^{114}Tc β^- decay:100 ms 2011Ri01

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jean Blachot	NDS 113, 515 (2012)	1-Jan-2012

Parent: ^{114}Tc: E=0+x; J^π=(≥4); $T_{1/2}$=100 ms *20*; Q(β^-)=11785 *12*; %β^- decay=100.0

^{114}Tc-Q(β^-): Measured in 2011Ri01 from cyclotron frequency ratio of singly charged ^{114}Ru and ^{114}Tc ions in Penning-trap method. This value represents a possible mixture of both the isomers of ^{114}Tc.

^{114}Tc-$T_{1/2}$: Measured by 2011Ri01 from the fitting of decay curves of 443γ and 544γ with a single exponential.

^{114}Tc-%β^- decay: Note that ^{114}Tc could also decay by delayed neutrons by a small fraction.

Penning-trap assisted γ-ray spectroscopy at JYFL facility.

Tc ions were produced in U(d,F) at 25 MeV beam energy at the IGISOL facility. Fission products were thermalized inside the gas cell, and guided through the sextupole ion guide (SPIG) and accelerated to 30 keV. The ions were directed through a 55° dipole magnet and injected into a gas-filled rf cooler buncher, and finally injected into the double Penning-trap JYFLTRAP. Measured cyclotron frequencies to determine Q value. For decay measurements, purified ions of ^{114}Tc were transported through the second Penning trap to the spectroscopy setup. Purified beam implanted into a movable tape surrounded a 2 mm thick plastic scintillation detector and three Ge detectors and a LOAX Ge detector for β, γ, and x rays, Eγ, Iγ, $\beta\gamma$ and $\gamma\gamma$ coin measurements. The yield of high-spin (≥4) isomer to the low-spin (1^+) isomer is deduced by 2011Ri01 to be 0.27 *6*.

In an e-mail reply of Jan 11, 2011 from the first author (J. Rissanen), it is stated that there is a misprint in table I of 2011Ri01. The intensity of the two components of the 563.4-keV γ rays should read as follows: 23 *4* for 828.5 –> 265.1 transition and 10 *4* for 563.4 –> 0.0 transition. Values were reversed in table I.

^{114}Ru Levels

E(level)†	J^π	E(level)†	J^π	E(level)†	J^π	E(level)†	J^π
0.0	0^+	708.2 *3*	(4^+)	1082.0 *6*	(4^+)	1578.5 *6*	(≥3)
265.2 *2*	2^+	828.5 *2*	(3^+)	1298.8 *4*	(6^+)	1602.4 *6*	(≥3)
563.3 *2*	(2^+)	1056.1 *4*	(≥3)	1372.5 *3*	(5^+)	2068.7 *10*	(≥3)

† From least-squares fit to Eγ's.

β^- radiations

E(decay)	E(level)	Iβ^-‡	Log *ft*†	Comments
(9716 *12*)	2068.7	4 *2*	>6.0	
(10183 *12*)	1602.4	3 *3*	>6.1	
(10207 *12*)	1578.5	5 *3*	>6.0	
(10413 *12*)	1372.5	14 *6*	>5.5	
(10486 *12*)	1298.8	14 *5*	>5.5	
(10703 *12*)	1082.0	12 *4*	>5.7	
(10729 *12*)	1056.1	6 *2*	>6.0	
(10957 *12*)	828.5	28 *14*	>5.3	Iβ^-: Xundl's note: from γ-intensity balance, the compiler obtains %β^-=21 *10*, this would give log *ft*>5.4.
(11077 *12*)	708.2	16 *7*	>5.6	

† All values are considered as lower limits by 2011Ri01 due to possible unobserved feedings to high-energy states. Note that ^{114}Tc could also decay by delayed neutrons by a small fraction (XUNDL's note).

‡ Absolute intensity per 100 decays.

^{114}Tc β^- decay:100 ms 2011Ri01 (continued)

$\gamma(^{114}Ru)$

Iγ normalization: From comparison of $\%\beta^-$ and γ-ray intensities as quoted in 2011Ri01.

E_γ	I_γ[†‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[#]	Comments
227.6 *3*	5 *2*	1056.1	(≥3)	828.5	(3$^+$)	[E2]	0.069	
265.1[@] *2*	59[@] *4*	265.2	2$^+$	0.0	0$^+$	[E2]	0.0408	I_γ: deduced by XUNDL from combined I(γ+ce)=100 *6* from mixed isomers.
265.1[@] *2*	14[@] *6*	828.5	(3$^+$)	563.3	(2$^+$)	[E2]	0.0408	I_γ: combined I(γ+ce)=15 *6* from mixed isomers; a small fraction (≈0.3 units) may be associated with the decay of the low-spin isomer.
298.0 *2*	14 *2*	563.3	(2$^+$)	265.2	2$^+$	[E2]	0.0274	I_γ: deduced by XUNDL from combined I(γ+ce)=29 *3* from mixed isomers.
443.0 *2*	29 *3*	708.2	(4$^+$)	265.2	2$^+$			
518.7 *5*	9 *2*	1082.0	(4$^+$)	563.3	(2$^+$)			
544.0 *2*	10 *2*	1372.5	(5$^+$)	828.5	(3$^+$)			
563.4[@] *2*	5[@] *2*	563.3	(2$^+$)	0.0	0$^+$	[E2]	0.0038	I_γ: deduced by XUNDL from combined I(γ+ce)=10 *4* from mixed isomers. Note that 23 *4* in table I of 2011Ri01 is a misprint.
563.4[@] *2*	23[@] *4*	828.5	(3$^+$)	265.2	2$^+$			I_γ: combined intensity from mixed isomers; a small fraction (≈0.5 units) may be associated with the decay of the low-spin isomer. Note that 10 *4* in table I of 2011Ri01 is a misprint.
590.6 *2*	10 *2*	1298.8	(6$^+$)	708.2	(4$^+$)			
773.9 *5*	2 *2*	1602.4	(≥3)	828.5	(3$^+$)			
870.3 *5*	4 *2*	1578.5	(≥3)	708.2	(4$^+$)			
1360.5[&] *9*	3 *1*	2068.7	(≥3)	708.2	(4$^+$)			

† Obtained from β-gated γ-singles spectra. 2011Ri01 state that intensities include correction for internal conversion with assumed E2 multipolarity for low-energy transitions.

‡ For absolute intensity per 100 decays, multiply by 1.37 *10*.

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.

@ Multiply placed with intensity suitably divided.

& Placement of transition in the level scheme is uncertain.

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Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
@ Multiply placed: intensity suitably divided

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