^{155}Er ε decay 1980Bu25

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 160, 1 (2019)	21-Oct-2019

Parent: ^{155}Er: E=0.0; J^π=7/2$^-$; $T_{1/2}$=5.3 min *3*; Q(ε)=3830 *18*; %ε+%β^+ decay=99.978 *7*

Source produced by 660-MeV proton spallation of Ta, followed by mass separation. Measured Eγ, Iγ, $\gamma\gamma$ coincidence, γce coincidence, Ice (magnetic spectrometer).

The decay scheme is not sufficiently complete to allow calculation of the γ-ray normalization factor. For example, if one assumes log *ft*>5.9 for the g.s. $\varepsilon+\beta^+$ branch, then I($\varepsilon+\beta^+$ g.s.)<10%. From I(K x ray)=843 *60*, fluorescence yield=0.943 *21*, I(ce(K))=231 *35* and ε(K)/($\varepsilon+\beta^+$)=0.55 one obtains Iγ normalization=0.083 *10*. This Iγ normalization value yields I($\varepsilon+\beta^+$ g.s.)=59% *5* and log *ft*=5.1. These values are quite inconsistent with the required log *ft*>5.9.

^{155}Ho Levels

E(level)	J^π	$T_{1/2}$	Comments
0.0	5/2$^+$	48 min *2*	
110.16 *6*	7/2$^+$	<0.7 ns	$T_{1/2}$: from 1990AbZS (and also 1990AbZW), ceγ(t).
141.97 *11*	11/2$^-$		
201.00 *9*	3/2$^+$,5/2$^+$,7/2$^+$		
230.28 *12*	9/2$^-$		
233.94 *8*	5/2$^-$,7/2$^-$		
241.44 *12*	3/2$^+$,5/2$^+$,7/2$^+$		
344.94 *18*	(9/2$^+$)		
388.95 *13*			
418.98 *12*			
451.12 *21*			
470.64 *17*			
529.48 *14*			
565.20 *23*			
653.05 *14*			
682.88 *24*			

γ(^{155}Ho)

Additional information 1.

Eγ	Iγ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	α[@]	Comments
31.7 *1*	0.17 *5*	141.97	11/2$^-$	110.16	7/2$^+$	M2	998 *21*	α(L)=759 *16*; α(M)=188 *4* α(N)=44.1 *9*; α(O)=6.01 *13*; α(P)=0.259 *6* I_γ: calculated from Ice(L1+L2+L3)=133 *40* (1980Bu25) and α(L). 1980Bu25 report Iγ=0.27. Requiring an exact intensity balance at the 142.0 level (that is, I(γ+ce)(31.7γ)=I(γ+ce)(88.2γ)= 114, assuming no $\varepsilon+\beta^+$ feeding of this level) yields Iγ(31.7γ)=0.11. Mult.: deduced from comparison of measured L-subshell ratios with theoretical values.
88.2 *1*	23.5 *8*	230.28	9/2$^-$	141.97	11/2$^-$	M1	3.75	α(K)=3.15 *5*; α(L)=0.469 *7*; α(M)=0.1034 *15* α(N)=0.0240 *4*; α(O)=0.00349 *5*; α(P)=0.000195 *3*
^{x}91.6 *3*	3.7 *5*							
110.12 *7*	100	110.16	7/2$^+$	0.0	5/2$^+$	M1	1.98	α(K)=1.665 *24*; α(L)=0.247 *4*; α(M)=0.0545 *8* α(N)=0.01267 *18*; α(O)=0.00184 *3*; α(P)=0.0001032 *15*

Continued on next page (footnotes at end of table)

^{155}Er ε decay 1980Bu25 (continued)

γ(^{155}Ho) (continued)

E_γ	I_γ †	E_i(level)	J^π_i	E_f	J^π_f	Mult. ‡	α @	Comments
123.8 *1*	27 *1*	233.94	5/2⁻,7/2⁻	110.16	7/2⁺	E1	0.179	α(K)=0.1500 *22*; α(L)=0.0230 *4*; α(M)=0.00506 *8* α(N)=0.001156 *17*; α(O)=0.0001580 *23*; α(P)=7.05×10⁻⁶ *10*
131.2 *3*	2.6 *7*	241.44	3/2⁺,5/2⁺,7/2⁺	110.16	7/2⁺			
147.6 *3*	2.8 *7*	388.95		241.44	3/2⁺,5/2⁺,7/2⁺			
ˣ157.0 *3*	3.0 *7*							
ˣ164.7 *3*	2.9 *7*							
185.1 *1*	19.5 *7*	418.98		233.94	5/2⁻,7/2⁻	M1	0.458	α(K)=0.385 *6*; α(L)=0.0567 *8*; α(M)=0.01251 *18* α(N)=0.00291 *4*; α(O)=0.000423 *6*; α(P)=2.38×10⁻⁵ *4*
188.1 *2*	5.0 *6*	388.95		201.00	3/2⁺,5/2⁺,7/2⁺			
ˣ193.6 *1*	10.7 *6*							
201.1 *1*	26.0 *10*	201.00	3/2⁺,5/2⁺,7/2⁺	0.0	5/2⁺	M1	0.364	α(K)=0.306 *5*; α(L)=0.0450 *7*; α(M)=0.00993 *14* α(N)=0.00231 *4*; α(O)=0.000336 *5*; α(P)=1.89×10⁻⁵ *3*
221.1 *2*	21 *5*	451.12		230.28	9/2⁻	(M1)	0.280	α(K)=0.236 *4*; α(L)=0.0346 *5*; α(M)=0.00764 *11* α(N)=0.00177 *3*; α(O)=0.000258 *4*; α(P)=1.455×10⁻⁵ *21*
229.2 *3*	15 *4*	470.64		241.44	3/2⁺,5/2⁺,7/2⁺			
234.0 *1*	40.0 *18*	233.94	5/2⁻,7/2⁻	0.0	5/2⁺	[E1]#	0.0335	α(K)=0.0282 *4*; α(L)=0.00410 *6*; α(M)=0.000899 *13* α(N)=0.000207 *3*; α(O)=2.91×10⁻⁵ *4*; α(P)=1.438×10⁻⁶ *21*
234.8 *2*	19.2 *18*	344.94	(9/2⁺)	110.16	7/2⁺	M1#	0.238	α(K)=0.200 *3*; α(L)=0.0293 *5*; α(M)=0.00647 *10* α(N)=0.001503 *22*; α(O)=0.000219 *4*; α(P)=1.234×10⁻⁵ *18*
241.5 *2*	65 *7*	241.44	3/2⁺,5/2⁺,7/2⁺	0.0	5/2⁺	M1	0.220	α(K)=0.186 *3*; α(L)=0.0272 *4*; α(M)=0.00599 *9* α(N)=0.001391 *20*; α(O)=0.000203 *3*; α(P)=1.142×10⁻⁵ *17*
264.4 *4*	2.5 *8*	653.05		388.95				
278.3 *5*	1.9 *9*	388.95		110.16	7/2⁺			
ˣ283.6 *4*	1.9 *7*							
288.2 *2*	5.8 *7*	529.48		241.44	3/2⁺,5/2⁺,7/2⁺			
295.6 *5*	1.9 *7*	529.48		233.94	5/2⁻,7/2⁻			E_γ: in their table of Eγ values, 1980Bu25 give Eγ=295.2, whereas, on their decay scheme, they show Eγ=295.6.
298.8 *2*	7.6 *9*	529.48		230.28	9/2⁻			
308.2 *3*	3.2 *7*	418.98		110.16	7/2⁺			
322.9 *3*	3.9 *9*	565.20		241.44	3/2⁺,5/2⁺,7/2⁺			
328.7 *2*	12.7 *15*	529.48		201.00	3/2⁺,5/2⁺,7/2⁺			
ˣ333.8 *2*	6.8 *13*							
ˣ339.6 *3*	5.3 *14*							
344.9 *3*	4.6 *16*	344.94	(9/2⁺)	0.0	5/2⁺			
ˣ352.0 *5*	2.2 *10*							

Continued on next page (footnotes at end of table)

^{155}Er ε decay 1980Bu25 (continued)

γ(^{155}Ho) (continued)

E_γ	I_γ †	E_i(level)	E_f	J^π_f
ˣ358.6 *3*	14.6 *17*			
360.9 *6*	≈3	470.64	110.16	7/2⁺
ˣ373.3 *5*	2.7 *11*			
ˣ385.9 *3*	4.4 *10*			
388.9 *2*	8.7 *10*	388.95	0.0	5/2⁺
ˣ397.0 *3*	5.0 *11*			
ˣ399.7 *5*	3.4 *11*			
ˣ404.8 *7*	1.8 *10*			
412.1 *3*	4.8 *9*	653.05	241.44	3/2⁺,5/2⁺,7/2⁺

E_γ	I_γ †	E_i(level)	J^π_i	E_f	J^π_f
422.7 *1*	20.2 *13*	653.05		230.28	9/2⁻
450.1 *4*	6.1 *18*	451.12		0.0	5/2⁺
452.6 *2*	24.1 *20*	682.88		230.28	9/2⁻
455.9 *3*	7.4 *13*	565.20		110.16	7/2⁺
470.6 *2*	12.8 *14*	470.64		0.0	5/2⁺
ˣ475.5 *3*	5.6 *13*				
ˣ511.0 *2*	15 *7*				
ˣ512.2 *2*	37 *7*				
ˣ557.1 *9*	≈5				

† I(Ho K x rays)=843 *60*, relative to Iγ(110.12γ)=100.

‡ Deduced from comparison of α(K)exp with α(K), unless otherwise noted.

The K-lines of the 234.0 and 234.8 γ′s were not resolved in the conversion-electron spectrum of 1980Bu25. Assuming an E1 multipolarity for the 234.0 γ and subtracting its contribution to the composite peak, the evaluator deduces α(K)exp(234.8γ)=0.54 *13* (using a reasonable estimate of 20% for the uncertainty of the intensity of the K-electron peak). 1980Bu25 estimate α(K)exp(234.8γ)≈0.4 using this procedure and conclude that the 234.8 γ is M1. Our deduced value is over twice the α(K) value for an M1 transition of this energy which excludes E1 and still favorizes M1 over M1+E2.

@ Additional information 2.

ˣ γ ray not placed in level scheme.

^{155}Er ε decay 1980Bu25

Decay Scheme

Intensities: Relative I_γ