Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. W. Reich	NDS 113, 157 (2012)	31-Dec-2010

Q(β^-)=−1838 *3*; S(n)=6831 *3*; S(p)=6985.4 *13*; Q(α)=477.8 *13* 2017Wa10
Q(ε)=365.2 *12*; S(2n)=15885 *3*; S(2p)=12921.6 *13* 2017Wa10
Additional information 1.
Additional information 2.

^{159}Dy Levels

Model calculations of possible interest include: configurations (1971Ma41,1973Ga29,1975Gr38,1978Mi17,1980Al06); influence of Coriolis coupling (1974Ny01,1975Gr38); and, other (1977Hj01,1983Ch36).

Cross Reference (XREF) Flags

A	^{159}Ho ε decay	D	^{159}Dy IT decay (122 μs)
B	^{160}Dy(d,t),(^{3}He,α)	E	(HI,xnγ)
C	^{158}Gd(α,3nγ),^{160}Gd(α,5nγ),	F	^{158}Dy(d,p)

E(level)[†]	J$^\pi$[#]	$T_{1/2}$	XREF	Comments
0[@]	3/2$^-$	144.4 d *2*	ABCDEF	%ε=100 μ=−0.354 *3*; Q=+1.37 *2* J$^\pi$: J, from atomic-beam magnetic resonance (1965Al16). π=−, from M1 γ from 5/2$^-$ level at 309 keV. μ value also supports π and the Nilsson-orbital assignment (1989Be04). $T_{1/2}$: From 1959Ke28. Others: 134 d (1951Bu24), 139 d *10* (1960Gr15), 130 d *20* (1961Bj02), 151 d *2* (1963Ho15), 138 d *5* (1963Ra15), and 138 d *7* (1964Ma10). The uncertainty of 0.2 d (1959Ke28) may not include all contributions. If one increases this uncertainty to 2 d, the weighted average of the six values with uncertainties is 146 d *2*. μ: From the 1989Ra17 evaluation and the compilation by 2005St24. Q: From the 1989Ra17 evaluation and the compilation by 2005St24. From an evaluation of data on nuclear rms charge radii, 2004An14 report $<r^2>^{1/2}$=5.18 fm *27*.
56.626[&] *6*	5/2$^-$	0.21 ns *4*	A CDEF	J$^\pi$: From M1 γ to 3/2$^-$ g.s. and expected band structure. $T_{1/2}$: From 1978AlZC and 1975VaYX from ^{159}Ho ε decay; other: 0.2 ns (1975Gr44).
136.435[@] *6*	7/2$^-$		ABCDEF	J$^\pi$: From E2 γ to 3/2$^-$ g.s. and expected band structure.
177.614[a] *6*	5/2$^+$	9.3 ns *5*	A CDEF	J$^\pi$: From E1 γ's to 3/2$^-$ and 7/2$^-$ levels. $T_{1/2}$: Weighted average of 9.0 ns *5* (1974An11), from (α,2nγ), 10.4 ns *10* (1975VaYX), from ^{159}Ho ε decay. Other: 9 ns (1975Gr44).
208.988[b] *6*	7/2$^+$	1.35 ns *7*	A CDEF	J$^\pi$: From E1 γ's to 5/2$^-$ and 7/2$^-$ levels and expected band structure. $T_{1/2}$: From ^{159}Ho ε decay (1987AlZC).
235.854[&] *10*	9/2$^-$		ABCDEF	XREF: B(239). J$^\pi$: From E2 γ's to 5/2$^-$ and 7/2$^-$ levels and expected band structure.
239.424[a] *10*	9/2$^+$		ABCDEF	XREF: B(239). J$^\pi$: From M1 γ to 7/2$^+$ level and expected band structure.
309.593[c] *7*	5/2$^-$	<0.2 ns	AB F	J$^\pi$: From M1 γ's to 3/2$^-$ and 7/2$^-$ levels and log *ft*=4.8, from ^{159}Ho decay. This *au* transition establishes the confs for both this level and the ^{159}Ho g.s., as well as the π of the ^{159}Dy g.s. $T_{1/2}$: From 1978AlZC, ^{159}Ho ε decay; others: 1.3 ns *2* (1975VaYX, by same authors) and 3 ns (1975Gr44).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{159}Dy Levels (continued)

E(level)[†]	Jπ[#]	$T_{1/2}$	XREF	Comments
328.10[b] *7*	11/2+		C E	Jπ: From γ's to 7/2+ and 9/2+ levels and expected band structure.
352.77[d] *14*	11/2−	122 μs *3*	BCDE	%IT=100 Jπ: From E1 γ to 9/2+ level, expected isomer based on the ν11/2[505] Nilsson state. $T_{1/2}$: From isomeric decay (1967Co26); other: 115 μs *10* (1965Bo22).
361.06[@] *13*	11/2−		BC EF	XREF: B(365). Jπ: From γ's to 7/2− and 9/2− levels and expected band structure.
365.39[a] *16*	(13/2+)		BC EF	Jπ: From γ to 9/2+ level and expected band structure.
395.266[c] *7*	7/2−		AB F	Jπ: From E1 γ's to 5/2+ and 9/2+ levels.
417[f]	3/2+		B F	Jπ: From identification of (d,p) and (d,t) cross-section ratio as the ν3/2[402] Nilsson state, with an admixture of ν3/2[651].
470			B F	
497.55[&] *14*	13/2−		C E	Jπ: From γ's to 9/2− and 11/2− levels and expected band structure.
504.977[c] *17*	9/2−		AB F	Jπ: From E1 γ's to 7/2+ and 9/2+ levels, M1 to 9/2−, and expected band structure.
515.47[e] *24*	13/2−		C E	Jπ: From (M1) γ to 11/2− level and expected band structure.
533[g]	1/2−		B F	Jπ: From the (d,p) cross-section data, assigned as the bandhead of the band built on the ν1/2[521] Nilsson orbital.
543.38[b] *15*	15/2+		C E	Jπ: From γ's to 11/2+ and 13/2+ levels and expected band structure.
549?[m]	(3/2+)		B	Jπ: From (d,t) cross-section data, identified as the bandhead of the ν3/2[651] Nilsson orbital, with an admixture of ν3/2[402].
562[h]	1/2+		B F	Jπ: From (d,p) and (d,t) cross-section data, assigned as the ν1/2[400] Nilsson orbital.
575.83[a] *17*	17/2+		C E	Jπ: From γ to 13/2+ level and expected band structure.
586[g]	3/2−		F	Jπ: From (d,p) cross-section data, assigned as a member of the band built on the ν1/2[521] Nilsson orbital.
607?			B	
621[g]	5/2−		F	Jπ: From (d,p) cross-section data, assigned as a member of the band built on the ν1/2[521] Nilsson orbital.
627[i]	3/2−		B	Jπ: From (d,t) cross-section data, assigned as the head of the band built on the ν3/2[532] Nilsson orbital.
635[c]	(11/2−)		F	Jπ: From band assignment in (d,p).
666.94[@] *16*	15/2−		C E	Jπ: From γ's to 13/2− and 11/2− levels and expected band structure.
689[i]	5/2−		B F	Jπ: From (d,t) cross-section data, assigned as a member of the band built on the ν3/2[532] Nilsson orbital.
699.6[d] *3*	15/2−		C E	Jπ: From γ's to 13/2− and 11/2− levels and expected band structure.
746[g]	7/2−		B F	Jπ: From (d,p) cross-section data, assigned as the 7/2− member of the ν1/2[521] band, but the peak is part of a doublet.
746[j]	3/2−		B F	Jπ: From (d,t) cross-section data, assigned as the 3/2− member of the ν1/2[530] band, but the peak is part of a doublet.
773[i]	7/2−		B F	Jπ: From (d,t) cross-section data, assigned as the 7/2− member of the ν3/2[532] band.
773[j]	5/2−		B F	Jπ: From (d,t) cross-section data, assigned as the 5/2− member of the ν1/2[530] band.
796			B F	Jπ: Assigned as the 9/2,1/2[521] state by 1974Ny01.
826[j]	7/2−		B F	Jπ: From (d,t) cross-section data, assigned as the 7/2− member of the ν1/2[530] band.
831.95[&] *15*	17/2−		C E	Jπ: From γ's to 15/2− and 13/2− levels and expected band structure.
856			B F	
860.40[b] *10*	19/2+		C E	Jπ: From γ's to 17/2+ and 15/2+ levels and expected band structure.
879.05[a] *19*	21/2+		C E	Jπ: From γ to 17/2+ level and expected band structure.
903.0[e] *4*	17/2−		C E	Jπ: From (M1) γ to 15/2− level, γ to 13/2−, and expected band structure.
983			B F	XREF: B(990).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{159}Dy Levels (continued)

E(level)[†]	Jπ[#]	XREF	Comments
1016.238[k] *11*	5/2⁻	A	Jπ: From M1 γ′s to 3/2⁻ and 7/2⁻ levels; also E0 component in γ to 5/2⁻ level. Since this E0 transition is between levels with K differing by 1, some K mixing in one, or both, levels is implied.
1041.60[@] *17*	19/2⁻	C E	Jπ: From γ′s to 15/2⁻ and 17/2⁻ levels and expected band structure.
1075.839 *14*	5/2⁻	A	Jπ: From E0 component in γ to 5/2⁻ level.
1090.603[k] *12*	7/2⁻	A F	Jπ: From E1 γ′s to 5/2⁺ and 9/2⁺ levels and M1 γ′s to 5/2⁻ and 9/2⁻. E0 component in γ to 7/2⁻ level. Since this E0 transition is between levels with K differing by 1, some K mixing in one,or both, levels is implied.
1124.8[d] *4*	19/2⁻	C E	Jπ: From (M1) γ to 17/2⁻ level, γ to 15/2⁻, and expected band structure.
1153.660 *16*	5/2⁻,7/2⁻	A F	XREF: F(1150). Jπ: From M1 γ to 7/2⁻ level and E1 γ to 5/2⁺.
1189[k]	(9/2⁻)	F	Jπ: From (d,p) cross-section data, assigned as the 9/2⁻ member of the ν5/2[512] band. Note that this 9/2,5/2[512] state is assigned to the 1213 level by 1974Ny01.
1201.921 *13*	5/2⁻,7/2⁻	A	Jπ: From E1 γ′s to 5/2⁺ and 7/2⁺ levels.
1213		F	Jπ: The 9/2,5/2[512] state is assigned to this level by 1974Ny01.
1227.94[&] *18*	21/2⁻	C E	Jπ: From γ′s to 19/2⁻ and 17/2⁻ levels and expected band structure.
1272.7[a] *3*	25/2⁺	C E	Jπ: From γ to 21/2⁺ level and expected band structure.
1274.29[b] *23*	23/2⁺	C E	Jπ: From γ′s to 21/2⁺ and 19/2⁺ levels and expected band structure.
1286.92 *4*		A F	XREF: F(1283).
1341		F	
1363.3[e] *5*	21/2⁻	C E	Jπ: From γ′s to 19/2⁻ and 17/2⁻ levels and expected band structure.
1370.684 *22*	5/2⁺	A	Jπ: From E2 γ to 5/2⁺ and γ′s to 3/2⁻ and 7/2⁻.
1391		F	
1411		F	
1431		F	
1470.87[@] *21*	23/2⁻	E	Jπ: From γ′s to 19/2⁻ and 21/2⁺ levels and band structure.
1473[l]	(3/2⁻)	F	Jπ: From (d,p) cross-section data, assigned as the 3/2⁻ member of the ν1/2[510] band.
1515		F	
1535[l]	(5/2⁻)	F	Jπ: From (d,p) cross-section data, assigned as the 5/2⁻ member of the ν1/2[510] band.
1558		F	
1590		F	
1617.5[d] *5*	23/2⁻	C E	Jπ: From γ′s to 21/2⁻ and 19/2⁻ levels and expected band structure.
1621[l]	(7/2⁻)	F	Jπ: From (d,p) cross-section data, assigned as the 7/2⁻ member of the ν1/2[510] band.
1643		F	
1673		F	
1673.00[&] *23*	25/2⁻	E	Jπ: From γ′s to 21/2⁻ and 23/2⁻ levels and band structure.
1696		F	
1727[‡]		F	
1748[‡]		F	
1750.3[a] *4*	29/2⁺	C E	Jπ: From γ to 25/2⁺ level and expected band structure.
1775.6[b] *5*	27/2⁺	C E	Jπ: From γ to 23/2⁺ level and expected band structure.
1786[‡]		F	
1796.6 *3*		C	
1824[‡]		F	
1849[‡]		F	
1884.9[e] *6*	25/2⁻	E	Jπ: From γ′s to 21/2⁻ and 23/2⁻ levels and band structure.
1891[‡]		b F	XREF: b(1898).
1918[‡]		b F	XREF: b(1898).
1941.0[@] *3*	27/2⁻	E	Jπ: From γ′s to 23/2⁻ and 25/2⁻ levels and band structure.
1961[‡]		F	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{159}Dy Levels (continued)

E(level)[†]	J$^{\pi}$[#]	XREF	Comments
1989[‡]		F	
2016[‡]		F	
2158.4[&] 3	29/2$^-$	E	J$^{\pi}$: From γ's to 25/2$^-$ and 27/2$^-$ levels and band structure.
2164.3[d] 6	27/2$^-$	E	J$^{\pi}$: From γ's to 23/2$^-$ and 25/2$^-$ levels and band structure.
2303.2[a] 5	33/2$^+$	C E	J$^{\pi}$: From γ to 29/2$^+$ level and expected band structure.
2354.7[b] 5	31/2$^+$	C E	J$^{\pi}$: From γ to 27/2$^+$ level and expected band structure.
2445.9[@] 4	31/2$^-$	E	J$^{\pi}$: From γ's to 27/2$^-$ and 29/2$^-$ levels and band structure.
2452.3[e] 6	29/2$^-$	E	J$^{\pi}$: From γ's to 25/2$^-$ and 27/2$^-$ levels and band structure.
2682.6[&] 5	33/2$^-$	E	J$^{\pi}$: From γ's to 29/2$^-$ and 31/2$^-$ levels and band structure.
2746.3[d] 6	31/2$^-$	E	
2922.3[a] 5	37/2$^+$	C E	J$^{\pi}$: From γ to 33/2$^+$ level and expected band structure.
2986.1[@] 4	35/2$^-$	E	J$^{\pi}$: From γ's to 31/2$^-$ and 33/2$^+$ levels and band structure.
3002.1[b] 6	35/2$^+$	C E	J$^{\pi}$: From γ to 31/2$^+$ level and expected band structure.
3043.4[e] 6	33/2$^-$	E	
3251.2[&] 7	37/2$^-$	E	J$^{\pi}$: From γ to 33/2$^-$ level and band structure.
3342.0[d] 6	35/2$^-$	E	
3568.4[@] 5	39/2$^-$	E	J$^{\pi}$: From γ's to 35/2$^-$ and 37/2$^+$ levels and band structure.
3600.1[a] 6	41/2$^+$	C E	J$^{\pi}$: From γ to 37/2$^+$ level and expected band structure.
3709.4[b] 6	39/2$^+$	E	J$^{\pi}$: From γ to 35/2$^+$ level and band structure.
3869.7[&] 9	41/2$^-$	E	J$^{\pi}$: From γ to 37/2$^-$ level and band structure.
4201.7[@] 6	43/2$^-$	E	J$^{\pi}$: From γ to 39/2$^-$ level and band structure.
4327.1[a] 6	45/2$^+$	C E	J$^{\pi}$: From γ to 41/2$^+$ level and band structure.
4466.9[b] 6	43/2$^+$	E	J$^{\pi}$: From γ to 39/2$^+$ level and band structure.
4540.7[&] 10	45/2$^-$	E	J$^{\pi}$: From γ to 41/2$^-$ level and band structure.
4889.7[@] 6	47/2$^-$	E	J$^{\pi}$: From γ's to 43/2$^-$ and 45/2$^+$ levels and band structure.
5096.3[a] 8	49/2$^+$	C E	J$^{\pi}$: From γ to 45/2$^+$ level and expected band structure.
5264.1[&] 11	49/2$^-$	E	J$^{\pi}$: From γ to 45/2$^-$ level and band structure.
5280.7[b] 7	47/2$^+$	E	J$^{\pi}$: From γ to 43/2$^+$ level and band structure.
5632.5[@] 6	51/2$^-$	E	J$^{\pi}$: From γ to 47/2$^-$ level and band structure.
5899.9[a] 8	53/2$^+$	E	J$^{\pi}$: From γ to 49/2$^+$ level and band structure.
6038.7[&] 12	53/2$^-$	E	J$^{\pi}$: From γ to 49/2$^-$ level and band structure.
6427.0[@] 6	55/2$^-$	E	J$^{\pi}$: From γ to 51/2$^-$ level and band structure.
6743.1[a] 8	57/2$^+$	E	J$^{\pi}$: From γ to 53/2$^+$ level and band structure.
6861.8[&] 12	57/2$^-$	E	J$^{\pi}$: From γ to 53/2$^-$ level and band structure.
7624.3[a] 9	61/2$^+$	E	J$^{\pi}$: From γ to 57/2$^+$ level and band structure.
8546[a]	65/2$^+$	E	
9514[a]	69/2$^+$	E	
10533[a]	73/2$^+$	E	
11603[a]	77/2$^+$	E	
12727[a]	81/2$^+$	E	
13897?[a]	(85/2$^+$)	E	

[†] From level energies from reactions where no γ data exist; and from a least-squares fit to γ energies where such data exist.

[‡] Above 1727 keV in the (d,p) spectra, there are several unresolved peaks (1970Gr46).

[#] For those levels populated in the (HI,xnγ) reactions for which no specific arguments are given, the listed values are based on the

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{159}Dy Levels (continued)

customary considerations in such studies, including expected band structure and mults from DCO (ADO) ratios.

[@] Band(A): $K^\pi=3/2^-$, $\nu 3/2[521]$ band, $\alpha=-1/2$. $\alpha=11.42$ keV, $\beta=-5.9$ eV, $A_3=-8.1$ eV, calculated from the energies of the $3/2^-$,$5/2^-$,$7/2^-$ and $9/2^-$ levels. Band crossing by a pair of AB neutrons occurs near an angular frequency of 0.26 MeV.

[&] Band(a): $K^\pi=3/2^-$, $\nu 3/2[521]$ band, $\alpha=+1/2$. See the comments on the $\alpha=-1/2$ branch.

[a] Band(B): $K^\pi=5/2^+$, $\nu 5/2[642]$ band, $\alpha=+1/2$. $\alpha=3.86$ keV, calculated from the energies of the $5/2^+$ and $9/2^+$ levels, but the energy-level spacings are strongly distorted.

[b] Band(b): $K^\pi=5/2^+$, $\nu 5/2[642]$ band, $\alpha=-1/2$. $\alpha=5.96$ keV, calculated from the energies of the $7/2^+$ and $11/2^+$ levels. See the comment on the $\alpha=+1/2$ branch.

[c] Band(C): $K^\pi=5/2^-$, $\nu 5/2[523]$ band. $\alpha=12.28$ keV, $\beta=-3.8$ eV, calculated from the energies of the $5/2^-$ through $9/2^-$ levels.

[d] Band(D): $K^\pi=11/2^-$, $\nu 11/2[505]$ band, $\alpha=-1/2$. A=12.72 keV, B=−8.6 eV, calculated from the energies of the $11/2^-$, $13/2^-$, $15/2^-$ and $17/2^-$ levels.

[e] Band(d): $K^\pi=11/2^-$, $\nu 11/2[505]$ band, $\alpha=+1/2$. See the comment on the $\alpha=-1/2$ branch.

[f] Band(E): $K^\pi=3/2^+$, $\nu 3/2[402]$ bandhead. Contains an admixture of $\nu 3/2[651]$.

[g] Band(F): $K^\pi=1/2^-$, $\nu 1/2[521]$ band. $\alpha=12.25$ keV, $\beta=+10$ eV, a=+0.44, calculated from the energies of the $1/2^-$ through $7/2^-$ levels. Band contains components of the K=2 γ vibrations built on the $\nu 5/2[523]$ and $\nu 3/2[521]$ Nilsson orbitals.

[h] Band(G): $K^\pi=1/2^+$, $\nu 1/2[400]$ bandhead.

[i] Band(H): $K^\pi=3/2^-$, $\nu 3/2[532]$ band. $\alpha=12.7$ keV, $\beta=-33$ eV, calculated from the energies of the $3/2^-$ through $7/2^-$ levels.

[j] Band(I): $K^\pi=1/2^-$, $\nu 1/2[530]$ band. $\alpha=6.5$ keV, a=+0.17, calculated from the energies of the $3/2^-$ through $7/2^-$ levels.

[k] Band(J): $K^\pi=5/2^-$, $\nu 5/2[512]$ band. $\alpha=10.39$ keV, $\beta=+19$ eV, calculated from the energies of the $5/2^-$ through $9/2^-$ levels.

[l] Band(K): $K^\pi=1/2^-$, $\nu 1/2[510]$ band. $\alpha=12.3$ keV, $a\approx 0$, calculated from the energies of the $3/2^-$ through $7/2^-$ levels.

[m] Band(L): $K^\pi=3/2^+$, $\nu 3/2[651]$ band. Contains an admixture of $\nu 3/2[402]$.

Adopted Levels, Gammas (continued)

γ(^{159}Dy)

E_i(level)	J_i^π	E_γ[†‡]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[@]	α[&]	Comments
56.626	5/2⁻	56.626 *8*	100	0	3/2⁻	M1+E2	0.19 *2*	12.76 *21*	B(M1)(W.u.)=0.041 *8*; B(E2)(W.u.)=2.3×10^2 *7*
136.435	7/2⁻	79.807 *3*	100 *3*	56.626	5/2⁻	M1+E2	0.18 *2*	4.64	
		136.438 *20*	22.6 *8*	0	3/2⁻	E2		0.879	I_γ: From ^{159}Ho ε decay; others: 93 *12*, from (HI,xnγ), and 82 from ^{158}Gd(α,3nγ).
177.614	5/2⁺	41.182 *4*	3.17 *19*	136.435	7/2⁻	E1		0.612	B(E1)(W.u.)=8.1×10^{-6} *7*
		121.012 *14*	100.0 *18*	56.626	5/2⁻	E1		0.185	B(E1)(W.u.)=1.00×10^{-5} *6*
		177.608 *10*	14.8 *6*	0	3/2⁻	E1		0.0665	B(E1)(W.u.)=4.7×10^{-7} *4*
									I_γ: From ^{159}Ho ε decay; other: 22.2 *19*, from (HI,xnγ).
208.988	7/2⁺	31.378 *8*	46.9 *10*	177.614	5/2⁺	M1+E2	0.19 *2*	26 *3*	B(M1)(W.u.)=0.017 *4*; B(E2)(W.u.)=3.1×10^2 *9*
		72.546 *4*	37.4 *14*	136.435	7/2⁻	E1		0.723	B(E1)(W.u.)=1.16×10^{-5} *14*
		152.375 *13*	100 *5*	56.626	5/2⁻	E1		0.1000	B(E1)(W.u.)=3.3×10^{-6} *5*
235.854	9/2⁻	99.419 *10*	100 *5*	136.435	7/2⁻	E2		2.77	Additional information 3.
		179.250 *22*	54 *6*	56.626	5/2⁻	E2		0.342	I_γ: From ^{159}Ho ε decay; other: 89, from ^{158}Gd(α,3nγ).
239.424	9/2⁺	30.427 *13*	71 *3*	208.988	7/2⁺	M1+E2	0.13 *2*	20 *3*	
		61.77 *11*	4	177.614	5/2⁺	E2		17.9	I_γ: From ^{158}Gd(α,3nγ).
		102.985 *22*	100 *12*	136.435	7/2⁻				
309.593	5/2⁻	100.599 *8*	20.4 *8*	208.988	7/2⁺	E1		0.304	B(E1)(W.u.)>7.6×10^{-5}
		131.973 *10*	100.0 *18*	177.614	5/2⁺	E1		0.1470	B(E1)(W.u.)>0.00016
		173.155 *17*	9.08 *21*	136.435	7/2⁻	M1		0.506	B(M1)(W.u.)>0.00063
		252.963 *8*	58.0 *17*	56.626	5/2⁻	M1		0.179	B(M1)(W.u.)>0.0013
		309.594 *18*	73.0 *24*	0	3/2⁻	M1		0.1038	B(M1)(W.u.)>0.00089
328.10	11/2⁺	88.6 *1*	100 *9*	239.424	9/2⁺				
		119.2 *1*	44 *5*	208.988	7/2⁺				I_γ: From (HI,xnγ); other: 61, from ^{158}Gd(α,3nγ).
352.77	11/2⁻	113.3 *2*	78 *22*	239.424	9/2⁺	E1		0.221	B(E1)(W.u.)=2.7×10^{-10} *10*
									I_γ: From ^{159}Dy isomeric decay.
		116.9 *2*	100 *26*	235.854	9/2⁻	M1		1.532	B(M1)(W.u.)=3.0×10^{-8} *10*
		218 *1*	20.9 *13*	136.435	7/2⁻	E2		0.178 *4*	B(E2)(W.u.)=1.03×10^{-5} *21*
									I_γ: From ^{159}Dy isomeric decay.
361.06	11/2⁻	125.2 *2*	79 *15*	235.854	9/2⁻				I_γ: From (HI,xnγ).
		224.7 *3*	100 *13*	136.435	7/2⁻				
365.39	(13/2⁺)	37.6		328.10	11/2⁺				
		125.9 *2*	100	239.424	9/2⁺				
395.266	7/2⁻	85.669 *9*	4.09 *23*	309.593	5/2⁻	M1+E2	0.65 *10*	4.07 *10*	
		155.851 *13*	53.1 *18*	239.424	9/2⁺	E1		0.0941	
		159.426 *16*	9.9 *5*	235.854	9/2⁻	M1		0.637	
		186.274 *9*	92 *4*	208.988	7/2⁺	E1		0.0586	
		217.647 *8*	100 *3*	177.614	5/2⁺	E1		0.0390	
		258.822 *11*	50.3 *17*	136.435	7/2⁻	M1		0.1679	
		338.629 *30*	22.0 *19*	56.626	5/2⁻	M1+E2	0.65 *20*	0.071 *5*	
		395.258 *14*	9.6 *3*	0	3/2⁻	E2		0.0287	
497.55	13/2⁻	136.5 *2*	67 *5*	361.06	11/2⁻				I_γ: From (HI,xnγ).
		261.7 *2*	100 *8*	235.854	9/2⁻				

Adopted Levels, Gammas (continued)

γ(^{159}Dy) (continued)

E_i(level)	J_i^π	E_γ[†‡]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[@]	α[&]	Comments
504.977	9/2⁻	195.40 *5*	8.2 *11*	309.593	5/2⁻	E2		0.255	
		265.56 *6*	37.6 *20*	239.424	9/2⁺	E1		0.0234	
		269.11 *5*	15.4 *16*	235.854	9/2⁻	M1		0.1511	
		295.939 *23*	100 *4*	208.988	7/2⁺	E1		0.01779	
		448.46 *4*	2.1 *3*	56.626	5/2⁻	E2		0.0202	
515.47	13/2⁻	162.7 *2*	100	352.77	11/2⁻	(M1+E2)	−0.41 *+21−49*	0.58 *4*	
543.38	15/2⁺	177.6	96 *13*	365.39	(13/2⁺)				I_γ: From (HI,xnγ); other: 135, from ^{158}Gd(α,3nγ).
		215.3 *2*	100 *8*	328.10	11/2⁺				
575.83	17/2⁺	(32.8)		543.38	15/2⁺				
		210.4 *2*	100	365.39	(13/2⁺)				
666.94	15/2⁻	169.4 *2*	36 *7*	497.55	13/2⁻				I_γ: From (HI,xnγ); other: 33, from ^{158}Gd(α,3nγ).
		305.9 *2*	100 *9*	361.06	11/2⁻				
699.6	15/2⁻	184.2 *2*	100 *12*	515.47	13/2⁻				
		346.8 *5*	37 *9*	352.77	11/2⁻				I_γ: From (HI,xnγ).
831.95	17/2⁻	165.0 *4*	20.0 *17*	666.94	15/2⁻				I_γ: From (HI,xnγ). Other: 27, from ^{158}Gd(α,3nγ).
		288.6 *1*	6.8 *3*	543.38	15/2⁺				
		334.4 *2*	100 *8*	497.55	13/2⁻				
860.40	19/2⁺	284.5 *2*	26 *4*	575.83	17/2⁺				I_γ: From (HI,xnγ). Other: 24, from ^{158}Gd(α,3nγ).
		316.9 *2*	100 *7*	543.38	15/2⁺				
879.05	21/2⁺	303.3 *1*	100	575.83	17/2⁺				
903.0	17/2⁻	203.4 *23*	100 *9*	699.6	15/2⁻	(M1+E2)	−0.20 *+15−20*	0.320 *15*	
		387.4 *3*	27 *5*	515.47	13/2⁻				I_γ: From (HI,xnγ). Other: 28, from ^{158}Gd(α,3nγ).
1016.238	5/2⁻	620.95 *4*	7.2 *4*	395.266	7/2⁻	M1+E2	0.59 *16*	0.0150 *9*	
		706.648 *15*	30.7 *7*	309.593	5/2⁻	M1		0.01242	
		807.236 *16*	33.4 *7*	208.988	7/2⁺	E1		0.00188	
		838.625 *18*	100.0 *24*	177.614	5/2⁺	E1		0.00175	
		879.55 *20*	2.34 *7*	136.435	7/2⁻	E2		0.00399	
		959.66 *5*	0.84 *4*	56.626	5/2⁻	E2+E0			Mult.: from α(K)exp, 1982Vy02 estimate %E0=0.91 *7*.
		1016.36 *10*	12.4 *3*	0	3/2⁻	M1		0.00510	
1041.60	19/2⁻	209.6 *5*	35 *7*	831.95	17/2⁻				I_γ: From (HI,xnγ). Other: 81, from ^{158}Gd(α,3nγ).
		374.7 *2*	100 *9*	666.94	15/2⁻				
		465.7 *1*	11 *4*	575.83	17/2⁺				
1075.839	5/2⁻	680.79 *6*	9.6 *6*	395.266	7/2⁻				
		766.12 *5*	59.5 *15*	309.593	5/2⁻	M1+E2	0.59 *13*	0.0089 *5*	
		866.82 *4*	20.1 *7*	208.988	7/2⁺				
		898.167 *25*	24.9 *6*	177.614	5/2⁺	(E1)		0.00152	
		939.453 *28*	25.2 *7*	136.435	7/2⁻	E2		0.00347	
		1019.20 *3*	100.0 *24*	56.626	5/2⁻	E2+E0			Mult.: from α(K)exp, 1982Vy02 estimate %E0=0.85 *8*.
		1075.87 *3*	64.3 *15*	0	3/2⁻	E2		0.00262	
1090.603	7/2⁻	585.54 *6*	8.3 *5*	504.977	9/2⁻	M1		0.0199	
		695.249 *26*	18.3 *26*	395.266	7/2⁻	M1		0.01293	
		780.99 *3*	13.0 *5*	309.593	5/2⁻	M1+E2	0.77 *20*	0.0080 *6*	
		851.133 *19*	67.3 *16*	239.424	9/2⁺	E1		0.00170	

$^{159}_{66}Dy_{93}$-7

Adopted Levels, Gammas (continued)

γ(^{159}Dy) (continued)

E_i(level)	J_i^π	E_γ[†‡]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[@]	α[&]	Comments
1090.603	7/2⁻	881.552 *28*	100.0 *21*	208.988	7/2⁺	E1		0.00158	
		913.119 *20*	71.7 *15*	177.614	5/2⁺	E1		0.00148	
		954.19 *9*	3.3 *3*	136.435	7/2⁻	E2+E0			Mult.: from α(K)exp, 1982Vy02 estimate %E0=1.3 *2*.
		1033.998 *28*	14.1 *3*	56.626	5/2⁻	E2		0.00284	
1124.8	19/2⁻	221.5 *5*	100 *8*	903.0	17/2⁻	(M1+E2)	−0.31 *+34−59*	0.25 *4*	
		425.3 *3*	55 *8*	699.6	15/2⁻				
1153.660	5/2⁻,7/2⁻	649.42	22 *5*	504.977	9/2⁻				
		758.330 *24*	94 *3*	395.266	7/2⁻	M1+E2	0.87 *5*	0.00832 *19*	
		843.78 *7*	41 *6*	309.593	5/2⁻				
		944.85 *4*	67 *3*	208.988	7/2⁺	E1		0.00139	
		976.09 *4*	73 *3*	177.614	5/2⁺	(E1)		0.00131	
		1097.03 *6*	29.0 *11*	56.626	5/2⁻				
		1153.675 *29*	100.0 *23*	0	3/2⁻	E2		0.00228	
1201.921	5/2⁻,7/2⁻	892.288 *23*	37.3 *12*	309.593	5/2⁻	(M1)		0.00700	
		992.940 *25*	31.6 *7*	208.988	7/2⁺	E1		0.00126	
		1024.317 *24*	100.0 *22*	177.614	5/2⁺	E1		0.00119	
		1065.43 *6*	6.5 *4*	136.435	7/2⁻	E2		0.00267	
		1145.32 *3*	23.7 *6*	56.626	5/2⁻	E2		0.00231	
		1201.93 *3*	72.3 *15*	0	3/2⁻	E2		0.00210	
1227.94	21/2⁻	186.2 *2*	18.2 *14*	1041.60	19/2⁻				I_γ: From (HI,xnγ). Other: 31, from ^{158}Gd(α,3nγ).
		367.5 *1*	12 *2*	860.40	19/2⁺				
		396.4 *4*	100 *9*	831.95	17/2⁻				
1272.7	25/2⁺	393.8 *3*	100	879.05	21/2⁺				
1274.29	23/2⁺	395.6 *5*	28 *3*	879.05	21/2⁺				I_γ: From (HI,xnγ).
		413.8 *4*	100 *8*	860.40	19/2⁺				
1286.92		1047.62 *10*	33 *3*	239.424	9/2⁺				
		1078.0 *5*	34 *7*	208.988	7/2⁺				
		1109.48 *9*	49 *3*	177.614	5/2⁺				
		1150.50 *8*	47 *3*	136.435	7/2⁻				
		1230.19 *5*	100 *3*	56.626	5/2⁻				
1363.3	21/2⁻	238.5 *3*	100 *9*	1124.8	19/2⁻	(M1+E2)	−0.05 *20*	0.209 *6*	
		460.7[a] *3*	95 *10*	903.0	17/2⁻				I_γ: From (HI,xnγ). Other: 132, from ^{158}Gd(α,3nγ).
1370.684	5/2⁺	1061.11 *4*	36.5 *11*	309.593	5/2⁻				
		1161.68 *5*	34.3 *11*	208.988	7/2⁺				
		1193.07 *3*	100.0 *22*	177.614	5/2⁺	E2		0.00213	
		1234.26 *13*	8.9 *14*	136.435	7/2⁻				
		1313.88 *23*	8.2 *7*	56.626	5/2⁻				
		1370.53 *11*	22.4 *9*	0	3/2⁻				
1470.87	23/2⁻	242.9 *2*	26 *3*	1227.94	21/2⁻				
		428.7 *5*	100 *8*	1041.60	19/2⁻				
		592.0 *2*	37 *4*	879.05	21/2⁺				
1617.5	23/2⁻	254.0 *3*	84 *9*	1363.3	21/2⁻				I_γ: From (HI,xnγ). Other: 163, from ^{158}Gd(α,3nγ).
		492.8 *5*	100 *12*	1124.8	19/2⁻				

Adopted Levels, Gammas (continued)

γ(^{159}Dy) (continued)

E_i(level)	J_i^π	E_γ[†‡]	I_γ[‡]	E_f	J_f^π
1673.00	25/2$^-$	202.2 *5*	6.0 *15*	1470.87	23/2$^-$
		398.7 *1*	14 *3*	1274.29	23/2$^+$
		444.9 *2*	100 *10*	1227.94	21/2$^-$
1750.3	29/2$^+$	477.5 *3*	100	1272.7	25/2$^+$
1775.6	27/2$^+$	501.4 *3*	100	1274.29	23/2$^+$
1796.6		522.4 *3*		1274.29	23/2$^+$
		523.8 *3*		1272.7	25/2$^+$
1884.9	25/2$^-$	268.3 *5*	54 *7*	1617.5	23/2$^-$
		521.8 *5*	100 *12*	1363.3	21/2$^-$
1941.0	27/2$^-$	267.3 *5*	21 *3*	1673.00	25/2$^-$
		470.2 *2*	100 *9*	1470.87	23/2$^-$
		669.1 *5*	62 *6*	1272.7	25/2$^+$
2158.4	29/2$^-$	217.9 *5*	33.3 *25*	1941.0	27/2$^-$
		382.8 *1*	8 *3*	1775.6	27/2$^+$
		485.3 *2*	100 *8*	1673.00	25/2$^-$
2164.3	27/2$^-$	279.5 *2*	61 *7*	1884.9	25/2$^-$
		546.6 *2*	100 *12*	1617.5	23/2$^-$
2303.2	33/2$^+$	552.6 *4*	100	1750.3	29/2$^+$
2354.7	31/2$^+$	580.0 *10*	100	1775.6	27/2$^+$
2445.9	31/2$^-$	287.7 *5*	11 *3*	2158.4	29/2$^-$
		504.8 *5*	100 *9*	1941.0	27/2$^-$
		695.7 *2*	46 *4*	1750.3	29/2$^+$
2452.3	29/2$^-$	288.0 *5*	30 *3*	2164.3	27/2$^-$
		567.8 *5*	100 *10*	1884.9	25/2$^-$
2682.6	33/2$^-$	236.5 *5*	7.1 *11*	2445.9	31/2$^-$
		327.9 *1*		2354.7	31/2$^+$
		524.2 *5*	100 *7*	2158.4	29/2$^-$
2746.3	31/2$^-$	293.9 *1*		2452.3	29/2$^-$
		582.0 *1*	100 *12*	2164.3	27/2$^-$
2922.3	37/2$^+$	619.1 *3*	100	2303.2	33/2$^+$
2986.1	35/2$^-$	540.2 *2*	100 *8*	2445.9	31/2$^-$
		682.7 *5*	40 *4*	2303.2	33/2$^+$
3002.1	35/2$^+$	647.4 *3*	100	2354.7	31/2$^+$
3043.4	33/2$^-$	297.1 *1*		2746.3	31/2$^-$
		591.1 *1*	100	2452.3	29/2$^-$
3251.2	37/2$^-$	568.6 *5*	100	2682.6	33/2$^-$
3342.0	35/2$^-$	298.6 *1*		3043.4	33/2$^-$
		595.7 *1*		2746.3	31/2$^-$
3568.4	39/2$^-$	582.6 *5*	100 *9*	2986.1	35/2$^-$
		647.0 *5*	39 *3*	2922.3	37/2$^+$
3600.1	41/2$^+$	677.3 *3*	100	2922.3	37/2$^+$
3709.4	39/2$^+$	707.3 *2*	100	3002.1	35/2$^+$
3869.7	41/2$^-$	618.5 *5*	100	3251.2	37/2$^-$
4201.7	43/2$^-$	601.4 *2*	78 *7*	3600.1	41/2$^+$
		633.4 *2*	100 *9*	3568.4	39/2$^-$
4327.1	45/2$^+$	727.1 *3*	100	3600.1	41/2$^+$
4466.9	43/2$^+$	757.5 *2*	100	3709.4	39/2$^+$
4540.7	45/2$^-$	671.0 *5*	100	3869.7	41/2$^-$
4889.7	47/2$^-$	562.6 *2*	40 *5*	4327.1	45/2$^+$
		688.0 *2*	100 *7*	4201.7	43/2$^-$
5096.3	49/2$^+$	769.2 *5*	100	4327.1	45/2$^+$
5264.1	49/2$^-$	723.4 *5*	100	4540.7	45/2$^-$
5280.7	47/2$^+$	813.8 *2*	100	4466.9	43/2$^+$
5632.5	51/2$^-$	742.8 *2*	100	4889.7	47/2$^-$
5899.9	53/2$^+$	803.6 *2*	100	5096.3	49/2$^+$
6038.7	53/2$^-$	774.6 *2*	100	5264.1	49/2$^-$
6427.0	55/2$^-$	794.5 *2*	100	5632.5	51/2$^-$
6743.1	57/2$^+$	843.2 *2*	100	5899.9	53/2$^+$
6861.8	57/2$^-$	823.1 *2*	100	6038.7	53/2$^-$
7624.3	61/2$^+$	881.2 *2*	100	6743.1	57/2$^+$
8546	65/2$^+$	923	100	7624.3	61/2$^+$
9514	69/2$^+$	968	100	8546	65/2$^+$
10533	73/2$^+$	1019	100	9514	69/2$^+$
11603	77/2$^+$	1070	100	10533	73/2$^+$
12727	81/2$^+$	1124	100	11603	77/2$^+$
13897?	(85/2$^+$)	1170[a]	100	12727	81/2$^+$

† Unplaced γ's are not included here, see ^{159}Ho ε decay.

‡ Usually from the ^{159}Ho ε decay, if available there.

From measured α from ^{159}Ho ε decay and ^{159}Dy isomeric decay. See the (α,xnγ) data for dipole and quadrupole assignments made by the evaluator from γ(θ) results. These are not adopted here because they were not assigned by the authors.

@ From measured α data from ^{159}Ho ε decay and γ(θ) in the (α,xnγ) studies.

& Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies,

$^{159}_{66}Dy_{93}$-9

$\gamma(^{159}Dy)$ (continued)

assigned multipolarities, and mixing ratios, unless otherwise specified.
[a] Placement of transition in the level scheme is uncertain.

$^{159}_{66}Dy_{93}$-10

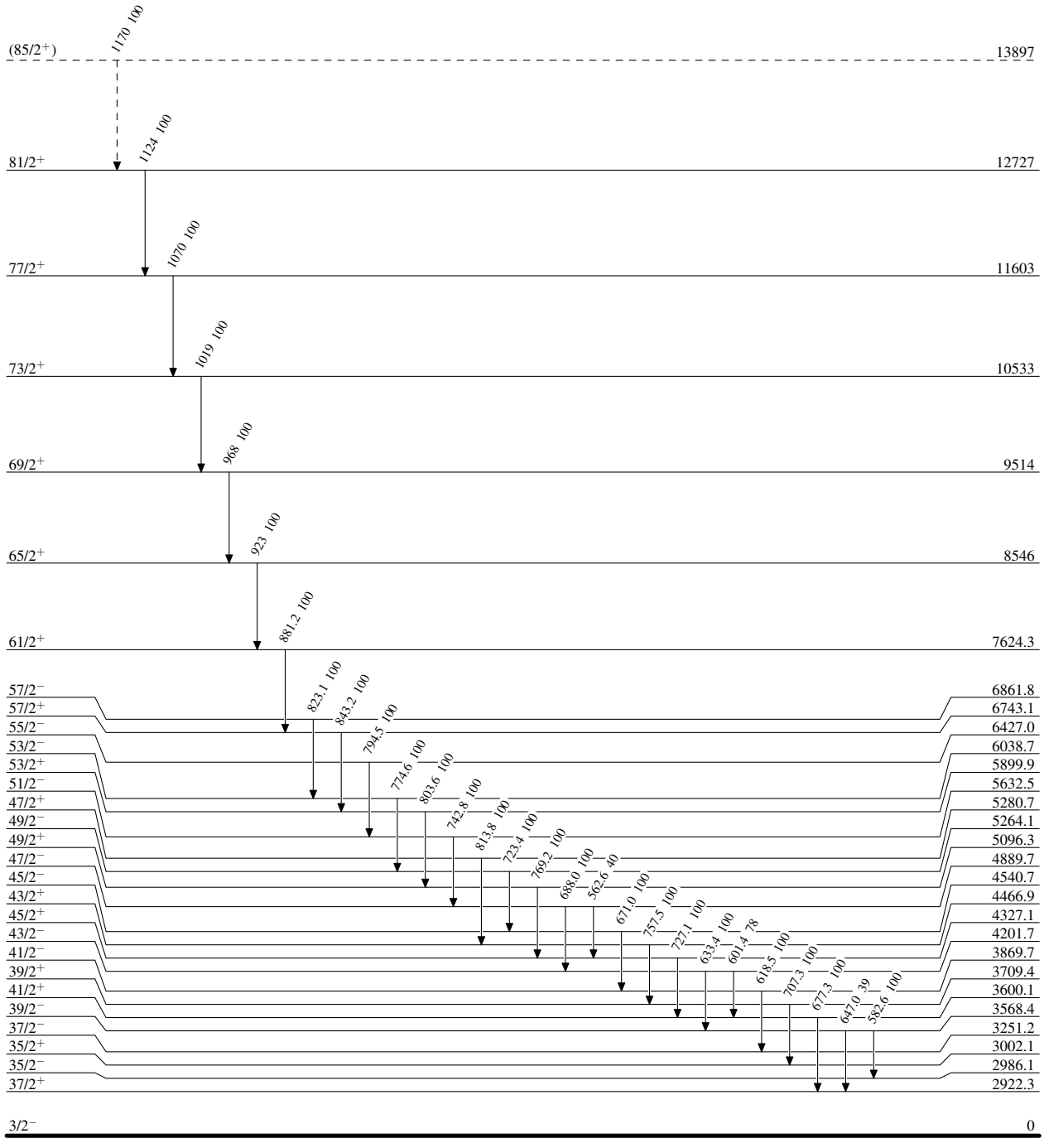
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

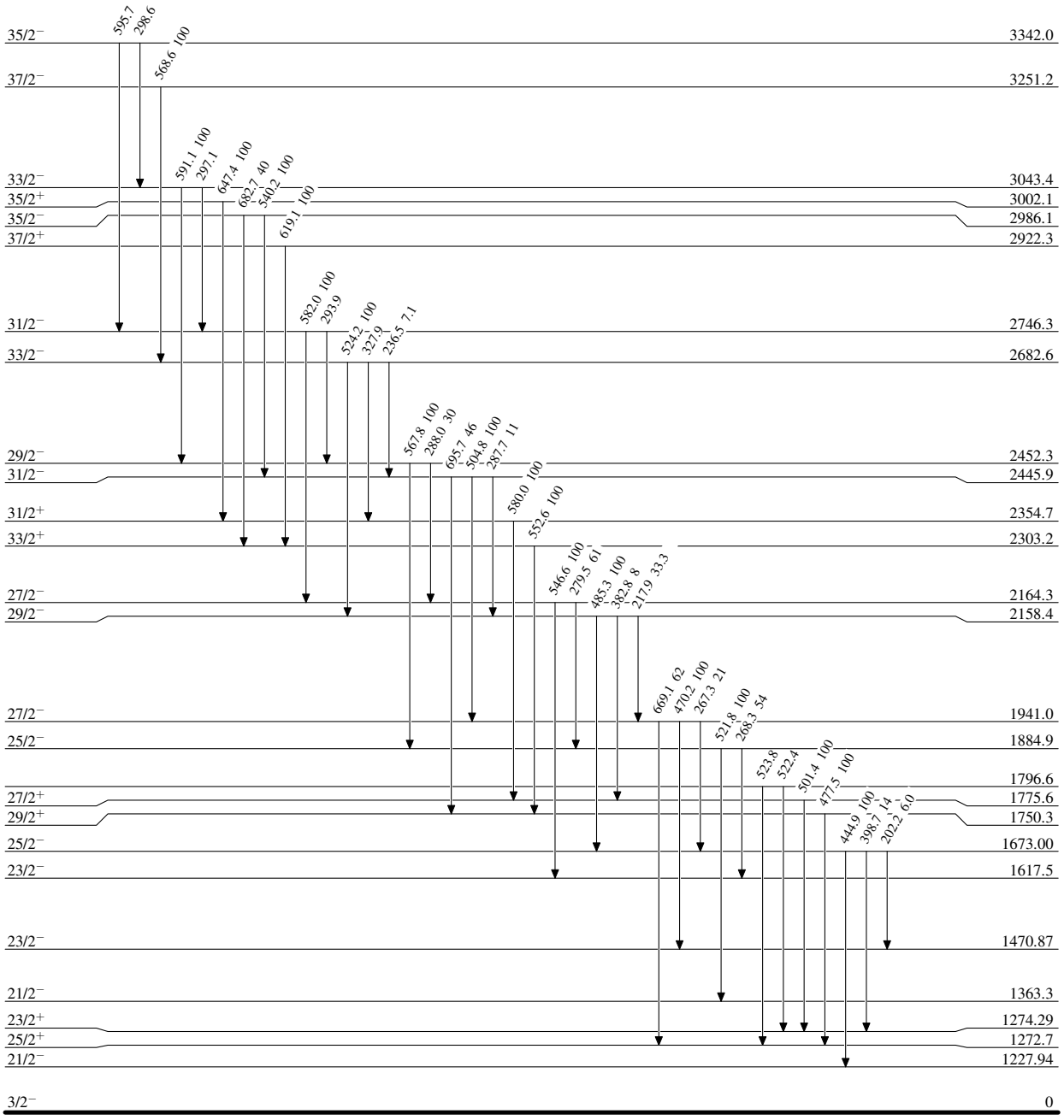


$^{159}_{66}Dy_{93}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{159}_{66}Dy_{93}$

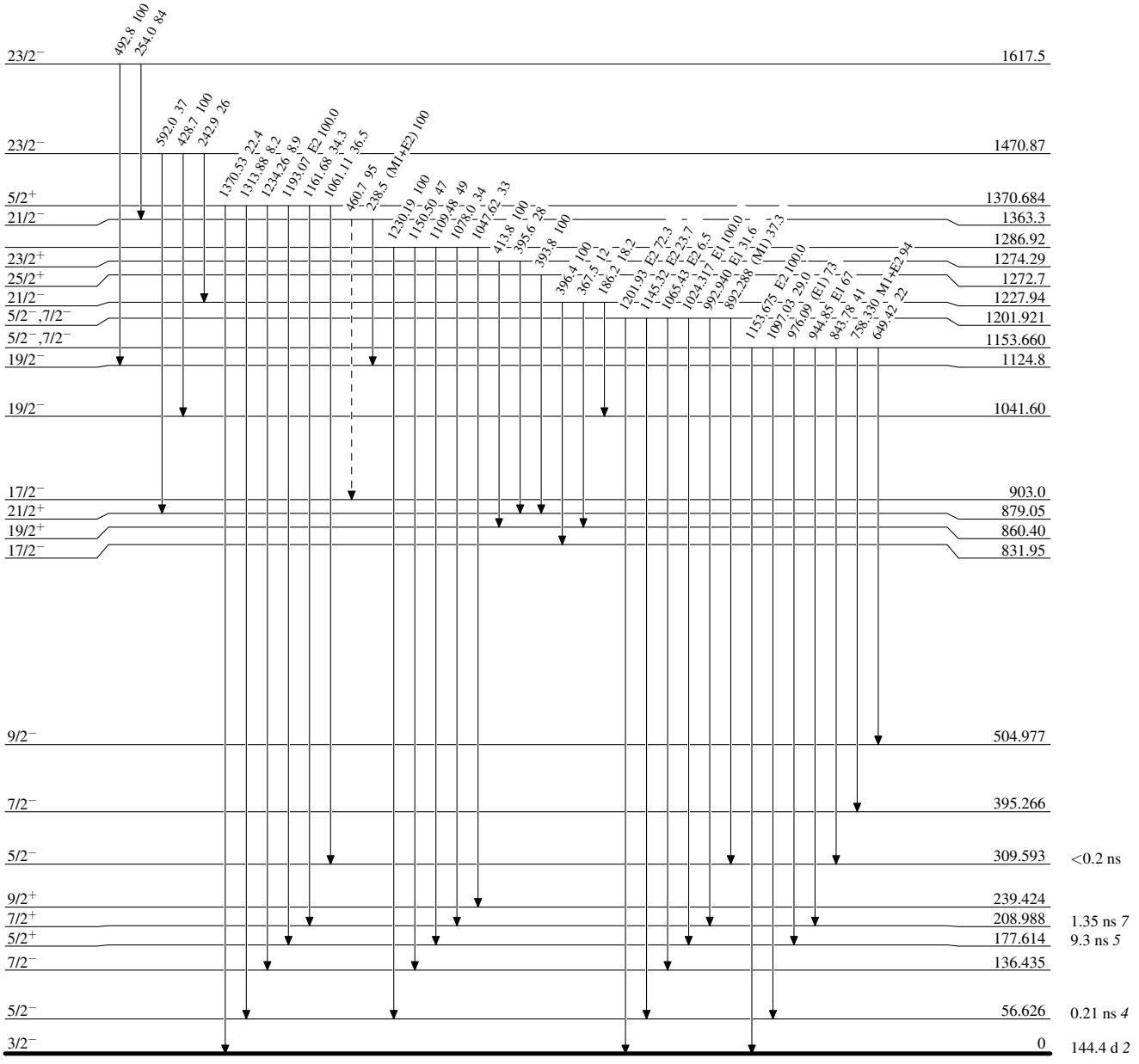
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

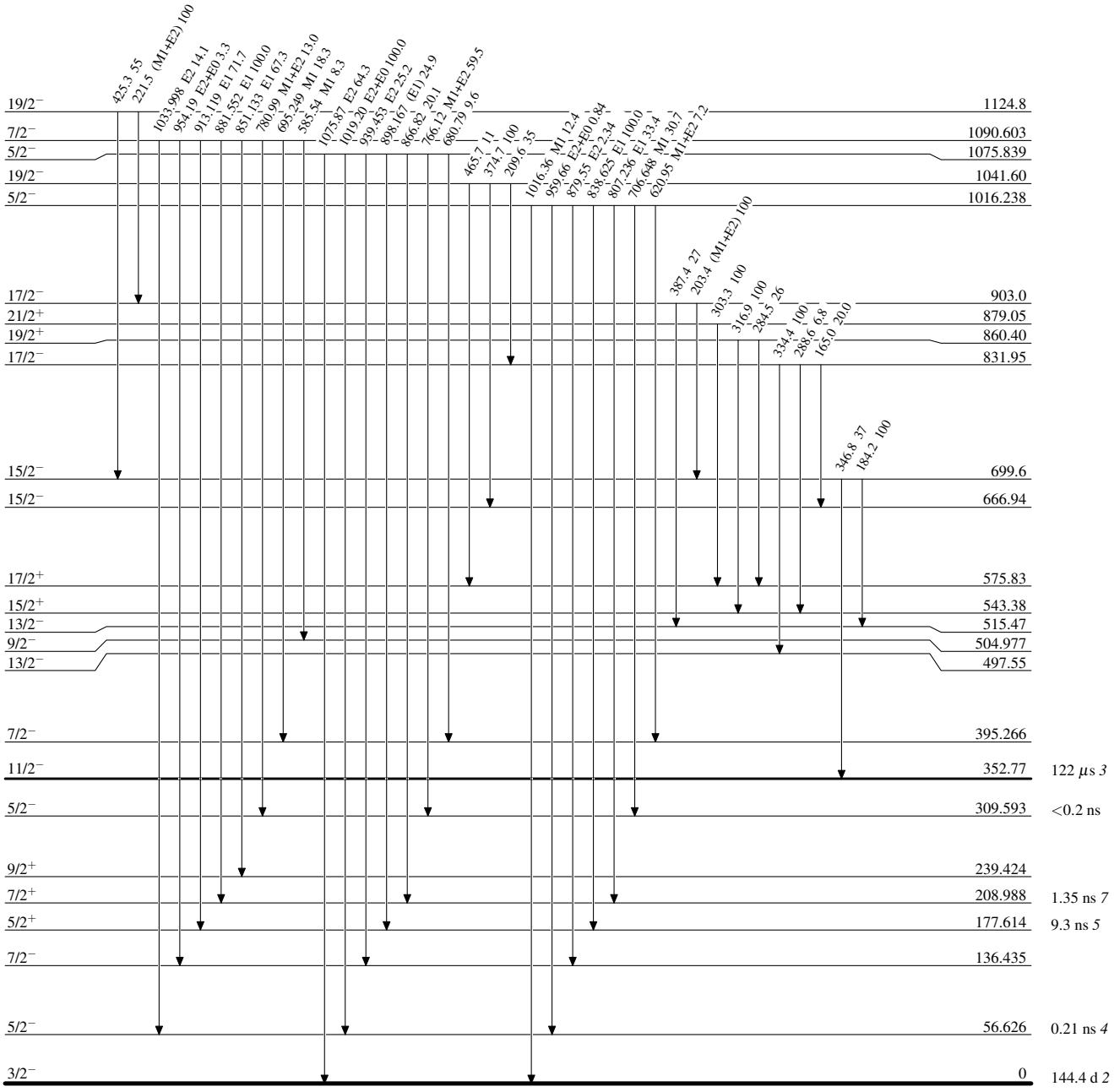


$^{159}_{66}Dy_{93}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{159}_{66}Dy_{93}$

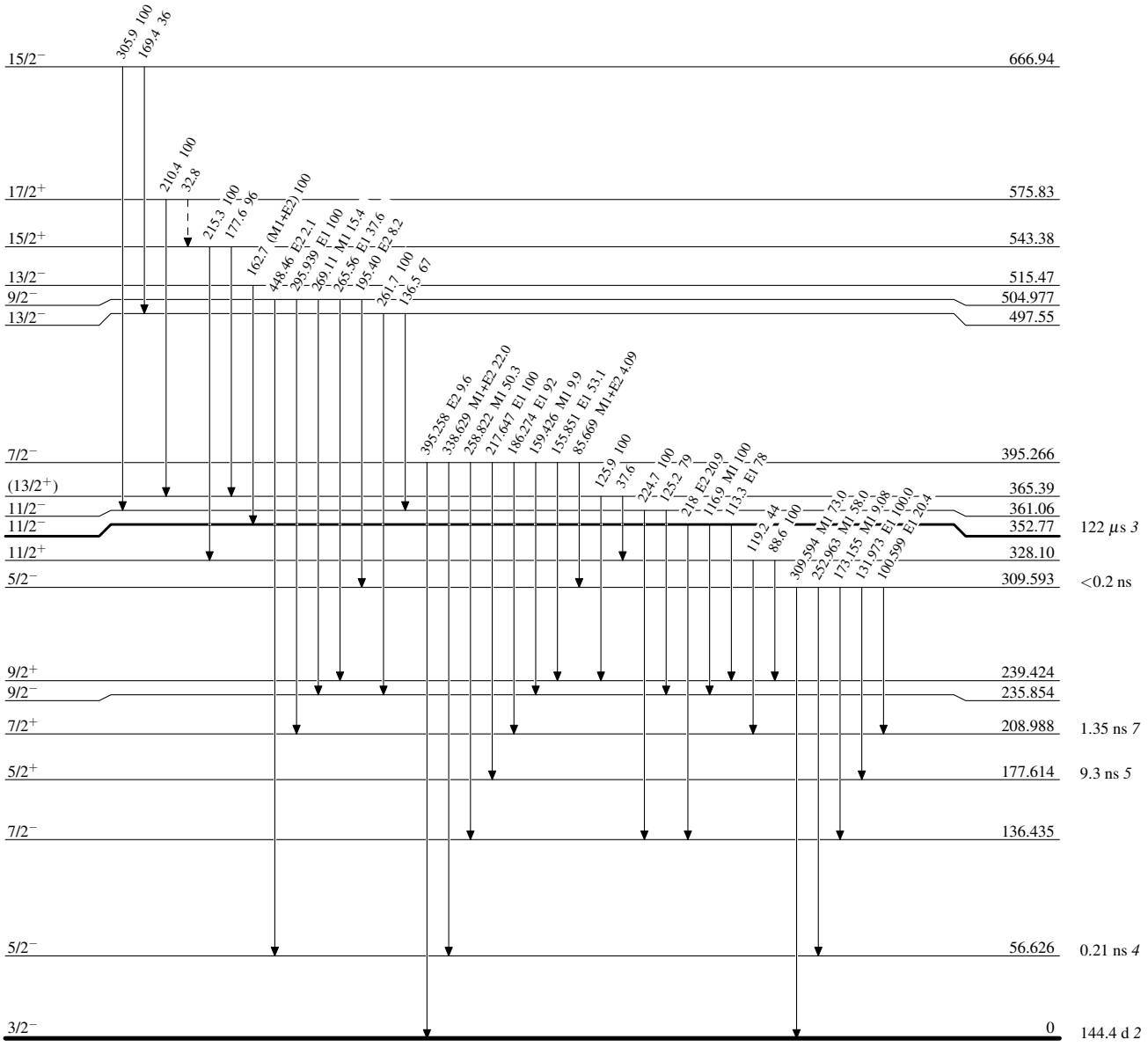
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)

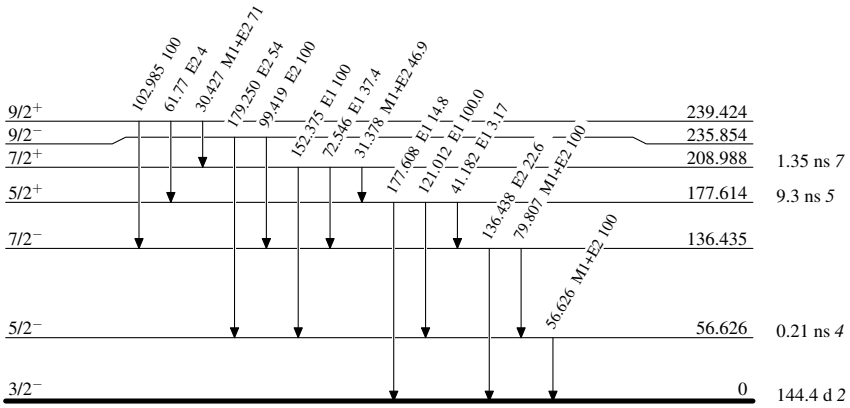


$^{159}_{66}Dy_{93}$

Adopted Levels, Gammas

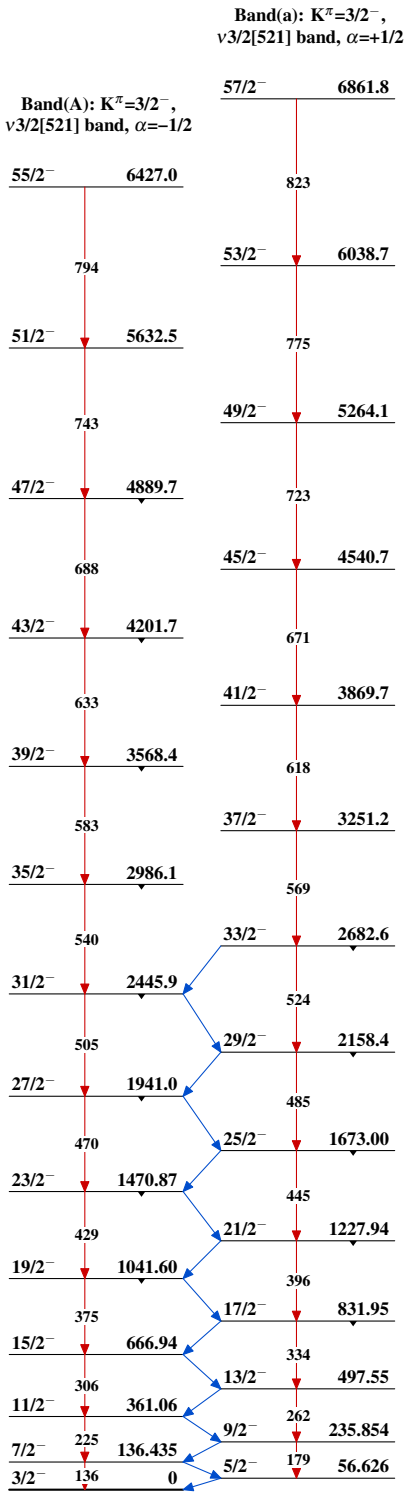
Level Scheme (continued)

Intensities: Relative photon branching from each level



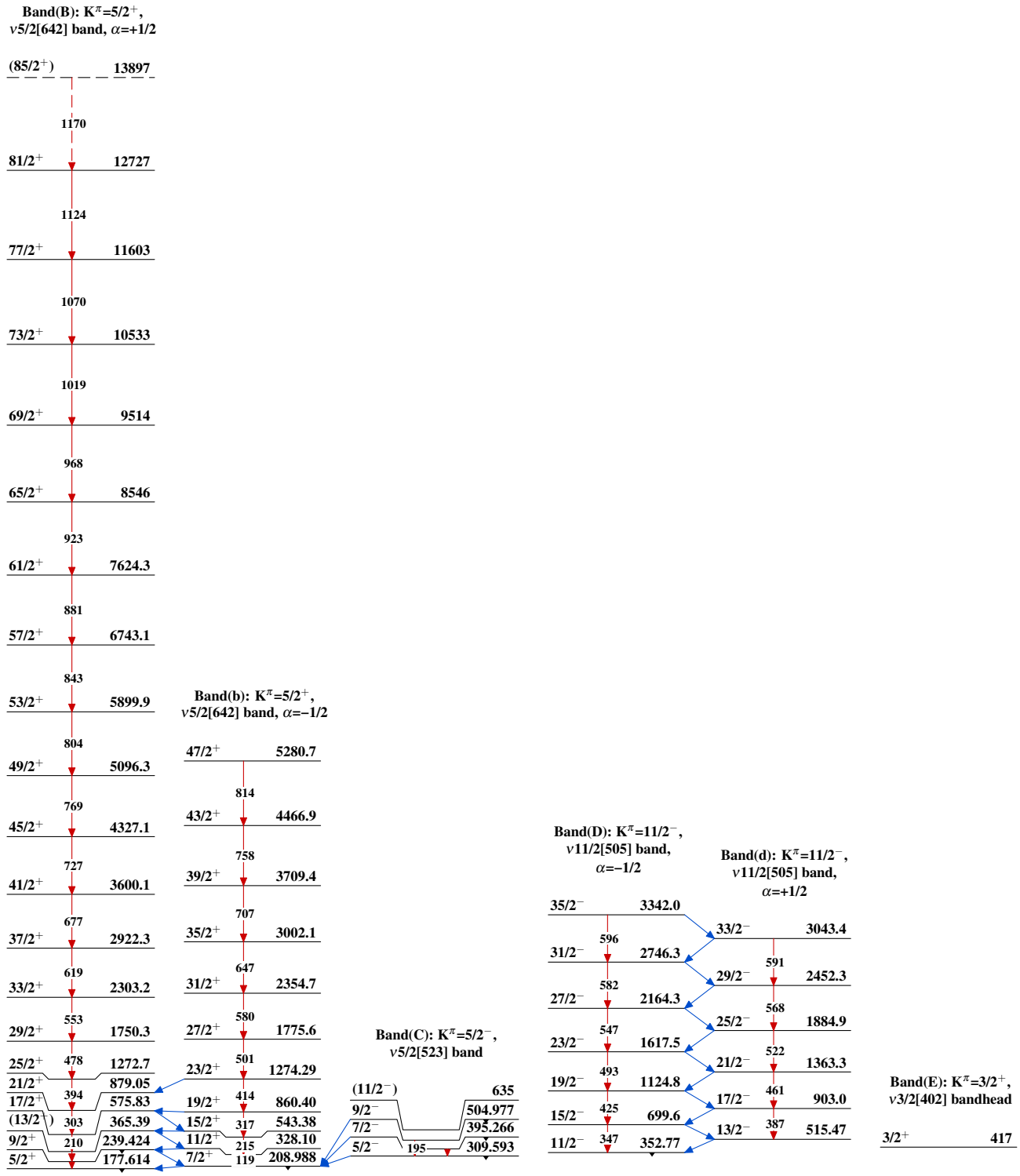
$^{159}_{66}Dy_{93}$

Adopted Levels, Gammas

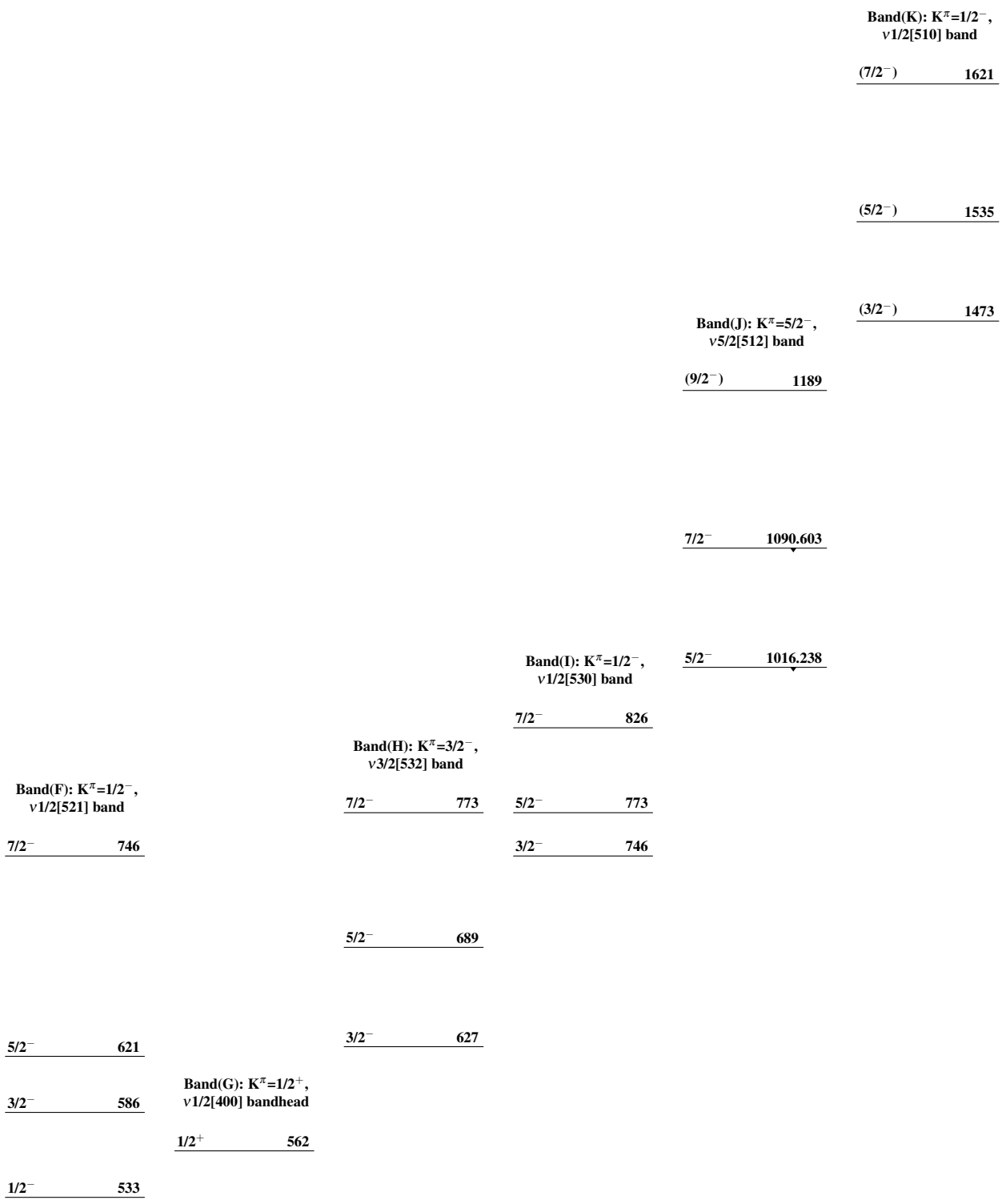


$^{159}_{66}Dy_{93}$

Adopted Levels, Gammas (continued)



Adopted Levels, Gammas (continued)



$^{159}_{66}Dy_{93}$

Adopted Levels, Gammas (continued)

Band(L): $K^{\pi}=3/2^{+}$, ν3/2[651] band

$(3/2^{+})$ **549**

$^{159}_{66}Dy_{93}$