Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	N. Nica and B. Singh	NDS 181, 1 (2022)	9-Mar-2022

Q(β^-)=−8439 *10*; S(n)=9712 *11*; S(p)=3720 *50*; Q(α)=1.61×10^3 *20* 2021Wa16
S(2n)=22096 *11*, S(2p)=5847 *22*, Q(εp)=4601 *10* (2021Wa16).

^{147}Dy Levels

Cross Reference (XREF) Flags

A ^{147}Dy IT decay (55.2 s)
B ^{147}Ho ε decay (5.8 s)
C ^{89}Y(^{60}Ni,pnγ)

E(level)†	J$^\pi$‡	T$_{1/2}$	XREF	Comments
0.0	(1/2$^+$)	67 s *7*	ABC	%ε+%β^+=100 (1983AlZN); %β^+p=5×10^{-2} (1984To07) μ=−0.915 *9* (2019StZV) %β^+p: other values: 2×10^{-3} *1* (1988WiZN); >0 (1984ScZT). μ: measured by collinear fast beam laser spectroscopy − accelerated beam (quoted by 2019StZV from R. Neugart, Private Communication, 1987). T$_{1/2}$: from 1985Al08 other values: 40 s *10* (1984ScZT), 67 s *7* (1983ByZZ), 75 s *4* (1983Al06). 1984ScZT is discrepant (this was adopted by 1992De38); the other values are in agreement but they are at least partially interrelated to each other as well as with 1985Al08 by authorship and experimental setup (1985Al08 and 1983ByZZ give identical results), reason for which the result of 1985Al08 is adopted. The average value by the limitation of statistical weights method of the three distinct values is 67 s *9* close to the adopted value.
72.04 *24*	(3/2$^+$)		ABC	J$^\pi$: (1/2$^+$,3/2$^+$) from M1 γ to (1/2$^+$) g.s. (IT decay dataset); (3/2$^+$) from nuclear structure configuration (d3/2$^+$ orbital).
750.5 *4*	(11/2$^-$)	55.2 s *5*	ABC	%IT=31.1 *23* (1997Co21); %ε+%β^+=68.9 *23* μ=−0.655 *10* (2019StZV) Q=+0.67 *10* (2016St14) E(level): 750.5 measured by 2005Ge10 and 2006Bo41 from mass differences of ^{147m}Dy and ^{147g}Dy. %IT: value from 1997Co21 by total absorption spectrometer; other values: 31 *3* (1985Al08), ≈40 (1976Ra07). μ: measured by collinear fast beam laser spectroscopy − accelerated beam (quoted by 2019StZV from R. Neugart, Private Communication, 1987). Q: measured by collinear fast beam laser spectroscopy − accelerated beam (quoted by 2019StZV from R. Neugart, Private Communication, 1987). J$^\pi$: (M4) γ to (3/2$^+$), 72; analog to 11/2$^-$, 83 s, 748 isomer in ^{145}Gd (see Adopted Levels). T$_{1/2}$: weighted average of 55.7 s *7* (1993Al03,1985Al08), 54.4 s *5* (1984ScZT), 55.7 s *5* (1983ByZZ); other values: 57 s *4* (1982Kl03), 59 s *3* (1976Ra07).
955.96 *24*	(5/2$^+$)		B	
1145.0 *3*	(7/2$^-$)		B	
1335.7 *4*	(7/2$^+$)		B	
1631.8 *4*	(9/2$^-$,11/2$^-$)		B	J$^\pi$: log *ft*≈5.3 from (11/2$^-$) parent (β^+ dataset, 1982No08); γ to 7/2$^-$, 1145.
1780.8 *5*			B	
1924.6 *4*	(9/2$^-$)		B	J$^\pi$: log *ft*≈5.1 from (11/2$^-$) parent (β^+ dataset, 1982No08); γ's to (7/2$^-$), 1145 and to (7/2$^+$), 1336, respectively.
2063.4 *4*			B	
2404.0 *8*	(15/2$^-$)		C	
2462.0 *8*	(15/2$^+$)		C	
2659.2 *10*	(17/2$^+$)		C	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{147}Dy Levels (continued)

E(level)†	J^{π}‡	$T_{1/2}$	XREF	E(level)†	J^{π}‡	$T_{1/2}$	XREF
2680.6 *8*	(19/2$^+$)	7# ns *1*	C	3325.3 *8*	(23/2$^-$)		C
2693.2 *8*	(21/2$^+$)		C	3407.2 *8*	(27/2$^-$)	0.40# μs *1*	C
2937.5 *8*	(21/2$^+$)		C	3558.3? *9*			C
3081.2 *8*	(19/2$^-$)		C	3650.6 *9*	(27/2$^-$)	16# ns *3*	C

† From least-squares fit to Eγ′s.

‡ Arguments for the assignments to the g.s. and first two excited levels are based on shell-model considerations, systematics of s1/2$^+$, d3/2$^+$ and h11/2$^-$ levels, systematics of M4 transitions and atomic-beam measurements of spins in adjacent nuclei. For levels from 956 to 2063 keV inclusive, J^{π}′s are taken from 1982No08, based on log *ft* values or γ′s from (to) levels with assigned J^{π}′s, in analogy with ^{145}Gd isotone levels. Above 2063 keV the J^{π} values are from 1985Br07, who rely on shell-model considerations and low-energy γ mults. Because the J^{π}′s of the g.s.′s of both ^{147}Ho parent and ^{147}Dy are tentative, all the other assignments are tentative (evaluator).

From 1985Br07 in (^{60}Ni,xpnγ).

$\gamma(^{147}Dy)$

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.	δ	α#	Comments
72.04	(3/2+)	72.0 3	100	0.0	(1/2+)	M1(+E2)	<0.4	6.4 3	α(K)=4.98 23; α(L)=1.11 34; α(M)=0.251 83 α(N)=0.057 19; α(O)=0.0078 21; α(P)=0.000309 17 Mult.: from α(K)exp=5.2 5 (IT decay dataset, 1982To01).
750.5	(11/2−)	678.4 3	100	72.04	(3/2+)	(M4)		0.211	B(M4)(W.u.)=1.50 11 α(K)=0.1636 23; α(L)=0.0364 6; α(M)=0.00843 12 α(N)=0.00195 3; α(O)=0.000276 4; α(P)=1.332×10^{-5} 19 Mult.: from 1975To04 who compare the 678.4-keV transition with the 721-keV transition in ^{145}Gd for which α(K)exp was determined by 1970Ep02 and was shown to be compatible with M4, and from well established systematics of the N=81 isotones (1985To11).
955.96	(5/2+)	883.9 3	100	72.04	(3/2+)	[M1]		0.00716	α(K)=0.00608 9; α(L)=0.000845 12; α(M)=0.000184 3 α(N)=4.27×10^{-5} 6; α(O)=6.28×10^{-6} 9; α(P)=3.68×10^{-7} 6
		956.0 3	22 3	0.0	(1/2+)	[E2]		0.00334	α(K)=0.00280 4; α(L)=0.000421 6; α(M)=9.28×10^{-5} 13 α(N)=2.14×10^{-5} 3; α(O)=3.07×10^{-6} 5; α(P)=1.617×10^{-7} 23
1145.0	(7/2−)	189.1 3	100 9	955.96	(5/2+)	[E1]		0.0564	α(K)=0.0475 7; α(L)=0.00692 11; α(M)=0.001512 23 α(N)=0.000346 5; α(O)=4.86×10^{-5} 8; α(P)=2.39×10^{-6} 4
		394.4 3	16 3	750.5	(11/2−)	[E2]		0.0288	α(K)=0.0226 4; α(L)=0.00485 7; α(M)=0.001104 16 α(N)=0.000252 4; α(O)=3.40×10^{-5} 5; α(P)=1.231×10^{-6} 18
1335.7	(7/2+)	1263.7 3	100	72.04	(3/2+)	[E2]		0.00191	α(K)=0.001605 23; α(L)=0.000229 4; α(M)=5.01×10^{-5} 7 α(N)=1.155×10^{-5} 17; α(O)=1.677×10^{-6} 24; α(P)=9.28×10^{-8} 13; α(IPF)=1.357×10^{-5} 20
1631.8	(9/2−,11/2−)	486.7 3	100	1145.0	(7/2−)				
1780.8		445.1 3	100	1335.7	(7/2+)				
1924.6	(9/2−)	292.7 3	74 14	1631.8	(9/2−,11/2−)				
		589.0 3	93 14	1335.7	(7/2+)	[E1]		0.00359	α(K)=0.00306 5; α(L)=0.000417 6; α(M)=9.06×10^{-5} 13 α(N)=2.09×10^{-5} 3; α(O)=3.02×10^{-6} 5; α(P)=1.682×10^{-7} 24
		779.6 3	100 17	1145.0	(7/2−)	[M1]		0.00974	α(K)=0.00827 12; α(L)=0.001154 17; α(M)=0.000252 4 α(N)=5.83×10^{-5} 9; α(O)=8.57×10^{-6} 12; α(P)=5.01×10^{-7} 7
2063.4		431.6 3	100 24	1631.8	(9/2−,11/2−)				
		918.3 3	69 17	1145.0	(7/2−)				
2404.0	(15/2−)	1653.4	100	750.5	(11/2−)	[E2]		1.26×10^{-3}	α(K)=0.000964 14; α(L)=0.0001328 19; α(M)=2.89×10^{-5} 4

From ENSDF

$^{147}_{66}Dy_{81}$-3

$\gamma(^{147}$Dy) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	α#	Comments
								α(N)=6.68×10^{-6} *10*; α(O)=9.76×10^{-7} *14*; α(P)=5.57×10^{-8} *8*; α(IPF)=0.0001300 *19*
2462.0	($15/2^+$)	58.0	100 *9*	2404.0	($15/2^-$)	E1‡	1.287	α(K)=1.052 *15*; α(L)=0.184 *3*; α(M)=0.0405 *6* α(N)=0.00910 *13*; α(O)=0.001191 *17*; α(P)=4.54×10^{-5} *7*
		1711.5	97 *6*	750.5	($11/2^-$)	[M2+E3]	0.00276 *70*	α(K)=0.00227 *60*; α(L)=0.00033 *8*; α(M)=7.2×10^{-5} *17* α(N)=1.7×10^{-5} *4*; α(O)=2.4×10^{-6} *6*; α(P)=1.39×10^{-7} *38*; α(IPF)=7.79×10^{-5} *15*
2659.2	($17/2^+$)	197.1	100 *4*	2462.0	($15/2^+$)	M1‡	0.353	α(K)=0.298 *5*; α(L)=0.0434 *6*; α(M)=0.00952 *14* α(N)=0.00220 *3*; α(O)=0.000323 *5*; α(P)=1.85×10^{-5} *3*
		255.2	26.8 *14*	2404.0	($15/2^-$)	[E1]	0.0259	α(K)=0.0219 *3*; α(L)=0.00312 *5*; α(M)=0.000682 *10* α(N)=0.0001563 *22*; α(O)=2.22×10^{-5} *4*; α(P)=1.136×10^{-6} *16*
2680.6	($19/2^+$)	(21.5)	62 *7*	2659.2	($17/2^+$)	[M1]	34.7	B(M1)(W.u.)=0.0084 *+14−11* α(L)=27.1 *4*; α(M)=5.96 *9* α(N)=1.378 *20*; α(O)=0.201 *3*; α(P)=0.01141 *16* I_γ: calculated from I(γ+ce)(21.5) in (^{60}Ni,xpnγ) from transition balance between the 2659 and 2681 levels.
		218.6 *1*	100 *9*	2462.0	($15/2^+$)	[E2]	0.1761	B(E2)(W.u.)=0.151 *+37−26* α(K)=0.1219 *18*; α(L)=0.0419 *6*; α(M)=0.00980 *14* α(N)=0.00221 *4*; α(O)=0.000282 *4*; α(P)=5.94×10^{-6} *9*
2693.2	($21/2^+$)	(12.5)	100	2680.6	($19/2^+$)	[M1]	173.7	α(L)=135.7 *19*; α(M)=30.0 *5* α(N)=6.93 *10*; α(O)=1.010 *15*; α(P)=0.0572 *8* I_γ: I(γ+ce)(12.5) was equated to I(γ+ce)(244.3)+I(γ+ce)(632.1) to obtain Iγ.
2937.5	($21/2^+$)	244.3 *2*	25 *5*	2693.2	($21/2^+$)	[M1]	0.196	α(K)=0.1657 *24*; α(L)=0.0240 *4*; α(M)=0.00526 *8* α(N)=0.001218 *18*; α(O)=0.000178 *3*; α(P)=1.025×10^{-5} *15*
		256.9 *1*	100 *5*	2680.6	($19/2^+$)	[M1]	0.1713	α(K)=0.1446 *21*; α(L)=0.0209 *3*; α(M)=0.00459 *7* α(N)=0.001061 *15*; α(O)=0.0001555 *22*; α(P)=8.94×10^{-6} *13*
3081.2	($19/2^-$)	677.2 *2*	100	2404.0	($15/2^-$)	[E2]	0.00717	α(K)=0.00591 *9*; α(L)=0.000981 *14*; α(M)=0.000218 *3* α(N)=5.01×10^{-5} *7*; α(O)=7.07×10^{-6} *10*; α(P)=3.38×10^{-7} *5*
3325.3	($23/2^-$)	244.1 *2*	8.6 *8*	3081.2	($19/2^-$)	[E2]	0.1231	α(K)=0.0880 *13*; α(L)=0.0272 *4*; α(M)=0.00632 *9* α(N)=0.001432 *21*; α(O)=0.000185 *3*; α(P)=4.40×10^{-6} *7*
		387.7 *1*	100 *3*	2937.5	($21/2^+$)	[E1]	0.00922	α(K)=0.00783 *11*; α(L)=0.001091 *16*; α(M)=0.000238 *4* α(N)=5.47×10^{-5} *8*; α(O)=7.85×10^{-6} *11*; α(P)=4.21×10^{-7} *6*
		632.1 *1*	40 *2*	2693.2	($21/2^+$)	[E1]	0.00309	α(K)=0.00264 *4*; α(L)=0.000358 *5*; α(M)=7.78×10^{-5} *11* α(N)=1.79×10^{-5} *3*; α(O)=2.60×10^{-6} *4*; α(P)=1.453×10^{-7} *21*
3407.2	($27/2^-$)	81.9 *1*	100	3325.3	($23/2^-$)	E2‡	5.78	B(E2)(W.u.)=1.229 *+36−34* α(K)=1.77 *3*; α(L)=3.09 *5*; α(M)=0.742 *12* α(N)=0.166 *3*; α(O)=0.0198 *3*; α(P)=7.41×10^{-5} *11*
3558.3?		151.2@ *3*	100†	3407.2	($27/2^-$)	(E2)	0.613 *10*	α(K)=0.362 *6*; α(L)=0.194 *4*; α(M)=0.0459 *8* α(N)=0.01033 *17*; α(O)=0.001276 *21*; α(P)=1.615×10^{-5} *25* Mult.: assumed by 1985Br07 (^{89}Y(^{60}Ni,pnγ)) based on intensity balance.

$^{147}_{66}Dy_{81}$-4

$\gamma(^{147}Dy)$ (continued)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.	α[#]	Comments
3650.6	(27/2⁻)	92.3 *3*	20[†] *6*	3558.3?		(M1)	3.01	B(M1)(W.u.)=1.9×10^{-4} *5* α(K)=2.54 *5*; α(L)=0.374 *7*; α(M)=0.0821 *14* α(N)=0.0190 *4*; α(O)=0.00278 *5*; α(P)=0.000158 *3* Mult.: assumed by 1985Br07 (^{89}Y(^{60}Ni,pnγ) based on intensity balance.
		243.4 *3*	100[†] *20*	3407.2	(27/2⁻)		0.1250	Mult.: half-life excludes M2.

[†] Normalization with respect to the intensities of the lines below the 0.4−μs isomer is estimated to be accurate within a factor of 2 (^{89}Y(^{60}Ni,pnγ) dataset, 1985Br07).

[‡] Based on α(exp) from intensity balance (^{89}Y(^{60}Ni,pnγ) dataset, 1985Br07).

[#] 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.

From ENSDF

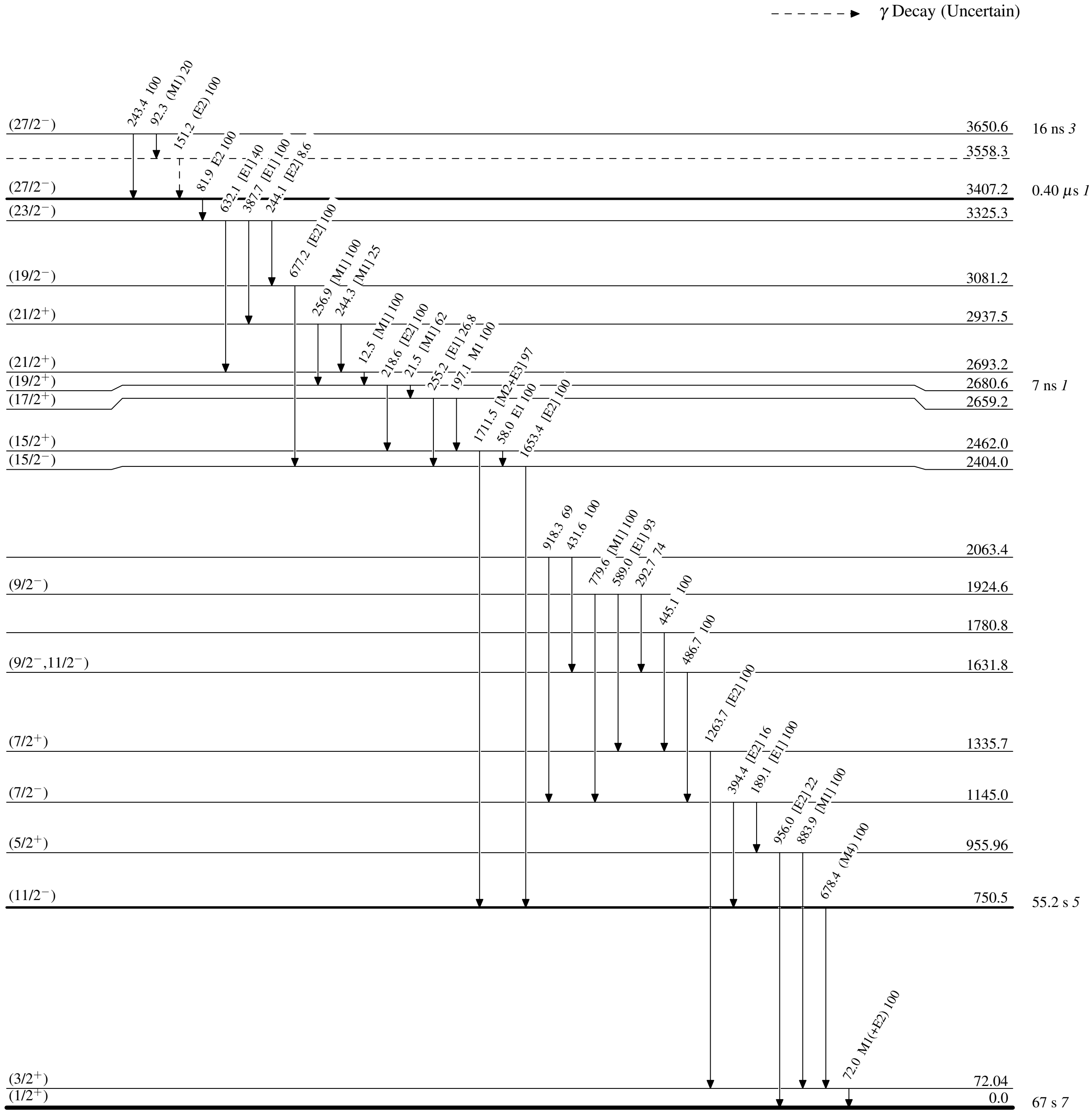
$^{147}_{66}Dy_{81}$-5

Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level



$^{147}_{66}Dy_{81}$