^{167}Dy β^- decay (6.20 min) 1977Tu01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 191,1 (2023)	22-Aug-2023

Parent: ^{167}Dy: E=0.0; J^π=(1/2$^-$); $T_{1/2}$=6.20 min *8*; Q(β^-)=2368 *7*; %β^- decay=100

^{167}Dy-J^π,$T_{1/2}$: From ^{167}Dy Adopted Levels.

^{167}Dy-Q(β^-): From 2021Wa16.

1977Tu01: ^{167}Dy from ^{170}Er(n,α),E(n)=14-15 MeV using 96.9% enriched ^{170}Er target at the 400 kV neutron generator of the University of Helsinki. Measured Eβ, Iβ, Eγ, Iγ, $\gamma\gamma$-coin, prompt and delayed $\beta\gamma$-coin using plastic scintillator for β detection and Ge(Li) detectors for γ rays.

Others:

1999As03: 133.2, 250.0, 310.3, and 569.7 keV γ rays reported from from the decay of ^{167}Dy in the main study of ^{167}Tb decay.

1974Ka21: 250.0, 258.9, 569.7, 599.2, 843.2, 975.9, 996.5, and 1014.1 keV γ rays tentatively assigned to the decay of ^{167}Dy in the main study of decays of ^{170}Ho isomers to ^{170}Er. The γ rays of 843.2, 975.9 and 1014.1 keV were not confirmed in 1977Tu01.

^{167}Ho Levels

E(level)[†]	J^π[‡]	$T_{1/2}$[‡]	Comments
0.0	7/2$^-$	2.98 h *3*	Configuration=π7/2[523] (1977Tu01).
259.34 *11*	3/2$^+$	6.0 μs *10*	$T_{1/2}$: from $\beta\gamma$(t) (1977Tu01). Configuration=π3/2[411] (1977Tu01).
319.75 *12*	5/2$^+$		Configuration=π3/2[411] (1977Tu01).
392.48 *13*	(1/2$^+$)		Configuration=π1/2[411] (1977Tu01).
409.97 *12*	3/2$^+$		Configuration=π1/2[411] (1977Tu01).
569.69 *12*	(3/2$^-$)		Configuration=π7/2[523]$\otimes$2$^+$ (1977Tu01).
922.0? *2*			
1099.5 *2*			
1149.0 *3*			
1168.8? *2*			
1240.6 *4*			
1664.9 *4*			
1919.0? *3*			

[†] From a least-squares fit to Eγ values, with tentative placements included.

[‡] From the Adopted Levels. Nilsson assignments proposed in 1977Tu01 were confirmed in (pol t,α) study by 1979Lo02.

β^- radiations

E(decay)	E(level)	Iβ^-[†‡]	Log *ft*	Comments
(449[#] *7*)	1919.0?	0.46 *5*	5.55 *5*	av Eβ=132.3 *24*
(703 *7*)	1664.9	0.79 *11*	5.97 *6*	av Eβ=222.2 *26*
(1127 *7*)	1240.6	≈1.3	≈6.5	av Eβ=387.0 *28*
(1199[#] *7*)	1168.8?	1.22 *22*	6.61 *8*	av Eβ=416.3 *29*
(1219 *7*)	1149.0	0.81 *16*	6.82 *9*	av Eβ=424.5 *29*
(1269 *7*)	1099.5	1.22 *24*	6.70 *9*	av Eβ=445.1 *29*
(1446[#] *7*)	922.0?	0.94 *13*	7.03 *6*	av Eβ=519.0 *30*
(1798 *7*)	569.69	82 *4*	5.452 *23*	av Eβ=669.6 *30*
(1958 *7*)	409.97	1.5 *5*	7.33 *15*	av Eβ=739.4 *31*
(1976 *7*)	392.48	6.3 *11*	6.73 *8*	av Eβ=747.2 *31*
(2048[#] *7*)	319.75	<4	>8.0[1u]	av Eβ=759.2 *29* Iβ^-: 0 *4* from intensity balance.
(2109[#] *7*)	259.34	<8	>6.7	av Eβ=805.7 *31* Iβ^-: 3 *6* from intensity balance.

Continued on next page (footnotes at end of table)

^{167}Dy β^- decay (6.20 min) 1977Tu01 (continued)

β^- radiations (continued)

† β^- feedings are from transition intensity balance at each level, with tentative placements included. No feeding to g.s. is expected, as ΔJ=3 and Δπ=no. Feedings to low-energy levels are uncertain because of lack of definite multipolarity assignments for the low-energy γ rays.

‡ Absolute intensity per 100 decays.

Existence of this branch is questionable.

^{167}Dy β^- decay (6.20 min) 1977Tu01 (continued)

$\gamma(^{167}Ho)$

Iγ normalization: From total I(γ+ce) to g.s.=100% (no feeding to g.s. expected, as ΔJ=3 and Δπ=no).
Iγ(Ho K x ray)=81 *12*, relative to Iγ=100.0 for 569.7γ. The corresponding decay-scheme value is Iγ(Ho K x ray)=64.4.

E_γ	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α[#]	Comments
60.44 *8*	1.9 *3*	319.75	5/2$^+$	259.34	3/2$^+$	M1(+E2)	≤1.25	14.1 *30*	α(K)exp=11 *5* %Iγ=0.92 *15* α(K)=7.2 *22*; α(L)=5 *4*; α(M)=1.3 *10* α(N)=0.29 *21*; α(O)=0.035 *24*; α(P)=4.5×10^{-4} *14* Mult.: from α(K)exp, determined from comparison of K x-rays and γ-ray intensities in singles and coincidence spectra (1977Tu01).
72.67[†@] *10*	≈0.3	392.48	(1/2$^+$)	319.75	5/2$^+$	[E2]		9.73 *15*	%Iγ≈0.15 α(K)=2.061 *29*; α(L)=5.89 *9*; α(M)=1.425 *22* α(N)=0.321 *5*; α(O)=0.0376 *6*; α(P)=9.32×10^{-5} *13*
90.26 *8*	0.89 *13*	409.97	3/2$^+$	319.75	5/2$^+$	[M1+E2]		3.83 *33*	%Iγ=0.43 *7* α(K)=2.2 *8*; α(L)=1.3 *8*; α(M)=0.30 *21* α(N)=0.07 *5*; α(O)=0.008 *5*; α(P)=1.2×10^{-4} *6*
133.19 *7*	6.5 *5*	392.48	(1/2$^+$)	259.34	3/2$^+$	[M1+E2]		1.07 *8*	α(K)=0.74 *23*; α(L)=0.25 *11*; α(M)=0.059 *28* %Iγ=3.1 *3* α(N)=0.013 *6*; α(O)=0.0017 *7*; α(P)=4.1×10^{-5} *19* This γ also reported in spectral Fig. 1 of 1999As03.
150.58 *8*	1.4 *2*	409.97	3/2$^+$	259.34	3/2$^+$	[M1+E2]		0.73 *9*	%Iγ=0.68 *10* α(K)=0.53 *16*; α(L)=0.16 *6*; α(M)=0.037 *14* α(N)=0.0083 *31*; α(O)=0.00108 *32*; α(P)=2.9×10^{-5} *13*
159.71 *8*	≈1.0	569.69	(3/2$^-$)	409.97	3/2$^+$	[E1]		0.0910 *13*	%Iγ≈0.48 α(K)=0.0764 *11*; α(L)=0.01141 *16*; α(M)=0.002509 *35* α(N)=0.000575 *8*; α(O)=7.96×10^{-5} *11*; α(P)=3.72×10^{-6} *5*
250.03 *13*	19.9 *11*	569.69	(3/2$^-$)	319.75	5/2$^+$	[E1]		0.0282 *4*	%Iγ=9.6 *6* α(K)=0.02385 *34*; α(L)=0.00344 *5*; α(M)=0.000756 *11* α(N)=0.0001740 *24*; α(O)=2.449×10^{-5} *34*; α(P)=1.223×10^{-6} *17*
259.33 *13*	58.0 *40*	259.34	3/2$^+$	0.0	7/2$^-$	M2		0.827 *12*	%Iγ=28.0 *10* α(K)exp=0.69 *11* α(K)=0.661 *9*; α(L)=0.1286 *18*; α(M)=0.0294 *4* α(N)=0.00685 *10*; α(O)=0.000980 *14*; α(P)=5.11×10^{-5} *7* $I_{(\gamma+ce)}$: 27.9% *9* based on adopted normalization. Mult.: from α(K)exp, determined from comparison of K x-rays and γ-ray intensities in singles and coincidence spectra (1977Tu01).
310.26 *12*	52.0 *30*	569.69	(3/2$^-$)	259.34	3/2$^+$	[E1]		0.01643 *23*	%Iγ=25.1 *17* α(K)=0.01390 *20*; α(L)=0.001981 *28*; α(M)=0.000435 *6* α(N)=0.0001001 *14*; α(O)=1.419×10^{-5} *20*; α(P)=7.27×10^{-7} *10*

$^{167}_{67}Ho_{100}$-3

$\gamma(^{167}\text{Ho})$ (continued)

E_γ	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[#]	Comments
352.2 *2*	2.1 *2*	922.0?		569.69	(3/2$^-$)	[D,E2]	0.046 *34*	%Iγ=1.01 *10*
569.7 *2*	100.0	569.69	(3/2$^-$)	0.0	7/2$^-$	[E2]	0.01135 *16*	%Iγ=48.3 *17* α(K)=0.00920 *13*; α(L)=0.001672 *23*; α(M)=0.000377 *5* α(N)=8.67×10^{-5} *12*; α(O)=1.198×10^{-5} *17*; α(P)=5.17×10^{-7} *7*
579.4 *3*	0.47 *8*	1149.0		569.69	(3/2$^-$)			%Iγ=0.23 *4*
599.2 *2*	1.7 *2*	1168.8?		569.69	(3/2$^-$)	[D,E2]	0.012 *8*	%Iγ=0.82 *10*
662.9[†@] *3*	0.70 *8*	922.0?		259.34	3/2$^+$			%Iγ=0.34 *4*
689.4[†@] *3*	≈0.5	1099.5		409.97	3/2$^+$			%Iγ≈0.24
707.1 *2*	2.0 *4*	1099.5		392.48	(1/2$^+$)	[D,E2]	0.008 *5*	%Iγ=0.97 *20*
738.8 *4*	1.2 *3*	1149.0		409.97	3/2$^+$	[D,E2]	0.007 *5*	%Iγ=0.58 *15*
[x]746.0[†] *2*	0.86 *10*							
[x]799.0[†] *4*	≈0.8							
830.8 *5*	≈0.7	1240.6		409.97	3/2$^+$			%Iγ≈0.34
848.3 *10*	≈1.0	1240.6		392.48	(1/2$^+$)			%Iγ≈0.48
909.1[†@] *5*	≈0.8	1168.8?		259.34	3/2$^+$			%Iγ≈0.39
920.5[†@] *5*	≈0.5	1240.6		319.75	5/2$^+$			%Iγ≈0.24
981.4 *8*	≈0.5	1240.6		259.34	3/2$^+$			%Iγ≈0.24
997.0 *2*	0.95 *10*	1919.0?		922.0?				%Iγ=0.46 *5*
[x]1080.3[†] *3*	0.62 *8*							
1094.6 *6*	0.5 *2*	1664.9		569.69	(3/2$^-$)			%Iγ=0.24 *10*
1272.9 *6*	0.65 *8*	1664.9		392.48	(1/2$^+$)			%Iγ=0.31 *4*
1405.6 *5*	0.48 *7*	1664.9		259.34	3/2$^+$			%Iγ=0.23 *4*

[†] Isotopic assignment of this γ ray is uncertain (1977Tu01).
[‡] For absolute intensity per 100 decays, multiply by 0.483 *17*.
[#] 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.
[x] γ ray not placed in level scheme.

$^{167}_{67}Ho_{100}$-4

^{167}Dy β^- decay (6.20 min) 1977Tu01

Decay Scheme

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