^{152}Eu β^- decay (9.3116 h)

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	M. J. Martin	NDS 114, 1497 (2013)	31-Aug-2013

Parent: ^{152}Eu: E=45.5998 *4*; J$^\pi$=0$^-$; T$_{1/2}$=9.3116 h *13*; Q(β^-)=1818.9 *7*; %β^- decay=73 *3*

^{152}Eu-%β^- decay: From I(γ+ce)(344γ)/Σ Iβ^-=0.034 *5* (1957Na01), Iβ^+(to ^{152}Sm g.s.)=0.0064% 8 per parent decay (1979Ar16,1959An31), ε/β^+(to ^{152}Sm g.s.)=32.0 *3* (theory) and the adopted decay schemes.

^{152}Gd Levels

Measured:
γ: 1975Pr05, 1973MeXQ, 1971Ba63, 1969Va09.
ce: 1990Ka35, 1984Bu35, 1979Ar16; others: 1975Sc32, 1960Ma11.
β^-: 1969An18, 1958Al99, 1957Na01; other: 1950Hi17.
$\beta\gamma$: 1957Na01.
$\gamma\gamma$, (ce(K))γ: 1975Pr05, 1975Sc32, 1971Ba63, 1960Ma11.
$\beta\gamma$(t): 1975Sc32.
$\beta\gamma(\theta)$: 1963Bh09, 1959Gr91.
$\beta\gamma(\theta)$ circular pol: 1965Lo09.
$\gamma\gamma(\theta)$: 1959Wo52.
$\gamma\gamma(\theta)$ (lin pol): 1959Wo52.

E(level)†	J$^\pi$‡	Comments
0.0	0$^+$	
344.29 *3*	2$^+$	
615.37 *4*	0$^+$	T$_{1/2}$: 1975Sc32 report T$_{1/2}$=20-210 ps. The adopted value is 37 ps *8*.
930.63 *12*	2$^+$	
1047.87 *6*	0$^+$	
1109.1 *3*	2$^+$	
1123.13 *21*	3$^-$	
1314.62 *3*	1$^-$	J$^\pi$: J$^\pi$=1$^-$ from $\gamma\gamma$(θ,pol) (1959Wo52).
1460.54 *12*	1,2$^+$	
1756.04 *5*	1$^-$	

† From a least-squares fit to the Eγ values.
‡ From Adopted Levels.

β^- radiations

E(decay)	E(level)	Iβ^-†‡	Log *ft*	Comments
(108.5 *7*)	1756.04	0.050 *8*	6.39 *7*	av Eβ=28.4 *4*
(404.0 *7*)	1460.54	0.0122 *24*	8.80 *9*	av Eβ=118.6 *4*
(549.9 *7*)	1314.62	1.57 *25*	7.13 *7*	av Eβ=168.7 *4* E(decay): 560 *50* from $\beta\gamma$ (1957Na01). (560β)(1315γ)(θ,circ pol) A=0.95 *8* (1965Lo09).
(816.6 *7*)	1047.87	0.087 *14*	8.84 *7*	av Eβ=267.3 *5*
(1520.2 *7*)	344.29	1.7 *3*	9.55^{1u} *7*	av Eβ=554.0 *5* Unique shape (1969An18). E(decay): 1550 *50* from $\beta\gamma$ (1957Na01).
(1864.5 *7*)	0.0	70 *3*	7.42 *2*	av Eβ=704.0 *5* E(decay): 1852 *4* (1969An18), 1855 *10* (1958Al99). Iβ^-: others: 95 (1969An18), 90 (1950Hi17).

Continued on next page (footnotes at end of table)

^{152}Eu β^- decay (9.3116 h) (continued)

β^- radiations (continued)

† From an intensity balance in the decay scheme.
‡ Absolute intensity per 100 decays.

^{152}Eu β^- decay (9.3116 h) (continued)

$\gamma(^{152}Gd)$

Iγ normalization: From I(γ+ce)(344γ)/Σ Iβ^-=0.034 *5* (1957Na01).
For unplaced transitions see ^{152}Eu ε decay (9.3116 h).

E_γ[‡]	I_γ[‡c]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	α[†]	$I_{(\gamma+ce)}$[c]	Comments
117.3 *3*	0.0150 *5*	1047.87	0^+	930.63	2^+	E2	1.410 *24*		α(K)=0.751 *12*; α(L)=0.509 *10*; α(M)=0.1194 *22*; α(N+..)=0.0302 *6* α(N)=0.0267 *5*; α(O)=0.00353 *7*; α(P)=3.82×10^{-5} *6* I_γ: From Iγ/Iγ(704γ)=0.0331 *14* in 17.5-h Tb ε decay. The value of 0.118 *12* reported by 1973MeXQ appears to be a typo. IT should perhaps be 0.0118 *12*. From the decay scheme, I(γ+ce)(117γ) should be ≤1.27I(γ+ce)(586γ). This requirement leads to Iγ(117γ)<0.047.
191.6 *3*	0.005 *3*	1314.62	1^-	1123.13	3^-	[E2]	0.256		α(K)=0.176 *3*; α(L)=0.0622 *10*; α(M)=0.01436 *23*; α(N+..)=0.00368 *6* α(N)=0.00323 *5*; α(O)=0.000442 *7*; α(P)=1.001×10^{-5} *15*
266.92 *22*	0.008 *4*	1314.62	1^-	1047.87	0^+	[E1]	0.0214		α(K)=0.0182 *3*; α(L)=0.00253 *4*; α(M)=0.000547 *8*; α(N+..)=0.0001450 *21* α(N)=0.0001249 *18*; α(O)=1.89×10^{-5} *3*; α(P)=1.146×10^{-6} *17*
271.13[b] *5*	0.525[b] *24*	615.37	0^+	344.29	2^+	E2	0.0826		α(K)=0.0620 *9*; α(L)=0.01600 *23*; α(M)=0.00364 *6*; α(N+..)=0.000942 *14* α(N)=0.000822 *12*; α(O)=0.0001158 *17*; α(P)=3.80×10^{-6} *6* Mult.: α(K)exp=0.058 *7*; K/L=4.5 *10*, L12/L3=4 *2* (1979Ar16). These data give mult=E2(+M1) with δ>1.1 from L12/L3, and >3.7 from α(K)exp.
344.29[b] *3*	16.8[b] *3*	344.29	2^+	0.0	0^+	E2	0.0397		α(K)=0.0310 *5*; α(L)=0.00678 *10*; α(M)=0.001527 *22*; α(N+..)=0.000398 *6* α(N)=0.000346 *5*; α(O)=4.97×10^{-5} *7*; α(P)=1.99×10^{-6} *3* $I_{(\gamma+ce)}$: 0.034 *5* per β^- decay (from Ice(K)/Σ β^- 1957Na01). The authors′ value of 0.035 *5* has been corrected by the evaluator for updated theory values for α(K) and K/L. Mult.: K/L=4.4 *4*, L/M=4.0 *14* (1975Sc32); theory: K/L=4.58, L/M=4.44.
412.0 *3*	0.005 *3*	1460.54	1,2$^+$	1047.87	0^+				
432.52 *10*		1047.87	0^+	615.37	0^+	E0		0.125 *10*	E_γ: from 1979Ar16. Mult.: no γ observed. $I_{(\gamma+ce)}$: From Ice(K)=0.120 *9*, a weighted average from 1979Ar16 and 1975Sc32, and Ice(K)/Ice=0.877 (E0 theory).
586.36[b] *13*	0.089[b] *7*	930.63	2^+	344.29	2^+				
615.44 *20*		615.37	0^+	0.0	0^+	E0		0.063 *3*	E_γ: from 1979Ar16. Mult.: no γ observed. $I_{(\gamma+ce)}$: From Ice(K)=0.0553 *25*, a weighted average of values from 1979Ar16,1975Sc32,1960Ma11) and Ice(K)/Ice=0.877 (E0 theory). ρ=0.25 *15* (1990Ka35).

$^{152}_{64}Gd_{88}$-3

$\gamma(^{152}$Gd) (continued)

E_γ[‡]	I_γ[‡c]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[#]	α[†]	$I_{(\gamma+ce)}$[c]	Comments
632.8 *3*	0.008 *5*	1756.04	1^-	1123.13	3^-					
646.9 *3*	0.005 *3*	1756.04	1^-	1109.1	2^+					
699.28[a] *4*	0.500[a] *14*	1314.62	1^-	615.37	0^+					
703.55[b] *6*	0.453[b] *16*	1047.87	0^+	344.29	2^+	E2		0.00598		α(K)=0.00498 *7*; α(L)=0.000786 *11*; α(M)=0.0001724 *25*; α(N+..)=4.57×10^{-5} *7* α(N)=3.94×10^{-5} *6*; α(O)=5.95×10^{-6} *9*; α(P)=3.41×10^{-7} *5* Mult.: From α(K)exp=0.0053 *27*.
764.9[@]	0.0026[@] *16*	1109.1	2^+	344.29	2^+					
778.9[&]	0.014[&] *7*	1123.13	3^-	344.29	2^+					
825.5 *3*	0.005 *3*	1756.04	1^-	930.63	2^+					
845.4 *5*	0.063 *9*	1460.54	$1,2^+$	615.37	0^+					
970.333[a] *9*	3.93[a] *14*	1314.62	1^-	344.29	2^+	E1+M2	−0.021 *12*	1.21×10^{-3} *2*		α(K)=0.001035 *16*; α(L)=0.0001353 *21*; α(M)=2.91×10^{-5} *5*; α(N+..)=7.77×10^{-6} *12* α(N)=6.67×10^{-6} *11*; α(O)=1.033×10^{-6} *16*; α(P)=6.95×10^{-8} *11* E_γ: 1984Bu35 measured Eγ-Eγ(963γ in Sm)=6.966 *6* keV. Using the ADOPTED value for Eγ(963) of 963.367 *7* one gets Eγ=970.333 *9* for Eγ(970). Mult.: α(K)exp=0.0009 *4* (from I(ce(K))=0.0038 *15* (1960Ma11). Mult=E1 from γγ(pol) (1959Wo52). δ: From γγ(θ) (1959Wo52).
1048.1 *3*		1047.87	0^+	0.0	0^+	E0			0.0079 *24*	E_γ: from 1979Ar16. $I_{(\gamma+ce)}$: From Ice(K)=0.0069 *21*, a weighted average from 1979Ar16 and 1975Sc32, and Ice(K)/Ice=0.876 (E0 theory). Mult.: no γ observed.
1109.2[@]	0.0024[@] *13*	1109.1	2^+	0.0	0^+	(E2)		0.00222		α(K)=0.00188 *3*; α(L)=0.000267 *4*; α(M)=5.80×10^{-5} *9*; α(N+..)=1.589×10^{-5} *23* α(N)=1.330×10^{-5} *19*; α(O)=2.04×10^{-6} *3*; α(P)=1.304×10^{-7} *19*; α(IPF)=4.22×10^{-7} *6*
1116.0 *10*	0.007 *4*	1460.54	$1,2^+$	344.29	2^+					
1314.61[a] *6*	6.55[a] *11*	1314.62	1^-	0.0	0^+	E1		7.73×10^{-4}		α(K)=0.000595 *9*; α(L)=7.69×10^{-5} *11*; α(M)=1.649×10^{-5} *23*; α(N+..)=8.45×10^{-5} *12* α(N)=3.79×10^{-6} *6*; α(O)=5.88×10^{-7} *9*; α(P)=4.01×10^{-8} *6*; α(IPF)=8.01×10^{-5} *12* Mult.: α(K)exp=0.00067 *16*.
1411.76[b] *5*	0.313[b] *6*	1756.04	1^-	344.29	2^+					

$^{152}_{64}Gd_{88}$-4

γ(^{152}Gd) (continued)

E_γ[‡]	I_γ[‡c]	E_i(level)	J_i^π	E_f	J_f^π
1460.65 *13*	0.011 *3*	1460.54	1,2$^+$	0.0	0$^+$
1755.98[b] *7*	0.0202[b] *18*	1756.04	1$^-$	0.0	0$^+$

† Additional information 1.

‡ From 1973MeXQ, except where noted otherwise. The evaluator has increased the author′s values by 8 eV to correct for a change in the energy of the 412 Au standard from 411.794, used by 1973MeXQ, to 411.80205 *17* (2000He14). At the same time, based on a comparison of the author′s values with later work, 1990Me15, and with the value for the 368γ of 1984Bu35, the evaluator has increased the uncertainty in the author′s values to a minimum of 70 eV. For the Iγ values, the evaluator has added in quadrature an uncertainty of 2% to account for the uncertainty in the efficiency curve.

From Adopted Gammas. Mult data from this dataset are given in comments. The α(K)exp are from the adopted Iγ′s and a weighted average of Ice(K) data of 1979Ar16, 1975Sc32, and 1960Ma11, normalized to α(K)exp(344γ)=0.03103 (E2 theory).

@ No deexciting transitions are observed from the 1109 level; however, this level is fed by the 647γ from the 1756 level. using the known decay properties from the 1109 level as given in Adopted Gammas, and if there is no direct β^- feeding of the 1109 level, an intensity balance gives the Iγ values shown. The energies are rounded-off values from Adopted Gammas.

& No deexciting transitions are observed from the 1123 level; however, this level is fed by the 192γ from the 1314 level and by the 633γ from the 1756 level. using the known decay properties from the 1123 level as given in Adopted Gammas, and if there is no direct β^- feeding of the 1123 level, an intensity balance gives the Iγ values shown. The energy is a rounded-off value from Adopted Gammas.

a Weighted average of data of 1975Pr05, 1973MeXQ, 1971Ba63 and 1969Va09.

b Weighted average of data of 1975Pr05, 1973MeXQ, and 1971Ba63.

c For absolute intensity per 100 decays, multiply by 0.142 *22*.

$^{152}_{64}$Gd$_{88}$-5

^{152}Eu β^- decay (9.3116 h)