^{153}Er ε decay 1996Xu03,1994Xu09

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

Parent: ^{153}Er: E=0.0; J$^\pi$=(7/2$^-$); $T_{1/2}$=37.1 s *2*; Q(ε)=4543 *10*; %ε+%β^+ decay=47 *3*
^{153}Er-%ε+%β^+ decay: See ^{153}Er Adopted Levels for α branching.
Produced by ^{142}Nd(^{16}O,5n) with E ≤ 138 MeV and measured γ singles, $\gamma\gamma$ coincidences, and γ(t).
Data here are from 1994Xu09 and 1996Xu03.

^{153}Ho Levels

E(level)	J$^\pi$ †‡	$T_{1/2}$ ‡	Comments
0.0	11/2$^-$	2.01 min *3*	%ε+%β^+=99.949 *25*, %α=0.051 *25*, from Adopted Levels. J$^\pi$: Possible $h_{11/2}$ proton state.
68.7 *3*	1/2$^+$	9.3 min *5*	%ε+%β^+=99.82 *8*, %α=0.18 *8*, from Adopted Levels. J$^\pi$: Possible $s_{1/2}$ proton state.
256.7 *3*	(3/2$^+$)		J$^\pi$: Possible $d_{3/2}$ proton state.
351.20 *18*	(7/2$^-$,9/2$^-$)		
398.41 *20*	(7/2$^-$,9/2$^-$)		
634.2 *3*	(5/2$^+$)		J$^\pi$: Possible $d_{5/2}$ proton-hole state.
706.1 *4*			
814.8 *3*			
926.6 *3*			
1150.60 *20*			
1700.09 *23*	(7/2$^-$,9/2$^-$)		J$^\pi$: Possible configuration=(π $h_{11/2}$)(ν $h_{9/2}$)1+(ν $f_{7/2}$)5/2$^-$.
1800.6 *11*			

† The J^π and configuration assignments are from 1996Xu03 and are based on comparison with model calculations and systematics of odd Ho isotopes. These are used to suggest the nucleus is spherical in the ground state.
‡ Adopted values.

ε,β^+ radiations

E(decay)	E(level)	Iβ^+ @	Iε @	Log *ft* ‡	I($\varepsilon+\beta^+$) †‡#@	Comments
(2742 *10*)	1800.6	0.50	2.7	5.4	3.2	av Eβ=778.3 *46*; εK=0.7044 *21*; εL=0.1076 *4*; εM+=0.03181 *10*
(2843 *10*)	1700.09	2.47	11.1	4.8	13.6	av Eβ=823.3 *45*; εK=0.6834 *22*; εL=0.1043 *4*; εM+=0.03082 *10*
(3392 *10*)	1150.60	1.8	3.6	5.4	5.4	av Eβ=1070.7 *46*; εK=0.5560 *24*; εL=0.0844 *4*; εM+=0.02492 *11*
(3616 *10*)	926.6	0.92	1.4	5.9	2.3	av Eβ=1172.4 *46*; εK=0.5029 *24*; εL=0.0762 *4*; εM+=0.02250 *11*
(3728 *10*)	814.8	1.2	1.5	5.9	2.7	av Eβ=1223.3 *46*; εK=0.4772 *23*; εL=0.0722 *4*; εM+=0.02133 *11*
(3837 *10*)	706.1	1.7	1.9	5.8	3.6	av Eβ=1273.0 *46*; εK=0.4528 *23*; εL=0.0685 *4*; εM+=0.02022 *10*
(3909 *10*)	634.2	5.82	6.38	5.3	12.2	av Eβ=1305.9 *46*; εK=0.4371 *22*; εL=0.0661 *4*; εM+=0.01951 *10*
(4145 *10*)	398.41	10	8.8	5.2	19	av Eβ=1414.0 *46*; εK=0.3883 *20*; εL=0.0586 *3*; εM+=0.01731 *9*
(4192 *10*)	351.20	20	17	5.0	37	av Eβ=1435.7 *46*; εK=0.3791 *20*; εL=0.0572 *3*; εM+=0.01689 *9*
(4286 *10*)	256.7	≤0.2	≤0.3	≥8.5^{1u}	≤0.5	av Eβ=1464.4 *45*; εK=0.5563 *19*; εL=0.0859 *3*;

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^{153}Er ε decay 1996Xu03,1994Xu09 (continued)

ϵ,β^+ radiations (continued)

E(decay)	E(level)	Comments
		εM+=0.02544 *9* I($\varepsilon+\beta^+$),Log *ft*: From the intensity balance one obtains I($\varepsilon+\beta^+$) ≤ 4.7% of the $\varepsilon+\beta^+$ decays and log$f_{1u}t$ ≥ 7.5. But, from log*ft* systematics (1998Si17) the log$f_{1u}t$ is expected to be ≥ 8.5 which corresponds to I($\varepsilon+\beta^+$) ≤ 0.5% of the $\varepsilon+\beta^+$ decays.

† From 1996Xu03 and based on intensity balances. Since the decay energy is 4.5 MeV and levels are reported only to 1.8 MeV, the decay scheme is incomplete and these values may not be very accurate. For example, the log*ft* of 5.9 for the unique first forbidden decay from (7/2$^-$) to (3/2$^+$) is too low. As the ε feeding is moved to higher energy levels, these I($\varepsilon+\beta^+$) will decrease and the log*ft* values increase becoming lower limits.

‡ The 2nd and 3rd forbidden decays to the ground state and 68-keV level are assumed to be negligible. Uncertainties are not given because the scheme is assumed to be incomplete.

Additional information 1.

@ For absolute intensity per 100 decays, multiply by 0.47 *3*.

γ(^{153}Ho)

Iγ normalization: Value computed to give 100% of the $\varepsilon+\beta^+$ decays feeding the ground state and 68-keV level, but the uncertainty is large since the decay scheme is assumed to be very incomplete.

E_γ†	I_γ†@	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α#	Comments
(68.7)		68.7	1/2$^+$	0.0	11/2$^-$			γ ray decaying the 9.3 min isomer (expected but not directly observed).
94.5 *2*	0.15 *10*	351.20	(7/2$^-$,9/2$^-$)	256.7	(3/2$^+$)	[M2,E3]	50 *19*	%Iγ=0.032 *21* I$_\gamma$: This value is given in 1994Xu09 and 1996Xu03 as 1.5 *10*, but this value is too large. For its minimum (1 σ) value of 0.5 and the minimum α(M2)=30.7, its minimum I(γ+ce) is 16; this gives a feeding of the 256 level of 55 units plus the I($\varepsilon+\beta^+$) feeding and a depopulation of only 49 units. If there is a significant E3 component with α=68.8, this discrepancy becomes quite large. 1994Xu09 and 1996Xu03 show ≈ 5% of the $\varepsilon+\beta^+$ decay to the 256-keV level, which suggests Iγ=0.15, and this value is used here. α: For mult=M2, α=31.5 and for mult=E3, α=68.8.
188.0 *2*	34 *2*	256.7	(3/2$^+$)	68.7	1/2$^+$	[M1]‡	0.439	%Iγ=7.2 *6* α(K)=0.369 *6*; α(L)=0.0543 *8*; α(M)=0.01198 *18* α(N)=0.00278 *4*; α(O)=0.000405 *6*; α(P)=2.28×10^{-5} *4*
351.2 *2*	100 *1*	351.20	(7/2$^-$,9/2$^-$)	0.0	11/2$^-$			%Iγ=21.3 *16*
377.5 *2*	29 *2*	634.2	(5/2$^+$)	256.7	(3/2$^+$)	[M1]‡	0.0667	%Iγ=6.2 *6* α(K)=0.0563 *8*; α(L)=0.00814 *12*; α(M)=0.00179 *3* α(N)=0.000416 *6*; α(O)=6.07×10^{-5} *9*; α(P)=3.44×10^{-6} *5*

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^{153}Er ε decay 1996Xu03,1994Xu09 (continued)

γ(^{153}Ho) (continued)

E_γ†	I_γ†@	E_i(level)	J^π_i	E_f	J^π_f	Comments
398.4 *2*	54 *8*	398.41	(7/2⁻,9/2⁻)	0.0	11/2⁻	%Iγ=11.5 *15*
449.4 *2*	8 *2*	706.1		256.7	(3/2⁺)	%Iγ=1.7 *4*
463.6 *2*	6 *1*	814.8		351.20	(7/2⁻,9/2⁻)	%Iγ=1.28 *23*
565.5 *2*	3 *1*	634.2	(5/2⁺)	68.7	1/2⁺	%Iγ=0.64 *22*
575.4 *2*	5 *1*	926.6		351.20	(7/2⁻,9/2⁻)	%Iγ=1.06 *23*
1150.6 *2*	12 *2*	1150.60		0.0	11/2⁻	%Iγ=2.6 *4*
1166.4	7	1800.6		634.2	(5/2⁺)	%Iγ=1.49 *11*
1301.4	12	1700.09	(7/2⁻,9/2⁻)	398.41	(7/2⁻,9/2⁻)	%Iγ=2.55 *19*
1348.9 *3*	15 *2*	1700.09	(7/2⁻,9/2⁻)	351.20	(7/2⁻,9/2⁻)	%Iγ=3.2 *5*
1700.1 *3*	3 *1*	1700.09	(7/2⁻,9/2⁻)	0.0	11/2⁻	%Iγ=0.64 *22*

† From 1994Xu09, except for the two γ′s that are only given in 1996Xu03. The larger intensities given in 1996Xu03 for the 188 and 377 γ′s are assumed to include internal conversion.

‡ Assumed in 1994Xu09 from $\Delta J^\pi_{(levels)}$ and so to keep the intensity balance of the coincidence relations.

Additional information 2.

@ For absolute intensity per 100 decays, multiply by 0.213 *16*.

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