^{91}Tc ε decay (3.14 min) 1976De37

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 114, 1293 (2013)	1-Sep-2013

Parent: ^{91}Tc: E=0.0; $J^\pi=(9/2)^+$; $T_{1/2}$=3.14 min *2*; Q(ε)=6222 *7*; %ε+%$β^+$ decay=100.0

Other measurements: 1974Ia01 (E($β^+$)=5.2 MeV *3*), 1956Sm96.

1976De37:Ge(Li) anti-Compton spectrometer. Measured Eγ, Iγ, γγ. A complete description of the experiment together with the complete set of data, is reported in 1975DeZX.

^{91}Mo Levels

E(level)	J^π†	$T_{1/2}$†	E(level)	J^π†
0.0	$9/2^+$	15.49 min *1*	1639.95 *8*	$(7/2,9/2^+)$
652.99‡ *10*	$1/2^-$	64.6 s *6*	1902.49 *7*	$9/2^+$
1156.23 *16*	$3/2^-$		2233.70 *9*	$9/2^+$
1362.02 *8*	$5/2^+$		2450.99 *9*	$9/2^+$
1414.21 *20*	$13/2^{(+)}$		2492.16 *17*	
1532.0 *3*	$5/2^-$		2716.44 *7*	$(7/2,9/2)^+$
1564.93 *9*			2781.12 *8*	$(7/2^+,9/2^+,11/2^+)$
1605.32 *7*			2887.54 *13*	$(9/2^+,11/2^+)$

† From Adopted Levels.

‡ γ feeding to 653 level: 0.69% 7.

ε,$β^+$ radiations

E(decay)	E(level)	I$β^+$ ‡	Iε‡	Log *ft*	I(ε+$β^+$)‡	Comments
(3334 *7*)	2887.54	2.0 *3*	0.44 *7*	5.82 *8*	2.4 *4*	av Eβ=1035.7 *33*; εK=0.1590 *13*; εL=0.01921 *15*; εM+=0.00442 *4*
(3441 *7*)	2781.12	3.6 *6*	0.70 *11*	5.64 *7*	4.3 *7*	av Eβ=1085.0 *33*; εK=0.1419 *11*; εL=0.01714 *13*; εM+=0.00394 *3*
(3506 *7*)	2716.44	8.1 *14*	1.4 *2*	5.35 *8*	9.5 *16*	av Eβ=1115.1 *33*; εK=0.1326 *10*; εL=0.01601 *12*; εM+=0.00368 *3*
(3730 *7*)	2492.16	1.3 *3*	0.18 *4*	6.30 *9*	1.5 *3*	av Eβ=1219.8 *33*; εK=0.1057 *8*; εL=0.01275 *9*; εM+=0.002930 *21*
(3771 *7*)	2450.99	19 *4*	2.6 *5*	5.16 *8*	22 *4*	av Eβ=1239.1 *33*; εK=0.1015 *7*; εL=0.01225 *9*; εM+=0.002814 *20*
(3988 *7*)	2233.70	1.1 *3*	0.11 *3*	6.56 *11*	1.2 *3*	av Eβ=1341.0 *33*; εK=0.0826 *6*; εL=0.00996 *7*; εM+=0.002290 *15*
(4320 *7*)	1902.49	2.5 *7*	0.19 *5*	6.41 *12*	2.7 *7*	av Eβ=1497.3 *34*; εK=0.0617 *4*; εL=0.00744 *5*; εM+=0.001709 *11*
(4582 *7*)	1639.95	2.8 *7*	0.17 *4*	6.51 *11*	3.0 *7*	av Eβ=1621.8 *34*; εK=0.0498 *3*; εL=0.00600 *4*; εM+=0.001378 *8*
(4617 *7*)	1605.32	2.4 *6*	0.14 *3*	6.60 *11*	2.5 *6*	av Eβ=1638.3 *34*; εK=0.0485 *3*; εL=0.00584 *4*; εM+=0.001341 *8*
(4657 *7*)	1564.93	4.5 *9*	0.26 *5*	6.34 *9*	4.8 *9*	av Eβ=1657.5 *34*; εK=0.0470 *3*; εL=0.00566 *3*; εM+=0.001300 *8*
(4690 *7*)	1532.0	0.48 *10*	0.027 *6*	7.33 *10*	0.51 *11*	av Eβ=1673.1 *34*; εK=0.04577 *25*; εL=0.00551 *3*; εM+=0.001267 *7*
(4808# *7*)	1414.21	0.73 *13*	0.037 *7*	7.21 *8*	0.77† *14*	av Eβ=1729.2 *34*; εK=0.04186 *22*; εL=0.00504 *3*; εM+=0.001158 *7*
(4860 *7*)	1362.02	2.3 *5*	0.11 *2*	6.75 *9*	2.4† *5*	av Eβ=1754.1 *34*; εK=0.04026 *21*; εL=0.00485 *3*; εM+=0.001114 *6*

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^{91}Tc ε decay (3.14 min) 1976De37 (continued)

ϵ,β^+ radiations (continued)

E(decay)	E(level)	Iβ^+ ‡	Iε‡	Log *ft*	I($\varepsilon+\beta^+$)‡	Comments
(6222 *7*)	0.0	41 *10*	0.81 *19*	6.10 *11*	42 *10*	av Eβ=2408.7 *34*; εK=0.01684 *7*; εL=0.002025 *8*; εM+=0.0004651 *1*

† log *ft* is too small, given the high degree of forbiddenness; probably results from incompleteness of the decay scheme.
‡ Absolute intensity per 100 decays.
# Existence of this branch is questionable.

^{91}Tc ε decay (3.14 min) 1976De37 (continued)

γ(^{91}Mo)

Iγ normalization: Calculated from intensity imbalance at excited states using theoretical I(β^+)/(I(β^+)+I(ε)) and Iγ($\gamma^{\pm}$, both decays)=15400 *2000*, assuming Iγ($\gamma^{\pm}$, 3.3-min decay)=3630 *260* as deduced from the decay scheme for that decay.

Since the difference in the half-lives of the two ^{91}Tc decays is too small to establish the assignment of γ′s to specific isomer decays, the assignments are based on the feeding of levels with previously known J^{π}. Levels with a transition to the g.s. are presumed to be fed in the 3.14-min decay from the ^{91}Tc ($9/2^+$) g.s. The γ-rays unplaced in the decay scheme could not be assigned unambiguously to either decay. Ground-state γ transitions from levels above 4600 keV could not be seen by 1976De37 because their energy exceeds the detector energy range.

Due to the large number of unplaced γ′s, weak ε+β^+ feedings should be regarded with caution.

E_γ	I_γ[&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[a]	Comments
205.6 *4*	3.1 *10*	1362.02	$5/2^+$	1156.23	$3/2^-$	[E1]	0.01572	α(K)=0.01383 *21*; α(L)=0.001569 *24*; α(M)=0.000279 *5*; α(N+..)=4.43×10^{-5} *7* α(N)=4.20×10^{-5} *7*; α(O)=2.25×10^{-6} *4*
217.8 *2*	9.0 *10*	2450.99	$9/2^+$	2233.70	$9/2^+$			
277.9 *2*	39 *4*	1639.95	$(7/2,9/2^+)$	1362.02	$5/2^+$			
297.1 *2*	14.9 *15*	1902.49	$9/2^+$	1605.32				
337.5 *2*	72 *12*	1902.49	$9/2^+$	1564.93				
375.8 *2*	32 *4*	1532.0	$5/2^-$	1156.23	$3/2^-$			
483.2 *6*	68 *5*	2716.44	$(7/2,9/2)^+$	2233.70	$9/2^+$			
502.9 *2*	44[@] *4*	1156.23	$3/2^-$	652.99	$1/2^-$			
548.7 *3*	105 *6*	2450.99	$9/2^+$	1902.49	$9/2^+$			
[x]562.0 *5*	11.4 *12*							Possibly coincident with 1639γ (1976De37).
628.4 *3*	47 *9*	2233.70	$9/2^+$	1605.32				
652.9 *1*		652.99	$1/2^-$	0.0	$9/2^+$	M4	0.0374	α(K)=0.0321 *5*; α(L)=0.00440 *7*; α(M)=0.000800 *12*; α(N+..)=0.0001265 *18* α(N)=0.0001203 *17*; α(O)=6.21×10^{-6} *9* $I_{(\gamma+ce)}$: intensity imbalance=44 *4* assuming negligible ε branch to 653 level. I_γ: 28 *3* in equilibrium deduced from the decay scheme.
668.8 *10*	20 *10*	2233.70	$9/2^+$	1564.93				
[x]690.8 *12*	4.3 *9*							
811.0 *5*	320 *20*	2450.99	$9/2^+$	1639.95	$(7/2,9/2^+)$			
813.9 *5*	110 *20*	2716.44	$(7/2,9/2)^+$	1902.49	$9/2^+$			
844.9 *3*	76 *8*	2450.99	$9/2^+$	1605.32				
851.8 *3*	54 *7*	2492.16		1639.95	$(7/2,9/2^+)$			
878.4 *1*	69 *5*	2781.12	$(7/2^+,9/2^+,11/2^+)$	1902.49	$9/2^+$			
[x]902.8 *2*	101 *5*							
[x]935.9 *2*	13.3 *12*							
985.0 *4*	13.9 *9*	2887.54	$(9/2^+,11/2^+)$	1902.49	$9/2^+$			
[x]992.7 *5*	13.9 *9*							
1076.5 *2*	59 *4*	2716.44	$(7/2,9/2)^+$	1639.95	$(7/2,9/2^+)$			

$^{91}_{42}Mo_{49}$-3

^{91}Tc ε decay (3.14 min) 1976De37 (continued)

γ(^{91}Mo) (continued)

E_γ	I_γ[&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[a]	Comments
1088.9 *4*	36.7 *23*	2450.99	9/2$^+$	1362.02	5/2$^+$			
1111.1 *1*	199 *7*	2716.44	(7/2,9/2)$^+$	1605.32				
x1146.7 *4*	9.1 *11*							
x1244.2 *3*	6.7 *9*							
x1255.6 *3*	6.7 *10*							
x1286.0 *2*	18.1 *17*							
1322.6 *2*	43.9 *20*	2887.54	(9/2$^+$,11/2$^+$)	1564.93				
1354.4 *2*	45.5 *19*	2716.44	(7/2,9/2)$^+$	1362.02	5/2$^+$			
1362.0 *1*	273[#] *12*	1362.02	5/2$^+$	0.0	9/2$^+$			
x1379.1 *3*	5.5 *10*							
1414.2 *2*	49.0 *30*	1414.21	13/2$^{(+)}$	0.0	9/2$^+$	E2	0.000421 *6*	α=0.000421 *6*; α(K)=0.000323 *5*; α(L)=3.60×10^{-5} *5*; α(M)=6.42×10^{-6} *9*; α(N+..)=5.60×10^{-5} *8* α(N)=9.78×10^{-7} *14*; α(O)=5.56×10^{-8} *8*; α(IPF)=5.49×10^{-5} *8*
x1491.4 *4*	11.7 *10*							
x1549.9[‡] *4*	5.3 *7*							
1564.9 *1*	438 *13*	1564.93		0.0	9/2$^+$			
1605.2 *1*	495 *15*	1605.32		0.0	9/2$^+$			
1639.9 *1*	583 *17*	1639.95	(7/2,9/2$^+$)	0.0	9/2$^+$			
x1650.4 *2*	35.9 *19*							
x1671.1 *3*	9.1 *8*							
1731.0 *2*	8.7 *8*	2887.54	(9/2$^+$,11/2$^+$)	1156.23	3/2$^-$			
x1752.0[‡] *3*	6.3 *8*							
x1762.7 *2*	7.1 *8*							
x1795.4[‡] *2*	7.1 *17*							
x1890.0[‡] *2*	6.0 *9*							
1902.3 *1*	380 *13*	1902.49	9/2$^+$	0.0	9/2$^+$			
x2173.0 *2*	19.3 *10*							Coincident with 375γ (1976De37).
2233.8 *1*	83.4 *35*	2233.70	9/2$^+$	0.0	9/2$^+$			
x2296.3 *2*	30.1 *15*							
x2397.3 *2*	5.2 *5*							
2450.9 *1*	863 *25*	2450.99	9/2$^+$	0.0	9/2$^+$			
2492.3 *2*	38.6 *15*	2492.16		0.0	9/2$^+$			
x2517.1 *3*	4.9 *5*							
x2527.4 *3*	41.6 *15*							
x2540.7 *7*	4.4 *6*							
x2580.8 *3*	7.8 *6*							
x2664.0 *4*	3.4 *6*							
2716.4 *1*	117 *4*	2716.44	(7/2,9/2)$^+$	0.0	9/2$^+$			
x2724.1 *3*	8.2 *6*							
2781.3 *1*	201 *8*	2781.12	(7/2$^+$,9/2$^+$,11/2$^+$)	0.0	9/2$^+$			
x2793.7 *2*	16.0 *12*							
x2820.4 *3*	6.0 *6*							

$^{91}_{42}Mo_{49}$-4

^{91}Tc ε decay (3.14 min) 1976De37 (continued)

γ(^{91}Mo) (continued)

E_γ	I_γ[&]	E_i(level)	J_i^π	E_f	J_f^π
[x]2859.6 *2*	8.6 *6*				
2887.8 *2*	88 *3*	2887.54	(9/2$^+$,11/2$^+$)	0.0	9/2$^+$
[x]3009.2 *2*	15.9 *13*				
[x]3045.6 *3*	7.0 *6*				
[x]3081.4 *6*	2.2 *4*				
[x]3118.3 *3*	15.3 *7*				
[x]3167.6 *4*	4.4 *5*				
[x]3197.4 *4*	11.5 *14*				
[x]3235.7[‡] *4*	2.0 *3*				
[x]3250.1[‡] *6*	0.7 *2*				
[x]3279.8 *3*	2.6 *5*				
[x]3307.8[‡] *6*	1.3 *4*				
[x]3374.0 *10*	1.1 *4*				
[x]3381.2 *5*	3.4 *4*				
[x]3403.7 *4*	5.0 *5*				
[x]3419.4 *4*	12.8 *9*				
[x]3453.6 *5*	7.3 *6*				
[x]3474.3[‡] *9*	1.0 *2*				
[x]3531.0 *3*	13.3 *7*				
[x]3541.8 *3*	6.0 *5*				
[x]3592.9 *3*	10.5 *8*				
[x]3627.5[‡] *15*	0.9 *3*				
[x]3645.7 *15*	2.6 *4*				
[x]3651.6 *15*	2.6 *4*				
[x]3669.8 *10*	1.4 *2*				
[x]3701.1 *6*	3.9 *2*				
[x]3737.0 *9*	7.4 *5*				
[x]3776.3[‡] *20*	1.5 *3*				
[x]3833.4 *9*	1.3 *2*				
[x]3887.2 *8*	1.8 *3*				
[x]3907.8[‡] *8*	2.5 *3*				
[x]3937.2 *5*	2.4 *3*				
[x]4033.5[‡] *6*	1.6 *4*				
[x]4046.7 *4*	3.2 *4*				
[x]4056.3 *4*	6.0 *4*				
[x]4075.6[‡] *4*	5.3 *6*				
[x]4086.2[‡] *4*	4.3 *4*				
[x]4118.9 *4*	3.7 *4*				
[x]4199.1 *8*	1.9 *3*				
[x]4216.7 *8*	3.3 *3*				
[x]4229.8 *9*	1.9 *3*				
[x]4401.1 *10*	1.1 *2*				
[x]4445.8 *15*	1.7 *3*				
[x]4592.9 *9*	1.1 *4*				

[†] From Adopted Gammas.
[‡] γ-ray not assigned unambiguously to ^{91}Tc ε decay.
[#] Intensity from 3.3-min decay has been subtracted. Iγ(206)=3.6 *10* and Iγ(1362)=320 *12* for (3.14 min + 3.3 min) decay.
[@] Calculated from intensity balance assuming there is no (ε+β$^+$) feeding to the 652 level (ΔJ=4) or 1156 level (ΔJ=3) in this decay.
[&] For absolute intensity per 100 decays, multiply by 0.0158 *25*.
[a] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[x] γ ray not placed in level scheme.

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^{91}Tc ε decay (3.14 min) 1976De37

Decay Scheme

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