^{147}Dy ε decay (67 s) 1984ScZU

History

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

Parent: ^{147}Dy: E=0.0; $J^\pi=(1/2^+)$; $T_{1/2}$=67 s *7*; Q(ε)=6547 *12*; %ε+%β^+ decay=100.0

^{147}Dy-E,J^π,$T_{1/2}$: from ^{147}Dy Adopted Levels.

^{147}Dy-Q(ε): From 2021Wa16.

According to 1984ScZU and 1982To01 both ^{147}Dy$^{g.s.}$ $\varepsilon+\beta^+$ decay (67 s) and ^{147}Dy^{m} $\varepsilon+\beta^+$ decay (55.2 s) contribute to this level scheme.

1984ScZU: ^{93}Nb(^{58}Ni,3pn), E=290 MeV, followed by $\varepsilon+\beta^+$ decay at UNILAC, GSI (from 1984ScZT). Measured Eγ, Iγ, $\gamma\gamma$, x-ray-γ from ^{147}Dy$^{g.s.}$, ^{147}Dy^{m} decays.

1983AlZN: measured Eγ, Iγ, $T_{1/2}$ from ^{147}Dy$^{g.s.}$, ^{147}Dy^{m} decays (no details about experiment).

1982To01: ^{142}Nd(^{12}C,7n), E≈127 MeV, followed by $\varepsilon+\beta^+$ decay at the on-line mass separator RAMA, LBNL. Measured Eγ, Iγ, $\gamma\gamma$ from ^{147}Dy$^{g.s.}$, ^{147}Dy^{m} decays.

Others:

2002RuZZ, ^{147}Dy $\varepsilon+\beta^+$ TAS measurements of Gamow-Teller strength functions.

1997Co21, ^{147}Dy $\varepsilon+\beta^+$ HPGe measurements of Gamow-Teller strength functions from g.s., and metastable state.

1989Ni02, ^{147}Dy($1/2^+$) β-delayed p decay, through ^{147}Tb($1/2^+$,$3/2^+$), to ^{146}Gd(0^+).

1988Al42, ^{147}Dy β-delayed p decay and Gamow-Teller $\varepsilon+\beta^+$ strength functions, from g.s. (max of Gamow-Teller resonance 3.95 MeV), and metastable state (max of Gamow-Teller resonance 4.85 MeV); others (same group, generally superseded): 1987Al12, 1985Al30, 1985Al13, 1985Al08, 1983ByZZ.

1988ScZV, ^{147}Dy($1/2^+$) β-delayed p decay, through ^{147}Tb(Ex≈4 MeV,$J^\pi=1/2^+$,$3/2^+$), to ^{146}Gd(0^+). Observed 2 strong proton lines with E(p)=2210 keV and 2600 keV (1988ScZV), and measured S(p)=1945 *18*. Supersede 1982Kl03.

1987Al18, ^{147}Dy β-delayed p decay and Gamow-Teller $\varepsilon+\beta^+$ strength functions (same as 1988Al42, same group). Studied fine structure of Gamow-Teller resonance from delayed protons spectra to ^{146}Gd g.s. and found regular strength maxima situated at multiples of 0.18 MeV from each other.

1984ScZT, ^{147}Dy β-delayed p decay.

1984To07, ^{147}Dy($1/2^+$) β-delayed p decay.

1976Ra07,1975To04, ^{147}Dy $\varepsilon+\beta^+$ decay.

Level scheme is from 1984ScZU. 1992De38 observe that data given by 1984ScZU and 1983AlZN do not agree and do not adopt any of the data. However the evaluator found consistent data common to 1984ScZU and 1995Co12 (^{144}Sm(^{6}Li,3nγ) dataset), based on which the 1984ScZU data are adopted here.

^{147}Tb Levels

E(level)†	J^π‡	$T_{1/2}$‡	Comments
0.0	$(1/2^+)$	1.64 h *3*	%ε+%β^+=100 %ε+%β^+: Adopted value.
253.2	$(3/2^+)$		
354.0	$(5/2^+)$		
718.8	$(7/2^+)$		populated from ^{147}Dy metastable $\varepsilon+\beta^+$ -decay branch (55.2 s) (1984ScZU).
1329.8	$(7/2^+)$		
1405	$(5/2^+)$		
1412.6	$(1/2^-,3/2^-,5/2^-)$		
1479.4			
1758.6	$(3/2^+)$		
1766.2			
1971	$(3/2^+,5/2^+,7/2^+)$		
1999			
2039			
2163			
2179.7	$(11/2^+)$		
2220			
2341			

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^{147}Dy ε decay (67 s) 1984ScZU (continued)

^{147}Tb Levels (continued)

E(level)†	Comments
2349	
2374	
2379	
2438	E(level): the last digit is illegible in 1984ScZU.
2508	
2525	
2635.2	
2737	
2758	
2954	
3084	
3363	
3372	
3622	
3758.5	
3953.8	
3975.3	
3993	
4019.7	
4044.6	
4084.8	
4167	
4385	
4818.7	
4828	

† No uncertainties are available for the E_γ input. The E(level) values are from a least-squares fit to the E_γ data with the assumption that the uncertainties are the same for all the E_γ's.

‡ Adopted values.

ε,β^+ radiations

In comments: relative intensity from γ intensity balance (Fig. 3, "The ^{147}Tb levels populated in β-decay of ^{147}Dy", 1984ScZU), except for g.s.

E(decay)	E(level)	Comments
(1719 *12*)	4828	I($\varepsilon+\beta^+$): 0.6.
(1728 *12*)	4818.7	I($\varepsilon+\beta^+$): 2.2.
(2162 *12*)	4385	I($\varepsilon+\beta^+$): 0.5.
(2380 *12*)	4167	I($\varepsilon+\beta^+$): 2.9.
(2462 *12*)	4084.8	I($\varepsilon+\beta^+$): 3.3.
(2502 *12*)	4044.6	I($\varepsilon+\beta^+$): 4.1.
(2527 *12*)	4019.7	I($\varepsilon+\beta^+$): 7.5.
(2554 *12*)	3993	I($\varepsilon+\beta^+$): 0.7.
(2572 *12*)	3975.3	I($\varepsilon+\beta^+$): 15.
(2593 *12*)	3953.8	I($\varepsilon+\beta^+$): 10.
(2789 *12*)	3758.5	I($\varepsilon+\beta^+$): 18.
(2925 *12*)	3622	I($\varepsilon+\beta^+$): 2.3.
(3175 *12*)	3372	I($\varepsilon+\beta^+$): 2.2.
(3184 *12*)	3363	I($\varepsilon+\beta^+$): 1.3.
(3463 *12*)	3084	I($\varepsilon+\beta^+$): 0.5.

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^{147}Dy ε decay (67 s) 1984ScZU (continued)

ε,β+ radiations (continued)

E(decay)	E(level)	Comments
(3593 *12*)	2954	I(ε+β+): 0.8.
(3789 *12*)	2758	I(ε+β+): 0.5.
(3810 *12*)	2737	I(ε+β+): 2.2.
(3912 *12*)	2635.2	I(ε+β+): 2.9.
(4022 *12*)	2525	I(ε+β+): 1.5.
(4039 *12*)	2508	I(ε+β+): 1.1.
(4109 *12*)	2438	I(ε+β+): 1.5.
(4168 *12*)	2379	I(ε+β+): 0.8.
(4173 *12*)	2374	I(ε+β+): 1.2.
(4198 *12*)	2349	I(ε+β+): 1.3.
(4206 *12*)	2341	I(ε+β+): 1.6.
(4327 *12*)	2220	I(ε+β+): 1.8.
(4367 *12*)	2179.7	I(ε+β+): 6.1.
(4384 *12*)	2163	I(ε+β+): 3.3.
(4508 *12*)	2039	I(ε+β+): 1.5.
(4548 *12*)	1999	I(ε+β+): 1.6.
(4576 *12*)	1971	I(ε+β+): 2.9.
(4781 *12*)	1766.2	I(ε+β+): 15.
(4788 *12*)	1758.6	I(ε+β+): 8.3.
(5068 *12*)	1479.4	I(ε+β+): 1.7.
(5134 *12*)	1412.6	I(ε+β+): 3.1.
(5142 *12*)	1405	I(ε+β+): 2.8.
(5217 *12*)	1329.8	I(ε+β+): 4.1.
(5828 *12*)	718.8	I(ε+β+): 6.0.
(6193 *12*)	354.0	I(ε+β+): 21.
(6294 *12*)	253.2	I(ε+β+): 18.
(6547 *12*)	0.0	I(ε+β+): feeding from (1/2+) of ^{147}Dy parent: 45% *4* (per 100 parent decays) (1997Co21), 30%−50% (1983ByZZ). Log *ft*: 4.8-5.0 (1983ByZZ).

γ(^{147}Tb)

Iγ normalization: not known; although 1997Co21 measured absolute ε+β+ feeding from ^{147}Dy g.s. to ^{147}Tb g.s., no attempt was made here to calculate Iγ normalization because of the fact that the extra ε+β+ feeding coming from ^{147}Dy metastable state decay is not known.

γ decay in general shown only for levels where at least one transition has Iγ>2 (1984ScZU).

E_γ	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[†]	Comments
101.1	23	354.0	(5/2+)	253.2	(3/2+)	M1	2.13	α(K)=1.79 *3*; α(L)=0.262 *4*; α(M)=0.0572 *8* α(N)=0.01321 *19*; α(O)=0.00203 *3*; α(P)=0.0001337 *19*
253.4	100	253.2	(3/2+)	0.0	(1/2+)	M1	0.1635	α(K)=0.1382 *20*; α(L)=0.0198 *3*; α(M)=0.00432 *6* α(N)=0.000999 *14*; α(O)=0.0001541 *22*; α(P)=1.022×10^{-5} *15*
364.8	25	718.8	(7/2+)	354.0	(5/2+)	M1	0.0620	α(K)=0.0525 *8*; α(L)=0.00744 *11*; α(M)=0.001620 *23* α(N)=0.000375 *6*; α(O)=5.78×10^{-5} *8*; α(P)=3.86×10^{-6} *6*
975.8	4.6	1329.8	(7/2+)	354.0	(5/2+)	(E2)	0.00305	α(K)=0.00256 *4*; α(L)=0.000378 *6*; α(M)=8.27×10^{-5} *12* α(N)=1.90×10^{-5} *3*; α(O)=2.89×10^{-6} *4*; α(P)=1.770×10^{-7} *25*

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^{147}Dy ε decay (67 s) 1984ScZU (continued)

γ(^{147}Tb) (continued)

E_γ	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[†]	Comments
1159.4	3.1	1412.6	(1/2$^-$,3/2$^-$,5/2$^-$)	253.2	(3/2$^+$)	(E1)	9.19×10^{-4}	α(K)=0.000778 *11*; α(L)=0.0001018 *15*; α(M)=2.20×10^{-5} *3* α(N)=5.07×10^{-6} *7*; α(O)=7.81×10^{-7} *11*; α(P)=5.22×10^{-8} *8*; α(IPF)=1.060×10^{-5} *15*
1225.9	0.4	1479.4		253.2	(3/2$^+$)			
1404.6	4.6	1758.6	(3/2$^+$)	354.0	(5/2$^+$)	(M1,E2)	0.0019 *4*	α(K)=0.0016 *4*; α(L)=0.00021 *4*; α(M)=4.6×10^{-5} *9* α(N)=1.07×10^{-5} *21*; α(O)=1.7×10^{-6} *4*; α(P)=1.10×10^{-7} *25*; α(IPF)=4.7×10^{-5} *4*
1412.2	3.2	1766.2		354.0	(5/2$^+$)			
1460.8	8.9	2179.7	(11/2$^+$)	718.8	(7/2$^+$)	(E2)	1.42×10^{-3}	α(K)=0.001156 *17*; α(L)=0.0001597 *23*; α(M)=3.47×10^{-5} *5* α(N)=8.00×10^{-6} *12*; α(O)=1.228×10^{-6} *18*; α(P)=8.00×10^{-8} *12*; α(IPF)=6.10×10^{-5} *9*
1479.8	5.3	1479.4		0.0	(1/2$^+$)			
1505.3	1.6	1758.6	(3/2$^+$)	253.2	(3/2$^+$)	(M1)	0.00196	α(K)=0.001600 *23*; α(L)=0.000216 *3*; α(M)=4.69×10^{-5} *7* α(N)=1.084×10^{-5} *16*; α(O)=1.680×10^{-6} *24*; α(P)=1.146×10^{-7} *16*; α(IPF)=8.65×10^{-5} *13*
1512.8	0.8	1766.2		253.2	(3/2$^+$)			
1758.8	5.0	1758.6	(3/2$^+$)	0.0	(1/2$^+$)	(M1,E2)	0.00132 *20*	α(K)=0.00097 *16*; α(L)=0.000131 *20*; α(M)=2.8×10^{-5} *5* α(N)=6.5×10^{-6} *10*; α(O)=1.01×10^{-6} *16*; α(P)=6.8×10^{-8} *12*; α(IPF)=0.000190 *15*
1766.5	12.4	1766.2		0.0	(1/2$^+$)			
2382.0	2.9	2635.2		253.2	(3/2$^+$)			
2639.0	2.2	4818.7		2179.7	(11/2$^+$)			
3404.4	1.1	3758.5		354.0	(5/2$^+$)			
3505.3	3.6	3758.5		253.2	(3/2$^+$)			
3690.7	2.4	4044.6		354.0	(5/2$^+$)			
3700.9	1.8	3953.8		253.2	(3/2$^+$)			
3758.4	13.2	3758.5		0.0	(1/2$^+$)			
3767.1	0.8	4019.7		253.2	(3/2$^+$)			
3791.2	1.7	4044.6		253.2	(3/2$^+$)			
3831.8	0.6	4084.8		253.2	(3/2$^+$)			
3953.5	6.4	3953.8		0.0	(1/2$^+$)			
3975.2	2.6	3975.3		0.0	(1/2$^+$)			
4019.1	0.7	4019.7		0.0	(1/2$^+$)			
4084.6	2.7	4084.8		0.0	(1/2$^+$)			

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^{147}Dy ε decay (67 s) 1984ScZU (continued)

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

† Additional information 1.
‡ Relative to 253γ.
# Adopted values.

^{147}Dy ε decay (67 s) 1984ScZU

Decay Scheme

Intensities: Relative I_γ