^{140}Gd ε decay 1991Fi03

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 154, 1 (2018)	20-Nov-2018

Parent: ^{140}Gd: E=0.0; J$^{\pi}$=0^{+}; T$_{1/2}$=15.8 s *4*; Q(ε)=5200 *60*; %ε+%β^{+} decay=100.0
^{140}Gd-E,J$^{\pi}$,T$_{1/2}$: from ^{140}Gd Adopted Levels.
^{140}Gd-Q(ε): from 2017Wa10.
Measured: γ, $\gamma\gamma$, Xγ (1991Fi03,1988Tu05); ce (1988Tu05).

^{140}Eu Levels

E(level)†	J$^{\pi}$‡	T$_{1/2}$	Comments
0.0	1^{+}	1.51 s *2*	%ε+%β^{+}=100 T$_{1/2}$,%ε+%β^{+}: from Adopted Levels.
174.59 *9*	2^{+}		
185.30 *20*	3^{+}		E(level): from Fig. 13 – decay scheme (1991Fi03).
191.24 *8*			
361.3 *4*			
379.00 *10*			
417.72 *10*			
427.92 *10*			
446.98 *13*			
453.25 *11*			
488.1 *4*			
535.7 *4*			
546.54 *15*			
610.99 *22*			
687.04 *22*			
722.28 *9*			
749.94 *8*	1^{+}		
882.69 *22*			
1077.8 *4*			
1092.6 *10*			
1131.1 *3*			
1215.99 *22*			

† From fit of γ's to levels (GTOL).
‡ Adopted values.

ε,β^{+} radiations

Strong ε decay to ^{140}Eu g.s.
Level 185 has non-zero I(ε+β^{+}) feeding although ΔJ=3 and $\Delta\pi$=no.

E(decay)	E(level)	Iβ^{+} †	Iε†	Log *ft*	I(ε+β^{+})†	Comments
(3.98×10^{3} *6*)	1215.99	0.8 *4*	0.6 *3*	5.54 *22*	1.4 *7*	av Eβ=1341 *28*; εK=0.356 *13*; εL=0.0515 *19*; εM+=0.0149 *6*
(4.07×10^{3} *6*)	1131.1	0.34 *10*	0.22 *7*	5.97 *14*	0.56 *17*	av Eβ=1380 *28*; εK=0.338 *12*; εL=0.0490 *18*; εM+=0.0142 *6*
(4.11×10^{3} *6*)	1092.6	0.6 *3*	0.39 *20*	5.74 *22*	1.0 *5*	av Eβ=1398 *28*; εK=0.331 *12*; εL=0.0479 *18*; εM+=0.0138 *5*
(4.12×10^{3} *6*)	1077.8	0.21 *9*	0.14 *6*	6.20 *19*	0.35 *15*	av Eβ=1405 *28*; εK=0.328 *12*; εL=0.0475 *18*; εM+=0.0137 *5*

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^{140}Gd ε decay 1991Fi03 (continued)

ϵ,$β^+$ radiations (continued)

E(decay)	E(level)	I$β^+$ †	Iε†	Log *ft*	I(ε+$β^+$)†	Comments
(4.32×10^{3} *6*)	882.69	0.69 *14*	0.36 *7*	5.82 *10*	1.05 *21*	av Eβ=1495 *28*; εK=0.292 *11*; εL=0.0423 *16*; εM+=0.0122 *5*
(4.45×10^{3} *6*)	749.94	14 *2*	6.7 *10*	4.58 *7*	21 *3*	av Eβ=1557 *28*; εK=0.271 *10*; εL=0.0391 *14*; εM+=0.0113 *4*
(4.48×10^{3} *6*)	722.28	2.3 *5*	1.0 *2*	5.39 *10*	3.3 *7*	av Eβ=1569 *28*; εK=0.266 *10*; εL=0.0385 *14*; εM+=0.0111 *4*
(4.51×10^{3} *6*)	687.04	0.73 *15*	0.32 *7*	5.91 *10*	1.05 *21*	av Eβ=1586 *28*; εK=0.261 *10*; εL=0.0377 *14*; εM+=0.0109 *4*
(4.59×10^{3} *6*)	610.99	0.54 *13*	0.23 *5*	6.07 *11*	0.77 *18*	av Eβ=1621 *28*; εK=0.250 *9*; εL=0.0361 *13*; εM+=0.0104 *4*
(4.65×10^{3} *6*)	546.54	1.9 *4*	0.77 *15*	5.56 *9*	2.7 *5*	av Eβ=1651 *28*; εK=0.240 *9*; εL=0.0347 *13*; εM+=0.0100 *4*
(4.66×10^{3} *6*)	535.7	0.15 *11*	0.06 *4*	6.7 *4*	0.21 *15*	av Eβ=1656 *28*; εK=0.239 *9*; εL=0.0345 *13*; εM+=0.0100 *4*
(4.71×10^{3} *6*)	488.1	0.9 *3*	0.36 *11*	5.90 *14*	1.3 *4*	av Eβ=1678 *28*; εK=0.232 *9*; εL=0.0336 *12*; εM+=0.0097 *4*
(4.75×10^{3} *6*)	453.25	1.8 *6*	0.65 *22*	5.65 *15*	2.4 *8*	av Eβ=1695 *28*; εK=0.228 *8*; εL=0.0329 *12*; εM+=0.0095 *4*
(4.75×10^{3} *6*)	446.98	0.58 *18*	0.21 *7*	6.13 *14*	0.79 *24*	av Eβ=1698 *28*; εK=0.227 *8*; εL=0.0328 *12*; εM+=0.0095 *4*
(4.77×10^{3} *6*)	427.92	2.3 *4*	0.85 *16*	5.54 *9*	3.2 *6*	av Eβ=1706 *28*; εK=0.224 *8*; εL=0.0324 *12*; εM+=0.0094 *4*
(4.78×10^{3} *6*)	417.72	3.0 *6*	1.1 *2*	5.43 *9*	4.1 *8*	av Eβ=1711 *28*; εK=0.223 *8*; εL=0.0322 *12*; εM+=0.0093 *4*
(4.82×10^{3} *6*)	379.00	4.4 *9*	1.5 *3*	5.29 *10*	5.9 *12*	av Eβ=1729 *28*; εK=0.218 *8*; εL=0.0315 *12*; εM+=0.0091 *4*
(4.84×10^{3} *6*)	361.3	0.31 *12*	0.11 *4*	6.45 *17*	0.42 *16*	av Eβ=1738 *28*; εK=0.216 *8*; εL=0.0312 *11*; εM+=0.0090 *4*
(5.03×10^{3}‡ *6*)	174.59	2 *2*	0.7 *7*	5.7^{2} *5*	3 *3*	av Eβ=1825 *29*; εK=0.194 *7*; εL=0.0280 *10*; εM+=0.0081 *3* Log *ft*,I$β^+$,Iε: Allowed spectrum assumed for calcuations by log *ft*. I(ε+$β^+$): estimated upper limit (90% C.L.) gives 7.39 (method 1) and 7.08 (method 2; see documentation of program GTOL).
(5.20×10^{3} *6*)	0.0	36 *7*	9.6 *19*	4.56 *9*	46 *9*	av Eβ=1907 *29*; εK=0.176 *6*; εL=0.0254 *9*; εM+=0.0073 *3*

† Absolute intensity per 100 decays.
‡ Existence of this branch is questionable.

γ(^{140}Eu)

Iγ normalization: Based on I(K x ray)/Iγ from 1991Fi03. The normalization value considered by 1994Pe19 from 1991Fi03 (Table XI), 0.70 *8*, is wrong because it leads to negative (ε+$β^+$) feeding of g.s. (and aberrant net feedings of excited levels). This also happened when I(K x ray)=75 *2* from 1991Fi03 (Table XI) was used by evaluator to calculate the normalization. The actual normalization value is from Table IV of 1991Fi03 and it can be obtained by calculation if the I(K x ray) is multiplied by a factor of 2.4.

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^{140}Gd ε decay 1991Fi03 (continued)

γ(^{140}Eu) (continued)

E_γ[†]	I_γ[†@]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	α[#]	Comments
174.8 *2*	108 *19*	174.59	2+	0.0	1+	M1	0.381	α(K)=0.323 *5*; α(L)=0.0458 *7*; α(M)=0.00989 *15* α(N)=0.00227 *4*; α(O)=0.000360 *6*; α(P)=3.56×10^{-5} *6* %Iγ=11.9 *24*, using the calculated normalization. Mult: α(K)exp=0.34 *4*, α(L)exp=0.053 *12*.
185.3 *2*	10 *2*	185.30	3+	0.0	1+	(E2)	0.278	α(K)=0.193 *3*; α(L)=0.0666 *10*; α(M)=0.01525 *23* α(N)=0.00341 *5*; α(O)=0.000482 *7*; α(P)=1.618×10^{-5} *24* %Iγ=1.1 *3*, using the calculated normalization. E_γ,I_γ,Mult.: from Fig. 13 – decay scheme (1991Fi03). ΔE,ΔIγ: assumed by evaluator.
186.7 *3*	3.8 *13*	361.3		174.59	2+			%Iγ=0.42 *16*, using the calculated normalization.
191.2 *1*	49 *9*	191.24		0.0	1+			%Iγ=5.4 *13*, using the calculated normalization.
236.7 *1*	8.9 *13*	427.92		191.24				%Iγ=0.98 *22*, using the calculated normalization.
253.3 *2*	8.9 *19*	427.92		174.59	2+			%Iγ=1.0 *3*, using the calculated normalization.
261.8 *2*	7.6 *13*	453.25		191.24		M1	0.1265	α(K)=0.1074 *16*; α(L)=0.01507 *22*; α(M)=0.00325 *5* α(N)=0.000745 *11*; α(O)=0.0001183 *17*; α(P)=1.179×10^{-5} *17* %Iγ=0.84 *20*, using the calculated normalization. Mult.: α(K)exp=0.095 *30*.
269.0 *2*	1.9 *6*	722.28		453.25				%Iγ=0.21 *8*, using the calculated normalization.
272.4 *1*	0.9	446.98		174.59	2+			%Iγ=0.099 *16*, using the calculated normalization. I_γ: from 1991Fi03; 10.8 in 1988Tu05.
278.4 *5*	10.1 *13*	453.25		174.59	2+			%Iγ=1.11 *23*, using the calculated normalization.
296.6 *2*	12.7 *13*	749.94	1+	453.25		M1	0.0907	α(K)=0.0769 *11*; α(L)=0.01076 *16*; α(M)=0.00232 *4* α(N)=0.000532 *8*; α(O)=8.45×10^{-5} *12*; α(P)=8.43×10^{-6} *12* %Iγ=1.4 *3*, using the calculated normalization. Mult.: α(K)exp=0.071 *18*.
304.5 *2*	1.3 *6*	722.28		417.72				%Iγ=0.14 *7*, using the calculated normalization.
313.5 *3*	12.0 *25*	488.1		174.59	2+			%Iγ=1.3 *4*, using the calculated normalization.
344.5 *4*	1.9 *13*	535.7		191.24				%Iγ=0.21 *15*, using the calculated normalization.
372.0 *2*	3.8 *13*	546.54		174.59	2+			%Iγ=0.42 *16*, using the calculated normalization.
379.0 *1*	54 *8*	379.00		0.0	1+			%Iγ=5.9 *13*, using the calculated normalization.
417.7 *1*	39 *4*	417.72		0.0	1+			%Iγ=4.3 *8*, using the calculated normalization.
427.9 *2*	11.4 *13*	427.92		0.0	1+			%Iγ=1.25 *25*, using the calculated normalization.
436.4 *2*	7.0 *13*	610.99		174.59	2+			%Iγ=0.77 *19*, using the calculated normalization.
446.9 *3*	6.3 *19*	446.98		0.0	1+			%Iγ=0.69 *24*, using the calculated normalization.
453.4 *2*	19 *6*	453.25		0.0	1+			%Iγ=2.1 *8*, using the calculated normalization.
495.8 *2*	9.5 *13*	687.04		191.24				%Iγ=1.04 *22*, using the calculated normalization.
x532.0 *4*	9 *5*							%Iγ=1.0 *6*, using the calculated normalization. E_γ,I_γ: from 1988Tu05.
546.5 *2*	20.3 *19*	546.54		0.0	1+			%Iγ=2.2 *5*, using the calculated normalization.
558.7 *3*	33 *3*	749.94	1+	191.24				%Iγ=3.6 *7*, using the calculated normalization.
575.4 *1*	39 *4*	749.94	1+	174.59	2+	M1	0.01638	α(K)=0.01395 *20*; α(L)=0.00191 *3*; α(M)=0.000411 *6* α(N)=9.41×10^{-5} *14*; α(O)=1.497×10^{-5} *21*; α(P)=1.511×10^{-6} *22* %Iγ=4.3 *8*, using the calculated normalization. Mult.: α(K)exp=0.016 *5*.
x686.2 *4*	6 *4*							%Iγ=0.7 *5*, using the calculated normalization. E_γ,I_γ: from 1988Tu05.
708.1 *2*	9.5 *13*	882.69		174.59	2+			%Iγ=1.04 *22*, using the calculated normalization.
722.3 *1*	27 *4*	722.28		0.0	1+			%Iγ=3.0 *7*, using the calculated normalization.
749.9 *1*	100 *6*	749.94	1+	0.0	1+			%Iγ=11.0 *19*, using the calculated normalization. I_γ: 41 *12* in 1988Tu05 (Iγ=38 if Iγ(174.8γ)=100).
x774.6 *3*								E_γ: from 1988Tu05. Seen only in γγ.
903.2 *3*	3.2 *13*	1077.8		174.59	2+			%Iγ=0.35 *16*, using the calculated normalization.

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^{140}Gd ε decay 1991Fi03 (continued)

$\gamma(^{140}Eu)$ (continued)

E_γ †	I_γ †@	E_i(level)	J_i^π	E_f	J_f^π	Comments
918 *1*	9 *4*	1092.6		174.59	2^+	%Iγ=1.0 *5*, using the calculated normalization.
ˣ982.9 *4*						Eγ: from 1988Tu05. Seen only in γγ.
1041.4 *2*	13 *6*	1215.99		174.59	2^+	%Iγ=1.4 *7*, using the calculated normalization.
1131.1 *3*	5.1 *13*	1131.1		0.0	1^+	%Iγ=0.56 *17*, using the calculated normalization.

† From 1991Fi03; for many γ′s Iγ(1991Fi03) strongly differs from Iγ(1988Tu05).

‡ From α(K)exp and α(L)exp(174.7γ) (1988Tu05), except where noted.

Additional information 1.

@ For absolute intensity per 100 decays, multiply by 0.110 *15*.

ˣ γ ray not placed in level scheme.

^{140}Gd ε decay 1991Fi03

Decay Scheme

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