

$^{163}\text{Dy}(\text{d,p}\gamma)$ 1981Ma22

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen [#]		NDS 147, 1 (2018)	30-Nov-2017

1981Ma22: E=10 MeV. Measured E_γ , I_γ , ce. 93.1% enriched target.

 ^{164}Dy Levels

E(level) [†]	J^π [‡]	E(level) [†]	J^π [‡]	E(level) [†]	J^π [‡]	E(level) [†]	J^π [‡]
0.0 [#]	0 ⁺	827.8 [@] 3	3 ⁺	1122.6 ^{&} 4	4 ⁻	1686.3 ^a 7	(5) ⁻
73.05 [#] 20	2 ⁺	915.7 [@] 3	4 ⁺	1155.2 [@] 4	(6) ⁺	1932.1 11	(4,5) ⁺
241.7 [#] 4	4 ⁺	976.7 ^{&} 4	2 ⁻	1225.1 ^{&} 5	(5) ⁻	1998.1 5	(4 ⁺)
500.9 [#] 4	6 ⁺	1023.9 [@] 4	5 ⁺	1588.4 ^a 4	(4) ⁻		
761.7 [@] 2	2 ⁺	1039.2 ^{&} 3	3 ⁻	1608.2 5	(4 ⁺)		

[†] From least-squares fit to E_γ data.

[‡] From Adopted Levels.

[#] Band(A): g.s. band.

[@] Band(B): γ -vibrational band.

[&] Band(C): $K^\pi=2^-$ band.

^a Band(D): $K^\pi=4^-$ band.

 $\gamma(^{164}\text{Dy})$

E_γ	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. ^c	α^d	Comments
73.0 2	31.9 16	73.05	2 ⁺	0.0	0 ⁺	E2	9.08 17	$\alpha(\text{K})=2.17$ 4; $\alpha(\text{L})=5.31$ 11; $\alpha(\text{M})=1.277$ 25 $\alpha(\text{N})=0.286$ 6; $\alpha(\text{O})=0.0339$ 7; $\alpha(\text{P})=9.51 \times 10^{-5}$ 15 $\alpha(\text{L})_{\text{exp}}=5.39$ 12.
^x 94.0 ^{&} 3 98.7 3	3.6 4 4.8 7	1122.6	4 ⁻	1023.9	5 ⁺	E1	0.320 6	$\alpha(\text{K})=0.267$ 5; $\alpha(\text{L})=0.0415$ 7; $\alpha(\text{M})=0.00909$ 15 $\alpha(\text{N})=0.00206$ 4; $\alpha(\text{O})=0.000281$ 5; $\alpha(\text{P})=1.228 \times 10^{-5}$ 20 $\alpha(\text{K})_{\text{exp}}=0.30$ 7 Additional information 20.
^x 123.3 ^{&} 10 131.4 2	[†] 3.6 3	1155.2	(6) ⁺	1023.9	5 ⁺	M1	1.099	$\alpha(\text{K})=0.926$ 14; $\alpha(\text{L})=0.1357$ 20; $\alpha(\text{M})=0.0298$ 5 $\alpha(\text{N})=0.00689$ 11; $\alpha(\text{O})=0.001009$ 15; $\alpha(\text{P})=5.76 \times 10^{-5}$ 9 $\alpha(\text{K})_{\text{exp}}=0.84$ 16 Additional information 22.
148.6 6	3.8 2	976.7	2 ⁻	827.8	3 ⁺	E1	0.1069 19	$\alpha(\text{K})=0.0899$ 16; $\alpha(\text{L})=0.01334$ 24; $\alpha(\text{M})=0.00292$ 6 $\alpha(\text{N})=0.000666$ 12; $\alpha(\text{O})=9.26 \times 10^{-5}$ 17; $\alpha(\text{P})=4.38 \times 10^{-6}$ 8 $\alpha(\text{K})_{\text{exp}}=0.126$ 18 Additional information 16.
168.5 [@] 2	100	241.7	4 ⁺	73.05	2 ⁺	E2	0.422	$\alpha(\text{K})=0.264$ 4; $\alpha(\text{L})=0.1220$ 19; $\alpha(\text{M})=0.0288$ 5 $\alpha(\text{N})=0.00649$ 10; $\alpha(\text{O})=0.000809$ 12;

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$^{163}\text{Dy}(\text{d},\text{p}\gamma)$ **1981Ma22** (continued) $\gamma(^{164}\text{Dy})$ (continued)

E_γ	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. ^c	α^d	Comments
185.9 5	4.8 8	1225.1	(5) ⁻	1039.2	3 ⁻	E2 ^a	0.302	$\alpha(\text{P})=1.207\times 10^{-5}$ 18 Additional information 8. $\alpha(\text{K})=0.197$ 4; $\alpha(\text{L})=0.0810$ 15; $\alpha(\text{M})=0.0190$ 4 $\alpha(\text{N})=0.00429$ 8; $\alpha(\text{O})=0.000540$ 10; $\alpha(\text{P})=9.24\times 10^{-6}$ 15 $\alpha(\text{K})_{\text{exp}}=0.25$ 9 Additional information 23.
207.1 5	10.8 5	1122.6	4 ⁻	915.7	4 ⁺	E1	0.0444	$\alpha(\text{K})=0.0375$ 6; $\alpha(\text{L})=0.00542$ 9; $\alpha(\text{M})=0.001184$ 19 $\alpha(\text{N})=0.000271$ 5; $\alpha(\text{O})=3.82\times 10^{-5}$ 6; $\alpha(\text{P})=1.90\times 10^{-6}$ 3 $\alpha(\text{K})_{\text{exp}}=0.045$ 12 Additional information 21.
211.4 6	10.2 12	1039.2	3 ⁻	827.8	3 ⁺	(E1) [#]	0.0421 7	$\alpha(\text{K})=0.0355$ 6; $\alpha(\text{L})=0.00513$ 9; $\alpha(\text{M})=0.001121$ 18 $\alpha(\text{N})=0.000257$ 4; $\alpha(\text{O})=3.62\times 10^{-5}$ 6; $\alpha(\text{P})=1.81\times 10^{-6}$ 3
215.0 4	29 3	976.7	2 ⁻	761.7	2 ⁺	E1 ^b	0.0403	$\alpha(\text{K})=0.0340$ 5; $\alpha(\text{L})=0.00490$ 8; $\alpha(\text{M})=0.001072$ 16 $\alpha(\text{N})=0.000245$ 4; $\alpha(\text{O})=3.46\times 10^{-5}$ 6; $\alpha(\text{P})=1.73\times 10^{-6}$ 3 $\alpha(\text{K})_{\text{exp}}=0.030$ 5 Additional information 17.
^x 245.0 2 259.1 3	2.6 4 27.0 14	500.9	6 ⁺	241.7	4 ⁺	# E2	0.1018	$\alpha(\text{K})_{\text{exp}}=0.068$ 8 $\alpha(\text{K})=0.0739$ 11; $\alpha(\text{L})=0.0216$ 4; $\alpha(\text{M})=0.00502$ 8 $\alpha(\text{N})=0.001137$ 17; $\alpha(\text{O})=0.0001474$ 22; $\alpha(\text{P})=3.74\times 10^{-6}$ 6 Additional information 9.
277.5 3	18.1 18	1039.2	3 ⁻	761.7	2 ⁺	E1	0.0209	$\alpha(\text{K})=0.0177$ 3; $\alpha(\text{L})=0.00251$ 4; $\alpha(\text{M})=0.000549$ 8 $\alpha(\text{N})=0.0001259$ 18; $\alpha(\text{O})=1.79\times 10^{-5}$ 3; $\alpha(\text{P})=9.27\times 10^{-7}$ 14 $\alpha(\text{K})_{\text{exp}}=0.021$ 4 Additional information 19.
295.3 @& 7 ^x 303.3 8	8.5 26 4.5 9	1122.6	4 ⁻	827.8	3 ⁺	E2 ^b	0.0624 10	$\alpha(\text{K})=0.0468$ 8; $\alpha(\text{L})=0.01206$ 21; $\alpha(\text{M})=0.00278$ 5 $\alpha(\text{N})=0.000630$ 11; $\alpha(\text{O})=8.30\times 10^{-5}$ 14; $\alpha(\text{P})=2.45\times 10^{-6}$ 4 $\alpha(\text{K})_{\text{exp}}=0.038$ 8 Additional information 1.
309.4 5	15.1 11	1225.1	(5) ⁻	915.7	4 ⁺	E1	0.01593	$\alpha(\text{K})=0.01350$ 20; $\alpha(\text{L})=0.00190$ 3; $\alpha(\text{M})=0.000416$ 6 $\alpha(\text{N})=9.54\times 10^{-5}$ 14; $\alpha(\text{O})=1.362\times 10^{-5}$ 20; $\alpha(\text{P})=7.14\times 10^{-7}$ 11 $\alpha(\text{K})_{\text{exp}}=0.016$ 4 Additional information 24.
^x 359.3 @ 7	2.8 4					M1+E2	0.054 17	$\alpha(\text{K})=0.044$ 15; $\alpha(\text{L})=0.0076$ 10; $\alpha(\text{M})=0.00169$ 18 $\alpha(\text{N})=0.00039$ 5; $\alpha(\text{O})=5.5\times 10^{-5}$ 9; $\alpha(\text{P})=2.6\times 10^{-6}$ 11 $\alpha(\text{K})_{\text{exp}}=0.038$ 7 Additional information 2.

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$^{163}\text{Dy}(\text{d},\text{p}\gamma)$ **1981Ma22** (continued) $\gamma(^{164}\text{Dy})$ (continued)

E_γ	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. ^c	α^d	Comments
$^{x}384.5 \& 8$	4.5 6					E2	0.0310	$\alpha(\text{K})=0.0242$ 4; $\alpha(\text{L})=0.00528$ 9; $\alpha(\text{M})=0.001202$ 19 $\alpha(\text{N})=0.000274$ 5; $\alpha(\text{O})=3.69\times 10^{-5}$ 6; $\alpha(\text{P})=1.313\times 10^{-6}$ 20 $\alpha(\text{K})_{\text{exp}}=0.022$ 6 Additional information 3.
389.9 2	5.7 6	1998.1	(4 ⁺)	1608.2 (4 ⁺)		M1	0.0565	$\alpha(\text{K})=0.0478$ 7; $\alpha(\text{L})=0.00682$ 10; $\alpha(\text{M})=0.001495$ 21 $\alpha(\text{N})=0.000346$ 5; $\alpha(\text{O})=5.07\times 10^{-5}$ 8; $\alpha(\text{P})=2.93\times 10^{-6}$ 5 $\alpha(\text{K})_{\text{exp}}=0.042$ 7 Additional information 29.
$^{x}402.2 \& 6$	3.0 3					M1	0.0521	$\alpha(\text{K})=0.0441$ 7; $\alpha(\text{L})=0.00629$ 10; $\alpha(\text{M})=0.001377$ 20 $\alpha(\text{N})=0.000319$ 5; $\alpha(\text{O})=4.68\times 10^{-5}$ 7; $\alpha(\text{P})=2.70\times 10^{-6}$ 4 $\alpha(\text{K})_{\text{exp}}=0.048$ 6 Additional information 4.
$^{x}421.8 \& 4$	5.7 5					M1	0.0460	$\alpha(\text{K})=0.0389$ 6; $\alpha(\text{L})=0.00555$ 8; $\alpha(\text{M})=0.001215$ 18 $\alpha(\text{N})=0.000281$ 4; $\alpha(\text{O})=4.13\times 10^{-5}$ 6; $\alpha(\text{P})=2.39\times 10^{-6}$ 4 $\alpha(\text{K})_{\text{exp}}=0.041$ 5 Additional information 5.
466.1 5	4.2 6	1588.4	(4) ⁻	1122.6 4 ⁻		E2 ^b	0.0182	$\alpha(\text{K})=0.01458$ 21; $\alpha(\text{L})=0.00285$ 4; $\alpha(\text{M})=0.000643$ 10 $\alpha(\text{N})=0.0001469$ 22; $\alpha(\text{O})=2.01\times 10^{-5}$ 3; $\alpha(\text{P})=8.10\times 10^{-7}$ 12 $\alpha(\text{K})_{\text{exp}}=0.011$ 2 Additional information 25.
$^{x}523.0$ 4	<5					(M1+E2)	0.020 7	$\alpha(\text{K})=0.017$ 6; $\alpha(\text{L})=0.0026$ 6; $\alpha(\text{M})=0.00057$ 13 $\alpha(\text{N})=0.00013$ 3; $\alpha(\text{O})=1.9\times 10^{-5}$ 5; $\alpha(\text{P})=1.0\times 10^{-6}$ 4 $\alpha(\text{K})_{\text{exp}}>0.014$ Additional information 6.
523.0 4	<5	1023.9	5 ⁺	500.9 6 ⁺		M1+E2	0.020 7	$\alpha(\text{K})=0.017$ 6; $\alpha(\text{L})=0.0026$ 6; $\alpha(\text{M})=0.00057$ 13 $\alpha(\text{N})=0.00013$ 3; $\alpha(\text{O})=1.9\times 10^{-5}$ 5; $\alpha(\text{P})=1.0\times 10^{-6}$ 4
549.2 6	5.0 10	1588.4	(4) ⁻	1039.2 3 ⁻		#		
569.0 3	11.0 13	1608.2	(4 ⁺)	1039.2 3 ⁻		E1	0.00387	$\alpha(\text{K})=0.00329$ 5; $\alpha(\text{L})=0.000449$ 7; $\alpha(\text{M})=9.78\times 10^{-5}$ 14 $\alpha(\text{N})=2.25\times 10^{-5}$ 4; $\alpha(\text{O})=3.26\times 10^{-6}$ 5; $\alpha(\text{P})=1.81\times 10^{-7}$ 3 $\alpha(\text{K})_{\text{exp}}=0.0032$ 7 Additional information 27.
586.1 @ 4	10.6 16	827.8	3 ⁺	241.7 4 ⁺		M1+E2	0.015 5	$\alpha(\text{K})=0.013$ 5; $\alpha(\text{L})=0.0019$ 5; $\alpha(\text{M})=0.00042$ 10 $\alpha(\text{N})=9.7\times 10^{-5}$ 23; $\alpha(\text{O})=1.4\times 10^{-5}$ 4; $\alpha(\text{P})=7.\text{E}-7$ 3 $\alpha(\text{K})_{\text{exp}}=0.013$ 3 Additional information 12.
$^{x}589.9$ 5	5.8 9					M1+E2	0.015 5	$\alpha(\text{K})=0.012$ 5; $\alpha(\text{L})=0.0019$ 5; $\alpha(\text{M})=0.00041$ 10 $\alpha(\text{N})=9.5\times 10^{-5}$ 23; $\alpha(\text{O})=1.4\times 10^{-5}$ 4;

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$^{163}\text{Dy}(\text{d},\text{p}\gamma)$ **1981Ma22** (continued) $\gamma(^{164}\text{Dy})$ (continued)

E_γ	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. ^c	α^d	Comments
								$\alpha(\text{P})=7.\text{E}-7$ 3 $\alpha(\text{K})_{\text{exp}}=0.0115$ 30 Additional information 7.
611.5 4	6.3 15	1588.4	(4) ⁻	976.7	2 ⁻	E2 ^a	0.00914	$\alpha(\text{K})=0.00748$ 11; $\alpha(\text{L})=0.001291$ 19; $\alpha(\text{M})=0.000288$ 4 $\alpha(\text{N})=6.61\times 10^{-5}$ 10; $\alpha(\text{O})=9.26\times 10^{-6}$ 13; $\alpha(\text{P})=4.25\times 10^{-7}$ 6 $\alpha(\text{K})_{\text{exp}}=0.009$ 4 Additional information 26.
647.1 6	5.8 3	1686.3	(5) ⁻	1039.2	3 ⁻	E2	0.00798	$\alpha(\text{K})=0.00656$ 10; $\alpha(\text{L})=0.001107$ 16; $\alpha(\text{M})=0.000247$ 4 $\alpha(\text{N})=5.66\times 10^{-5}$ 8; $\alpha(\text{O})=7.96\times 10^{-6}$ 12; $\alpha(\text{P})=3.74\times 10^{-7}$ 6 $\alpha(\text{K})_{\text{exp}}=0.0067$ 13 Additional information 28.
653.0 10	7.5 4	1155.2	(6) ⁺	500.9	6 ⁺	(E2)	0.00781	$\alpha(\text{K})_{\text{exp}}=0.0071$ 23 $\alpha(\text{K})=0.00642$ 10; $\alpha(\text{L})=0.001080$ 16; $\alpha(\text{M})=0.000241$ 4 $\alpha(\text{N})=5.52\times 10^{-5}$ 8; $\alpha(\text{O})=7.78\times 10^{-6}$ 12; $\alpha(\text{P})=3.66\times 10^{-7}$ 6
673.8 3	23.5 12	915.7	4 ⁺	241.7	4 ⁺	E2+M1	0.011 4	$\alpha(\text{K})=0.009$ 3; $\alpha(\text{L})=0.0013$ 4; $\alpha(\text{M})=0.00029$ 8 $\alpha(\text{N})=6.7\times 10^{-5}$ 17; $\alpha(\text{O})=1.0\times 10^{-5}$ 3; $\alpha(\text{P})=5.3\times 10^{-7}$ 19 $\alpha(\text{K})_{\text{exp}}=0.0073$ 7 Additional information 14.
688.6 2	38 8	761.7	2 ⁺	73.05	2 ⁺	E2+M1	0.010 4	$\alpha(\text{K})=0.008$ 3; $\alpha(\text{L})=0.0013$ 4; $\alpha(\text{M})=0.00028$ 7 $\alpha(\text{N})=6.4\times 10^{-5}$ 16; $\alpha(\text{O})=9.2\times 10^{-6}$ 25; $\alpha(\text{P})=5.0\times 10^{-7}$ 18 $\alpha(\text{K})_{\text{exp}}=0.0081$ 18 Additional information 10.
707.0 10 754.7 3	[†] 50.6 25	1932.1 827.8	(4,5) ⁺ 3 ⁺	1225.1 73.05	(5) ⁻ 2 ⁺	M1+E2	0.0081 25	$\alpha(\text{K})=0.0068$ 22; $\alpha(\text{L})=0.0010$ 3; $\alpha(\text{M})=0.00022$ 6 $\alpha(\text{N})=5.1\times 10^{-5}$ 13; $\alpha(\text{O})=7.3\times 10^{-6}$ 20; $\alpha(\text{P})=4.0\times 10^{-7}$ 14 $\alpha(\text{K})_{\text{exp}}=0.0066$ 10 Additional information 13.
761.8 3	35 4	761.7	2 ⁺	0.0	0 ⁺	E2	0.00547	$\alpha(\text{K})=0.00454$ 7; $\alpha(\text{L})=0.000725$ 11; $\alpha(\text{M})=0.0001608$ 23 $\alpha(\text{N})=3.70\times 10^{-5}$ 6; $\alpha(\text{O})=5.25\times 10^{-6}$ 8; $\alpha(\text{P})=2.61\times 10^{-7}$ 4 $\alpha(\text{K})_{\text{exp}}=0.0051$ 7 Additional information 11.
782.4 4	17.6 9	1023.9	5 ⁺	241.7	4 ⁺	E2,M1	0.0074 23	$\alpha(\text{K})=0.0062$ 20; $\alpha(\text{L})=0.00091$ 24; $\alpha(\text{M})=0.00020$ 5 $\alpha(\text{N})=4.6\times 10^{-5}$ 12; $\alpha(\text{O})=6.7\times 10^{-6}$ 18; $\alpha(\text{P})=3.7\times 10^{-7}$ 13 $\alpha(\text{K})_{\text{exp}}=0.0053$ 6 Additional information 18.
^x 796.0 10 842.9 3	4.5 5 22 3	915.7	4 ⁺	73.05	2 ⁺	# E2	0.00438	$\alpha(\text{K})=0.00365$ 6; $\alpha(\text{L})=0.000566$ 8; $\alpha(\text{M})=0.0001251$ 18

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$^{163}\text{Dy}(\text{d,p}\gamma)$ [1981Ma22](#) (continued) $\gamma(^{164}\text{Dy})$ (continued)

<u>E_γ</u>	<u>I_γ</u>	<u>$E_i(\text{level})$</u>	<u>Comments</u>
			$\alpha(\text{N})=2.88\times 10^{-5}$ 4; $\alpha(\text{O})=4.11\times 10^{-6}$ 6; $\alpha(\text{P})=2.10\times 10^{-7}$ 3 $\alpha(\text{K})_{\text{exp}}=0.0032$ 6 Additional information 15.
^x 966.3 5	3.0 [‡] 3		
^x 1015.0 10	15.1 [‡] 11		

[†] No intensity available since the conversion line is very weak.

[‡] Line is masked in the spectrum.

Conversion line is very weak.

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& This γ may be contributed by impurities also such as ^{163}Dy , ^{165}Dy and Ho nuclides, thus the assignment to ^{164}Dy is uncertain.

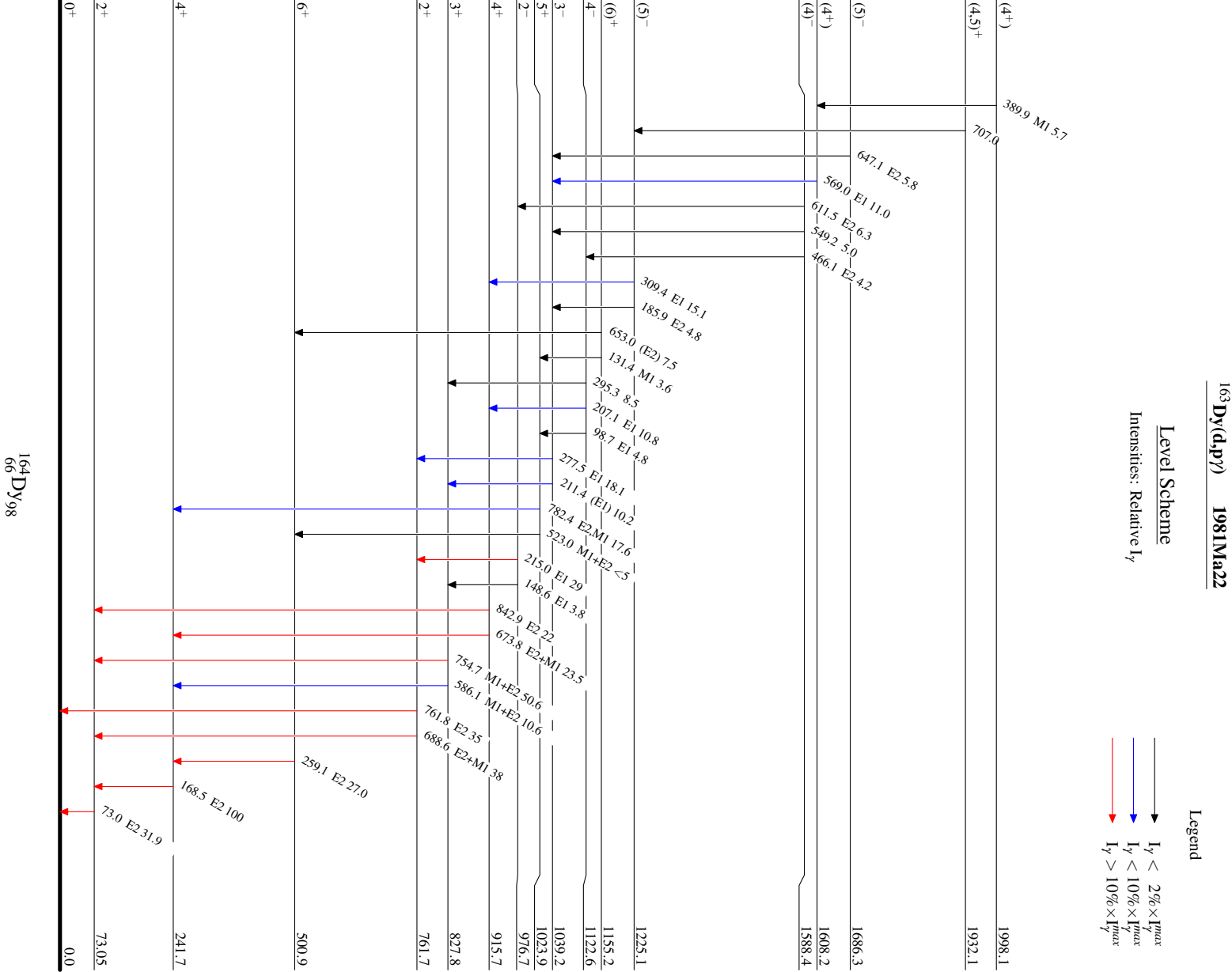
^a Electron intensity was obtained from the spectrum indirectly due to its relative weakness or composite nature.

^b L-line contribution and/or Ho line taken into account.

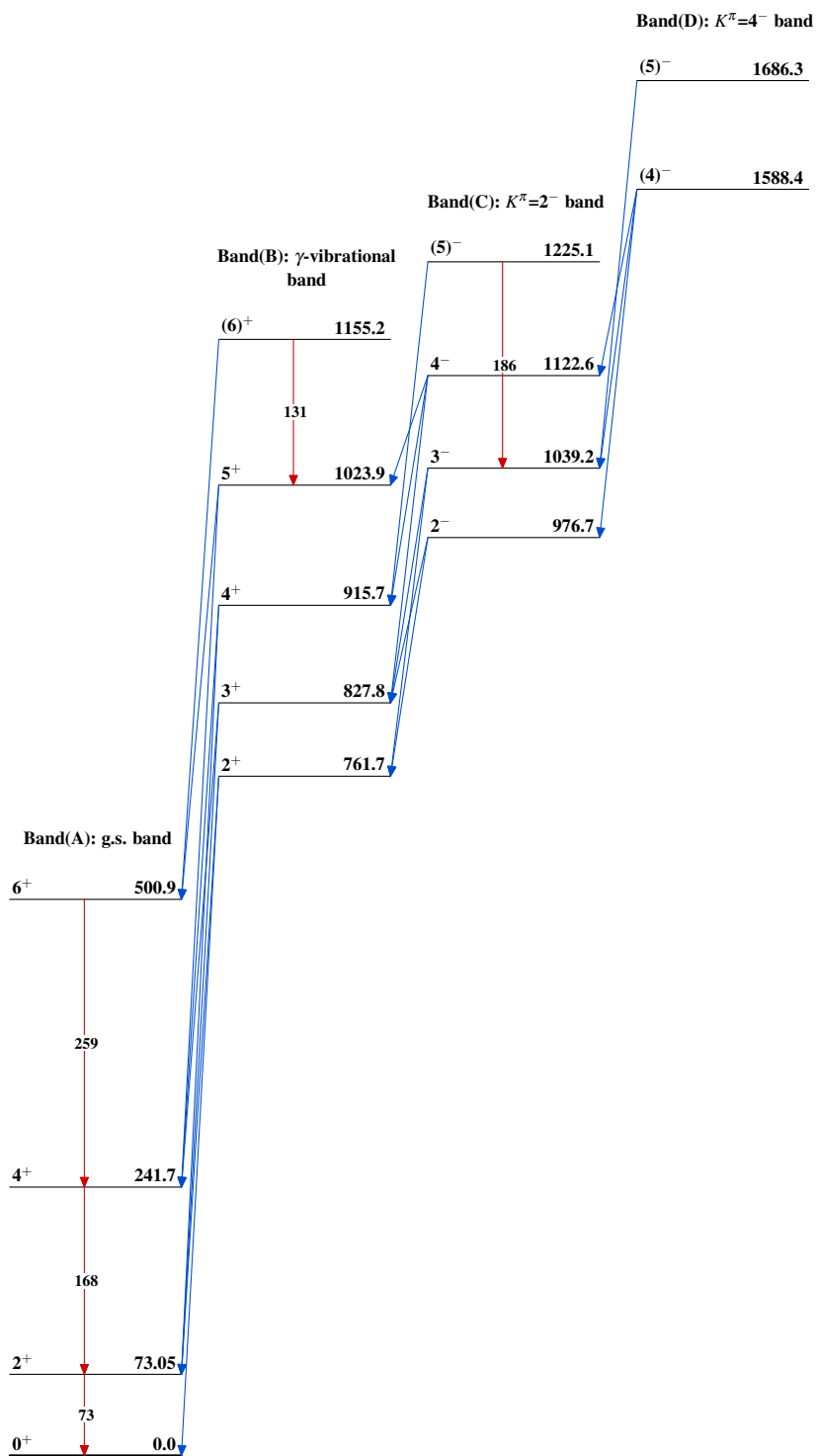
^c From ce data. $\alpha(\text{K})_{\text{exp}}(168.5, \text{E}2)=0.267$ used for normalization.

^d 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.

^x γ ray not placed in level scheme.



$^{163}\text{Dy}(\text{d,p}\gamma)$ 1981Ma22



$^{164}_{66}\text{Dy}_{98}$