^{157}Dy ε decay 1997Ad08

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 132, 1 (2016)	4-Dec-2015

Parent: ^{157}Dy: E=0.0; J$^{\pi}$=3/2$^-$; T$_{1/2}$=8.14 h *4*; Q(ε)=1339 *5*; %ε+%β^+ decay=100.0

^{157}Dy has been produced by several reactions including ^{159}Tb(p,3n), ^{159}Tb(d,4n), Gd(α,xn), Er(p,3pxn), ^{163}Dy(p,p4n), and p spallation of Ta target. Measurements include γ singles and $\gamma\gamma$ coincidences with NaI and Ge detectors, ce in magnetic spectrometers, lifetimes by several methods, and $\gamma(\theta$,t).

The decay scheme is that of 1997Ad08 which agrees with the earlier ones of 1967Bl12 and 1966Fu06 with the addition of several levels and many γ's. Some of the γ rays placed by 1997Ad08 are based on energy combinations and some are placed from levels previously reported in the (d,2nγ) and (p,t) studies.

Experimental measurements and results include:

1953Ha81: ^{157}Dy half-life measured.

1957Go72: γ's measured with NaI and CsI detectors.

1957Mi67: measured ce for 6 γ's, 3 multipolarities given.

1958Do61: γ's measured with NaI detector. ^{157}Dy T$_{1/2}$ measured.

1961Dz04: measured ce-ce coincidences.

1961Na04: deduced J^{π} of 326 level and μ of ground state from $\gamma(\theta$,t) for oriented nuclei at low temperatures.

1961To02: deduce 6 multipolarities from ce singles and ceγ coincidences,

1963Pe20: deduce multipolarities for $\approx$ 13 γ's from ce and γ measurements; 17 γ's from γ singles; ^{157}Dy T$_{1/2}$ measured.

1963Ra15: ^{157}Dy T$_{1/2}$ measured.

1964Ma10: ^{157}Dy T$_{1/2}$ measured.

1966Fu06: decay scheme with 25 γ's; γ singles with Ge detector; $\gamma\gamma$ coincidences with NaI detectors; ce singles.

1966FuZZ: see 1966Fu06.

1966Gn01: measured ce spectrum.

1966Me06: lifetime measured from Kx $-$ 326 γ coincidences.

1967Bl12: report 23 γ's from singles with Ge detectors; deduced 20 multipolarities using others$'$ ce data.

1967Ha12: lifetime measured from Kx $-$ 326 γ coincidences.

1967Ko17: lifetime measured from Kx $-$ 326 γ coincidences.

1967Ma33: lifetimes from Auger electrons and ce coincidences.

1970Ro21: measured ^{157}Dy half-life.

1972Af03: lifetimes measured.

1975Gr44: summary of laboratory research.

1997Ad08: with chemically and isotopically separated sources report 76 γ's from γ singles, ce singles with Si detector, and $\gamma\gamma$ coincidences.

Model and theory discussions include Alaga rules for allowed β decay (1970Fu02) and number fluctuations in calculations of first-forbidden β decay (1975Fe13).

^{157}Tb Levels

E(level)[†]	J$^{\pi}$[‡]	T$_{1/2}$[#]	Comments
0.0[@]	3/2$^+$		
60.881[@] *3*	5/2$^+$	0.49 ns *12*	T$_{1/2}$: from 1972Af03; other: <0.42 ns (Muminov, thesis, Dubna, 1978 as cited in 1997Ad08.).
143.920[@] *6*	7/2$^+$		
252.58 *7*	9/2$^+$		
326.346[&] *6*	5/2$^-$	0.20 ns *4*	T$_{1/2}$: The five reported values form two groups each of which is internally consistent, but the groups are inconsistent. The adopted value is from 1967Ma33; and the values that are consistent with it are <0.25 ns (1966Me06) and ≤0.23 (1972Af03). The average of the other two values is 0.34 ns *4* from 0.33 ns *4* (1967Ko17) and 0.41 ns *9* (1967Ha12). If the three actual values are averaged, the result is 0.28 ns *5* with a reduced-χ^2 value of 3.8. All values are from ^{157}Dy ε decay and measured by X-γ(t) with two plastic scintillators (1966Me06) and with two NaI(Tl) detectors (1967Ha12 and 1967Ko17) and Auger electron-ce(t) (1967Ma33) with double lens magnetic spectrometer.

Continued on next page (footnotes at end of table)

^{157}Dy ε decay 1997Ad08 (continued)

^{157}Tb Levels (continued)

E(level)[†]	Jπ[‡]	E(level)[†]	Jπ[‡]	E(level)[†]	Jπ[‡]
327.648 *21*	5/2+	883.324 *22*	(1/2)−	1096.497 *18*	(1/2−)
357.663[&] *8*	7/2−	895.058 *20*	(1/2+,3/2+,5/2+)	1102.365 *8*	(3/2)−
597.376[a] *8*	1/2+	922.70 *8*	(5/2−)	1160.719 *17*	(3/2,5/2)−
637.358[a] *8*	3/2+	925.304 *25*	(3/2,5/2)+	1275.51 *3*	3/2−,5/2−
658.4 *3*	7/2+	970.381 *20*	3/2−	1318.62 *6*	
697.292[a] *7*	5/2+	991.701[b] *16*	3/2+		
793.52 *20*	7/2+	1044.352[b] *19*	5/2+		

† From least-squares fit to γ energies.
‡ From ^{157}Tb Adopted Levels.
\# Values are from measurements after decay of ^{157}Dy only; but these are the only measurements for the levels in ^{157}Tb. The methods used are Xγ(t) with two plastic scintillators (1966Me06) and two NaI(Tl) detectors (1967Ha12 and 1967Ko17) Auger electrons-ce(t) with double lens magnetic spectrometer.
@ Band(A): 3/2[411] band.
& Band(B): 5/2[532] band.
a Band(C): 1/2[411] band mixed with γ-vibration based on 3/2[411] ground state.
b Band(D): K^{π}=3/2+ band, β-vibration band based on 3/2[411] ground state.

ε,β+ radiations

E(decay)	E(level)	Iβ+ [#]	Iε[#]	Log *ft*	I(ε+β+)[†‡#]	Comments
(20 *5*)	1318.62		0.00032 *4*	6.4 *4*	0.00032 *4*	εL=0.58 *12*; εM+=0.42 *12*
(63 *5*)	1275.51		0.0066 *3*	6.42 *14*	0.0066 *3*	εK=0.18 *11*; εL=0.60 *8*; εM+=0.22 *4*
(178 *5*)	1160.719		0.00204 *14*	8.40 *5*	0.00204 *14*	εK=0.744 *5*; εL=0.195 *3*; εM+=0.0611 *11*
(237 *5*)	1102.365		0.136 *5*	6.89 *3*	0.136 *5*	εK=0.7759 *19*; εL=0.1713 *14*; εM+=0.0528 *5*
(243 *5*)	1096.497		0.0427 *22*	7.42 *4*	0.0427 *22*	εK=0.7779 *18*; εL=0.1698 *13*; εM+=0.0523 *5*
(295 *5*)	1044.352		0.00636 *25*	8.446 *25*	0.00636 *25*	εK=0.7921 *11*; εL=0.1594 *8*; εM+=0.0486 *3*
(347 *5*)	991.701		0.0136 *5*	8.282 *22*	0.0136 *5*	εK=0.8012 *8*; εL=0.1526 *6*; εM+=0.04617 *19*
(369 *5*)	970.381		0.0120 *8*	8.40 *4*	0.0120 *8*	εK=0.8040 *7*; εL=0.1505 *5*; εM+=0.04543 *17*
(416 *5*)	922.70		0.00023 *5*	10.23 *10*	0.00023 *5*	εK=0.8091 *5*; εL=0.1468 *4*; εM+=0.04410 *13*
(456 *5*)	883.324		0.0034 *5*	9.15 *7*	0.0034 *5*	εK=0.8124 *4*; εL=0.1443 *3*; εM+=0.04325 *10*
(545 *5*)	793.52		0.00010 *3*	10.85 *13*	0.00010 *3*	εK=0.8180 *3*; εL=0.14023 *19*; εM+=0.04181 *7*
(642 *5*)	697.292		0.0076 *23*	9.12 *14*	0.0076 *23*	εK=0.8220 *2*; εL=0.1372 *2*; εM+=0.04076 *5*
(681 *5*)	658.4		0.0012 *5*	9.98 *19*	0.0012 *5*	εK=0.8233 *2*; εL=0.1363 *2*; εM+=0.04043 *4*
(702 *5*)	637.358		0.048 *3*	8.41 *3*	0.048 *3*	εK=0.8239 *2*; εL=0.1358 *1*; εM+=0.04027 *4*
(742 *5*)	597.376		0.062 *3*	8.347 *22*	0.062 *3*	εK=0.8250 *2*; εL=0.1350 *1*; εM+=0.03999 *4*
(1011 *5*)	327.648		0.0239 *12*	9.045 *23*	0.0239 *12*	εK=0.8299; εL=0.13135 *5*; εM+=0.03871 *2*
(1013 *5*)	326.346		96 *3*	5.442 *15*	96 *3*	εK=0.8299; εL=0.13134 *5*; εM+=0.03871 *2*
(1278 *5*)	60.881		0.27 *7*	8.20 *12*	0.27 *7*	εK=0.8325; εL=0.12930 *4*; εM+=0.03800 *1*
(1339 *5*)	0.0	0.002 *2*	4 *4*	7.1 *5*	4 *4*	av Eβ=157.0 *23*; εK=0.8328; εL=0.12892 *3*; εM+=0.03787 *1*

† The evaluator has set the direct feeding of the 326 level to 96% *4* based on the reported values of 94% *2* (1963Pe20) and 98% (1967Bl12). The remaining ε+β+ feedings follow from the intensity balances.
‡ The ε+β+ intensities are the same as the ε intensities, since the smallest capture-to-positron ratio is 2.6×10^{3} and 96% transition to the 326 level is below the threshold for β+ emission.
\# Absolute intensity per 100 decays.

$\gamma(^{157}Tb)$

Iγ normalization: from the measure I(K x)/Iγ(326) ratio, 1963Pe20 deduce that the ε+β^+ feeding to 326 level is 94% *2*. 1967Bl12 report a value of 98.1% for this feeding. The evaluator has assigned a value 96% *3* which results in Iγ normalization=0.93 *3*.

The $\gamma\gamma$ coincidence data shown in drawing are from 1966Fu06, 1961To02, and 1997Ad08.

1997Ad08 report upper limits for the intensities of a number of γ rays that have been reported depopulating J = 7/2 and 9/2 levels in (d,2nγ) (1971Wi24). These limits and the associated levels are (the γ energies are from 1971Wi24): 68.3 keV, I_γ < 0.0012 from 425 keV level; 99.1, <0.0015 from 425; 137.3, <0.0012 from 709; 156.2, <3.0 from 513; 186.3, <0.0020 from 513; 191.6, <0.0023 from 252; 214, <0.0009 from 571; 251.1, <0.0011 from 658; 282.1, <0.0009 from 425; 331.1, <0.0037 from 658; 347.1, <0.0037 from 407; 351.5, <0.0037 from 709; 370.0, <0.0018 from 513; 408.0, <0.0025 from 407; 453.0, <0.0020 from 513; and 650, <0.0011 from 793 level. Of the levels in this list, those at 252, 658, and 793 are reported by 1997Ad08 based on the placement of other γ rays. For these three levels, the limits from 1997Ad08 are consistent with the data from 1971Wi24.

α(K)exp values in the table are calculated by evaluator from γ and K x rays intensities measured by 1997Ad08 (with normalization constant, 11.4 *7*, deduced from 326γ).

E_γ †	I_γ †‡b	E_i(level)	J^π_i	E_f	J^π_f	Mult.#	δ@a	α&	$I_{(\gamma+ce)}$ b	Comments
31.32		357.663	7/2⁻	326.346	5/2⁻	[E2]		391	≈0.013	ce(L)/(γ+ce)=0.769 *8*; ce(M)/(γ+ce)=0.182 *4* ce(N)/(γ+ce)=0.0407 *8*; ce(O)/(γ+ce)=0.00511 *10*; ce(P)/(γ+ce)=1.79×10^{-6} *4* α(L)=302 *5*; α(M)=71.5 *10* α(N)=15.94 *23*; α(O)=2.00 *3*; α(P)=0.000701 *10* E_γ: unobserved, but existence proposed by 1997Ad08. $I_{(\gamma+ce)}$: value deduced by evaluator to produce intensity balance at this level; a larger value would require ε feeding which is not expected since it is a 2nd forbidden decay. 1997Ad08 indicate value is ≤ 0.0097; their argument is not given, but is probably similar.
60.882 *3*	0.191 *5*	60.881	5/2⁺	0.0	3/2⁺	M1+E2	0.10 *2*	9.28 *14*		α(K)=7.69 *11*; α(L)=1.25 *5*; α(M)=0.274 *12* α(N)=0.063 *3*; α(O)=0.0096 *4*; α(P)=0.000577 *9* δ: From 1963Pe20. Other: 0.18 +*5*−*8* (1967Bl12). α(K)exp=7.9 *5* (1997Ad08).
83.04 *4*	0.283 *6*	143.920	7/2⁺	60.881	5/2⁺	M1+E2	<0.17	3.77		α(K)=3.14 *5*; α(L)=0.49 *4*; α(M)=0.108 *8* α(N)=0.0250 *18*; α(O)=0.00380 *22*; α(P)=0.000234 *4* α(K)exp=3.1 *3* (1997Ad08). I_γ: other: 0.67 *20* (1967Bl12) and 0.50 *10* (1963Pe20). δ: From 1963Pe20. Other: ≤0.14 (1967Bl12).
108.65 *18*	0.0015 *6*	252.58	9/2⁺	143.920	7/2⁺					
143.922 *10*	0.067 *6*	143.920	7/2⁺	0.0	3/2⁺	E2		0.706		α(K)=0.417 *6*; α(L)=0.223 *4*; α(M)=0.0524 *8* α(N)=0.01180 *17*; α(O)=0.001558 *22*; α(P)=2.20×10^{-5} *3* α(K)exp=0.28 *3* (1997Ad08). I_γ: other: 0.39 *7* from ce(K) and α(K)(E2). Measured Iγ<0.08 (1967Bl12) and <0.09 (1963Pe20).

γ(^{157}Tb) (continued)

E_γ †	I_γ †‡b	E_i(level)	J^π_i	E_f	J^π_f	Mult.#	α&	Comments
171.20 *4*	0.0035 *16*	1096.497	(1/2⁻)	925.304	(3/2,5/2)⁺			
182.424 *9*	1.43 *4*	326.346	5/2⁻	143.920	7/2⁺	E1	0.0599	α(K)=0.0506 *7*; α(L)=0.00730 *11*; α(M)=0.001588 *23* α(N)=0.000363 *5*; α(O)=5.39×10⁻⁵ *8*; α(P)=3.04×10⁻⁶ *5* α(K)exp=0.057 *5* (1997Ad08). I_γ: other: 2.0 *2* (1963Pe20) and 2.4 *+5−12* (1967Bl12).
201.44 *4*	0.00102 *21*	1096.497	(1/2⁻)	895.058	(1/2⁺,3/2⁺,5/2⁺)			
207.31 *3*	0.0018 *3*	1102.365	(3/2)⁻	895.058	(1/2⁺,3/2⁺,5/2⁺)			
ˣ243.78 *4*	0.0034 *5*							
245.96 *4*	0.0012 *3*	883.324	(1/2)⁻	637.358	3/2⁺			
265.469 *9*	0.183 *4*	326.346	5/2⁻	60.881	5/2⁺	E1	0.0225	α(K)=0.0191 *3*; α(L)=0.00269 *4*; α(M)=0.000585 *9* α(N)=0.0001340 *19*; α(O)=2.01×10⁻⁵ *3*; α(P)=1.196×10⁻⁶ *17* α(K)exp=0.040 *4* (1997Ad08).
266.766 *20*	0.0225 *8*	327.648	5/2⁺	60.881	5/2⁺	M1	0.1423	α(K)=0.1203 *17*; α(L)=0.01722 *25*; α(M)=0.00376 *6* α(N)=0.000869 *13*; α(O)=0.0001340 *19*; α(P)=8.89×10⁻⁶ *13*
273.09 *4*	0.0036 *7*	970.381	3/2⁻	697.292	5/2⁺			
285.96 *5*	0.0017 *4*	883.324	(1/2)⁻	597.376	1/2⁺			
287.7 *2*	0.0010 *4*	925.304	(3/2,5/2)⁺	637.358	3/2⁺			
296.784 *11*	0.0411 *8*	357.663	7/2⁻	60.881	5/2⁺	E1	0.01701	α(K)=0.01443 *21*; α(L)=0.00202 *3*; α(M)=0.000439 *7* α(N)=0.0001006 *14*; α(O)=1.516×10⁻⁵ *22*; α(P)=9.13×10⁻⁷ *13* α(K)exp=0.0172 *25* (1997Ad08).
300.7 *3*	0.0013 *5*	658.4	7/2⁺	357.663	7/2⁻	[E1]	0.01646	α(K)=0.01397 *20*; α(L)=0.00195 *3*; α(M)=0.000424 *6* α(N)=9.73×10⁻⁵ *14*; α(O)=1.466×10⁻⁵ *21*; α(P)=8.84×10⁻⁷ *13*
326.336 *10*	100	326.346	5/2⁻	0.0	3/2⁺	E1	0.01344	α(K)=0.01141 *16*; α(L)=0.001589 *23*; α(M)=0.000345 *5* α(N)=7.92×10⁻⁵ *11*; α(O)=1.195×10⁻⁵ *17*; α(P)=7.27×10⁻⁷ *11* I_γ: reference value given in 1997Ad08 as 10⁶, but deduced by evaluator from comparison with other sets of values to be 10⁵.
333.03 *6*	0.00070 *11*	970.381	3/2⁻	637.358	3/2⁺			
373.01 *4*	0.00626 *23*	970.381	3/2⁻	597.376	1/2⁺			
405.08 *2*	0.0232 *5*	1102.365	(3/2)⁻	697.292	5/2⁺	E1	0.00798	α(K)=0.00679 *10*; α(L)=0.000935 *13*; α(M)=0.000203 *3* α(N)=4.66×10⁻⁵ *7*; α(O)=7.06×10⁻⁶ *10*; α(P)=4.39×10⁻⁷ *7* α(K)exp=0.0065 *6* (1997Ad08).
459.16 *4*	0.00250 *21*	1096.497	(1/2⁻)	637.358	3/2⁺	E1	0.00597	α(K)=0.00508 *8*; α(L)=0.000695 *10*; α(M)=0.0001506 *21* α(N)=3.46×10⁻⁵ *5*; α(O)=5.27×10⁻⁶ *8*; α(P)=3.31×10⁻⁷ *5* α(K)exp=0.0078 *24* (1997Ad08).
464.93 *17*	0.00016 *7*	1102.365	(3/2)⁻	637.358	3/2⁺			
493.44 *2*	0.00016 *2*	637.358	3/2⁺	143.920	7/2⁺	[E2]	0.01506	α(K)=0.01217 *17*; α(L)=0.00225 *4*; α(M)=0.000503 *7* α(N)=0.0001151 *17*; α(O)=1.683×10⁻⁵ *24*; α(P)=8.13×10⁻⁷ *12*

$^{157}_{65}Tb_{92}$-4

^{157}Dy ε decay 1997Ad08 (continued)

$\gamma(^{157}$Tb) (continued)

E_γ[†]	I_γ[†‡b]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[@a]	α[&]	Comments
499.12 *4*	0.0108 *3*	1096.497	(1/2$^-$)	597.376	1/2$^+$	E1		0.00494	α(K)=0.00421 *6*; α(L)=0.000573 *8*; α(M)=0.0001241 *18* α(N)=2.86×10^{-5} *4*; α(O)=4.35×10^{-6} *6*; α(P)=2.76×10^{-7} *4* α(K)exp=0.0046 *6* (1997Ad08). I_γ: other: 0.021 *5* (1966Fu06) and ≈0.011 (1967Bl12).
504.99 *2*	0.00623 *16*	1102.365	(3/2)$^-$	597.376	1/2$^+$	E1		0.00481	α(K)=0.00410 *6*; α(L)=0.000558 *8*; α(M)=0.0001209 *17* α(N)=2.78×10^{-5} *4*; α(O)=4.24×10^{-6} *6*; α(P)=2.69×10^{-7} *4* α(K)exp=0.0048 *8* (1997Ad08).
523.36 *3*	0.00039 *6*	1160.719	(3/2,5/2)$^-$	637.358	3/2$^+$				
^{x}530.82 *9*	0.00026 *4*								
540.94 *18*	0.00011 *3*	793.52	7/2$^+$	252.58	9/2$^+$				
^{x}548.91 *8*	0.00019 *6*								
553.374 *10*	0.0157 *3*	697.292	5/2$^+$	143.920	7/2$^+$	E2+M1	10 *+99−5*	0.0113 *4*	α(K)=0.0092 *3*; α(L)=0.00162 *4*; α(M)=0.000360 *8* α(N)=8.24×10^{-5} *18*; α(O)=1.22×10^{-5} *3*; α(P)=6.24×10^{-7} *22* α(K)exp=0.0100 *14* (1997Ad08). Mult.: from 1997Ad08; other: M1 from 1967Bl12.
576.475 *9*	0.0352 *7*	637.358	3/2$^+$	60.881	5/2$^+$	E2+M1	1.9 *+7−5*	0.0121 *11*	α(K)=0.0100 *10*; α(L)=0.00161 *11*; α(M)=0.000356 *22* α(N)=8.2×10^{-5} *5*; α(O)=1.23×10^{-5} *9*; α(P)=7.0×10^{-7} *8* α(K)exp=0.0112 *11* (1997Ad08). Mult.: from 1997Ad08; other: M1 from 1967Bl12.
597.376 *8*	0.0909 *19*	597.376	1/2$^+$	0.0	3/2$^+$	M1+E2	0.72 *+17−13*	0.0147 *9*	α(K)=0.0124 *8*; α(L)=0.00180 *9*; α(M)=0.000394 *18* α(N)=9.1×10^{-5} *4*; α(O)=1.39×10^{-5} *7*; α(P)=8.9×10^{-7} *6* α(K)exp=0.0082 *8* (1997Ad08). Mult.: from 1997Ad08; other: M1 from 1967Bl12.
636.41 *4*	0.0159 *22*	697.292	5/2$^+$	60.881	5/2$^+$	M1		0.01491	α(K)=0.01267 *18*; α(L)=0.001761 *25*; α(M)=0.000383 *6* α(N)=8.86×10^{-5} *13*; α(O)=1.370×10^{-5} *20*; α(P)=9.21×10^{-7} *13* α(K)exp=0.036 *4* (1997Ad08).
637.36 *3*	0.0218 *21*	637.358	3/2$^+$	0.0	3/2$^+$	M1		0.01486	α(K)=0.01262 *18*; α(L)=0.001755 *25*; α(M)=0.000382 *6* α(N)=8.82×10^{-5} *13*; α(O)=1.364×10^{-5} *20*; α(P)=9.18×10^{-7} *13*
686.68 *6*	0.00036 *4*	1044.352	5/2$^+$	357.663	7/2$^-$				
697.290 *10*	0.00308 *9*	697.292	5/2$^+$	0.0	3/2$^+$	E2+M1	1.5 *+99−12*	0.0081 *34*	α(K)=0.0068 *30*; α(L)=1.02×10^{-3} *34*; α(M)=2.24×10^{-4} *71* α(N)=5.2×10^{-5} *17*; α(O)=7.8×10^{-6} *27*; α(P)=4.8×10^{-7} *23* α(K)exp=0.0074 *23* (1997Ad08).
^{x}720.02 *13*	0.00006 *2*								
^{x}734.81 *6*	0.00027 *3*								
744.702 *8*	0.0520 *12*	1102.365	(3/2)$^-$	357.663	7/2$^-$	E2		0.00550	α(K)=0.00457 *7*; α(L)=0.000722 *11*; α(M)=0.0001592

From ENSDF

$^{157}_{65}Tb_{92}$-5

$\gamma(^{157}$Tb) (continued)

E_γ[†]	I_γ[†‡b]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[@a]	α[&]	$I_{(\gamma+ce)}$[b]	Comments
										23 α(N)=3.66×10^{-5} *6*; α(O)=5.49×10^{-6} *8*; α(P)=3.14×10^{-7} *5* α(K)exp=0.0041 *4* (1997Ad08).
770.12 *3*	0.0278 *6*	1096.497	(1/2$^-$)	326.346	5/2$^-$	E2		0.00509		α(K)=0.00425 *6*; α(L)=0.000664 *10*; α(M)=0.0001462 *21* α(N)=3.36×10^{-5} *5*; α(O)=5.05×10^{-6} *7*; α(P)=2.92×10^{-7} *4* α(K)exp=0.0042 *4* (1997Ad08).
776.010 *10*	0.0570 *12*	1102.365	(3/2)$^-$	326.346	5/2$^-$	E2+M1	19 *+99−16*	0.0050 *4*		α(K)=0.0042 *4*; α(L)=0.00065 *5*; α(M)=0.000144 *9* α(N)=3.30×10^{-5} *21*; α(O)=5.0×10^{-6} *4*; α(P)=2.9×10^{-7} *3* α(K)exp=0.0044 *4* (1997Ad08).
781.37 *6*	0.00020 *6*	925.304	(3/2,5/2)$^+$	143.920	7/2$^+$					
791.77 *7*	0.00070 *5*	1044.352	5/2$^+$	252.58	9/2$^+$					
^{x}793.7	0.00010 *3*									
803.05 *3*	0.00075 *6*	1160.719	(3/2,5/2)$^-$	357.663	7/2$^-$	E2		0.00464		α(K)=0.00387 *6*; α(L)=0.000599 *9*; α(M)=0.0001317 *19* α(N)=3.03×10^{-5} *5*; α(O)=4.56×10^{-6} *7*; α(P)=2.66×10^{-7} *4* α(K)exp=0.0035 *10* (1997Ad08).
834.37 *3*	0.00052 *4*	1160.719	(3/2,5/2)$^-$	326.346	5/2$^-$	E2+M1	19 *+99−16*	0.0043 *4*		α(K)=0.0036 *3*; α(L)=0.00055 *4*; α(M)=0.000120 *8* α(N)=2.76×10^{-5} *18*; α(O)=4.2×10^{-6} *3*; α(P)=2.46×10^{-7} *23* α(K)exp=0.0037 *8* (1997Ad08).
^{x}839.70 *5*	0.00035 *5*					M1		0.00752		α(K)=0.00640 *9*; α(L)=0.000881 *13*; α(M)=0.000191 *3* α(N)=4.43×10^{-5} *7*; α(O)=6.85×10^{-6} *10*; α(P)=4.63×10^{-7} *7* α(K)exp=0.0062 *14* (1997Ad08).
847.75 *5*	0.00236 *8*	991.701	3/2$^+$	143.920	7/2$^+$	E2		0.00412		α(K)=0.00345 *5*; α(L)=0.000525 *8*; α(M)=0.0001153 *17* α(N)=2.65×10^{-5} *4*; α(O)=4.00×10^{-6} *6*; α(P)=2.37×10^{-7} *4* α(K)exp=0.0029 *4* (1997Ad08).
861.78 *9*	0.00013 *4*	922.70	(5/2$^-$)	60.881	5/2$^+$					
864.42 *4*	0.00150 *9*	925.304	(3/2,5/2)$^+$	60.881	5/2$^+$	E2+M1	1.6 *+40−10*	0.0048 *14*		α(N)=3.0×10^{-5} *8*; α(O)=4.5×10^{-6} *12*; α(P)=2.85×10^{-7} *93* α(K)=0.0041 *12*; α(L)=0.00059 *15*; α(M)=0.00013 *4* α(K)exp=0.0044 *7* (1997Ad08).

$^{157}_{65}$Tb$_{92}$-6

^{157}Dy ε decay 1997Ad08 (continued)

γ(^{157}Tb) (continued)

E_γ[†]	I_γ[†‡b]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[@a]	α[&]	Comments
883.32 *3*	0.00072 *4*	883.324	$(1/2)^-$	0.0	$3/2^+$	E1		1.51×10^{-3}	α(K)=0.001289 *18*; α(L)=0.0001706 *24*; α(M)=3.69×10^{-5} *6* α(N)=8.49×10^{-6} *12*; α(O)=1.305×10^{-6} *19*; α(P)=8.60×10^{-8} *12* α(K)exp=0.0011 *5* (1997Ad08).
^{x}889.9 *3*	0.00004 *1*								
895.06 *3*	0.00310 *11*	895.058	$(1/2^+,3/2^+,5/2^+)$	0.0	$3/2^+$	M1+E2	0.7 *+6−3*	0.0055 *9*	α(K)=0.0047 *8*; α(L)=0.00066 *9*; α(M)=0.000143 *19* α(N)=3.3×10^{-5} *5*; α(O)=5.1×10^{-6} *7*; α(P)=3.4×10^{-7} *6* α(K)exp=0.0046 *4* (1997Ad08).
900.43 *3*	0.00174 *8*	1044.352	$5/2^+$	143.920	$7/2^+$	E2+M1	3 *+29−2*	0.0039 *11*	α(K)=0.00327 *95*; α(L)=0.00048 *12*; α(M)=0.000106 *25* α(N)=2.4×10^{-5} *6*; α(O)=3.7×10^{-6} *10*; α(P)=2.27×10^{-7} *73* α(K)exp=0.0036 *5* (1997Ad08).
909.49 *3*	0.00226 *9*	970.381	$3/2^-$	60.881	$5/2^+$	E1		1.42×10^{-3}	α(K)=0.001219 *17*; α(L)=0.0001611 *23*; α(M)=3.48×10^{-5} *5* α(N)=8.02×10^{-6} *12*; α(O)=1.233×10^{-6} *18*; α(P)=8.14×10^{-8} *12* α(K)exp=0.0009 *3* (1997Ad08).
922.78 *15*	0.00012 *2*	922.70	$(5/2^-)$	0.0	$3/2^+$				
925.35 *6*	0.00110 *5*	925.304	$(3/2,5/2)^+$	0.0	$3/2^+$	M1+E2	0.3 *+5−3*	0.0057 *8*	α(K)=0.0049 *7*; α(L)=0.00067 *9*; α(M)=0.000146 *18* α(N)=3.4×10^{-5} *5*; α(O)=5.2×10^{-6} *7*; α(P)=3.5×10^{-7} *6* α(K)exp=0.0049 *6* (1997Ad08). Mult.,δ: From α(K)exp.
930.82 *3*	0.00850 *23*	991.701	$3/2^+$	60.881	$5/2^+$	E2		0.00337	α(K)=0.00283 *4*; α(L)=0.000421 *6*; α(M)=9.23×10^{-5} *13* α(N)=2.12×10^{-5} *3*; α(O)=3.22×10^{-6} *5*; α(P)=1.95×10^{-7} *3* α(K)exp=0.0027 *3* (1997Ad08).
^{x}944.55 *6*	0.00014 *4*								
949.20 *4*	0.00052 *5*	1275.51	$3/2^-,5/2^-$	326.346	$5/2^-$				α(K)exp=0.0009 *3* (1997Ad08). Mult.: E1 based on α(K)exp is not supported by Δπ='no'.
970.38 *9*	0.00012 *2*	970.381	$3/2^-$	0.0	$3/2^+$				
983.50 *6*	0.00069 *3*	1044.352	$5/2^+$	60.881	$5/2^+$	E0+(E2)		0.134 *10*	δ: %E0 > 7% and %E2 < 93% (1967Bl12). α: 0.134 *10* from α(K)exp=0.113 *8* (1997Ad08) and α/α(K)=1.19; theoretical value of α(K)(E2) is 0.00252 *4*; other value: >0.094 from α(K)exp>0.079 (1967Bl12).

$^{157}_{65}$Tb$_{92}$-7

γ(^{157}Tb) (continued)

E_γ[†]	I_γ[†‡b]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[@a]	α[&]	Comments
991.70 *2*	0.00345 *11*	991.701	3/2$^+$	0.0	3/2$^+$	E0+(E2)		0.074 *4*	δ: %E0 ≈ 6 and %E2 ≈ 94 (1966Fu06, 1967Bl12). α: From α(K)exp=0.062 *3*, average of 0.039 *15* (1966Fu06), 0.072 *+71−34* (1967Bl12), and 0.064 *3* (1997Ad08), and α/α(K)=1.19; theoretical α(K)(E2) is 0.00248 *4*.
1016.71 *18*	0.00014 *4*	1160.719	(3/2,5/2)$^-$	143.920	7/2$^+$				
1041.48 *3*	0.00290 *8*	1102.365	(3/2)$^-$	60.881	5/2$^+$				
1044.34 *3*	0.00324 *9*	1044.352	5/2$^+$	0.0	3/2$^+$	M1+E2	0.8 *+15−8*	0.0037 *9*	α(K)=0.0032 *7*; α(L)=0.00044 *9*; α(M)=9.6×10^{-5} *19* α(N)=2.2×10^{-5} *5*; α(O)=3.4×10^{-6} *7*; α(P)=2.3×10^{-7} *6* α(K)exp=0.0032 *7* (1997Ad08). Mult.,δ: From α(K)exp. Other: Assignment of E1 (1966Fu06) is inconsistent with assigned J^π, but α limit is close to E2 value.
1096.55 *7*	0.00013 *1*	1096.497	(1/2$^-$)	0.0	3/2$^+$				
1099.89 *6*	0.00020 *4*	1160.719	(3/2,5/2)$^-$	60.881	5/2$^+$				
1102.36 *6*	0.00168 *7*	1102.365	(3/2)$^-$	0.0	3/2$^+$	E1		9.97×10^{-4}	α(K)=0.000853 *12*; α(L)=0.0001118 *16*; α(M)=2.41×10^{-5} *4* α(N)=5.56×10^{-6} *8*; α(O)=8.56×10^{-7} *12*; α(P)=5.71×10^{-8} *8*; α(IPF)=1.93×10^{-6} *3* α(K)exp=0.0012 *5* (1997Ad08).
[x]1147.78 *16*	0.00005 *1*								
1160.68 *6*	0.00019 *7*	1160.719	(3/2,5/2)$^-$	0.0	3/2$^+$				
[x]1171.5 *4*	0.00004 *1*								
1174.79 *8*	0.00013 *4*	1318.62		143.920	7/2$^+$				
1214.60 *5*	0.00220 *10*	1275.51	3/2$^-$,5/2$^-$	60.881	5/2$^+$				α(K)exp=0.0016 *6* (1997Ad08). Mult.: E2 based on α(K)exp is not compatible with $\Delta\pi$='yes'.
1257.65 *13*	0.00009 *1*	1318.62		60.881	5/2$^+$				
1275.46 *6*	0.00438 *12*	1275.51	3/2$^-$,5/2$^-$	0.0	3/2$^+$	E1		8.25×10^{-4}	α(K)=0.000657 *10*; α(L)=8.57×10^{-5} *12*; α(M)=1.85×10^{-5} *3* α(N)=4.26×10^{-6} *6*; α(O)=6.57×10^{-7} *10*; α(P)=4.41×10^{-8} *7*; α(IPF)=5.86×10^{-5} *9* α(K)exp=0.00060 *24* (1997Ad08). Mult.: Based on α(K)exp.
1318.50 *11*	0.00012 *1*	1318.62		0.0	3/2$^+$				

[†] From 1997Ad08; other extensive lists are given by 1967Bl12, 1966Fu06, and 1963Pe20.

[‡] I(ann. rad.) < 0.003 (1966Fu06); other: from evaluator′s decay scheme < 0.0024.

$\gamma(^{157}Tb)$ (continued)

[#] From 1997Ad08 and based on α_K from measured I_γ and I_K values normalized to give α_K=0.0114 for the 326 keV E1 γ, unless otherwise noted. Differing values are noted in comments. Other assignments are given by 1967Bl12, 1966Fu06, 1963Pe20, and a few by 1966Gn01, 1961To02, and 1957Mi67.

[@] From 1997Ad08, unless otherwise noted.

[&] Additional information 1.

[a] If no value given it was assumed δ=1.00 for E2/M1, δ=1.00 for E3/M2 and δ=0.10 for the other multipolarities.

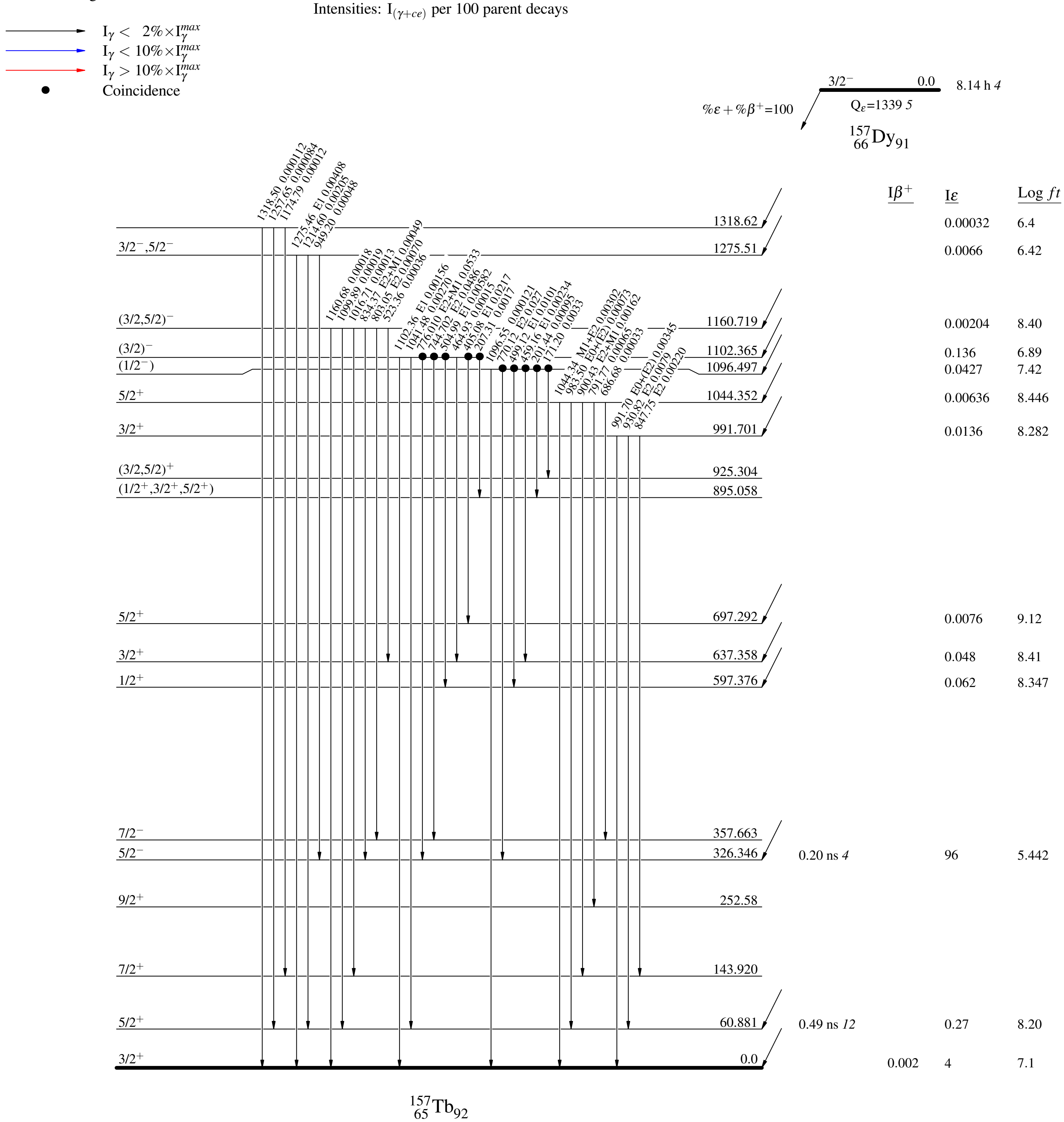
[b] For absolute intensity per 100 decays, multiply by 0.93 *3*.

[x] γ ray not placed in level scheme.

^{157}Dy ε decay 1997Ad08

Decay Scheme

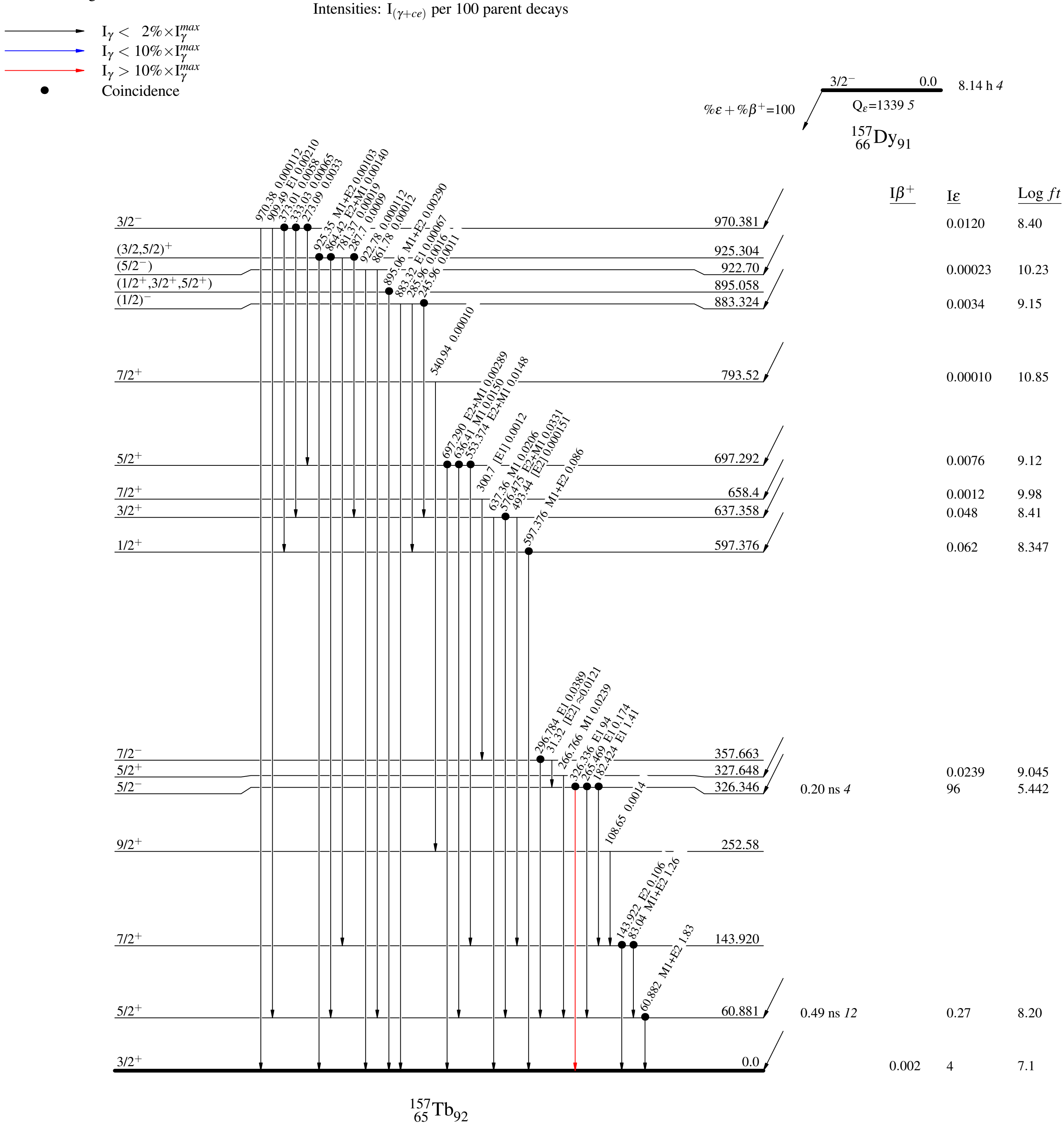
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays

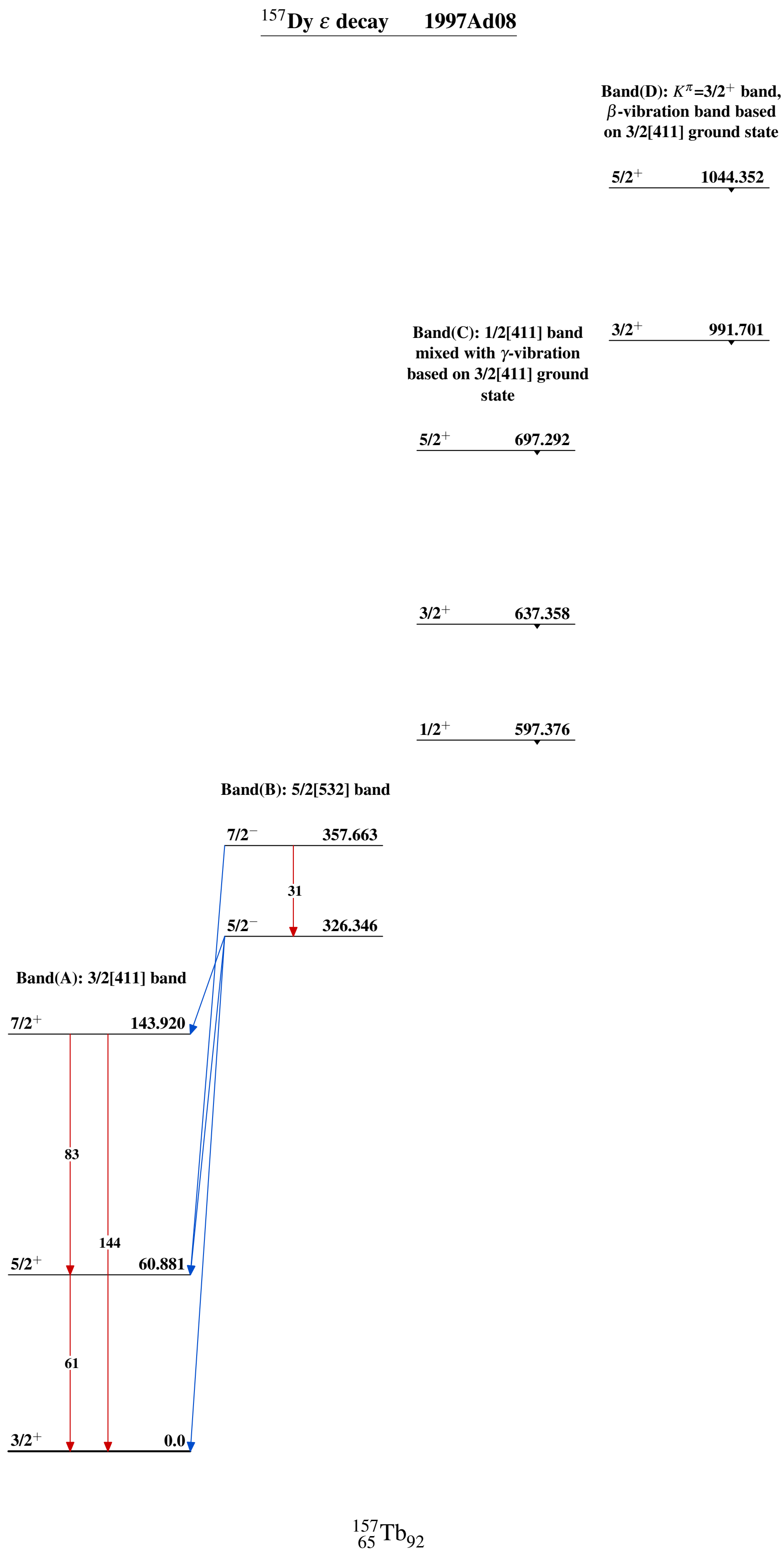


^{157}Dy ε decay 1997Ad08

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays




^{157}Dy ε decay 1997Ad08
Band(D): K^{π}=3/2^{+} band, β-vibration band based on 3/2[411] ground state
5/2^{+} 1044.352
3/2^{+} 991.701
Band(C): 1/2[411] band mixed with γ-vibration based on 3/2[411] ground state
5/2^{+} 697.292
3/2^{+} 637.358
1/2^{+} 597.376
Band(B): 5/2[532] band
7/2^{-} 357.663
31
5/2^{-} 326.346
Band(A): 3/2[411] band
7/2^{+} 143.920
83
144
5/2^{+} 60.881
61
3/2^{+} 0.0
$^{157}_{65}Tb_{92}$