^{159}Dy ε decay

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

Parent: ^{159}Dy: E=0; $J^{\pi}=3/2^{-}$; $T_{1/2}$=144.4 d *2*; Q(ε)=365.6 *12*; %ε decay=100.0

Additional information 1.

The decay scheme is from 1963Ry02 and later authors.

The many reports related to the ^{159}Dy ε decay include measurements of the γ-ray energies and the x- and γ-ray intensities (1957Mi67,1959Ke28,1960Gr20,1960Vi03,1961Bi09,1962Ry03,1963Ry02,1970Mc2 1,1971Le06,1972Se24,1973Ge09,1973Ni07); I(ε) to a specific level (1959Ke28,1960Gr20,1961Bi09,1963Ry02,1970Mc21,1970Sh09,1972Se24); level half-lives (1961Be30,1961Be37); ^{159}Dy half-life (1961Bj02,1963Ho15,1963Ra15); γ mixing ratios (1957Mi67,1960Gr20,1963Ry02,1965Ba37,1970Mc21); and Q(ε) (2009AuZZ,(1968My01)).

^{159}Tb Levels

E(level)‡	J^{π}†	$T_{1/2}$#	Comments
0	$3/2^{+}$	stable	
58.0	$5/2^{+}$	0.13 ns *4*	$T_{1/2}$: From 1961Be30 (and 1961Be37, by same author).
137.4	$7/2^{+}$		
348.1	$5/2^{+}$		
363.5 *3*	$5/2^{-}$		

† From ^{159}Tb Adopted Levels.
‡ From ^{159}Tb Adopted Levels and truncated to 0.1 keV.
# From measurements from ^{159}Dy ε decay only; see ^{159}Tb Adopted Levels for all measurements.

ε radiations

E(decay)	E(level)	Iε†‡	Log *ft*	Comments
(2.1 *12*)	363.5	0.00019 *5*	6.1 *+6−9*	E(decay): Since decay energy is only 2 keV, no capture fractions are given. Iε: From I(ε)(348) and I(ε)(363)/I(ε)(348)=0.162 *38* (1968My01). Log *ft*: Calculated with E(ε)=2.0 *10* keV, assuming no M_1 shell capture.
(17.5 *12*)	348.1	0.0012 *1*	8.25	εL=0.53 *3*; εM+=0.47 *3*
(228.2 *12*)	137.4	0.0028 *6*	10.34[1u]	εK=0.6003 *18*; εL=0.2979 *13*; εM+=0.1019 *5* Iε: From 1970Sh09.
(307.6 *12*)	58.0	26.6 *14*	7.49	εK=0.7947; εL=0.15745; εM+=0.04787 *5* Iε: From I(ε)(0)=74.0% *13* (1972Se24) and I(ε)(58)=26.8% *14* (1970Mc21) renormalized to give a total of 100%. ce(K)/(γ+ce)=0.803 *32* (1973Ge06).
(365.6 *12*)	0	73.4 *14*	7.22	εK=0.8037; εL=0.15081; εM+=0.04553 Iε: From I(ε)(0)=74.0% *13* (1972Se24) and I(ε)(58)=26.8% *14* (1970Mc21) renormalized to give a total of 100%.

† From individual measurements for each level.
‡ Absolute intensity per 100 decays.

^{159}Dy ε decay (continued)

γ(^{159}Tb)

Iγ normalization: based on I(ε)(58)=26.6% *14* and α=11.0 for M1+1.40% E2 for the 58 G.

E_γ [†]	I_γ [‡#@a]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	δ[&]	α[b]	Comments
15.4		363.5	5/2⁻	348.1	5/2⁺	[E1]		9.03	E_γ: Observed in γγ coincidences by 1968My01.
58.0	2.27 *13*	58.0	5/2⁺	0	3/2⁺	M1+E2	+0.119 *2*	10.73	α(K)=8.80 *13*; α(L)=1.503 *22*; α(M)=0.333 *5*; α(N+..)=0.0886 *13* α(N)=0.0765 *12*; α(O)=0.01146 *17*; α(P)=0.000663 *10* I_γ: From I(ε)(58)=26.6% and α(58). From I(γ+ce)(58γ) from 1963Ry02 and α, Iγ=2.2 *3*.
79.4	4.6×10^{-4} *6*	137.4	7/2⁺	58.0	5/2⁺	M1+E2	+0.126 *8*	4.30	α(K)=3.57 *5*; α(L)=0.569 *10*; α(M)=0.1255 *23*; α(N+..)=0.0335 *6* α(N)=0.0289 *5*; α(O)=0.00438 *8*; α(P)=0.000266 *4* I_γ: Weighted average of: 4.9×10^{-4} *6*, from [I(ε)(137)-I(γ+ce)(137.5γ)+Iγ(210γ+226γ)/(1+α(79.4γ)); and 2.8×10^{-4} *15*, from I(γ+ce)(79.4γ) and α(79.4γ) from 1963Ry02.
137.5	1.1×10^{-4} *3*	137.4	7/2⁺	0	3/2⁺	[E2]		0.828	α(K)=0.476 *7*; α(L)=0.272 *4*; α(M)=0.0640 *9*; α(N+..)=0.01632 *23* α(N)=0.01440 *21*; α(O)=0.00190 *3*; α(P)=2.49×10^{-5} *4* I_γ: From intensity balance within the level scheme. From I(γ+ce)(137γ) from 1963Ry02 and α, Iγ=1.1×10^{-4} *8*.
210.8	$4.\times10^{-5}$ *2*	348.1	5/2⁺	137.4	7/2⁺	[M1,E2]		0.23 *4*	α(K)=0.18 *5*; α(L)=0.039 *7*; α(M)=0.0088 *17*; α(N+..)=0.0023 *4* α(N)=0.0020 *4*; α(O)=0.00029 *4*; α(P)=1.2×10^{-5} *5* I_γ: From 1963Ry02.
226.0	3.6×10^{-6} *2*	363.5	5/2⁻	137.4	7/2⁺	E1		0.0341	α(K)=0.0289 *4*; α(L)=0.00411 *6*; α(M)=0.000893 *13*; α(N+..)=0.000237 *4* α(N)=0.000204 *3*; α(O)=3.06×10^{-5} *5*; α(P)=1.779×10^{-6} *25* I_γ: Calculated from I(ε)=0.00019 and Iγ from ^{159}Gd β^- decay for γ′s at 226, 305 and 363 keV, with all assumed to be E1′s.
290.2	1.37×10^{-4} *46*	348.1	5/2⁺	58.0	5/2⁺	[M1+E2]		0.091 *23*	α(K)=0.074 *22*; α(L)=0.0135 *3*; α(M)=0.00301 *5*; α(N+..)=0.000797 *14*

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^{159}Dy ε decay (continued)

γ(^{159}Tb) (continued)

E_γ[†]	I_γ[‡#@a]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	δ[&]	α[b]	Comments
									α(N)=0.000690 *10*; α(O)=0.000102 *6*; α(P)=5.2×10^{-6} *20*
305.5	1.08×10^{-6} *8*	363.5	5/2$^-$	58.0	5/2$^+$	E1		0.01582	α(K)=0.01343 *19*; α(L)=0.00188 *3*; α(M)=0.000407 *6*; α(N+..)=0.0001084 *16* α(N)=9.35×10^{-5} *13*; α(O)=1.409×10^{-5} *20*; α(P)=8.51×10^{-7} *12*
348.1	9.5×10^{-4} *10*	348.1	5/2$^+$	0	3/2$^+$	M1+E2	0.43 *+10−9*	0.0654 *22*	α(K)=0.0549 *20*; α(L)=0.00819 *15*; α(M)=0.00180 *3*; α(N+..)=0.000481 *9* α(N)=0.000414 *8*; α(O)=6.32×10^{-5} *13*; α(P)=3.99×10^{-6} *16*
363.5	5.5×10^{-5} *3*	363.5	5/2$^-$	0	3/2$^+$	E1		0.01033	α(K)=0.00878 *13*; α(L)=0.001216 *17*; α(M)=0.000264 *4*; α(N+..)=7.03×10^{-5} *10* α(N)=6.06×10^{-5} *9*; α(O)=9.17×10^{-6} *13*; α(P)=5.64×10^{-7} *8*

[†] From ^{159}Tb Adopted γ radiations and truncated to 0.1 keV.
[‡] Based on I(ε) values for each level and γ branching from the level; see individual comments.
[#] I(K x ray)/Iγ(58)=42.7 *13* (1972Se24). Others: 38 *6* (1959Ke28), 35 *+5−6* (1960Gr20), and 53 (1961Bi09).
[@] εL(exp)/εK(exp)=0.198 *9* (1971Le06). Other: 0.213 *21* (1972NiZQ).
[&] From ^{159}Tb Adopted γ radiations.
[a] Absolute intensity per 100 decays.
[b] 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.

^{159}Dy ε decay

Decay Scheme

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