^{110}Tc β^- decay 2000Wa07,1990Ay02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	G. Gürdal and F. G. Kondev	NDS 113, 1315 (2012)	1-Aug-2011

Parent: ^{110}Tc: E=0.0; J$^\pi$=(2,3$^+$); $T_{1/2}$=0.900 s *13*; Q(β^-)=9039 *13*; %β^- decay=100.0

2000Wa07: Source : ^{110}Tc was produced by proton induced-fission of ^{238}U and was extracted using online-mass separation technique at Jyvaskyla. A moving tape, 2 plastic scintillators, 3 Ge detectors and one LEPS detector were used. Measured: $\beta\gamma$, $\gamma\gamma$. Deduced: Eγ, Iγ, J^π.

1990Ay02: ^{110}Tc was produced by proton induced-fission of ^{238}U and was extracted using online-mass separation technique at Jyvaskyla. The intensity of the separated ^{110}Tc beam was 200 μC. A moving tape was used to transport the mass-separated beam. Gamma-rays were detected using 25 % and 20 % Ge detectors. The x-rays and the low-energy γ-rays were detected by using 1.4 cm^3 Ge detector. The β-rays were observed with a telescope system consisting of a 300 mm^2, 500 μm thick surface barrier ΔE detector and a 6 cm thick, 7.5 cm in diameter NE102 plastic E-detector. Elli spectrometer was used to measure the internal conversion electrons.

Others: 2000Wa14, 1995Sc24, 1990Al43, 1991Jo11, 1990Al43, 1988AlZY, 1978Fr16, 1976MaYL, 1976Tr02, 1975Fe12, 1973TrZM, 1969WiZX.

^{110}Ru Levels

E(level)†	J$^\pi$‡	$T_{1/2}$	Comments
0.0	0$^+$	12.04 s *17*	$T_{1/2}$: From Adopted Levels.
240.73 *8*	2$^+$	0.50 ns *8*	$T_{1/2}$: From 1995Sc24 using the centroid shift.
612.86 *8*	(2$^+$)	0.16 ns *8*	$T_{1/2}$: From 372.1γ(t) in 1995Sc24 using the centroid shift. Others: 0.01 ns *16* for 613.0γ(t) in 1995Sc24 using the centroid shift.
663.35 *9*	4$^+$		
859.97 *9*	(3$^+$)		
1084.36 *12*	(4$^+$)		
1137.33 *10*	(0$^+$)		
1396.42 *8*	2$^+$		
1655.84 *10*	(2,3,4$^+$)		
1799.5 *3*	(2,3,4$^+$)		
1820.48 *10*	(2,3,4$^+$)		
1883.34 *22*	(2,3,4$^+$)		
1978.20 *19*	(2$^+$,3,4$^+$)		
2003.57 *22*	(2,3,4$^+$)		
2042.38 *14*	(2,3,4)		
2047.02 *23*	(1,2$^+$)		
2085.27 *13*	(2,3,4$^+$)		
2143.1 *3*	(1$^+$,2,3,4$^+$)		
2152.70 *18*	(2,3,4$^+$)		
2204.6 *4*	(2,3,4$^+$)		
2266.3 *4*	(2,3,4$^+$)		
2337.9 *4*	(2$^+$,3,4$^+$)		
2366.9 *5*	(2,3,4$^+$)		
2413.02 *25*			
2419.6 *4*	(1,2$^+$)		
2491.4 *6*	(2,3,4$^+$)		
2552.04 *23*	(1,2$^+$)		
2573.8 *7*	(2,3,4$^+$)		
2942.8 *4*	(3$^-$)		
3006.07 *23*	(1,2$^+$)		
3019.5 *8*	(2,3,4$^+$)		
3072.2 *3*	(2,3,4$^+$)		
3091.39 *14*			

Continued on next page (footnotes at end of table)

^{110}Tc β^- decay 2000Wa07,1990Ay02 (continued)

^{110}Ru Levels (continued)

† From a least-square fit to E_γ.
‡ From Adopted Levels.

β^- radiations

E(decay)	E(level)	$I\beta^-$ †#	Log *ft* ‡	Comments
(5948 *13*)	3091.39	1.23 *23*	6.41 *9*	av Eβ=2662.1 *63*
(5967 *13*)	3072.2	2.92 *23*	6.05 *4*	av Eβ=2671.3 *63*
(6020 *13*)	3019.5	0.77 *16*	6.64 *9*	av Eβ=2696.5 *63*
(6033 *13*)	3006.07	2.45 *25*	6.14 *5*	av Eβ=2703.0 *63*
(6096 *13*)	2942.8	0.38 *7*	6.97 *8*	av Eβ=2733.2 *63*
(6465 *13*)	2573.8	0.75 *11*	6.79 *7*	av Eβ=2909.9 *63*
(6487 *13*)	2552.04	0.34 *7*	7.14 *9*	av Eβ=2920.3 *63*
(6548 *13*)	2491.4	1.23 *16*	6.60 *6*	av Eβ=2949.3 *63*
(6619 *13*)	2419.6	0.41 *6*	7.10 *7*	av Eβ=2983.7 *63*
(6626 *13*)	2413.02	0.69 *16*	6.88 *10*	av Eβ=2986.8 *63*
(6672 *13*)	2366.9	1.53 *16*	6.54 *5*	av Eβ=3008.9 *63*
(6701 *13*)	2337.9	0.60 *10*	6.96 *8*	av Eβ=3022.8 *63*
(6773 *13*)	2266.3	0.92 *8*	6.79 *4*	av Eβ=3057.1 *63*
(6834 *13*)	2204.6	0.67 *9*	6.95 *6*	av Eβ=3086.6 *63*
(6886 *13*)	2152.70	3.4 *4*	6.26 *6*	av Eβ=3111.4 *63*
(6896 *13*)	2143.1	0.77 *8*	6.91 *5*	av Eβ=3116.0 *63*
(6954 *13*)	2085.27	2.91 *25*	6.35 *4*	av Eβ=3143.7 *63*
(6992 *13*)	2047.02	4.3 *7*	6.19 *8*	av Eβ=3162.0 *63*
(6997 *13*)	2042.38	1.30 *16*	6.71 *6*	av Eβ=3164.2 *63*
(7035 *13*)	2003.57	2.22 *23*	6.49 *5*	av Eβ=3182.8 *63*
(7061 *13*)	1978.20	1.61 *18*	6.63 *5*	av Eβ=3194.9 *63*
(7156 *13*)	1883.34	1.00 *8*	6.87 *4*	av Eβ=3240.3 *63*
(7219 *13*)	1820.48	4.7 *7*	6.21 *7*	av Eβ=3270.3 *63*
(7240 *13*)	1799.5	1.30 *16*	6.78 *6*	av Eβ=3280.4 *63*
(7383 *13*)	1655.84	2.0 *4*	6.63 *9*	av Eβ=3349.1 *63*
(7643 *13*)	1396.42	5.0 *7*	6.30 *7*	av Eβ=3473.1 *63*
(7955 *13*)	1084.36	1.04 *8*	7.06 *4*	av Eβ=3622.2 *63*
(8179 *13*)	859.97	8.5 *6*	6.20 *4*	av Eβ=3729.4 *62*
(8376 *13*)	663.35	3.0 *4*	6.70 *6*	av Eβ=3823.3 *62*
(8426 *13*)	612.86	18.3 *11*	5.93 *3*	av Eβ=3847.4 *62*
(8798 *13*)	240.73	23.3 *11*	5.907 *22*	av Eβ=4024.9 *62*

† From intensity balances and the level scheme by the evaluators. Since the decay scheme suffers from pandemonium, values should be considered as tentative.
‡ Since the decay scheme is incomplete (pandemonium), the values are tentative.
# Absolute intensity per 100 decays.

$\gamma(^{110}Ru)$

Iγ normalization: From Σ Ti(g.s.)=100. β^- feeding to the $J^\pi = 0^+$ g.s. is assumed to be negligible.

E_γ ‡	I_γ ‡@	E_i(level)	J^π_i	E_f	J^π_f	Mult.#	α †	Comments
164.7 *1*	2.2 *4*	1820.48	(2,3,4$^+$)	1655.84	(2,3,4$^+$)			
196.6 *1*	0.23 *3*	859.97	(3$^+$)	663.35	4$^+$	[M1]	0.0490	α(K)=0.0428 *6*; α(L)=0.00508 *8*; α(M)=0.000934 *14*; α(N+..)=0.0001589 *23* α(N)=0.0001510 *22*; α(O)=7.90×10^{-6} *12*

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^{110}Tc β^- decay 2000Wa07,1990Ay02 (continued)

$\gamma(^{110}Ru)$ (continued)

E_γ ‡	I_γ ‡@	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	α †	Comments
221.9 *1*	1.70 *20*	2042.38	(2,3,4)	1820.48	(2,3,4$^+$)			
224.5 *5*	0.017 *1*	1084.36	(4$^+$)	859.97	(3$^+$)	[M1]	0.0345	α(K)=0.0302 *5*; α(L)=0.00357 *6*; α(M)=0.000656 *10*; α(N+..)=0.0001117 *17* α(N)=0.0001062 *17*; α(O)=5.57×10^{-6} *9*
240.7 *1*	100	240.73	2$^+$	0.0	0$^+$	E2	0.0569	α(K)=0.0485 *7*; α(L)=0.00686 *10*; α(M)=0.001267 *18*; α(N+..)=0.000206 *3* α(N)=0.000198 *3*; α(O)=7.97×10^{-6} *12*
247.1 *1*	3.1 *3*	859.97	(3$^+$)	612.86	(2$^+$)	[M1]	0.0269	α(K)=0.0235 *4*; α(L)=0.00278 *4*; α(M)=0.000510 *8*; α(N+..)=8.68×10^{-5} *13* α(N)=8.25×10^{-5} *12*; α(O)=4.33×10^{-6} *6*
259.2 *1*	0.21 *1*	1396.42	2$^+$	1137.33	(0$^+$)	[E2]	0.0441	α(K)=0.0377 *6*; α(L)=0.00523 *8*; α(M)=0.000965 *14*; α(N+..)=0.0001576 *23* α(N)=0.0001514 *22*; α(O)=6.24×10^{-6} *9*
366.0 *1*	0.90 *20*	2413.02		2047.02	(1,2$^+$)			
372.1 *1*	23.7 *10*	612.86	(2$^+$)	240.73	2$^+$	(M1+E2)	0.0114 *19*	α(K)=0.0099 *16*; α(L)=0.0012 *3*; α(M)=0.00023 *5*; α(N+..)=3.8×10^{-5} *8* α(N)=3.6×10^{-5} *7*; α(O)=1.74×10^{-6} *22*
421.0 *5*	0.319 *9*	1084.36	(4$^+$)	663.35	4$^+$			
422.6 *1*	6.9 *4*	663.35	4$^+$	240.73	2$^+$	E2	0.0089 *13*	α(K)=0.00769 *11*; α(L)=0.000971 *14*; α(M)=0.000178 *3*; α(N+..)=2.97×10^{-5} *5* α(N)=2.84×10^{-5} *4*; α(O)=1.325×10^{-6} *19*
424.2 *1*	4.4 *7*	1820.48	(2,3,4$^+$)	1396.42	2$^+$			
471.5 *1*	0.63 *8*	1084.36	(4$^+$)	612.86	(2$^+$)	[E2]	0.0064 *9*	α(K)=0.00552 *8*; α(L)=0.000686 *10*; α(M)=0.0001261 *18*; α(N+..)=2.11×10^{-5} *3* α(N)=2.01×10^{-5} *3*; α(O)=9.58×10^{-7} *14*
536.3 *1*	0.24 *5*	1396.42	2$^+$	859.97	(3$^+$)	[M1]	0.0039 *6*	α(K)=0.00345 *5*; α(L)=0.000398 *6*; α(M)=7.29×10^{-5} *11*; α(N+..)=1.245×10^{-5} *18* α(N)=1.182×10^{-5} *17*; α(O)=6.30×10^{-7} *9*
612.9 *1*	19.0 *6*	612.86	(2$^+$)	0.0	0$^+$	[E2]	0.0030 *5*	α(K)=0.00262 *4*; α(L)=0.000315 *5*; α(M)=5.78×10^{-5} *8*; α(N+..)=9.73×10^{-6} *14* α(N)=9.27×10^{-6} *13*; α(O)=4.60×10^{-7} *7*
619.2 *1*	15.0 *5*	859.97	(3$^+$)	240.73	2$^+$	[M1]	0.0028 *4*	α(K)=0.00247 *4*; α(L)=0.000283 *4*; α(M)=5.18×10^{-5} *8*; α(N+..)=8.85×10^{-6} *13* α(N)=8.41×10^{-6} *12*; α(O)=4.49×10^{-7} *7*
733.1 *1*	0.83 *6*	1396.42	2$^+$	663.35	4$^+$	[E2]	0.0019 *3*	α(K)=0.001633 *23*; α(L)=0.000193 *3*; α(M)=3.54×10^{-5} *5*; α(N+..)=5.99×10^{-6} *9* α(N)=5.70×10^{-6} *8*; α(O)=2.89×10^{-7} *4*
783.6 *1*	0.67 *9*	1396.42	2$^+$	612.86	(2$^+$)			
796.1 *2*	1.10 *10*	1655.84	(2,3,4$^+$)	859.97	(3$^+$)			
843.6 *2*	0.39 *5*	1084.36	(4$^+$)	240.73	2$^+$	[E2]	0.0013 *19*	α(K)=0.001153 *17*; α(L)=0.0001349 *19*; α(M)=2.47×10^{-5} *4*;

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^{110}Tc β^- decay 2000Wa07,1990Ay02 (continued)

$\gamma(^{110}Ru)$ (continued)

E_γ ‡	I_γ ‡@	E_i(level)	J^π_i	E_f	J^π_f	Mult.#	α†	Comments
								α(N+..)=4.19×10^{-6} α(N)=3.99×10^{-6} *6*; α(O)=2.05×10^{-7} *3*
853.4 *2*	0.40 *7*	3006.07	(1,2$^+$)	2152.70	(2,3,4$^+$)			
896.7 *1*	2.40 *10*	1137.33	(0$^+$)	240.73	2$^+$	[E2]	0.0011 *16*	α(K)=0.000997 *14*; α(L)=0.0001161 *17*; α(M)=2.13×10^{-5} *3*; α(N+..)=3.61×10^{-6} α(N)=3.43×10^{-6} *5*; α(O)=1.771×10^{-7} *25*
960.5 *1*	0.90 *10*	1820.48	(2,3,4$^+$)	859.97	(3$^+$)			
1025.2 *3*	1.11 *20*	3072.2	(2,3,4$^+$)	2047.02	(1,2$^+$)			I_γ: Uncertainty of 0.020 quoted in table I of 2000Wa07 is probably a misprint. The evaluator has increased it by a factor of 10.
1043.6 *5*	0.75 *6*	1655.84	(2,3,4$^+$)	612.86	(2$^+$)			
1155.8 *1*	6.9 *4*	1396.42	2$^+$	240.73	2$^+$			
1186.6 *3*	1.70 *20*	1799.5	(2,3,4$^+$)	612.86	(2$^+$)			E_γ: Assigned to depopulate 2047 keV level in 1990Ay02.
1225.3 *1*	3.1 *3*	2085.27	(2,3,4$^+$)	859.97	(3$^+$)			
1270.9 *1*	1.6 *3*	3091.39		1820.48	(2,3,4$^+$)			
1282.3 *3*	0.54 *7*	2419.6	(1,2$^+$)	1137.33	(0$^+$)			
1292.9 *2*	0.70 *10*	2152.70	(2,3,4$^+$)	859.97	(3$^+$)			
1314.7 *2*	1.30 *20*	1978.20	(2$^+$,3,4$^+$)	663.35	4$^+$			
1390.7 *2*	2.9 *3*	2003.57	(2,3,4$^+$)	612.86	(2$^+$)			
1396.4 *2*	2.00 *20*	1396.42	2$^+$	0.0	0$^+$	[E2]	0.0005 *7*	α(K)=0.000380 *6*; α(L)=4.31×10^{-5} *6*; α(M)=7.89×10^{-6} *11*; α(N+..)=5.06×10^{-5} *8* α(N)=1.277×10^{-6} *18*; α(O)=6.78×10^{-8} *10*; α(IPF)=4.93×10^{-5} *7*
1414.7 *2*	0.45 *9*	2552.04	(1,2$^+$)	1137.33	(0$^+$)			
1415.1 *1*	3.00 *20*	1655.84	(2,3,4$^+$)	240.73	2$^+$			
1539.5 *3*	4.2 *5*	2152.70	(2,3,4$^+$)	612.86	(2$^+$)			
1579.0 *2*	1.90 *20*	1820.48	(2,3,4$^+$)	240.73	2$^+$			E_γ: Least-square fit gives 1579.8 *1* keV.
1642.6 *2*	1.30 *10*	1883.34	(2,3,4$^+$)	240.73	2$^+$			
1674.6 *4*	0.36 *7*	2337.9	(2$^+$,3,4$^+$)	663.35	4$^+$			
1737.8 *3*	0.80 *10*	1978.20	(2$^+$,3,4$^+$)	240.73	2$^+$			
1806.4 *3*	3.8 *3*	2047.02	(1,2$^+$)	240.73	2$^+$			
1844.5 *3*	0.70 *10*	2085.27	(2,3,4$^+$)	240.73	2$^+$			
1868.6 *5*	0.60 *9*	3006.07	(1,2$^+$)	1137.33	(0$^+$)			
1902.4 *3*	1.00 *10*	2143.1	(1$^+$,2,3,4$^+$)	240.73	2$^+$			
1963.9 *4*	0.87 *11*	2204.6	(2,3,4$^+$)	240.73	2$^+$			
2025.6 *4*	1.20 *10*	2266.3	(2,3,4$^+$)	240.73	2$^+$			
2046.8 *4*	3.8 *7*	2047.02	(1,2$^+$)	0.0	0$^+$			
2082.8 *4*	0.49 *8*	2942.8	(3$^-$)	859.97	(3$^+$)			
2096.8 *7*	0.42 *11*	2337.9	(2$^+$,3,4$^+$)	240.73	2$^+$			
2126.2 *5*	2.00 *20*	2366.9	(2,3,4$^+$)	240.73	2$^+$			
2212.2 *5*	0.80 *10*	3072.2	(2,3,4$^+$)	859.97	(3$^+$)			
2250.6 *6*	1.60 *20*	2491.4	(2,3,4$^+$)	240.73	2$^+$			
2333.0 *7*	0.98 *14*	2573.8	(2,3,4$^+$)	240.73	2$^+$			
2393.0 *7*	2.2 *3*	3006.07	(1,2$^+$)	612.86	(2$^+$)			
2406.6 *8*	1.00 *20*	3019.5	(2,3,4$^+$)	612.86	(2$^+$)			
2459.4 *8*	1.90 *20*	3072.2	(2,3,4$^+$)	612.86	(2$^+$)			

† Additional information 1.

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^{110}Tc β^- decay 2000Wa07,1990Ay02 (continued)

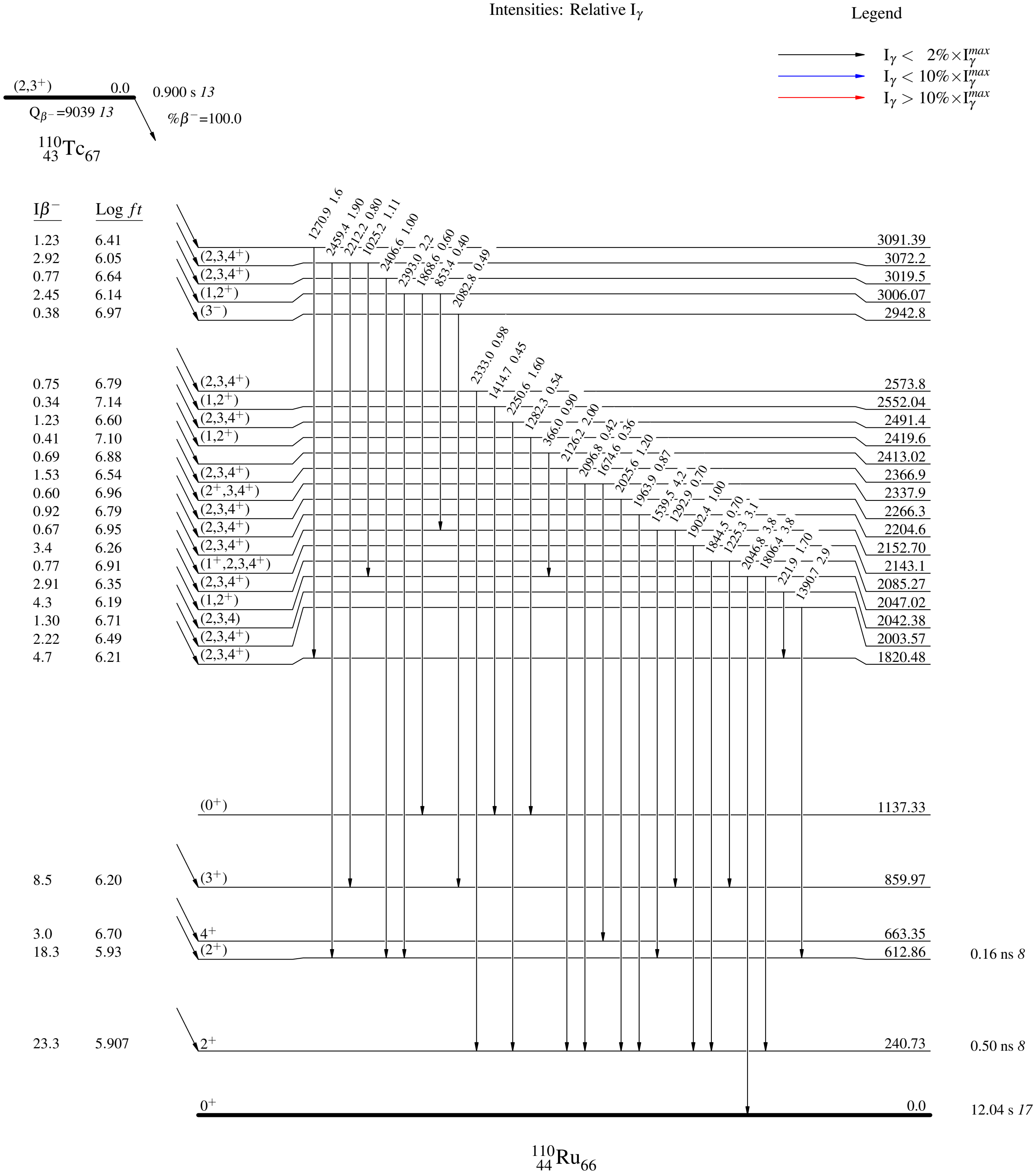
γ(^{110}Ru) (continued)

‡ From 2000Wa07, unless otherwise stated.
# From ^{110}Ru adopted gammas.
@ For absolute intensity per 100 decays, multiply by 0.77 *13*.

^{110}Tc β^- decay 2000Wa07,1990Ay02

Decay Scheme

Intensities: Relative I_γ



^{110}Tc β^- decay 2000Wa07,1990Ay02

Decay Scheme (continued)

Intensities: Relative I_γ