ: 2558.9 (1988Bo44; level energy difference).
2644.3[b] *3*	5.3[d] *15*	3345.4	1/2$^{(-)}$,3/2,5/2$^+$	701.056	5/2$^-$	other Eγ: 2644.1 (1988Bo44; level energy difference). I(2644γ):I(2924γ)=10.6:17.0 (1988Bo44).
2668.2[i]		3347.2	(1/2,3/2)	679.518	3/2$^-$	I(2668γ):I(2973γ)=8.2:14.1 (1988Bo44).
2689.6[a]		6099.06	1/2$^+$	3409.4	(1/2,3/2)	
2703.3[i]		3177.9	1/2$^{(-)}$,3/2,5/2$^+$	476.336	5/2$^-$	
2729.9[i]		3409.4	(1/2,3/2)	679.518	3/2$^-$	
2751.9[b] *4*	11.5[e] *20*	6099.06	1/2$^+$	3347.2	(1/2,3/2)	other Eγ: 2751.3 (1988Bo44).
2753.8[a]		6099.06	1/2$^+$	3345.4	1/2$^{(-)}$,3/2,5/2$^+$	
2919.4[b]	6.7[e] *16*	6099.06	1/2$^+$	3177.9	1/2$^{(-)}$,3/2,5/2$^+$	other Eγ: 2919.4 (1988Bo44). I$\gamma\approx$11 for doublet In 1972Al19.
2924.3[i]		3345.4	1/2$^{(-)}$,3/2,5/2$^+$	420.895	3/2$^-$	absent In 2007ChZX (Budapest data).
2949.9[a]	$\approx$9[g]	6099.06	1/2$^+$	3148.8	(1/2$^-$,3/2)	
2972.7[i]		3347.2	(1/2,3/2)	375.037	1/2$^-$	
3022.9[b] *3*	4.8[e] *12*	6099.06	1/2$^+$	3076.2	(1/2$^-$,3/2)	other: Eγ=3021.8 (1988Bo44); I$\gamma\approx$6 (1972Al19).
3034.4[i]		3409.4	(1/2,3/2)	375.037	1/2$^-$	I(3034γ):I(2730γ)=9.1:11.5 (1988Bo44).
3115.7[a]	$\approx$8[g]	6099.06	1/2$^+$	2983.3	1/2$^{(-)}$,3/2,5/2$^+$	I$_\gamma$: for doublet.
3193.8[a]	$\approx$4[g]	6099.06	1/2$^+$	2905.2	(1/2,3/2)	
3356.2[a]		6099.06	1/2$^+$	2743.72	(1/2$^-$,3/2)	
3396.1[a]	$\approx$6[g]	6099.06	1/2$^+$	2702.9	(1/2$^-$,3/2)	I$_\gamma$: for doublet.
3445.9[a]	$\approx$4[g]	6099.06	1/2$^+$	2654.13	(1/2$^-$,3/2)	
3460.7[a]		6099.06	1/2$^+$	2638.8	(1/2,3/2)	Absent in 1972Al19.
3487.1[b] *3*	11.5[e] *16*	6099.06	1/2$^+$	2610.9	(1/2$^-$,3/2)	other: Eγ=3488.3 (1988Bo44); I$\gamma\approx$14 (1972Al19).
3497.9[b] *3*	15.9[e] *20*	6099.06	1/2$^+$	2601.2	(1/2$^-$,3/2)	other: Eγ=3497.8 (1988Bo44); I$\gamma\approx$13 (1972Al19).
3576.3[a]	$\approx$7[g]	6099.06	1/2$^+$	2522.7	(1/2$^-$,3/2)	
3589.5[a]	$\approx$6[g]	6099.06	1/2$^+$	2509.5	(1/2,3/2)	
3623.5[a]	11.2[g]	6099.06	1/2$^+$	2475.5	(3/2$^-$)	
3638.7[a]		6099.06	1/2$^+$	2460.3	(1/2,3/2)	Absent in 1972Al19.
3648.0[a]	6.0[g]	6099.06	1/2$^+$	2451.31	(3/2$^-$)	I$_\gamma$: for doublet.
3673.7[a]		6099.06	1/2$^+$	2425.3	(1/2$^-$,3/2)	Absent in 1972Al19.
3683.8[b] *3*	6.0[e] *12*	6099.06	1/2$^+$	2415.3	(1/2$^-$,3/2)	other: Eγ=3684.1 (1988Bo44). Absent in 1972Al19.
3704.8[a]	2.6[g]	6099.06	1/2$^+$	2394.2	1/2$^{(-)}$,3/2,5/2$^+$	
3732.1[a]	9.6[g]	6099.06	1/2$^+$	2366.9	(1/2$^-$,3/2)	
3789.8[a]	2.2[g]	6099.06	1/2$^+$	2309.2	1/2,3/2,5/2$^+$	I$_\gamma$: for doublet.
3844.8[a]		6099.06	1/2$^+$	2254.2	1/2$^{(-)}$,3/2,5/2$^+$	Absent in 1972Al19.
3849.4[a]	6.8[g]	6099.06	1/2$^+$	2249.87	(3/2$^-$)	

$^{179}_{72}$Hf$_{107}$-31

γ(^{179}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	Comments
3871.0[b] 4	8.3[e] 16	6099.06	1/2$^+$	2228.1	1/2,3/2,5/2$^+$		other: Eγ=3870.8 (1988Bo44); Iγ=4.7 (1972Al19).
3883.4[a]		6099.06	1/2$^+$	2214.3	(1/2,3/2)		Absent in 1972Al19.
3915.9[a]	3.9[g]	6099.06	1/2$^+$	2183.1	1/2,3/2,5/2$^+$		
3930.8 10	2.1	6099.06	1/2$^+$	2168.2	1/2,3/2,5/2$^+$		Eγ and Iγ from 1972Al19; γ absent in 1988Bo44.
3948.7[a]	2.4[g]	6099.06	1/2$^+$	2150.3	1/2$^{(-)}$,3/2,5/2$^+$		
3952.9[a]	2.4[g]	6099.06	1/2$^+$	2146.1	(1/2,3/2)		
4010.6[a]	6.5[g]	6099.06	1/2$^+$	2088.4	(1/2,3/2)		
4016.2[a]	4.4[g]	6099.06	1/2$^+$	2082.8	(1/2,3/2)		
4028.3[a]	2.4[g]	6099.06	1/2$^+$	2070.7	(1/2,3/2)		
4046.4[a]		6099.06	1/2$^+$	2052.6	1/2,3/2,5/2$^+$		Absent in 1972Al19.
4052.2[a]	2.8[g]	6099.06	1/2$^+$	2047.0	(1/2,3/2)		
4141.43 9	0.95 6	6099.06	1/2$^+$	1957.58	1/2,3/2,5/2$^+$		
4153.11 4	2.05 11	6099.06	1/2$^+$	1945.865	(1/2,3/2)		other: Eγ=4152.6 7, Iγ=4.4 16 (2007ChZX; Budapest data).
4169.89 18	1.10 13	6099.06	1/2$^+$	1928.845	1/2$^+$,3/2$^+$		I_γ: based on data in table 3 of 1989Ri03; misprinted as 1.1 13 in table 1.
4185.43 3	3.68 19	6099.06	1/2$^+$	1913.469	3/2$^-$		other: Eγ=4184.5 5, Iγ=7.5 16 (2007ChZX; Budapest data).
4199.35 24	0.32 4	6099.06	1/2$^+$	1899.66	1/2,3/2,5/2$^+$		
4205.1 5	0.14 4	6099.06	1/2$^+$	1893.9	1/2,3/2,5/2$^+$		
4237.78 5	1.97 11	6099.06	1/2$^+$	1861.235	5/2$^+$		
4247.71 14	0.56 5	6099.06	1/2$^+$	1851.502	3/2$^+$,5/2$^+$		
4252.7 3	0.28 6	6099.06	1/2$^+$	1846.3	(3/2$^-$)		
4278.07 3	2.36 25	6099.06	1/2$^+$	1821.19	(1/2$^-$,3/2)		
4287.662 19	6.4 3	6099.06	1/2$^+$	1811.50	3/2$^-$		
4299.38 19	0.83 9	6099.06	1/2$^+$	1800.51	3/2$^-$	[c]	
4302.5 5	0.34 8	6099.06	1/2$^+$	1796.5	1/2,3/2,5/2$^+$	[c]	
4315.86 13	0.62 5	6099.06	1/2$^+$	1783.14	1/2,3/2,5/2$^+$		other: Eγ=4316.6 5, Iγ=5.2 12 (2007ChZX; Budapest data).
4336.193 12	15.1 8	6099.06	1/2$^+$	1762.91	(3/2)$^-$		other: Eγ=4335.94 21, Iγ=17.9 16 (2007ChZX; Budapest data).
4343.707 8	26.7 13	6099.06	1/2$^+$	1755.346	3/2$^-$		other: Eγ=4343.46 15, Iγ=25.4 20 (2007ChZX; Budapest data).
4367.61 3	6.4 3	6099.06	1/2$^+$	1731.438	3/2$^-$		
4373.302 13	15.4 8	6099.06	1/2$^+$	1725.787	3/2$^-$		
4383.22 4	2.08 11	6099.06	1/2$^+$	1715.934	1/2$^+$,3/2$^+$,5/2$^+$		
4392.967 15	9.1 5	6099.06	1/2$^+$	1706.066	(3/2)$^-$		other: Eγ=4393.0 3, Iγ=9.5 20 (2007ChZX; Budapest data).
4412.03 8	0.72 5	6099.06	1/2$^+$	1687.13	(3/2)$^-$		
4429.74 13	1.56 11	6099.06	1/2$^+$	1668.955	3/2$^+$		
4484.95 9	0.91 7	6099.06	1/2$^+$	1614.124	1/2$^-$,3/2$^-$		other: Eγ=4484.9 4, Iγ=11.1 20 (2007ChZX; Budapest data).
4526.62 5	1.63 10	6099.06	1/2$^+$	1572.56	3/2$^-$		
4567.41 7	0.86 6	6099.06	1/2$^+$	1532.275	5/2$^+$		other: Eγ=4567.7 3, Iγ=4.8 10 (2007ChZX; Budapest data).
4617.04 16	0.53 4	6099.06	1/2$^+$	1482.030	3/2$^+$		
4667.0[m] 3	0.185 20	6099.06	1/2$^+$	1433.187	3/2$^-$		Contaminant present.
4829.49 5	1.25 7	6099.06	1/2$^+$	1269.445	3/2$^-$		I_γ: from table 1 of 1989Ri03; 1.4 7 (based on table 3) is presumed by the evaluator to be a misprint.
4849.66[m] 23	0.37 3	6099.06	1/2$^+$	1249.552	3/2$^-$		Contaminant present. other: Eγ=4851.3 4, Iγ=6.7 16 (2007ChZX; Budapest data).

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γ(^{179}Hf) (continued)

Eγ[†]	Iγ[‡]	Ei(level)	J^{π}_{i}	Ef	J^{π}_{f}	Comments
4863.56 *15*	0.33 *3*	6099.06	1/2+	1235.440	5/2+	
4913.06 *5*	1.75 *10*	6099.06	1/2+	1185.847	3/2+	
5095.14 *15*	0.31 *3*	6099.06	1/2+	1003.650	5/2+	
5378.36 *6*	0.98 *6*	6099.06	1/2+	720.614	3/2−	
5419.316 *16*	8.2 *4*	6099.06	1/2+	679.518	3/2−	other: Eγ=5417.7 *8*, Iγ=10.3 *20* (2007ChZX; Budapest data).
5484.7 *6*	0.084 *18*	6099.06	1/2+	614.205	1/2−	I_{γ}: from table 1 of 1989Ri03; Iγ=0.091 *23*, based on table 3.
5677.804 *10*	17.5 *9*	6099.06	1/2+	420.895	3/2−	other: Eγ=5678.4 *3*, Iγ=17.5 *20* (2007ChZX; Budapest data).
5723.620 *4*	100 *5*	6099.06	1/2+	375.037	1/2−	other Eγ: 5723.90 *15* (2007ChZX; Budapest data).

[†] For secondary and unplaced γ-rays, Eγ data are from 1989Ri03, unless noted otherwise. The evaluator has not removed the recoil correction applied by 1989Ri03 to their measured Eγ values since it is insignificant (<1 eV for Eγ<580, <8 eV for highest Eγ reported); uncertainties are statistical only. Eγ values for primary transitions are not given explicitly by 1989Ri03; except as noted, the evaluator has deduced these from (S(n) − E(level)) in 1989Ri03, minus recoil energy. See 1972Al19 for additional unplaced γ rays with Eγ>2000. See also 1976Be23 for numerous unplaced transitions (Eγ<1145) absent in 1989Ri03; since 1989Ri03 report many weaker transitions which are absent in 1976Be23, it is reasonable to expect the former transitions to have been seen in 1989Ri03 if they do indeed belong to ^{179}Hf.

[‡] From 1989Ri03, unless otherwise specified. Iγ for primary and secondary γ rays are relative to 100 and 1000 for 5723.6γ and 214.3γ, respectively. Statistical uncertainties only are given here. Relative photon intensities for two-photon cascades (from 1988Bo44, uncertainty unstated) are given in comments, unless branching has been definitively determined in 1989Ri03; consistency between 1989Ri03 and 1988Bo44 is fair to poor. Intensities from 2007ChZX (Budapest data) are frequently In poor agreement with adopted values, possibly As a result of the complexity of the spectrum from a natural Hf target.

[#] Assigned by evaluator on basis of α(K)exp or α(L)exp from 1989Ri03, except as noted; 1989Ri03 normalize their conversion coefficient data assuming theoretical values for various (unspecified) transitions of known multipolarity. The evaluator assumes that 1989Ri03, in fact, measured α(L)exp if Eγ is below K-shell binding energy or E(ce(K))<18 keV (the spectrometer′s low energy limit).

[@] Deduced by evaluator from α(K)exp or α(L)exp from 1989Ri03. Note that these values may differ somewhat from authors′ deduced admixtures.

[&] α(K)exp may be influenced by contaminant electron lines and may, therefore, be overestimated.

[a] Eγ from 1988Bo44; uncertainty not stated by authors.

[b] From Budapest data In 2007ChZX.

[c] Doublet (1989Ri03). Significance of this designation is unclear since α(K)exp and mult are typically given for each of the closely-spaced γ lines whose mult carries this footnote; evaluator presumes that α(K)exp values for transitions so designated have been extracted from complex ce peaks whose components could only be inferred with recourse to the authors′ γ-ray data. Presumably the stated α(K)exp values are reliable to within their indicated uncertainties, but the evaluator does not adopt the δ values implied for M1+E2 transitions with this designation.

[d] From Budapest data In 2007ChZX, relative to I(214γ)=1000 *19*.

[e] From Budapest data In 2007ChZX, relative to I(5724γ)=100 *4*.

[f] Transition should have been observed in 1988Bo44, but is absent there.

[g] From 1972Al19. Uncertainty unstated by authors; however, agreement with data from 1989Ri03 is typically better than 20% for Iγ>5 and better than a factor of two for weak lines.

[h] 1991Bo51, reinterpreting data of 1989Ri03 and 1988Bo44, propose 7 transitions with E=1330-1337 keV, whereas 1989Ri03 observe only 2 γ rays (Eγ=1330.95 *2* and 1334.23 *8*). While the latter may well be multiplets, their summed intensity is less than half that expected based on branching data in 1989Ri03 and

$^{179}_{72}$Hf$_{107}$-33

γ(^{179}Hf) (continued)

1988Bo44 for 1706, 1755, 1812, 1946 and 2053 levels alone; additional transitions from 1991Bo51′s newly proposed levels at 2035 and 2121 are shown here as tentative and neither the level nor the transition is adopted in those instances.

[i] Eγ is level energy difference. The relative two-photon coin intensity is given in a comment on Iγ. Transition is deduced from two-photon cascade data of 1988Bo44, assuming that authors′ cascade γ order is correct, that cascade γ rays are consecutive and that only two-photon cascades have been identified.

[j] 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.

[k] Multiply placed with undivided intensity.

[l] Multiply placed with intensity suitably divided.

[m] Placement of transition in the level scheme is uncertain.

[x] γ ray not placed in level scheme.

$^{179}_{72}$Hf$_{107}$-34

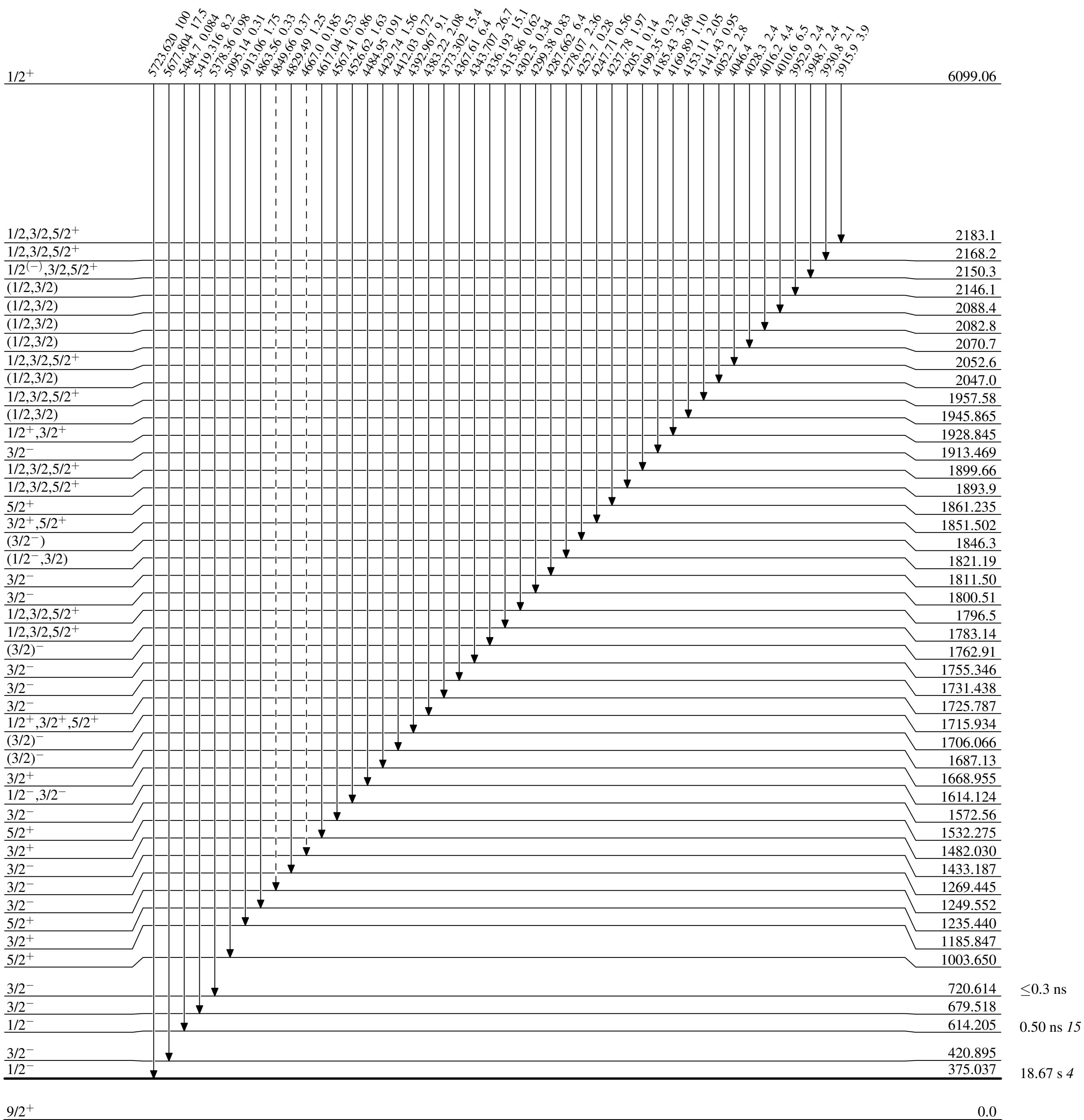
^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23

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)

Level Scheme

Intensities: Relative I_γ



$^{179}_{72}Hf_{107}$

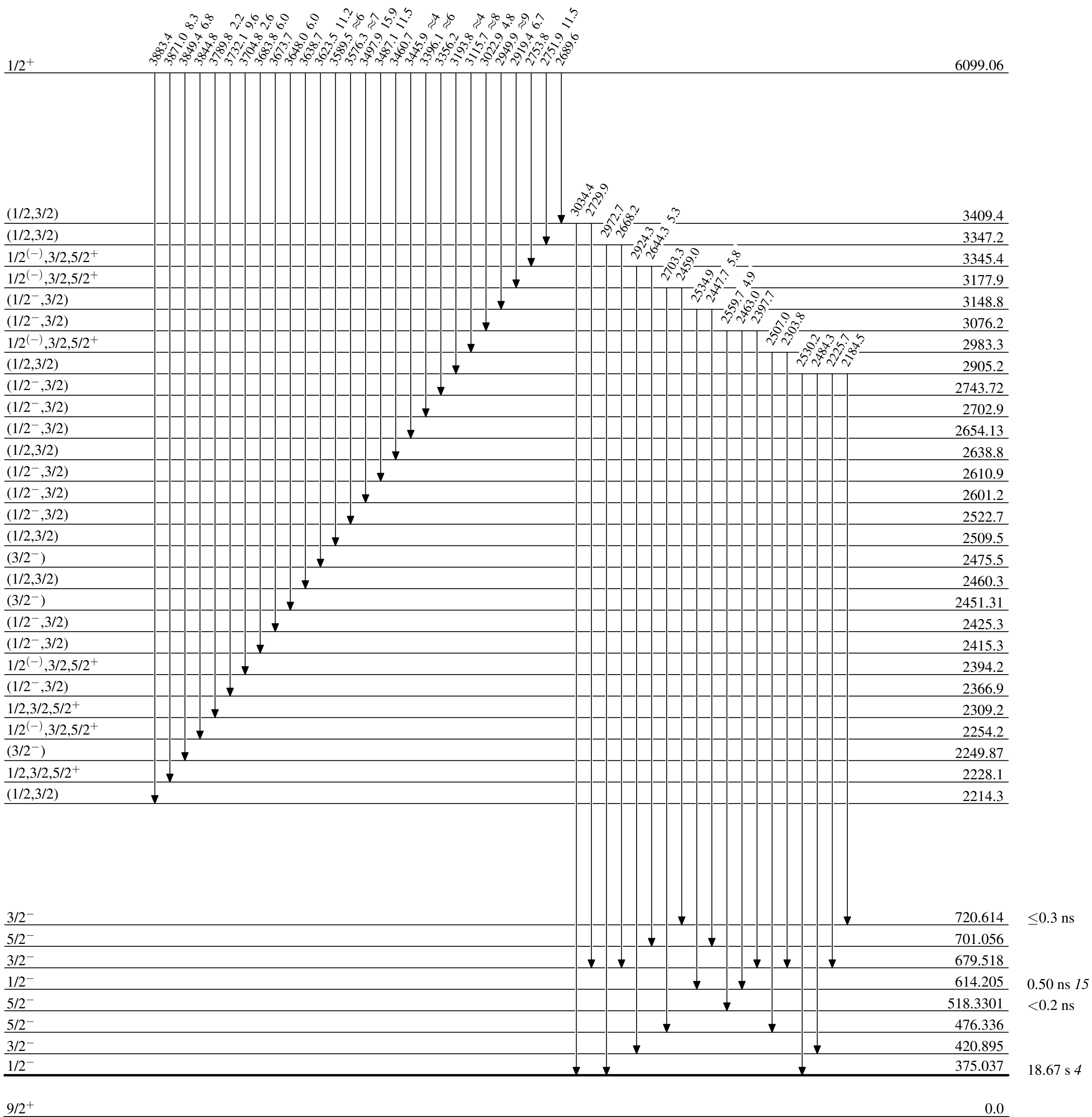
^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23

Level Scheme (continued)

Intensities: Relative I_γ

Legend

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

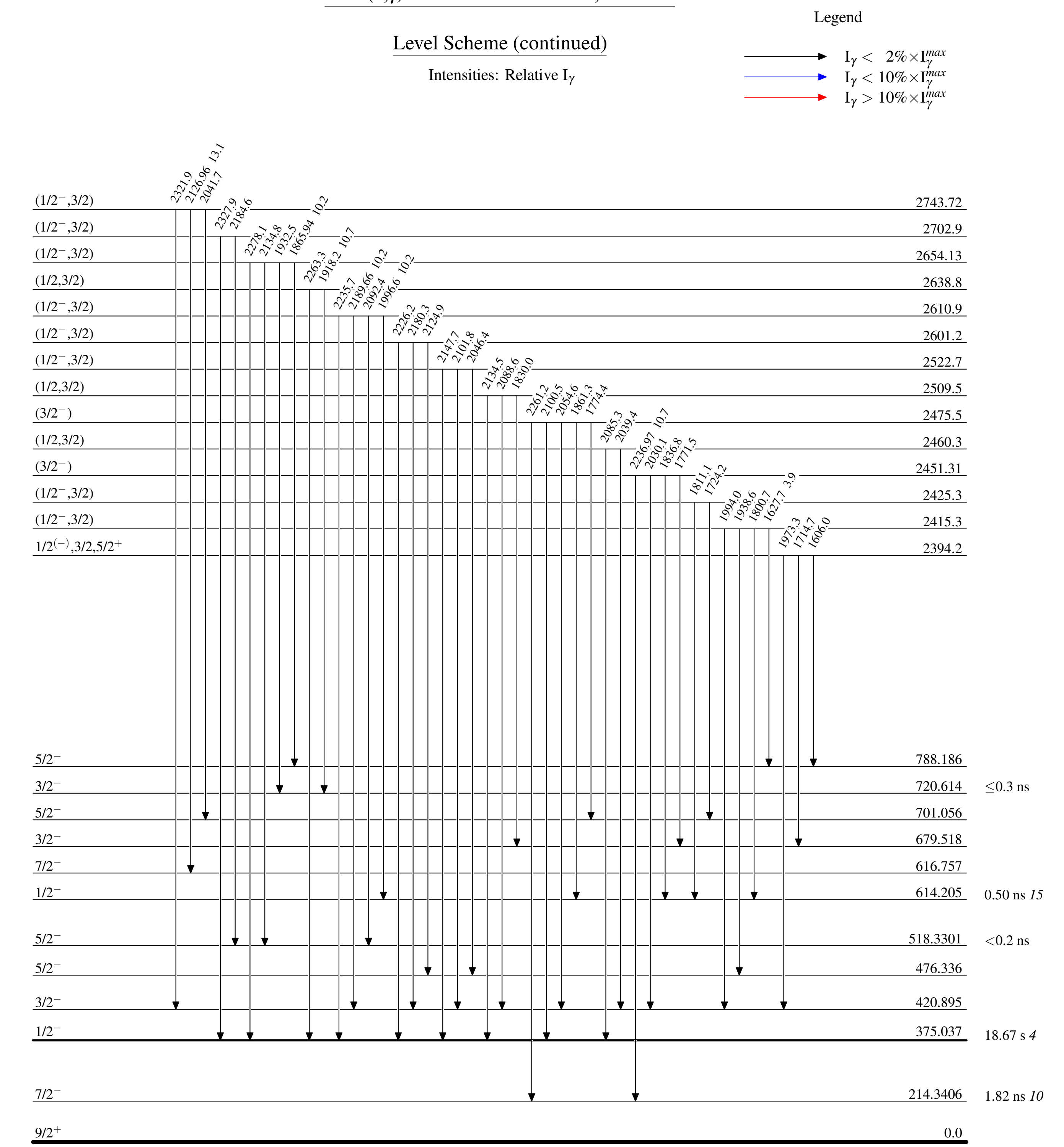


$^{179}_{72}Hf_{107}$

^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23

Level Scheme (continued)

Intensities: Relative I_γ



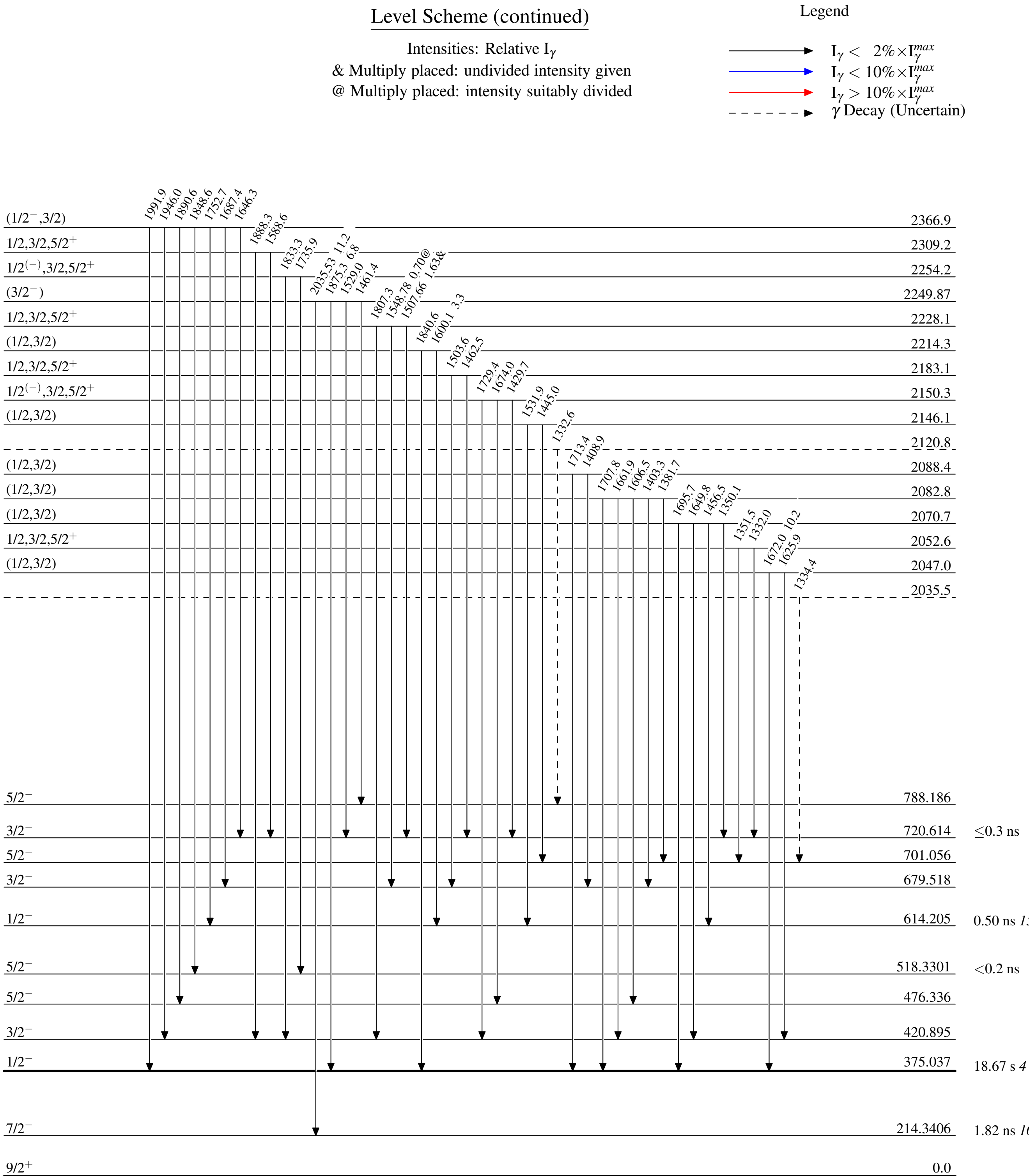
^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23

Level Scheme (continued)

Intensities: Relative I_γ

& Multiply placed: undivided intensity given

@ Multiply placed: intensity suitably divided



$^{179}_{72}Hf_{107}$

^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23

Level Scheme (continued)

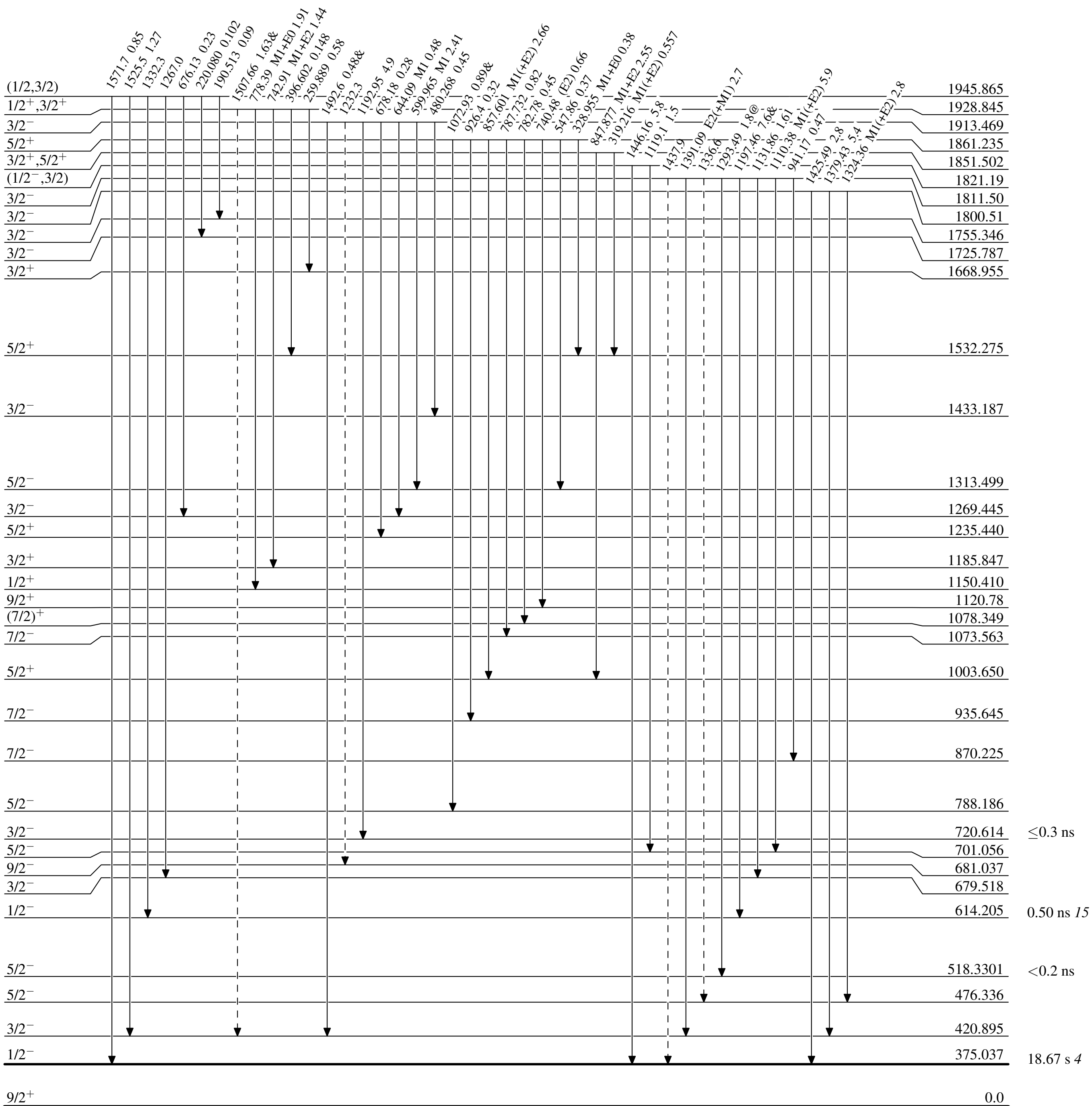
Intensities: Relative I_γ

& Multiply placed: undivided intensity given

@ Multiply placed: intensity suitably divided

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)

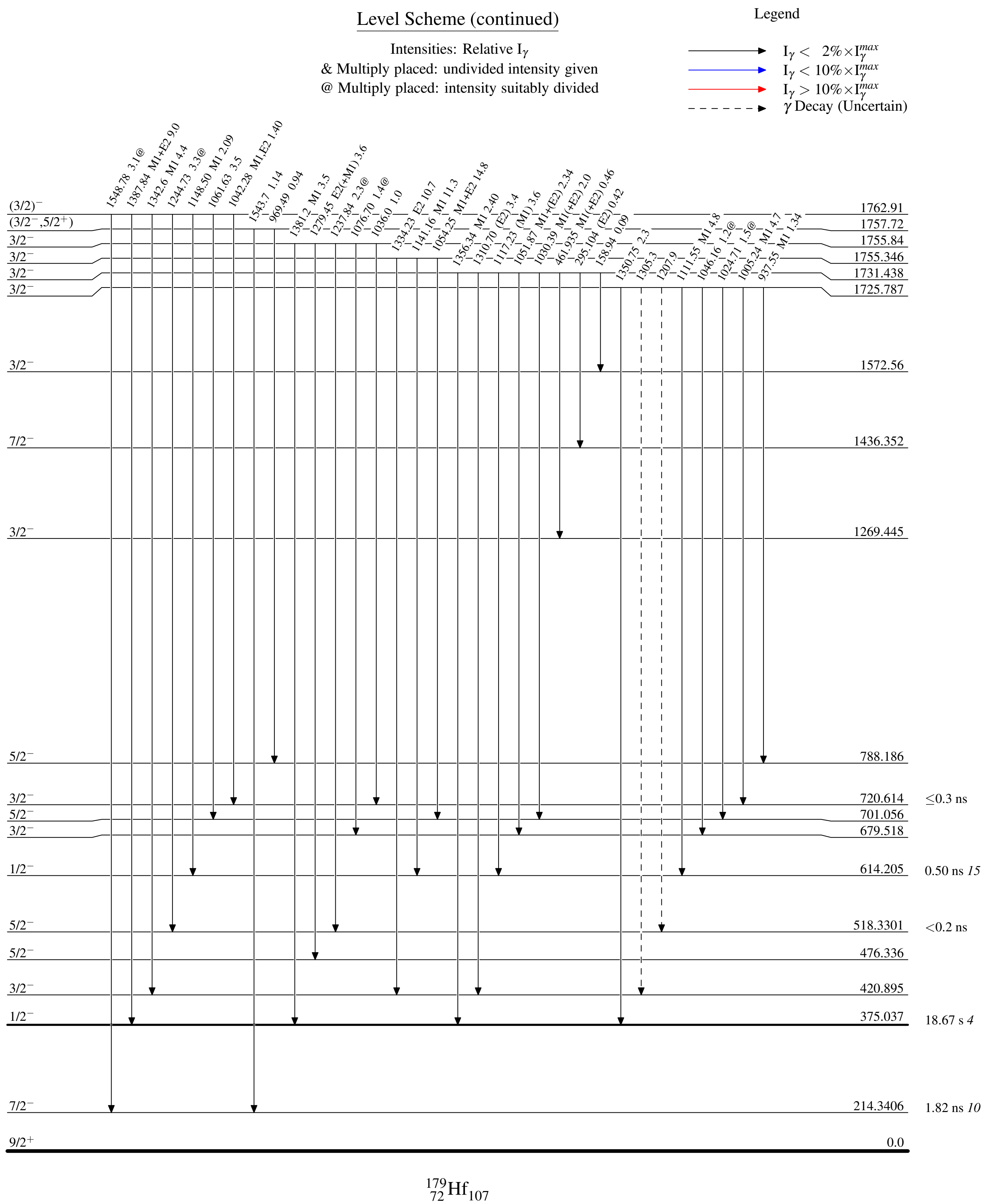


$^{179}_{72}Hf_{107}$

^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23

Level Scheme (continued)

Intensities: Relative I_γ
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



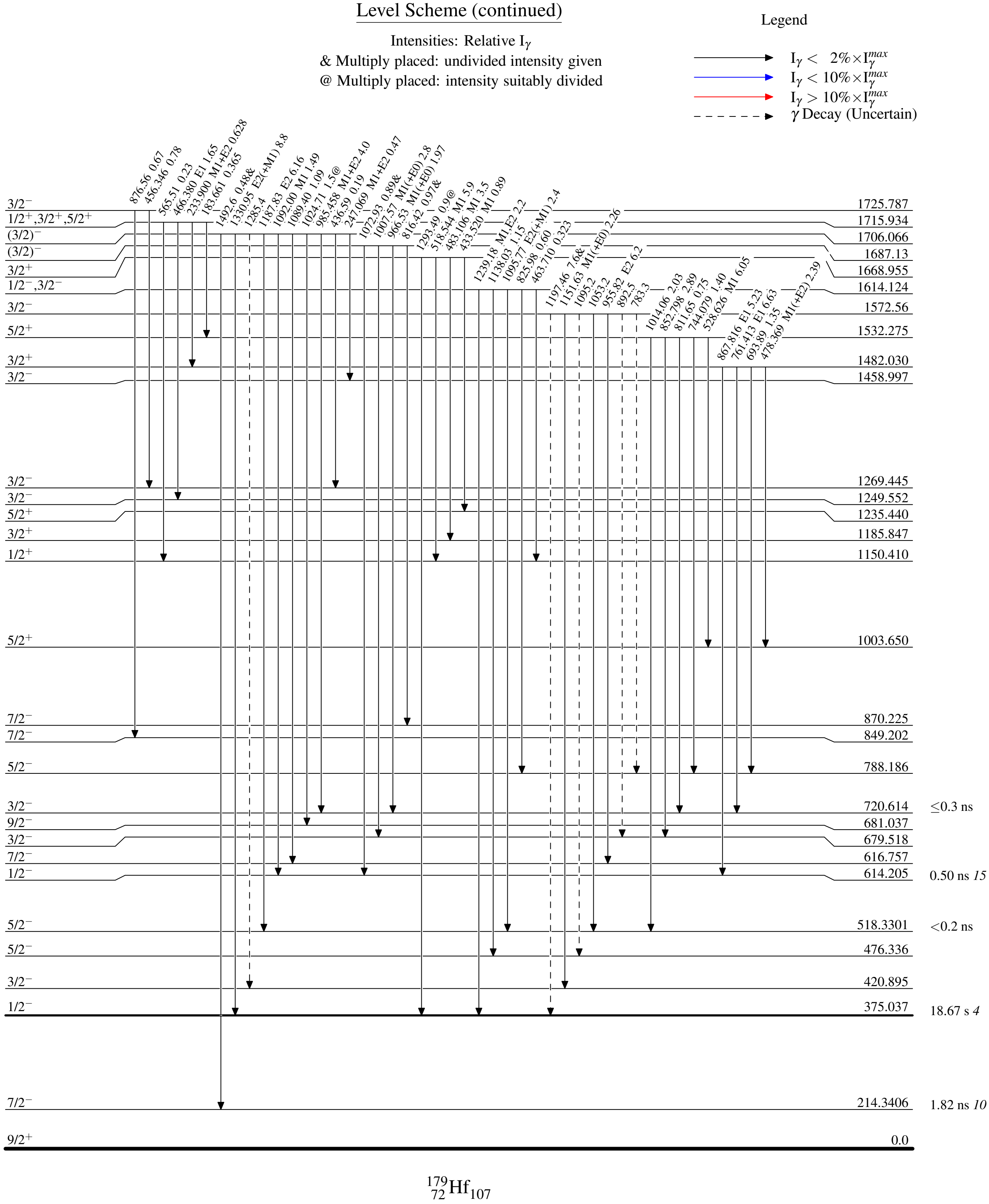
^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23

Level Scheme (continued)

Intensities: Relative I_γ

& Multiply placed: undivided intensity given

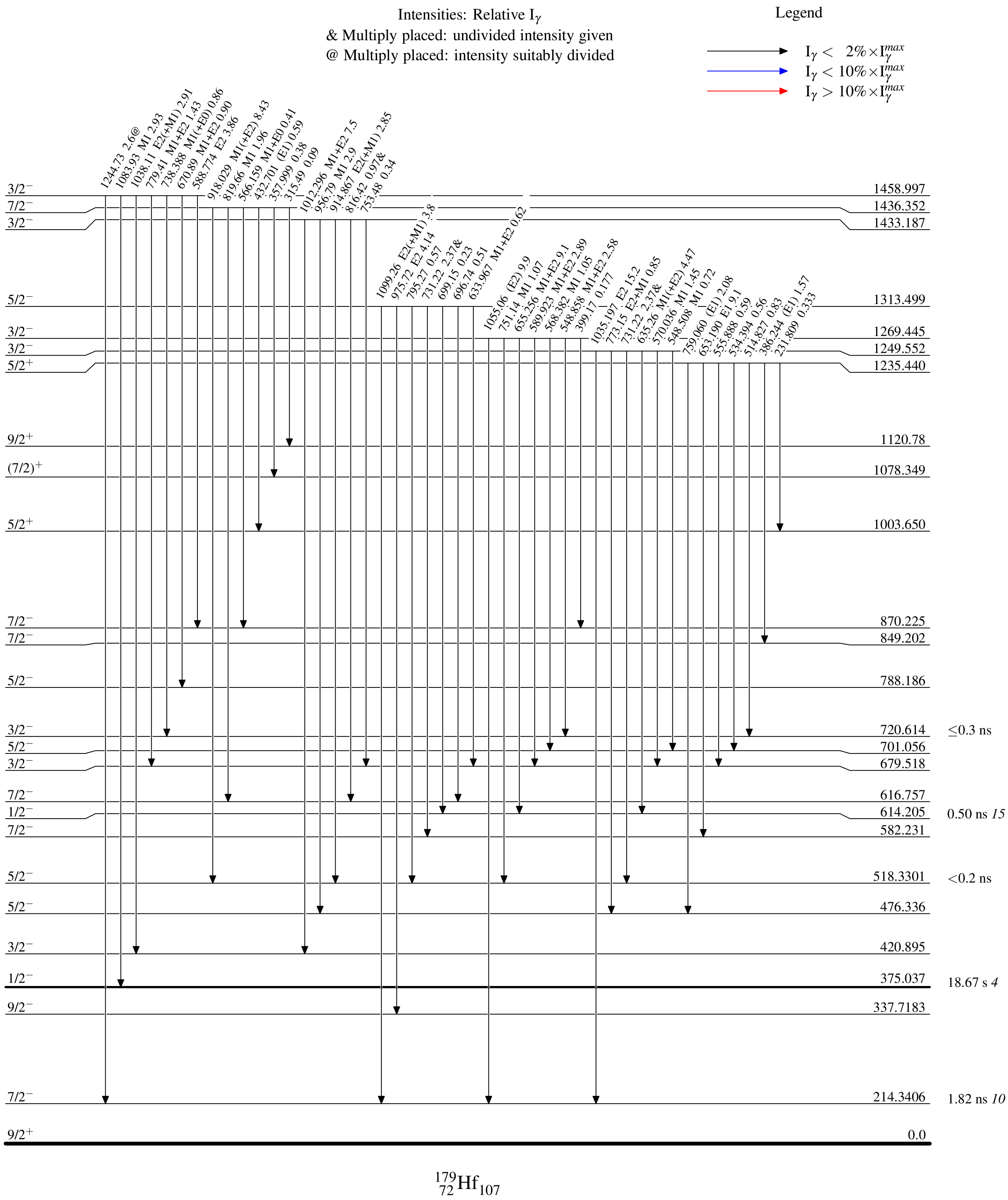
@ Multiply placed: intensity suitably divided



^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23

Level Scheme (continued)

Intensities: Relative I_γ
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



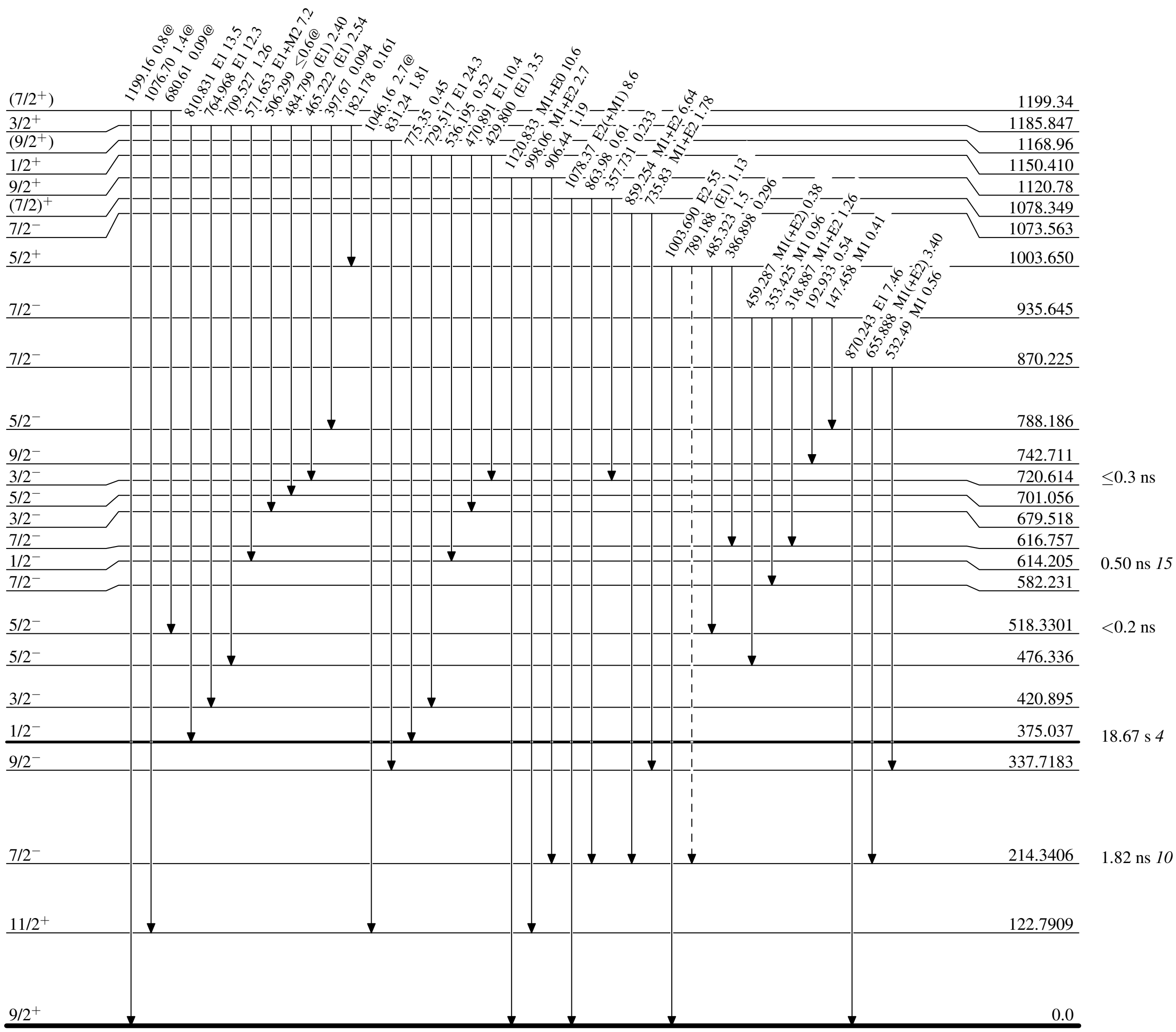
^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23

Level Scheme (continued)

Intensities: Relative I_γ
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

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)



$^{179}_{72}Hf_{107}$

^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23

Level Scheme (continued)

Intensities: Relative I_γ

& Multiply placed: undivided intensity given

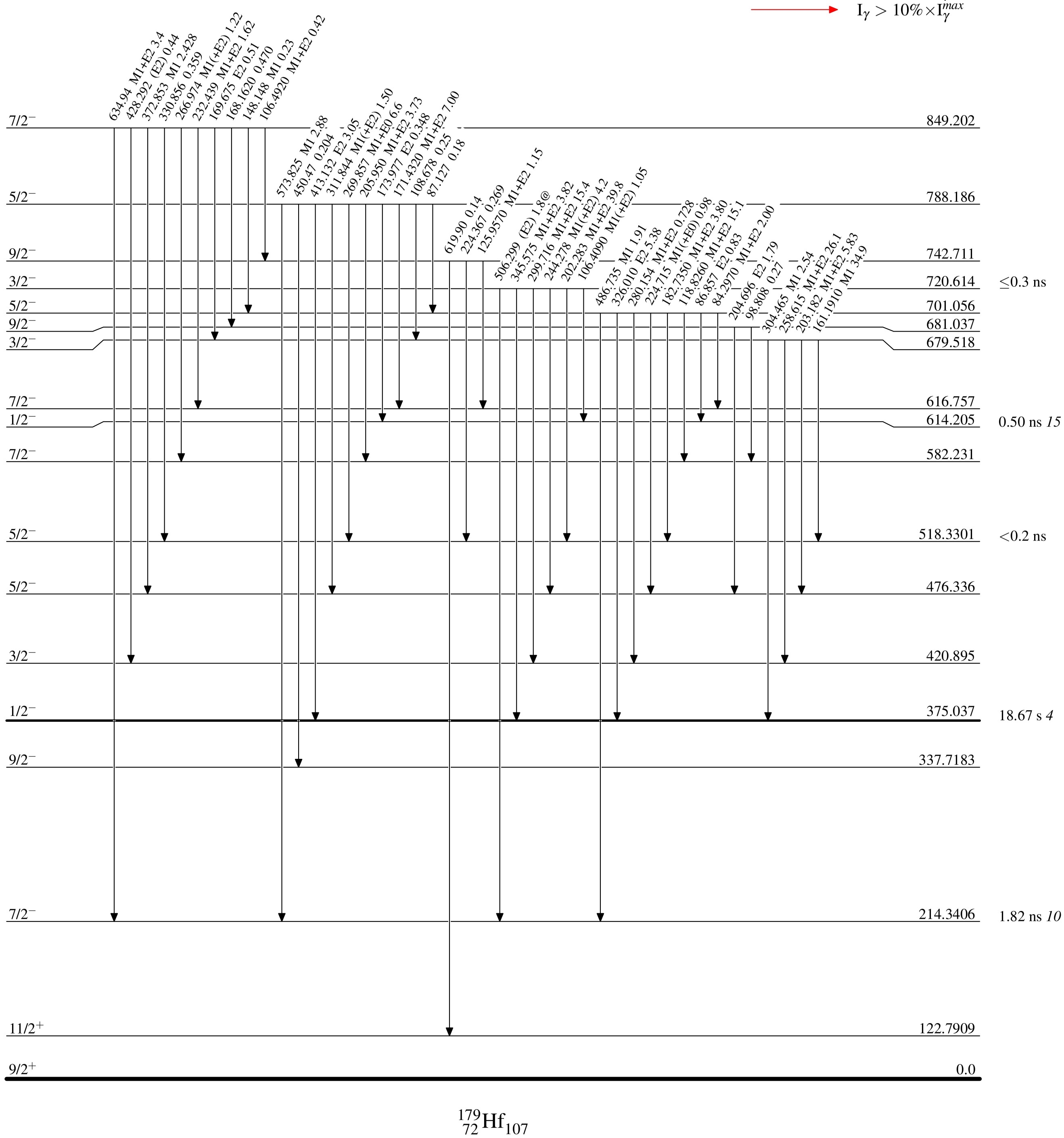
@ Multiply placed: intensity suitably divided

Legend

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

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

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

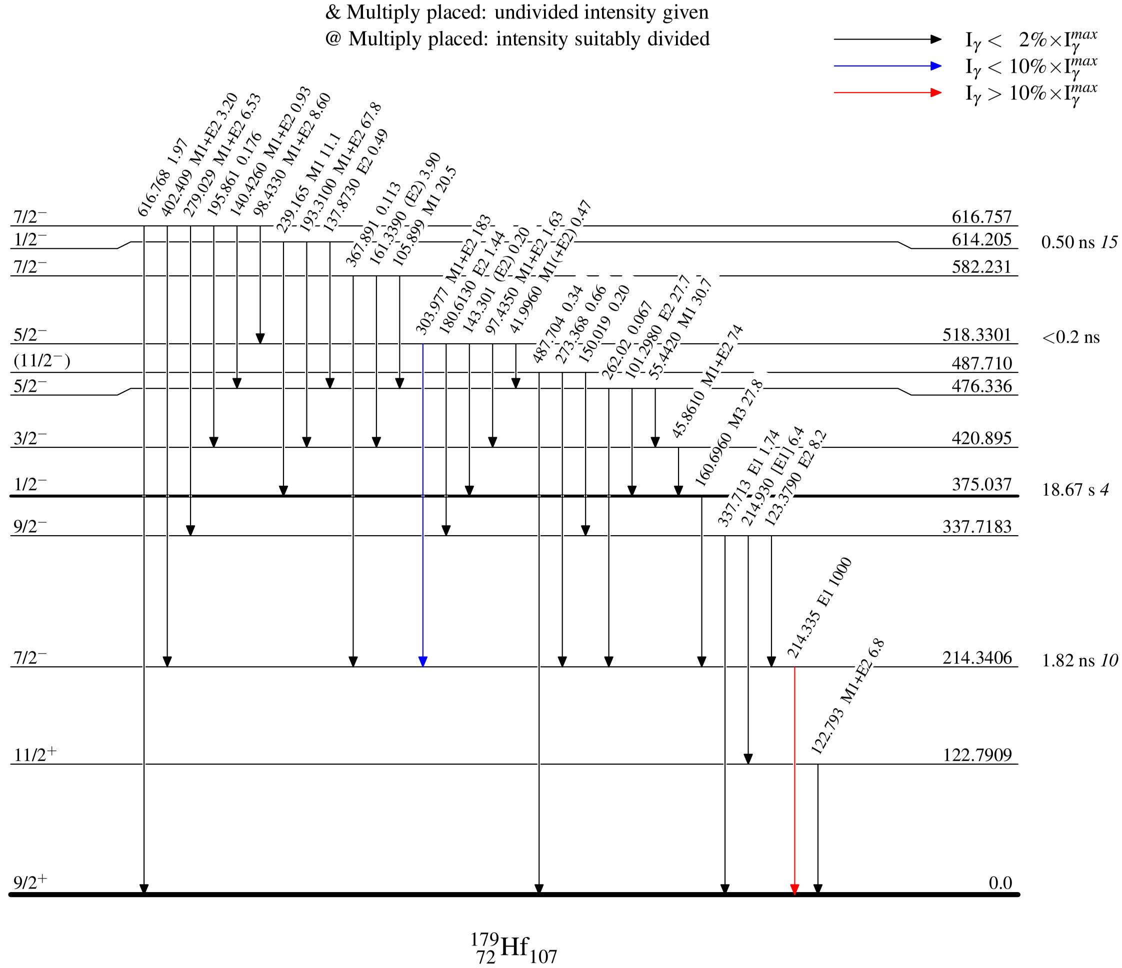


$^{179}_{72}Hf_{107}$

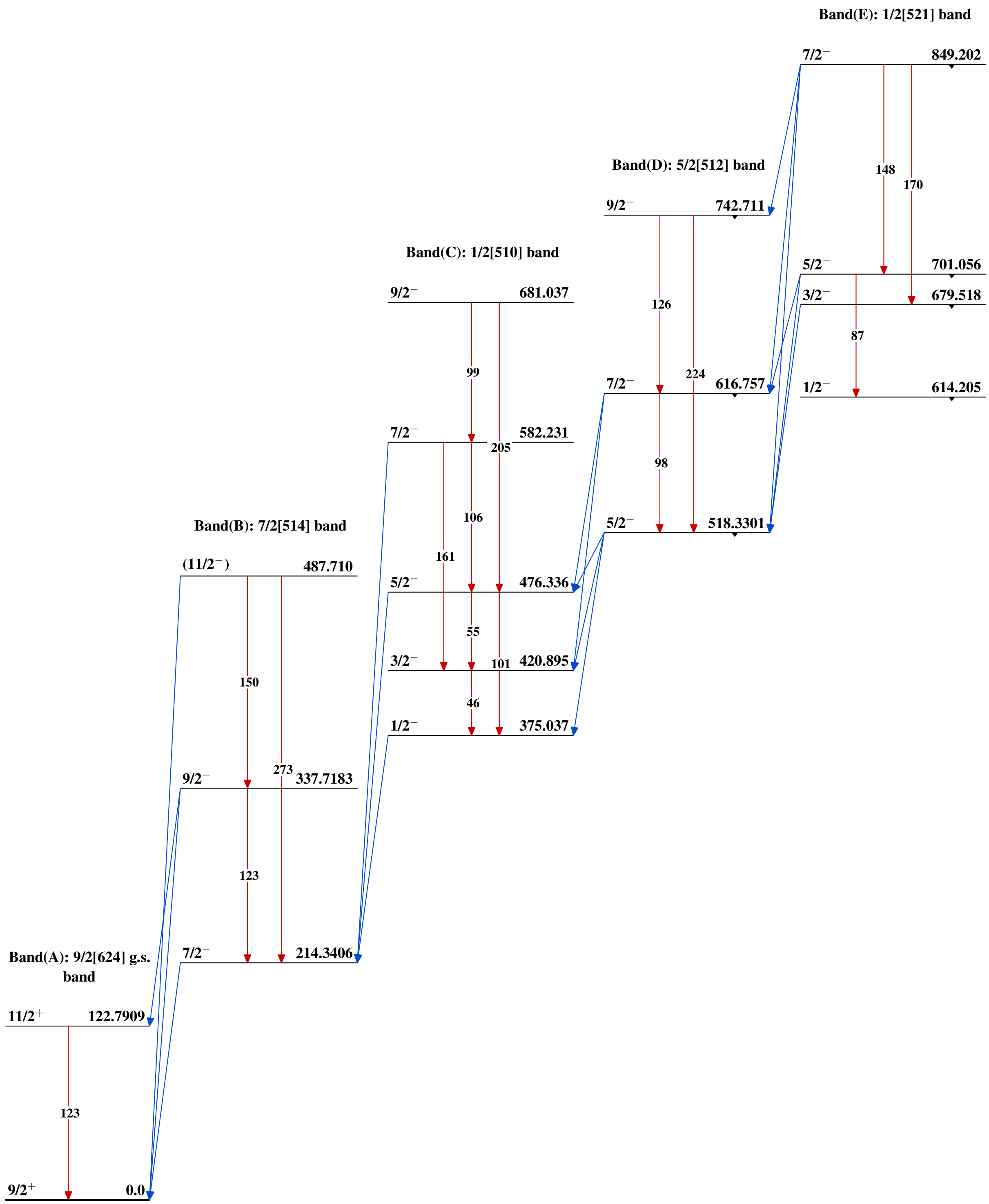
^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23

Level Scheme (continued)

Intensities: Relative I_γ
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

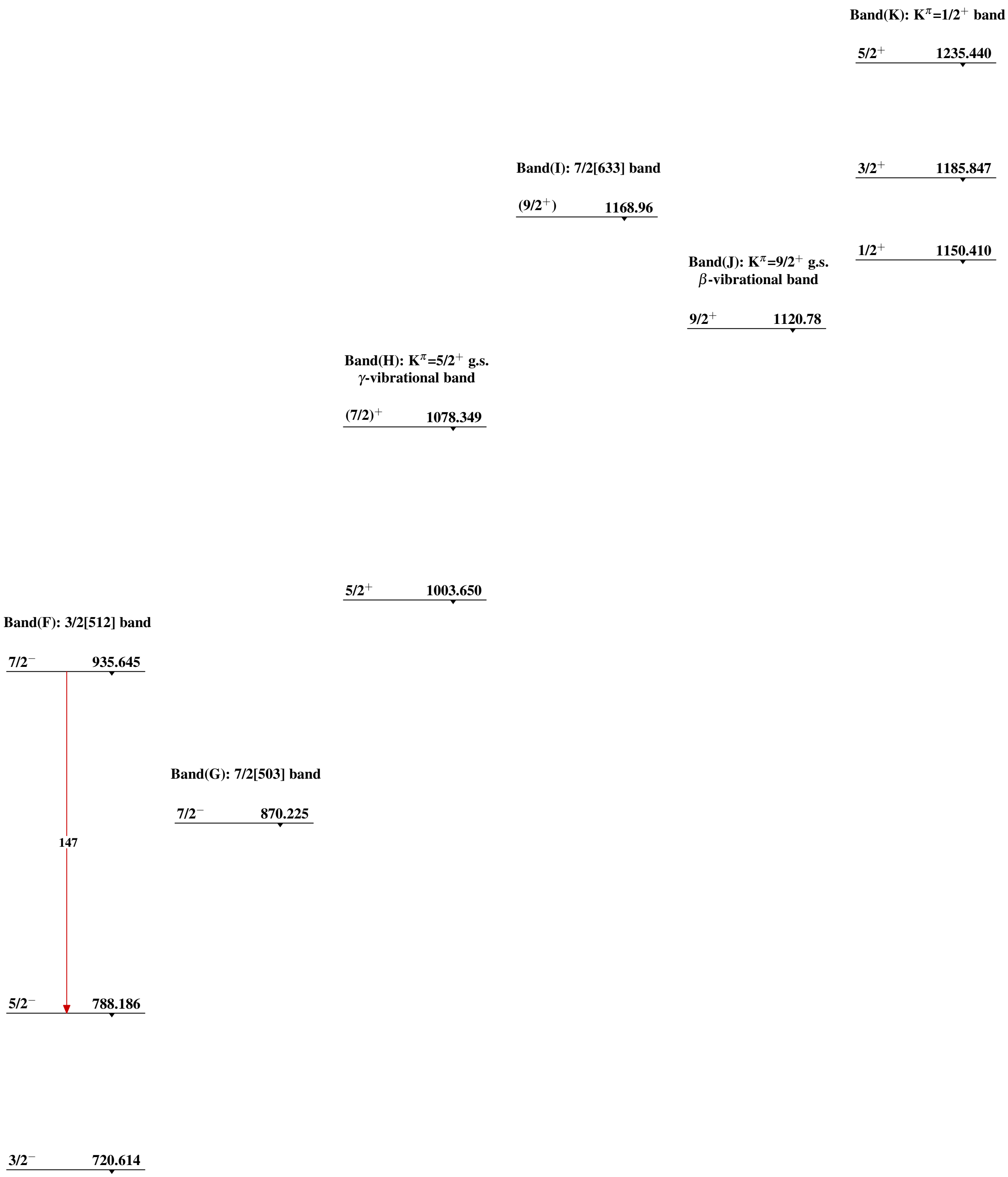


^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23



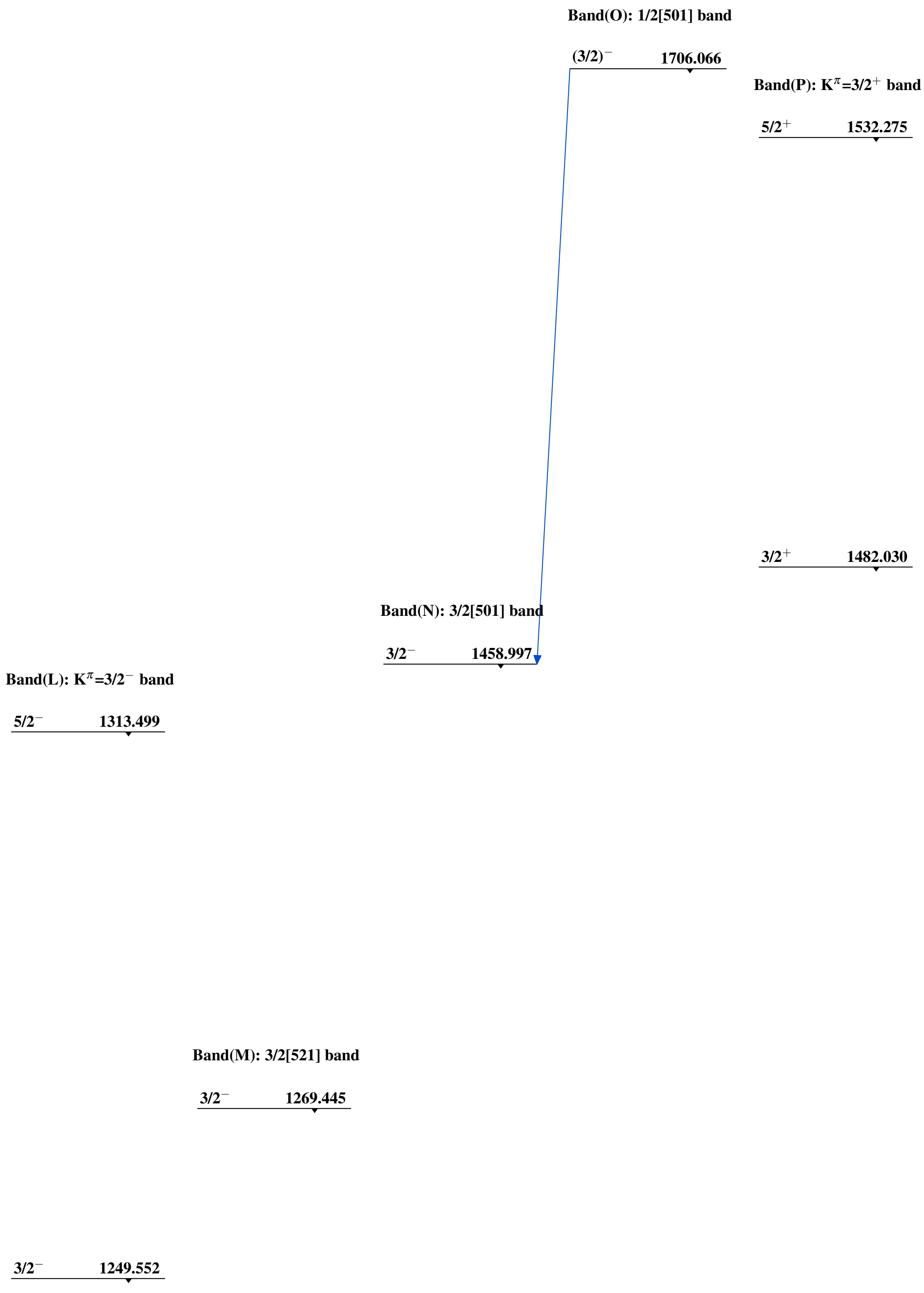
$^{179}_{72}Hf_{107}$

^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23 (continued)



$^{179}_{72}Hf_{107}$

^{178}Hf(n,γ) E=thermal 1989Ri03,1976Be23 (continued)



$^{179}_{72}Hf_{107}$