Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 170, 1 (2020)	16-Aug-2020

Q(β^-)=−4543 *10*; S(n)=9479 *13*; S(p)=2183 *7*; Q(α)=4052 *4* 2017Wa10
There is no overlap between the levels populated in the ^{153}Er ε decay and those from the in-beam reactions.

^{153}Ho Levels

For population intensities of SD bands, see that data set.

Cross Reference (XREF) Flags

- A ^{153}Er ε decay
- B ^{120}Sn(^{37}Cl,4nγ):SD
- C ^{139}La(^{20}Ne,6nγ)
- D (HI,xnγ)

E(level)[†‡]	J$^\pi$[#]	T$_{1/2}$[@]	XREF	Comments
0.0	11/2$^-$	2.01 min *3*	A CD	%ε+%β^+=99.949 *25*; %α=0.051 *25* μ=+6.81 *5*; Q=−1.1 *5* <r^2>$^{1/2}$=5.076 fm *34* (2013An02,evaluation). %α: α branching deduced by 1974Sc19 from measured I$_{Kx}$, corrected for direct feeding of excited states in ^{153}Dy. Value may be incorrect since Iγ in 1974Sc19 do not agree with subsequent measurements. J$^\pi$: From collinear spectroscopy measurements (1988NeZZ and 1989Al27); parity deduced from HF ≈ 0.5 for α decay to 11/2$^-$ level. J$^\pi$: Possible h$_{11/2}$ proton state. T$_{1/2}$: Weighted average of 2.0 m *1* (1971To01), 2.00 m *5* (1984Al31), 2.02 m *3* (1993Al03). μ: From 2014StZZ compilation and based on data of 1989Al27 (by laser resonance ionization mass spectroscopy). Q: From 2016St14 and based on data of 1989Al27 (by laser resonance ionization mass spectroscopy). Δ<r^2> values (1989Al27) are: (153-165)=1.252 fm^2 *5*, (153-154)=0.085 *6*, (153-155)=0.303 *6*, and (152-153)=0.154 *7*. The uncertainties are the statistical contributions only. Other: see plot in 1988NeZZ.
68.7 *3*	1/2$^+$	9.3 min *5*	A	%ε+%β^+=99.82 *8*; %α=0.18 *8* μ=+1.19 *1* Additional information 1. J$^\pi$: From collinear laser spectroscopy measurements (1988NeZZ); parity deduced from HF ≈ 3 to 1/2$^+$ level. Possible s$_{1/2}$ proton state. %α: α branching deduced by 1974Sc19 from measured I$_{Kx}$, corrected for direct feeding of excited states in ^{153}Dy. Value may be incorrect since Iγ in 1974Sc19 do not agree subsequent measurements. Other %α: 0.12 *7* (1967Ha34, some of same authors as 1974Sc19), 0.3 *2* (1963Ma17), and 0.08 *5* (quoted in 1974Sc19 from Golovkov, 1969). E(level): From γ energies in ^{153}Er ε decay; other: 68 *7* from the measured α-decay energies for the 2.0-min and 9.3-min states and E(h$_{11/2}$ in ^{149}Tb)=36.0 *3*. T$_{1/2}$: From 1967Ha34; other: 9 m *2* (1963Ma17). μ: From 2014StZZ compilation and based on data of 1989Al27 (by laser resonance ionization mass spectroscopy) with sign from 1989Ra17 evaluation. Δ<r^2> value (1989Al27) is: (153m-165)=1.271 fm^2 *7* compared to 1.252 *5* for the ^{153}Ho ground state.

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Adopted Levels, Gammas (continued)

^{153}Ho Levels (continued)

E(level)[†‡]	J$^{\pi}$[#]	T$_{1/2}$[@]	XREF	Comments
256.7 *4*	(3/2$^+$)		A	J$^{\pi}$: Possible d$_{3/2}$ proton state.
351.20 *15*	(7/2$^-$,9/2$^-$)		A	J$^{\pi}$: (5/2$^-$,7/2$^-$,9/2$^-$) from log *ft*=5.0 from (7/2$^-$) g.s. of ε decay parent; (7/2$^-$,9/2$^-$) from γ to 11/2$^-$ ground state.
398.41 *20*	(7/2$^-$,9/2$^-$)		A	J$^{\pi}$: (5/2$^-$,7/2$^-$,9/2$^-$) from log *ft*=5.2 from (7/2$^-$) g.s. of ε decay parent; (7/2$^-$,9/2$^-$) from γ to 11/2$^-$ ground state.
576.3 *8*	15/2$^-$		CD	J$^{\pi}$: From E2 γ to 11/2$^-$ ground state and expected J progression.
634.2 *4*	(5/2$^+$)		A	J$^{\pi}$: Possible d$_{5/2}$ proton-hole state.
706.1 *4*			A	
726.7 *8*	15/2$^-$		CD	J$^{\pi}$: From E2 γ to 11/2$^-$ ground state and expected J progression.
814.80 *25*			A	
926.60 *25*			A	
1091.1 *10*	15/2$^+$		CD	J$^{\pi}$: From E1, ΔJ=0 γ's to 15/2$^-$ levels.
1150.60 *20*			A	
1207.4 *10*	19/2$^-$		CD	J$^{\pi}$: From E2 γ to 15/2$^-$ level and expected J progression.
1359.3 *10*	19/2$^-$		CD	J$^{\pi}$: From E2 γ to 15/2$^-$ level and expected J progression.
1646.3 *10*	19/2$^+$		CD	J$^{\pi}$: From E2 γ to 15/2$^+$ level and expected J progression.
1700.09 *22*	(7/2$^-$,9/2$^-$)		A	J$^{\pi}$: (5/2$^-$,7/2$^-$,9/2$^-$) from log *ft*=4.8 from (7/2$^-$) g.s. of ε decay parent; (7/2$^-$,9/2$^-$) from γ to 11/2$^-$ ground state. Possible configuration=(π h$_{11/2}$)(ν h$_{9/2}$)1+(ν f$_{7/2}$)5/2$^-$.
1800.6 *11*			A	
1873.4 *12*	23/2$^-$		CD	J$^{\pi}$: From E2 γ to 19/2$^-$ level and expected J progression.
2002.4? *13*			CD	
2030.0 *11*	23/2$^-$		CD	J$^{\pi}$: From γ's to 19/2$^-$ levels and expected J progression.
2125.4 *12*	23/2$^-$		CD	J$^{\pi}$: From E2 γ to 19/2$^-$ level and expected J progression.
2203.2 *11*	23/2$^+$		CD	J$^{\pi}$: From E2 γ to 19/2$^+$ level and expected J progression.
2297.3 *13*	27/2$^-$		CD	J$^{\pi}$: From M1 γ from 25/2$^-$ level and expected J progression.
2358.4 *12*	25/2$^-$		CD	J$^{\pi}$: From M1 γ to 23/2$^-$ level and expected J progression.
2736.3 *13*	27/2$^+$		CD	J$^{\pi}$: From E2 γ to 23/2$^+$ level and expected J progression.
2772.3[c] *14*	31/2$^+$	229 ns *2*	CD	J$^{\pi}$: From E2 γ to 27/2$^+$ level and expected J progression. T$_{1/2}$: other value 251 ns *+54–38* (RF-γ(t) spectra, from 2016Pr06 in ^{139}La(^{20}Ne,6nγ)).
3209.3 *16*	33/2$^+$		CD	J$^{\pi}$: From M1 γ to 31/2$^+$ level and expected J progression.
3685.3[c] *16*	35/2$^+$		CD	J$^{\pi}$: From E2 γ to 31/2$^+$ level and band assignment.
4316.3[c] *19*	39/2$^+$		CD	J$^{\pi}$: From E2 γ to 35/2$^+$ level and band assignment.
4679.3[c] *22*	43/2$^+$	0.5 ns *2*	CD	J$^{\pi}$: From E2 γ to 39/2$^+$ level and band assignment. T$_{1/2}$: unit is ps in (HI,xnγ) but subsequebtly corrected to ns by 2016Pr06 in ^{139}La(^{20}Ne,6nγ).
5134.3[c] *24*	45/2$^+$		CD	J$^{\pi}$: From M1 γ to 43/2$^+$ level and band assignment.
5771 *3*	(47/2$^+$)		CD	J$^{\pi}$: From (M1(+E2)) γ to 45/2$^+$ level and expected J progression.
5896[c] *3*	49/2$^+$		D	J$^{\pi}$: From E2 γ to 45/2$^+$ level and band assignment.
6076 *3*	(49/2$^+$)		CD	J$^{\pi}$: From (M1+E2) γ to (47/2$^+$) level and expected J progression.
6393 *3*	(51/2$^+$)		D	J$^{\pi}$: From (M1(+E2)) γ to (49/2$^+$) level and expected J progression.
6518 *3*			CD	
6937[c] *3*	53/2$^+$		CD	Level depopulated by 761γ observed only in ^{139}La(^{20}Ne,6nγ) and by 1042γ observed only in (HI,xnγ). J$^{\pi}$: From E2 γ to 49/2$^+$ level and band assignment.
7127 *3*	(53/2$^-$)		D	J$^{\pi}$: From E1 γ to (51/2$^+$) level and expected J progression.
7403[c] *3*	(57/2$^+$)		CD	J$^{\pi}$: From E2 γ to (53/2$^+$) level and expected J progression.
7598[c] *3*	61/2$^+$	2.95 ns *15*	CD	J$^{\pi}$: From E2 γ to 57/2$^+$ level and band assignment.
7933 *4*	(63/2$^+$)		D	J$^{\pi}$: From (M1) γ to (61/2$^+$) level and expected J progression.
8934 *4*	(65/2$^-$)		CD	J$^{\pi}$: From E1(+M2) γ to (63/2$^+$) level and band assignment.
9074 *4*	67/2$^-$	0.3 ns *1*	CD	J$^{\pi}$: From unambiguous E3 γ to 61/2$^+$ level and and band assignment. T$_{1/2}$: other value: ≈50 ns (2016Pr06, ^{139}La(^{20}Ne,6nγ)).
9870 *4*	67/2$^-$		CD	J$^{\pi}$: From E2 γ from 71/2$^-$ level and band assignment.
10200 *4*	(69/2$^-$)		CD	J$^{\pi}$: From (M1+E2) γ to 67/2$^-$ level and expected J progression.

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Adopted Levels, Gammas (continued)

^{153}Ho Levels (continued)

E(level)[†‡]	J$^{\pi}$[#]	XREF	Comments
10259 *4*	(69/2$^-$)	CD	J$^{\pi}$: From E2 γ to (65/2$^-$) level and band assignment.
10602 *4*	71/2$^-$	CD	J$^{\pi}$: From E2 γ to 67/2$^-$ level and band assignment. J progression.
10911 *4*	(73/2$^-$)	CD	J$^{\pi}$: From E2 γ to (69/2$^-$) level and expected J progression.
11303 *4*	75/2$^-$	CD	J$^{\pi}$: From E2 γ to 71/2$^-$ level and band assignment.
11679 *4*	79/2$^-$	CD	J$^{\pi}$: From E2 γ to 75/2$^-$ level and band assignment.
12120 *4*		CD	
12476 *4*		D	
x[&]	J	B	J$^{\pi}$: J $\approx$ (51/2$^-$).
x+651.3[&] *14*	J+2	B	
x+1347.1[&] *8*	J+4	B	
x+2087.1[&]	J+6	B	
x+2871.1[&] *2*	J+8	B	
x+3701.7[&] *5*	J+10	B	
x+4577.3[&] *6*	J+12	B	
x+5499.6[&] *7*	J+14	B	
x+6469.1[&] *8*	J+16	B	
x+7484.0[&] *10*	J+18	B	
x+8543.9[&] *10*	J+20	B	
x+9647.0[&] *11*	J+22	B	
x+10791.4[&] *11*	J+24	B	
x+11971.7[&] *12*	J+26	B	
x+13187.2[&] *12*	J+28	B	
x+14438.3[&] *12*	J+30	B	
x+15733.5[&] *14*	J+32	B	
x+17076[&] *2*	J+34	B	
x+18466[&] *2*	J+36	B	
y[a]	J1	B	J$^{\pi}$: J$_1$ $\approx$ (57/2$^-$).
y+713.[a] *2*	J1+2	B	
y+1474.0[a]	J1+4	B	
y+2282.4[a] *3*	J1+6	B	
y+3136.5[a] *4*	J1+8	B	
y+4036.8[a] *5*	J1+10	B	
y+4983.4[a] *6*	J1+12	B	
y+5976.5[a] *8*	J1+14	B	
y+7017.8[a] *9*	J1+16	B	
y+8105.4[a] *10*	J1+18	B	
y+9239.1[a] *11*	J1+20	B	
y+10421.4[a] *12*	J1+22	B	
y+11651.0[a] *12*	J1+24	B	
y+12929.4[a] *13*	J1+26	B	
y+14255.6[a] *13*	J1+28	B	
y+15632.6[a] *14*	J1+30	B	
y+17058[a] *2*	J1+32	B	
z[b]	J2	B	J$^{\pi}$: J$_2$ $\approx$ (49/2$^-$).
z+657.0[b] *9*	J2+2	B	
z+1340.3[b] *5*	J2+4	B	
z+2066.6[b]	J2+6	B	
z+2837.4[b] *3*	J2+8	B	

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Adopted Levels, Gammas (continued)

^{153}Ho Levels (continued)

E(level)[†‡]	J$^{\pi}$[#]	XREF	Comments
z+3653.7[b] *4*	J2+10	B	
z+4515.0[b] *5*	J2+12	B	
z+5421.9[b] *7*	J2+14	B	
z+6375.2[b] *8*	J2+16	B	
z+7371.6[b] *9*	J2+18	B	
z+8417.7[b] *10*	J2+20	B	
z+9510.4[b] *11*	J2+22	B	
z+10653.7[b] *12*	J2+24	B	
z+11848.6[b] *13*	J2+26	B	
z+13096.0[b] *16*	J2+28	B	
z+14393.4[b] *19*	J2+30	B	
z+15744[b] *3*	J2+32	B	
w[d]	53/2^{-}	D	E(level): From strong feeding of level at 5896 keV and weak population of level at 6937, W is ≥ 7 MeV.
806.2+w[d] *13*	57/2^{-}	D	
1669.1+w[d] *15*	61/2^{-}	D	
2616.9+w[d] *20*	65/2^{-}	D	
3631.5+w[d] *21*	69/2^{-}	D	
4714.1+w[d] *21*	73/2^{-}	D	
5864.3+w[d] *22*	77/2^{-}	D	
7083.0+w[d] *22*	81/2^{-}	D	
8370.4+w[d] *23*	85/2^{-}	D	
9713.3+w[d] *24*	89/2^{-}	D	

[†] From least-squares fit on γ ray energies with ΔE_{γ}=1 keV for γ's reported without uncertainty.

[‡] As suggested in 2002Ap04 in (HI,xnγ) dataset the order of the 762 and 1043 γ's given in 1983Ra19 has been reversed. This moved 49/2^{+} level at 6176 keV down to 5896 keV, 6573 to 6393, and 7307 to 7127 on the assumption that these levels follow the 49/2^{+} level. Similarly the order of 335 and 1001 γ's had been reversed moving the intermediary 8599 keV level to 7933 keV.

[#] From comparison with model calculations for ^{153}Er ε decay levels; from multipolarity assignments and band (or cascade) structures for the levels of normal deformation bands from ^{139}La(^{20}Ne,6nγ) and (HI,xnγ) datasets; authors' values assigned relative to the spins of the yrast SD band in ^{152}Dy for SD bands from ^{120}Sn(^{37}Cl,4nγ):SD dataset.

[@] Above 100 keV excitation energy, the values are from (HI,xnγ) unless noted otherwise.

[&] Band(A): SD-1 band. Configuration=$\pi 6^4 \nu 7^2 \otimes (\pi 1/2[530])$, α=−1/2 at lower frequencies and $\pi 6^4 \nu 7^2 (\pi 1/2[770])$, α=−1/2 at higher frequencies.

[a] Band(B): SD-2 band. Configuration=$\pi 6^4 \nu 7^2 \otimes (\pi 1/2[530])$, α=+1/2; signature partner of SD-1 band.

[b] Band(C): SD-3 band. Configuration=$\pi 6^4 \nu 7^2 \otimes (\pi 7/2[523])$, α=+1/2.

[c] Seq.(E): Band based on 31/2^{+} isomer at 2772 keV.

[d] Band(D): π 1/2[541] band, α=+1/2.

Adopted Levels, Gammas (continued)

γ(^{153}Ho)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α[a]	Comments
256.7	(3/2$^+$)	188.0 *2*	100	68.7	1/2$^+$	[M1][#]	0.439	α(K)=0.369 *6*; α(L)=0.0543 *8*; α(M)=0.01198 *18* α(N)=0.00278 *4*; α(O)=0.000405 *6*; α(P)=2.28×10^{-5} *4*
351.20	(7/2$^-$,9/2$^-$)	94.5 *2*	0.15 *10*	256.7	(3/2$^+$)	[M2,E3]	50 *20*	α(K)=13.2 *93*; α(L)=28 *22*; α(M)=7.1 *56* α(N)=1.6 *13*; α(O)=0.19 *15*; α(P)=0.0014 *10*
		351.2 *2*	100 *1*	0.0	11/2$^-$			
398.41	(7/2$^-$,9/2$^-$)	398.4 *2*	100	0.0	11/2$^-$			
576.3	15/2$^-$	576	100	0.0	11/2$^-$	E2[@]	0.01105	α(K)=0.00896 *13*; α(L)=0.001621 *23*; α(M)=0.000365 *6* α(N)=8.40×10^{-5} *12*; α(O)=1.162×10^{-5} *17*; α(P)=5.04×10^{-7} *7*
634.2	(5/2$^+$)	377.5 *2*	100 *7*	256.7	(3/2$^+$)	[M1][#]	0.0667	α(K)=0.0563 *8*; α(L)=0.00814 *12*; α(M)=0.00179 *3* α(N)=0.000416 *6*; α(O)=6.07×10^{-5} *9*; α(P)=3.44×10^{-6} *5*
		565.5 *2*	10 *3*	68.7	1/2$^+$			
706.1		449.4 *2*	100	256.7	(3/2$^+$)			
726.7	15/2$^-$	150		576.3	15/2$^-$	(M1)[@]	0.824	α(K)=0.693 *10*; α(L)=0.1024 *15*; α(M)=0.0226 *4* α(N)=0.00525 *8*; α(O)=0.000764 *11*; α(P)=4.29×10^{-5} *6*
		727	100	0.0	11/2$^-$	E2[@]	0.00637	α(K)=0.00526 *8*; α(L)=0.000868 *13*; α(M)=0.000194 *3* α(N)=4.47×10^{-5} *7*; α(O)=6.28×10^{-6} *9*; α(P)=2.99×10^{-7} *5*
814.80		463.6 *2*	100	351.20	(7/2$^-$,9/2$^-$)			
926.60		575.4 *2*	100	351.20	(7/2$^-$,9/2$^-$)			
1091.1	15/2$^+$	364		726.7	15/2$^-$	E1[@]	0.01115	α(K)=0.00945 *14*; α(L)=0.001334 *19*; α(M)=0.000292 *4* α(N)=6.74×10^{-5} *10*; α(O)=9.60×10^{-6} *14*; α(P)=5.00×10^{-7} *7*
		515	100	576.3	15/2$^-$	E1[@]	0.00502	α(K)=0.00426 *6*; α(L)=0.000590 *9*; α(M)=0.0001291 *18* α(N)=2.98×10^{-5} *5*; α(O)=4.28×10^{-6} *6*; α(P)=2.31×10^{-7} *4*
1150.60		1150.6 *2*	100	0.0	11/2$^-$			
1207.4	19/2$^-$	631	100	576.3	15/2$^-$	E2[@]	0.00886	α(K)=0.00724 *11*; α(L)=0.001259 *18*; α(M)=0.000283 *4* α(N)=6.51×10^{-5} *10*; α(O)=9.07×10^{-6} *13*; α(P)=4.10×10^{-7} *6*
1359.3	19/2$^-$	152		1207.4	19/2$^-$	(M1,E2)[@]	0.71 *9*	α(K)=0.51 *16*; α(L)=0.151 *53*; α(M)=0.035 *14* α(N)=0.0080 *30*; α(O)=1.04×10^{-3} *31*; α(P)=2.9×10^{-5} *13*
		633		726.7	15/2$^-$			
		783	100	576.3	15/2$^-$	E2[@]	0.00540	α(K)=0.00447 *7*; α(L)=0.000720 *10*; α(M)=0.0001605 *23* α(N)=3.70×10^{-5} *6*; α(O)=5.23×10^{-6} *8*; α(P)=2.55×10^{-7} *4*
1646.3	19/2$^+$	287	100	1359.3	19/2$^-$	E1[@]	0.0199	α(K)=0.01686 *24*; α(L)=0.00241 *4*; α(M)=0.000530 *8* α(N)=0.0001220 *17*; α(O)=1.725×10^{-5} *25*; α(P)=8.76×10^{-7} *13*
		439		1207.4	19/2$^-$	E1[@]	0.00719	α(K)=0.00610 *9*; α(L)=0.000852 *12*; α(M)=0.000187 *3* α(N)=4.31×10^{-5} *6*; α(O)=6.16×10^{-6} *9*; α(P)=3.27×10^{-7} *5*
		555		1091.1	15/2$^+$	E2[@]	0.01211	α(K)=0.00980 *14*; α(L)=0.00180 *3*; α(M)=0.000406 *6* α(N)=9.35×10^{-5} *13*; α(O)=1.289×10^{-5} *18*; α(P)=5.50×10^{-7} *8*
1700.09	(7/2$^-$,9/2$^-$)	1301.4	80	398.41	(7/2$^-$,9/2$^-$)			
		1348.9 *3*	100 *13*	351.20	(7/2$^-$,9/2$^-$)			
		1700.1 *3*	20 *7*	0.0	11/2$^-$			

$^{153}_{67}Ho_{86}$-5

Adopted Levels, Gammas (continued)

γ(^{153}Ho) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α[a]	Comments
1800.6		1166.4	100	634.2	(5/2$^+$)			
1873.4	23/2$^-$	666	100	1207.4	19/2$^-$	E2[@]	0.00780	α(K)=0.00640 *9*; α(L)=0.001090 *16*; α(M)=0.000244 *4* α(N)=5.63×10^{-5} *8*; α(O)=7.86×10^{-6} *11*; α(P)=3.63×10^{-7} *5*
2002.4?		795	100	1207.4	19/2$^-$			
2030.0	23/2$^-$	671		1359.3	19/2$^-$			
		822		1207.4	19/2$^-$			
2125.4	23/2$^-$	252	56 *6*	1873.4	23/2$^-$	M1[@]	0.196	α(K)=0.1654 *24*; α(L)=0.0242 *4*; α(M)=0.00533 *8* α(N)=0.001238 *18*; α(O)=0.000180 *3*; α(P)=1.017×10^{-5} *15*
		918	100 *10*	1207.4	19/2$^-$	E2[@]	0.00382	α(K)=0.00319 *5*; α(L)=0.000492 *7*; α(M)=0.0001091 *16* α(N)=2.52×10^{-5} *4*; α(O)=3.59×10^{-6} *5*; α(P)=1.83×10^{-7} *3*
2203.2	23/2$^+$	173		2030.0	23/2$^-$	E1+M2[@]	0.106 *33*	α(K)=0.087 *26*; α(L)=0.0148 *56*; α(M)=0.0033 *13* α(N)=7.7×10^{-4} *31*; α(O)=1.07×10^{-4} *43*; α(P)=5.2×10^{-6} *22*
		330		1873.4	23/2$^-$			
		557		1646.3	19/2$^+$	E2[@]	0.01200	α(K)=0.00971 *14*; α(L)=0.001783 *25*; α(M)=0.000402 *6* α(N)=9.25×10^{-5} *13*; α(O)=1.276×10^{-5} *18*; α(P)=5.45×10^{-7} *8*
2297.3	27/2$^-$	424	100	1873.4	23/2$^-$			
2358.4	25/2$^-$	61		2297.3	27/2$^-$	M1(+E2)[@]	15.4 *46*	α(K)=5.7 *34*; α(L)=7.5 *62*; α(M)=1.8 *15* α(N)=0.41 *34*; α(O)=0.048 *38*; α(P)=3.5×10^{-4} *22*
		233		2125.4	23/2$^-$	M1[@]	0.243	α(K)=0.205 *3*; α(L)=0.0300 *5*; α(M)=0.00661 *10* α(N)=0.001535 *22*; α(O)=0.000224 *4*; α(P)=1.260×10^{-5} *18*
		356		2002.4?				
		485		1873.4	23/2$^-$	(M1)[@]	0.0348	α(K)=0.0294 *5*; α(L)=0.00421 *6*; α(M)=0.000927 *13* α(N)=0.000215 *3*; α(O)=3.14×10^{-5} *5*; α(P)=1.79×10^{-6} *3*
2736.3	27/2$^+$	378	67 *4*	2358.4	25/2$^-$	E1[@]	0.01019	α(K)=0.00864 *12*; α(L)=0.001217 *17*; α(M)=0.000267 *4* α(N)=6.15×10^{-5} *9*; α(O)=8.77×10^{-6} *13*; α(P)=4.59×10^{-7} *7*
		439		2297.3	27/2$^-$	E1[@]	0.00719	α(K)=0.00610 *9*; α(L)=0.000852 *12*; α(M)=0.000187 *3* α(N)=4.31×10^{-5} *6*; α(O)=6.16×10^{-6} *9*; α(P)=3.27×10^{-7} *5*
		533	100 *5*	2203.2	23/2$^+$	E2[@]	0.01341	α(K)=0.01080 *16*; α(L)=0.00202 *3*; α(M)=0.000458 *7* α(N)=0.0001052 *15*; α(O)=1.445×10^{-5} *21*; α(P)=6.04×10^{-7} *9*
2772.3	31/2$^+$	36		2736.3	27/2$^+$	E2[@]	233	α(L)=179 *3*; α(M)=43.1 *6* α(N)=9.66 *14*; α(O)=1.118 *16*; α(P)=0.000437 *7* B(E2)(W.u.)=3.5 *5*
		475		2297.3	27/2$^-$	M2[@]	0.1192	α(K)=0.0980 *14*; α(L)=0.01655 *24*; α(M)=0.00372 *6* α(N)=0.000866 *13*; α(O)=0.0001251 *18*; α(P)=6.78×10^{-6} *10* B(M2)(W.u.)=0.00258 *5*
3209.3	33/2$^+$	437	100	2772.3	31/2$^+$	M1[@]	0.0456	α(K)=0.0385 *6*; α(L)=0.00553 *8*; α(M)=0.001217 *17* α(N)=0.000283 *4*; α(O)=4.13×10^{-5} *6*; α(P)=2.34×10^{-6} *4*
3685.3	35/2$^+$	476		3209.3	33/2$^+$	(M1)[@]	0.0365	α(K)=0.0309 *5*; α(L)=0.00442 *7*; α(M)=0.000973 *14* α(N)=0.000226 *4*; α(O)=3.30×10^{-5} *5*; α(P)=1.88×10^{-6} *3*

$^{153}_{67}Ho_{86}$-6

Adopted Levels, Gammas (continued)

γ(^{153}Ho) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡b]	α[a]	Comments
3685.3	35/2$^+$	913		2772.3	31/2$^+$	E2[@]		0.00387	α(K)=0.00323 *5*; α(L)=0.000498 *7*; α(M)=0.0001105 *16* α(N)=2.55×10^{-5} *4*; α(O)=3.63×10^{-6} *5*; α(P)=1.85×10^{-7} *3*
4316.3	39/2$^+$	631	100	3685.3	35/2$^+$	E2[@]		0.00886	α(K)=0.00724 *11*; α(L)=0.001259 *18*; α(M)=0.000283 *4* α(N)=6.51×10^{-5} *10*; α(O)=9.07×10^{-6} *13*; α(P)=4.10×10^{-7} *6*
4679.3	43/2$^+$	363	100	4316.3	39/2$^+$	E2[@]		0.0379	α(K)=0.0291 *4*; α(L)=0.00683 *10*; α(M)=0.001571 *22* α(N)=0.000359 *5*; α(O)=4.76×10^{-5} *7*; α(P)=1.557×10^{-6} *22* B(E2)(W.u.)=3.6 *+22−11*
5134.3	45/2$^+$	455	100	4679.3	43/2$^+$	M1+E2	+0.33 *3*	0.0390 *7*	α(K)=0.0328 *6*; α(L)=0.00481 *8*; α(M)=0.001060 *16* α(N)=0.000246 *4*; α(O)=3.57×10^{-5} *6*; α(P)=1.99×10^{-6} *4* Mult.: M1 in (HI,xnγ) and (M1+E2) in ^{139}La(^{20}Ne,6nγ).
5771	(47/2$^+$)	637	100	5134.3	45/2$^+$	(M1(+E2))	+0.08 *+12−9*	0.0174 *4*	α(K)=0.0147 *4*; α(L)=0.00209 *4*; α(M)=0.000458 *9* α(N)=0.0001065 *21*; α(O)=1.55×10^{-5} *3*; α(P)=8.88×10^{-7} *20*
5896	49/2$^+$	762	100	5134.3	45/2$^+$	E2[@]		0.00573	α(K)=0.00474 *7*; α(L)=0.000771 *11*; α(M)=0.0001718 *24* α(N)=3.97×10^{-5} *6*; α(O)=5.59×10^{-6} *8*; α(P)=2.70×10^{-7} *4*
6076	(49/2$^+$)	305	100	5771	(47/2$^+$)	(M1+E2)	+0.11 *+11−5*	0.1168 *25*	α(K)=0.0984 *23*; α(L)=0.01437 *21*; α(M)=0.00317 *5* α(N)=0.000736 *11*; α(O)=0.0001071 *17*; α(P)=6.03×10^{-6} *15*
6393	(51/2$^+$)	497	100	5896	49/2$^+$	(M1(+E2))	+0.3 *5*	0.031 *6*	α(K)=0.026 *5*; α(L)=0.0038 *5*; α(M)=0.00084 *10* α(N)=0.000196 *23*; α(O)=2.9×10^{-5} *4*; α(P)=1.6×10^{-6} *3*
6518		442	100	6076	(49/2$^+$)				
6937	53/2$^+$	1042[c]		5896	49/2$^+$	E2[@]		0.00294	α(K)=0.00247 *4*; α(L)=0.000369 *6*; α(M)=8.15×10^{-5} *12* α(N)=1.89×10^{-5} *3*; α(O)=2.70×10^{-6} *4*; α(P)=1.414×10^{-7} *20* E_γ: γ ray placed at 6937 in (HI,xnγ) is placed at 6176 in ^{139}La(^{20}Ne,6nγ).
7127	(53/2$^-$)	734	100	6393	(51/2$^+$)	E1		0.00238	α(K)=0.00203 *3*; α(L)=0.000275 *4*; α(M)=6.01×10^{-5} *9* α(N)=1.390×10^{-5} *20*; α(O)=2.01×10^{-6} *3*; α(P)=1.112×10^{-7} *16*
7403	(57/2$^+$)	466	100	6937	53/2$^+$	E2		0.0190	α(K)=0.01509 *22*; α(L)=0.00303 *5*; α(M)=0.000689 *10* α(N)=0.0001582 *23*; α(O)=2.15×10^{-5} *3*; α(P)=8.33×10^{-7} *12*
7598	61/2$^+$	195	100	7403	(57/2$^+$)	E2		0.265	α(K)=0.1729 *25*; α(L)=0.0713 *10*; α(M)=0.01687 *24* α(N)=0.00383 *6*; α(O)=0.000477 *7*; α(P)=8.14×10^{-6} *12* B(E2)(W.u.)=11.1 *6*
7933	(63/2$^+$)	335	100	7598	61/2$^+$	(M1)[@]		0.0915	α(K)=0.0772 *11*; α(L)=0.01118 *16*; α(M)=0.00246 *4* α(N)=0.000572 *8*; α(O)=8.34×10^{-5} *12*; α(P)=4.72×10^{-6} *7*
8934	(65/2$^-$)	1001[c]		7933	(63/2$^+$)	E1(+M2)[@]		0.00143 *13*	α(K)=0.00122 *11*; α(L)=0.000165 *17*; α(M)=3.6×10^{-5} *4* α(N)=8.4×10^{-6} *9*; α(O)=1.22×10^{-6} *13*; α(P)=6.9×10^{-8} *7* E_γ: γ ray placed at 8934 in (HI,xnγ) is placed at 8599 in ^{139}La(^{20}Ne,6nγ).
9074	67/2$^-$	140	100 *5*	8934	(65/2$^-$)	(M1+E2)	+0.20 *+9−5*	0.994 *16*	α(K)=0.827 *20*; α(L)=0.131 *7*; α(M)=0.0291 *17* α(N)=0.0067 *4*; α(O)=0.00097 *4*; α(P)=5.08×10^{-5} *15* B(M1)(W.u.)=0.012 *+7−4*; B(E2)(W.u.)=13 *+28−8*
		1476	18 *2*	7598	61/2$^+$	E3[@]		0.00291	α(K)=0.00240 *4*; α(L)=0.000377 *6*; α(M)=8.38×10^{-5} *12*

$^{153}_{67}Ho_{86}$-7

Adopted Levels, Gammas (continued)

γ(^{153}Ho) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡][b]	α[a]	Comments
									α(N)=1.94×10^{-5} *3*; α(O)=2.78×10^{-6} *4*; α(P)=1.442×10^{-7} *21*; α(IPF)=2.69×10^{-5} *4* B(E3)(W.u.)=16 *+12−6*
9870	67/2$^-$	796	100	9074	67/2$^-$				
10200	(69/2$^-$)	1126	100	9074	67/2$^-$	(M1+E2)	+0.17 *+14−11*	0.00425 *13*	α(K)=0.00361 *11*; α(L)=0.000502 *14*; α(M)=0.000110 *3* α(N)=2.56×10^{-5} *7*; α(O)=3.74×10^{-6} *11*; α(P)=2.16×10^{-7} *7*; α(IPF)=8.37×10^{-7} *15*
10259	(69/2$^-$)	389	100 *10*	9870	67/2$^-$	(M1+E2)	+0.17 *+11−8*	0.0608 *16*	α(K)=0.0513 *15*; α(L)=0.00745 *14*; α(M)=0.00164 *3* α(N)=0.000381 *7*; α(O)=5.55×10^{-5} *12*; α(P)=3.13×10^{-6} *10*
		1185	20 *2*	9074	67/2$^-$				
		1325	48 *5*	8934	(65/2$^-$)	E2		0.00185	α(K)=0.001540 *22*; α(L)=0.000220 *3*; α(M)=4.85×10^{-5} *7* α(N)=1.122×10^{-5} *16*; α(O)=1.621×10^{-6} *23*; α(P)=8.83×10^{-8} *13*; α(IPF)=2.40×10^{-5} *4*
10602	71/2$^-$	343	100 *5*	10259	(69/2$^-$)	(M1+E2)	+0.19 *+9−8*	0.0845 *20*	α(K)=0.0711 *18*; α(L)=0.01042 *17*; α(M)=0.00230 *4* α(N)=0.000534 *9*; α(O)=7.76×10^{-5} *14*; α(P)=4.34×10^{-6} *12*
		732	33 *3*	9870	67/2$^-$	E2		0.00627	α(K)=0.00518 *8*; α(L)=0.000853 *12*; α(M)=0.000190 *3* α(N)=4.39×10^{-5} *7*; α(O)=6.18×10^{-6} *9*; α(P)=2.95×10^{-7} *5*
		1528	55 *6*	9074	67/2$^-$	E2		1.47×10^{-3}	α(K)=0.001175 *17*; α(L)=0.0001650 *24*; α(M)=3.62×10^{-5} *5* α(N)=8.39×10^{-6} *12*; α(O)=1.216×10^{-6} *17*; α(P)=6.74×10^{-8} *10*; α(IPF)=8.20×10^{-5} *12*
10911	(73/2$^-$)	652		10259	(69/2$^-$)				
		711		10200	(69/2$^-$)	E2		0.00670	α(K)=0.00553 *8*; α(L)=0.000919 *13*; α(M)=0.000205 *3* α(N)=4.74×10^{-5} *7*; α(O)=6.65×10^{-6} *10*; α(P)=3.14×10^{-7} *5*
11303	75/2$^-$	392		10911	(73/2$^-$)				
		701		10602	71/2$^-$	E2		0.00692	α(K)=0.00570 *8*; α(L)=0.000953 *14*; α(M)=0.000213 *3* α(N)=4.92×10^{-5} *7*; α(O)=6.89×10^{-6} *10*; α(P)=3.24×10^{-7} *5*
11679	79/2$^-$	376	100	11303	75/2$^-$	E2		0.0343	α(K)=0.0265 *4*; α(L)=0.00606 *9*; α(M)=0.001392 *20* α(N)=0.000318 *5*; α(O)=4.24×10^{-5} *6*; α(P)=1.423×10^{-6} *20*
12120		441	100	11679	79/2$^-$				
12476		356	100	12120					

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$\gamma(^{153}Ho)$ (continued)

E_i(level)	J^π_i	E_γ †	I_γ †	E_f	J^π_f	Mult. ‡
x+651.3	J+2	651.3 *19*	0.44[&] *5*	x	J	
x+1347.1	J+4	695.8 *11*	0.75[&] *8*	x+651.3	J+2	(Q)
x+2087.1	J+6	740.0 *8*	0.95[&] *8*	x+1347.1	J+4	(Q)
x+2871.1	J+8	784.0 *2*	0.99[&] *8*	x+2087.1	J+6	(Q)
x+3701.7	J+10	830.6 *5*		x+2871.1	J+8	
x+4577.3	J+12	875.6 *3*	0.97[&] *10*	x+3701.7	J+10	(Q)
x+5499.6	J+14	922.3 *3*	1.06[&] *9*	x+4577.3	J+12	
x+6469.1	J+16	969.5 *5*	0.89[&] *9*	x+5499.6	J+14	(Q)
x+7484.0	J+18	1014.9 *5*	0.92[&] *8*	x+6469.1	J+16	(Q)
x+8543.9	J+20	1059.9 *3*	0.60[&] *10*	x+7484.0	J+18	(Q)
x+9647.0	J+22	1103.1 *3*	0.71[&] *10*	x+8543.9	J+20	
x+10791.4	J+24	1144.4 *3*	0.41[&] *7*	x+9647.0	J+22	
x+11971.7	J+26	1180.3 *3*	0.52[&] *8*	x+10791.4	J+24	
x+13187.2	J+28	1215.5 *3*	0.27[&] *6*	x+11971.7	J+26	
x+14438.3	J+30	1251.1 *3*	0.27[&] *5*	x+13187.2	J+28	
x+15733.5	J+32	1295.2 *6*		x+14438.3	J+30	
x+17076	J+34	1343[c] *1*		x+15733.5	J+32	
x+18466	J+36	1390[c] *1*		x+17076	J+34	
y+713.	J1+2	713.[c] *2*		y	J1	
y+1474.0	J1+4	761[c] *2*		y+713.	J1+2	
y+2282.4	J1+6	808.4 *3*	0.41[&] *8*	y+1474.0	J1+4	
y+3136.5	J1+8	854.1 *3*	0.74[&] *8*	y+2282.4	J1+6	
y+4036.8	J1+10	900.3 *3*	1.26[&] *9*	y+3136.5	J1+8	
y+4983.4	J1+12	946.6 *3*	0.96[&] *9*	y+4036.8	J1+10	
y+5976.5	J1+14	993.1 *5*		y+4983.4	J1+12	
y+7017.8	J1+16	1041.3 *5*		y+5976.5	J1+14	
y+8105.4	J1+18	1087.6 *3*	1.04[&] *10*	y+7017.8	J1+16	
y+9239.1	J1+20	1133.7 *6*	0.92[&] *9*	y+8105.4	J1+18	
y+10421.4	J1+22	1182.3 *3*	0.94[&] *9*	y+9239.1	J1+20	
y+11651.0	J1+24	1229.6 *3*	0.84[&] *8*	y+10421.4	J1+22	
y+12929.4	J1+26	1278.4 *4*	0.71[&] *8*	y+11651.0	J1+24	
y+14255.6	J1+28	1326.2 *4*	0.24[&] *8*	y+12929.4	J1+26	
y+15632.6	J1+30	1377.0 *4*		y+14255.6	J1+28	
y+17058	J1+32	1425[c] *2*		y+15632.6	J1+30	
z+657.0	J2+2	657[c] *2*		z	J2	
z+1340.3	J2+4	683.3 *7*	0.95[&] *8*	z+657.0	J2+2	
z+2066.6	J2+6	726.3 *5*		z+1340.3	J2+4	

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Adopted Levels, Gammas (continued)

γ(^{153}Ho) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α[a]	Comments
z+2837.4	J2+8	770.8 *3*	0.83[&] *9*	z+2066.6	J2+6			
z+3653.7	J2+10	816.3 *3*	0.98[&] *8*	z+2837.4	J2+8			
z+4515.0	J2+12	861.3 *3*	1.00[&] *8*	z+3653.7	J2+10			
z+5421.9	J2+14	906.9 *5*		z+4515.0	J2+12			
z+6375.2	J2+16	953.3 *3*	0.89[&] *8*	z+5421.9	J2+14			
z+7371.6	J2+18	996.4 *5*		z+6375.2	J2+16			
z+8417.7	J2+20	1046.1 *4*	0.67[&] *10*	z+7371.6	J2+18			
z+9510.4	J2+22	1092.7 *3*	0.71[&] *8*	z+8417.7	J2+20			
z+10653.7	J2+24	1143.3 *5*	0.64[&] *8*	z+9510.4	J2+22			
z+11848.6	J2+26	1194.9 *5*		z+10653.7	J2+24			
z+13096.0	J2+28	1247.4 *10*	0.51[&] *8*	z+11848.6	J2+26			
z+14393.4	J2+30	1297.4 *19*	0.32[&] *9*	z+13096.0	J2+28			
z+15744	J2+32	1351[c] *2*		z+14393.4	J2+30			
806.2+w	57/2$^-$	806.2 *13*	100	w	53/2$^-$			
1669.1+w	61/2$^-$	862.9 *6*	100	806.2+w	57/2$^-$	E2[@]	0.00436	α(K)=0.00364 *6*; α(L)=0.000569 *8*; α(M)=0.0001264 *18* α(N)=2.92×10^{-5} *5*; α(O)=4.14×10^{-6} *6*; α(P)=2.08×10^{-7} *3*
2616.9+w	65/2$^-$	947.8 *13*	100	1669.1+w	61/2$^-$	E2[@]	0.00358	α(K)=0.00299 *5*; α(L)=0.000457 *7*; α(M)=0.0001012 *15* α(N)=2.34×10^{-5} *4*; α(O)=3.34×10^{-6} *5*; α(P)=1.713×10^{-7} *25*
3631.5+w	69/2$^-$	1014.6 *6*	100	2616.9+w	65/2$^-$	E2[@]	0.00310	α(K)=0.00260 *4*; α(L)=0.000391 *6*; α(M)=8.66×10^{-5} *13* α(N)=2.00×10^{-5} *3*; α(O)=2.86×10^{-6} *4*; α(P)=1.492×10^{-7} *21*
4714.1+w	73/2$^-$	1082.6 *5*	100	3631.5+w	69/2$^-$	E2[@]	0.00272	α(K)=0.00229 *4*; α(L)=0.000339 *5*; α(M)=7.48×10^{-5} *11* α(N)=1.732×10^{-5} *25*; α(O)=2.48×10^{-6} *4*; α(P)=1.311×10^{-7} *19*
5864.3+w	77/2$^-$	1150.2 *5*	100	4714.1+w	73/2$^-$	E2[@]	0.00241	α(K)=0.00203 *3*; α(L)=0.000297 *5*; α(M)=6.55×10^{-5} *10* α(N)=1.516×10^{-5} *22*; α(O)=2.18×10^{-6} *3*; α(P)=1.163×10^{-7} *17*; α(IPF)=1.54×10^{-6} *4*
7083.0+w	81/2$^-$	1218.7 *5*	100	5864.3+w	77/2$^-$	E2[@]	0.00215	α(K)=0.00181 *3*; α(L)=0.000263 *4*; α(M)=5.78×10^{-5} *9* α(N)=1.339×10^{-5} *19*; α(O)=1.93×10^{-6} *3*; α(P)=1.038×10^{-7} *15*; α(IPF)=7.30×10^{-6} *12*
8370.4+w	85/2$^-$	1287.4 *5*	100	7083.0+w	81/2$^-$	E2[@]	0.00194	α(K)=0.001627 *23*; α(L)=0.000234 *4*; α(M)=5.15×10^{-5} *8* α(N)=1.192×10^{-5} *17*; α(O)=1.720×10^{-6} *25*; α(P)=9.34×10^{-8} *13*; α(IPF)=1.71×10^{-5} *3*
9713.3+w	89/2$^-$	1342.9 *7*	100	8370.4+w	85/2$^-$	E2[@]	0.00180	α(K)=0.001501 *21*; α(L)=0.000214 *3*; α(M)=4.71×10^{-5} *7* α(N)=1.092×10^{-5} *16*; α(O)=1.576×10^{-6} *23*; α(P)=8.61×10^{-8} *12*; α(IPF)=2.79×10^{-5} *5*

[†] γ′s from the level scheme connected to g.s.: Eγ values with decimal point and their Iγ values are from ^{153}Er ε decay. Rounded off Eγ′s are from (HI,xnγ),

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Adopted Levels, Gammas (continued)

$\gamma(^{153}Ho)$ (continued)

with Iγ's from $^{139}La(^{20}Ne,6n\gamma)$. γ's from the "hanging bands" (not connected to g.s.): Eγ's and Iγ's from energy levels coded as 'letter+number' are from $^{120}Sn(^{37}Cl,4n\gamma)$:SD, while those from energy levels coded as 'number+letter' are from (HI,xnγ).

‡ From $^{139}La(^{20}Ne,6n\gamma)$ from DCO and angular polarization measurements unless stated otherwise.

Assumed in ^{153}Er ε decay from $\Delta J^{\pi}_{(levels)}$ and so to keep the intensity balance of the coincidence relations.

@ From (HI,xnγ) from α_K(exp) values.

& Relative intensity within the SD band, normalized to ≈1 for for the most intense transition in each SD band.

a Additional information 2.

b Additional information 3.

c Placement of transition in the level scheme is uncertain.

$^{153}_{67}Ho_{86}$-11

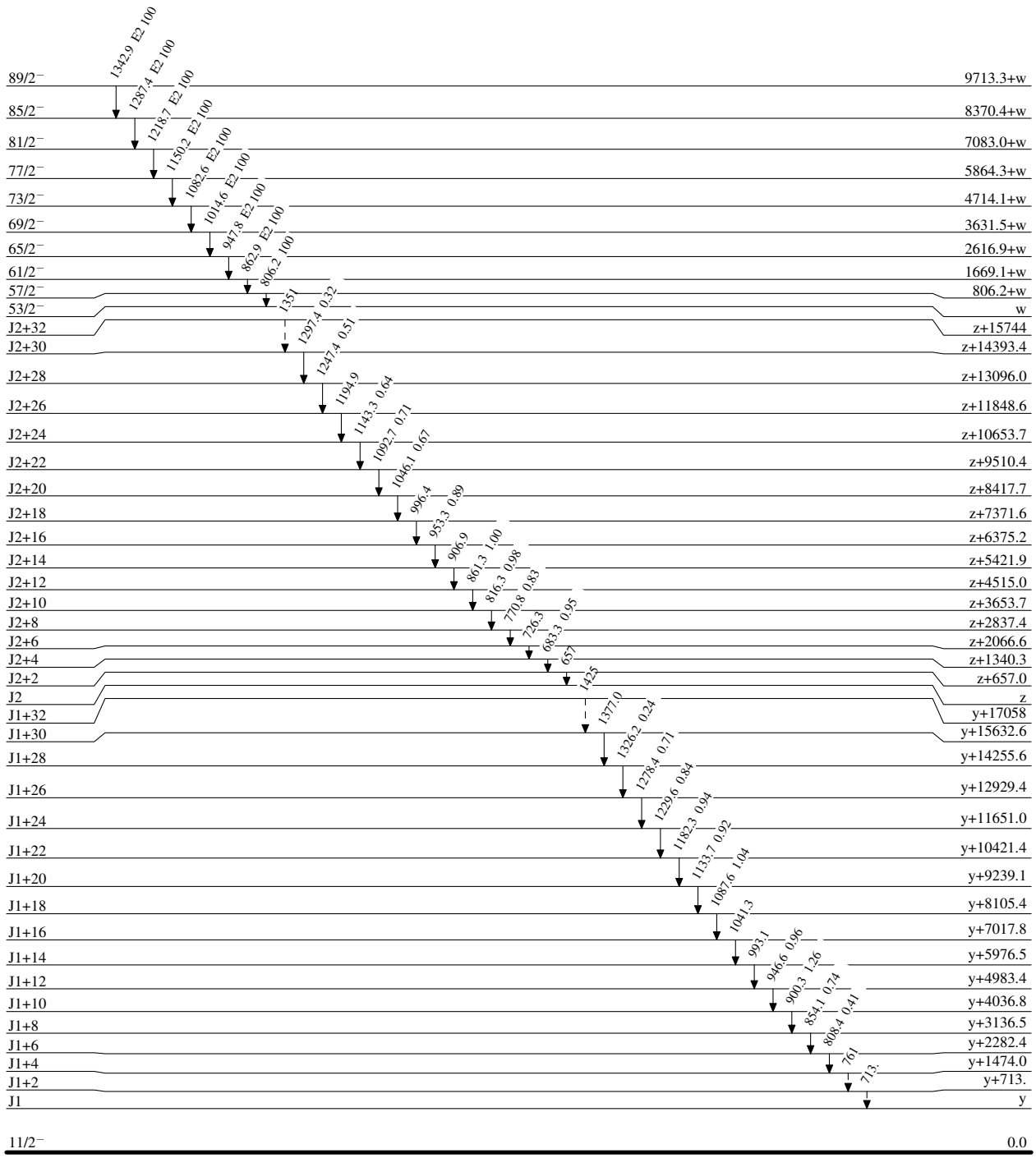
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



2.01 min *3*

$^{153}_{67}Ho_{86}$

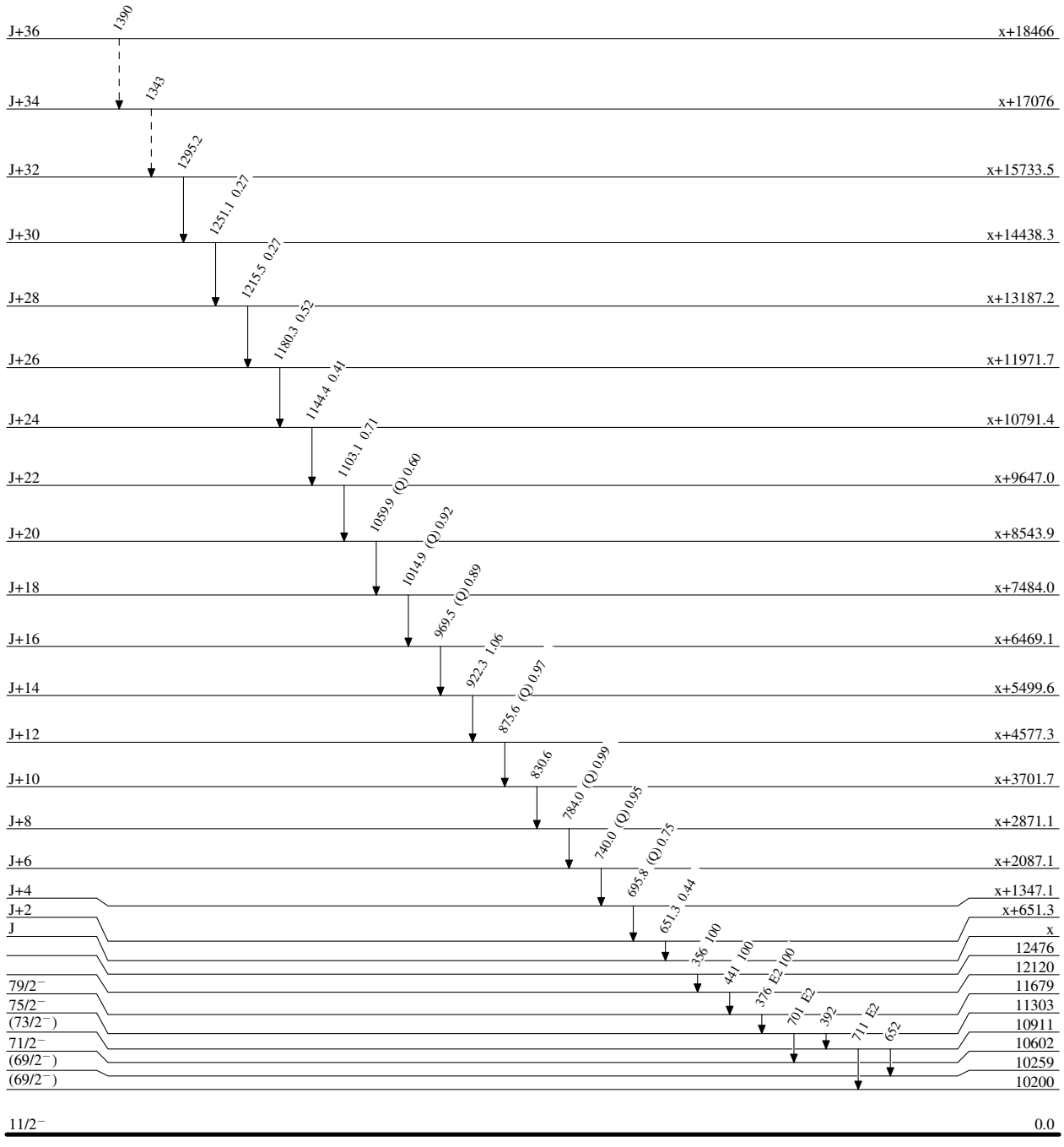
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{153}_{67}Ho_{86}$

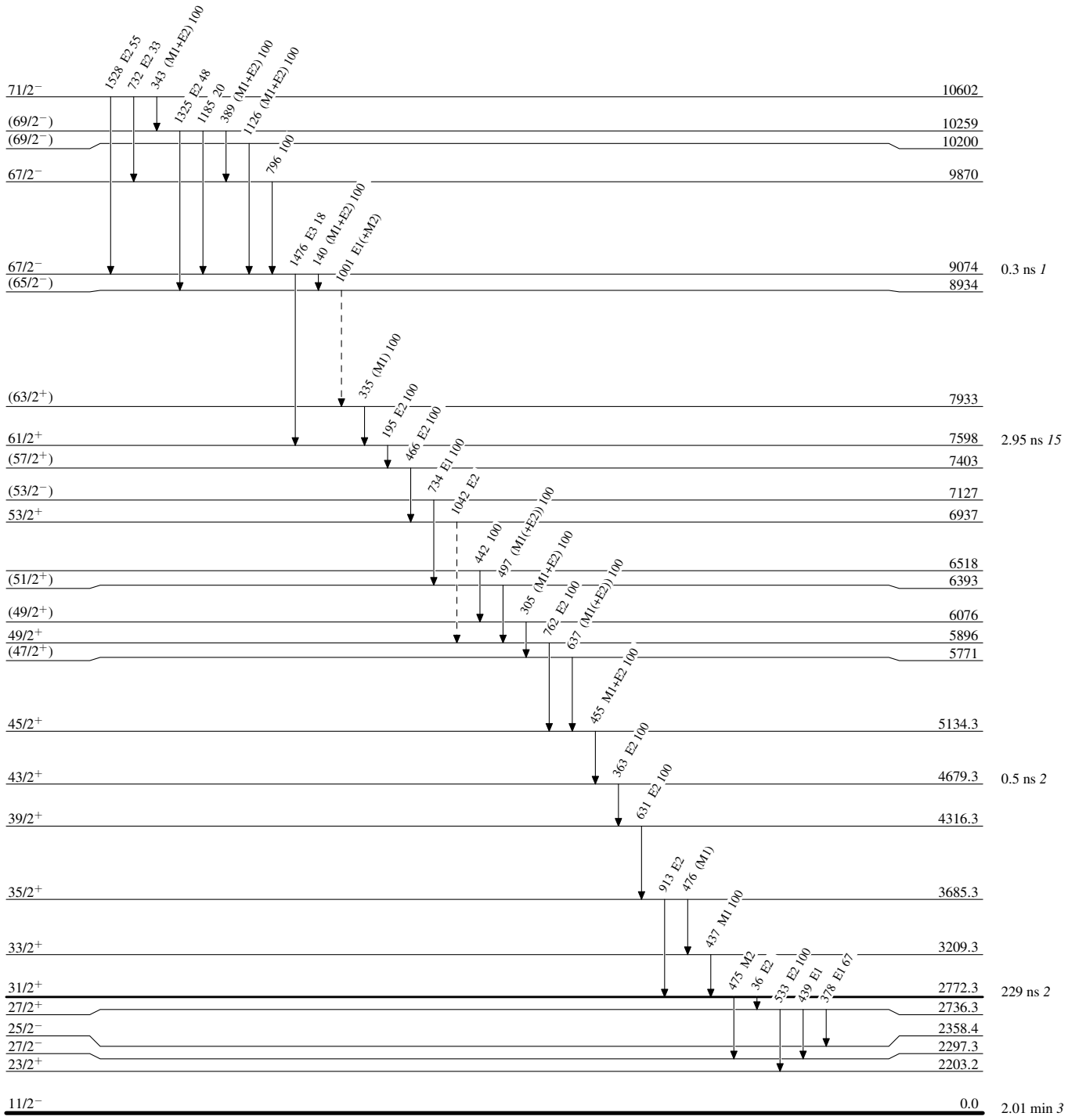
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

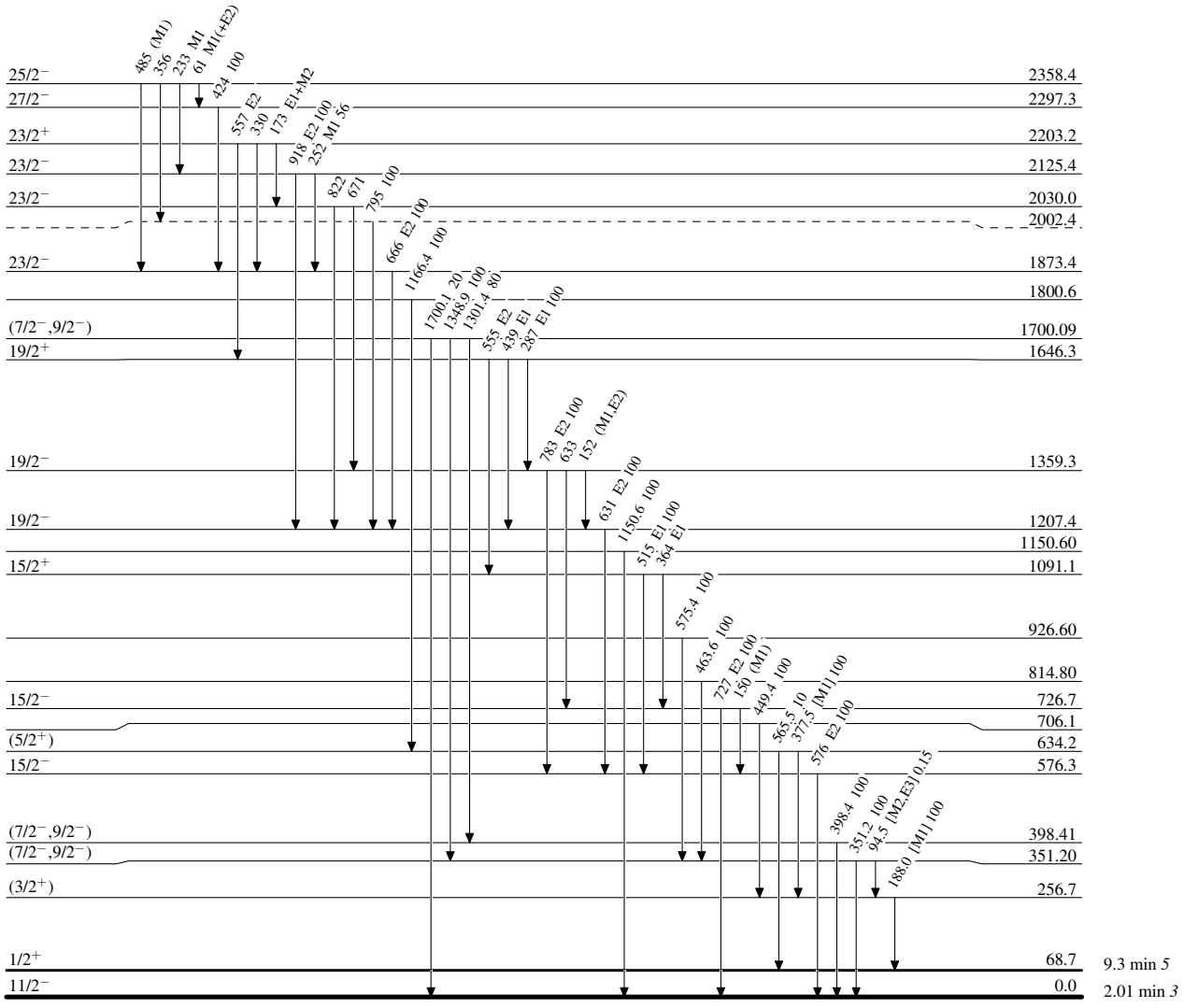


$^{153}_{67}Ho_{86}$

Adopted Levels, Gammas

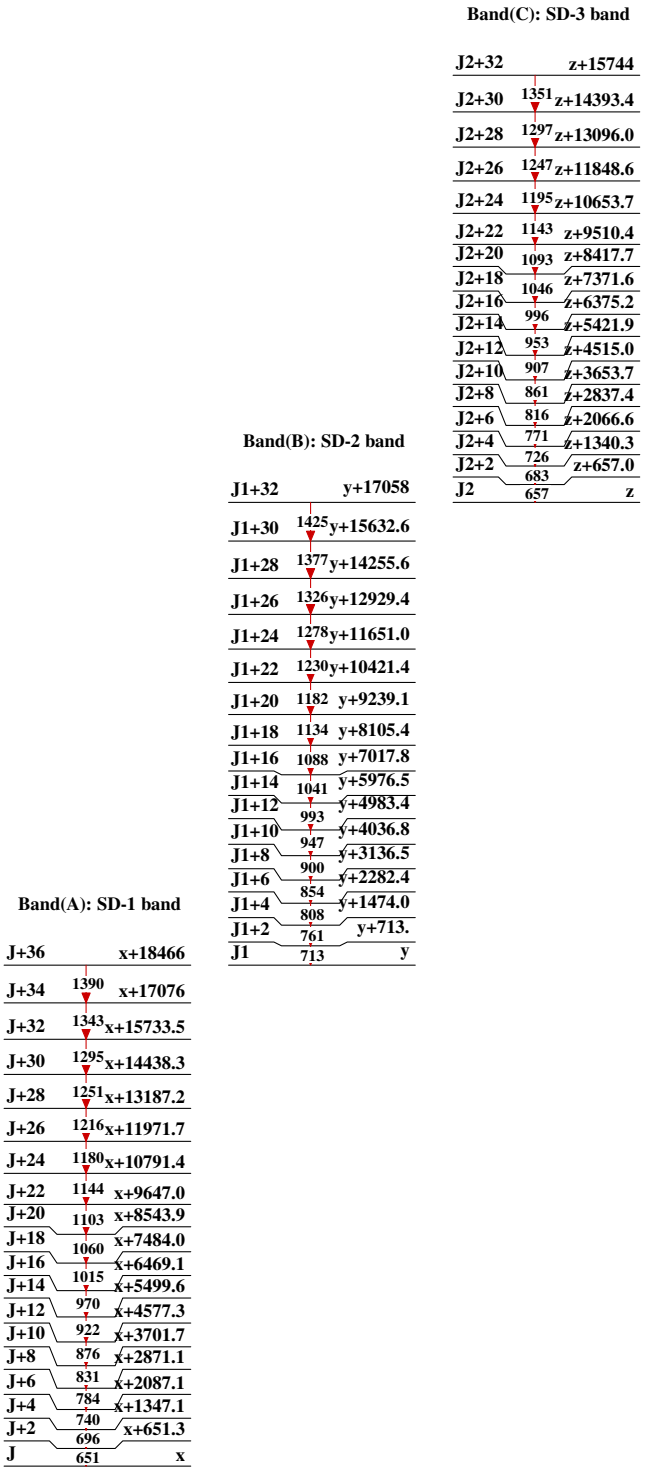
Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{153}_{67}Ho_{86}$

Adopted Levels, Gammas



$^{153}_{67}Ho_{86}$

Adopted Levels, Gammas (continued)