^{153}Ho ε decay (9.3 min) 1978An25,1977ZuZV

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 170, 1 (2020)	16-Aug-2020

Parent: ^{153}Ho: E=68 *7*; $J^{\pi}=1/2^{+}$; $T_{1/2}$=9.3 min *5*; Q(ε)=4131 *6*; %ε+%$β^{+}$ decay=99.82 *8*

^{153}Ho-%ε+%$β^{+}$ decay: Based on determination of the α branching by 1974Sc19; however, the dramatically different Iγ of 1974Sc19 and 1978An25 (e.g., Iγ(108)/Iγ(565)=0.3 and 5.0, respectively) casts doubt on this analysis.

1978An25 and 1977ZuZV produced sources by spallation of Ta target with 660-MeV protons followed by mass separation; measured Eγ, Iγ, γ-ce coincidences with Ge detector and magnetic spectrometer as well as level $T_{1/2}$ by delayed γ-ce coincidences with magnetic spectrometer and plastic scintillator.

Other measurements: 1974Sc19 with sources from ^{147}Sm(^{10}B,4n) and 1981PaZP with sources from Tb(^{3}He,xn).

^{153}Dy Levels

E(level)	J^{π}[†]	$T_{1/2}$[‡]	Comments
0.0	$7/2^{(-)}$		
108.90 *8*	$(3/2^{-})$	1.35 ns *10*	
270.66 *8*	$(3/2^{-},5/2^{-})$	≤0.25 ns	
366.00 *10*	$(5/2^{-},7/2^{-},9/2^{-})$		E(level): From ^{153}Ho ε decay (2.01 m). The 366 γ was unplaced by 1978An25.
500.81 *12*	$(^{-})$	≤0.2 ns	
565.58 *11*	$(3/2^{-},5/2^{-})$		

[†] From ^{153}Dy Adopted Levels.

[‡] From delayed coincidences (1978An25).

γ(^{153}Dy)

Iγ normalization: The decay energy is 4130 keV and only a few levels are reported, so the scheme is too incomplete to compute a γ intensity normalization factor.

Additional information 1.

E_{γ}[†]	I_{γ}[‡]	E_i(level)	J_i^{π}	E_f	J_f^{π}	Mult.[#]	α[b]	Comments
x72.8[&] *1*	2.85[&] *25*							
x90.5[&] *1*	6.3[&] *5*							
108.8 *1*	109 *4*	108.90	$(3/2^{-})$	0.0	$7/2^{(-)}$	E2	1.99	α(K)=0.905 *13*; α(L)=0.832 *13*; α(M)=0.199 *3* α(N)=0.0446 *7*; α(O)=0.00539 *8*; α(P)=3.78×10^{-5} *6* Mult.: From α(K)exp=1.07 *2*, K/L=2.71 *+56−46* (1981PaZP).
x121.5[&] *1*	2.3[&] *3*							
161.8 *1*	91 *5*	270.66	$(3/2^{-},5/2^{-})$	108.90	$(3/2^{-})$	M1	0.612	α(K)=0.515 *8*; α(L)=0.0753 *11*; α(M)=0.01654 *24* α(N)=0.00383 *6*; α(O)=0.000560 *8*; α(P)=3.20×10^{-5} *5* Mult.: From α(K)exp=0.66 *7*, K/L=8.03 *+282−188* (1981PaZP).
x198.9 *2*	8.0 *20*							
230.2 *1*	58 *4*	500.81	$(^{-})$	270.66	$(3/2^{-},5/2^{-})$	M1	0.231	α(K)=0.195 *3*; α(L)=0.0282 *4*; α(M)=0.00620 *9* α(N)=0.001434 *21*; α(O)=0.000210

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^{153}Ho ε decay (9.3 min) 1978An25,1977ZuZV (continued)

γ(^{153}Dy) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[b]	Comments
								3; α(P)=1.206×10^{-5} *17* Mult.: From α(K)exp=0.19 *3*, K/L=8.13 *+327−219* (1981PaZP).
x259.0[@] *1*	12.1[a] *10*					E2	0.1019	α(K)=0.0740 *11*; α(L)=0.0217 *3*; α(M)=0.00502 *7* α(N)=0.001139 *16*; α(O)=0.0001476 *21*; α(P)=3.74×10^{-6} *6*
270.7 *1*	78 *4*	270.66	(3/2$^-$,5/2$^-$)	0.0	7/2$^{(-)}$	E2	0.0887	α(K)=0.0650 *10*; α(L)=0.0183 *3*; α(M)=0.00424 *6* α(N)=0.000962 *14*; α(O)=0.0001253 *18*; α(P)=3.32×10^{-6} *5* Mult.: From α(K)exp=0.050 *15*, K/L=4.11 *+125−92* (1981PaZP).
295.6[@] *5*		565.58	(3/2$^-$,5/2$^-$)	270.66	(3/2$^-$,5/2$^-$)			Mult.: K/L=6.74 *+51−48* (1981PaZP).
366.0 *1*	100	366.00	(5/2$^-$,7/2$^-$,9/2$^-$)	0.0	7/2$^{(-)}$	M1	0.0667	α(K)=0.0564 *8*; α(L)=0.00807 *12*; α(M)=0.001768 *25* α(N)=0.000409 *6*; α(O)=6.00×10^{-5} *9*; α(P)=3.47×10^{-6} *5* Mult.: From α(K)exp=0.059 *6*, K/L=7.92 *+170−132* (1981PaZP).
391.7 *2*	13 *3*	500.81	(−)	108.90	(3/2$^-$)			
x405.4[&] *2*	4.3[&] *5*							
x420.1[@] *1*	17.5[a] *12*					M1	0.0465	α(K)=0.0394 *6*; α(L)=0.00561 *8*; α(M)=0.001228 *18* α(N)=0.000284 *4*; α(O)=4.17×10^{-5} *6*; α(P)=2.41×10^{-6} *4*
456.6[@] *1*	46[a] *2*	565.58	(3/2$^-$,5/2$^-$)	108.90	(3/2$^-$)	M1+E2	0.0284 *92*	α(K)=0.0236 *82*; α(L)=0.0038 *8*; α(M)=0.00084 *16* α(N)=0.00019 *4*; α(O)=2.7×10^{-5} *6*; α(P)=1.40×10^{-6} *55* I_γ: Other: ≈ 37 from branching in ^{153}Ho ε decay (2.01 m).
x551.0[&] *2*	9.0[&] *7*							
x553.7 *2*	29 *4*					E2+M1	0.0173 *57*	α(K)=0.0144 *50*; α(L)=0.0022 *6*; α(M)=0.00049 *11* α(N)=0.00011 *3*; α(O)=1.63×10^{-5} *41*; α(P)=8.6×10^{-7} *33*

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^{153}Ho ε decay (9.3 min) 1978An25,1977ZuZV (continued)

γ(^{153}Dy) (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [#]	α [b]	Comments
565.8 *2*	22 *7*	565.58	(3/2$^-$,5/2$^-$)	0.0	7/2$^{(-)}$	E2	0.01106	α(K)=0.00900 *13*; α(L)=0.001603 *23*; α(M)=0.000359 *5* α(N)=8.23×10^{-5} *12*; α(O)=1.147×10^{-5} *16*; α(P)=5.09×10^{-7} *8*
[x]617.3[&] *1*	29.9[&] *21*					M1+E2	0.0132 *43*	α(K)=0.0110 *38*; α(L)=0.0017 *4*; α(M)=0.00037 *9* α(N)=8.5×10^{-5} *21*; α(O)=1.22×10^{-5} *32*; α(P)=6.6×10^{-7} *25*
[x]685.2[&] *2*	9.8[&] *7*							
[x]698.3[&] *2*	9.0[&] *8*							
[x]726.2[&] *2*	6.4[&] *8*							
[x]781.3[&] *3*	19.2[&] *12*							
[x]828.1[&] *3*	4.4[&] *5*							
[x]921.9[&] *4*	6.9[&] *6*							
[x]925.3[&] *3*	23.1[&] *7*							
[x]929.0[&] *4*	7.0[&] *7*							
[x]1013.0[&] *3*	6.5[&] *8*							
[x]1045.8[&] *5*	1.6[&] *3*							
[x]1110.0[&] *3*	4.5[&] *6*							
[x]1380.1[&] *4*	9.4[&] *8*							

[†] From 1978An25, unless otherwise noted from 1977ZuZV.
[‡] From 1978An25, unless otherwise noted from 1977ZuZV. The values of 1974Sc19 differ dramatically, including five strong lines not reported by 1978An25 or 1977ZuZV, and are not given here.
[#] From ^{153}Dy Adopted γ's, but based primarily on the α_K(exp) and α_L(exp) or K/L ratios of 1977ZuZV and 1981PaZP.
[@] γ peak includes contribution from ^{153}Dy ε decay (1978An25).
[&] From 1977ZuZV.
[a] From 1977ZuZV; no value given by 1978An25 due to ^{153}Dy ε decay contribution.
[b] Additional information 2.
[x] γ ray not placed in level scheme.

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Decay Scheme

Intensities: Relative I_γ