Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 194,460 (2024)	31-Oct-2022

Q(β^-)=−5790 *30*; S(n)=7890 *30*; S(p)=4280 *40*; Q(α)=3770 *30* 2021Wa16
Q(ε)=4810 *40*, Q(εp)=2090 *30*, S(2n)=18510 *40*, S(2p)=6920 *30* (2021Wa16).
Mass measurement: 2000Ra23.
Additional information 1.

^{165}Hf Levels

Nomenclature for quasiparticle configurations:
A, B, C, and D: $\nu i_{13/2}$ orbitals.
E and F: N=5, negative-parity neutron orbitals.
A_p, B_p: $\pi h_{11/2}$ orbitals.

Cross Reference (XREF) Flags

A ^{165}Ta ε decay (31.0 s)
B ^{130}Te(^{40}Ca,5nγ)
C ^{148}Sm(^{22}Ne,5nγ),

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	XREF	Comments
0.0[c]	(5/2$^-$)	76 s *4*	BC	%ε+%β^+=100 J$^\pi$: orbitals ν5/2[523] and ν3/2[521] close to the Fermi surface suggest 5/2$^-$ or 3/2$^-$; 5/2$^-$ assigned tentatively by 1987Bl06. $T_{1/2}$: from ^{165}Hf decay (1989Hi04). Others: 75 s *3* (1981LiZM), 102 s *6* (1981Br30).
76.4 *6*	(7/2$^-$)		BC	E(level): either 76.4, (7/2$^-$) or 93.9, (7/2$^-$) may be a signature partner member of E band.
93.9 *6*	(7/2$^-$)		B	E(level): either 76.4, (7/2$^-$) or 93.9, (7/2$^-$) may be a signature partner member of E band.
119.6[&] *9*	(13/2$^+$)		BC	
218.3[c] *4*	(9/2$^-$)		BC	
334.9[&] *8*	(17/2$^+$)		BC	
530.8[c] *5*	(13/2$^-$)		BC	
532.4[a] *8*	(15/2$^+$)		BC	
716.2[&] *8*	(21/2$^+$)		BC	
938.6[a] *8*	(19/2$^+$)		BC	
954.6[c] *6*	(17/2$^-$)		BC	
1224.8[&] *8*	(25/2$^+$)		BC	
1436.1[c] *7*	(21/2$^-$)		BC	
1468.1[a] *8*	(23/2$^+$)		BC	
1732.7[b] *9*	(23/2$^-$)		BC	
1826.1[&] *8*	(29/2$^+$)		BC	
1861.5[#] *10*	(23/2$^-$)		B	
1873.3[d] *7*	(25/2$^-$)		BC	
2017.7[c] *7*	(25/2$^-$)		BC	
2067.3[b] *8*	(27/2$^-$)		BC	
2075.2[a] *8*	(27/2$^+$)		BC	
2313.9[#] *10*	(27/2$^-$)		BC	
2338.9[d] *8*	(29/2$^-$)		BC	

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Adopted Levels, Gammas (continued)

^{165}Hf Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	XREF	Comments
2423.8[c] 8	(29/2$^-$)	BC	
2471.6[b] 8	(31/2$^-$)	BC	
2485.9[&] 9	(33/2$^+$)	BC	
2728.7[a] 9	(31/2$^+$)	BC	
2759.4[#] 10	(31/2$^-$)	BC	
2840.2[c] 8	(33/2$^-$)	BC	
2870.2[d] 8	(33/2$^-$)	BC	
2960.3[b] 9	(35/2$^-$)	BC	
3167.6[&] 9	(37/2$^+$)	BC	
3264.7[#] 10	(35/2$^-$)	BC	
3362.9[c] 8	(37/2$^-$)	BC	
3405.9[a] 9	(35/2$^+$)	BC	XREF: B(?).
3454.9[d] 9	(37/2$^-$)	BC	
3554.4[@] 10	(37/2$^+$)	B	
3560.2[b] 9	(39/2$^-$)	BC	
3843.2[&] 10	(41/2$^+$)	BC	
3849.6[#] 10	(39/2$^-$)	BC	
3988.5[c] 9	(41/2$^-$)	BC	
4110.9[d] 9	(41/2$^-$)	BC	
4167.8[@] 10	(41/2$^+$)	B	
4276.8[b] 10	(43/2$^-$)	BC	
4513.8[#] 12	(43/2$^-$)	BC	
4532.7[&] 10	(45/2$^+$)	BC	
4717.8[c] 9	(45/2$^-$)	BC	
4831.7[d] 10	(45/2$^-$)	BC	
4861.1[@] 10	(45/2$^+$)	B	
5087.9[b] 11	(47/2$^-$)	BC	
5258.9[#] 12	(47/2$^-$)	BC	
5272.2[&] 11	(49/2$^+$)	BC	
5536.2[c] 10	(49/2$^-$)	BC	
5604.8[@] 12	(49/2$^+$)	B	
5614.0[d] 11	(49/2$^-$)	BC	
5931.9[b] 12	(51/2$^-$)	BC	
6079.2[&] 11	(53/2$^+$)	BC	
6087.6[#] 13	(51/2$^-$)	B	
6393.2[c] 12	(53/2$^-$)	B	
6411.5[@] 16	(53/2$^+$)	B	
6484.1[d] 15	(53/2$^-$)	B	
6780.9[b] 13	(55/2$^-$)	BC	
6961.8[&] 12	(57/2$^+$)	BC	
7270.4[@] 19	(57/2$^+$)	B	
7272.3[c] 13	(57/2$^-$)	B	
7419.6?[d] 18	(57/2$^-$)	B	XREF: B(?).
7668.1[b] 17	(59/2$^-$)	B	
7914.1[&] 13	(61/2$^+$)	BC	

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Adopted Levels, Gammas (continued)

^{165}Hf Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	XREF	Comments
8184.8?[@] *21*	(61/2$^+$)	B	XREF: B(?).
8198.6[c] *17*	(61/2$^-$)	B	
8604.9[b] *19*	(63/2$^-$)	B	
8882.8[&] *16*	(65/2$^+$)	B	
9177.9?[@] *23*	(65/2$^+$)	B	XREF: B(?).
9178.4?[c] *19*	(65/2$^-$)	B	XREF: B(?).
9585.8[b] *20*	(67/2$^-$)	B	
9928.7?[&] *19*	(69/2$^+$)	B	XREF: B(?).

[†] From a least-squares fit to Eγ data.
[‡] As proposed in ^{130}Te(^{40}Ca,5nγ) (1993Ne01), and ^{148}Sm(^{22}Ne,5nγ) (1987Bl06) reactions, based on multipolarities and ΔJ values deduced from $\gamma\gamma(\theta)$(DCO) data in both the reactions, combined with membership in bands. Ascending spins with excitation energy are assumed in yrast pattern of population of levels in heavy-ion γ-ray reactions. Assignments for bandheads are proposed based on theoretical predictions.
[#] Band(A): Band based on (23/2$^-$), α=−1/2.
[@] Band(B): Band based on (37/2$^+$), α=+1/2.
[&] Band(C): $\nu i_{13/2}$ band, α=+1/2. Configuration=ABC at 41/2$^+$, tentative ABCA$_p$B$_p$ at 61/2$^+$. Average g factor=0.14 *3* (1996We01,transient-field technique). The value represents a weighted average of 0.13 *6* at E(^{40}Ca)=175 MeV, 0.17 *5* at E(^{40}Ca)=180 MeV, and 0.12 *5* at E(^{40}Ca)=182.5 MeV.
[a] Band(c): $i_{13/2}$ band, α=−1/2.
[b] Band(D): ABF band, α=−1/2. Configuration=ABCDF at 55/2$^-$.
[c] Band(E): ν5/2[523] or E, α=+1/2. Configuration=ABE at 29/2$^-$, ABCDE at 53/2$^-$.
[d] Band(F): Band based on (25/2$^-$), α=+1/2.

γ(^{165}Hf)

E$_i$(level)	J$_i^{\pi}$	E$_\gamma$[†]	I$_\gamma$[†]	E$_f$	J$_f^{\pi}$	Mult.[#]	Comments
76.4	(7/2$^-$)	76.2 *10*	100	0.0	(5/2$^-$)		E$_\gamma$: from (^{40}Ca,5nγ). Other: 76 *1* from (^{22}Ne,5nγ).
93.9	(7/2$^-$)	93.4 *10*	100	0.0	(5/2$^-$)		
218.3	(9/2$^-$)	124.2 *6*	59 *19*	93.9	(7/2$^-$)		
		141.9[‡] *5*	59 *13*	76.4	(7/2$^-$)	(D)	E$_\gamma$: other: 141.8 *6* from (^{40}Ca,5nγ). I$_\gamma$: weighted average of 89 *26* from (^{40}Ca,5nγ) and 54 *11* from (^{22}Ne,5nγ).
		218.5[‡] *5*	100 *15*	0.0	(5/2$^-$)	Q	E$_\gamma$: other: 218.5 *6* from (^{40}Ca,5nγ). I$_\gamma$: other: 100 *22* from (^{22}Ne,5nγ).
334.9	(17/2$^+$)	215.1[‡] *3*	100	119.6	(13/2$^+$)	Q	E$_\gamma$: other: 215.1 *4* from (^{40}Ca,5nγ).
530.8	(13/2$^-$)	312.5 *3*	100	218.3	(9/2$^-$)	Q	E$_\gamma$: weighted average of 312.4 *4* from (^{40}Ca,5nγ) and 312.6 *3* from (^{22}Ne,5nγ).
532.4	(15/2$^+$)	197.5 *5*	25[‡] *5*	334.9	(17/2$^+$)	D	E$_\gamma$: weighted average of 197.2 *10* from (^{40}Ca,5nγ) and 197.6 *5* from (^{22}Ne,5nγ).
		412.9[‡] *3*	100[‡] *11*	119.6	(13/2$^+$)	(D+Q)	E$_\gamma$: other: 412.5 *10* from (^{40}Ca,5nγ).
716.2	(21/2$^+$)	381.3[‡] *3*	100	334.9	(17/2$^+$)	Q	E$_\gamma$: other: 381.4 *4* from (^{40}Ca,5nγ).
938.6	(19/2$^+$)	222.5 *5*	19[‡] *4*	716.2	(21/2$^+$)	D	E$_\gamma$: weighted average of 223.1 *10* from (^{40}Ca,5nγ) and 222.3 *5* from (^{22}Ne,5nγ). I$_\gamma$: other: <31 from (^{40}Ca,5nγ).
		406.3 *3*	100[‡] *10*	532.4	(15/2$^+$)	(Q)	E$_\gamma$: weighted average of 406.6 *4* from (^{40}Ca,5nγ) and

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Adopted Levels, Gammas (continued)

$\gamma(^{165}Hf)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	Comments
							406.1 *3* from (^{22}Ne,5nγ). I_γ: other: 100 *15* from (^{40}Ca,5nγ).
938.6	(19/2$^+$)	603.6[‡] *3*	94[‡] *10*	334.9	(17/2$^+$)	(D+Q)	E_γ: other: 603.2 *10* from (^{40}Ca,5nγ). I_γ: other: <31 in (^{40}Ca,5nγ).
954.6	(17/2$^-$)	423.8 *3*	100	530.8	(13/2$^-$)	Q	E_γ: weighted average of 424.0 *4* from (^{40}Ca,5nγ) and 423.7 *3* from (^{22}Ne,5nγ).
1224.8	(25/2$^+$)	508.6[‡] *3*	100	716.2	(21/2$^+$)	Q	E_γ: other: 508.5 *4* from (^{40}Ca,5nγ).
1436.1	(21/2$^-$)	481.5[‡] *3*	100	954.6	(17/2$^-$)	Q	E_γ: other: 481.6 *4* from (^{40}Ca,5nγ).
1468.1	(23/2$^+$)	243.8 *10*	<48	1224.8	(25/2$^+$)		
		529.5 *3*	100[‡] *10*	938.6	(19/2$^+$)	Q	E_γ: weighted average of 529.2 *6* from (^{40}Ca,5nγ) and 529.6 *3* from (^{22}Ne,5nγ). I_γ: other: 100 *31* from (^{40}Ca,5nγ).
		751.6[‡] *5*	51 *13*	716.2	(21/2$^+$)	(D+Q)	E_γ: other: 751.6 *6* from (^{40}Ca,5nγ). I_γ: weighted average of 81 *24* from (^{40}Ca,5nγ) and 46 *10* from (^{22}Ne,5nγ).
1732.7	(23/2$^-$)	1016.6[‡] *5*	100	716.2	(21/2$^+$)	D	E_γ: other: 1016.6 *6* from (^{40}Ca,5nγ).
1826.1	(29/2$^+$)	601.2 *3*	100	1224.8	(25/2$^+$)	Q	E_γ: weighted average of 601.0 *4* from (^{40}Ca,5nγ) and 601.3 *3* from (^{22}Ne,5nγ).
1861.5	(23/2$^-$)	1145.8 *10*	100	716.2	(21/2$^+$)		
1873.3	(25/2$^-$)	405.2 *3*	26 *4*	1468.1	(23/2$^+$)		E_γ: weighted average of 405.3 *4* from (^{40}Ca,5nγ) and 405.1 *3* from (^{22}Ne,5nγ). I_γ: weighted average of 27 *4* from (^{40}Ca,5nγ) and 25 *5* from (^{22}Ne,5nγ).
		437.2 *3*	100 *5*	1436.1	(21/2$^-$)	Q	E_γ: weighted average of 437.3 *4* from (^{40}Ca,5nγ) and 437.1 *3* from (^{22}Ne,5nγ). I_γ: other: 100 *10* from (^{22}Ne,5nγ).
2017.7	(25/2$^-$)	581.5 *3*	100	1436.1	(21/2$^-$)	Q	E_γ: weighted average of 581.6 *4* from (^{40}Ca,5nγ) and 581.4 *3* from (^{22}Ne,5nγ).
2067.3	(27/2$^-$)	334.7[‡] *5*	8.5 *18*	1732.7	(23/2$^-$)	Q	E_γ: other: 334.6 *10* from (^{40}Ca,5nγ). I_γ: weighted average of 14 *5* from (^{40}Ca,5nγ) and 7.9 *16* from (^{22}Ne,5nγ).
		842.6 *3*	100[‡] *11*	1224.8	(25/2$^+$)	D	E_γ: weighted average of 842.7 *4* from (^{40}Ca,5nγ) and 842.5 *3* from (^{22}Ne,5nγ). I_γ: other: 100 *15* from (^{40}Ca,5nγ).
2075.2	(27/2$^+$)	607.1 *3*	100	1468.1	(23/2$^+$)	Q	E_γ: weighted average of 607.2 *4* from (^{40}Ca,5nγ) and 607.0 *3* from (^{22}Ne,5nγ).
2313.9	(27/2$^-$)	452.5 *6*	100 *29*	1861.5	(23/2$^-$)		
		1089.6 *10*	100	1224.8	(25/2$^+$)	D	E_γ: weighted average of 1089.1 *10* from (^{40}Ca,5nγ) and 1090 *1* from (^{22}Ne,5nγ).
2338.9	(29/2$^-$)	465.6[‡] *3*	100	1873.3	(25/2$^-$)	Q	E_γ: other: 465.7 *4* from (^{40}Ca,5nγ).
2423.8	(29/2$^-$)	356.6[‡] *5*	85 *22*	2067.3	(27/2$^-$)	(D)	E_γ: other: 356.7 *6* from (^{40}Ca,5nγ). I_γ: weighted average of 65 *19* from (^{40}Ca,5nγ) and 109 *21* from (^{22}Ne,5nγ).
		406.0[‡] *5*	100 *15*	2017.7	(25/2$^-$)	Q	E_γ: other: 406.1 *6* from (^{40}Ca,5nγ). I_γ: other: 100 *21* from (^{22}Ne,5nγ).
2471.6	(31/2$^-$)	404.3 *3*	100[‡] *10*	2067.3	(27/2$^-$)	Q	E_γ: weighted average of 404.2 *4* from (^{40}Ca,5nγ) and 404.4 *3* from (^{22}Ne,5nγ). I_γ: other: 100 *15* from (^{40}Ca,5nγ).
		645.5 *3*	66 *7*	1826.1	(29/2$^+$)	D	E_γ: from (^{22}Ne,5nγ). Other: 645.5 *4* from

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Adopted Levels, Gammas (continued)

$\gamma(^{165}Hf)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	Comments
							(^{40}Ca,5nγ). I_γ: weighted average of 61 *9* from (^{40}Ca,5nγ) and 69 *7* from (^{22}Ne,5nγ).
2485.9	(33/2$^+$)	659.8[‡] *3*	100	1826.1	(29/2$^+$)	Q	E_γ: other: 659.9 *4* from (^{40}Ca,5nγ).
2728.7	(31/2$^+$)	653.5[‡] *3*	100	2075.2	(27/2$^+$)	Q	E_γ: other: 653.6 *6* from (^{40}Ca,5nγ).
2759.4	(31/2$^-$)	445.6[‡] *3*	114 *25*	2313.9	(27/2$^-$)	(Q)	E_γ: other: 446.1 *10* from (^{40}Ca,5nγ). I_γ: weighted average 97 *30* from (^{40}Ca,5nγ) and 125 *25* from (^{22}Ne,5nγ).
		933.0 *6*	100[‡] *16*	1826.1	(29/2$^+$)		E_γ: weighted average of 932.7 *6* from (^{40}Ca,5nγ) and 934 *1* from (^{22}Ne,5nγ). I_γ: other: 100 *30* from (^{40}Ca,5nγ).
2840.2	(33/2$^-$)	368.3 *10*	<22	2471.6	(31/2$^-$)		
		416.4 *3*	88 *12*	2423.8	(29/2$^-$)	Q	E_γ: weighted average of 416.6 *4* from (^{40}Ca,5nγ) and 416.3 *3* from (^{22}Ne,5nγ). I_γ: weighted average of 84 *12* from (^{40}Ca,5nγ) and 97 *18* from (^{22}Ne,5nγ).
		501.3[‡] *3*	100 *15*	2338.9	(29/2$^-$)	Q	E_γ: other: 501.4 *4* from (^{40}Ca,5nγ). I_γ: from (^{40}Ca,5nγ). Other: 100 *18* from (^{22}Ne,5nγ).
2870.2	(33/2$^-$)	531.3 *3*	100	2338.9	(29/2$^-$)	Q	E_γ: weighted average of 531.6 *4* from (^{40}Ca,5nγ) and 531.2 *3* from (^{22}Ne,5nγ).
2960.3	(35/2$^-$)	488.7[‡] *3*	100	2471.6	(31/2$^-$)	Q	E_γ: other: 488.7 *4* from (^{40}Ca,5nγ).
3167.6	(37/2$^+$)	681.7[‡] *3*	100	2485.9	(33/2$^+$)	Q	E_γ: other: 681.6 *4* from (^{40}Ca,5nγ).
3264.7	(35/2$^-$)	505.3 *3*	100	2759.4	(31/2$^-$)	(Q)	E_γ: weighted average of 505.1 *6* from (^{40}Ca,5nγ) and 505.4 *3* from (^{22}Ne,5nγ).
3362.9	(37/2$^-$)	522.7[‡] *3*	100	2840.2	(33/2$^-$)	Q	E_γ: other: 522.6 *4* from (^{40}Ca,5nγ).
3405.9	(35/2$^+$)	677.2 *3*	100	2728.7	(31/2$^+$)	(Q)	E_γ: weighted average of 676.4 *10* from (^{40}Ca,5nγ) and 677.3 *3* from (^{22}Ne,5nγ).
3454.9	(37/2$^-$)	584.7[‡] *3*	100	2870.2	(33/2$^-$)	Q	E_γ: other: 584.8 *4* from (^{40}Ca,5nγ).
3554.4	(37/2$^+$)	1068.4 *6*	100	2485.9	(33/2$^+$)	(Q)	
3560.2	(39/2$^-$)	599.9 *3*	100	2960.3	(35/2$^-$)	Q	E_γ: weighted average of 599.5 *4* from (^{40}Ca,5nγ) and 600.1 *3* from (^{22}Ne,5nγ).
3843.2	(41/2$^+$)	675.8[‡] *3*	100	3167.6	(37/2$^+$)	Q	E_γ: other: 675.8 *4* from (^{40}Ca,5nγ).
3849.6	(39/2$^-$)	584.9 *3*	100	3264.7	(35/2$^-$)	Q	E_γ: weighted average of 585.2 *6* from (^{40}Ca,5nγ) and 584.8 *3* from (^{22}Ne,5nγ).
3988.5	(41/2$^-$)	625.6 *3*	100	3362.9	(37/2$^-$)	Q	E_γ: weighted average of 625.3 *4* from (^{40}Ca,5nγ) and 625.7 *3* from (^{22}Ne,5nγ).
4110.9	(41/2$^-$)	656.0[‡] *3*	100	3454.9	(37/2$^-$)	Q	E_γ: other: 655.9 *4* from (^{40}Ca,5nγ).
4167.8	(41/2$^+$)	613.2 *10*	40 *11*	3554.4	(37/2$^+$)		
		999.7 *6*	100 *15*	3167.6	(37/2$^+$)		
4276.8	(43/2$^-$)	716.6[‡] *3*	100	3560.2	(39/2$^-$)	Q	E_γ: other: 716.6 *4* from (^{40}Ca,5nγ).
4513.8	(43/2$^-$)	664.2 *5*	100	3849.6	(39/2$^-$)	(Q)	E_γ: unweighted average of 664.7 *4* from (^{40}Ca,5nγ) and 663.7 *3* from (^{22}Ne,5nγ).
4532.7	(45/2$^+$)	689.5[‡] *3*	100	3843.2	(41/2$^+$)	Q	E_γ: other: 689.6 *4* from (^{40}Ca,5nγ).
4717.8	(45/2$^-$)	729.3[‡] *3*	100	3988.5	(41/2$^-$)	Q	E_γ: other: 729.2 *4* from (^{40}Ca,5nγ).
4831.7	(45/2$^-$)	720.8 *4*	100	4110.9	(41/2$^-$)	Q	E_γ: other: 720.7 *5* from (^{22}Ne,5nγ).
4861.1	(45/2$^+$)	693.1 *4*	100 *15*	4167.8	(41/2$^+$)		
		1018.5 *6*	<101	3843.2	(41/2$^+$)	(Q)	
5087.9	(47/2$^-$)	811.1 *4*	100	4276.8	(43/2$^-$)	Q	E_γ: weighted average of 810.6 *4* from (^{40}Ca,5nγ) and 811.3 *3* from (^{22}Ne,5nγ).

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Adopted Levels, Gammas (continued)

γ(^{165}Hf) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [†]	E_f	J_f^π	Mult.[#]	Comments
5258.9	(47/2$^-$)	745.1 *3*	100	4513.8	(43/2$^-$)	(Q)	E_γ: weighted average of 745.0 *4* from (^{40}Ca,5nγ) and 745.2 *3* from (^{22}Ne,5nγ).
5272.2	(49/2$^+$)	739.5 *3*	100	4532.7	(45/2$^+$)	Q	E_γ: weighted average of 739.7 *4* from (^{40}Ca,5nγ) and 739.4 *3* from (^{22}Ne,5nγ).
5536.2	(49/2$^-$)	818.4 *4*	100	4717.8	(45/2$^-$)	(Q)	E_γ: other: 818.3 *5* from (^{22}Ne,5nγ).
5604.8	(49/2$^+$)	743.7 *6*	100	4861.1	(45/2$^+$)		
5614.0	(49/2$^-$)	782.3 *4*	100	4831.7	(45/2$^-$)	Q	E_γ: other: 782.2 *5* from (^{22}Ne,5nγ).
5931.9	(51/2$^-$)	844.0 *6*	100	5087.9	(47/2$^-$)	Q	E_γ: unweighted average of 843.4 *4* from (^{40}Ca,5nγ) and 844.6 *5* from (^{22}Ne,5nγ).
6079.2	(53/2$^+$)	807.0[‡] *3*	100	5272.2	(49/2$^+$)	Q	E_γ: other: 806.9 *4* from (^{40}Ca,5nγ).
6087.6	(51/2$^-$)	828.7 *6*	100	5258.9	(47/2$^-$)		
6393.2	(53/2$^-$)	857.0 *6*	100	5536.2	(49/2$^-$)	Q	
6411.5	(53/2$^+$)	806.7 *10*	100	5604.8	(49/2$^+$)		
6484.1	(53/2$^-$)	870.1 *10*	100	5614.0	(49/2$^-$)		
6780.9	(55/2$^-$)	849.0 *5*	100	5931.9	(51/2$^-$)	Q	E_γ: weighted average of 849.6 *6* from (^{40}Ca,5nγ) and 848.6 *5* from (^{22}Ne,5nγ).
6961.8	(57/2$^+$)	882.6 *4*	100	6079.2	(53/2$^+$)	Q	E_γ: weighted average of 882.5 *4* from (^{40}Ca,5nγ) and 882.8 *5* from (^{22}Ne,5nγ).
7270.4	(57/2$^+$)	858.9 *10*	100	6411.5	(53/2$^+$)		
7272.3	(57/2$^-$)	879.1 *6*	100	6393.2	(53/2$^-$)		
7419.6?	(57/2$^-$)	935.5[@] *10*	100	6484.1	(53/2$^-$)		
7668.1	(59/2$^-$)	887.2 *10*	100	6780.9	(55/2$^-$)	(Q)	
7914.1	(61/2$^+$)	952.3 *5*	100	6961.8	(57/2$^+$)	Q	E_γ: weighted average of 951.8 *6* from (^{40}Ca,5nγ) and 952.7 *5* from (^{22}Ne,5nγ).
8184.8?	(61/2$^+$)	914.4[@] *10*	100	7270.4	(57/2$^+$)		
8198.6	(61/2$^-$)	926.3 *10*	100	7272.3	(57/2$^-$)		
8604.9	(63/2$^-$)	936.8 *10*	100	7668.1	(59/2$^-$)		
8882.8	(65/2$^+$)	968.7 *10*	100	7914.1	(61/2$^+$)		
9177.9?	(65/2$^+$)	993.1[@] *10*	100	8184.8?	(61/2$^+$)		
9178.4?	(65/2$^-$)	979.8[@] *10*	100	8198.6	(61/2$^-$)		
9585.8	(67/2$^-$)	980.9 *6*	100	8604.9	(63/2$^-$)		
9928.7?	(69/2$^+$)	1045.9[@] *10*	100	8882.8	(65/2$^+$)		

[†] From (^{40}Ca,5nγ), unless otherwise noted.
[‡] From (^{22}Ne,5nγ).
[#] Assigned by the evaluators based on γγ(θ)(DCO) values in ^{130}Te(^{40}Ca,5nγ) (1993Ne01), and ^{148}Sm(^{22}Ne,5nγ) (1987Bl06). Mult=Q represents ΔJ=2, quadrupole (likely E2), while mult=D or D+Q corresponds to ΔJ=1, dipole (E1, M1 or M1+E2).
[@] Placement of transition in the level scheme is uncertain.

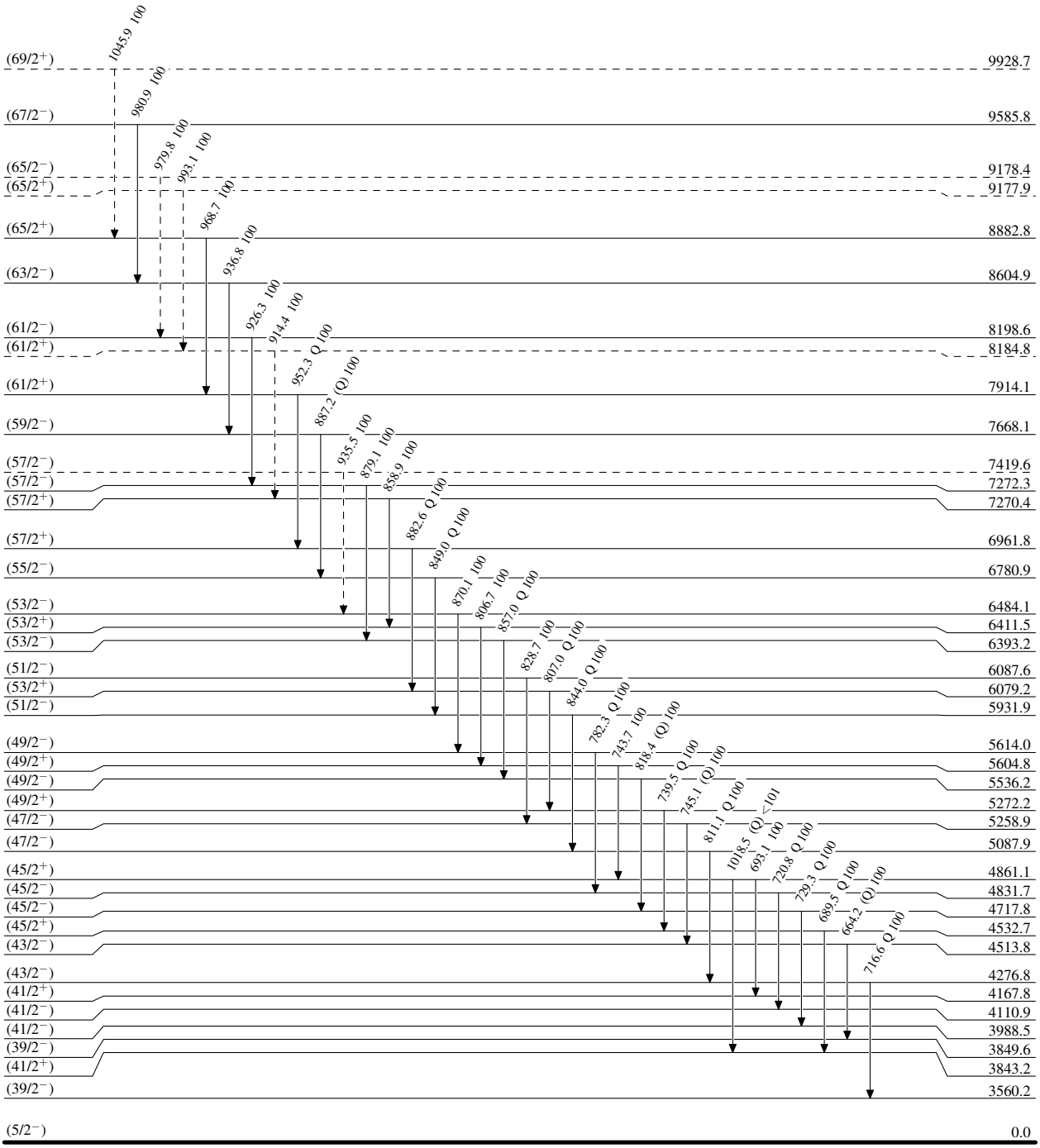
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

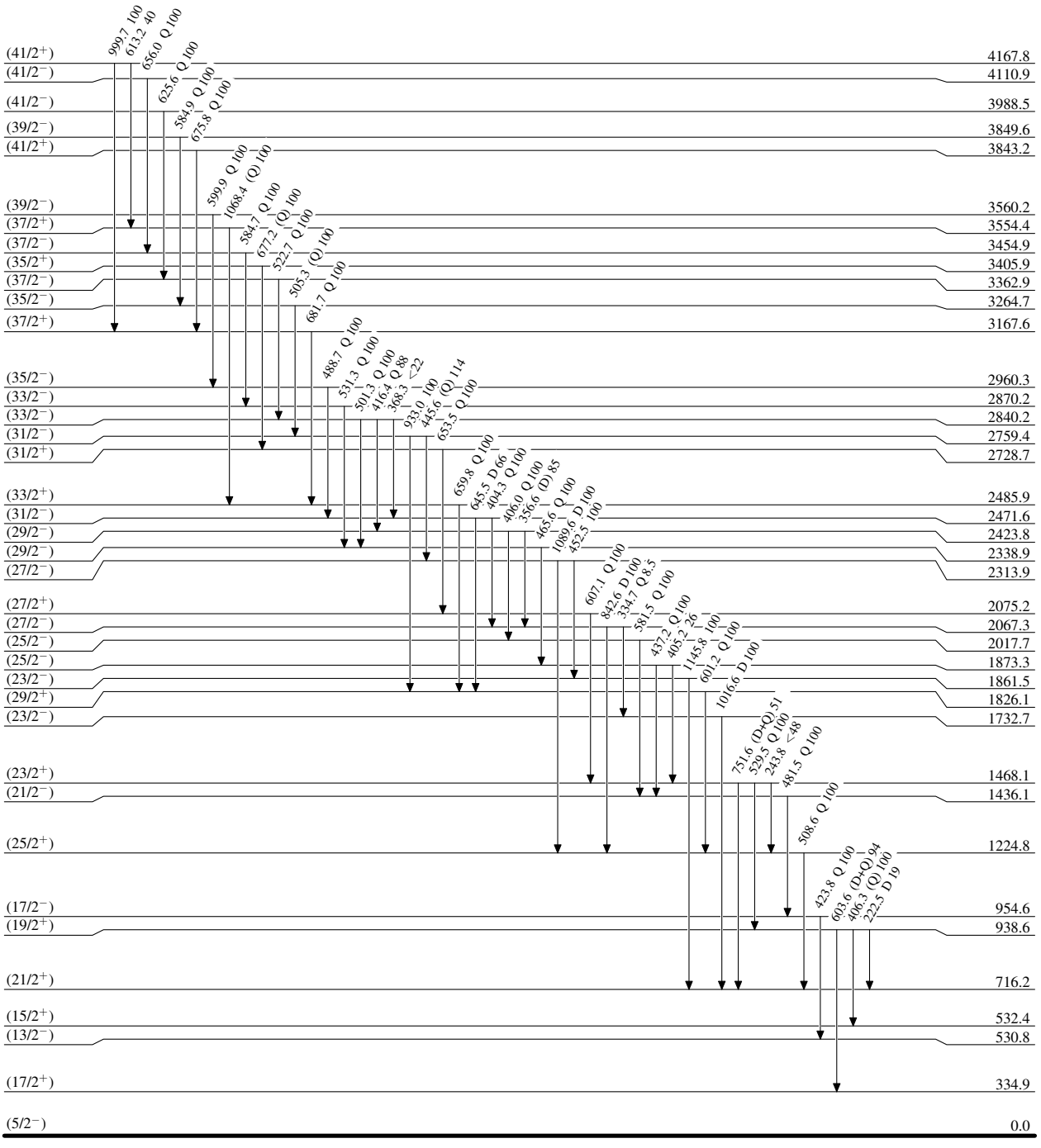


$^{165}_{72}Hf_{93}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

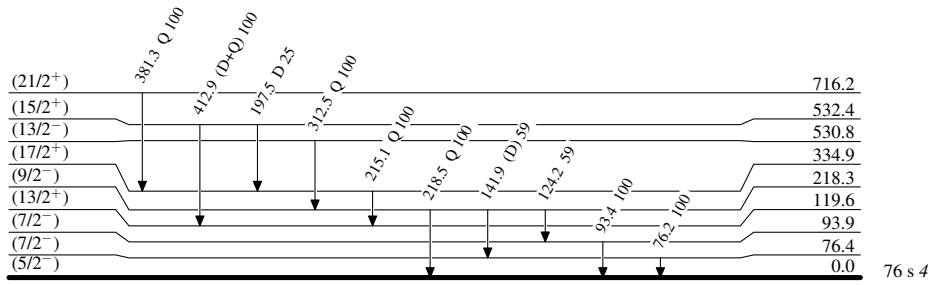


$^{165}_{72}Hf_{93}$

Adopted Levels, Gammas

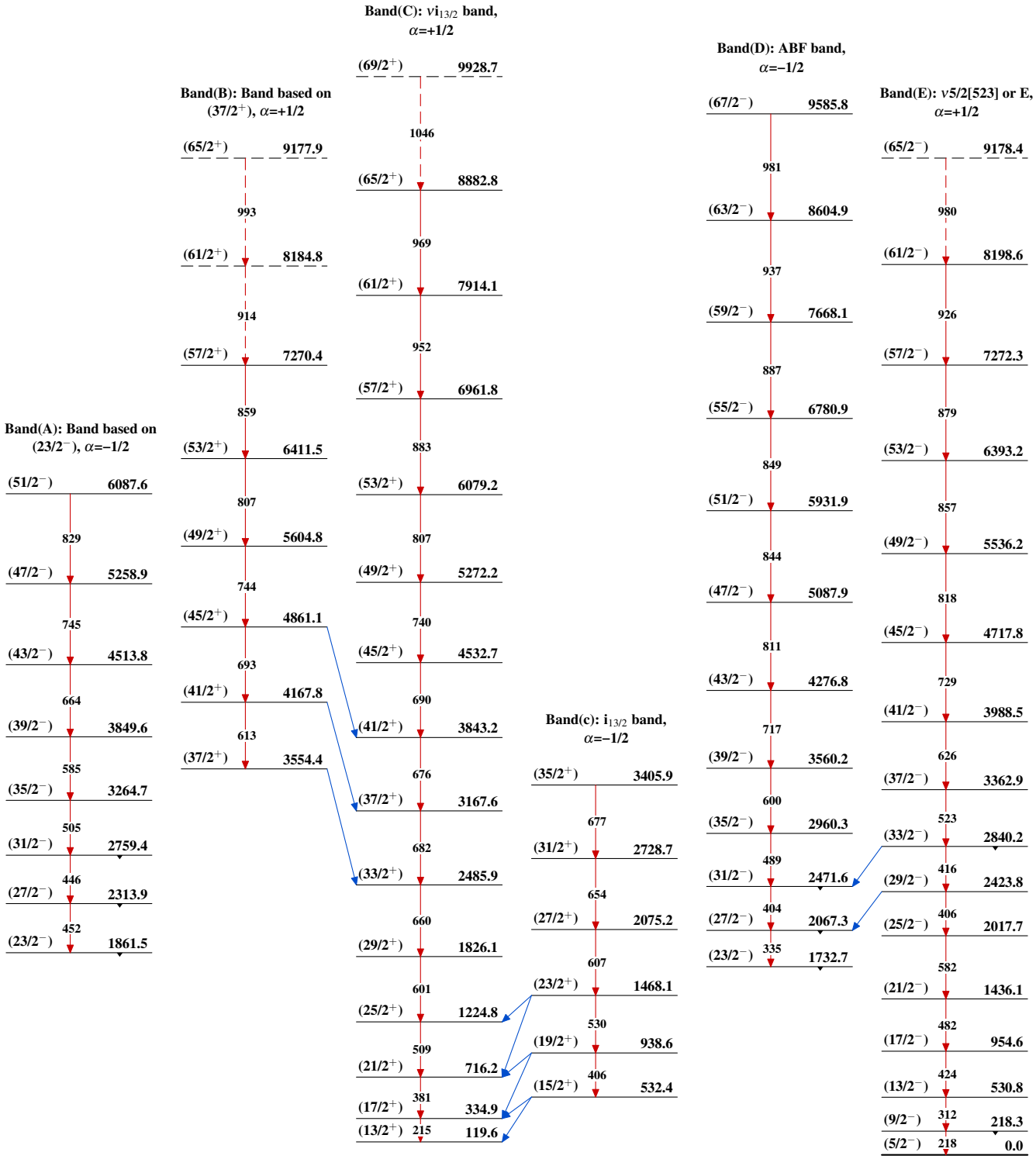
Level Scheme (continued)

Intensities: Relative photon branching from each level



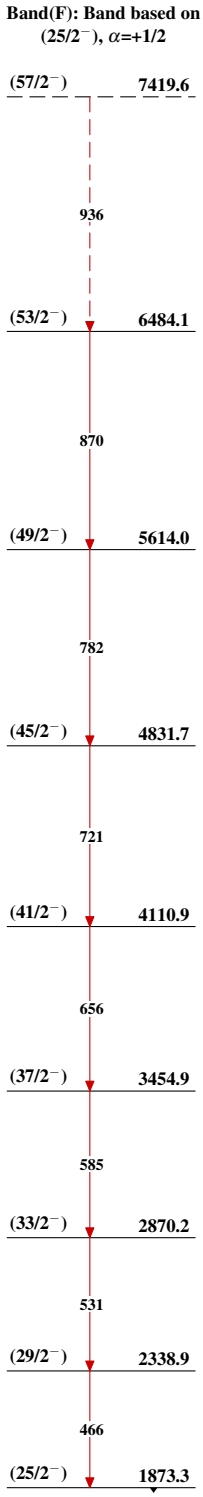
$^{165}_{72}Hf_{93}$

Adopted Levels, Gammas



$^{165}_{72}Hf_{93}$

Adopted Levels, Gammas (continued)



$^{165}_{72}Hf_{93}$