

Adopted Levels, Gammas

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

$Q(\beta^-) = -1.84 \times 10^3$ *sys*; $S(n) = 7625.95$ *18*; $S(p) = 7340.9$ *8*; $Q(\alpha) = 2082.9$ *15* [2012Wa38](#)

Note: Current evaluation has used the following Q record -1937 15 7625.9618 7344.2 7 2080.4 *15* [2003Au03](#).

 ^{178}Hf LevelsCross Reference (XREF) Flags

A	^{178}Lu β^- decay (28.4 min)	G	$^{176}\text{Yb}(\alpha, 2n\gamma)$	M	$^{177}\text{Hf}(\text{d}, \text{p})$
B	^{178}Lu β^- decay (23.1 min)	H	$^{176}\text{Yb}(^9\text{Be}, \alpha 3n\gamma)$	N	$^{178}\text{Hf}(\text{n}, \text{n}'\gamma)$
C	^{178}Hf IT decay (4.0 s)	I	$^{177}\text{Hf}(\text{n}, \gamma)$ E=thermal	O	$^{178}\text{Hf}(\text{pol p}, \text{p}') \text{ E}=65 \text{ MeV}$
D	^{178}Hf IT decay (31 y)	J	$^{177}\text{Hf}(\text{n}, \gamma)$ E=1-163 eV res	P	$^{180}\text{Hf}(\text{p}, \text{t})$
E	^{178}Ta ε decay (2.36 h)	K	$^{177}\text{Hf}(\text{n}, \gamma)$ E=2, 24 keV res:av	Q	$^{181}\text{Ta}(\text{p}, \alpha)$
F	^{178}Ta ε decay (9.31 min)	L	Coulomb excitation	R	$^{178}\text{Hf}(\gamma, \gamma')$

E(level) [†]	J^π [‡]	$T_{1/2}$ [#]	XREF	Comments
0.0 [@]	0 ⁺	stable	ABCDEFGHIJKLMNPQR	Isotope shift: $\Delta\langle r^2 \rangle = 0.106$ 7 fm ² relative to ^{180}Hf (1984Ta10 , muonic x-rays). RMS charge radius: $\langle r^2 \rangle = 5.338$ <i>11</i> (1984Ta10 , from muonic x-ray data). $Q_0 = 6.86$ <i>17</i> (1967Ab06). $\beta = 0.266$ (1967Ab06). $\mu = +0.48$ <i>3</i> $Q = -2.02$ <i>2</i> J^π : 93γ E2 to 0 ⁺ ; rotational band. Isomer shift: $\Delta\langle r^2 \rangle = 0.0031$ <i>18</i> 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 <i>5</i> (1963Bo13), 1.50 ns <i>3</i> (1962Ka14); ^{178}Ta ε decay (2.36 h): 1.47 ns <i>6</i> (1963Fo02); Coulomb excitation: 1.52 ns <i>12</i> (1961Ha21); 1.50 ns <i>10</i> (1967Ab06). Other: 1.25 ns <i>8</i> (1961Ga05 , ^{178}Ta ε decay (9.31 min); 1.87 ns <i>10</i> (1959Bi10 , Coulomb excitation). μ : Integral perturbed angular distribution of γ rays following Coulomb excitation (1968Be04 , 1989Ra17). Other values: +0.60 <i>4</i> (1962Ka14), +0.73 <i>7</i> (1962Bo13). Q : Hyperfine structure of muonic x rays (1984Ta10 , 1989Ra17). $Q(^{178}\text{Hf})/Q(^{180}\text{Hf}) = 1.07$ <i>3</i> (1968GeZY , using quadrupole hyperfine splitting in Mossbauer experiments), other value: 1.05 <i>3</i> (1973BoVM , Mossbauer quadrupole interaction measurements). $g = +0.29$ <i>2</i> (1962Ka14). J^π : 213γ E2 to 2 ⁺ ; rotational band. J^π : 326γ E2 to 4 ⁺ ; populated in Coulomb excitation; rotational band. J^π : 426γ E2 to 6 ⁺ ; populated in Coulomb excitation; rotational band. %IT=100 J^π : 89γ E1 to 8 ⁺ ; $\gamma\gamma(\theta)$ in ^{178}Hf IT decay (4.0 s) (1960De26). $g_K = 0.37$ <i>1</i> (1997Mu05).
93.1803 [@] <i>10</i>	2 ⁺	1.494 ns <i>23</i>	ABCDEFGHIJKL NOPQ	
306.6182 [@] <i>22</i>	4 ⁺		ABCDEFGHIJKL NOPQ	
632.178 [@] <i>4</i>	6 ⁺	11.2 ps <i>6</i>	BCDE GHIJ L NOPQ	
1058.550 [@] <i>6</i>	8 ⁺	2.77 ps <i>6</i>	BCDE GHIJ L N	
1147.416 ^{&} <i>6</i>	8 ⁻	4.0 s <i>2</i>	BCDE G I L N Q	

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Adopted Levels, Gammas (continued) ^{178}Hf Levels (continued)

E(level) [†]	J ^π [‡]	T _{1/2} [#]	XREF				Comments
1174.630 ^a 4	2 ⁺	0.62 ps 2	A	F	IJKLMN	P R	T _{1/2} : From ^{178}Hf IT decay (4.0 s). $\mu=1.4$ to 5.3, brute force nuclear orientation (1989Ra17). J ^π : $\gamma\gamma(\theta)$ (1972Li03), Coulomb excitation (1982Ha25,1977Ro08).
1199.385 ^b 11	0 ⁺		A	F	I	N Q	J ^π : 1199 γ 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	J ^π : 1276 γ E2 to 0 ⁺ . 1183 γ E0+E2+M1 to 2 ⁺ ; $\gamma\gamma(\theta)$ (1972Li03).
1310.068 ^d 4	1 ⁻		A	F	IJ	N R	J ^π : 1216 γ E1 to 2 ⁺ , 1310 γ E1 to 0 ⁺ .
1322.463 ^c 4	3 ⁻		A		IJKL	N P	J ^π : 1229 γ E1 to 2 ⁺ , 1016 γ E1 to 4 ⁺ .
1362.551 ^d 4	2 ⁻		A	F	IJ	N	J ^π : $\gamma\gamma(\theta)$ (1972Li03); 52 γ 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	J ^π : 1078 γ E2 to 4 ⁺ ; 1291 γ E2 to 2 ⁺ ; reduced I γ in $^{177}\text{Hf}(n,\gamma)$ E=2, 24 keV res:av.
1409.439 ^c 4	4 ⁻				IJK	N	J ^π : 1102 γ E1 to 4 ⁺ , 141 γ E1 to 3 ⁺ ; reduced I γ in $^{177}\text{Hf}(n,\gamma)$ 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	J ^π : 1434 γ E0 to 0 ⁺ .
1443.934 ^f 10	0 ⁺		A	F	I	N	J ^π : 1443 γ E0 to 0 ⁺ .
1450.363 ^b 5	4 ⁺	1.0 ps 9			IJK	N PQ	J ^π : 1144 γ E0+M1+E2 to 4 ⁺ .
1479.025 ^r 7	8 ⁻		B E G		N	Q	J ^π : 332 γ 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	J ^π : $\gamma\gamma(\theta)$ (1968Ni03); 1496 γ E2 to 0 ⁺ .
1512.592 ^c 4	(5) ⁻				IJK	N	
1513.607 ^f 9	2 ⁺				IJ	N P	J ^π : 1514 γ 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		J ^π : 1207 γ M1+E2 to 4 ⁺ .
1533.153 ^a 5	5 ⁺				IJKL	N	J ^π : 1226 γ M1+E2 to 4 ⁺ .
1538.790 ^d 4	4 ⁻				I	K	J ^π : 216 γ M1+E2 to 3 ⁻ , 1232 γ E1 to 4 ⁺ .
1553.997 ^h 4	6 ⁺	77.5 ns 7			G IJ L		$\mu=+5.84$ 5 J ^π : 922 γ E2 to 6 ⁺ , 407 γ (M2) to 8 ⁻ . T _{1/2} : from $^{176}\text{Yb}(\alpha,2n\gamma)$ studies: weighted average of 78 ns I (1977Kh01) and 77 ns I (1980Wa23), g=0.959 8, from 1980Wa23 in $^{176}\text{Yb}(\alpha,2n\gamma)$ 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	J ^π : 1468 γ E0+M1+E2 to 2 ⁺ , 1561 γ E2 to 0 ⁺ .
1566.668 ^j 4	2 ⁻		A	F	I	K N	J ^π : 257 γ M1+E2 to 1 ⁻ , 204 γ M1 to 2 ⁻ .
1570.3 [@] 8	10 ⁺	1.03 ps 3			GH	L	
1601.484 ^{&} 10	10 ⁻		B D	G	L	Q	J ^π : 237 γ M1+E2 to 9 ⁻ .
1635.603 ^e 5	4 ⁺				IJK	N	E(level): from ^{178}Hf IT decay (31 y). J ^π : 1542 γ E2 to 2 ⁺ , 185 γ M1+E2 to 4 ⁺ .

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Adopted Levels, Gammas (continued) ^{178}Hf Levels (continued)

E(level) [†]	J ^π [‡]	T _{1/2} [#]	XREF	Comments
1636.727 ^k 4	5 ⁻	0.4 ns 1	G I	J ^π : 1330γ E1 to 4 ⁺ , 82.7γ E1 to 6 ⁺ . T _{1/2} : from $^{176}\text{Yb}(\alpha, 2n\gamma)$ (1982Ko08).
1639.758 ^j 4	3 ⁻		I Q	J ^π : 277γ M1+E2 to 2 ⁻ , 101γ (M1) to 4 ⁻ .
1640.452 ^g 4	5 ⁺		IJKLMN P	J ^π : 126γ M1+E2 to 4 ⁺ , 1008γ E2 to 6 ⁺ .
1648.838 ^c 5	(6) ⁻		I	J ^π : 1017γ E1 to 6 ⁺ .
1651.459 ^d 4	(5) ⁻		I K	J ^π : 242γ M1+E2 to 4 ⁻ .
1654.3 ^f 6	(4 ⁺)		N	Level seen only in $^{178}\text{Hf}(n, n'\gamma)$.
1691.083 ^a 11	6 ⁺		IJ L N	J ^π : 1059γ M1+E2 to 6 ⁺ .
1697.5 ^r 10	(9 ⁻)		G	From $^{176}\text{Yb}(\alpha, 2n\gamma)$.
1731.064 ^b 4	(6) ⁺		I	J ^π : 1099γ M1 to 6 ⁺ .
1741.7 ^h 8	(7 ⁺)		G L	From $^{176}\text{Yb}(\alpha, 2n\gamma)$.
1747.102 ^j 4	4 ⁻		I K	J ^π : 337γ M1 to 4 ⁻ , 425γ M1+E2 to 3 ⁻ .
1758.143 ^l 4	3 ⁺		IJK	J ^π : 498γ E1 to 2 ⁻ , 490γ M1 to 3 ⁺ .
1772.15 ^m 7	0 ⁺		A F I N P	J ^π : 1772γ E0 to 0 ⁺ .
1781.264 ^k 4	(6) ⁻		G I	J ^π : 144γ E2 to 5 ⁻ .
1788.598 ^g 4	6 ⁺		IJ LMN	J ^π : 1156γ E2 to 6 ⁺ , 1482γ E2 to 4 ⁺ .
1803.389 ⁿ 4	3 ⁻		I K	J ^π : 289γ E1 to 4 ⁺ , 543γ M1+E2 to 2 ⁻ .
1808.275 ^o 4	(2) ⁺		IJK	Additional information 2. J ^π : 1715γ M1(+E2) to 2 ⁺ .
1818.286 ^m 7	2 ⁺	0.50 ps 23	A IJK N P	J ^π : 1725γ E0+M1+E2 to 2 ⁺ .
1857.151 ^p 5	(2) ⁻		I	J ^π : 597γ M1+E2 to 2 ⁻ , 535γ M1+E2 to 3 ⁻ .
1859.118 ^{&} 12	(11) ⁻		D G L N	J ^π : 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 $^{177}\text{Hf}(n, \gamma)$ thermal) dataset. J ^π : 688γ M1 to 2 ⁺ , 348γ M1 to 4 ⁺ .
1863.712 ^j 4	(5) ⁻		I	J ^π : 454γ M1 to 4 ⁻ , 351γ M1+E2 to 5 ⁻ .
1869.840 ^l 4	4 ⁺		I K PQ	J ^π : 547γ E1 to 3 ⁻ , 1776γ E2 to 2 ⁺ .
1890.0 ^a 9	7 ⁺		L	
1891.304 8	2 ⁺		I K	J ^π : 716γ M1+E2 to 2 ⁺ , 622γ M1+E2 to 3 ⁺ .
1913.617 ⁿ 4	4 ⁻		I K	J ^π : 273γ E1 to 5 ⁺ , 645γ E1 to 3 ⁺ .
1917.436 ^p 4	3 ⁻		I K	J ^π : 404γ E1 to 4 ⁺ , 595γ M1+E2 to 3 ⁻ .
1939.1 ^r 7	(10 ⁻)		G L Q	g _K =0.62 7 from $^{176}\text{Yb}(\alpha, 3n\gamma)$.
1942.007 5	1 ⁺ , 2 ⁺ , 3 ⁺		IJK	J ^π : 1848γ M1 to 2 ⁺ .
1947.951 ^k 4	(7) ⁻		G I K P	J ^π : 311γ E2 to 5 ⁻ .
1952.0 ^h 8	(8 ⁺)		G L	From $^{176}\text{Yb}(\alpha, 2n\gamma)$.
1953.132 ^q 5	4 ⁺		IJK M	J ^π : 1646γ E0+M1+E2 to 4 ⁺ .
1953.682 ^g 5	7 ⁺		I L	J ^π : 895γ M1 to 8 ⁺ .
1956.423 ^m 5	4 ⁺		IJK	J ^π : 1650γ E0+M1+E2 to 4 ⁺ .
1986.450 4	1 ⁺ , 2 ⁺ , 3 ⁺		IJ	J ^π : 536γ M1 to 4 ⁺ suggests J ^π =3 ⁺ , 4 ⁺ , 5 ⁺ ; 1893γ M1+E2(+E0) to 2 ⁺ suggests J ^π =1 ⁺ , 2 ⁺ , 3 ⁺ ; reduced I _y in $^{177}\text{Hf}(n, \gamma)$ E=1-163 eV res suggests J ^π =2 ⁺ .
1997.466 8	3 ⁺		IJ	J ^π : 179γ M1 to 2 ⁺ , 1690γ M1 to 4 ⁺ .
2007.566 4	4 ⁺ , 3 ⁺		I	J ^π : 138γ M1+E2 to 4 ⁺ , 249γ M1+E2 to 3 ⁺ .
2013.551 5	3 ⁺ , 4 ⁺ , 5 ⁺		I	J ^π : 378γ M1 to 4 ⁺ .
2021.181 4	1 ⁺ , 2 ⁺ , 3 ⁺		A I	J ^π : 1928γ M1 to 2 ⁺ .
2024	(0 ⁺)		PQ	J ^π : L=(0) in $^{180}\text{Hf}(p, t)$.
2025.8 7	0 ⁺		I	J ^π : L=0 in (p, t).
2027.565 ^p 5	4 ⁻		I	J ^π : 705γ M1+E2 to 3 ⁻ , 515γ M1+E2 to (5) ⁻ .

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Adopted Levels, Gammas (continued) ^{178}Hf Levels (continued)

E(level) [†]	J ^π [‡]	T _{1/2} [#]	XREF			Comments
2050.489 10	3 ⁺		I	J		J ^π : 1957γ M1 to 2 ⁺ , 1744γ M1 to 4 ⁺ .
2056	(2 ⁺)				P	J ^π : L=(2) in $^{180}\text{Hf}(\text{p},\text{t})$.
2068.035 ^q 5	5 ⁺		I	M		J ^π : 279γ M1+E2 to 6 ⁺ , 115γ M1 to 4 ⁺ .
2082.2 ^a 6	8 ⁺				L	
2099.874 5	3 ⁺ , 4 ⁺		I			J ^π : 777γ E1 to 3 ⁻ , 649γ M1+E2 to 4 ⁺ .
2118.6 6			I			
2136.522 ^{&} 16	(12) ⁻		D	G	L	J ^π : 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	J ^π : L=(0) in $^{180}\text{Hf}(\text{p},\text{t})$.
2334.4 10	1				R	
2349.7 ^g 10	9 ⁺			L		
2354 1					Q	
2365.5 7	(2 ⁺)		I		P	J ^π : L=(2) in $^{180}\text{Hf}(\text{p},\text{t})$.
2393 10					P	
2432.5 10	(1,2)				R	
2433.334 ^{&} 17	(13) ⁻		D	G	L	J ^π : 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 J ^π : 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	J ^π : 140γ M1 to (13) ⁻ . T _{1/2} : From $^{176}\text{Yb}(\alpha, 2n\gamma)$.
2604.2 ^g 9	10 ⁺			L		
2612.7 10	1				R	
2631.4 7			I			
2668 10	(2 ⁺)				P	J ^π : L=(2) in $^{180}\text{Hf}(\text{p},\text{t})$.
2700.7 ^h 12	(11 ⁺)		G	L		

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Adopted Levels, Gammas (continued) ^{178}Hf Levels (continued)

E(level) [†]	J ^π [‡]	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	J ^π : from Coulomb excitation.
2785.3 r 10	(13 ⁻)		G	
2797.8 a 13	11 ⁺		L	
2803.5 t 3	17 ⁺		H L	
2827.5 10	1			R
2827.7 g 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
2942.0 s 10	(12 ⁺)		L	
2957.7 7			I	
2987.2 h 13	(12 ⁺)		L	
3018.8 10	1			R
3052.7 a 11	(12 ⁺)		L	
3084.3 & 10	15 ⁻		L	
3100.5 6			I	
3100.6 r 7	(14 ⁻)		L	
3112.8 7			I	
3135.2 g 14	12 ⁺		L	
3144.4 10	1			R
3180.9 t 7	18 ⁺		H L	
3263.7 9	16 ⁻		H	
3283.8 h 13	13 ⁺		L	
3293.4 10	1			R
3335.8 a 17	13 ⁺		L	
3379.7 g 18	13 ⁺		L	
3410.0 10	1			R
3435.0 @ 14	16 ⁺		H L	J ^π : from Coulomb excitation.
3452.7 10	1			R
3521.8 s 11	(14 ⁺)		L	
3546.0 10	1			R
3572.5 10	1			R
3577.7 10	1			R
3578.4 t 8	19 ⁺		H L	
3589.3 10	1			R
3595.5 h 14	14 ⁺		L	
3609.9 10	1			R
3624.7 a 15	14 ⁺		L	
3625.6 10	(1,2)			R
3710.8 10	1			R
3741.2 g 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

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Adopted Levels, Gammas (continued) ^{178}Hf Levels (continued)

E(level) [†]	J ^π [‡]	XREF		Comments
3927.8 ^a 20	15 ⁺		L	
3932.2 10	1			R
3995.5 ^t 9	20 ⁺	H	L	
3997 ^g 8	15 ⁺	H	L	
4119.4 [@] 17	18 ⁺	H	L	J ^π : 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	J ^π : from Coulomb excitation.
4431.7 ^t 10	21 ⁺	H		
4593.1 7		I		
4781.9 7		I		
4837.4 [@] 20	20 ⁺	H	L	J ^π : from Coulomb excitation.
4873.7 7		I		
4886.1 ^t 12	(22 ⁺)	H		J ^π : from $^{176}\text{Yb}(^9\text{Be}, \alpha 3n\gamma)$.
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)

$\gamma(^{178}\text{Hf})$									
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	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 : I _γ (1082γ)/I _γ (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	

Adopted Levels, Gammas (continued)

$\gamma(^{178}\text{Hf})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	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 I _{γ} of the 62.2 γ .
		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 ⁻				
		190.13j 3	9.2j 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		151.2d 3	46d 18	1362.551	2 ⁻	(E0+M1+E2)		0.99 24	
		203.6d 3	100d 10	1310.068	1 ⁻				
		1420.53ek 10	54e 4	93.1803	2 ⁺				
		1513.62fk 10	58f 3	0.0	0 ⁺				
1513.831	4 ⁺	129.365j 3	1.71j 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 ⁺				

Adopted Levels, Gammas (continued)

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

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	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: I _γ (244)=0.3 2 relative to I _γ (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

Adopted Levels, Gammas (continued)

$\gamma(^{178}\text{Hf})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^{\dagger}$	$I_\gamma^{\dagger}$	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	
1648.838	$(6)^-$	1333.796 20	100 3	306.6182	4^+	M1+E2	2.7 6	0.00256 12	
		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	
1654.3	(4^+)	1344.86 7	100 3	306.6182	4^+	(E1)		1.05×10^{-3}	
		331 1	≤ 59	1322.463	3^-				
		378 1	47 18	1276.692	2^+				
		1348 1	100 25	306.6182	4^+				
1691.083	6^+	1561 ^k 1	≤ 35	93.1803	2^+				
		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	
1697.5	(9^-)	1384.46 3	59.2 24	306.6182	4^+	E2		0.00220	
		333.4 @	100	1364.078	9^-				

Adopted Levels, Gammas (continued)

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

Adopted Levels, Gammas (continued)

$\gamma(^{178}\text{Hf})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^{\dagger}$	$I_\gamma^{\dagger}$	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	

Adopted Levels, Gammas (continued)

$\gamma(^{178}\text{Hf})$ (continued)								
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	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
1917.436	3 ⁻	1607.17 10	9.9 15	306.6182	4 ⁺			
		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 ⁺			
1947.951	(7) ⁻	1848.80 7	100 9	93.1803	2 ⁺	M1		0.00214
		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 ⁻			

Adopted Levels, Gammas (continued)

$E_i(\text{level})$	J_i^π	$\gamma(^{178}\text{Hf})$ (continued)							Comments
		E_γ	I_γ	E_f	J_f^π	Mult. ^g	δ^g	α^i	
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 ⁺				
		895.148 21	31.4 21	1058.550	8 ⁺	M1		0.01095	Additional information 3.
		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 ⁺				
2013.551	3 ⁺ ,4 ⁺ ,5 ⁺	738.982 20	85.5 19	1268.537	3 ⁺	M1+E2	1.6 +3-2	0.0105 7	
		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	

Adopted Levels, Gammas (continued)

$\gamma(^{178}\text{Hf})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	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 ⁺				

Adopted Levels, Gammas (continued)

$\gamma(^{178}\text{Hf})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	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 <i>l</i>		2202.51	(11) ⁻				E_γ : from ^{178}Hf IT decay (31 y).
		296.812 <i>l</i> 0	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 <i>l</i> 0 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 <i>l</i> 0	8.42 13	B(M4)(W.u.)=(2.35×10 ⁻⁵ <i>l</i> 1); B(E5)(W.u.)=(0.005 +8-5) δ : from ^{178}Hf IT decay (31 y). B(E5)(W.u.)=0.000122 <i>l</i> 0
2474.8		587.0 [‡] <i>l</i>	41 [‡] 3	1859.118	(11) ⁻	E5		0.284	
		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)

<u>$\gamma(^{178}\text{Hf})$ (continued)</u>									
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	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 ⁺				

Adopted Levels, Gammas (continued)

						$\gamma(^{178}\text{Hf})$ (continued)				
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	E_f	J_f^π
3135.2	12 ⁺	531 [#]		2604.2	10 ⁺	4178.8	(16 ⁺)	744 [#]	3435.0	16 ⁺
3180.9	18 ⁺	377 ^c		2803.5	17 ⁺			1402 [#]	2776.6	14 ⁺
		735 ^c		2446.09	16 ⁺	4210.5		3904.2	306.6182	4 ⁺
3263.7	16 ⁻	355 ^c		2909.1	(15 ⁻)			4117.0	93.1803	2 ⁺
		691 ^c		2572.4	14 ⁻	4325.2		3064.7	1260.248	2 ⁻
3283.8	13 ⁺	296 [#]		2987.2	(12 ⁺)			4232.1	93.1803	2 ⁺
		582 [#]		2700.7	(11 ⁺)	4378.0		3109.0	1268.537	3 ⁺
3335.8	13 ⁺	538 [#]		2797.8	11 ⁺			4071.7	306.6182	4 ⁺
3379.7	13 ⁺	552 [#]		2827.7	11 ⁺	4417.2	16 ⁺	676 [#]	3741.2	14 ⁺
3435.0	16 ⁺	658.6 [#]	100	2776.6	14 ⁺	4431.7	21 ⁺	436	3995.5	20 ⁺
3521.8	(14 ⁺)	580 [#]		2942.0	(12 ⁺)			853	3578.4	19 ⁺
		745 [#]		2776.6	14 ⁺	4593.1		3317.3	1276.692	2 ⁺
		1372 [#]		2149.6	12 ⁺			4592.2	0.0	0 ⁺
3578.4	19 ⁺	397 ^c		3180.9	18 ⁺	4781.9		3514.9	1268.537	3 ⁺
		775 ^c		2803.5	17 ⁺			4687.0	93.1803	2 ⁺
3595.5	14 ⁺	310 [#]		3283.8	13 ⁺	4837.4	20 ⁺	718 [#]	4119.4	18 ⁺
		610 [#]		2987.2	(12 ⁺)	4873.7		4567.0	306.6182	4 ⁺
3624.7	14 ⁺	572 [#]		3052.7	(12 ⁺)			4780.4	93.1803	2 ⁺
		1475 ^{#k}		2149.6	12 ⁺	4886.1	(22 ⁺)	454 ^c	4431.7	21 ⁺
3741.2	14 ⁺	606 [#]		3135.2	12 ⁺			891 ^c	3995.5	20 ⁺
3902?	15 ⁺	307 ^{#k}		3595.5	14 ⁺	4914.7		3739.1	1174.630	2 ⁺
		618 ^{#k}		3283.8	13 ⁺			4609.0	306.6182	4 ⁺
3909.5		2736.5		1174.630	2 ⁺	5010.1		4702.1	306.6182	4 ⁺
		3601.2		306.6182	4 ⁺			4918.2	93.1803	2 ⁺
3927.8	15 ⁺	592 [#]		3335.8	13 ⁺	5283.0		4652.7	632.178	6 ⁺
3995.5	20 ⁺	417 ^c		3578.4	19 ⁺			4974.3	306.6182	4 ⁺
		815 ^c		3180.9	18 ⁺	5388.6		4119.3	1268.537	3 ⁺
3997?	15 ⁺	618 ^{#k}		3379.7	13 ⁺			5083.3	306.6182	4 ⁺
4119.4	18 ⁺	684.4 [#]		3435.0	16 ⁺			5294.8	93.1803	2 ⁺
4178.8	(16 ⁺)	657 [#]		3521.8	(14 ⁺)					

[†] From $^{177}\text{Hf}(n,\gamma)$ E=thermal, unless otherwise specified.

[‡] From ^{178}Hf IT decay (31 y).

[#] From Coulomb excitation.

Adopted Levels, Gammas (continued) $\gamma(^{178}\text{Hf})$ (continued)

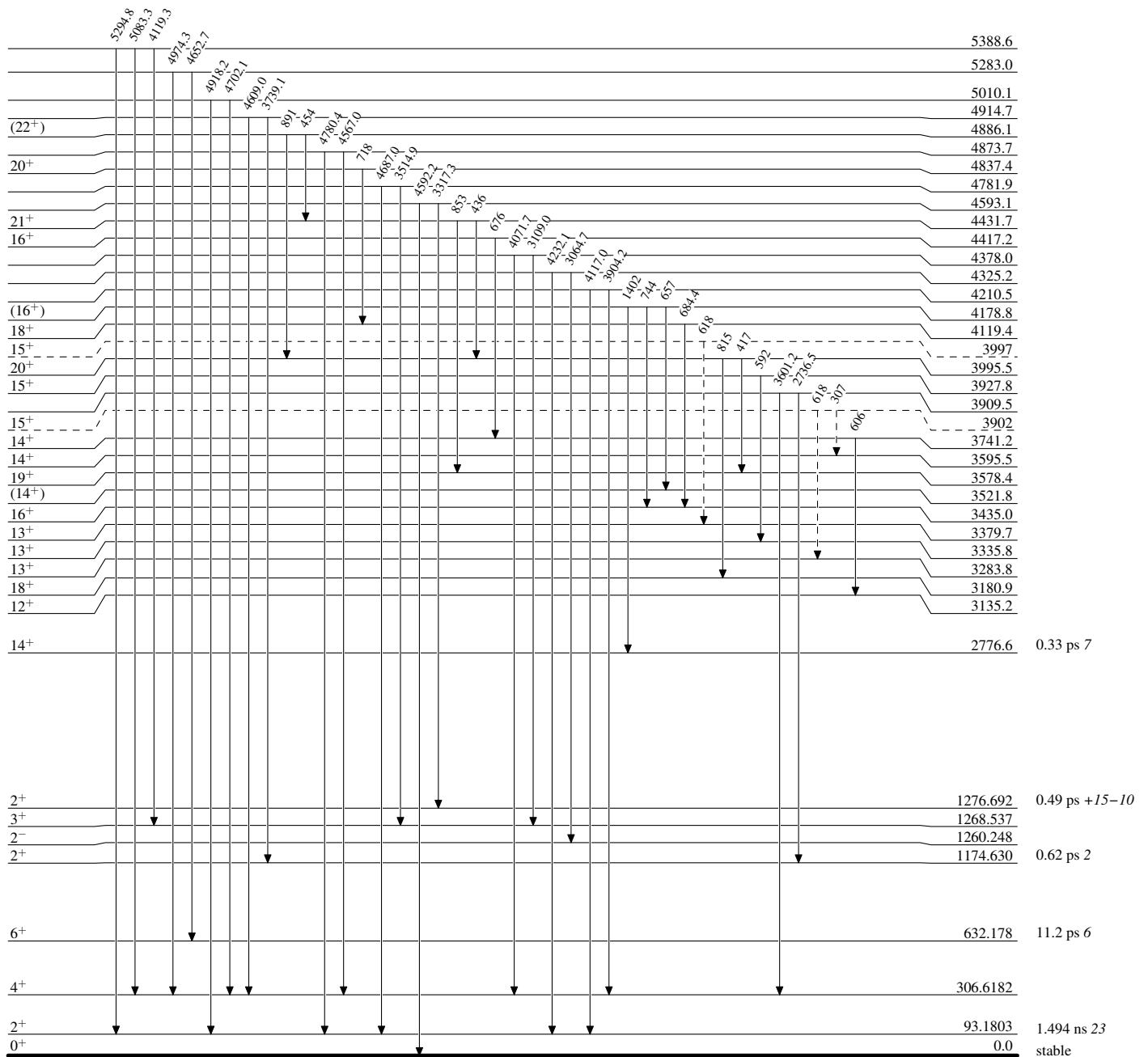
- @ From $^{176}\text{Yb}(\alpha, 2n\gamma)$.
- & Weighted average of data from $^{177}\text{Hf}(n, \gamma)$ E=thermal, $^{178}\text{Lu} \beta^-$ decay (28.4 min), and $^{178}\text{Ta} \varepsilon$ decay (9.31 min).
- ^a Weighted average from $^{177}\text{Hf}(n, \gamma)$ E=thermal, ^{178}Hf IT decay (31 y), ^{178}Hf IT decay (4.0 s), $^{178}\text{Lu} \beta^-$ decay (28.4 min), and $^{178}\text{Ta} \varepsilon$ decay (2.36 h).
- ^b Weighted average from $^{177}\text{Hf}(n, \gamma)$ E=thermal, ^{178}Hf IT decay (31 y), ^{178}Hf IT decay (4.0 s), and $^{178}\text{Ta} \varepsilon$ decay (2.36 h).
- ^c From $^{176}\text{Yb}(^9\text{Be}, \alpha 3n\gamma)$.
- ^d Seen only in $^{178}\text{Ta} \varepsilon$ decay (9.31 min) and $^{178}\text{Lu} \beta^-$ decay (28.4 min).
- ^e From $^{178}\text{Ta} \varepsilon$ decay (9.31 min) and $^{178}\text{Lu} \beta^-$ decay (28.4 min). Probable doublet, other transition with similar energy from 1513.83 keV 4^+ level.
- ^f From $^{178}\text{Ta} \varepsilon$ decay (9.31 min) and $^{178}\text{Lu} \beta^-$ decay (28.4 min). Probable doublet, other transition with similar energy from 1513.61 keV 2^+ level.
- ^g From conversion electron data in $^{177}\text{Hf}(n, \gamma)$ 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 multiplicities, and mixing ratios, unless otherwise specified.
- ^j Multiply placed with undivided intensity.
- ^k Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

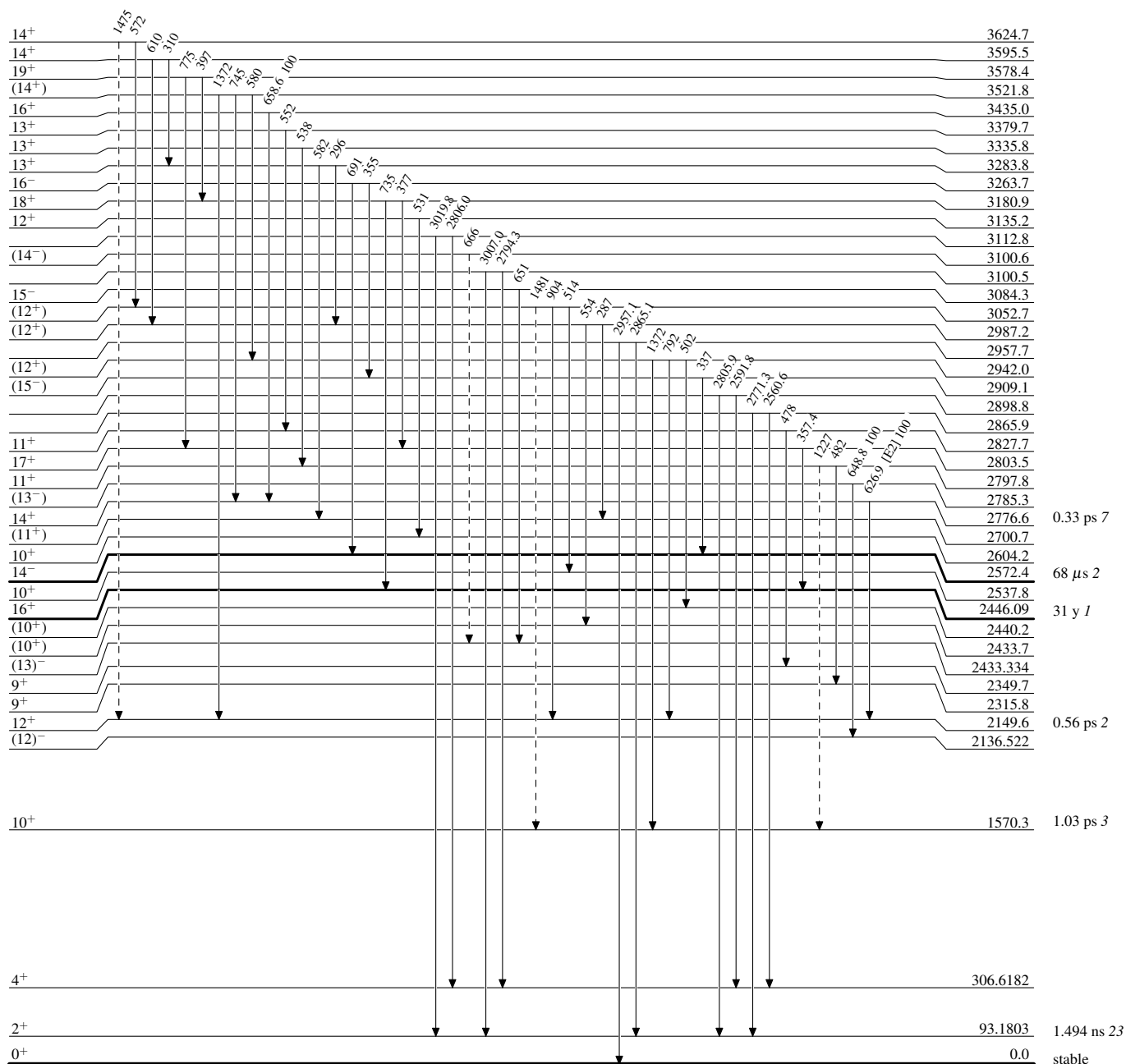
-----► γ Decay (Uncertain)

Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

-----> γ Decay (Uncertain)

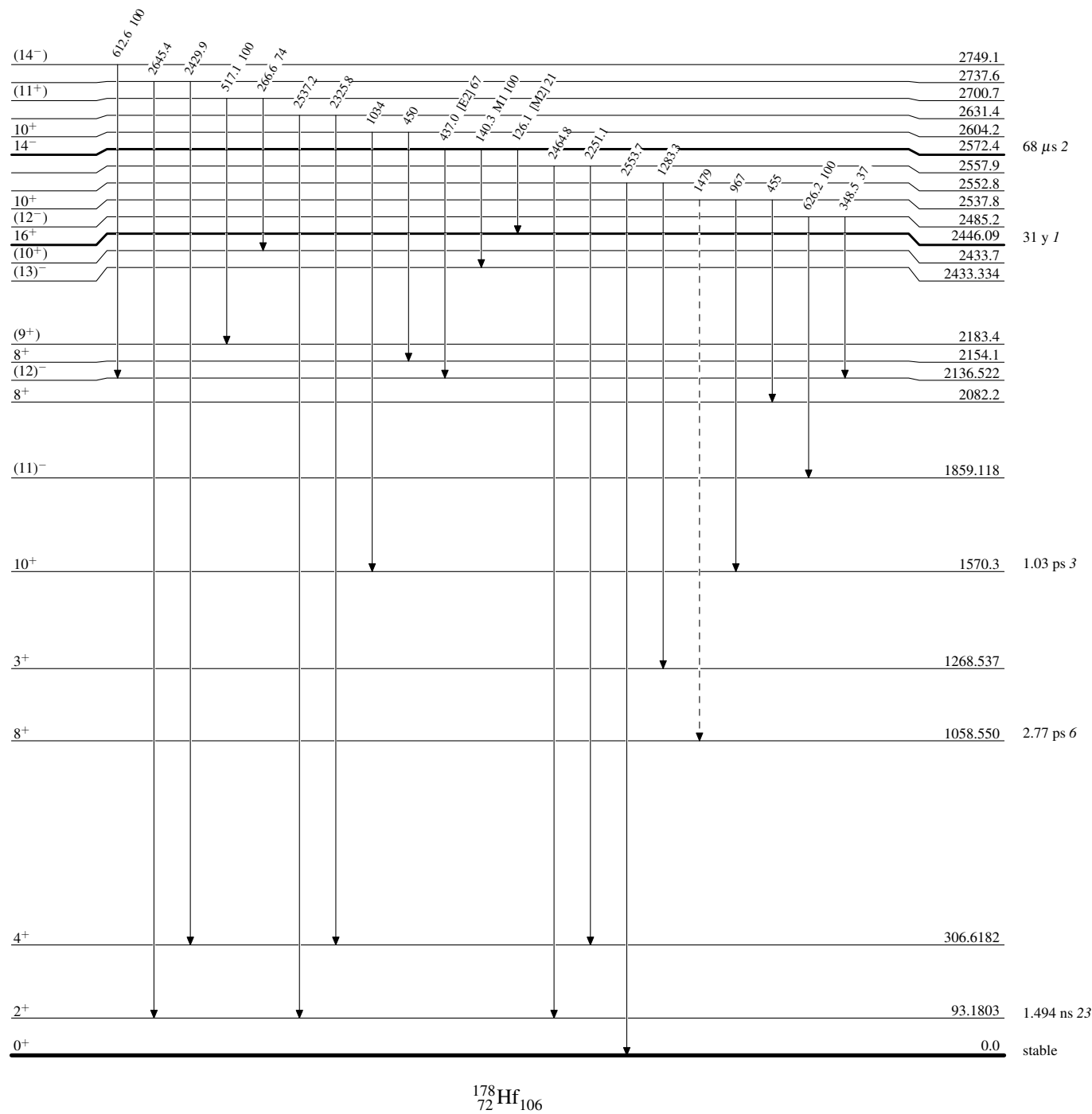
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

-----> γ Decay (Uncertain)



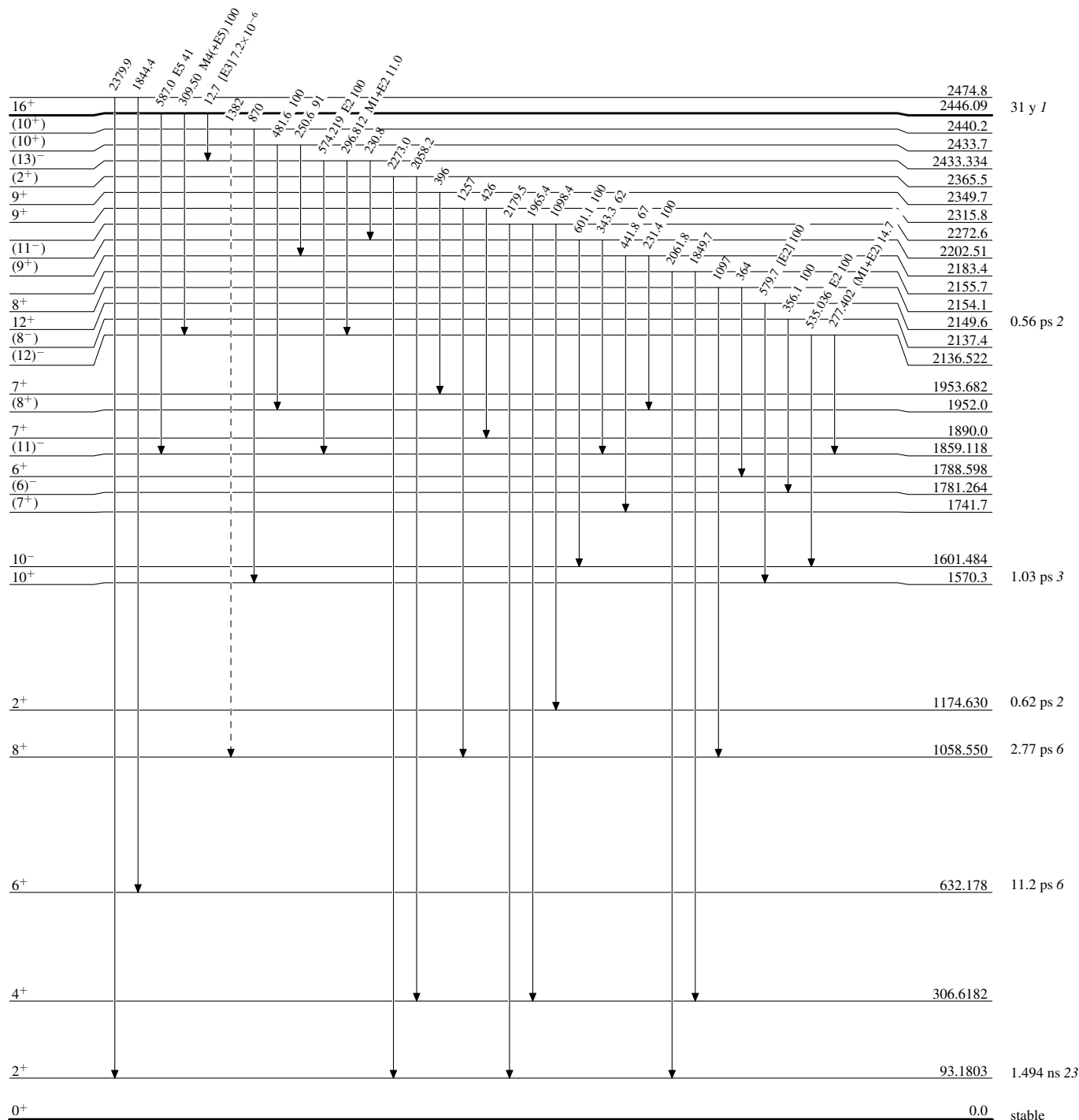
$^{178}_{72}\text{Hf}_{106}$

Adopted Levels, Gammas

Legend

Level Scheme (continued)

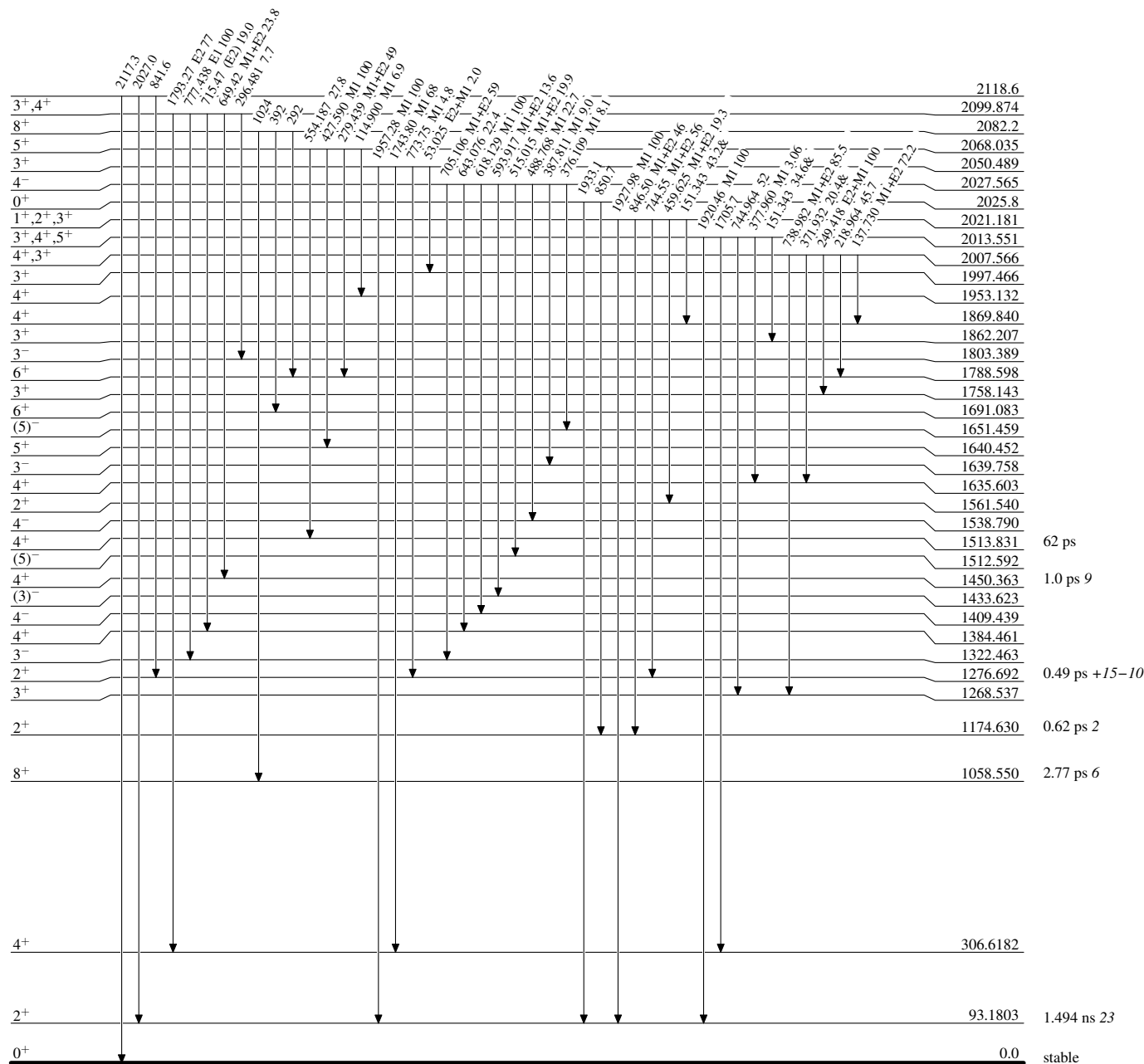
Intensities: Relative photon branching from each level

-----► γ Decay (Uncertain)


Adopted Levels, Gammas

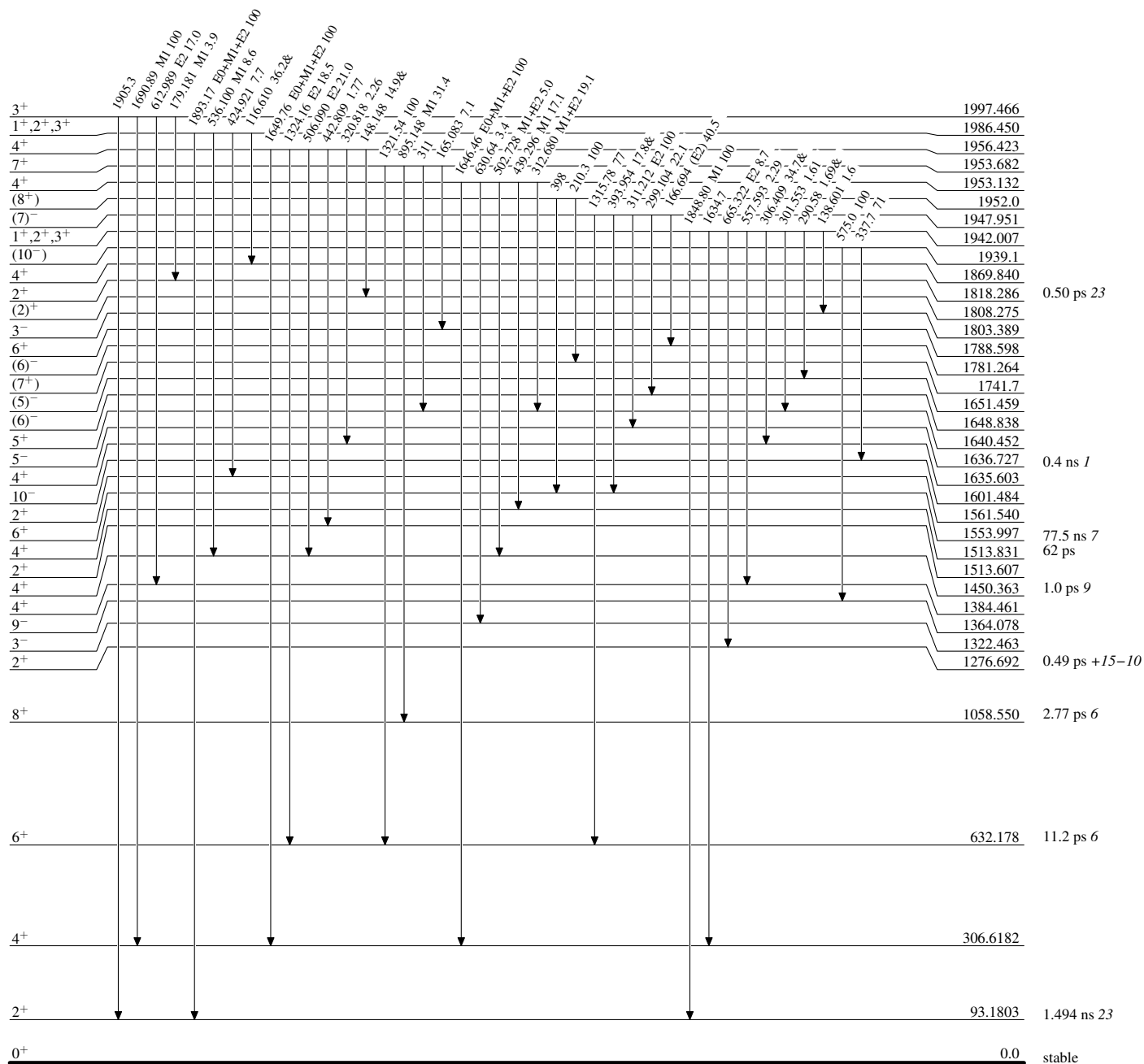
Level Scheme (continued)

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



Adopted Levels, Gammas**Level Scheme (continued)**

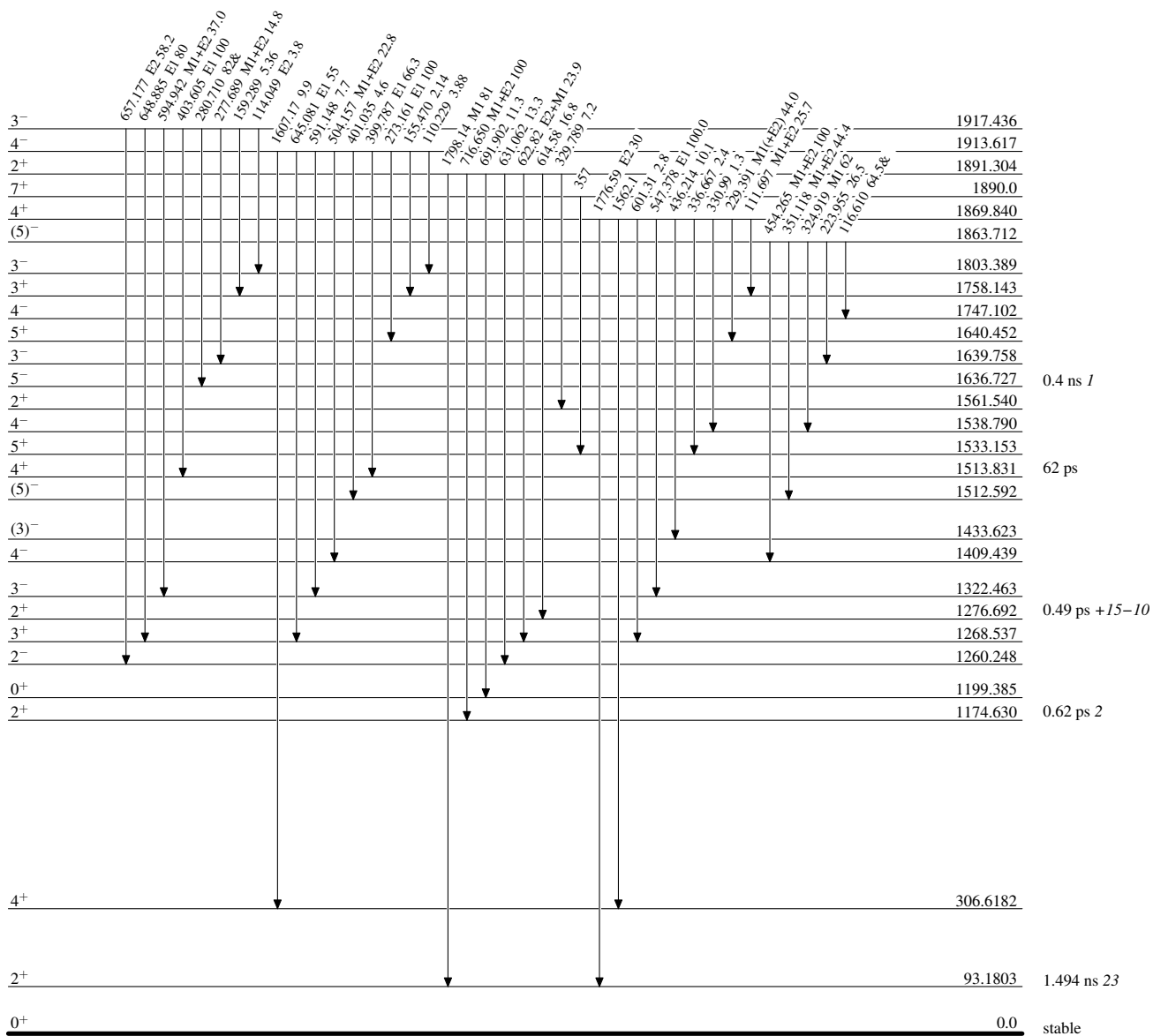
Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



Adopted Levels, Gammas

Level Scheme (continued)

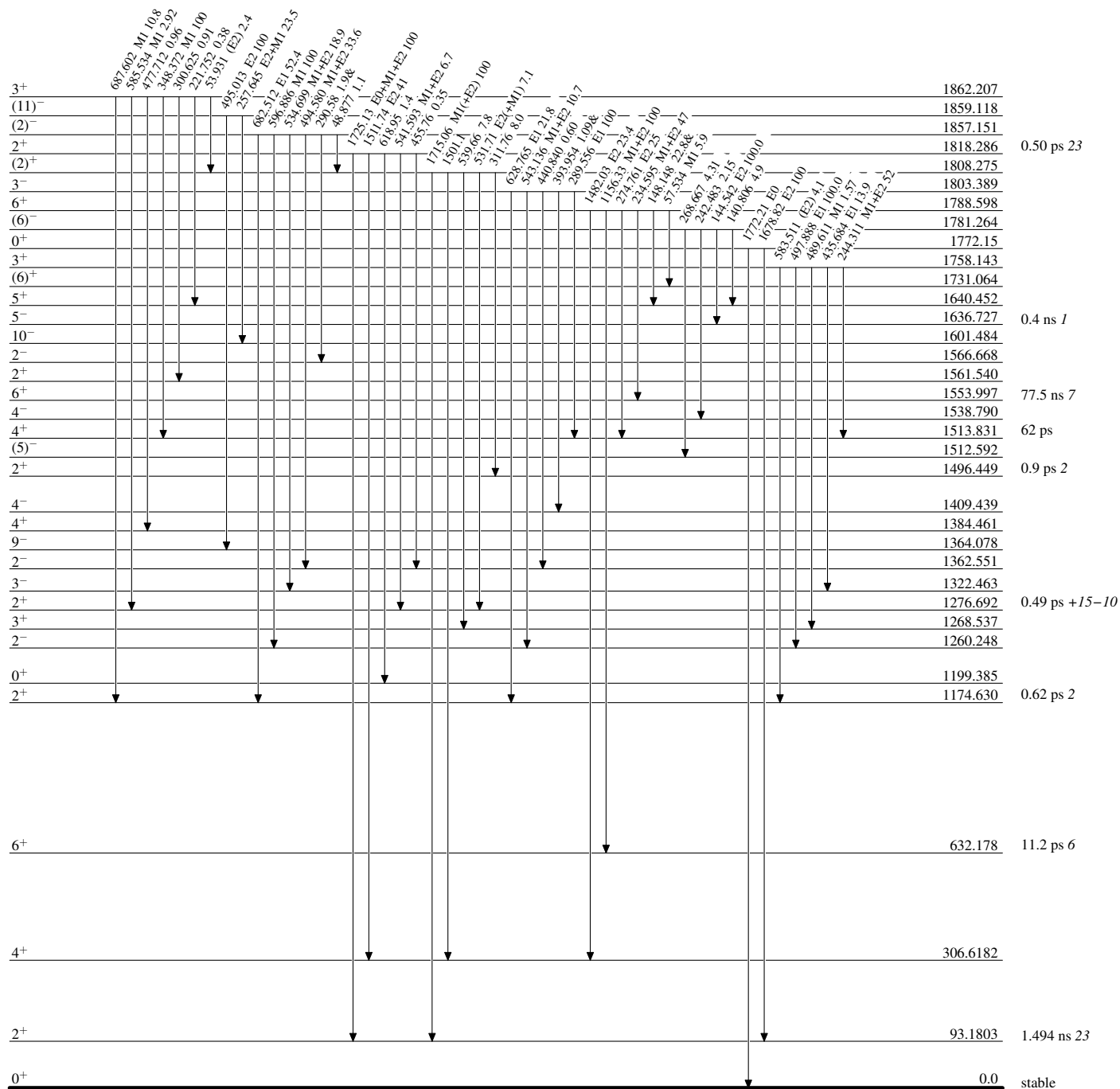
Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



Adopted Levels, Gammas

Level Scheme (continued)

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



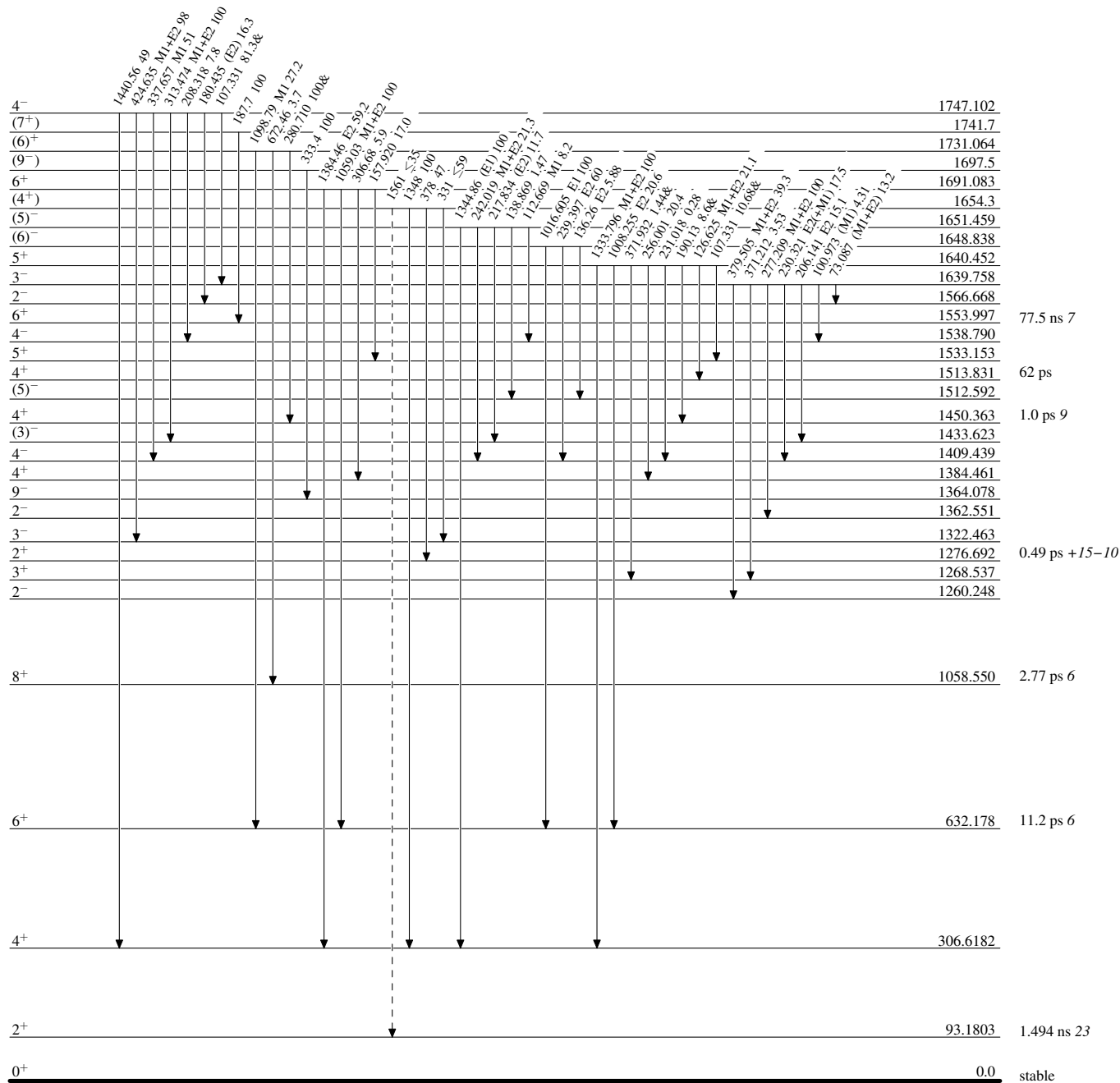
Adopted Levels, Gammas

Legend

Level Scheme (continued)

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

-----► γ Decay (Uncertain)



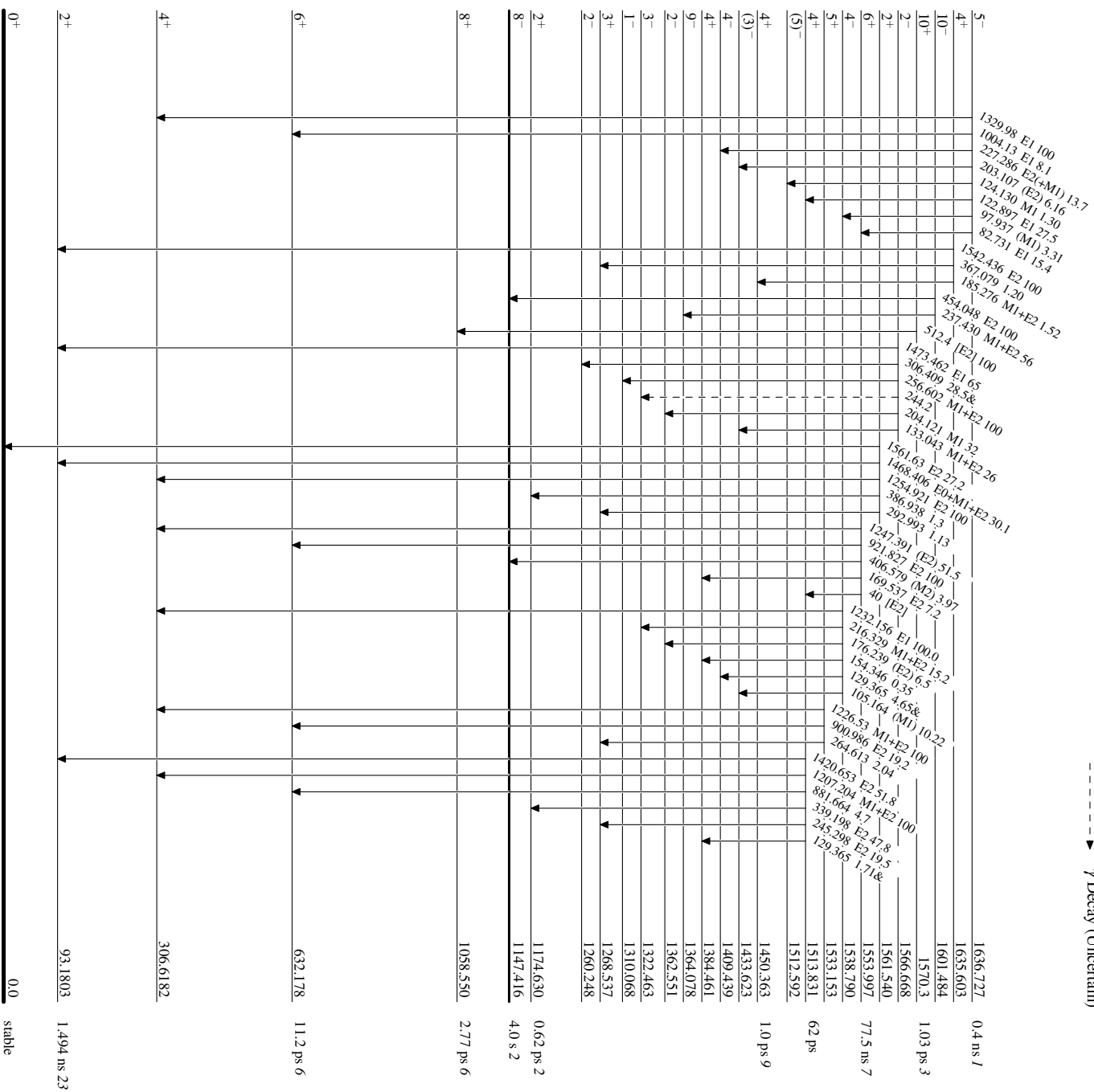
Adopted Levels, Gammas

Level Scheme (continued)

Legend

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

-----▶ γ Decay (Uncertain)



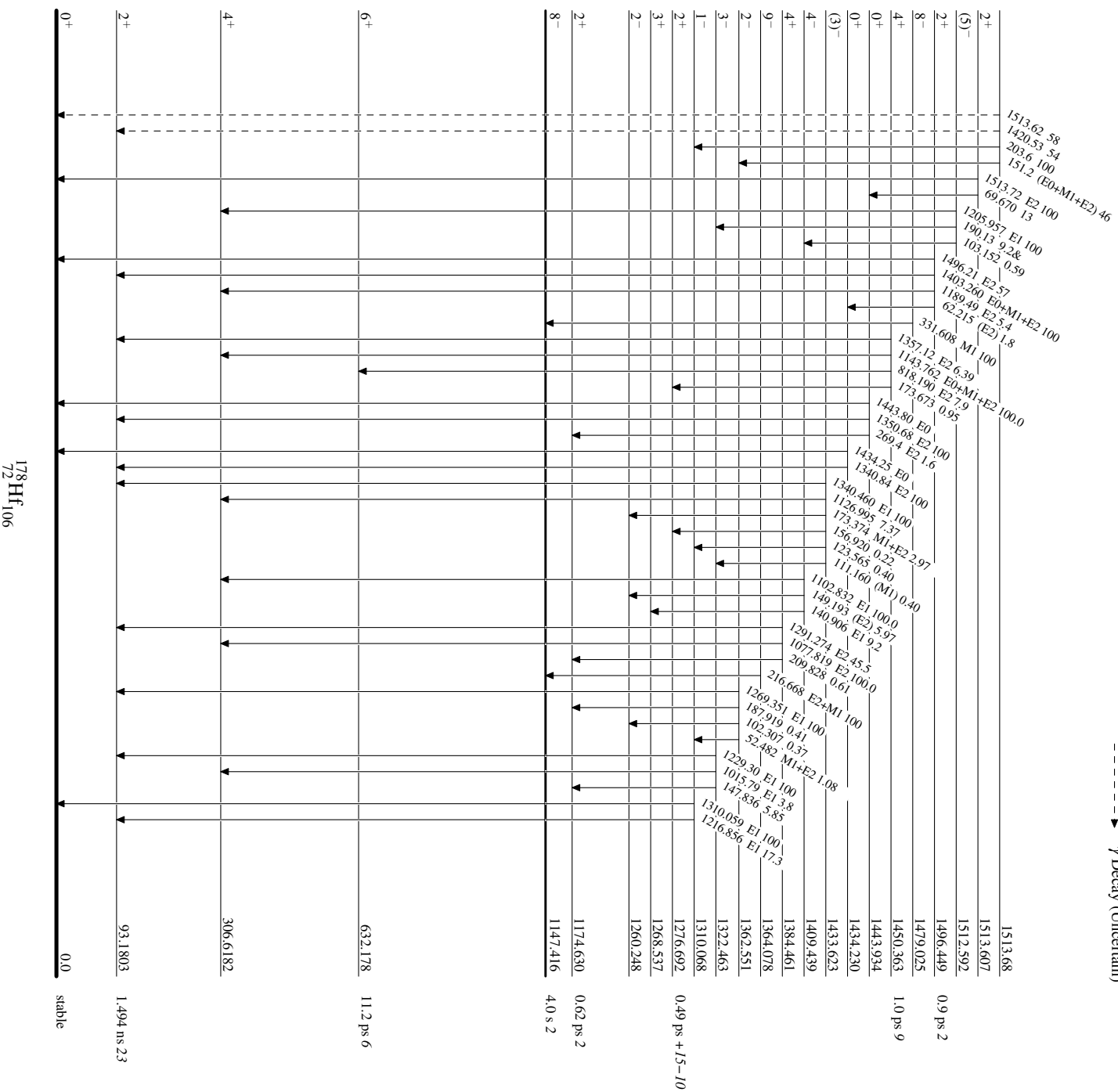
Adopted Levels, Gammas

Level Scheme (continued)

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

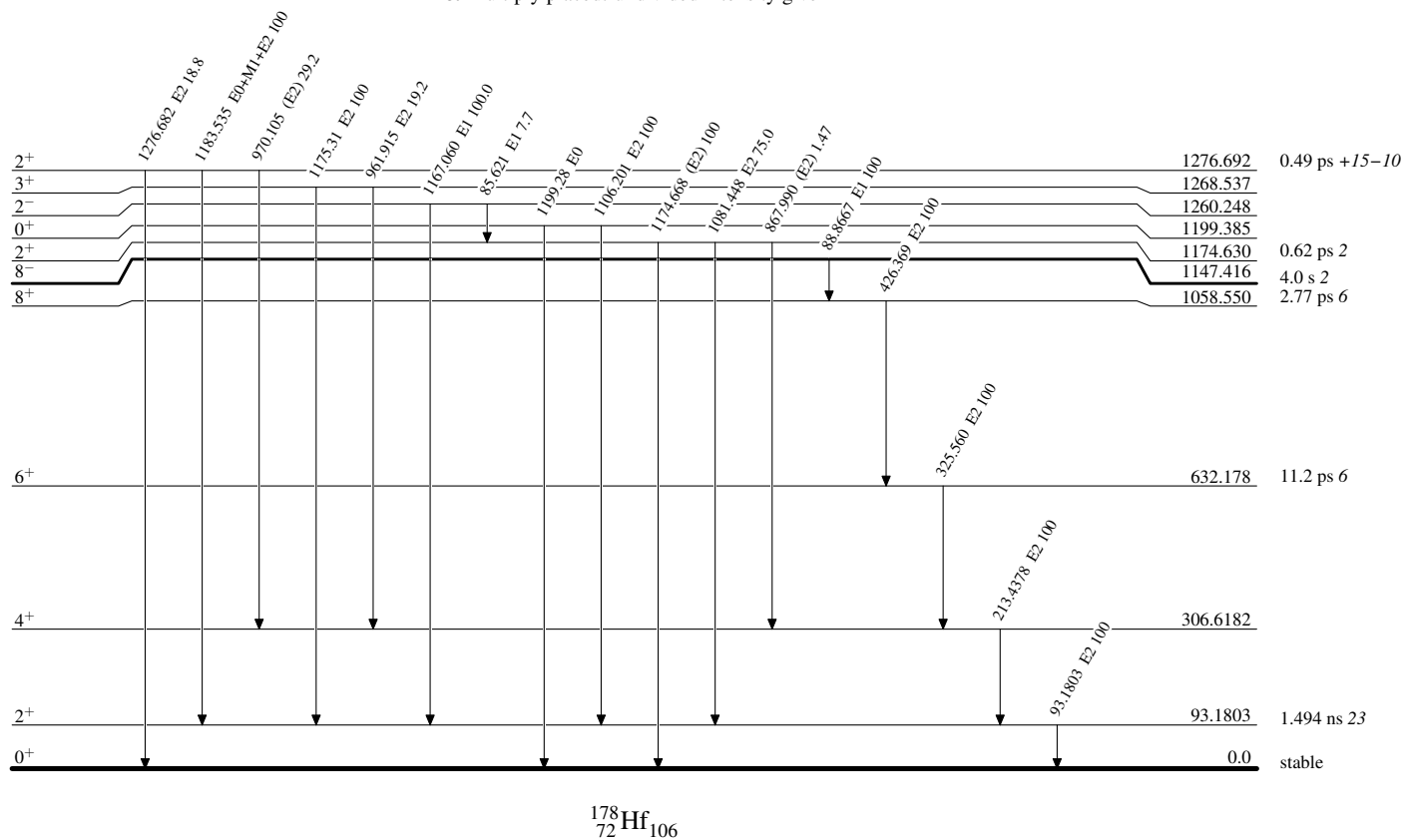
Legend

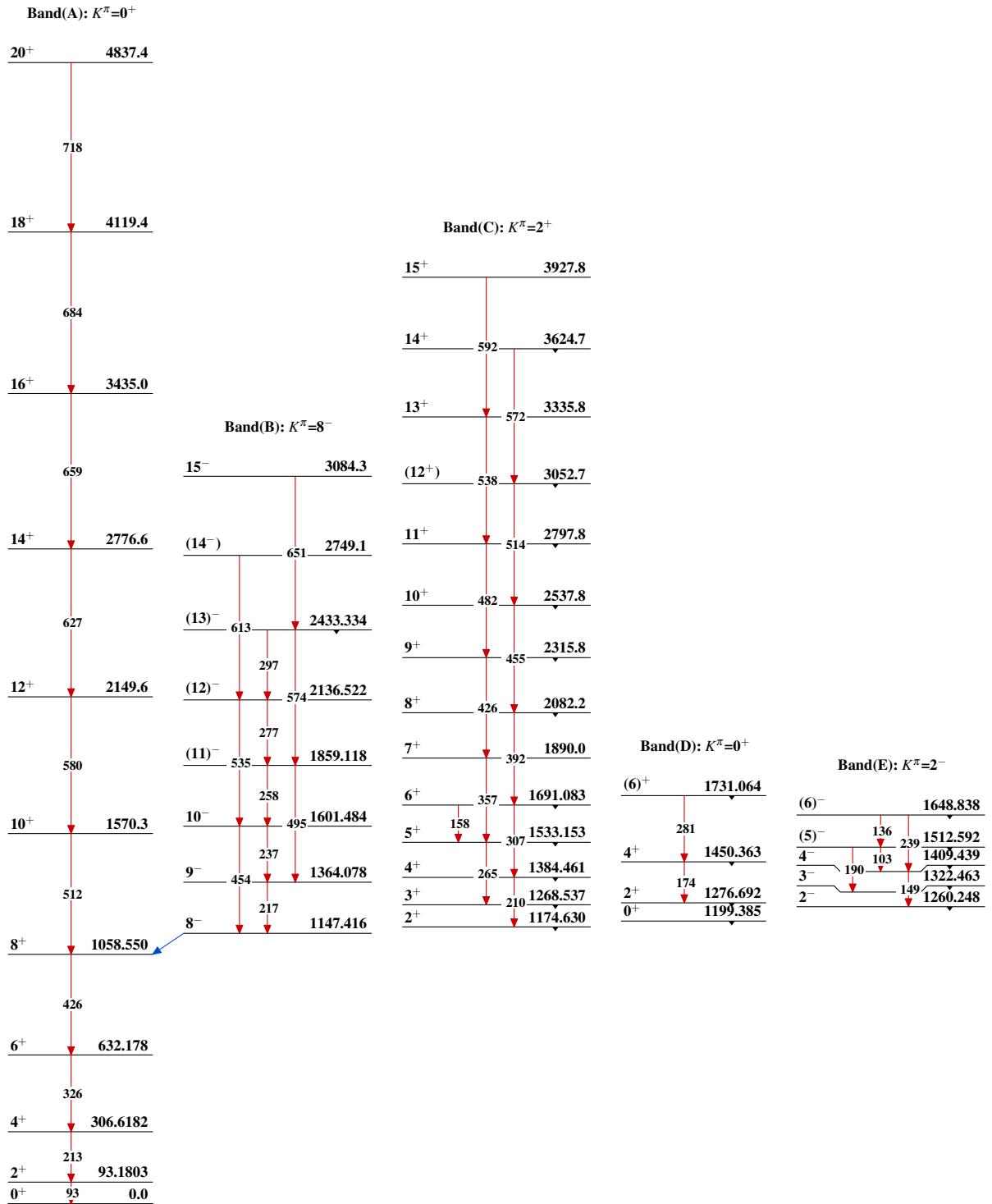
-----► γ Decay (Uncertain)

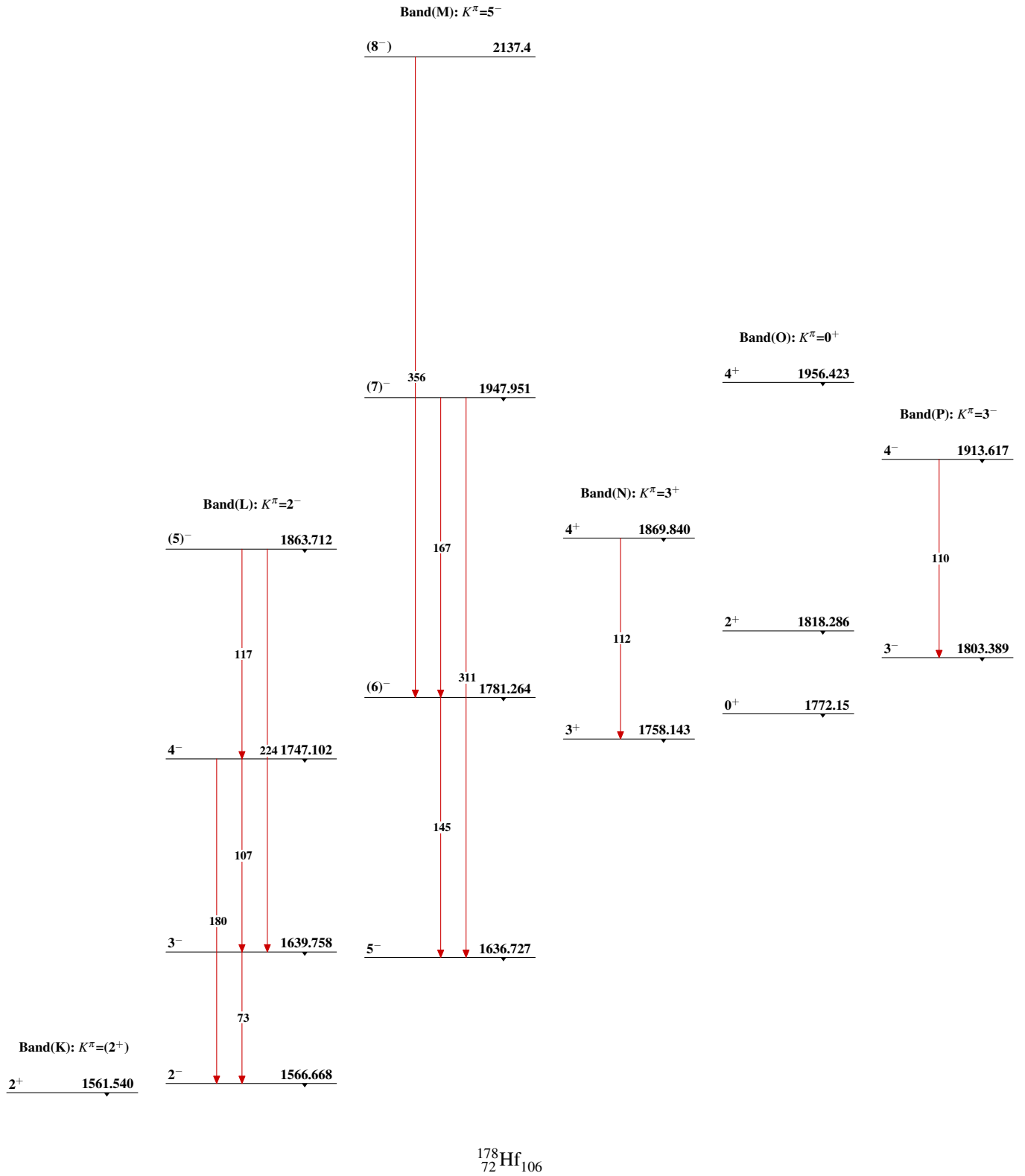


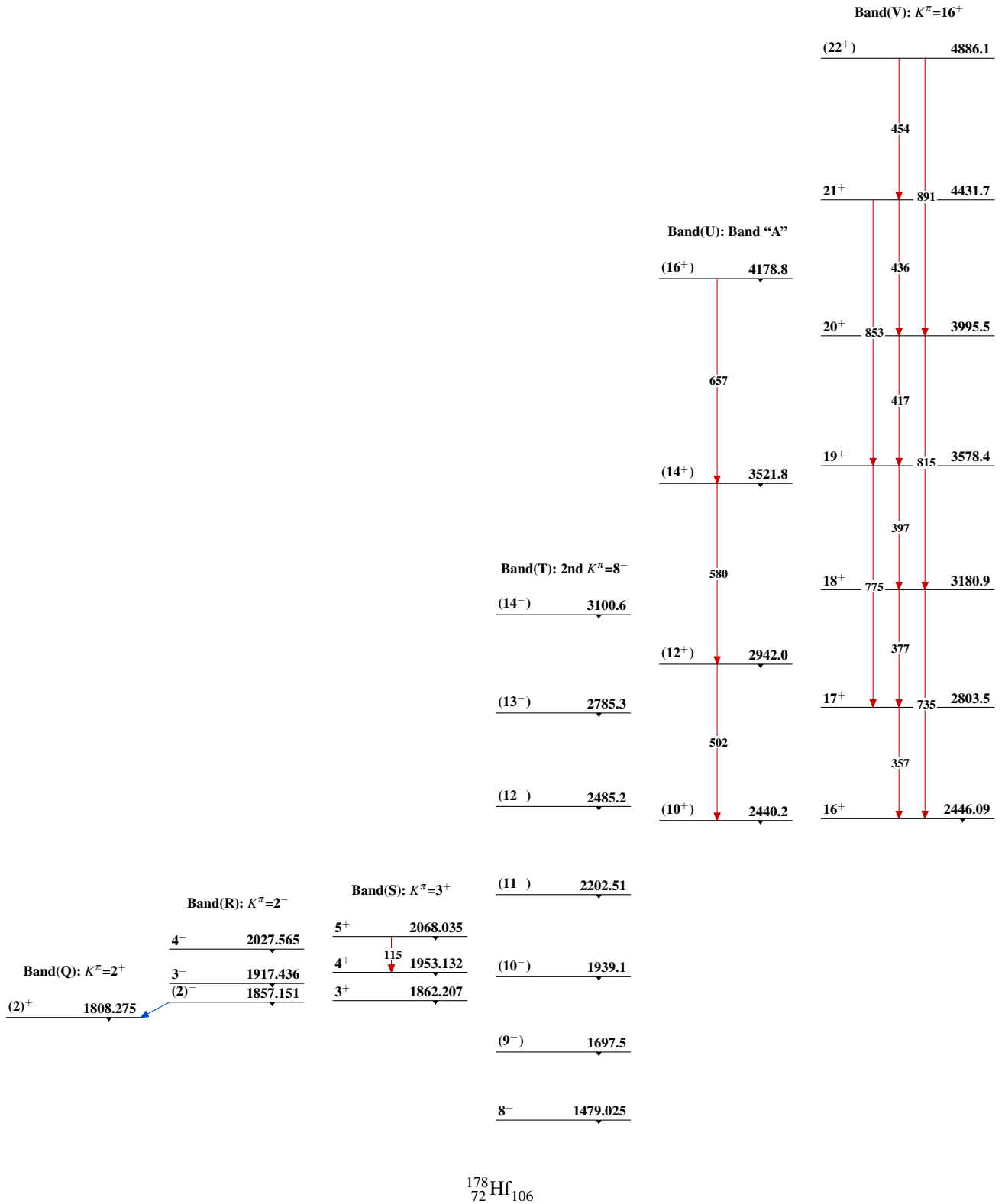
Adopted Levels, Gammas**Level Scheme (continued)**

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

 $^{178}_{72}\text{Hf}_{106}$

Adopted Levels, Gammas

Adopted Levels, Gammas (continued)

Adopted Levels, Gammas (continued)

Adopted Levels, Gammas (continued)

Band(W): *K*^π=14⁻

14⁻ 2572.4
 ↓

¹⁷⁸₇₂Hf₁₀₆