^{100}Tc β^- decay (15.65 s) 1969Be69,2001Fu21,2017Gu17

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 172, 1 (2021)	31-Jan-2021

Parent: ^{100}Tc: E=0.0; $J^\pi=1^+$; $T_{1/2}$=15.65 s *12*; Q(β^-)=3206.4 *14*; %β^- decay=99.9982 *9*

^{100}Tc-$T_{1/2}$: from ^{100}Tc Adopted Levels.

^{100}Tc-Q(β^-): From 2017Wa10.

^{100}Tc-%β^- decay: %ε=0.0018 *9* for ^{100}Tc ε decay.

1969Be69: ^{100}Tc source was produced by irradiating samples of ^{99}Tc with thermal neutrons at Los Alamos Scientific Laboratory. γ rays were detected with Ge(Li) and NaI(Tl) detectors. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$, $\beta\gamma$-coin, $T_{1/2}$. Deduced levels, J, π, β- decay branching ratios, log *ft*, γ-ray multipolarities.

2001Fu21 (also 2005Fu18,2004Fu30): ^{100}Tc source was produced by irradiating ^{99}Tc samples with thermal neutrons at the Kyoto University Research Reactor Institute (KURRI). γ rays were detected with a HPGe detector and β particles were detected with a plastic scintillator. Measured Eγ, Iγ, $\beta\gamma$-coin, isotopic half-life, absolute intensities of 539γ and 591γ.

2017Gu17 (also 2020Gu06): ^{100}Tc produced in ^{100}Mo(p,n),E(p)=10 MeV at University of Jyvaskyla. Target was enriched to 97.42% ^{100}Mo. Purification in the JYFLTRAP double Penning Trap and then the activity was implanted directly at the bottom on a plastic β detector. Measured Eγ, Iγ, $\gamma\beta$ coincidences using the Decay Total Absorption Spectrometer (DTAS) composed of NaI(Tl) crystals. Deduced β intensity and absolute Iγ. Comparison with quasiparticle random-phase approximation calculations.

Additional information 1.

Others:

$T_{1/2}$(^{100}Tc g.s.): 2002Ab03, 1995Ha46, 1963Cs01, 1952Ho17, 1952Bo30.

β^- data: 1977ReZK, 1958Ok13, 1952Bo30, 1952Ho17.

$\beta\gamma$-coin: 1958Ok13.

Total decay energy deposit of 3205 keV *4* calculated by RADLIST code is in agreement with expected value of 3206.4 keV *14*.

^{100}Ru Levels

E(level)[†]	J^π[‡]	Comments
0.0	0^+	
539.48 *8*	2^+	
1130.25 *12*	0^+[#]	
1362.21 *8*	2^+	
1740.95 *10*	0^+[#]	
1864.99 *17*	2^+	
2051.51 *10*	0^+[#]	
2098.4 *4*	2^+	
2240.5 *10*	2^+	
2387.12 *12*	0^+[#]	
2660.3 *6*	$1,2^+$	
2837.9 *4*	$(1^+,2^+)$	
2933.7	$(1,2)^+$	E(level): from 2017Gu17.

[†] From least-squares fit to Eγ data, except where noted.

[‡] From the Adopted Levels.

[#] Spin=0 from $\gamma\gamma(\theta)$ in 1969Be69.

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β^- radiations

E(decay)	E(level)	Iβ^-[†#]	Log *ft*	Comments
(272.7 *14*)	2933.7	0.0024[‡] *9*	5.2 *2*	av Eβ=77.87 *45*
(368.5 *15*)	2837.9	0.006[‡] *3*	5.2 *2*	av Eβ=109.43 *50*
(546.1 *15*)	2660.3	0.0046 *9*	5.9 *1*	av Eβ=172.34 *57* Iβ^-: 0.0032 *30* from TAGS data (2017Gu17).
(819.3 *14*)	2387.12	0.063 *4*	5.42 *3*	av Eβ=277.62 *57* Iβ^-: 0.062 *6* from TAGS data (2017Gu17).
(965.9 *17*)	2240.5	0.0013 *7*	7.4 *3*	av Eβ=337.26 *71* Iβ^-: 0.006 *5* from TAGS data (2017Gu17).
(1108.0 *15*)	2098.4	0.0073 *7*	6.84 *5*	av Eβ=396.67 *62* Iβ^-: 0.0045 *40* from TAGS data (2017Gu17).
(1154.9 *14*)	2051.51	0.36 *5*	5.22 *6*	av Eβ=416.57 *60* Iβ^-: 0.31 *2* from TAGS data (2017Gu17).
(1341.4 *14*)	1864.99	0.030 *4*	6.55 *6*	av Eβ=496.96 *62* Iβ^-: 0.029 *3* from TAGS data (2017Gu17).
(1465.4 *14*)	1740.95	0.066 *3*	6.35 *2*	av Eβ=551.36 *62* Iβ^-: 0.062 *6* from TAGS data (2017Gu17).
(1844.2 *14*)	1362.21	0.029 *4*	7.11 *6*	av Eβ=721.00 *64* Iβ^-: 0.026 *8* from TAGS data (2017Gu17).
(2076.1 *14*)	1130.25	5.38 *13*	5.05 *1*	av Eβ=826.87 *65* E(decay),Iβ^-: E$\beta\approx$ 2200 from (2200β)(591γ) (1969Be69). Iβ^-: 5.2 *4* from TAGS data (2017Gu17).
(2666.9 *14*)	539.48	0.76 *14*	6.4 *1*	av Eβ=1100.94 *66* Measured Eβ=2880 *70* (1958Ok13). Others: 1952Bo30, 1952Ho17. Iβ^-: 0.39 *5* from TAGS data (2017Gu17).
(3206.4 *14*)	0.0	93.29 *3*	4.598 *4*	av Eβ=1354.78 *67* Measured Eβ=3380 *60* (1958Ok13). Others: 1952Bo30, 1952Ho17. Iβ^-: 93.9 *5* from TAGS data, also 92.8 *5* from 4$\pi\gamma$-β coin (2020Gu06,2017Gu17).

[†] From γ+ce intensity balance at each level, unless otherwise noted.
[‡] From TAGS data (2017Gu17).
[#] For absolute intensity per 100 decays, multiply by 0.999982 *9*.

$\gamma(^{100}Ru)$

Iγ normalization: from measurement of absolute intensity (per 100 decays of ^{100}Tc) of 6.60 *3* for 539.5γ and 5.50 *2* for 590.8γ (2005Fu18, 2001Fu21). Others: 6.0 *5* (2017Gu17, from branching ratio matrix and Iβ distribution); 0.070 from Iβ(1130 level)/Iβ(total)=0.057 (1969Be69); Iβ(1130 level) measured through (2200β)(591γ) coin.

E_γ [†]	I_γ [†&]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	δ [‡]	α [a]	$I_{(\gamma+ce)}$ [&]	Comments
378.7 *1*	0.46 *3*	1740.95	0^+	1362.21	2^+	E2		0.01252		α(K)=0.01083 *16*; α(L)=0.001390 *20*; α(M)=0.000256 *4* α(N)=4.06×10^{-5} *6*; α(O)=1.85×10^{-6} *3*
499.8 [@b]	≈0.01	2240.5	2^+	1740.95	0^+					
539.52 *11*	100	539.48	2^+	0.0	0^+	E2		0.00428		α(K)=0.00373 *6*; α(L)=0.000456 *7*; α(M)=8.37×10^{-5} *12* α(N)=1.339×10^{-5} *19*; α(O)=6.52×10^{-7} *10* I$_\gamma$: 6.60 *3* per 100 decays of ^{100}Tc from $\beta\gamma$ coin (2005Fu18,2001Fu21).
590.77 *10*	81.4 *19*	1130.25	0^+	539.48	2^+	E2		0.00332		α(K)=0.00289 *4*; α(L)=0.000350 *5*; α(M)=6.42×10^{-5} *9* α(N)=1.029×10^{-5} *15*; α(O)=5.08×10^{-7} *8* I$_\gamma$: 5.50 *2* per 100 decays of ^{100}Tc from $\beta\gamma$ coin (2005Fu18,2001Fu21), 5.2 *5* (2017Gu17). I$_\gamma$: from unweighted average of Iγ(591γ)/Iγ(539γ)=1.232 *8*/1.550 *10*= 0.795 *7* (2004Fu30) and Iγ(591γ)/Iγ(539γ)=5.50 *2*/6.60 *3*=0.833 *5* (2005Fu18,2001Fu21). Others: 84.7 *21* (2001Fu21) and 82 *6* (1969Be69) are in agreement with this value. (591γ)(540γ)(θ): A$_2$=+0.36 *5*, A$_4$=+1.13 *9* (1969Be69).
689.2 *1*	0.59 *2*	2051.51	0^+	1362.21	2^+	[E2]		0.00219		α(K)=0.00191 *3*; α(L)=0.000228 *4*; α(M)=4.18×10^{-5} *6* α(N)=6.72×10^{-6} *10*; α(O)=3.38×10^{-7} *5*
734.8 *3*	0.17 *2*	1864.99	2^+	1130.25	0^+	E2		0.00186		α(K)=0.001623 *23*; α(L)=0.000192 *3*; α(M)=3.52×10^{-5} *5* α(N)=5.67×10^{-6} *8*; α(O)=2.87×10^{-7} *4*
736.9 [@b]	0.02	2098.4	2^+	1362.21	2^+	(M1,E2)				
822.6 *1*	1.05 *3*	1362.21	2^+	539.48	2^+	M1+E2	+3.7 *3*			(822γ)(540γ)(θ): A$_2$=−0.16 *11*, A$_4$=+0.47 *19* (1969Be69).
1024.9 *1*	0.54 *2*	2387.12	0^+	1362.21	2^+					
1130.1		1130.25	0^+	0.0	0^+	E0			≈0.0012	E$_\gamma$,I$_{(\gamma+ce)}$: from the Adopted Gammas.
1201.5 *1*	0.54 *2*	1740.95	0^+	539.48	2^+					(1201γ)(540γ)(θ): A$_2$=+0.4 *3*, A$_4$=+1.1 *5* (1969Be69).
1325.8 *5*	0.15 *5*	1864.99	2^+	539.48	2^+	M1+E2	−1.0 *3*			
1362.2 *1*	1.00 *3*	1362.21	2^+	0.0	0^+	E2				Additional information 2.
1512.1 *1*	4.8 *7*	2051.51	0^+	539.48	2^+	E2				(1512γ)(540γ)(θ): A$_2$=+0.30 *6*, A$_4$=+1.26 *10* (1969Be69).
1558.9 *3*	0.11 *1*	2098.4	2^+	539.48	2^+	M1				
1701.0 [#] *10*	0.02 [#] *1*	2240.5	2^+	539.48	2^+					
1847.6 *2*	0.41 *5*	2387.12	0^+	539.48	2^+					(1848γ)(540γ)(θ): A$_2$=+0.6 *4*, A$_4$=+1.2 *5* (1969Be69).
1864.9 *2*	0.14 *1*	1864.99	2^+	0.0	0^+	E2				
[x]1875.0 [#] *10*	0.02 [#] *1*									

^{100}Tc β^- decay (15.65 s) 1969Be69,2001Fu21,2017Gu17 (continued)

$\gamma(^{100}Ru)$ (continued)

E_γ [†]	I_γ [†&]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]
2121.2[#] *7*	0.05[#] *1*	2660.3	$1,2^+$	539.48	2^+	
[x]2127.7[#] *10*	0.02[#] *1*					
2298.4 *4*	0.09 *4*	2837.9	$(1^+,2^+)$	539.48	2^+	D+Q
2659.5[#] *10*	0.02[#] *1*	2660.3	$1,2^+$	0.0	0^+	

[†] Weighted averages from 2001Fu21 and 1969Be69, unless otherwise stated.
[‡] From the Adopted Gammas, except where assumed assignment is given in square brackets from ΔJ^π.
[#] γ from 1969Be69 only.
[@] γ unobserved but its existence assumed (by 1969Be69) according to the proposed decay scheme.
[&] For absolute intensity per 100 decays, multiply by 0.0660 *3*.
[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.
[b] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

$^{100}_{44}Ru_{56}$-4

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Legend

Decay Scheme

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

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)
- Coincidence
- Coincidence (Uncertain)