Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	31-Dec-2014

Q(β^-)=−6730 *50*; S(n)=8166 *26*; S(p)=3720 *80*; Q(α)=4150 *30* 2012Wa38
S(2n)=19090 *30*, S(2p)=6003 *29*, Q(εp)=3274 *29* (2012Wa38).
1981LiZM: ^{163}Hf produced and identified in Yb(^{3}He,xn) reaction followed by on-line isotopes separation using ISOCELE Separator. Concurrent studies by 1982Sc15 and 1982Br31 confirmed the isotope and obtained precise half-life of the ground state. No level scheme is proposed for ^{163}Ta ε decay. See ^{163}Ta ε decay for seven unplaced gamma rays reported in this decay.

^{163}Hf Levels

Quasiparticle labels:
A: ν3/2[651],α=+1/2 from $\nu i_{13/2}$ orbital.
B: ν3/2[651],α=−1/2 from $\nu i_{13/2}$ orbital.
C: ν1/2[660],α=+1/2 from $\nu i_{13/2}$ orbital.
D: ν3/2[651],α=−1/2 from $\nu i_{13/2}$ orbital.
E: ν5/2[523],α=+1/2 from $\nu h_{9/2}$ orbital.
F: ν5/2[523],α=−1/2 from $\nu h_{9/2}$ orbital.
G: ν3/2[521],α=+1/2 from $\nu f_{7/2}$ orbital.
H: ν3/2[521],α=−1/2 from $\nu f_{7/2}$ orbital.
a: π5/2[402],α=+1/2 from $\pi d_{5/2}$ orbital.
b: π5/2[402],α=−1/2 from $\pi d_{5/2}$ orbital.
c: π1/2[411],α=+1/2 from $\pi d_{3/2}$ orbital.
d: π1/2[411],α=−1/2 from $\pi d_{3/2}$ orbital.
e: π9/2[514],α=+1/2 from $\pi h_{11/2}$ orbital.
f: π9/2[514],α=−1/2 from $\pi h_{11/2}$ orbital.
g: π1/2[541],α=+1/2 from $\pi h_{9/2}$ orbital.

Cross Reference (XREF) Flags

A ^{163}Ta ε decay (10.6 s)
B ^{167}W α decay (19.9 s)
C ^{94}Zr(^{74}Ge,5nγ)
D ^{148}Sm(^{20}Ne,5nγ)

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	XREF	Comments
0.0[&]	(5/2$^-$)	40.0 s *6*	BC	%ε+%β^+=100; %α<0.0001 (1995Hi12) XREF: B(?). E(level),J$^\pi$: lowest level populated in ^{94}Zr(^{74}Ge,5nγ) (2014Ya30) is proposed to be the ground state with possible ν5/2[523] configuration. E(level): difference between Q(α) for the ^{167}W α decay and the measured Eα value for the α transition from this decay suggests that this α may not populate the ^{163}Hf g.s. (see the comment in the ^{167}W α Decay data set. $T_{1/2}$: from 1982Sc15. Others: 44 s *2* (1981LiZM), 44 s *6* (1982Br31).
107.10[&] *2*	(9/2$^-$)		CD	J$^\pi$: stretched quadrupole to (5/2$^-$); band member.
150.9[#] *5*	(13/2$^+$)		CD	E(level): this level may be an isomer.
406.3[#] *5*	(17/2$^+$)	103 ps *8*	CD	μ=0.4 *7* (1998We02) $T_{1/2}$: recoil-distance method (1998We02). μ: transient-field technique (1998We02).
457.4[&] *3*	(13/2$^-$)		C	

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Adopted Levels, Gammas (continued)

^{163}Hf Levels (continued)

E(level)[†]	Jπ[‡]	XREF	Comments
840.8[#] 5	(21/2+)	CD	
953.5[&] 4	(17/2−)	C	
1144.1[@] 4	(19/2+)	C	
1150.2[d] 5	(17/2+)	C	
1404.6[#] 5	(25/2+)	CD	
1537.8[&] 4	(21/2−)	C	
1549.0[d] 5	(21/2+)	C	
1612.6[g] 6	(17/2+)	C	
1630.0 4	(21/2−)	C	E(level): side structure of ν5/2[523],α=+1/2 band.
1710.3[@] 4	(23/2+)	C	
1759.1[f] 5	(19/2+)	C	
1933.1[g] 5	(21/2+)	C	
1968.7[a] 5	(23/2−)	CD	
2007.0[d] 5	(25/2+)	C	
2019.0[&] 4	(25/2−)	C	
2063.2[#] 5	(29/2+)	CD	
2138.6[b] 4	(25/2−)	C	
2139.5[f] 5	(23/2+)	C	
2224.8[e] 5	(25/2+)	C	
2322.9[a] 5	(27/2−)	CD	
2325.2[g] 5	(25/2+)	C	
2488.1[&] 4	(29/2−)	C	
2492.5[c] 6	(27/2−)	C	
2542.8[d] 5	(29/2+)	C	
2555.9[b] 4	(29/2−)	C	
2615.4[f] 5	(27/2+)	C	
2664.1[a] 5	(31/2−)	CD	
2749.3[e] 5	(29/2+)	C	
2792.9[#] 5	(33/2+)	CD	
2878.2[g] 6	(29/2+)	C	
2915.7[c] 5	(31/2−)	C	
2920.6[&] 5	(33/2−)	C	
3092.8[b] 5	(33/2−)	C	
3133.2[a] 5	(35/2−)	CD	
3142.9[d] 6	(33/2+)	C	
3220.8[f] 6	(31/2+)	C	
3321.4[e] 5	(33/2+)	C	
3433.9[&] 5	(37/2−)	C	
3442.9[c] 5	(35/2−)	C	
3556.4[#] 5	(37/2+)	CD	
3566.8[g] 6	(33/2+)	C	
3683.0[b] 5	(37/2−)	C	
3733.6[a] 5	(39/2−)	CD	
3795.9[d] 6	(37/2+)	C	
3856.3[h] 6	(35/2−)	C	
3936.8[e] 5	(37/2+)	C	
3941.4[f] 8	(35/2+)	C	

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Adopted Levels, Gammas (continued)

^{163}Hf Levels (continued)

E(level)[†]	Jπ[‡]	XREF	Comments
4053.2[&] 5	(41/2−)	C	
4054.8[c] 5	(39/2−)	C	
4271.1[#] 5	(41/2+)	CD	
4329.2[b] 5	(41/2−)	C	
4370.4[g] 8	(37/2+)	C	
4407.9[h] 6	(39/2−)	C	
4442.7[a] 5	(43/2−)	C	
4536.0[d] 6	(41/2+)	C	
4633.6[e] 5	(41/2+)	C	
4719.7[f] 9	(39/2+)	C	
4753.4[c] 6	(43/2−)	C	
4781.7[&] 6	(45/2−)	C	
4964.2[#] 6	(45/2+)	CD	
5000.4[h] 8	(43/2−)	C	
5092.6[b] 5	(45/2−)	C	
5104.4[g] 9	(41/2+)	C	
5206.5 9		C	E(level): side structure of band AEH.
5231.6[a] 6	(47/2−)	CD	
5291.5[d] 6	(45/2+)	C	
5335.6 8	(45/2+)	C	E(level): side structure of Gamma-vibrational band.
5495.2[c] 7	(47/2−)	C	
5597.4[&] 6	(49/2−)	C	
5668.2[h] 10	(47/2−)	C	
5705.0[#] 6	(49/2+)	CD	
5888.1[b] 7	(49/2−)	C	
5989.0 8	(49/2−)	C	E(level): side structure of band GAB.
6011.1[d] 7	(49/2+)	C	
6096.0[a] 6	(51/2−)	CD	
6257.8[c] 7	(51/2−)	C	
6380.4[h] 11	(51/2−)	C	
6484.6[&] 6	(53/2−)	C	
6510.9[#] 6	(53/2+)	CD	
6593.6[b] 6	(53/2−)	C	
6985.3[a] 6	(55/2−)	C	
7058.8 6	(55/2−)	CD	E(level): side structure of band FAB.
7155.6[h] 12	(55/2−)	C	
7314.4[&] 6	(57/2−)	C	
7385.0[#] 7	(57/2+)	CD	
7452.6 8	(57/2−)	C	E(level): side structure of ν5/2[523],α=+1/2 band.
7812.3[a] 6	(59/2−)	C	
7998.3[h] 13	(59/2−)	C	
8036.1 8	(59/2−)	C	E(level): side structure of band FAB.
8133.6[&] 8	(61/2−)	C	
8322.2[#] 7	(61/2+)	C	
8360.0 9	(61/2+)	C	E(level): side structure of ν3/2[651],α=+1/2 band.
8450.6 8	(61/2−)	C	E(level): side structure of ν5/2[523],α=+1/2 band.
8690.3[a] 8	(63/2−)	C	
8903.1[h] 14	(63/2−)	C	

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Adopted Levels, Gammas (continued)

^{163}Hf Levels (continued)

E(level)[†]	Jπ[‡]	XREF	Comments
9018.4[&] *10*	(65/2⁻)	C	
9171.5[#] *9*	(65/2⁺)	C	
9326.0 *9*	(65/2⁺)	C	E(level): side structure of *ν*3/2[651],*α*=+1/2 band.
9623.1[a] *10*	(67/2⁻)	C	
9979.6[&] *11*	(69/2⁻)	C	
10050.7[#] *10*	(69/2⁺)	C	
10609.3[a] *11*	(71/2⁻)	C	
10986.4[#] *11*	(73/2⁺)	C	
11011.5[&] *12*	(73/2⁻)	C	
11972.4[#] *12*	(77/2⁺)	C	

[†] From least-squares fit to E*γ* data.
[‡] From multipolarities deduced from DCO ratios, systematics and band structures in the work of 2014Ya30.
[#] Band(A): *ν*3/2[651],*α*=+1/2. Configuration=A –>ABC –>ABCfg. First band crossing at *ħω*=0.36 MeV, second at 0.45 MeV. Average g factor=+0.18 *4*(stat) *2*(syst) (1998We02) for 434.5*γ* (21/2⁺ to 17/2⁺) and 658.6*γ* (29/2⁺ to 25/2⁺) (transient-field method).
[@] Band(a): *ν*3/2[651],*α*=−1/2.
[&] Band(B): *ν*5/2[523],*α*=+1/2. Configuration=E –>EAB –>EABfg. First band crossing at *ħω*=0.24 MeV, second at 0.43 MeV.
[a] Band(C): 3-qp, FAB band,*α*=−1/2. Configuration=FAB –>FABfg. Band crossing at *ħω*=0.43 MeV.
[b] Band(D): 3-qp GAB band,*α*=+1/2.
[c] Band(d): 3-qp, HAB band,*α*=−1/2.
[d] Band(E): Gamma-vibrational band. Configuration=*γ* –>*γ*⊗BC. Band crossing at *ħω*=0.36 MeV.
[e] Band(F): Gamma-vibrational band.
[f] Band(G): 3-qp, AEG band, *α*=−1/2.
[g] Band(g): 3-qp, AEH Band, *α*=+1/2 Configuration=AEH –>AEHBC. Band crossing at *ħω*=0.37 MeV.
[h] Band(H): 5-qp, ABCfb band.

γ(^{163}Hf)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	*α*[@]	Comments
107.10	(9/2⁻)	107.1 *2*	100	0.0	(5/2⁻)	(E2)	2.70 *5*	
406.3	(17/2⁺)	255.4 *2*	100	150.9	(13/2⁺)	(E2)	0.1299	Additional information 1.
457.4	(13/2⁻)	350.3 *2*	100	107.10	(9/2⁻)	(E2)	0.0503	
840.8	(21/2⁺)	434.5 *2*	100	406.3	(17/2⁺)	(E2)	0.0278	Additional information 2.
953.5	(17/2⁻)	496.1 *2*	100	457.4	(13/2⁻)	(E2)	0.0197	
1144.1	(19/2⁺)	303.3 *2*	23 *3*	840.8	(21/2⁺)	D		
		737.8 *2*	100 *11*	406.3	(17/2⁺)	Q		
1150.2	(17/2⁺)	743.9 *5*	100	406.3	(17/2⁺)			
1404.6	(25/2⁺)	563.7 *2*	100	840.8	(21/2⁺)	Q		Additional information 3.
1537.8	(21/2⁻)	584.3 *2*	100	953.5	(17/2⁻)	Q		
1549.0	(21/2⁺)	398.8 *2*	67 *11*	1150.2	(17/2⁺)	(E2)	0.0350	
		708.2 *2*	74 *11*	840.8	(21/2⁺)			
		1142.7 *2*	100 *11*	406.3	(17/2⁺)			
1612.6	(17/2⁺)	462.4 *5*	100	1150.2	(17/2⁺)	D[#]		
1630.0	(21/2⁻)	485.9 *2*	100 *13*	1144.1	(19/2⁺)	D		
		676.5 *2*	69 *13*	953.5	(17/2⁻)	Q		
1710.3	(23/2⁺)	305.7 *5*	13.3 *21*	1404.6	(25/2⁺)	D		

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Adopted Levels, Gammas (continued)

$\gamma(^{163}Hf)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α[@]	Comments
1710.3	(23/2$^+$)	566.2 *2*	72 *12*	1144.1	(19/2$^+$)			
		869.4 *2*	100 *21*	840.8	(21/2$^+$)	Q		
1759.1	(19/2$^+$)	615.0 *5*	69 *12*	1144.1	(19/2$^+$)			
		918.3 *2*	100 *18*	840.8	(21/2$^+$)			
		1352.8 *5*	79 *14*	406.3	(17/2$^+$)			
1933.1	(21/2$^+$)	320.5 *5*	83 *17*	1612.6	(17/2$^+$)			
		384.1 *5*	100 *17*	1549.0	(21/2$^+$)	D[#]		
		1092.3 *5*	<83	840.8	(21/2$^+$)			
1968.7	(23/2$^-$)	1127.9 *2*	100	840.8	(21/2$^+$)	D		Additional information 4.
2007.0	(25/2$^+$)	458.0 *2*	58 *8*	1549.0	(21/2$^+$)	(E2)	0.0242	
		602.4 *5*	36 *6*	1404.6	(25/2$^+$)			
		1166.2 *2*	100 *15*	840.8	(21/2$^+$)	Q		
2019.0	(25/2$^-$)	308.7 *2*	58 *5*	1710.3	(23/2$^+$)	D		
		389.0 *2*	63 *11*	1630.0	(21/2$^-$)	(E2)	0.0375	
		481.2 *2*	100 *11*	1537.8	(21/2$^-$)	(E2)	0.0213	
2063.2	(29/2$^+$)	658.6 *2*	100	1404.6	(25/2$^+$)	Q		Additional information 5.
2138.6	(25/2$^-$)	600.8 *2*	100	1537.8	(21/2$^-$)	Q		
2139.5	(23/2$^+$)	380.4 *5*	74 *13*	1759.1	(19/2$^+$)	(E2)	0.0399	
		590.5 *5*	74 *13*	1549.0	(21/2$^+$)	D		
		734.9 *5*	45 *7*	1404.6	(25/2$^+$)			
		1298.7 *2*	100 *17*	840.8	(21/2$^+$)	D		
2224.8	(25/2$^+$)	1384.0 *5*	100	840.8	(21/2$^+$)			
2322.9	(27/2$^-$)	303.9 *5*	3.1 *5*	2019.0	(25/2$^-$)	D		
		354.2 *2*	18 *3*	1968.7	(23/2$^-$)	(E2)	0.0487	Additional information 6.
		918.3 *2*	100 *12*	1404.6	(25/2$^+$)	D		Additional information 7.
2325.2	(25/2$^+$)	318.2 *5*	20 *4*	2007.0	(25/2$^+$)	D[#]		
		392.1 *2*	100 *16*	1933.1	(21/2$^+$)	(E2)	0.0367	
		614.9 *5*	32 *8*	1710.3	(23/2$^+$)			
2488.1	(29/2$^-$)	349.5 *2*	30 *5*	2138.6	(25/2$^-$)			
		469.1 *2*	100 *13*	2019.0	(25/2$^-$)	(E2)	0.0228	
2492.5	(27/2$^-$)	1087.9 *5*	100	1404.6	(25/2$^+$)			
2542.8	(29/2$^+$)	535.8 *2*	100 *11*	2007.0	(25/2$^+$)	Q		
		1138.2 *2*	59 *11*	1404.6	(25/2$^+$)	Q		
2555.9	(29/2$^-$)	417.3 *2*	50 *12*	2138.6	(25/2$^-$)	Q		
		536.9 *2*	100 *15*	2019.0	(25/2$^-$)	Q		
2615.4	(27/2$^+$)	475.9 *2*	100 *14*	2139.5	(23/2$^+$)	(E2)	0.0219	
		1210.8 *5*	<17	1404.6	(25/2$^+$)			
2664.1	(31/2$^-$)	176.0 *5*	<3.3	2488.1	(29/2$^-$)			
		341.3 *2*	100 *13*	2322.9	(27/2$^-$)	(E2)	0.0542	Additional information 8.
		600.9 *2*	32 *5*	2063.2	(29/2$^+$)	(Q)		Additional information 9.
2749.3	(29/2$^+$)	524.5 *2*	100 *16*	2224.8	(25/2$^+$)			
		686.1 *5*	42 *11*	2063.2	(29/2$^+$)			
		1344.7[&] *5*	<26	1404.6	(25/2$^+$)			
2792.9	(33/2$^+$)	729.7 *2*	100	2063.2	(29/2$^+$)	Q		Additional information 10.
2878.2	(29/2$^+$)	553.0 *2*	100	2325.2	(25/2$^+$)	Q		
2915.7	(31/2$^-$)	423.2 *5*	25 *5*	2492.5	(27/2$^-$)			
		427.6 *5*	<22	2488.1	(29/2$^-$)			
		592.8 *2*	61 *9*	2322.9	(27/2$^-$)	Q		
		852.5 *2*	100 *17*	2063.2	(29/2$^+$)	D		
2920.6	(33/2$^-$)	364.7 *2*	30 *5*	2555.9	(29/2$^-$)	(E2)	0.0449	
		432.5 *2*	100 *18*	2488.1	(29/2$^-$)	(E2)	0.0281	
3092.8	(33/2$^-$)	428.7 *5*	<5.8	2664.1	(31/2$^-$)			
		536.9 *2*	100 *11*	2555.9	(29/2$^-$)	Q		
		604.7 *2*	31 *5*	2488.1	(29/2$^-$)	Q		
3133.2	(35/2$^-$)	212.6 *5*	<3.6	2920.6	(33/2$^-$)			

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Adopted Levels, Gammas (continued)

$\gamma(^{163}Hf)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α[@]	Comments
3133.2	(35/2$^-$)	469.1 *2*	100 *14*	2664.1	(31/2$^-$)	(E2)	0.0228	Additional information 11.
3142.9	(33/2$^+$)	600.1 *5*	100 *18*	2542.8	(29/2$^+$)	Q		
		1079.7 *5*	<59	2063.2	(29/2$^+$)			
3220.8	(31/2$^+$)	605.4 *2*	100	2615.4	(27/2$^+$)	Q		
3321.4	(33/2$^+$)	572.1 *2*	100 *20*	2749.3	(29/2$^+$)	Q		
		1258.2 *2*	73 *13*	2063.2	(29/2$^+$)	Q		
3433.9	(37/2$^-$)	513.3 *2*	100	2920.6	(33/2$^-$)	Q		
3442.9	(35/2$^-$)	527.2 *2*	100 *18*	2915.7	(31/2$^-$)	Q		
		650.0 *2*	50 *7*	2792.9	(33/2$^+$)			
3556.4	(37/2$^+$)	763.5 *2*	100	2792.9	(33/2$^+$)	Q		Additional information 12.
3566.8	(33/2$^+$)	688.6 *2*	100	2878.2	(29/2$^+$)	Q		
3683.0	(37/2$^-$)	549.8 *2*	28 *4*	3133.2	(35/2$^-$)	D		
		590.2 *2*	100 *16*	3092.8	(33/2$^-$)	Q		
3733.6	(39/2$^-$)	299.7 *5*	<4.1	3433.9	(37/2$^-$)			
		600.4 *2*	100 *7*	3133.2	(35/2$^-$)	Q		Additional information 13.
3795.9	(37/2$^+$)	653.0 *5*	100 *15*	3142.9	(33/2$^+$)			
		1003.0 *5*	<81	2792.9	(33/2$^+$)			
3856.3	(35/2$^-$)	1063.4 *5*	100	2792.9	(33/2$^+$)	D		
3936.8	(37/2$^+$)	615.4 *2*	100 *15*	3321.4	(33/2$^+$)	Q		
		1143.9 *2*	64 *9*	2792.9	(33/2$^+$)	Q		
3941.4	(35/2$^+$)	720.6 *5*	100	3220.8	(31/2$^+$)	Q		
4053.2	(41/2$^-$)	619.3 *2*	100	3433.9	(37/2$^-$)	Q		
4054.8	(39/2$^-$)	611.9 *2*	100	3442.9	(35/2$^-$)	Q		
4271.1	(41/2$^+$)	714.7 *2*	100	3556.4	(37/2$^+$)	Q		Additional information 14.
4329.2	(41/2$^-$)	646.2 *2*	100	3683.0	(37/2$^-$)	Q		
4370.4	(37/2$^+$)	803.6 *5*	100	3566.8	(33/2$^+$)			
4407.9	(39/2$^-$)	551.6 *5*	100 *17*	3856.3	(35/2$^-$)	Q		
		974.0 *5*	<83	3433.9	(37/2$^-$)			
4442.7	(43/2$^-$)	709.1 *2*	100	3733.6	(39/2$^-$)	Q		Additional information 15.
4536.0	(41/2$^+$)	740.1 *5*	100 *20*	3795.9	(37/2$^+$)			
		979.6 *5*	100 *20*	3556.4	(37/2$^+$)			
4633.6	(41/2$^+$)	696.8 *2*	100 *16*	3936.8	(37/2$^+$)	Q		
		1077.2 *2*	60 *12*	3556.4	(37/2$^+$)			
4719.7	(39/2$^+$)	778.3 *5*	100	3941.4	(35/2$^+$)	Q		
4753.4	(43/2$^-$)	698.6 *5*	100	4054.8	(39/2$^-$)	Q		
4781.7	(45/2$^-$)	728.5 *2*	100	4053.2	(41/2$^-$)	Q		
4964.2	(45/2$^+$)	693.1 *2*	100	4271.1	(41/2$^+$)	Q		Additional information 16.
5000.4	(43/2$^-$)	592.5 *5*	100	4407.9	(39/2$^-$)	Q		
5092.6	(45/2$^-$)	763.4 *2*	100	4329.2	(41/2$^-$)	Q		
5104.4	(41/2$^+$)	734.0 *5*	100	4370.4	(37/2$^+$)			
5206.5		836.1 *5*	100	4370.4	(37/2$^+$)			
5231.6	(47/2$^-$)	788.9 *2*	100	4442.7	(43/2$^-$)	Q		Additional information 17.
5291.5	(45/2$^+$)	755.5 *5*	<68	4536.0	(41/2$^+$)			
		1020.4 *5*	100 *16*	4271.1	(41/2$^+$)			
5335.6	(45/2$^+$)	799.6 *5*	100	4536.0	(41/2$^+$)			
5495.2	(47/2$^-$)	741.8 *2*	100	4753.4	(43/2$^-$)	Q		
5597.4	(49/2$^-$)	815.7 *2*	100	4781.7	(45/2$^-$)	Q		
5668.2	(47/2$^-$)	667.8 *5*	100	5000.4	(43/2$^-$)	Q		
5705.0	(49/2$^+$)	740.8 *2*	100	4964.2	(45/2$^+$)	Q		Additional information 18.
5888.1	(49/2$^-$)	795.5 *5*	100	5092.6	(45/2$^-$)	Q		
5989.0	(49/2$^-$)	896.4 *5*	100	5092.6	(45/2$^-$)			
6011.1	(49/2$^+$)	719.6 *5*	<100	5291.5	(45/2$^+$)			
		1046.9 *5*	<100	4964.2	(45/2$^+$)			
6096.0	(51/2$^-$)	864.4 *2*	100	5231.6	(47/2$^-$)	Q		Additional information 19.
6257.8	(51/2$^-$)	762.6 *2*	100	5495.2	(47/2$^-$)	Q		
6380.4	(51/2$^-$)	712.2 *5*	100	5668.2	(47/2$^-$)			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

γ(^{163}Hf) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	Comments
6484.6	(53/2$^-$)	887.2 *2*	100	5597.4	(49/2$^-$)	Q	
6510.9	(53/2$^+$)	805.9 *2*	100	5705.0	(49/2$^+$)	Q	Additional information 20.
6593.6	(53/2$^-$)	705.5 *5*	71 *14*	5888.1	(49/2$^-$)	Q	
		996.2 *5*	100 *14*	5597.4	(49/2$^-$)		
6985.3	(55/2$^-$)	727.5 *5*	27 *5*	6257.8	(51/2$^-$)		
		889.3 *2*	100 *15*	6096.0	(51/2$^-$)	Q	
7058.8	(55/2$^-$)	962.8 *2*	100	6096.0	(51/2$^-$)	Q	Additional information 21.
7155.6	(55/2$^-$)	775.2 *5*	100	6380.4	(51/2$^-$)	Q	
7314.4	(57/2$^-$)	720.8 *5*	38 *8*	6593.6	(53/2$^-$)	Q	
		829.8 *2*	100 *15*	6484.6	(53/2$^-$)	Q	
7385.0	(57/2$^+$)	874.1 *2*	100	6510.9	(53/2$^+$)	Q	Additional information 22.
7452.6	(57/2$^-$)	968.0 *5*	100	6484.6	(53/2$^-$)		
7812.3	(59/2$^-$)	827.0 *2*	100	6985.3	(55/2$^-$)	Q	
7998.3	(59/2$^-$)	842.7 *5*	100	7155.6	(55/2$^-$)	Q	
8036.1	(59/2$^-$)	977.3 *5*	100	7058.8	(55/2$^-$)		
8133.6	(61/2$^-$)	819.2 *5*	100	7314.4	(57/2$^-$)		
8322.2	(61/2$^+$)	937.2 *2*	100	7385.0	(57/2$^+$)	Q	
8360.0	(61/2$^+$)	975.0 *5*	100	7385.0	(57/2$^+$)		
8450.6	(61/2$^-$)	998.0 *2*	100	7452.6	(57/2$^-$)	Q	
8690.3	(63/2$^-$)	878.0 *5*	100	7812.3	(59/2$^-$)	Q	
8903.1	(63/2$^-$)	904.8 *5*	100	7998.3	(59/2$^-$)		
9018.4	(65/2$^-$)	884.8 *5*	100	8133.6	(61/2$^-$)	Q	
9171.5	(65/2$^+$)	849.3 *5*	100	8322.2	(61/2$^+$)		
9326.0	(65/2$^+$)	1003.8 *5*	100	8322.2	(61/2$^+$)		
9623.1	(67/2$^-$)	932.8 *5*	100	8690.3	(63/2$^-$)	Q	
9979.6	(69/2$^-$)	961.2 *5*	100	9018.4	(65/2$^-$)	Q	
10050.7	(69/2$^+$)	879.2 *5*	100	9171.5	(65/2$^+$)		
10609.3	(71/2$^-$)	986.2 *5*	100	9623.1	(67/2$^-$)		
10986.4	(73/2$^+$)	935.7 *5*	100	10050.7	(69/2$^+$)		
11011.5	(73/2$^-$)	1031.9 *5*	100	9979.6	(69/2$^-$)		
11972.4	(77/2$^+$)	986.0 *5*	100	10986.4	(73/2$^+$)		

[†] From ^{94}Zr(^{74}Ge,5nγ) (2014Ya30). Available values from ^{148}Sm(^{20}Ne,5nγ) (1987Bl06) are in agreement but with only two bands and about 22 γ rays.

[‡] Assignments are based on DCO ratios, where mult=Q indicates ΔJ=2, quadrupole (most likely E2) transition and mult=D indicates ΔJ=1, dipole or dipole with some quadrupole admixture. In a few cases, as noted, mult=D indicates ΔJ=0, dipole or dipole with some quadrupole admixture. For transitions below 500 keV, ΔJ=2, quadrupole transitions are assigned (E2) from RUL=1 for M2, assuming level half-life <10 ns.

[#] ΔJ=0 transition.

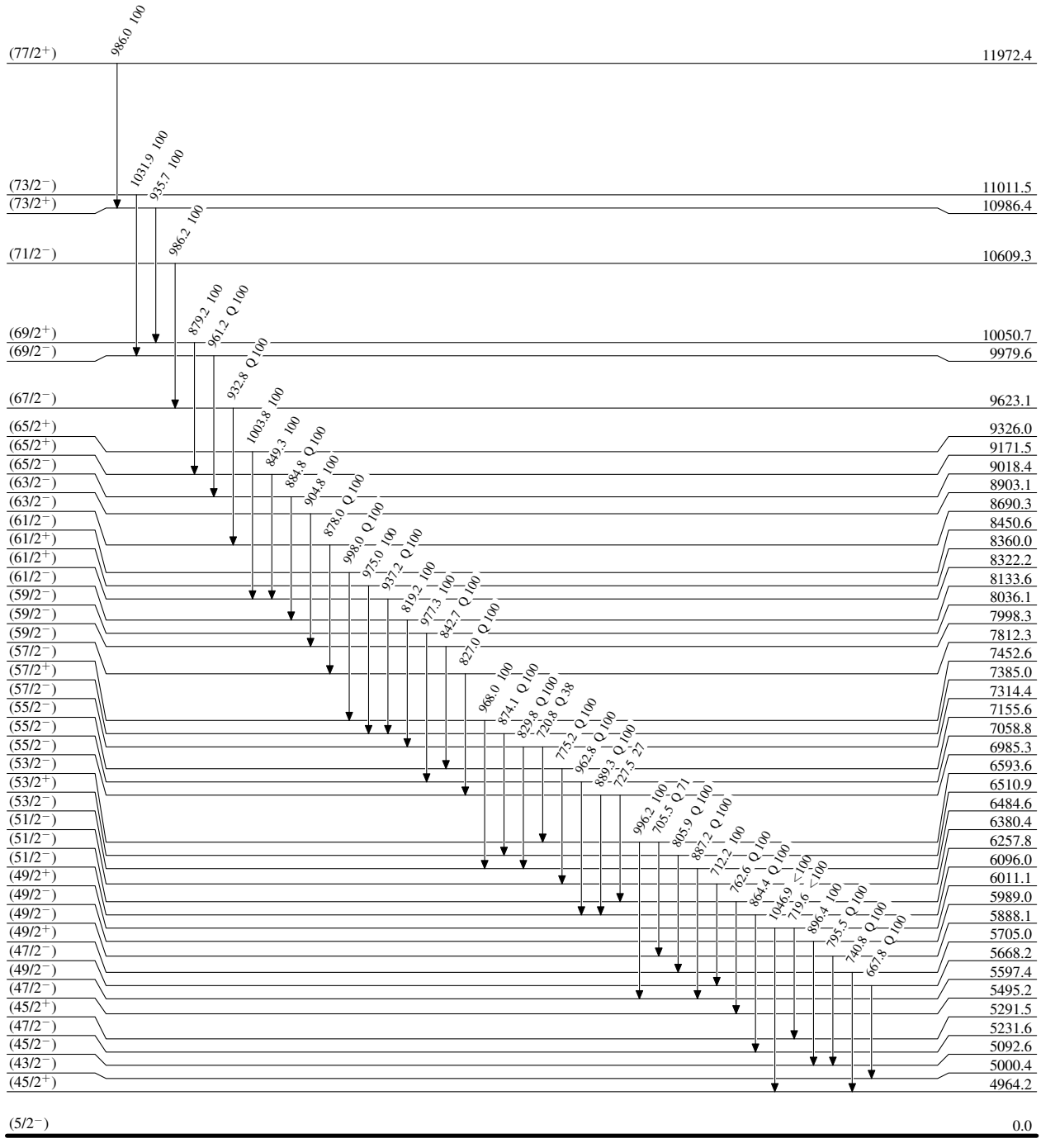
[@] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

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

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

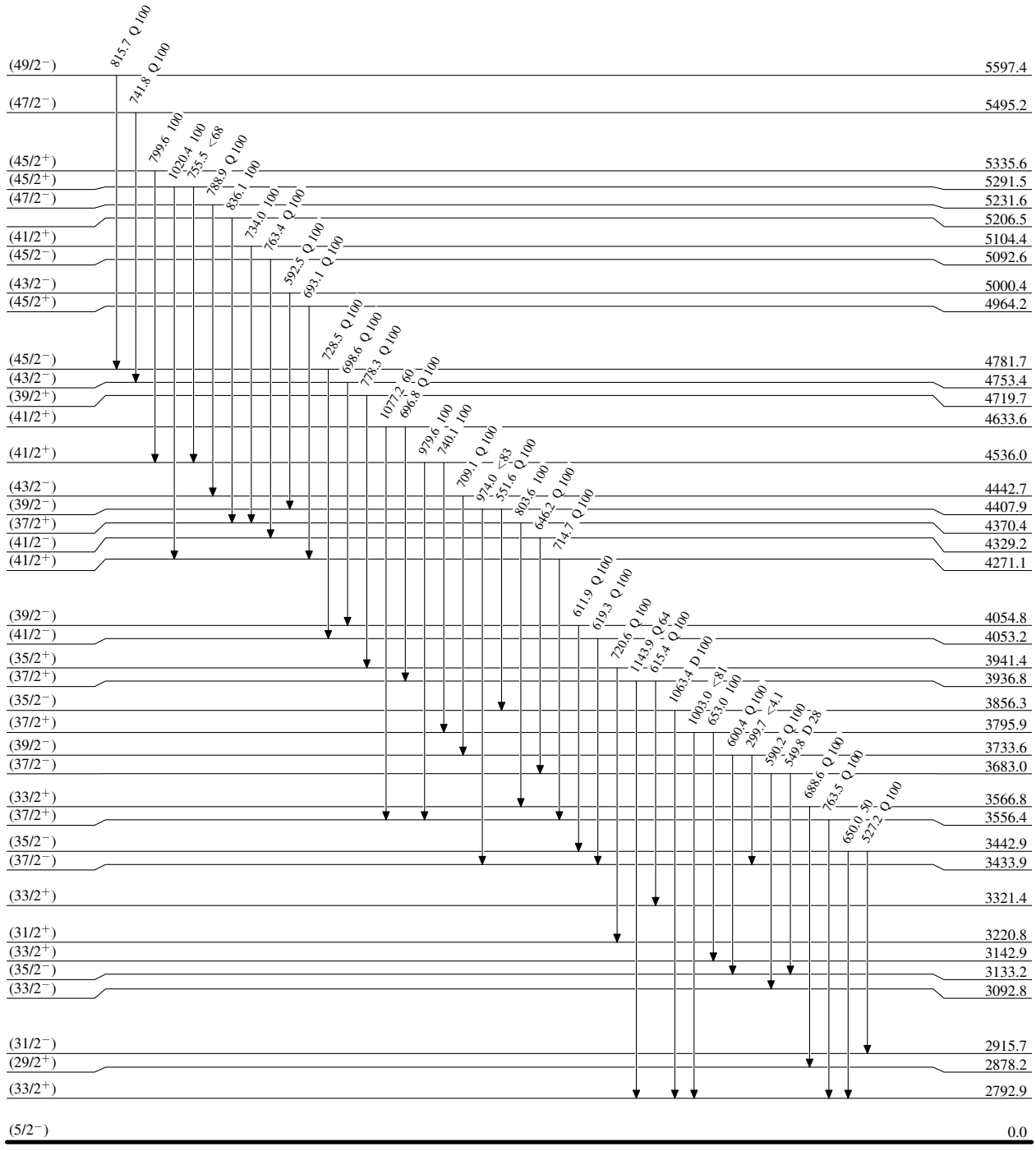


$^{163}_{72}Hf_{91}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{163}_{72}Hf_{91}$

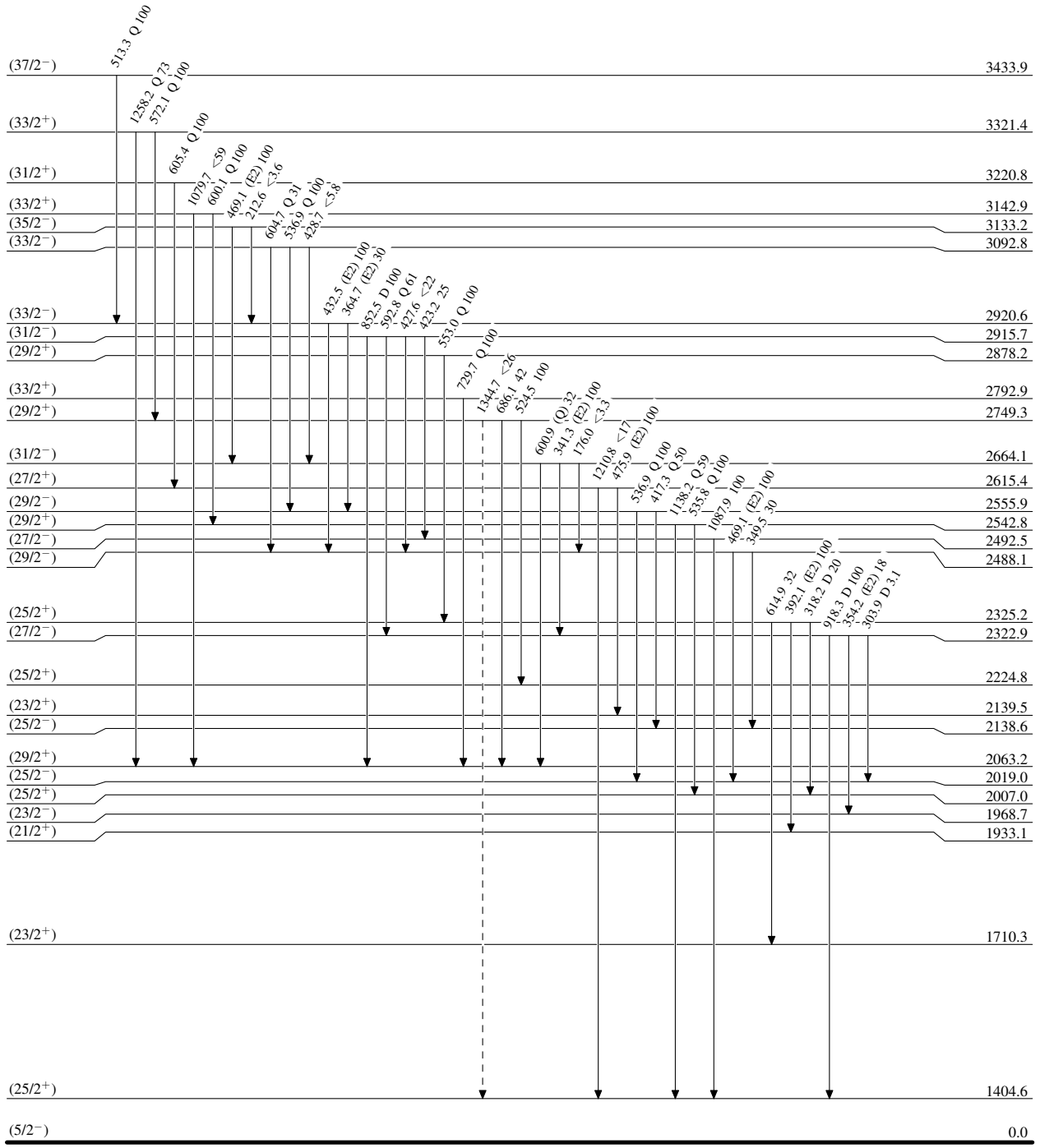
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)

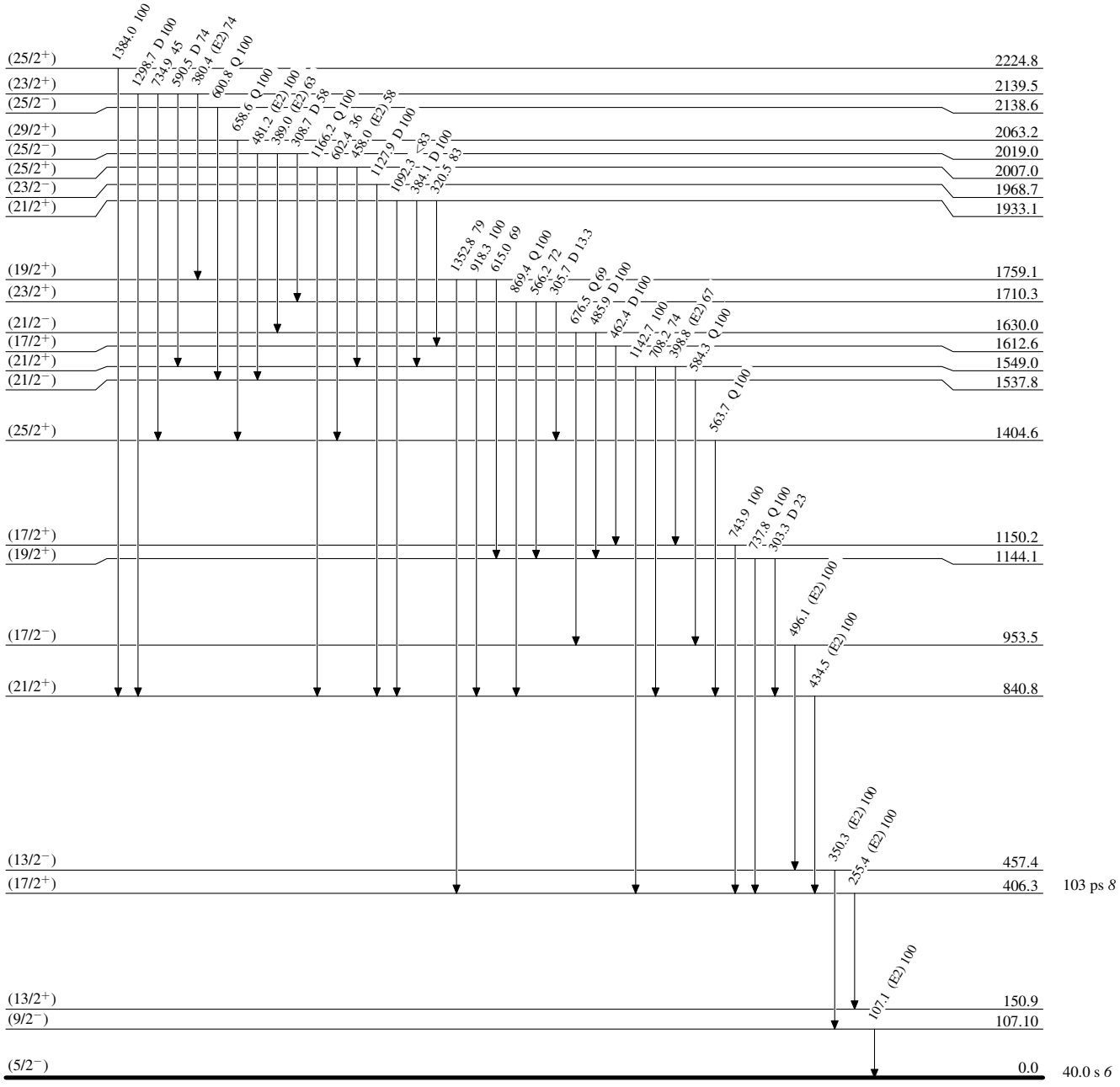


$^{163}_{72}Hf_{91}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



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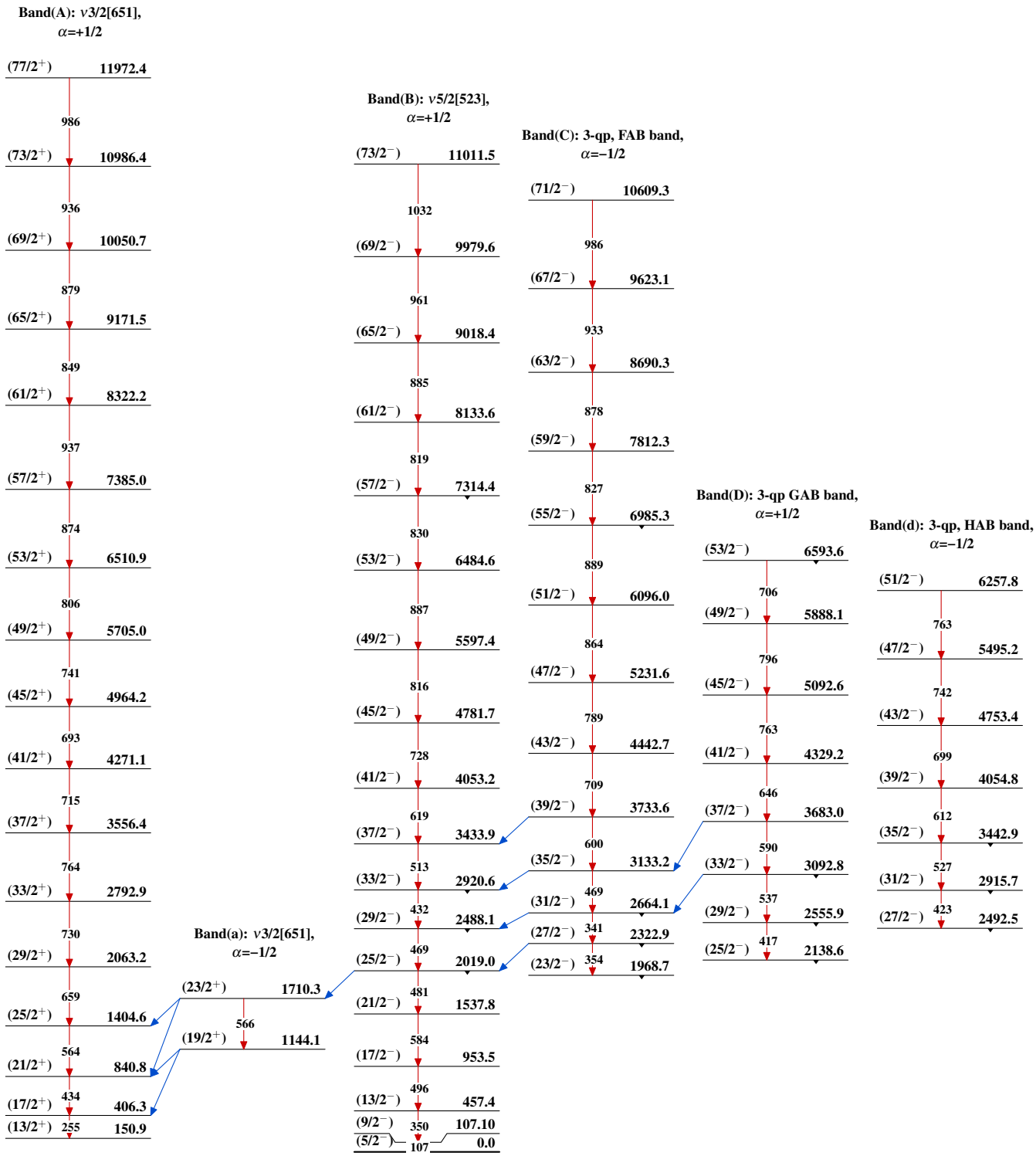
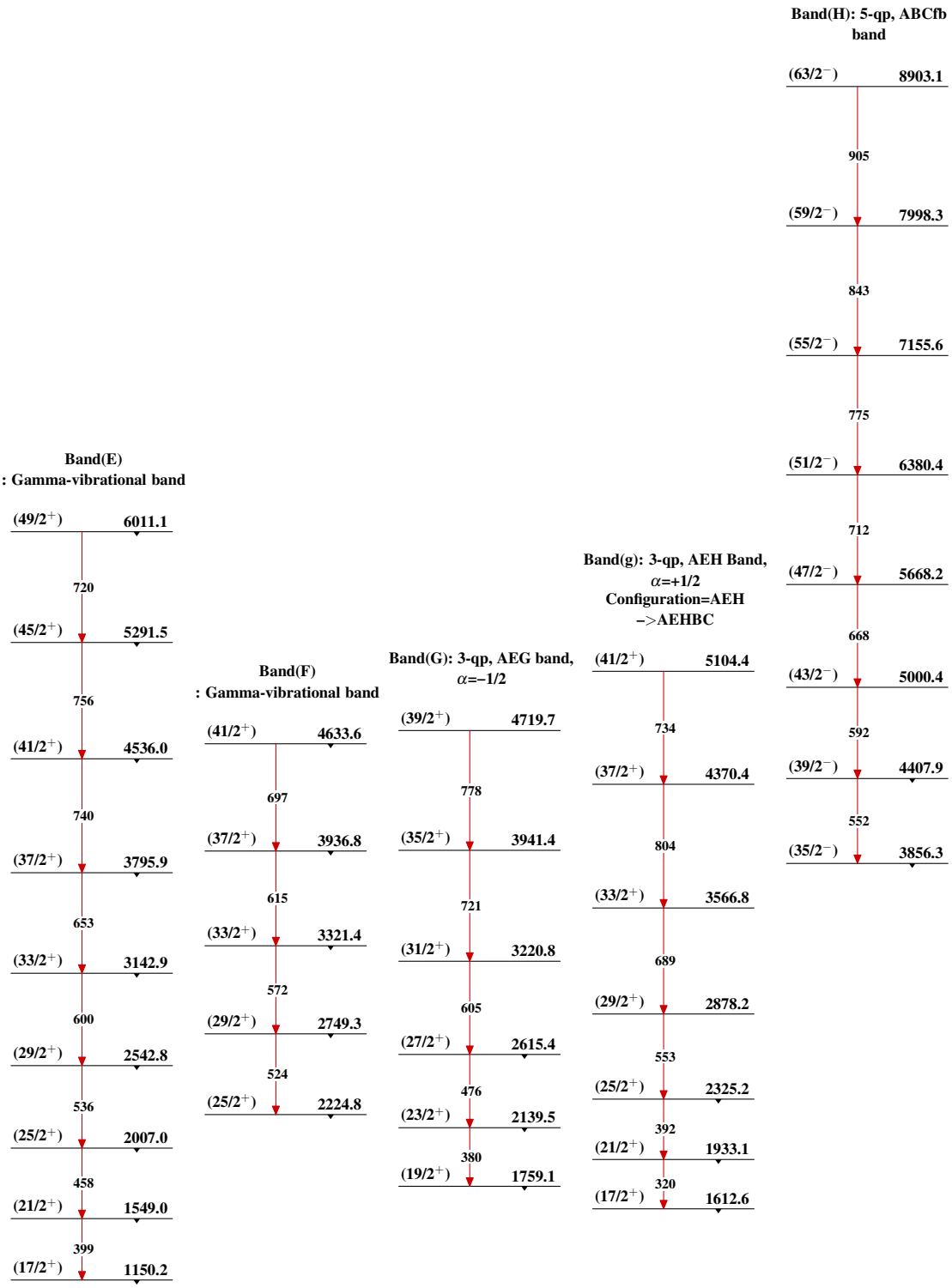
Adopted Levels, Gammas



Adopted Levels, Gammas (continued)



$^{163}_{72}Hf_{91}$