

Adopted Levels, Gammas

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin, E. A. Mccutchan		NDS 151, 334 (2018)	30-Jun-2018

$Q(\beta^-) = -3710$ 40; $S(n) = 7250$ 40; $S(p) = 5410$ 30; $Q(\alpha) = 2734$ 29 [2017Wa10](#)
 $S(2n) = 16860$ 40; $S(2p) = 9632$ 29 ([2017Wa10](#)).
 For isotope shift measurements, see [2000Ye02](#).

 ^{171}Hf Levels

Band structure adopted from ($^{48}\text{Ca}, 5n\gamma$).
 Nomenclature used for quasiparticle orbitals:
 A: $\nu 7/2[633], \alpha = +1/2; i_{13/2}$.
 B: $\nu 7/2[633], \alpha = -1/2; i_{13/2}$.
 C: $\nu 5/2[642], \alpha = +1/2; i_{13/2}$.
 D: $\nu 5/2[642], \alpha = -1/2; i_{13/2}$.
 E: $\nu 1/2[521], \alpha = +1/2; f_{5/2}$.
 F: $\nu 1/2[521], \alpha = -1/2; f_{5/2}$.
 G: $\nu 5/2[512], \alpha = +1/2; f_{7/2}$.
 H: $\nu 5/2[512], \alpha = -1/2; f_{7/2}$.
 M: $\nu 7/2[514], \alpha = +1/2; h_{9/2}$.
 N: $\nu 7/2[514], \alpha = -1/2; h_{9/2}$.
 a: $\pi 7/2[404], \alpha = +1/2; g_{7/2}$.
 b: $\pi 7/2[404], \alpha = -1/2; g_{7/2}$.
 c: $\pi 5/2[402], \alpha = +1/2; d_{5/2}$.
 d: $\pi 5/2[402], \alpha = -1/2; d_{5/2}$.
 m: $\pi 1/2[660], \alpha = +1/2; i_{13/2}$.
 e: $\pi 9/2[514], \alpha = +1/2; h_{11/2}$.
 f: $\pi 9/2[514], \alpha = -1/2; h_{11/2}$.
 g: $\pi 1/2[541], \alpha = +1/2; h_{9/2}$.

Cross Reference (XREF) Flags

A	^{171}Ta ε decay	D	$^{160}\text{Gd}(^{18}\text{O}, 7n\gamma)$
B	($\text{HI}, xn\gamma$)	E	$^{128}\text{Te}(^{48}\text{Ca}, 5n\gamma)$
C	^{171}Hf IT decay		

E(level) [†]	J^π [‡]	$T_{1/2}$ [#]	XREF	Comments
0.0 ^a	7/2 ⁽⁺⁾	12.1 h 4	ABCDE	$\% \varepsilon + \% \beta^+ = 100$ $\mu = -0.674$ 12 (2000Ye02); $Q = 3.463$ 27 (2000Ye02) μ , Q: from collinear laser beam spectroscopy; ^{171}Hf mixed g.s. and isomeric state beam from $^{175}\text{Lu}(p, 5n)$ at $E(p) = 55$ MeV. J^π : $\Delta J = 3$ transition from $1/2^{(-)}$ level; μ consistent with that expected for 7/2[633] Nilsson orbital, as for heavier Hf nuclei, and also close to that for $7/2^+ ^{169}\text{Yb}$. See also comment on J^π of 21.93-keV level. $T_{1/2}$: from 1970Ch17 . Other values: 16.0 h 5 (1951Wi08), 12 h 1 (1955Ne03), 10.7 h 3 (1962Va17), 12.4 h 3 (1967Gi08); see also: 1954Wa02 , 1959Ba10 , 1959Gr22 , 1961Br39 , 1963Ra14 , 1971Na28 .
21.93 ^c 9	1/2 ⁽⁻⁾	29.5 s 9	ABCDE	$\% \text{IT} \leq 100$; $\% \varepsilon + \% \beta^+ = ?$ $\mu = +0.526$ 16 (2000Ye02) μ : from collinear laser beam spectroscopy; ^{171}Hf mixed g.s. and isomeric state beam from $^{175}\text{Lu}(p, 5n)$ at $E(p) = 55$ MeV.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{171}Hf Levels (continued)

E(level) [†]	J ^π [‡]	T _{1/2} [#]	XREF	Comments
$\Delta\langle r^2 \rangle(^{171}\text{Hf}(\text{g.s.}), ^{171}\text{Hf}(\text{isomer})) = +0.0003 \text{ } 5 \text{ (2000Ye02)}$. T _{1/2} : from ^{171}Hf IT decay. J ^π : line intensities in collinear LASER beam spectroscopy using a mixed g.s. and isomeric state beam exclude J>1/2 for the isomer and are fitted best if J=7/2 for the g.s. (2000Ye02); μ is close to values for known 1/2[521] ^{173}Hf g.s. and ^{169}Yb isomeric state. J ^π : (E1) γ to (7/2 ⁺); assumed low-lying 5/2[512] Nilsson orbital bandhead. T _{1/2} : $\gamma\gamma(t)$ in $^{162}\text{Dy}(^{12}\text{C}, 3n\gamma)$ (1979Dr08).				
49.60 ^e 8	(5/2 ⁻)	64 ns 4	AB DE	
61.89 ^{&} 7	(9/2 ⁺)		AB DE	
88.55 ^d 8	(3/2 ⁻)		AB DE	
102.61 ^c 8	(5/2 ⁻)		AB DE	
141.79 ^f 10	(7/2 ⁻)		AB DE	
145.96 ^a 10	(11/2 ⁺)		AB DE	
244.05 ^{&} 14	(13/2 ⁺)		B DE	
254.72 ^d 9	(7/2 ⁻)		AB DE	
258.58 ^e 10	(9/2 ⁻)		AB DE	
277.88 ^c 9	(9/2 ⁻)		AB DE	
382.47 ^a 15	(15/2 ⁺)		B DE	
399.08 ^f 12	(11/2 ⁻)		AB DE	
492.57 ^h 9	(5/2 ⁺)		A	J ^π : band assignment In ε decay.
494.10 ^m 10	(5/2 ⁻)		A	J ^π : band assignment In ε decay.
506.25 ^o 7	(7/2 ⁻)		A	J ^π : band assignment In ε decay.
508.47 ^d 10	(11/2 ⁻)		AB DE	
512.49 ^{&} 15	(17/2 ⁺)		B DE	
537.18 ^c 10	(13/2 ⁻)		AB DE	XREF: E(536.8).
554.55 ^h 8	(7/2 ⁺)		A	J ^π : band assignment In ε decay.
559.96 ^b 9	(3/2 ⁻)		A	J ^π : 538 γ to 1/2 ⁻ ; 458 γ to (5/2 ⁻); band assignment.
561.07 ^e 15	(13/2 ⁻)		B DE	
565.19 ^m 14	(7/2 ⁻)		A	J ^π : band assignment In ε decay.
592.37 ^o 10	(9/2 ⁻)		A	J ^π : band assignment In ε decay.
624.76 ^b 9	(5/2 ⁻)		A	J ^π : 536 γ to (3/2 ⁻); 370 γ to (7/2 ⁻); band assignment.
709.77 ^b 9	(7/2 ⁻)		A	J ^π : 622 γ to (3/2 ⁻); 432 γ to (9/2 ⁻); band assignment.
716.48 ^a 16	(19/2 ⁺)		B DE	
741.91 ^f 17	(15/2 ⁻)		B DE	
767.67 7			A	
788.96 7	(7/2, 9/2 ⁺)		A	J ^π : 789 γ to (5/2 ⁻), 727 γ to (9/2 ⁺), possible 530 γ to (9/2 ⁻). Tentatively suggested As 9/2[624] bandhead In 1974La24.
832.38 ^b 14	(9/2 ⁻)		A	J ^π : 555 γ to (9/2 ⁻); band assignment.
838.40 ^d 15	(15/2 ⁻)		B DE	
866.65 ^{&} 22	(21/2 ⁺)		B DE	
866.84 ^c 14	(17/2 ⁻)		B DE	
899.14 9	(3/2, 5/2, 7/2)		A	J ^π : γ 's to (5/2 ⁺) and to (5/2 ⁻).
940.69 ^e 19	(17/2 ⁻)		B DE	
1001.21 8	(9/2 ⁻)		A	J ^π : 1001 γ to (5/2 ⁻), 464 γ to (13/2 ⁻).
1007.93 8	(7/2 ⁺ , 9/2 ⁻)		A	J ^π : 1008 γ to (5/2 ⁻), 502 γ to (7/2 ⁻); possible 861 γ to (11/2 ⁺). 1974La24 suggest this could be 9/2[505] bandhead.
1077.08 9			A	
1146.10 ^a 17	(23/2 ⁺)		B DE	XREF: E(1146).
1153.91 ^f 19	(19/2 ⁻)		B DE	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{171}Hf Levels (continued)				
E(level) [†]	J ^π [‡]	T _{1/2} [#]	XREF	Comments
1234.46 ^d 18	(19/2 ⁻)		B DE	
1256.97 ^c 22	(21/2 ⁻)		B DE	
1306.66 ^{&} 18	(25/2 ⁺)		B DE	
1379.64 ^e 20	(21/2 ⁻)		B DE	XREF: E(1379.3).
1615.91 ^f 18	(23/2 ⁻)		DE	
1644.84 ^j 17	(19/2 ⁺)	6.2 ns 14	B E	J ^π : M1 γ to (17/2 ⁺) and $\Delta J=1$ ($\gamma(\theta)$ for 1133.0 γ) allow (15/2 ⁺) or (19/2 ⁺); absence of decay to other lower spin states favors (19/2 ⁺). T _{1/2} : $\gamma\gamma(t)$ in $^{160}\text{Gd}(^{16}\text{O},5n\gamma)$, $^{162}\text{Dy}(^{13}\text{C},4n\gamma)$ (1979Dr08).
1662.01 ^a 20	(27/2 ⁺)		B DE	
1688.74 ^d 24	(23/2 ⁻)		B DE	
1697.2 ^c 3	(25/2 ⁻)		B DE	XREF: D(1693).
1794.13 ⁱ 23	(21/2 ⁺)		B E	J ^π : M1 γ to (19/2 ⁺) and $\Delta J=1$ ($\gamma(\theta)$ for 148.9 γ) allow (17/2 ⁺) or (21/2 ⁺). Absence of decay to any but (19/2 ⁺) level favors (21/2 ⁺).
1828.06 ^{&} 21	(29/2 ⁺)		B DE	
1858.32 ^e 19	(25/2 ⁻)		DE	
1977.25 ^j 23	(23/2 ⁺)		B E	
1984.4 ^l 3	(23/2 ⁻)	18 ns 2	B E	J ^π : E1 γ to (21/2 ⁺) and $\Delta J=1$ ($\gamma(\theta)$ for 190.6 γ) allow (19/2 ⁻) or (23/2 ⁻). Absence of decay to (19/2 ⁺) level favors (23/2 ⁻). T _{1/2} : $\gamma\gamma(t)$, $n\gamma(t)$ in $^{160}\text{Gd}(^{16}\text{O},5n\gamma)$, $^{162}\text{Dy}(^{13}\text{C},4n\gamma)$ (1979Dr08).
2113.37 ^f 19	(27/2 ⁻)		DE	XREF: D(2108)E(2113).
2161.8 ^k 4	(25/2 ⁻)		B E	
2183.6 ^c 3	(29/2 ⁻)		B DE	XREF: B(2184)D(2178).
2188.8 ⁱ 3	(25/2 ⁺)		E	
2195.9 ^d 3	(27/2 ⁻)		B DE	XREF: B(2196)D(2191).
2254.83 ^a 23	(31/2 ⁺)		B DE	XREF: D(2252).
2365.63 ^e 23	(29/2 ⁻)		DE	XREF: D(2361).
2372.0 ^l 4	(27/2 ⁻)		B E	
2425.8 ^j 3	(27/2 ⁺)		E	
2426.27 ^{&} 24	(33/2 ⁺)		B DE	XREF: B(2426).
2611.3 ^k 4	(29/2 ⁻)		B E	
2641.49 ^f 23	(31/2 ⁻)		DE	XREF: D(2636).
2685.2 ⁱ 3	(29/2 ⁺)		E	
2711.8 ^c 4	(33/2 ⁻)		B DE	XREF: B(2712)D(2705).
2753.2 ^d 4	(31/2 ⁻)		B DE	XREF: B(2753)D(2746).
2876.6 ^l 4	(31/2 ⁻)		B E	
2882.9 ^s 5	(33/2 ⁺)		E	
2908.27 ^e 25	(33/2 ⁻)		DE	XREF: D(2902).
2913.98 ^a 25	(35/2 ⁺)	0.46 ps +8-6	B DE	XREF: D(2909).
2966.3 ^j 3	(31/2 ⁺)		E	
3090.2 ^g 5	(33/2 ⁻)		E	
3093.1 ^{&} 3	(37/2 ⁺)	0.37 ps +8-3	B DE	XREF: B(3092)D(3087).
3166.1 ^k 4	(33/2 ⁻)		B E	
3200.2 ^f 3	(35/2 ⁻)		DE	XREF: D(3193).
3265.9 ⁱ 4	(33/2 ⁺)		E	
3283.2 ^c 4	(37/2 ⁻)	0.59 ps 5	B DE	XREF: B(3283)D(3275).
3356.7 ^d 4	(35/2 ⁻)	0.43 ps +3-5	B DE	XREF: B(3357)D(3349).
3429.0 5	(37/2)		E	
3477.0 ^l 4	(35/2 ⁻)		B E	
3481.3 ^s 3	(37/2 ⁺)		E	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{171}Hf Levels (continued)

E(level) [†]	J ^π [‡]	T _{1/2} [#]	XREF	Comments
3503.0 ^e 3	(37/2 ⁻)		DE	XREF: D(3495).
3515.7 ^p 8	(33/2 ⁻)		E	
3584.3 ^j 4	(35/2 ⁺)		E	
3629.7 ^a 3	(39/2 ⁺)	0.215 ps 21	B DE	XREF: B(3629).
3642.2 ^g 4	(37/2 ⁻)		E	
3800.3 ^f 3	(39/2 ⁻)		DE	XREF: D(3792).
3808.2 ^k 4	(37/2 ⁻)		B E	XREF: B(3806).
3820.0 ^{&} 3	(41/2 ⁺)	0.208 ps 21	B DE	XREF: B(3820).
3904.5 ^c 5	(41/2 ⁻)	0.35 ps 3	B DE	XREF: B(3904)D(3895).
3920.1 ⁱ 4	(37/2 ⁺)		E	
3999.3 ^d 4	(39/2 ⁻)	0.46 ps +10-4	B DE	XREF: B(3998)D(3990).
4070.1 ^p 6	(37/2 ⁻)		E	
4087.9 ^s 3	(41/2 ⁺)		E	
4154.7 ^e 5	(41/2 ⁻)		DE	XREF: D(4146).
4157.0 ^l 5	(39/2 ⁻)		B E	XREF: B(4155).
4261.2 ^g 5	(41/2 ⁻)		E	
4262.3 ^j 4	(39/2 ⁺)		E	
4394.2 ^a 3	(43/2 ⁺)	0.18 ps 3	B DE	XREF: B(4391)D(4386).
4434.8 15			E	
4456.2 ^f 4	(43/2 ⁻)		DE	XREF: D(4447).
4523.6 ^k 5	(41/2 ⁻)		E	
4570.9 ^q 6	(39/2 ⁺)		E	
4582.7 ^c 5	(45/2 ⁻)	0.249 ps 21	B DE	XREF: B(4583)D(4571).
4594.5 ^{&} 4	(45/2 ⁺)	0.194 ps 21	B DE	XREF: B(4593)D(4586).
4615.2 ⁱ 4	(41/2 ⁺)		E	
4678.3 ^p 6	(41/2 ⁻)		E	
4679.3 ^d 5	(43/2 ⁻)	0.25 ps 5	B DE	XREF: B(4678)D(4671).
4736.5 ^s 4	(45/2 ⁺)		E	
4861.8 ^e 7	(45/2 ⁻)		DE	XREF: D(4851).
4904.0 ^l 5	(43/2 ⁻)		E	
4944.5 ^g 5	(45/2 ⁻)		E	
4965.3 ^j 4	(43/2 ⁺)		E	
5046.8 12			E	
5122.8 12			E	
5139.4 ^q 6	(43/2 ⁺)		E	
5175.8 ^f 4	(47/2 ⁻)		DE	XREF: D(5165).
5204.9 ^a 4	(47/2 ⁺)		B DE	XREF: B(5201)D(5196)E(5205).
5296.2 ^k 5	(45/2 ⁻)		E	
5302.4 ⁱ 4	(45/2 ⁺)		E	
5321.0 ^c 5	(49/2 ⁻)	0.17 ps 3	B DE	XREF: D(5308)E(5321).
5330.6 ^p 6	(45/2 ⁻)		E	
5379.0 ^{&} 4	(49/2 ⁺)		B DE	XREF: B(5378)E(5379).
5414.1 ^d 5	(47/2 ⁻)	0.19 ps 4	DE	XREF: D(5405)E(5414).
5493.3 ^s 4	(49/2 ⁺)		E	
5626.0 ^e 9	(49/2 ⁻)		DE	XREF: D(5614)E(5626).
5640.0 ^j 5	(47/2 ⁺)		E	
5682.7 ^g 5	(49/2 ⁻)		DE	XREF: D(?).
5696.4 ^l 6	(47/2 ⁻)		E	XREF: E(5696).
5699.8 ^q 6	(47/2 ⁺)		E	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{171}Hf Levels (continued)				
E(level) [†]	J ^π [‡]	T _{1/2} [#]	XREF	Comments
5961.7 ^f 5	(51/2 ⁻)		DE	XREF: D(5949)E(5961).
5989.4 ⁱ 5	(49/2 ⁺)		E	
6042.5 ^p 4	(49/2 ⁻)		E	
6067.8 ^a 4	(51/2 ⁺)		B DE	XREF: B(6063)D(6056).
6096.0 ^k 6	(49/2 ⁻)		E	
6120.6 ^c 5	(53/2 ⁻)	0.194 ps +28-21	B DE	XREF: D(6106)E(6120).
6179.4 ^{&} 5	(53/2 ⁺)		B DE	XREF: D(6168).
6209.7 ^d 6	(51/2 ⁻)		DE	
6327.2 ^q 6	(51/2 ⁺)		E	
6340.0 [@] 6	(53/2 ⁺)	0.30 ps 6	DE	XREF: D(5432)E(6340).
6354.9 ^j 5	(51/2 ⁺)		E	
6401.1 ⁿ 6	(53/2 ⁺)		E	
6449.1 ^e 10	(53/2 ⁻)		DE	XREF: D(6435).
6469.4 ⁸ 5	(53/2 ⁻)		DE	XREF: D(6452).
6481.3 ^l 7	(51/2 ⁻)		E	
6735.6 ⁱ 6	(53/2 ⁺)		E	
6812.7 ^f 7	(55/2 ⁻)		DE	XREF: D(6798).
6829.1 ^p 5	(53/2 ⁻)		E	
6862.3 ^k 9	(53/2 ⁻)		E	
6976.5 ^a 5	(55/2 ⁺)		DE	
6981.1 ^c 6	(57/2 ⁻)	0.097 ps 21	B DE	XREF: D(6964).
7006.8 ^q 6	(55/2 ⁺)	90 fs 10	E	Q(transition)=11.0 6 (2011Mu02).
7042.3 ^{&} 5	(57/2 ⁺)		DE	XREF: D(7028).
7071.3 ^d 6	(55/2 ⁻)		DE	XREF: D(7058).
7134.8 ^j 6	(55/2 ⁺)		E	
7183.9 [@] 8	(57/2 ⁺)		DE	XREF: D(7284).
7235.6 ^l 8	(55/2 ⁻)		E	
7300.6 ⁸ 5	(57/2 ⁻)		DE	XREF: D(7281).
7310.0 ⁿ 6	(57/2 ⁺)		DE	XREF: D(7284).
7327.5 ^e 11	(57/2 ⁻)		DE	XREF: D(7312).
7551.1 ⁱ 6	(57/2 ⁺)		E	
7684.9 ^p 7	(57/2 ⁻)		E	
7724.9 ^f 9	(59/2 ⁻)		DE	XREF: D(7708).
7743.7 ^q 7	(59/2 ⁺)	72 fs 10	E	Q(transition)=10.0 6 (2011Mu02).
7902.4 ^c 6	(61/2 ⁻)		B D	XREF: D(7883).
7938.7 ^a 5	(59/2 ⁺)		DE	XREF: D(7925).
7972.7 ^{&} 6	(61/2 ⁺)		DE	
7986.2 ^j 7	(59/2 ⁺)		E	
7988.1 ^d 8	(59/2 ⁻)		DE	XREF: D(7974).
8055.6 ^l 13	(59/2 ⁻)		E	
8080.1 [@] 9	(61/2 ⁺)		DE	XREF: E(8080).
8171.0 ⁸ 6	(61/2 ⁻)		DE	XREF: D(8150).
8273.9 ^e 12	(61/2 ⁻)		DE	XREF: D(8255).
8281.0 ⁿ 12	(61/2 ⁺)		E	
8437.0 ⁱ 7	(61/2 ⁺)		E	
8539.2 ^q 7	(63/2 ⁺)	53 fs 8	E	Q(transition)=9.7 6 (2011Mu02).
8611.1 ^p 9	(61/2 ⁻)		E	
8698.8 ^f 10	(63/2 ⁻)		DE	XREF: D(8679).
8882.6 ^c 6	(65/2 ⁻)		B DE	XREF: D(8861).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{171}Hf Levels (continued)

E(level) [†]	J ^π [‡]	T _{1/2} [#]	XREF	Comments
8905.1 ^j 9	(63/2 ⁺)		E	
8944.9 ^a 7	(63/2 ⁺)		DE	XREF: D(8930)E(8945).
8962.1 ^d 9	(63/2 ⁻)		DE	XREF: D(8945).
8964.9 ^{&} 6	(65/2 ⁺)		DE	XREF: D(8947).
9042.1 [@] 11	(65/2 ⁺)		E	
9092.3 ^g 6	(65/2 ⁻)		E	
9266.2 ^e 13	(65/2 ⁻)		DE	XREF: D(9243).
9277.0 ⁿ 16	(65/2 ⁺)		E	
9387.0 ⁱ 11	(65/2 ⁺)		E	
9394.9 ^q 7	(67/2 ⁺)	40 fs 5	E	Q(transition)=9.2 6 (2011Mu02).
9601.2 ^p 10	(65/2 ⁻)		E	
9714.9 ^f 11	(67/2 ⁻)		DE	XREF: D(9694).
9892.9 ^a 9	(67/2 ⁺)		E	
9917.1 ^c 7	(69/2 ⁻)		B DE	XREF: D(9896).
9978.1 ^d 14	(67/2 ⁻)		DE	XREF: D(9961).
10011.0 ^{&} 8	(69/2 ⁺)		DE	
10060.1 [@] 15	(69/2 ⁺)		DE	XREF: D(9990).
10073.7 ^g 7	(69/2 ⁻)		E	
10229.0 ⁿ 19	(69/2 ⁺)		E	
10299.2 ^e 17	(69/2 ⁻)		E	
10309.1 ^q 8	(71/2 ⁺)	27.0 fs 35	E	Q(transition)=9.5 7 (2011Mu02).
10645.7 ^p 11	(69/2 ⁻)		E	
10761.9 ^f 12	(71/2 ⁻)		DE	XREF: D(10739).
10857.6 ^a 9	(71/2 ⁺)		E	
10995.6 ^c 7	(73/2 ⁻)		B DE	XREF: D(10972).
11028.1 ^d 17	(71/2 ⁻)		E	
11099.1 ^{&} 9	(73/2 ⁺)		DE	XREF: D(11080).
11111.9 ^g 8	(73/2 ⁻)		E	
11112.1 [@] 18	(73/2 ⁺)		E	
11280.7 ^q 8	(75/2 ⁺)	19.4 fs 35	E	Q(transition)=9.6 10 (2011Mu02).
11729.4 ^p 12	(73/2 ⁻)		E	
11810.1 ^f 13	(75/2 ⁻)		DE	XREF: D(11804).
11859.9 ^a 11	(75/2 ⁺)		E	
12104.5 ^c 9	(77/2 ⁻)		DE	XREF: D(12069).
12187.1 [@] 21	(77/2 ⁺)		E	
12199.0 ^{&} 11	(77/2 ⁺)		E	
12199.9 ^g 13	(77/2 ⁻)		E	
12306.6 ^q 8	(79/2 ⁺)		E	
12829.4 ^p 16	(77/2 ⁻)		E	
12890.1 ^f 14	(79/2 ⁻)		E	
12910.9 ^a 15	(79/2 ⁺)		E	
13240.2 ^c 10	(81/2 ⁻)		DE	XREF: D(13202).
13313.9 ^g 17	(81/2 ⁻)		E	
13332.0 ^{&} 15	(81/2 ⁺)		E	
13385.8 ^q 8	(83/2 ⁺)		E	
14016.8 ^f 15	(83/2 ⁻)		E	
14407.2 ^c 14	(85/2 ⁻)		DE	XREF: D(14365).
14515.7 ^q 9	(87/2 ⁺)		E	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{171}Hf Levels (continued)

E(level) [†]	J ^π [‡]	XREF	Comments
15195.8 ^f 18	(87/2 ⁻)	E	
15602.2 ^c 18	(89/2 ⁻)	E	
15698.4 ^q 9	(91/2 ⁺)	E	
16431.8 ^f 21	(91/2 ⁻)	E	
16933.9 ^q 10	(95/2 ⁺)	E	
17732.8 ^f 23	(95/2 ⁻)	E	
18226.5 ^q 11	(99/2 ⁺)	E	
19575.2 ^q 13	(103/2 ⁺)	E	
20981.2 ^q 16	(107/2 ⁺)	E	
0.0+x ^r	J	E	Additional information 1.
717.50+x ^r 20	(J+2)	E	
1490.0+x ^r 6	(J+4)	E	
2321.7+x ^r 6	(J+6)	E	
3213.8+x ^r 6	(J+8)	E	
4167.6+x ^r 7	(J+10)	E	
5184.3+x ^r 9	(J+12)	E	
6265.1+x ^r 10	(J+14)	E	
7409.8+x ^r 11	(J+16)	E	
8621.4+x ^r 12	(J+18)	E	
9899.4+x ^r 16	(J+20)	E	

[†] From least-squares fit to adopted E_γ, by evaluators.

[‡] From γ-ray multiplicities, coincidence data and rotational structure in (HI,xnγ) and/or (¹⁸O,7nγ), except where noted.

Bandhead assignments (shown with levels) are from systematics.

From DSAM in (⁴⁸Ca,5nγ): E=200 MeV, except as noted.

@ Band(A): Band based on 53/2⁺, α=+1/2. Proposed as 7/2[633] band fork, α=+1/2 in [2000Cu01](#). This band may involve A, B and C orbitals and GH crossing.

& Band(B): 7/2[633], α=+1/2 band. α=7.3 (7/2, 9/2, 11/2 levels); band highly perturbed. BC crossing at $\hbar\omega \approx 380$ keV (alignment gain $\approx 6\hbar$) ([2012Zh22](#)).

a Band(b): 7/2[633], α=-1/2 band. see comment on signature partner band.

b Band(C): Possible 3/2[521] band ([1974La24](#)). α=13.0 (3/2, 5/2 levels). Analogous to band known in isotone ¹⁶⁹Yb. J^π values of (3/2⁻) for 560, (5/2⁻) for 625, (7/2⁻) for 710 and (9/2⁻) for 833 levels are consistent with exclusive decay to levels in 1/2[521] band, as in other N=99 nuclei.

c Band(D): 1/2[521], α=+1/2 band. α=12.6, β=-16.1, a=+0.77 (1/2, 3/2, 5/2, 7/2, 9/2 levels). AB crossing at $\hbar\omega \approx 240$ keV; fg crossing at $\hbar\omega \approx 510$ keV ([2012Zh22](#)), with alignment gains of 9.5 $\hbar$ and >4.7 $\hbar$, respectively.

d Band(d): 1/2[521], α=-1/2 band. see comment on signature partner band.

e Band(E): 5/2[512], α=+1/2 band. α=13.3, β=-9.1 (5/2, 7/2, 9/2 levels). see comment on signature partner band.

f Band(e): 5/2[512], α=-1/2 band. AB crossing at $\hbar\omega \approx 250$ keV; fg crossing at $\hbar\omega \approx 550$ keV, with alignment gains of 9.5 $\hbar$ and 5.2 $\hbar$, respectively ([2012Zh22](#)). see comment on signature partner band.

g Band(F): K^π=33/2- 3-qp band, α=+1/2. Lower part of the band may be vibrational band based on EAB configuration. CD crossing at $\hbar\omega \approx 410$ keV.

h Band(G): Possible 5/2[642] band ([1974La24](#)). band known in isotone ¹⁶⁹Yb.

i Band(H): K^π=19/2⁺, α=+1/2, 3-quasiparticle band. Likely configuration=((π 7/2[404])(π 5/2[402])6⁺)⊗(ν 7/2[633]) ([1979Dr08](#)). AB crossing at $\hbar\omega \approx 300$ keV.

j Band(h): K^π=19/2⁺, α=-1/2 3-quasiparticle band. see comment on signature partner band.

k Band(I): K^π=23/2⁻, α=+1/2 3-quasiparticle band. Likely configuration=((π 7/2[404])(π 9/2[514])8⁻)⊗(ν 7/2[633]) ([1979Dr08](#)). BC crossing at $\hbar\omega \approx 360$ keV.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{171}Hf Levels (continued)

- ^l Band(i): $K^\pi=23/2^-$, $\alpha=-1/2$ 3-quasiparticle band. see comment on signature partner band.
- ^m Band(J): $5/2[523]$ band (1974La24). band known In isotone ^{169}Yb .
- ⁿ Band(K): Band based on $53/2^+$, $\alpha=+1/2$. Continuation of band A with either proton pair crossing or CD neutron crossing at $\hbar\omega\approx 500$ keV.
- ^o Band(L): Possible $7/2[514]$ band (1974La24).
- ^p Band(M): 3-qp, MAB band.
- ^q Band(N): ED-1 band. enhanced-deformation band with $Q(\text{transition})=9.5$ 6 (2011Mu02) from lifetime measurements in ($^{48}\text{Ca}, 5n\gamma$). At lower spins, expected configuration is $\pi(i_{13/2}, h_{9/2})\otimes \nu j_{15/2}$ and at higher spins, $\pi i_{13/2}^2 \otimes \nu(i_{13/2}, h_{9/2}, j_{15/2})$.
This structure is not significantly associated with triaxiality, thus the band is probably not TSD (2011Mu02).
- ^r Band(O): ED-2 band. Enhanced deformation band with alignment similar to ED-1 band. This band may be signature partner of ED-1, SD or TSD band.
- ^s Band(P): $\alpha=+1/2$ band based on $(33/2^+)$.

Adopted Levels, Gammas (continued)

$\gamma(^{171}\text{Hf})$									
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	$\delta^\#$	α^b	Comments
21.93	1/2 ⁽⁻⁾	(21.93 9)	100	0.0	7/2 ⁽⁺⁾	[E3]		5.44×10 ⁵ 16	B(E3)(W.u.)=0.0179 10 E _γ : from level energy difference. Mult.: ΔJ= 3 transition; see comment In ¹⁷¹ Hf IT decay data set. Δπ=(yes) from orbital assignments based on measured μ for g.s. and 22 level. B(E3)(W.u.): assuming %IT=100 for 22 level. B(E1)(W.u.)=1.94×10 ⁻⁵ 13
49.60	(5/2 ⁻)	49.6 ^a 1	100 ^a	0.0	7/2 ⁽⁺⁾	(E1)		0.447	
61.89	(9/2 ⁺)	61.9 1	100	0.0	7/2 ⁽⁺⁾	(M1+E2)	≈0.2 ^{&}	≈3.57	
88.55	(3/2 ⁻)	66.7 ^a 1	100 ^a	21.93	1/2 ⁽⁻⁾	(M1+E2)		16 3	
102.61	(5/2 ⁻)	(14.04 12)		88.55	(3/2 ⁻)				E _γ : From level energy difference; existence implied by coincidence data in (HI,xnγ).
		80.7 ^a 1	100 ^a 10	21.93	1/2 ⁽⁻⁾	[E2]		8.35	E _γ : others: 79.7 1 from (¹⁸ O,7nγ), 80.5 2 from (⁴⁸ Ca,4nγ), 80.6 2 from (HI,xnγ).
141.79	(7/2 ⁻)	92.2 ^a 1	100 ^a	49.60	(5/2 ⁻)	(M1+E2)		4.96 13	E _γ : other: 92.6 2 in (¹⁸ O,7nγ). Mult.: D+Q from (¹⁸ O,7nγ) for intraband transition.
145.96	(11/2 ⁺)	84.1 2	100 10	61.89	(9/2 ⁺)	M1+E2	-0.18 +12-14	6.58	I _γ : from (HI,xnγ).
		146.00 [@] 15	17 3	0.0	7/2 ⁽⁺⁾	E2 [@]		0.855	I _γ : from (HI,xnγ).
244.05	(13/2 ⁺)	98.9 2	100 10	145.96	(11/2 ⁺)	M1+E2	-0.28 +16-26	4.11 10	E _γ : others: 98.80 15 from (HI,xnγ), 98.9 1 from (¹⁸ O,7nγ). I _γ : from (HI,xnγ); however, see comment on I(183γ) from 245 level. Mult.: from (HI,xnγ). Mult.: from (HI,xnγ).
		183.0 ^e 2	86 ^e 24	61.89	(9/2 ⁺)	E2		0.386	E _γ : others: 183.2 3 from (HI,xnγ), 183.6 1 from (¹⁸ O,7nγ). I _γ : 62 ≤ I _γ ≤ 110 from (HI,xnγ); however, I _γ =800 for E=183.6 1 transition in (¹⁸ O,7nγ) and 135 6 in (⁴⁸ Ca,5nγ).
254.72	(7/2 ⁻)	152.3 2	43 25	102.61	(5/2 ⁻)	[M1,E2]		0.97 24	E _γ : others: 153.6 2 from (¹⁸ O,7nγ), 152.4 1 from ε decay. I _γ : unweighted average of 90 10 from (⁴⁸ Ca,5nγ), 7.5 30 from (¹⁸ O,7nγ), and 30.2 31 from ε decay.
		165.8 2	100 9	88.55	(3/2 ⁻)	E2		0.541	E _γ : others: 165.3 1 from (¹⁸ O,7nγ), 166.0 2 from (HI,xnγ), and 166.3 1 from ε decay.
258.58	(9/2 ⁻)	116.63 20	100 9	141.79	(7/2 ⁻)	M1(+E2)	-0.11 +11-12	2.55 5	E _γ : unweighted average of 116.3 2 from (⁴⁸ Ca,5nγ), 116.81 15 from (HI,xnγ), 117.1 1 from ε decay, 116.3 4 from (¹⁸ O,7nγ).
		209.1 2	53 5	49.60	(5/2 ⁻)	[E2]		0.247	I _γ : from ε decay; others: 75 25 from (⁴⁸ Ca,5nγ), ≈ 74 from (HI,xnγ). E _γ : others: 209.0 5 from (HI,xnγ), 209.2 1 from ε decay, 208.8 1 from (¹⁸ O,7nγ).

Adopted Levels, Gammas (continued)

$\gamma(^{171}\text{Hf})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	$\delta^\#$	α^b	Comments
277.88	(9/2 ⁻)	(23.0 14) 175.4 2		254.72 (7/2 ⁻) 102.61 (5/2 ⁻)		E2		0.449	E_γ : from level energy difference. E_γ : others: 175.10 15 from (HI,xn γ), 175.5 1 from ε decay, 174.6 1 from (¹⁸ O,7n γ).
382.47	(15/2 ⁺)	137.2 [@] 2	56 3	244.05 (13/2 ⁺)		M1+E2 [@]	-0.35 +15-23	1.56 9	I_γ : weighted average of 59 3 from (HI,xn γ) and 53 7 from (⁴⁸ Ca,5n γ); other: 0.9 3 from (¹⁸ O,7n γ).
		236.5 2	100 7	145.96 (11/2 ⁺)		E2		0.1663	Mult.: from (HI,xn γ).
399.08	(11/2 ⁻)	140.5 ^a 1	73 ^a 7	258.58 (9/2 ⁻)		M1(+E2)	-0.04 10	1.520 24	E_γ : others: 139.6 5 from (⁴⁸ Ca,5n γ), 139.6 2 from (¹⁸ O,7n γ), 140.1 2 from (HI,xn γ).
		257.1 2	100 10	141.79 (7/2 ⁻)		E2		0.1268	E_γ : others: 255.8 1 from (¹⁸ O,7n γ), 256.5 4 from (HI,xn γ), 257.5 1 from ε decay.
492.57	(5/2 ⁺)	492.7 ^{da} 1	100 ^{da}	0.0 7/2 ⁽⁺⁾					
494.10	(5/2 ⁻)	352.4 ^a 1	100 ^a 10	141.79 (7/2 ⁻)					
		444.4 ^{ca} 1	<503 ^a	49.60 (5/2 ⁻)					
506.25	(7/2 ⁻)	247.5 ^{af}	^a	258.58 (9/2 ⁻)					
		444.4 ^{ca} 1	<29 ^a	61.89 (9/2 ⁺)					
		506.4 ^a 1	100 ^a 11	0.0 7/2 ⁽⁺⁾					
508.47	(11/2 ⁻)	230.4 2	13.5 25	277.88 (9/2 ⁻)					I_γ : from (¹⁸ O,7n γ); other: 14.7 29 from (⁴⁸ Ca,5n γ).
		253.8 1	100 6	254.72 (7/2 ⁻)		E2		0.1327	E_γ : from ε decay; others: 253.3 2 from (HI,xn γ), 253.9 2 from (⁴⁸ Ca,5n γ), 252.8 1 from (¹⁸ O,7n γ).
512.49	(17/2 ⁺)	129.90 [@] 15	27.3 15	382.47 (15/2 ⁺)		M1+E2 [@]	-0.9 +7-19	1.6 3	E_γ : others: 129.4 1 from (¹⁸ O,7n γ), 129.8 2 from (⁴⁸ Ca,5n γ).
		267.3 [@] 2	100 6	244.05 (13/2 ⁺)		E2 [@]		0.1127	I_γ : from (HI,xn γ); other: 22 4 from (⁴⁸ Ca,5n γ).
									I_γ : from (HI,xn γ).
									E_γ : others: 267.3 2 from (⁴⁸ Ca,5n γ), 267.1 1 from (¹⁸ O,7n γ).
537.18	(13/2 ⁻)	259.2 ^a 1	100 ^a	277.88 (9/2 ⁻)		E2		0.1240	Mult.: from (HI,xn γ).
554.55?	(7/2 ⁺)	409.1 ^{af} 1	^a	145.96 (11/2 ⁺)					
		492.7 ^{da} 1	100 ^{da} 11	61.89 (9/2 ⁺)					
		554.5 ^{daf} 1	52 ^{da} 5	0.0 7/2 ⁽⁺⁾					
559.96	(3/2 ⁻)	457.5 ^a 1	12.8 ^a 13	102.61 (5/2 ⁻)					
		471.3 ^a 1	60 ^a 6	88.55 (3/2 ⁻)					
		538.0 ^a 1	100 ^a 10	21.93 1/2 ⁽⁻⁾					
561.07	(13/2 ⁻)	161.6 2	49 8	399.08 (11/2 ⁻)		M1+E2	-0.19 +14-18	1.00 4	I_γ , Mult.: from (HI,xn γ). other I_γ : 130 52 from (⁴⁸ Ca,5n γ), 220.40 from (¹⁸ O,7n γ).
		302.4 2	100 19	258.58 (9/2 ⁻)		E2		0.0776	I_γ , Mult.: from (HI,xn γ).
									E_γ : other: 301.6 2 from (¹⁸ O,7n γ).
565.19	(7/2 ⁻)	423.4 ^a 1	100 ^a	141.79 (7/2 ⁻)					
592.37	(9/2 ⁻)	446.5 ^a 1	100 ^a 9	145.96 (11/2 ⁺)					
		530.4 ^{da} 1	<115 ^{da}	61.89 (9/2 ⁺)					
624.76	(5/2 ⁻)	370.1 ^a 1	11.8 ^a 12	254.72 (7/2 ⁻)					

Adopted Levels, Gammas (continued)

$\gamma(^{171}\text{Hf})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	$\delta^\#$	α^b	Comments
624.76	(5/2 ⁻)	522.3 ^a 1	100 ^a 10	102.61	(5/2 ⁻)				
		536.0 ^a 1	70 ^a 7	88.55	(3/2 ⁻)				
709.77	(7/2 ⁻)	432.1 ^a 1	27 ^a 3	277.88	(9/2 ⁻)				
		454.7 ^a 1	100 ^a 11	254.72	(7/2 ⁻)				
		606.8 ^a 1	87 ^a 9	102.61	(5/2 ⁻)				
		621.7 ^a 1	80 ^a 9	88.55	(3/2 ⁻)				
716.48	(19/2 ⁺)	203.6 2	42.8 20	512.49	(17/2 ⁺)	M1+E2	-0.13 +10-12	0.528 14	Mult.: from (HI,xn γ). E γ : from (⁴⁸ Ca,5n γ); other: 204.2 2 in (¹⁸ O,7n γ). I γ : from (¹⁸ O,7n γ); others: 25.5 15 in (HI,xn γ), 40 5 in (⁴⁸ Ca,5n γ). Mult.: from (HI,xn γ). E γ : others: 180.9 3 from (HI,xn γ) and 180.1 1 from (¹⁸ O,7n γ). I γ : others: 43 15 from (HI,xn γ) and 86 57 from (¹⁸ O,7n γ). Mult.: from (HI,xn γ). E γ : other: 342.1 1 from (¹⁸ O,7n γ). Mult.: from (HI,xn γ).
741.91	(15/2 ⁻)	334.0 2	100.0 25	382.47	(15/2 ⁺)	E2		0.0577	
		180.4 2	32 16	561.07	(13/2 ⁻)	M1(+E2)	-0.07 +12-14	0.744 17	
		343.0 2	100 5	399.08	(11/2 ⁻)	E2		0.0535	
767.67		665.0 ^a 1	28 ^a 3	102.61	(5/2 ⁻)				
		718.2 ^a 1	26 ^a 3	49.60	(5/2 ⁻)				
		767.6 ^a 1	100 ^a 10	0.0	7/2 ⁽⁺⁾				
788.96	(7/2,9/2 ⁺)	530.4 ^{da} 1	<87 ^{da}	258.58	(9/2 ⁻)				
		727.1 ^a 1	91 ^a 9	61.89	(9/2 ⁺)				
		788.9 ^a 1	100 ^a 11	0.0	7/2 ⁽⁺⁾				
832.38?	(9/2 ⁻)	554.5 ^{ca} 1	100 ^a	277.88	(9/2 ⁻)				
838.40	(15/2 ⁻)	301.0 2	9 3	537.18	(13/2 ⁻)				E γ : other: 300.3 4 from (¹⁸ O,7n γ). I γ : from (¹⁸ O,7n γ). other: 8 4 from (⁴⁸ Ca,5n γ). E γ : others: 329.1 1 from (¹⁸ O,7n γ) and 330.3 3 from (HI,xn γ). E γ : others: 151.7 2 in (¹⁸ O,7n γ), 149.7 2 from (HI,xn γ). I γ : 17.3 7 in (¹⁸ O,7n γ), 7.7 7 in (HI,xn γ), 34 4 in (⁴⁸ Ca,5n γ). Mult.: from (HI,xn γ). Mult.: from (HI,xn γ). E γ : others: 330.3 3 for doublet in (HI,xn γ), 330.4 2 from (⁴⁸ Ca,5n γ).
		330.1 2	100 9	508.47	(11/2 ⁻)	E2		0.0602	
866.65	(21/2 ⁺)	150.2 2		716.48	(19/2 ⁺)	M1(+E2)	-0.04 +12-11	1.268 21	
		354.1 3	100 4	512.49	(17/2 ⁺)	E2		0.0488	
866.84	(17/2 ⁻)	330.4 2	100	537.18	(13/2 ⁻)	E2 [@]		0.0600	
899.14	(3/2,5/2,7/2)	406.7 ^a 1	100 ^a 11	492.57	(5/2 ⁺)				
		899.0 ^a 1	35 ^a 3	0.0	7/2 ⁽⁺⁾				
940.69	(17/2 ⁻)	198.3 5	35 17	741.91	(15/2 ⁻)				
		379.6 2	100 9	561.07	(13/2 ⁻)	E2		0.0401	I γ : other: $\approx$ 18 from (HI,xn γ). Mult.: from (¹⁸ O,7n γ). E γ : other: 378.8 1 from (¹⁸ O,7n γ).

Adopted Levels, Gammas (continued)

$\gamma(^{171}\text{Hf})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	$\delta^\#$	α^b	Comments
1001.21	(9/2 ⁻)	463.8 ^a 1	^a	537.18 (13/2 ⁻)					
		492.7 ^{ca} 1	35 ^a 5	508.47 (11/2 ⁻)					
		723.3 ^a 1	58 ^a 6	277.88 (9/2 ⁻)					
		746.7 ^a 1	100 ^a 9	254.72 (7/2 ⁻)					
		1001.3 ^a 1	63 ^a 7	0.0 7/2 ⁽⁺⁾					
1007.93	(7/2 ⁺ , 9/2 ⁻)	501.8 ^a 1	100 ^a 10	506.25 (7/2 ⁻)					
		861.4 ^{af} 1	7.5 ^a 8	145.96 (11/2 ⁺)					
		957.8 ^{af} 1	8.0 ^a 8	49.60 (5/2 ⁻)					
		1007.8 ^a 1	15.0 ^a 13	0.0 7/2 ⁽⁺⁾					
1077.08		570.9 ^a 1	100 ^a 9	506.25 (7/2 ⁻)					
		1027.4 ^a 1	56 ^a 6	49.60 (5/2 ⁻)					
1146.10	(23/2 ⁺)	279.3 2	20.4 25	866.65 (21/2 ⁺)		M1(+E2)	-0.01 +8-9	0.226	I_γ : unweighted average of 25.3 17 In ($^{18}\text{O}, 7n\gamma$), 16.8 26 In (HI, $xn\gamma$), and 19.2 19 In ($^{48}\text{Ca}, 5n\gamma$) (weighted average is 21.5 25). Mult.: from (HI, $xn\gamma$).
1153.91	(19/2 ⁻)	429.3 [@] 2	100 4	716.48 (19/2 ⁺)		E2 [@]		0.0287	
		213.5 5	20 4	940.69 (17/2 ⁻)					I_γ : others: ≤ 11 from (HI, $xn\gamma$), 17 27 from ($^{18}\text{O}, 7n\gamma$).
		411.8 2	100 15	741.91 (15/2 ⁻)					E_γ : others: 410.3 1 from ($^{18}\text{O}, 7n\gamma$) and 411.5 4 from (HI, $xn\gamma$).
1234.46	(19/2 ⁻)	367.8 2	9.9 23	866.84 (17/2 ⁻)					E_γ : other: 366.8 4 from ($^{18}\text{O}, 7n\gamma$).
1256.97	(21/2 ⁻)	396.0 2	100 6	838.40 (15/2 ⁻)		E2		0.0357	I_γ : from ($^{18}\text{O}, 7n\gamma$); other: 6 4 from ($^{48}\text{Ca}, 5n\gamma$).
		390.0 2	100	866.84 (17/2 ⁻)		E2		0.0372	E_γ : other: 389.1 1 from ($^{18}\text{O}, 7n\gamma$).
1306.66	(25/2 ⁺)	160.3 2	4.3 7	1146.10 (23/2 ⁺)					Mult.: from (HI, $xn\gamma$).
1379.64	(21/2 ⁻)	440.0 2	100 3	866.65 (21/2 ⁺)		E2 [@]		0.0273	E_γ : others: 160.5 3 in (HI, $xn\gamma$), 159.9 1 in ($^{18}\text{O}, 7n\gamma$).
		225.4 5	25 9	1153.91 (19/2 ⁻)					I_γ : other: 8.9 5 from ($^{18}\text{O}, 7n\gamma$).
									E_γ : other: 438.9 1 from ($^{18}\text{O}, 7n\gamma$).
1615.91	(23/2 ⁻)								E_γ : others: 225.6 4 in (HI, $xn\gamma$), 224.6 2 from ($^{18}\text{O}, 7n\gamma$).
		438.8 2	100 38	940.69 (17/2 ⁻)		E2 [@]		0.0273	I_γ : from (HI, $xn\gamma$) where $I_\gamma(225\gamma):I_\gamma(438\gamma)=25:9 \approx 100$; other: 50 from ($^{18}\text{O}, 7n\gamma$).
		663.5 5	21 25	716.48 (19/2 ⁺)		[E1]			E_γ : other: 440.0 3 from (HI, $xn\gamma$); 437.8 2 from ($^{18}\text{O}, 7n\gamma$).
		235.8 5	18 4	1379.64 (21/2 ⁻)		D			
		461.9 2	100 14	1153.91 (19/2 ⁻)		Q			
1644.84	(19/2 ⁺)	749.4 2	27 4	866.65 (21/2 ⁺)		D			E_γ : other: 461.1 1 from ($^{18}\text{O}, 7n\gamma$).
		778.1 2	11 6	866.65 (21/2 ⁺)					
		928.2 2	25 8	716.48 (19/2 ⁺)					E_γ : from ($^{48}\text{Ca}, 5n\gamma$).

Adopted Levels, Gammas (continued)

$\gamma(^{171}\text{Hf})$ (continued)								
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	α^b	Comments
1644.84	(19/2 ⁺)	1132.4 2	100 10	512.49	(17/2 ⁺)	M1	0.00612 9	B(M1)(W.u.)=1.7×10 ⁻⁶ 5 E _γ : other: 1133.0 4 from (HI,xnγ). Mult.: from α(K)exp ln (HI,xnγ).
1662.01	(27/2 ⁺)	1262.3 5 354.9 2	8.5 3 16.0 13	382.47 (15/2 ⁺) 1306.66 (25/2 ⁺)				E _γ : others: 354.5 3 from (¹⁸ O,7nγ), 355.1 from (HI,xnγ). I _γ : other: 17.8 16 from (¹⁸ O,7nγ).
1688.74	(23/2 ⁻)	515.9 2 432.0 5 454.4 2	100.0 19 10.1 24 100 6	1146.10 (23/2 ⁺) 1256.97 (21/2 ⁻) 1234.46 (19/2 ⁻)	E2 [@] E2	0.0180 0.0248		E _γ : others: 516.1 3 in (HI,xnγ), 515.2 2 from (¹⁸ O,7nγ). I _γ : from (¹⁸ O,7nγ); other: 5 4 from (⁴⁸ Ca,5nγ). E _γ : other: 453.1 1 from (¹⁸ O,7nγ). Mult.: from (HI,xnγ).
1697.2	(25/2 ⁻)	440.1 2	100	1256.97 (21/2 ⁻)	E2 [@]	0.0269		E _γ : others: 439.8 1 from (¹⁸ O,7nγ); 440.9 4 from (HI,xnγ).
1794.13	(21/2 ⁺)	149.3 2	100	1644.84 (19/2 ⁺)	M1	1.288		Mult.: from (HI,xnγ). E _γ : other: 148.9 2 from (¹⁸ O,7nγ).
1828.06	(29/2 ⁺)	165.4 2	2.1 13	1662.01 (27/2 ⁺)	D			E _γ : other: 165.4 2 from (¹⁸ O,7nγ). I _γ : other: 6.4 6 from (¹⁸ O,7nγ).
1858.32	(25/2 ⁻)	521.8 2 241.9 5 478.6 2	100 7 11 5 100 26	1306.66 (25/2 ⁺) 1615.91 (23/2 ⁻) 1379.64 (21/2 ⁻)	E2 [@] D Q	0.01747		E _γ : others: 521.7 3 in (HI,xnγ), 520.9 1 from (¹⁸ O,7nγ). E _γ : other: 241.4 2 from (¹⁸ O,7nγ). E _γ : others: 478.2 4 in (HI,xnγ) where γ was placed differently; 477.9 3 from (¹⁸ O,7nγ).
1977.25	(23/2 ⁺)	712.2 2 183.1 2 332.4 2	89 16 100 7 14 5	1146.10 (23/2 ⁺) 1794.13 (21/2 ⁺) 1644.84 (19/2 ⁺)	D			
1984.4	(23/2 ⁻)	190.3 2	100	1794.13 (21/2 ⁺)	E1	0.0667		B(E1)(W.u.)=1.65×10 ⁻⁶ 19 E _γ : other: 190.6 2 from (HI,xnγ). Mult.: from (HI,xnγ).
2113.37	(27/2 ⁻)	254.8 2 497.7 2	17 3 100 8	1858.32 (25/2 ⁻) 1615.91 (23/2 ⁻)	E2	0.0196		E _γ : other: 254.4 1 from (¹⁸ O,7nγ). Mult.: from (HI,xnγ). E _γ : others: 498.5 3, placed in signature partner band in (HI,xnγ); 497.3 2 from (¹⁸ O,7nγ).
2161.8	(25/2 ⁻)	806.7 2 177.4 2	18 3 100	1306.66 (25/2 ⁺) 1984.4 (23/2 ⁻)	D			E _γ : other: 176.3 3 from (HI,xnγ).
2183.6	(29/2 ⁻)	486.4 2	100	1697.2 (25/2 ⁻)	E2 [@]	0.0209		E _γ : others: 485.9 3 in (HI,xnγ), 485.0 1 in (¹⁸ O,7nγ).
2188.8	(25/2 ⁺)	211.6 2 394.7 2	100 8 33 9	1977.25 (23/2 ⁺) 1794.13 (21/2 ⁺)				
2195.9	(27/2 ⁻)	498.5 2	10.6 29	1697.2 (25/2 ⁻)				E _γ : others: 498.0 4 in (HI,xnγ) where γ was given alternate placement, 498.0 4 in (¹⁸ O,7nγ). I _γ : others: 6.3 23 in (HI,xnγ) and 6.3 23 in (¹⁸ O,7nγ). E _γ : others: 507.7 4 in (HI,xnγ), 506.1 1 in (¹⁸ O,7nγ). Mult.: Q intraband γ from (¹⁸ O,7nγ).
2254.83	(31/2 ⁺)	426.7 2 593.0 2	13.1 21 100 3	1828.06 (29/2 ⁺) 1662.01 (27/2 ⁺)	(E2) E2	0.01280		I _γ : other: 8.4 19 from (¹⁸ O,7nγ). Mult.: from (HI,xnγ). E _γ : others: 593.4 3 in (HI,xnγ), 592.2 2 in (¹⁸ O,7nγ).

Adopted Levels, Gammas (continued)

$\gamma(^{171}\text{Hf})$ (continued)								
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	α^b	Comments
2365.63	(29/2 ⁻)	252.3 5	<9.7	2113.37	(27/2 ⁻)	D		E_γ : other: 253.3 2 in ($^{18}\text{O}, 7n\gamma$). I_γ : other: 44 22 in ($^{18}\text{O}, 7n\gamma$). E_γ : other: 506.4 3 in ($^{18}\text{O}, 7n\gamma$). Mult.: Q from ($^{18}\text{O}, 7n\gamma$); $\Delta\pi$ from level scheme. Mult.: $\Delta\pi$ from level scheme.
		507.4 2	100 16	1858.32	(25/2 ⁻)	(E2)		
		703.6 5	19 3	1662.01	(27/2 ⁺)	(E1)		
2372.0	(27/2 ⁻)	210.2 2	100 10	2161.8	(25/2 ⁻)	[M1+E2]	0.37 13	
		387.6 2	21 6	1984.4	(23/2 ⁻)	[E2]	0.0379	
2425.8	(27/2 ⁺)	237.1 2	100 8	2188.8	(25/2 ⁺)	[M1+E2]	0.26 10	
		448.4 2	48 5	1977.25	(23/2 ⁺)	[E2]	0.0256	
2426.27	(33/2 ⁺)	170.8 5	0.72 14	2254.83	(31/2 ⁺)	(M1(+E2))	0.69 20	E_γ : other: 170.6 1 in ($^{18}\text{O}, 7n\gamma$). I_γ : other: 1.9 6 in ($^{18}\text{O}, 7n\gamma$). Mult.: from ($^{18}\text{O}, 7n\gamma$). E_γ : others: 598.0 3 in (HI,xn γ), 596.9 1 in ($^{18}\text{O}, 7n\gamma$).
		598.1 2	100 3	1828.06	(29/2 ⁺)	E2	0.01251	
2611.3	(29/2 ⁻)	239.3 2	100 13	2372.0	(27/2 ⁻)	[M1+E2]	0.25 10	
		449.4 5	20 13	2161.8	(25/2 ⁻)	[E2]	0.0254	
2641.49	(31/2 ⁻)	276.0 5	13 7	2365.63	(29/2 ⁻)	(M1)	0.24	Mult.: D intraband γ from ($^{18}\text{O}, 7n\gamma$). E_γ : other: 526.9 1 in ($^{18}\text{O}, 7n\gamma$). Mult.: Q intraband γ from ($^{18}\text{O}, 7n\gamma$). Mult.: D γ from $^{128}\text{Te}(^{48}\text{Ca}, 5n\gamma)$; $\Delta\pi$ from level scheme.
		528.1 2	100 17	2113.37	(27/2 ⁻)	(E2)	0.01688	
		813.1 5	30 7	1828.06	(29/2 ⁺)	(E1)		
2685.2	(29/2 ⁺)	259.4 2	100 10	2426.27	(33/2 ⁺)			
		496.4 2	52 3	2188.8	(25/2 ⁺)	[E2]	0.0197	
2711.8	(33/2 ⁻)	528.2 2	100	2183.6	(29/2 ⁻)	E2 [@]	0.01688	E_γ : others: 528.0 3 in (HI,xn γ), 526.9 1 in ($^{18}\text{O}, 7n\gamma$).
2753.2	(31/2 ⁻)	557.3 2	100 13	2195.9	(27/2 ⁻)	(E2)	0.01480	E_γ : others: 557.0 in (HI,xn γ), 555.9 1 in ($^{18}\text{O}, 7n\gamma$). Mult.: Q intraband γ from ($^{18}\text{O}, 7n\gamma$).
		568.9 5	5.6 6	2183.6	(29/2 ⁻)	[M1+E2]	0.024 11	E_γ : other: 566.7 4 in ($^{18}\text{O}, 7n\gamma$). I_γ : other: 35.5 26 in ($^{18}\text{O}, 7n\gamma$).
2876.6	(31/2 ⁻)	265.3 2	100 5	2611.3	(29/2 ⁻)	[M1+E2]	0.19 8	I_γ : from ($^{48}\text{Ca}, 5n\gamma$) at 200 MeV. Other: 100 13 in ($^{48}\text{Ca}, 5n\gamma$) at 209 MeV.
		504.6 2	25 4	2372.0	(27/2 ⁻)	[E2]	0.0189	I_γ : from ($^{48}\text{Ca}, 5n\gamma$) at 200 MeV. Other: 44 10 in ($^{48}\text{Ca}, 5n\gamma$) at 209 MeV.
2882.9	(33/2 ⁺)	456.7 5	100	2426.27	(33/2 ⁺)			
2908.27	(33/2 ⁻)	266.4 5	33 33	2641.49	(31/2 ⁻)			Mult.: D intraband γ from $^{128}\text{Te}(^{48}\text{Ca}, 5n\gamma)$.
		542.7 2	100 42	2365.63	(29/2 ⁻)	Q		
		653.2 5	58 25	2254.83	(31/2 ⁺)	E1		
2913.98	(35/2 ⁺)	487.5 2	15.5 28	2426.27	(33/2 ⁺)	M1+E2	0.036 16	E_γ : other: 487.1 2 from ($^{18}\text{O}, 7n\gamma$). B(E2)(W.u.)=150 +25-30
		659.4 2	100 7	2254.83	(31/2 ⁺)	E2	0.01002	Mult.: Q intraband γ from (HI,xn γ); M2 excluded by comparison to RUL. E_γ : others: 658.0 2 from ($^{18}\text{O}, 7n\gamma$), 659.4 3 from (HI,xn γ).
2966.3	(31/2 ⁺)	281.0 2	100 8	2685.2	(29/2 ⁺)	[M1+E2]	0.16 7	
		540.7 2	89 9	2425.8	(27/2 ⁺)	[E2]	0.01593	I_γ : from ($^{48}\text{Ca}, 5n\gamma$) At E=209 MeV. other: 81 3 from ($^{18}\text{O}, 7n\gamma$).
3090.2	(33/2 ⁻)	378.4 5	100 67	2711.8	(33/2 ⁻)	[M1]	0.0998	

Adopted Levels, Gammas (continued)

$\gamma(^{171}\text{Hf})$ (continued)								
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	α^b	Comments
3090.2	(33/2 ⁻)	906.6 5	<50	2183.6	(29/2 ⁻)	[E2]		
3093.1	(37/2 ⁺)	179.2 5	1.1 3	2913.98	(35/2 ⁺)	[M1+E2]	0.59 18	
		666.7 2	100.0 26	2426.27	(33/2 ⁺)	[E2]	0.00977 14	B(E2)(W.u.)=200 +18-44 E $_\gamma$: others: 666.6 3 in (Hf,xn γ), 665.3 1 from (¹⁸ O,7n γ). Mult.: Q γ from DCO in (¹⁸ O,7n γ); M2 excluded by comparison to RUL.
3166.1	(33/2 ⁻)	289.4 2	100 16	2876.6	(31/2 ⁻)	[M1+E2]	0.15 6	I $_\gamma$: other: 100 5 from (⁴⁸ Ca,5n γ) at 200 MeV.
		554.8 2	47 10	2611.3	(29/2 ⁻)	[E2]	0.01497	I $_\gamma$: other: 38 5 from (⁴⁸ Ca,5n γ) at 200 MeV.
3200.2	(35/2 ⁻)	291.4 5	<14	2908.27	(33/2 ⁻)	(M1)	0.204	Mult.: D intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		558.7 2	100 16	2641.49	(31/2 ⁻)	[E2]	0.01471	E $_\gamma$: other: 557.4 2 from (¹⁸ O,7n γ).
		774.0 5	33 29	2426.27	(33/2 ⁺)	[E1]		
3265.9	(33/2 ⁺)	299.6 2	25 7	2966.3	(31/2 ⁺)	[M1+E2]	0.13 6	E $_\gamma$: other: 299.9 (⁴⁸ Ca,5n γ) at 200 MeV.
								I $_\gamma$: other: 95 4 from (⁴⁸ Ca,5n γ) at 200 MeV.
		580.6	100 8	2685.2	(29/2 ⁺)	[E2]	0.01342	E $_\gamma$,I $_\gamma$: from (⁴⁸ Ca,5n γ) At 200 MeV.
3283.2	(37/2 ⁻)	571.4 2	100	2711.8	(33/2 ⁻)	[E2] [@]	0.01394	B(E2)(W.u.)=275 24 E $_\gamma$: others: 571.4 4 in (Hf,xn γ), 570.1 1 in (¹⁸ O,7n γ).
3356.7	(35/2 ⁻)	603.5 2	100 13	2753.2	(31/2 ⁻)	[E2]	0.01224	B(E2)(W.u.)=290 +70-60 E $_\gamma$: other: 602.6 1 in (¹⁸ O,7n γ).
		645.5 5	<2.0	2711.8	(33/2 ⁻)	[M1+E2]	0.018 8	E $_\gamma$: other: 646.0 5 from (¹⁸ O,7n γ).
								I $_\gamma$: other: 12.0 17 from (¹⁸ O,7n γ).
3429.0	(37/2)	515.0 5	100	2913.98	(35/2 ⁺)			
3477.0	(35/2 ⁻)	310.9 2	100 9	3166.1	(33/2 ⁻)	[M1+E2]	0.12 5	
		600.3 2	50 21	2876.6	(31/2 ⁻)	[E2]	0.01240	E $_\gamma$: other: 599.8 6 from (¹⁸ O,7n γ).
								I $_\gamma$: other: < 24 from (¹⁸ O,7n γ).
3481.3	(37/2 ⁺)	388.2 2	85 5	3093.1	(37/2 ⁺)	(M1)	0.0933	Mult.: D intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		567.4 5	15 5	2913.98	(35/2 ⁺)	(M1+E2)	0.024 11	Mult.: (D+Q) intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		598.4 5	<15	2882.9	(33/2 ⁺)	(E2)	0.01249	Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		1055.1 2	100 10	2426.27	(33/2 ⁺)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
3503.0	(37/2 ⁻)	302.2 5	<9	3200.2	(35/2 ⁻)	(M1+E2)	0.13 6	Mult.: D+Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		589.1 5	<9	2913.98	(35/2 ⁺)	[E1]		
		594.8 2	100 18	2908.27	(33/2 ⁻)	(E2)	0.01267	E $_\gamma$: other: 593.7 3 from (¹⁸ O,7n γ).
								Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
3584.3	(35/2 ⁺)	318.4 2	35 9	3265.9	(33/2 ⁺)	(M1+E2)	0.11 5	I $_\gamma$: other: 90 4 from (⁴⁸ Ca,5n γ) at 200 MeV.
								Mult.: D+Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		617.9 2	100 4	2966.3	(31/2 ⁺)	(E2)	0.01159	E $_\gamma$,I $_\gamma$: from (⁴⁸ Ca,5n γ) at 200 MeV.
								Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
3629.7	(39/2 ⁺)	536.4 2	8.4 16	3093.1	(37/2 ⁺)	(M1+E2)	0.028 12	Mult.: D+Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		715.7 2	100 11	2913.98	(35/2 ⁺)	(E2)		B(E2)(W.u.)=230 50 E $_\gamma$: others: 715.0 5 in (Hf,xn γ), 714.1 2 in (¹⁸ O,7n γ).
								Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
3642.2	(37/2 ⁻)	359.1 5	50 42	3283.2	(37/2 ⁻)	(M1)	0.1147	Mult.: D γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		552.0 2	100 42	3090.2	(33/2 ⁻)	(E2)	0.01515	Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).

Adopted Levels, Gammas (continued)

 $\gamma(^{171}\text{Hf})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	α^b	Comments
3642.2	(37/2 ⁻)	930.4 5	33 25	2711.8	(33/2 ⁻)	(E2)		Mult.: Q γ from $^{128}\text{Te}(^{48}\text{Ca},5n\gamma)$.
3800.3	(39/2 ⁻)	296.7 5	<10	3503.0	(37/2 ⁻)	(M1+E2)	0.14 6	Mult.: D+Q intraband γ from $^{128}\text{Te}(^{48}\text{Ca},5n\gamma)$.
		600.1 2	100 17	3200.2	(35/2 ⁻)	(E2)	0.01241	E_γ : other: 598.9 2 from ($^{18}\text{O},7n\gamma$). Mult.: Q intraband γ from $^{128}\text{Te}(^{48}\text{Ca},5n\gamma)$.
3808.2	(37/2 ⁻)	707.2 5	17 13	3093.1	(37/2 ⁺)	[E1]		
		331.2 2	100 20	3477.0	(35/2 ⁻)	(M1+E2)	0.10 5	Mult.: D+Q intraband γ from $^{128}\text{Te}(^{48}\text{Ca},5n\gamma)$.
		642.1 2	49 23	3166.1	(33/2 ⁻)	(E2)	0.01060	E_γ : from ($^{48}\text{Ca},5n\gamma$) at E=209 MeV. Other: 641.4 from ($^{48}\text{Ca},5n\gamma$) at 200 MeV. I_γ : from ($^{48}\text{Ca},5n\gamma$) At 200 MeV. Other: 49 23 from ($^{48}\text{Ca},5n\gamma$) At 209 MeV.
3820.0	(41/2 ⁺)	190.2 5	1.9 11	3629.7	(39/2 ⁺)	[M1+E2]	0.49 16	Mult.: Q intraband γ from $^{128}\text{Te}(^{48}\text{Ca},5n\gamma)$.
		727.0 2	100 4	3093.1	(37/2 ⁺)	[E2]		E_γ : other: 189.9 3 from ($^{18}\text{O},7n\gamma$). I_γ : other: 1.2 8 from ($^{18}\text{O},7n\gamma$). B(E2)(W.u.)=230 30 Other E_γ : 727.1 4 in (HI,xn γ), 725.7 1 in ($^{18}\text{O},7n\gamma$). B(E2)(W.u.)=310 30
3904.5	(41/2 ⁻)	621.4 2	100	3283.2	(37/2 ⁻)	[E2]	0.01143	E_γ : others: 620.8 4 in (HI,xn γ), 619.7 2 in ($^{18}\text{O},7n\gamma$).
3920.1	(37/2 ⁺)	335.8 5		3584.3	(35/2 ⁺)	[M1+E2]	0.10 4	
		654.2 2	100 10	3265.9	(33/2 ⁺)	[E2]	0.01016	
3999.3	(39/2 ⁻)	642.6 2	100 7	3356.7	(35/2 ⁻)	[E2]	0.01058	B(E2)(W.u.)=190 +30-50 E_γ : others: 641.9 in (HI,xn γ), 641.5 1 in ($^{18}\text{O},7n\gamma$).
4070.1	(37/2 ⁻)	716.0 ^f 5	<3.1	3283.2	(37/2 ⁻)	[M1+E2]	0.014 6	
		554.4 5	<50	3515.7	(33/2 ⁻)			
		641.1 5	100 33	3429.0	(37/2)			
4087.9	(41/2 ⁺)	267.8 5	<15	3820.0	(41/2 ⁺)			
		458.1 5	<15	3629.7	(39/2 ⁺)	(M1)	0.0604	Mult.: D from $^{128}\text{Te}(^{48}\text{Ca},5n\gamma)$; $\Delta\pi$ =no from level scheme.
		607.2 5	15 15	3481.3	(37/2 ⁺)	(E2)	0.01207	Mult.: Q intraband γ from $^{128}\text{Te}(^{48}\text{Ca},5n\gamma)$.
		994.8 2	100 10	3093.1	(37/2 ⁺)	(E2)		Mult.: Q from $^{128}\text{Te}(^{48}\text{Ca},5n\gamma)$; $\Delta\pi$ =no from level scheme.
4154.7	(41/2 ⁻)	354.2 5	<38	3800.3	(39/2 ⁻)	[M1+E2]	0.08 4	
		651.9 5	100 63	3503.0	(37/2 ⁻)	[E2]	0.01024	E_γ : other: 650.3 2 from ($^{18}\text{O},7n\gamma$). I_γ : other: 100 44 from ($^{18}\text{O},7n\gamma$).
4157.0	(39/2 ⁻)	348.8 2	100 9	3808.2	(37/2 ⁻)	[M1+E2]	0.09 4	E_γ : from ($^{48}\text{Ca},5n\gamma$) at E=209 MeV. Other: 349.0 6 in (HI,xn γ). I_γ : from ($^{48}\text{Ca},5n\gamma$) at 200 MeV. Other: 100 29 from 209 MeV data.
		680.0 2	59 12	3477.0	(35/2 ⁻)	[E2]		E_γ : from ($^{48}\text{Ca},5n\gamma$) at E=209 MeV. I_γ : from ($^{48}\text{Ca},5n\gamma$) at 200 MeV, Other: 67 29 from 209 MeV data.
4261.2	(41/2 ⁻)	356.7 5	31 23	3904.5	(41/2 ⁻)	[M1]	0.1168	
		619.0 2	100 38	3642.2	(37/2 ⁻)	[E2]	0.01154	
		978.1 5	<23	3283.2	(37/2 ⁻)	(E2)		Mult.: Q γ from $^{128}\text{Te}(^{48}\text{Ca},5n\gamma)$; $\Delta\pi$ =yes from level scheme.
4262.3	(39/2 ⁺)	342.1 2	44 11	3920.1	(37/2 ⁺)	[M1+E2]	0.09 4	
		678.0 2	100 10	3584.3	(35/2 ⁺)	[E2]		
4394.2	(43/2 ⁺)	574.4 2	13 8	3820.0	(41/2 ⁺)	[M1+E2]	0.024 10	E_γ : other: 572.5 5 from ($^{18}\text{O},7n\gamma$). I_γ : other: 43.0 17 from ($^{18}\text{O},7n\gamma$).

Adopted Levels, Gammas (continued)

$\gamma(^{171}\text{Hf})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	α^b	Comments
4394.2	(43/2 ⁺)	764.4 2	100 25	3629.7	(39/2 ⁺)	[E2]		B(E2)(W.u.)=190 80 E _γ : others: 762.8 2, 761.4 8 from (HI,xn _γ). I _γ : others: 100 4 from (¹⁸ O,7n _γ).
4456.2	(43/2 ⁻)	636.2 5	<27	3820.0	(41/2 ⁺)	[E1]		
		655.9 2	100 45	3800.3	(39/2 ⁻)	[E2]	0.01010	E _γ : other: 654.6 2 from (¹⁸ O,7n _γ).
4523.6	(41/2 ⁻)	366.6 2	67 29	4157.0	(39/2 ⁻)	[M1+E2]	0.08 4	I _γ : other: 172 28 from (¹⁸ O,7n _γ).
		715.4 2	100 29	3808.2	(37/2 ⁻)	[E2]		
4570.9	(39/2 ⁺)	1287.7 5	100	3283.2	(37/2 ⁻)	[E1]		
4582.7	(45/2 ⁻)	678.2 2	100	3904.5	(41/2 ⁻)	[E2]		B(E2)(W.u.)=281 24 E _γ : others: 678.8 4 in (HI,xn _γ), 676.7 2 in (¹⁸ O,7n _γ). B(E2)(W.u.)=186 20 E _γ : others: 773.8 5 in (HI,xn _γ), 772.6 1 in (¹⁸ O,7n _γ).
4594.5	(45/2 ⁺)	774.5 2	100	3820.0	(41/2 ⁺)	[E2]		
4615.2	(41/2 ⁺)	352.9 2	≈31	4262.3	(39/2 ⁺)	[M1+E2]	0.08 4	
		695.1 2	100 14	3920.1	(37/2 ⁺)	[E2]		
4678.3	(41/2 ⁻)	608.2 2	100 27	4070.1	(37/2 ⁻)	(E2)	0.01202	Mult.: (Q) intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n _γ).
		1048.4 ^f 5	<27	3629.7	(39/2 ⁺)	[E1]		
4679.3	(43/2 ⁻)	679.9 2	100 10	3999.3	(39/2 ⁻)	[E2]		B(E2)(W.u.)≈280
		774.7 ^f 5	<3.9	3904.5	(41/2 ⁻)	[M1+E2]	0.011 5	
4736.5	(45/2 ⁺)	649.0 5	13 13	4087.9	(41/2 ⁺)	(E2)	0.01034	Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n _γ).
		916.5 2	100 13	3820.0	(41/2 ⁺)	(E2)		Mult.: Q γ from ¹²⁸ Te(⁴⁸ Ca,5n _γ); $\Delta\pi$ from level scheme.
4861.8	(45/2 ⁻)	707.1 5	100	4154.7	(41/2 ⁻)	[E2]		E _γ : other: 705.7 2 from (¹⁸ O,7n _γ).
4904.0	(43/2 ⁻)	380.4 2	100 64	4523.6	(41/2 ⁻)	[M1+E2]		E _γ : other: 381 from (⁴⁸ Ca,5n _γ) at 200 MeV.
		747.0 5	82 36	4157.0	(39/2 ⁻)	[E2]		E _γ : other: 744 from (⁴⁸ Ca,5n _γ) at 200 MeV.
4944.5	(45/2 ⁻)	362.0 5	17 8	4582.7	(45/2 ⁻)	[M1]	0.1123	DCO for 362 γ +362 γ doublet consistent with Q $\Delta J=2$ transition in (⁴⁸ Ca,5n _γ).
		683.2 2	100 19	4261.2	(41/2 ⁻)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n _γ).
		1039.9 5	11 8	3904.5	(41/2 ⁻)	(E2)		Mult.: Q γ from ¹²⁸ Te(⁴⁸ Ca,5n _γ).
4965.3	(43/2 ⁺)	350.1 2	38 9	4615.2	(41/2 ⁺)	[E2]		E _γ : from (⁴⁸ Ca,5n _γ) at 200 MeV. E _γ =361 in figure 1 of 2000Cu01 does not fit placement and is presumed to be a misprint of 351. E _γ =350 (1997Cu01 and 2012Zh22) in (⁴⁸ Ca,5n _γ).
		703.0 2	100 13	4262.3	(39/2 ⁺)			E _γ : from (⁴⁸ Ca,5n _γ) at 200 MeV.
5046.8		612 1	100	4434.8				
5139.4	(43/2 ⁺)	568.4 5	100 14	4570.9	(39/2 ⁺)	[E2]	0.01412	
		1234.7 5	71 29	3904.5	(41/2 ⁻)	(E1)		Mult.: stretched D from DCO; $\Delta J=0$ with large E2 admixture is also consistent with DCO but not likely from decay pattern. $\Delta\pi$ from decay scheme.
5175.8	(47/2 ⁻)	719.6 2	100	4456.2	(43/2 ⁻)	[E2]		E _γ : other: 718.2 1 from (¹⁸ O,7n _γ).
5204.9	(47/2 ⁺)	810.7 2	100	4394.2	(43/2 ⁺)	[E2]		E _γ : others: 809.5 3 from (¹⁸ O,7n _γ), 510.2 from (HI,xn _γ).
5296.2	(45/2 ⁻)	392.2 2	100 29	4904.0	(43/2 ⁻)	[M1+E2]	0.06 3	E _γ : other: 390 from (⁴⁸ Ca,5n _γ) at 200 MeV.
		772.6 2	76 33	4523.6	(41/2 ⁻)	[E2]		E _γ : other: 771 from (⁴⁸ Ca,5n _γ) at 200 MeV.
5302.4	(45/2 ⁺)	337.1 5		4965.3	(43/2 ⁺)	[M1+E2]	0.10 4	
		687.2 2	≈100	4615.2	(41/2 ⁺)	[E2]		

Adopted Levels, Gammas (continued)

$\gamma(^{171}\text{Hf})$ (continued)								
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	α^b	Comments
5321.0	(49/2 ⁻)	738.3 2	100	4582.7	(45/2 ⁻)	[E2]		B(E2)(W.u.)=270 50 E γ : others: 738.2 in (HI,xn γ), 736.7 2 in (¹⁸ O,7n γ).
5330.6	(45/2 ⁻)	652.3 5	100	4678.3	(41/2 ⁻)	(E2)	0.01022	Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
5379.0	(49/2 ⁺)	784.5 2	100	4594.5	(45/2 ⁺)	[E2]		E γ : others: 783.1 3 from (¹⁸ O,7n γ), 784.6 from (HI,xn γ).
5414.1	(47/2 ⁻)	734.8 2	100 10	4679.3	(43/2 ⁻)	[E2]		B(E2)(W.u.)=240 60 E γ : other: 734.0 2 from (¹⁸ O,7n γ).
		831.1 ^f 5	<5.9	4582.7	(45/2 ⁻)	[M1+E2]		Mult.: from (¹⁸ O,7n γ).
5493.3	(49/2 ⁺)	756.8 2	27 9	4736.5	(45/2 ⁺)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		898.8 2	100 7	4594.5	(45/2 ⁺)	(E2)		Mult.: Q interband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
5626.0	(49/2 ⁻)	764.2 5	100	4861.8	(45/2 ⁻)	[E2]		E γ : other: 762.3 1 from (¹⁸ O,7n γ).
5640.0	(47/2 ⁺)	337.8 5		5302.4	(45/2 ⁺)	[M1+E2]	0.10 4	
		674.7 2	100.0 21	4965.3	(43/2 ⁺)	[E2]		
5682.7	(49/2 ⁻)	361.7 5	14 7	5321.0	(49/2 ⁻)		0.1126	Mult.: DCO for 362 γ +362 γ doublet consistent with D, ΔJ =1. E γ : other: 359.7 2 in (¹⁸ O,7n γ) for γ possibly deexciting J=51/2 member of same band.
		738.3 2	100 18	4944.5	(45/2 ⁻)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		1100.0 5	7	4582.7	(45/2 ⁻)	[E2]		
5696.4	(47/2 ⁻)	400.3 5		5296.2	(45/2 ⁻)	[M1+E2]	0.06 3	
		792.4 5	100 78	4904.0	(43/2 ⁻)	[E2]		E γ : other: 790 from (⁴⁸ Ca,5n γ) at 200 MeV.
5699.8	(47/2 ⁺)	560.4 2	100 11	5139.4	(43/2 ⁺)	(E2)	0.01461	Mult.: (Q) intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		577 1		5122.8				
		653 1		5046.8				
		1117.4 5	47 5	4582.7	(45/2 ⁻)	(E1)		Mult.: stretched D from DCO; ΔJ =0 with large E2 admixture is also consistent with DCO but not likely based on decay pattern.
5961.7	(51/2 ⁻)	785.9 2	100	5175.8	(47/2 ⁻)	[E2]		E γ : other: 784.5 3 from (¹⁸ O,7n γ).
5989.4	(49/2 ⁺)	349.4 5	≈70	5640.0	(47/2 ⁺)	[M1+E2]	0.09 4	
		687.0 2	≈100	5302.4	(45/2 ⁺)	[E2]		
6042.5	(49/2 ⁻)	711.9 5	27 20	5330.6	(45/2 ⁻)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		837.6 2	100 20	5204.9	(47/2 ⁺)	(E1)		Mult.: D γ from ¹²⁸ Te(⁴⁸ Ca,5n γ); $\Delta\pi$ from level scheme.
6067.8	(51/2 ⁺)	862.9 2	100	5204.9	(47/2 ⁺)	[E2]		E γ : others: 860.9 4 from (¹⁸ O,7n γ), 862.2 in (HI,xn γ).
6096.0	(49/2 ⁻)	399.6 5		5696.4	(47/2 ⁻)	[M1+E2]	0.06 3	
		799.9 5	100 75	5296.2	(45/2 ⁻)	[E2]		
6120.6	(53/2 ⁻)	799.6 2	100	5321.0	(49/2 ⁻)	[E2]		B(E2)(W.u.)≈160 E γ : others: 799.2 in (HI,xn γ), 797.7 2 in (¹⁸ O,7n γ).
6179.4	(53/2 ⁺)	800.4 2	100	5379.0	(49/2 ⁺)	[E2]		E γ : others: 799.8 in (HI,xn γ), 798.8 3 in (¹⁸ O,7n γ).
6209.7	(51/2 ⁻)	795.6 2	100	5414.1	(47/2 ⁻)	[E2]		E γ : other: 793.4 3 from (¹⁸ O,7n γ).
6327.2	(51/2 ⁺)	627.4 2	100	5699.8	(47/2 ⁺)	(E2)	0.01118	Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
6340.0	(53/2 ⁺)	846.7 5	100	5493.3	(49/2 ⁺)	E2		B(E2)(W.u.)=78 16 E γ : other: 845.0 2 in (¹⁸ O,7n γ) for γ with different placement; however, see comment on 843.9 γ from 7183 level.
								Mult.: Q intraband γ In (⁴⁸ Ca,5n γ); not M2 from RUL.
6354.9	(51/2 ⁺)	365.5 2	62 33	5989.4	(49/2 ⁺)	[M1+E2]	0.08 4	
		714.9 2	100 19	5640.0	(47/2 ⁺)	[E2]		

Adopted Levels, Gammas (continued)

$\gamma(^{171}\text{Hf})$ (continued)								
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	α^b	Comments
6401.1	(53/2 ⁺)	907.8 5	100	5493.3	(49/2 ⁺)			Mult.: DCO for 908 γ +909 γ doublet consistent with stretched Q.
6449.1	(53/2 ⁻)	823.1 5	100	5626.0	(49/2 ⁻)	[E2]		E_γ : other: 821.4 3 from (¹⁸ O,7n γ).
6469.4	(53/2 ⁻)	348.8 5	6.8 23	6120.6	(53/2 ⁻)	[M1]	0.1240	
		786.7 2	100 18	5682.7	(49/2 ⁻)	(E2)		E_γ : other: 784.4 2 from (¹⁸ O,7n γ).
								Mult.: (Q) intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
6481.3	(51/2 ⁻)	1148.4 5	<6.8	5321.0	(49/2 ⁻)	[E2]		
		385.3 5	<50	6096.0	(49/2 ⁻)	[M1+E2]	0.07 3	
		784.9 5	1.0 $\times$ 10 ² 10	5696.4	(47/2 ⁻)	[E2]		
6735.6	(53/2 ⁺)	380.7 5	6 $\times$ 10 ¹ 12	6354.9	(51/2 ⁺)	[M1+E2]	0.07 3	
		746.2 5	1.0 $\times$ 10 ² 16	5989.4	(49/2 ⁺)	[E2]		
6812.7	(55/2 ⁻)	851.0 5	100	5961.7	(51/2 ⁻)	[E2]		E_γ : other: 848.8 2 from (¹⁸ O,7n γ).
6829.1	(53/2 ⁻)	786.6 2	100	6042.5	(49/2 ⁻)	(E2)		Mult.: (Q) intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
6862.3	(53/2 ⁻)	381 1	<60	6481.3	(51/2 ⁻)	[M1+E2]	0.07 3	
		766 1	1.0 $\times$ 10 ² 14	6096.0	(49/2 ⁻)	[E2]		
6976.5	(55/2 ⁺)	908.7 2	100	6067.8	(51/2 ⁺)	[E2]		E_γ : other: 907.8 5 from (¹⁸ O,7n γ).
6981.1	(57/2 ⁻)	860.5 2	100	6120.6	(53/2 ⁻)	[E2]		B(E2)(W.u.)=220 50
								E_γ : others: 860.5 in (HI,xn γ), 858.4 2 from (¹⁸ O,7n γ).
7006.8	(55/2 ⁺)	679.6 2	100	6327.2	(51/2 ⁺)	(E2)		B(E2)(W.u.)=7.7 $\times$ 10 ² 9
								Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
7042.3	(57/2 ⁺)	862.9 2	100	6179.4	(53/2 ⁺)	[E2]		E_γ : other: 860.7 2 from (¹⁸ O,7n γ).
7071.3	(55/2 ⁻)	861.6 2	100	6209.7	(51/2 ⁻)	[E2]		E_γ : other: 860.0 5 from (¹⁸ O,7n γ).
7134.8	(55/2 ⁺)	399.2 5		6735.6	(53/2 ⁺)	[M1+E2]	0.06 3	
		779.9 5		6354.9	(51/2 ⁺)	[E2]		
7183.9	(57/2 ⁺)	843.9 5	100	6340.0	(53/2 ⁺)	(E2)		Mult.: (Q) intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
								E_γ : other: 845.0 2 in (¹⁸ O,7n γ), for γ placed out-of-band to J=45/2 member of gs band rather than in-band; possibly a doublet comprised of this transition and the out-of-band 846.7 γ observed in (⁴⁸ Ca,5n γ) but absent in (¹⁸ O,7n γ).
7235.6	(55/2 ⁻)	373 1	<75	6862.3	(53/2 ⁻)	[M1+E2]	0.07 3	
		754.4 5	100 75	6481.3	(51/2 ⁻)	[E2]		
7300.6	(57/2 ⁻)	831.2 2	100 14	6469.4	(53/2 ⁻)	(E2)		E_γ : other: 829.1 2 from (¹⁸ O,7n γ).
								Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		1180.0 5	<7.1	6120.6	(53/2 ⁻)	[E2]		
7310.0	(57/2 ⁺)	908.9 5	100 50	6401.1	(53/2 ⁺)	[E2]		Mult.: DCO for 908 γ +909 γ doublet consistent with stretched Q.
		970.0 5	100 67	6340.0	(53/2 ⁺)	[E2]		
7327.5	(57/2 ⁻)	878.4 5	100	6449.1	(53/2 ⁻)	[E2]		E_γ : other: 876.4 3 from (¹⁸ O,7n γ).
7551.1	(57/2 ⁺)	416.3 5		7134.8	(55/2 ⁺)	[M1+E2]	0.054 24	
		815.5 5		6735.6	(53/2 ⁺)	[E2]		
7684.9	(57/2 ⁻)	855.8 5	100	6829.1	(53/2 ⁻)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
7724.9	(59/2 ⁻)	912.2 5	100	6812.7	(55/2 ⁻)	[E2]		E_γ : other: 910.0 3 from (¹⁸ O,7n γ).
7743.7	(59/2 ⁺)	736.8 2	100	7006.8	(55/2 ⁺)	(E2)		B(E2)(W.u.)=6.4 $\times$ 10 ² 9
								Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).

Adopted Levels, Gammas (continued)

$\gamma(^{171}\text{Hf})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	α^b	Comments
7902.4	(61/2 ⁻)	921.3 2	100	6981.1	(57/2 ⁻)	[E2]		E_γ : others: 920.4 in (Hf,xn γ), 918.8 2 in (¹⁸ O,7n γ).
7938.7	(59/2 ⁺)	962.2 2	100	6976.5	(55/2 ⁺)	[E2]		E_γ : other: 961.2 5 from (¹⁸ O,7n γ).
7972.7	(61/2 ⁺)	930.4 2	100	7042.3	(57/2 ⁺)	[E2]		E_γ : other: 928.0 1 from (¹⁸ O,7n γ).
7986.2	(59/2 ⁺)	435.1 5		7551.1	(57/2 ⁺)	[M1+E2]	0.048 21	
		851.4 5		7134.8	(55/2 ⁺)	[E2]		
7988.1	(59/2 ⁻)	916.8 5	100	7071.3	(55/2 ⁻)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
8055.6	(59/2 ⁻)	820 1	100	7235.6	(55/2 ⁻)	[E2]		
8080.1	(61/2 ⁺)	896.2 5	100	7183.9	(57/2 ⁺)	(E2)		E_γ : other: 1014.5 5 from (¹⁸ O,7n γ).
								Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
8171.0	(61/2 ⁻)	870.4 2	100	7300.6	(57/2 ⁻)	(E2)		E_γ : other: 868.5 2 from (¹⁸ O,7n γ).
								Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
8273.9	(61/2 ⁻)	946.4 5	100	7327.5	(57/2 ⁻)	(E2)		E_γ : other: 943.0 5 from (¹⁸ O,7n γ).
								Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
8281.0	(61/2 ⁺)	971 1	100	7310.0	(57/2 ⁺)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
8437.0	(61/2 ⁺)	450.8 5		7986.2	(59/2 ⁺)	[M1+E2]	0.044 19	
		885.9 5		7551.1	(57/2 ⁺)	[E2]		
8539.2	(63/2 ⁺)	795.5 2	100	7743.7	(59/2 ⁺)	(E2)		B(E2)(W.u.)=5.9 $\times$ 10 ² 9
								Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
8611.1	(61/2 ⁻)	926.2 5	100	7684.9	(57/2 ⁻)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
8698.8	(63/2 ⁻)	973.9 5	100	7724.9	(59/2 ⁻)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
								E_γ : other: 971.1 4 from (¹⁸ O,7n γ).
8882.6	(65/2 ⁻)	980.2 2	100	7902.4	(61/2 ⁻)			E_γ : others: 980.0 in (Hf,xn γ), 978.0 2 from (¹⁸ O,7n γ).
8905.1	(63/2 ⁺)	468 1		8437.0	(61/2 ⁺)	[M1+E2]	0.040 18	Mult.: D+Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
		919 1		7986.2	(59/2 ⁺)	[E2]		
8944.9	(63/2 ⁺)	1006.2 5	100	7938.7	(59/2 ⁺)	[E2]		E_γ : other: 1004.5 5 from (¹⁸ O,7n γ).
8962.1	(63/2 ⁻)	974.0 5	100	7988.1	(59/2 ⁻)	(E2)		E_γ : other: 971.0 8 from (¹⁸ O,7n γ).
								Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
8964.9	(65/2 ⁺)	992.2 2	100	7972.7	(61/2 ⁺)	(E2)		E_γ : other: 990.5 2 from (¹⁸ O,7n γ).
								Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
9042.1	(65/2 ⁺)	962.0 5	100	8080.1	(61/2 ⁺)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
9092.3	(65/2 ⁻)	921.3 2	100	8171.0	(61/2 ⁻)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
9266.2	(65/2 ⁻)	992.3 5	100	8273.9	(61/2 ⁻)	[E2]		E_γ : other: 988.7 5 from (¹⁸ O,7n γ).
9277.0	(65/2 ⁺)	996 1	100	8281.0	(61/2 ⁺)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
9387.0	(65/2 ⁺)	482 1		8905.1	(63/2 ⁺)	[M1+E2]	0.037 16	
		950 1		8437.0	(61/2 ⁺)	[E2]		
9394.9	(67/2 ⁺)	855.7 2	100	8539.2	(63/2 ⁺)	E2		B(E2)(W.u.)=5.5 $\times$ 10 ² 7
								Mult.: Q intraband γ from (⁴⁸ Ca,5n γ).
9601.2	(65/2 ⁻)	990.1 5	100	8611.1	(61/2 ⁻)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
9714.9	(67/2 ⁻)	1016.1 5	100	8698.8	(63/2 ⁻)	[E2]		E_γ : other: 1014.4 4 from (¹⁸ O,7n γ).
9892.9	(67/2 ⁺)	948.0 5	100	8944.9	(63/2 ⁺)	[E2]		
9917.1	(69/2 ⁻)	1034.5 2	100	8882.6	(65/2 ⁻)	[E2]		E_γ : others: 1035.3 in (Hf,xn γ), 1034.9 2 from (¹⁸ O,7n γ).
9978.1	(67/2 ⁻)	1016 1	100	8962.1	(63/2 ⁻)	(E2)		Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
10011.0	(69/2 ⁺)	1046.1 5	100	8964.9	(65/2 ⁺)	[E2]		E_γ : other: 1043.3 3 from (¹⁸ O,7n γ).

Adopted Levels, Gammas (continued)

$\gamma(^{171}\text{Hf})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	Comments
10060.1	(69/2 ⁺)	1018 <i>1</i>	100	9042.1	(65/2 ⁺)	(E2)	Mult.: (Q) intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ). E γ : other: 1043.3 <i>3</i> from (¹⁸ O,7n γ). Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
10073.7	(69/2 ⁻)	981.4 <i>2</i>	100	9092.3	(65/2 ⁻)	(E2)	Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
10229.0?	(69/2 ⁺)	952 <i>f 1</i>	100	9277.0	(65/2 ⁺)	[E2]	
10299.2	(69/2 ⁻)	1033 <i>1</i>	100	9266.2	(65/2 ⁻)	[E2]	
10309.1	(71/2 ⁺)	914.2 <i>2</i>	100	9394.9	(67/2 ⁺)	(E2)	B(E2)(W.u.)=5.8 $\times$ 10 ² <i>8</i> Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
10645.7	(69/2 ⁻)	1044.5 <i>5</i>	100	9601.2	(65/2 ⁻)	[E2]	
10761.9	(71/2 ⁻)	1047.0 <i>5</i>	100	9714.9	(67/2 ⁻)	[E2]	E γ : other: 1045.1 <i>4</i> from (¹⁸ O,7n γ).
10857.6	(71/2 ⁺)	964.6 <i>2</i>	100	9892.9	(67/2 ⁺)	[E2]	
10995.6	(73/2 ⁻)	1078.5 <i>2</i>	100	9917.1	(69/2 ⁻)	(E2)	E γ : other: 1076.0 <i>2</i> in (¹⁸ O,7n γ), 1085 in (HI,xn γ). Mult.: (Q) intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
11028.1	(71/2 ⁻)	1050 <i>1</i>	100	9978.1	(67/2 ⁻)	[E2]	
11099.1	(73/2 ⁺)	1088.1 <i>5</i>	100	10011.0	(69/2 ⁺)	[E2]	E γ : other: 1090.1 <i>4</i> from (¹⁸ O,7n γ).
11111.9	(73/2 ⁻)	1038.2 <i>5</i>	100	10073.7	(69/2 ⁻)	(E2)	Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
11112.1	(73/2 ⁺)	1052 <i>1</i>	100	10060.1	(69/2 ⁺)	(E2)	Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
11280.7	(75/2 ⁺)	971.6 <i>2</i>	100	10309.1	(71/2 ⁺)	(E2)	B(E2)(W.u.)=6.0 $\times$ 10 ² <i>11</i> Mult.: (Q) intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
11729.4	(73/2 ⁻)	1083.6 <i>5</i>	100	10645.7	(69/2 ⁻)	[E2]	
11810.1	(75/2 ⁻)	1048.2 <i>5</i>	100	10761.9	(71/2 ⁻)	[E2]	E γ : other: 1065.1 <i>4</i> from (¹⁸ O,7n γ).
11859.9	(75/2 ⁺)	1002.3 <i>5</i>	100	10857.6	(71/2 ⁺)	[E2]	
12104.5	(77/2 ⁻)	1108.9 <i>5</i>	100	10995.6	(73/2 ⁻)	[E2]	E γ : other: 1097.0 <i>2</i> from (¹⁸ O,7n γ).
12187.1	(77/2 ⁺)	1075 <i>1</i>	100	11112.1	(73/2 ⁺)	[E2]	
12199.0	(77/2 ⁺)	1099.9 <i>5</i>	100	11099.1	(73/2 ⁺)	[E2]	
12199.9	(77/2 ⁻)	1088 <i>1</i>	100	11111.9	(73/2 ⁻)	[E2]	
12306.6	(79/2 ⁺)	1025.9 <i>2</i>	100	11280.7	(75/2 ⁺)	(E2)	Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
12829.4	(77/2 ⁻)	1100 <i>1</i>	100	11729.4	(73/2 ⁻)	[E2]	
12890.1	(79/2 ⁻)	1080.0 <i>5</i>	100	11810.1	(75/2 ⁻)	[E2]	
12910.9	(79/2 ⁺)	1051 <i>1</i>	100	11859.9	(75/2 ⁺)	[E2]	
13240.2	(81/2 ⁻)	1135.7 <i>5</i>	100	12104.5	(77/2 ⁻)	[E2]	E γ : other: 1133.4 <i>2</i> from (¹⁸ O,7n γ).
13313.9	(81/2 ⁻)	1114 <i>1</i>	100	12199.9	(77/2 ⁻)	[E2]	
13332.0	(81/2 ⁺)	1133 <i>1</i>	100	12199.0	(77/2 ⁺)	[E2]	
13385.8	(83/2 ⁺)	1079.2 <i>2</i>	100	12306.6	(79/2 ⁺)	(E2)	Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
14016.8	(83/2 ⁻)	1126.7 <i>5</i>	100	12890.1	(79/2 ⁻)	[E2]	
14407.2	(85/2 ⁻)	1167 <i>1</i>	100	13240.2	(81/2 ⁻)	[E2]	E γ : other: 1162.2 <i>2</i> from (¹⁸ O,7n γ).
14515.7	(87/2 ⁺)	1129.9 <i>2</i>	100	13385.8	(83/2 ⁺)	(E2)	Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
15195.8	(87/2 ⁻)	1179 <i>1</i>	100	14016.8	(83/2 ⁻)	[E2]	
15602.2	(89/2 ⁻)	1195 <i>1</i>	100	14407.2	(85/2 ⁻)	[E2]	
15698.4	(91/2 ⁺)	1182.7 <i>2</i>	100	14515.7	(87/2 ⁺)	(E2)	Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
16431.8	(91/2 ⁻)	1236 <i>1</i>	100	15195.8	(87/2 ⁻)	[E2]	
16933.9	(95/2 ⁺)	1235.5 <i>5</i>	100	15698.4	(91/2 ⁺)	(E2)	Mult.: Q intraband γ from ¹²⁸ Te(⁴⁸ Ca,5n γ).
17732.8?	(95/2 ⁻)	1301 <i>f 1</i>	100	16431.8	(91/2 ⁻)	[E2]	

Adopted Levels, Gammas (continued)

$\gamma(^{171}\text{Hf})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]
18226.5	(99/2 ⁺)	1292.6 5	100	16933.9	(95/2 ⁺)	[E2]
19575.2	(103/2 ⁺)	1348.7 5	100	18226.5	(99/2 ⁺)	[E2]
20981.2	(107/2 ⁺)	1406 1	100	19575.2	(103/2 ⁺)	[E2]
717.50+x	(J+2)	717.5 2	100	0.0+x	J	[E2]
1490.0+x	(J+4)	772.5 5	100	717.50+x	(J+2)	[E2]
2321.7+x	(J+6)	831.7 2	100	1490.0+x	(J+4)	[E2]
3213.8+x	(J+8)	892.1 2	100	2321.7+x	(J+6)	[E2]
4167.6+x	(J+10)	953.8 2	100	3213.8+x	(J+8)	[E2]
5184.3+x	(J+12)	1016.7 5	100	4167.6+x	(J+10)	[E2]
6265.1+x	(J+14)	1080.8 5	100	5184.3+x	(J+12)	[E2]
7409.8+x	(J+16)	1144.7 5	100	6265.1+x	(J+14)	[E2]
8621.4+x	(J+18)	1211.6 5	100	7409.8+x	(J+16)	[E2]
9899.4+x	(J+20)	1278 1	100	8621.4+x	(J+18)	[E2]

[†] Relative photon branching from each level. data are from ¹²⁸Te(⁴⁸Ca,5n γ), except As noted. Upper limits are given for photon branchings affected by multiple placement.

[‡] From (⁴⁸Ca,5n γ) except As noted.

From (HI,xn γ), except where noted.

@ From (HI,xn γ).

& From ¹⁷¹Ta ε decay.

^a From ε decay.

^b 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.

^c Multiply placed.

^d Multiply placed with undivided intensity.

^e Multiply placed with intensity suitably divided.

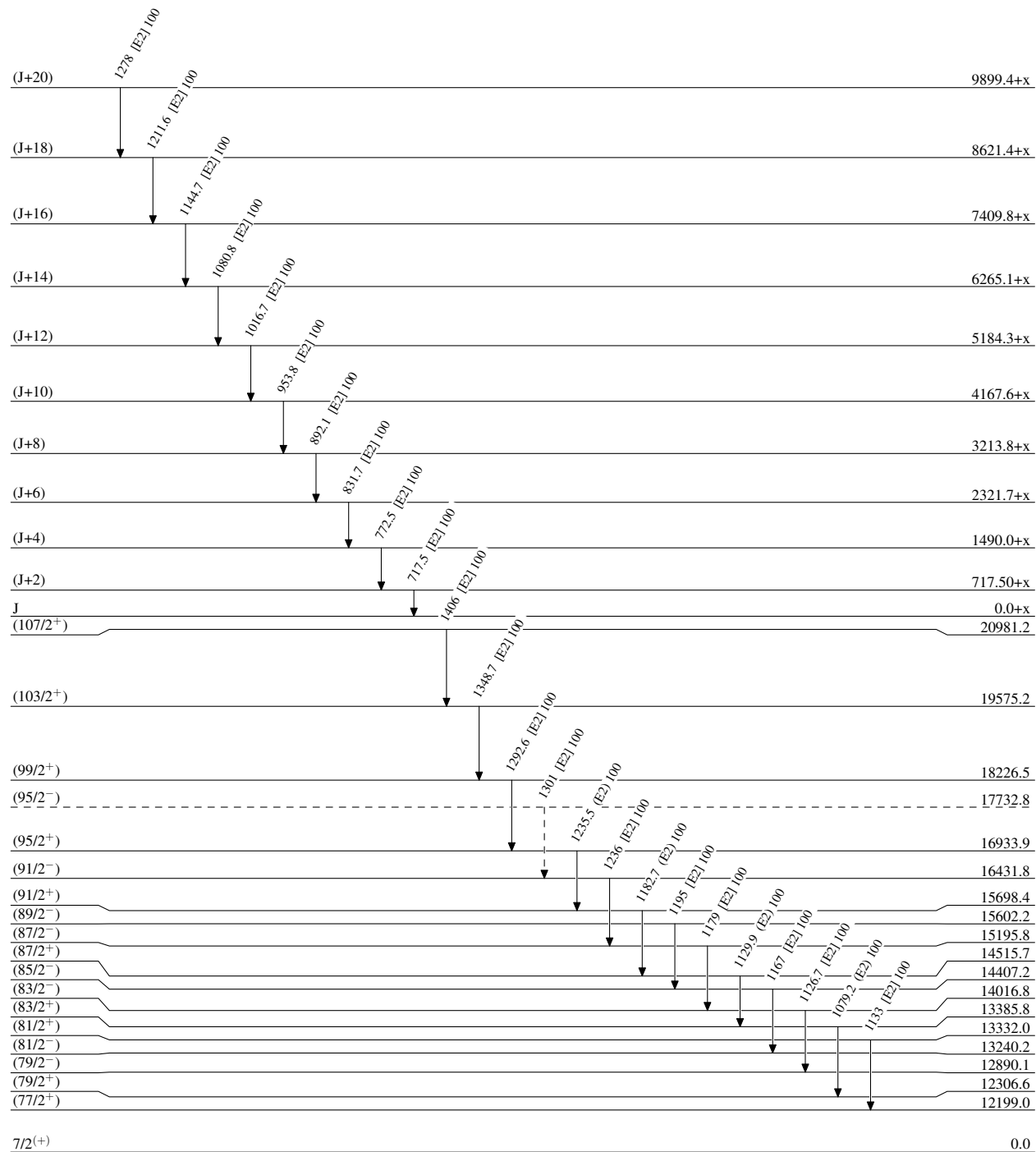
^f Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Legend

Level Scheme

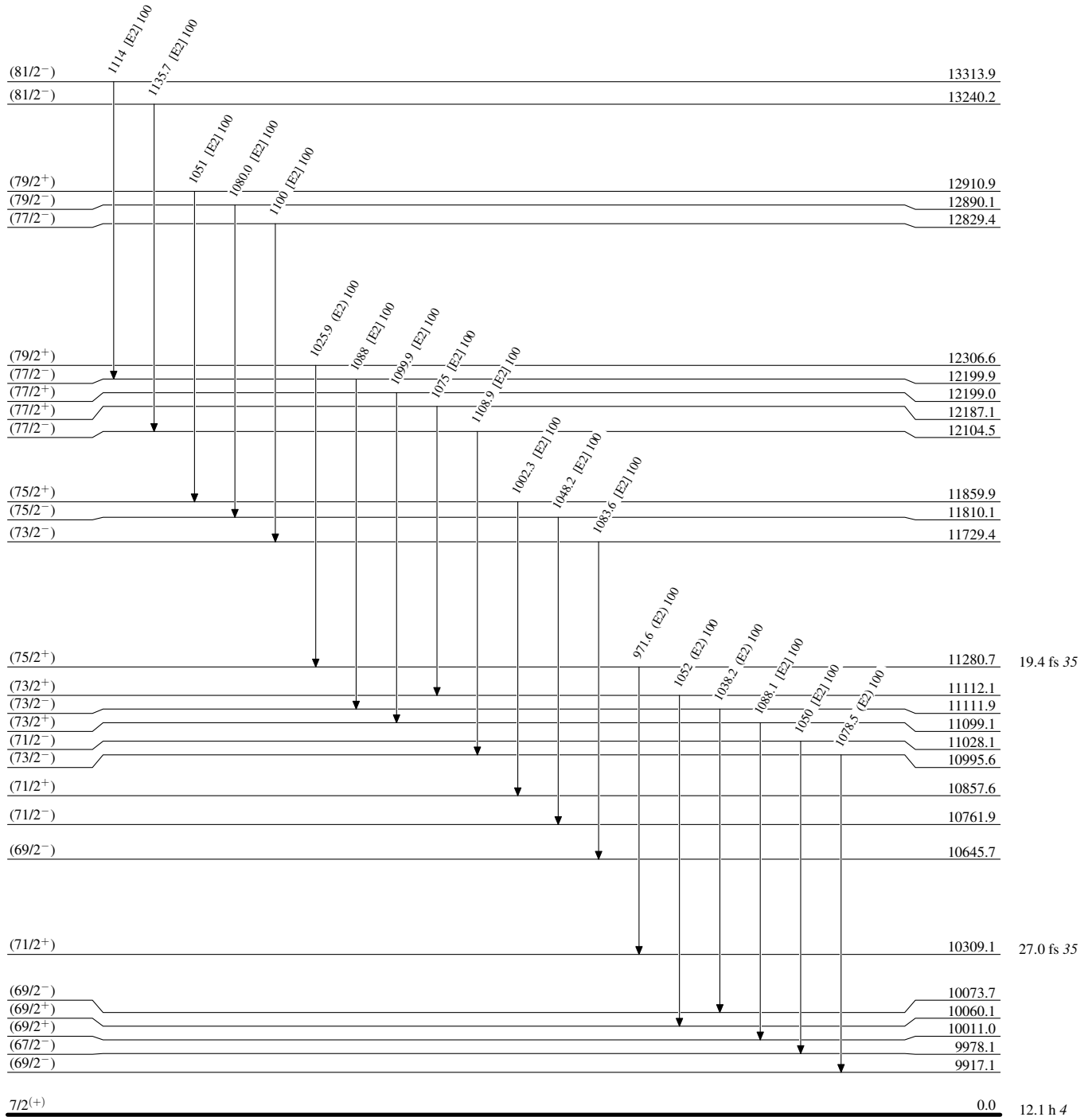
Intensities: Relative photon branching from each level

-----► γ Decay (Uncertain)

12.1 h 4

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

Intensities: Relative photon branching from each level

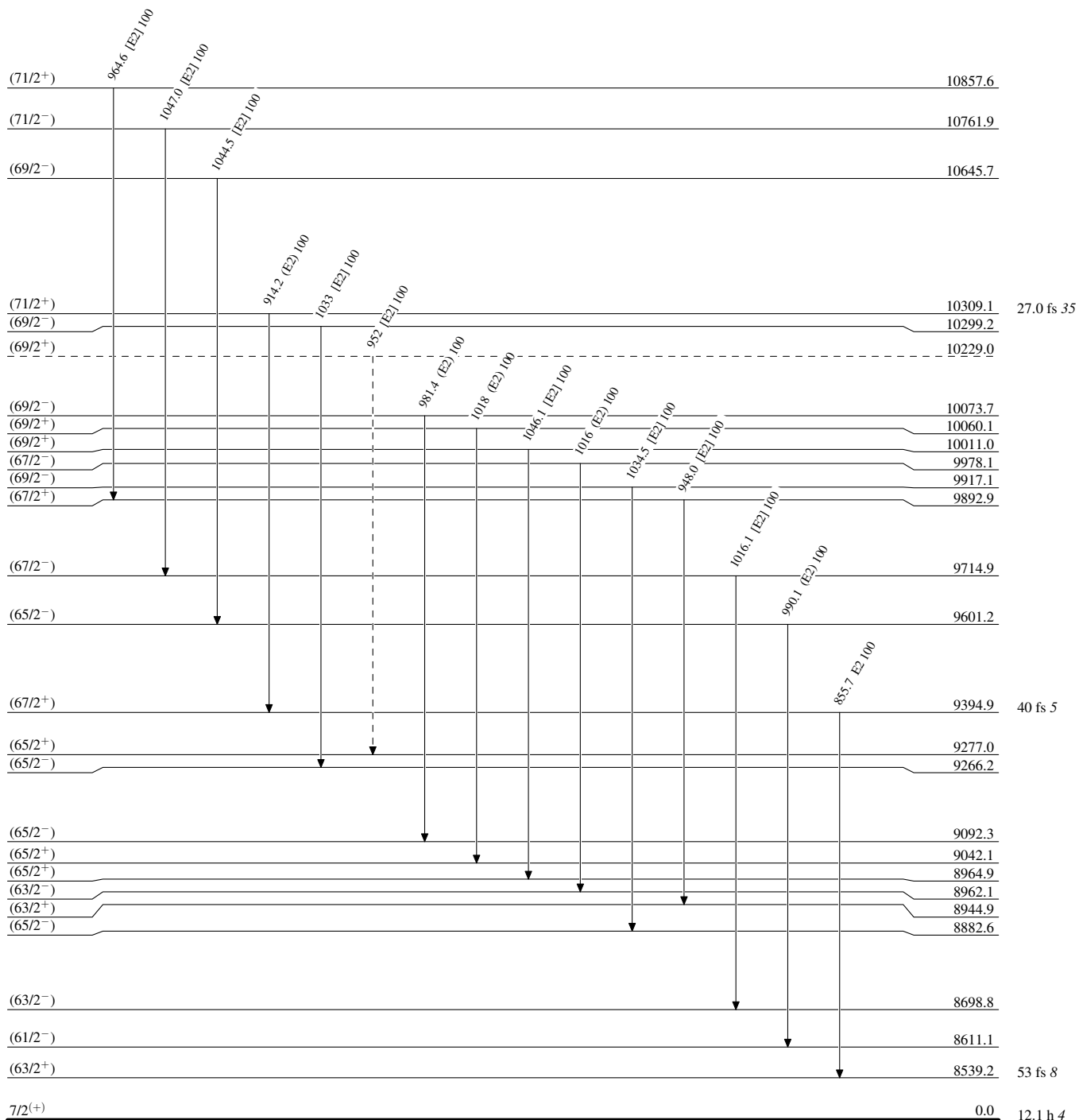


Adopted Levels, Gammas

Legend

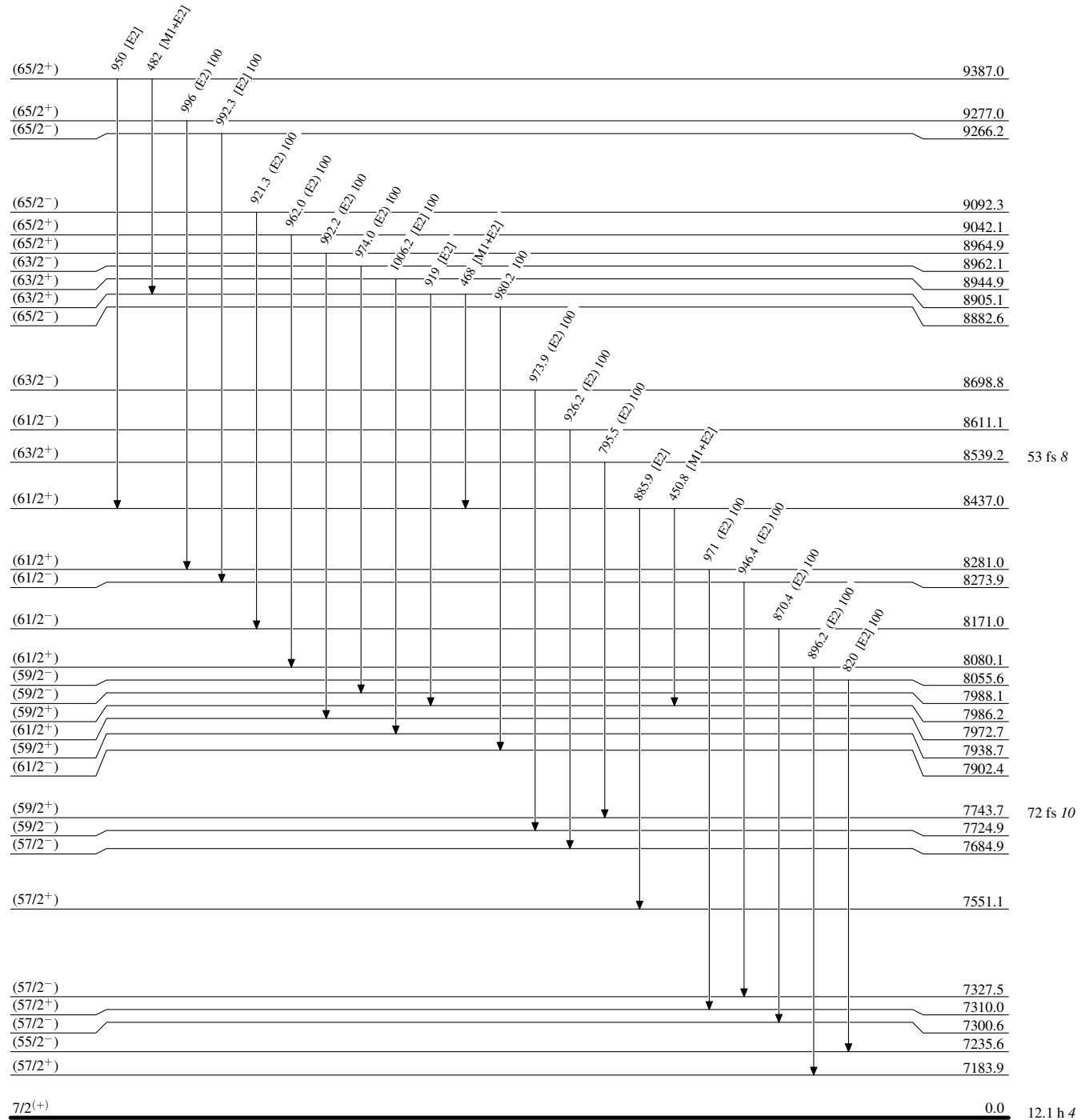
Level Scheme (continued)

Intensities: Relative photon branching from each level

-----► γ Decay (Uncertain)


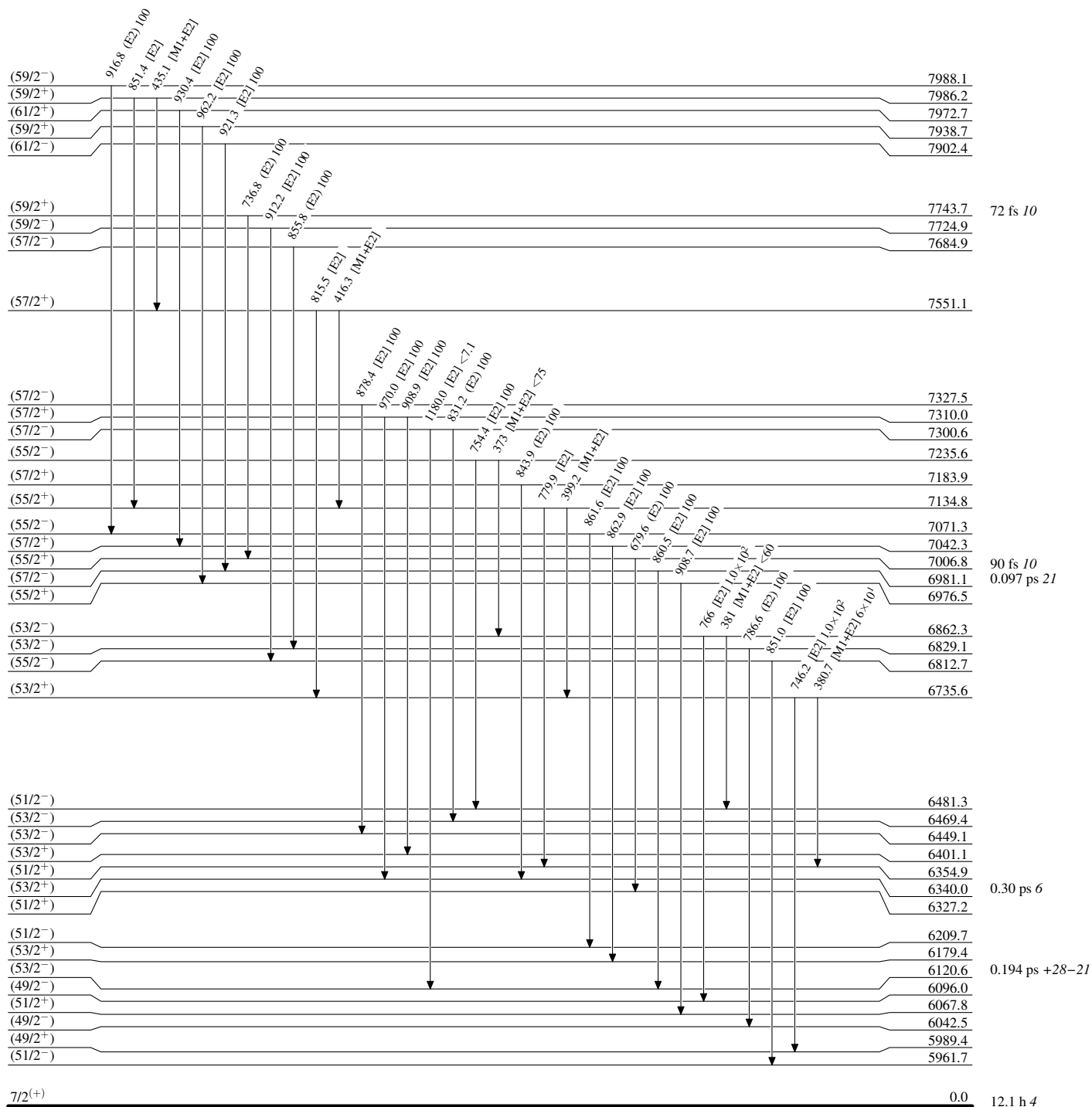
Adopted Levels, Gammas**Level Scheme (continued)**

Intensities: Relative photon branching from each level



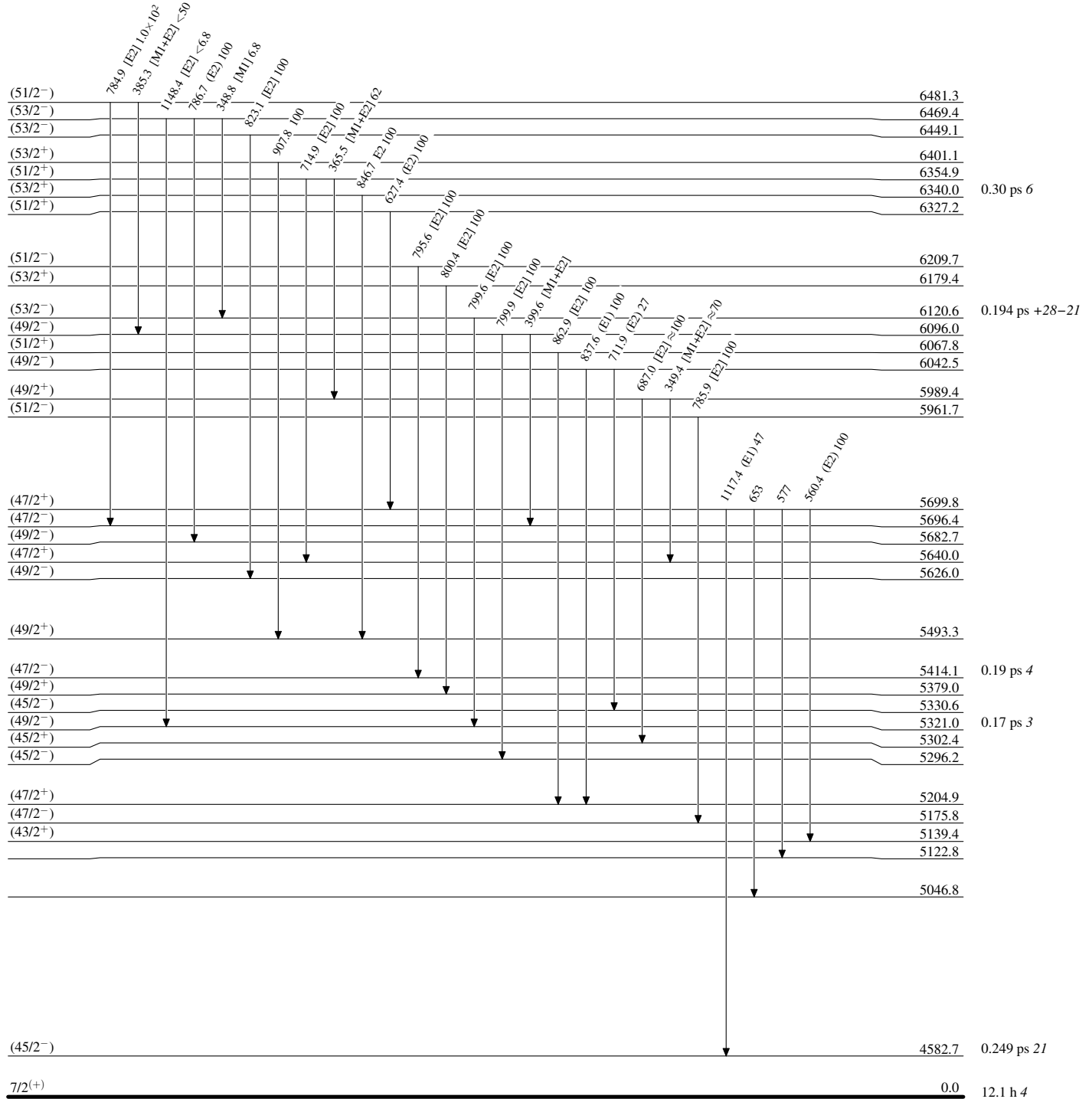
Adopted Levels, Gammas**Level Scheme (continued)**

Intensities: Relative photon branching from each level



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

Intensities: Relative photon branching from each level

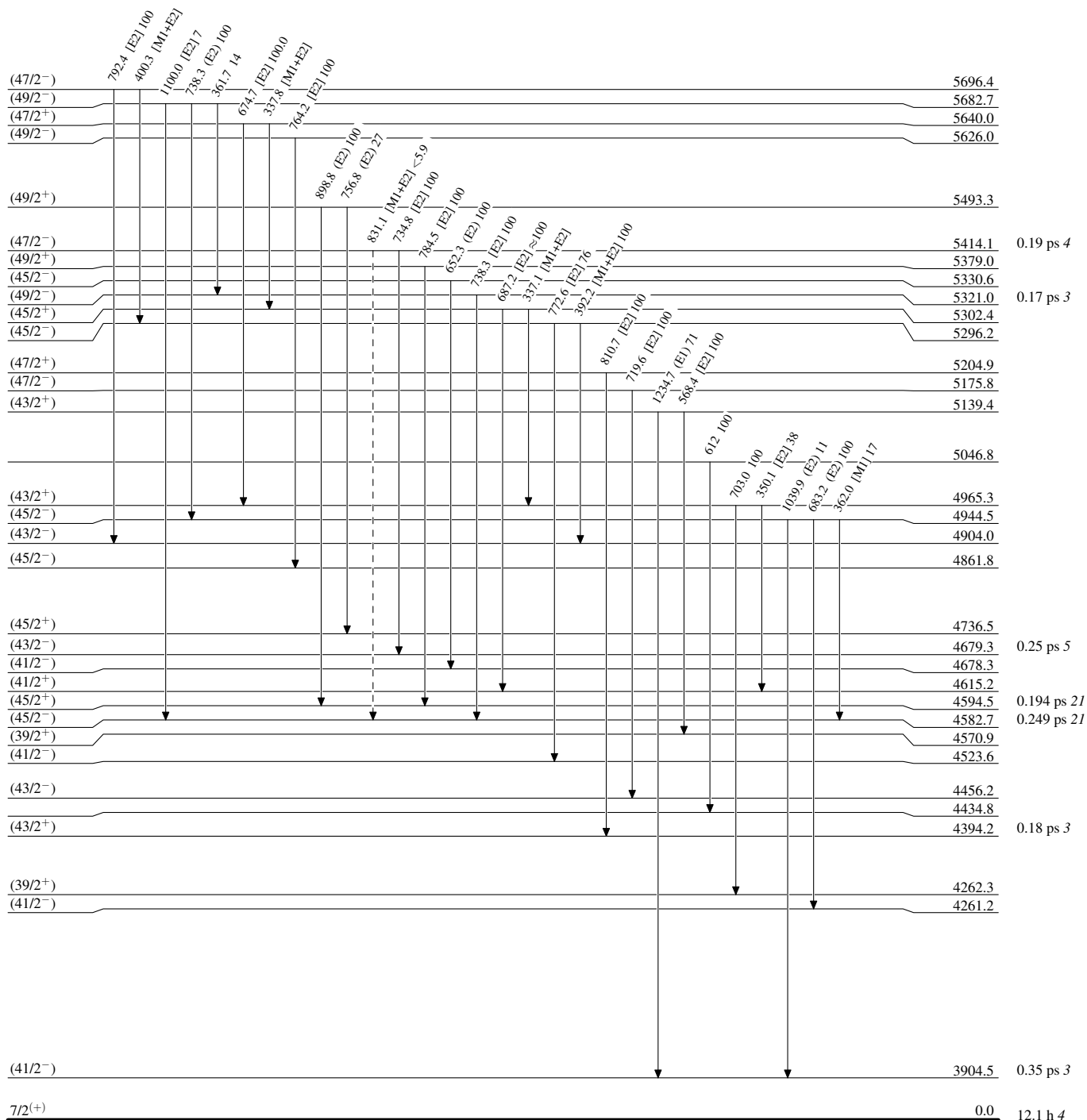


Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

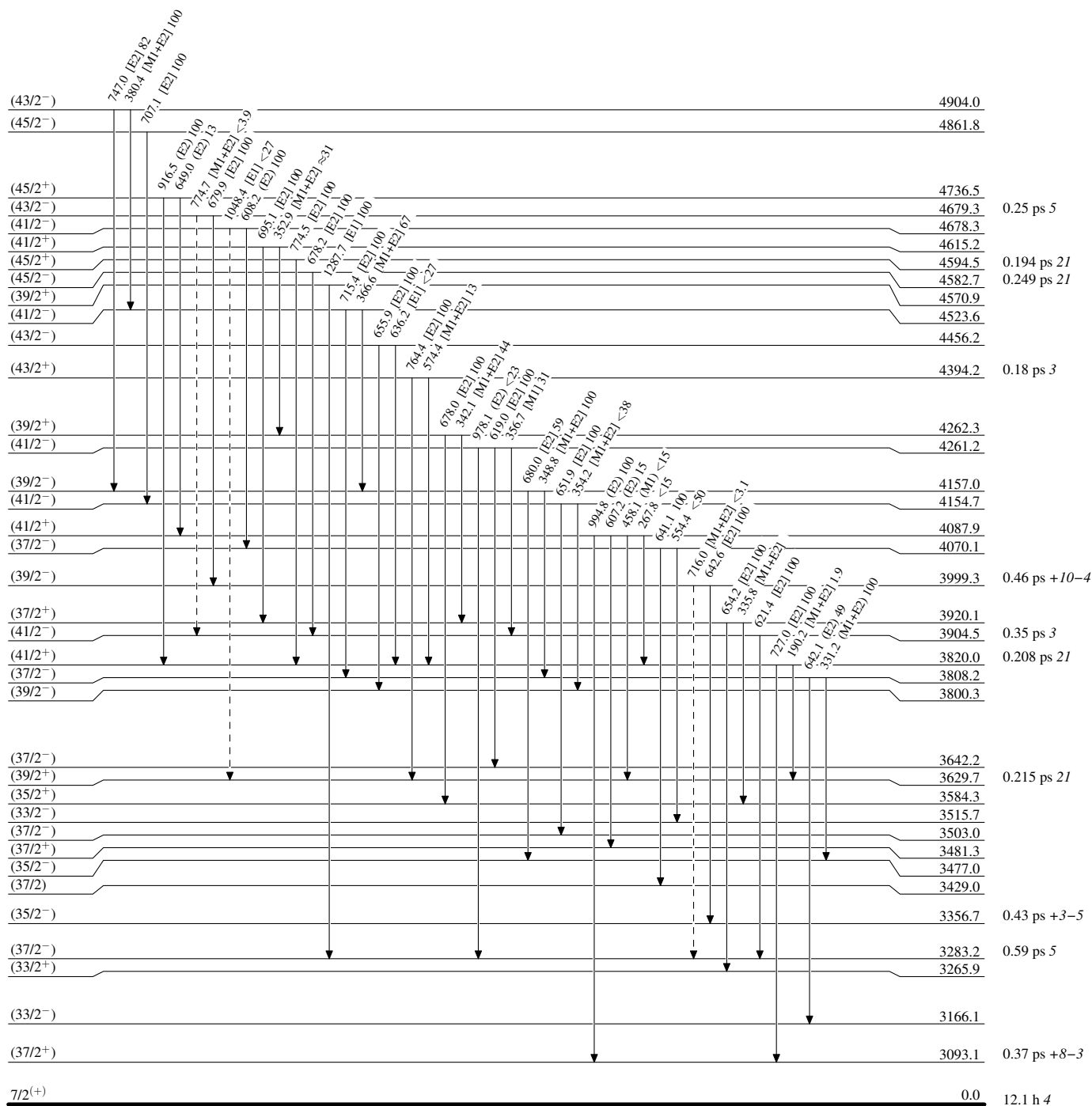
-----► γ Decay (Uncertain)


Adopted Levels, Gammas

Legend

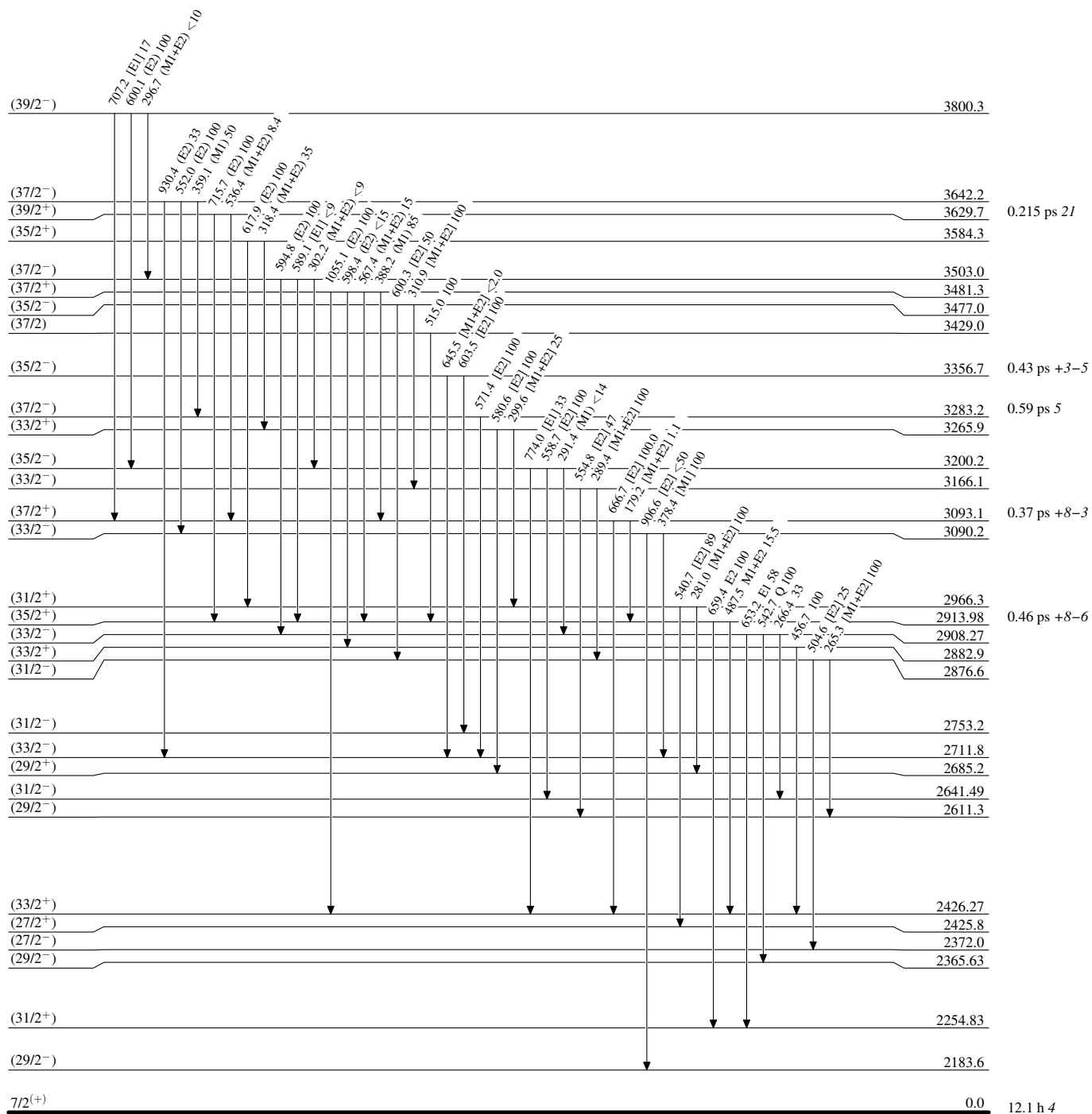
Level Scheme (continued)

Intensities: Relative photon branching from each level

-----► γ Decay (Uncertain)

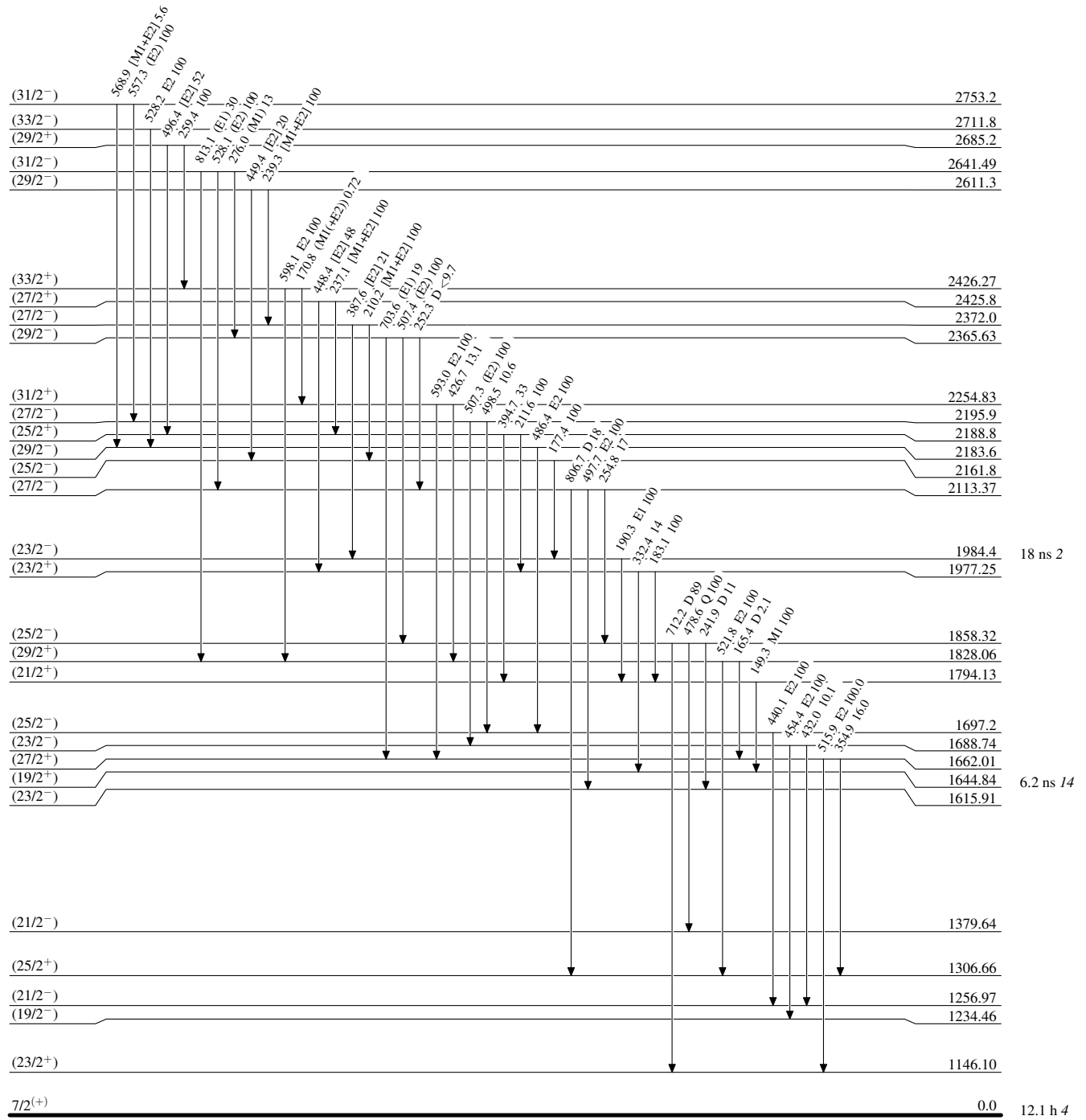
Adopted Levels, Gammas**Level Scheme (continued)**

Intensities: Relative photon branching from each level



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

Intensities: Relative photon branching from each level

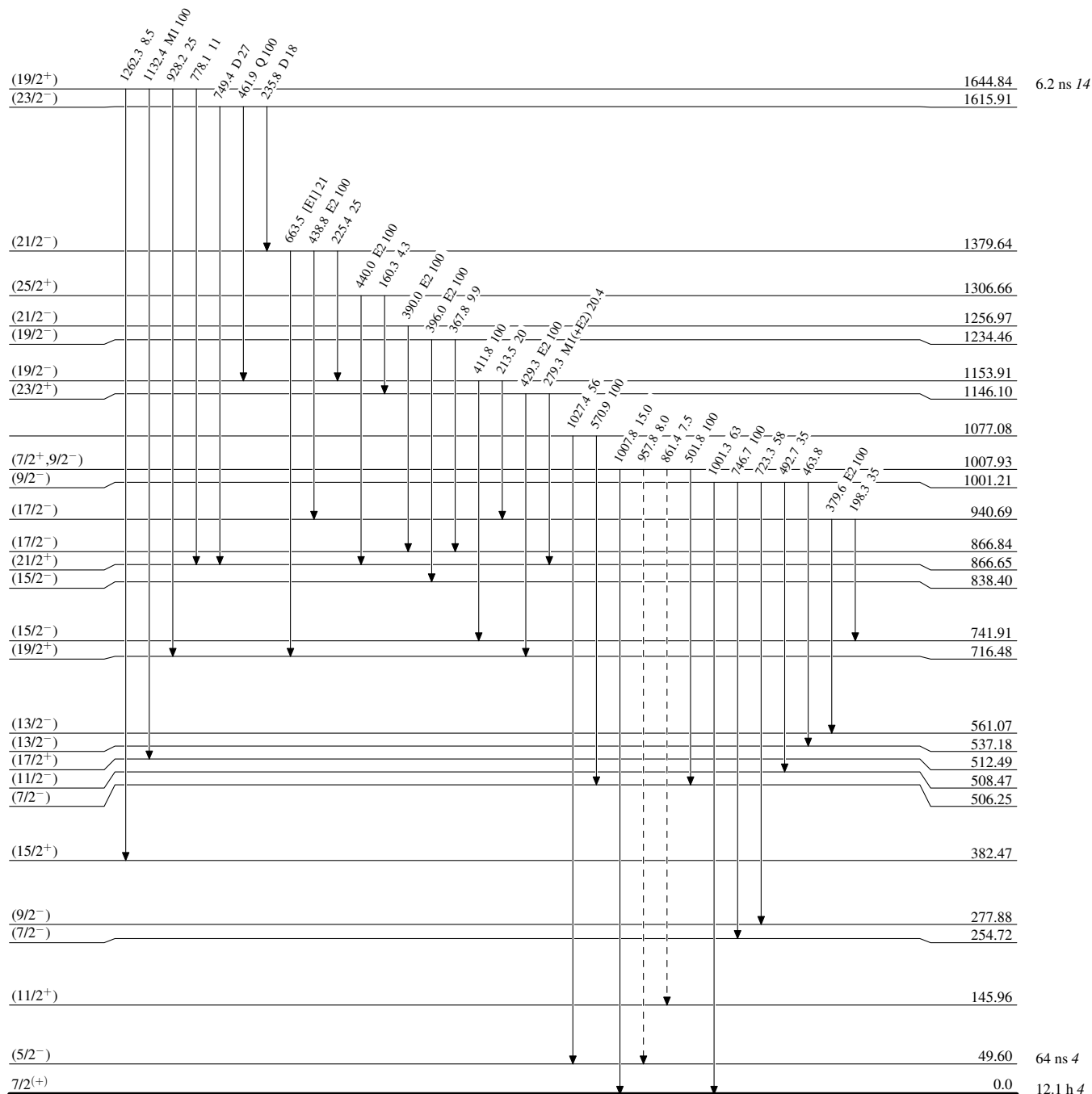


Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

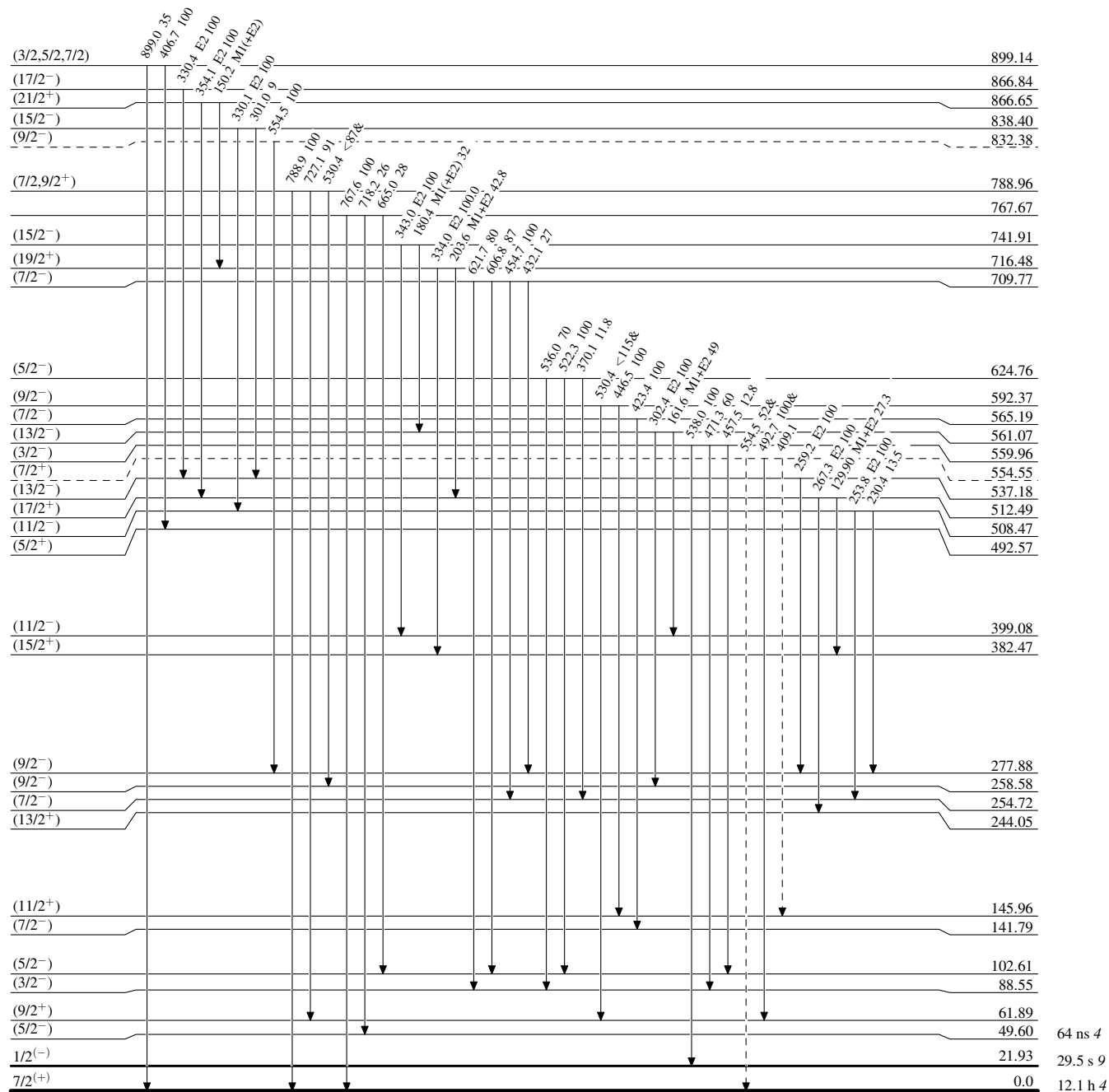
-----► γ Decay (Uncertain)

 $^{171}_{72}\text{Hf}_{99}$

Adopted Levels, Gammas

Legend

Level Scheme (continued)

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

-----► γ Decay (Uncertain) $^{171}_{72}\text{Hf}_{99}$

64 ns 4

29.5 s 9

12.1 h 4

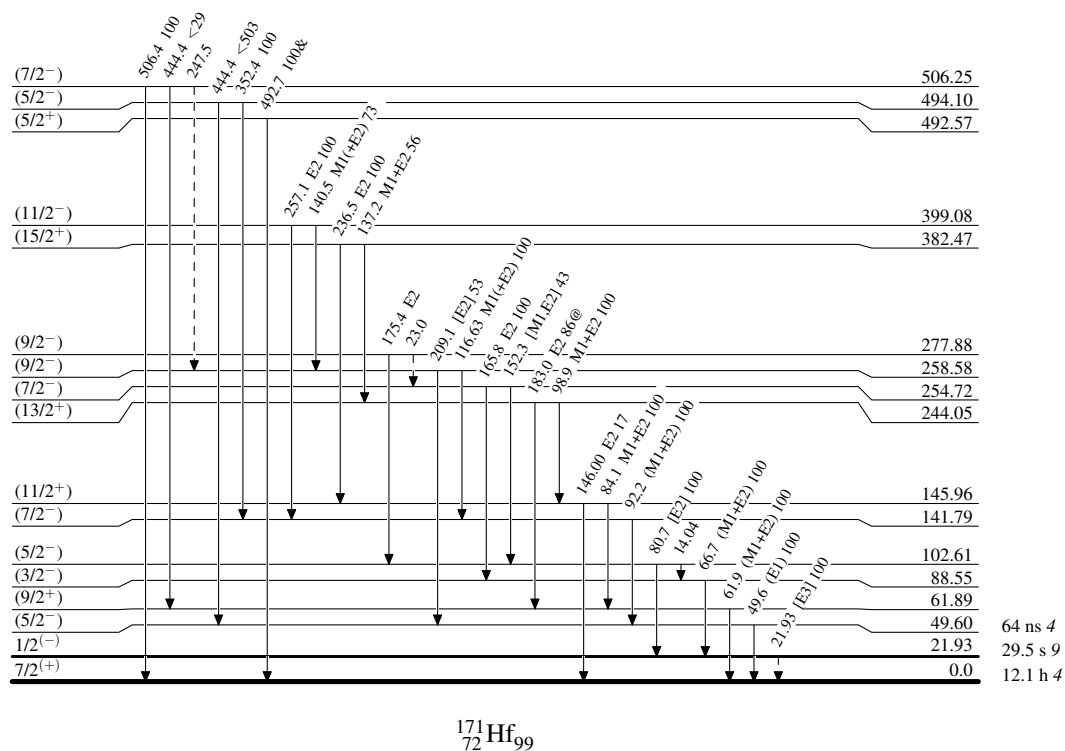
Adopted Levels, Gammas

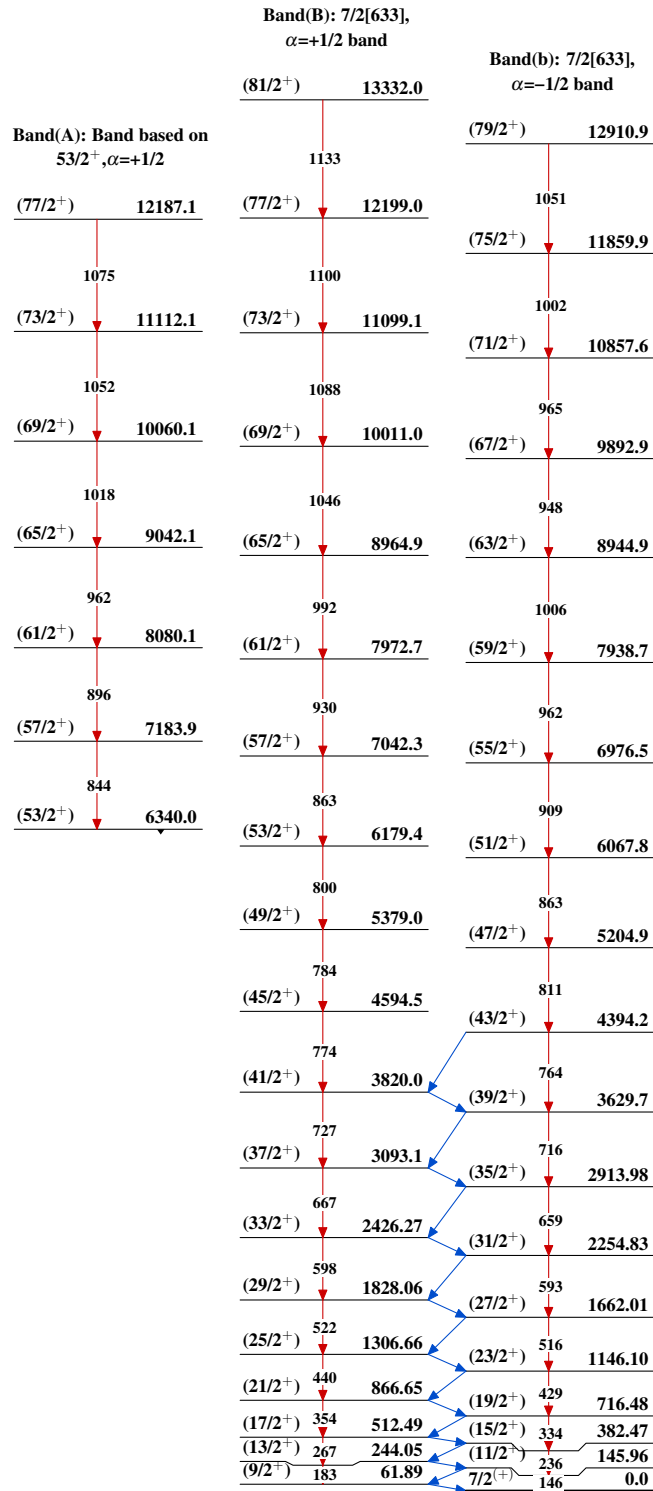
Level Scheme (continued)

Legend

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

-----► γ Decay (Uncertain)



Adopted Levels, Gammas $^{171}_{72}\text{Hf}_{99}$

Adopted Levels, Gammas (continued)

Band(C): Possible
3/2[521] band (1974La24)

(9/2⁻) 832.38

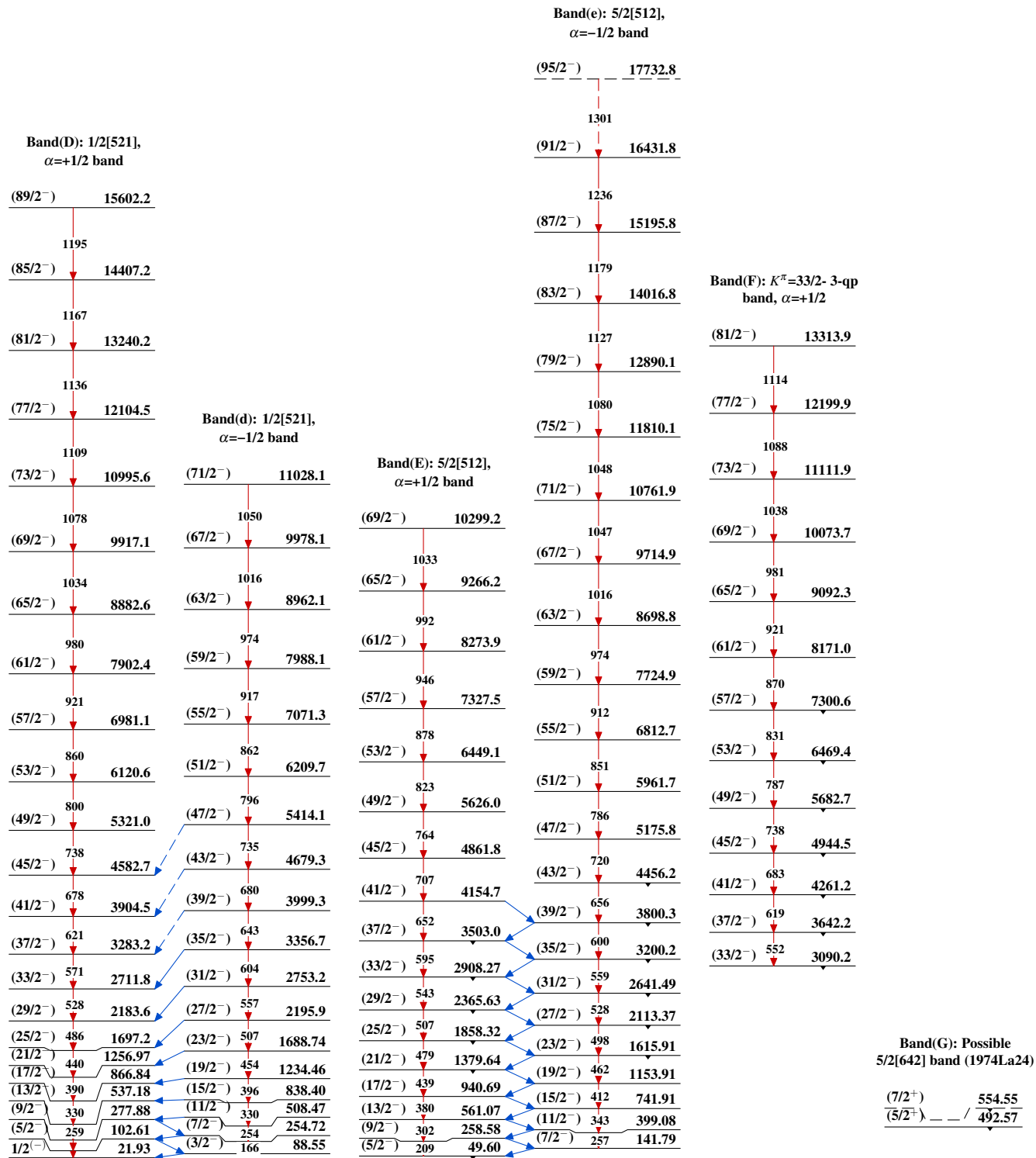
(7/2⁻) 709.77

(5/2⁻) 624.76

(3/2⁻) 559.96

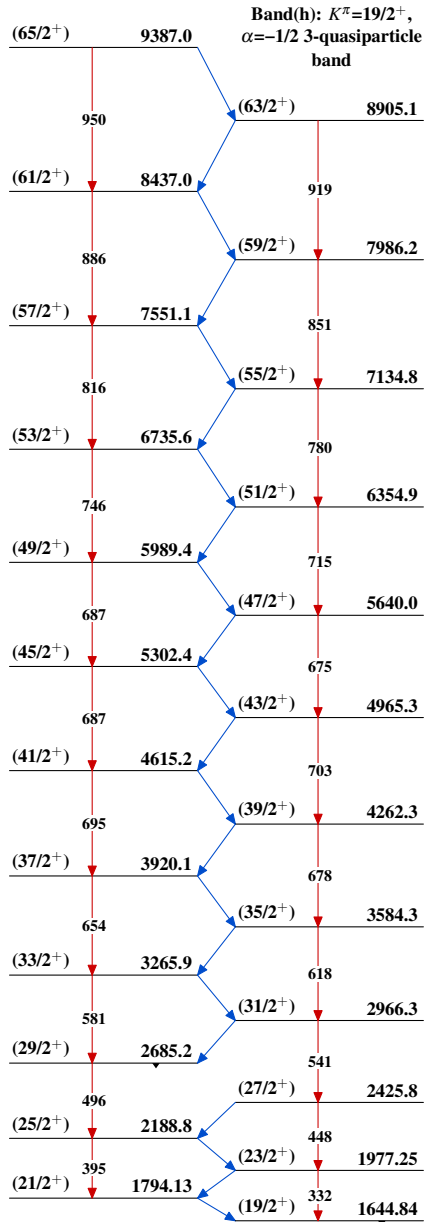
$^{171}_{72}\text{Hf}_{99}$

Adopted Levels, Gammas (continued)



Adopted Levels, Gammas (continued)

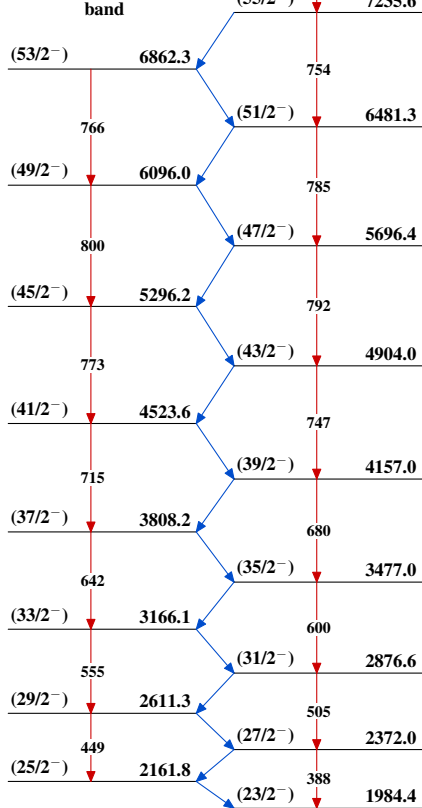
Band(H): $K^\pi=19/2^+$,
 $\alpha=+1/2$, 3-quasiparticle
 band



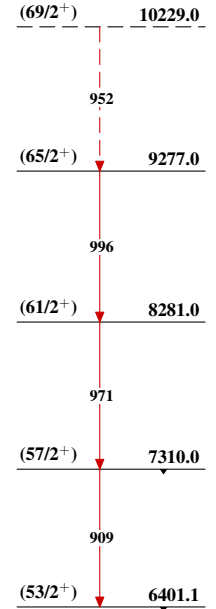
Band(h): $K^\pi=19/2^+$,
 $\alpha=-1/2$ 3-quasiparticle
 band

Band(i): $K^\pi=23/2^-$,
 $\alpha=-1/2$ 3-quasiparticle
 band

Band(l): $K^\pi=23/2^-$,
 $\alpha=+1/2$ 3-quasiparticle
 band



Band(K): Band based on
 $53/2^+$, $\alpha=+1/2$

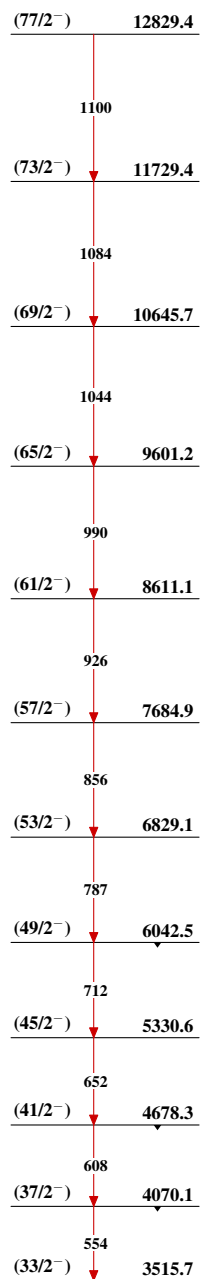


Band(J): 5/2[523] band
 (1974La24)

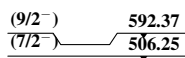


Adopted Levels, Gammas (continued)

Band(M): 3-qp, MAB band



Band(L): Possible
7/2[514] band (1974La24)



Band(O): ED-2 band

(J+20)	9899.4+x
(J+18)	1278 8621.4+x
(J+16)	1212 7409.8+x
(J+14)	1145 6265.1+x
(J+12)	1081 5184.3+x
(J+10)	1017 4167.6+x
(J+8)	954 3213.8+x
(J+6)	892 2321.7+x
(J+4)	832 1490.0+x
(J+2)	772 717.50+x
J	718 0.0+x

Band(N): ED-1 band

$(107/2^+)$	20981.2
$(103/2^+)$	19575.2
$(99/2^+)$	18226.5
$(95/2^+)$	16933.9
$(91/2^+)$	15698.4
$(87/2^+)$	14515.7
$(83/2^+)$	13385.8
$(79/2^+)$	12306.6
$(75/2^+)$	11280.7
$(71/2^+)$	10309.1
$(67/2^+)$	9394.9
$(63/2^+)$	8539.2
$(59/2^+)$	7743.7
$(55/2^+)$	7006.8
$(51/2^+)$	6327.2
$(47/2^+)$	5699.8
$(43/2^+)$	5139.4
$(39/2^+)$	4570.9

**Band(P): $\alpha=+1/2$ band
based on $(33/2^+)$**

$(49/2^+)$		5493.3
$(45/2^+)$	757	4736.5
$(41/2^+)$	649	4087.9
$(37/2^+)$	607	3481.3
$(33/2^+)$	598	2882.9