

$^{104}\text{Mo } \beta^- \text{ decay}$ 1981TiZZ

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jean Blachot	NDS 108,2035 (2007)	30-Mar-2007

Parent: ^{104}Mo : $E=0.0$; $J^\pi=0^+$; $T_{1/2}=60 \text{ s}$ 2; $Q(\beta^-)=2157 \text{ 28}$; $\% \beta^- \text{ decay}=100.0$

Activity $^{235}\text{U}(\text{n},\text{f})$ from LOHENGRIN on-line isotope separation, chem.

Measured: γ , $\gamma\gamma$, $\gamma\gamma(\text{t})$ (1981TiZZ), $\gamma(\text{t})$ (1976KaYO), $\beta\gamma$ (1987Gr18).

The preliminary level scheme is as given by 1981TiZZ was confirmed by 1987Gr18.

 ^{104}Tc Levels

E(level)	$J^\pi^\dagger$	$T_{1/2}$	Comments
0	(3^+)	18.3 min 3	
69.7 2	($^+$)	3.5 μs 3	$T_{1/2}$: from $\gamma\gamma(\text{t})$ (1981TiZZ), other: 5 μs 2 (1999Ge01).
106.1 3	($^+$)	0.40 μs 2	$T_{1/2}$: from 1999Ge01.
119.7 3	($^+$)		
174.8 3	1^+		
220.8 3	($0^+, 1^+, 2^+$)		
265.8 3			
306.9 3			
363.9 3			
399.1 4			
442.6 3			
613.9 3	1^+		
642.0 3	1^+		
710.6 3			
728.8 4	1^+		
765.1 3			
778.9 3			
908.5 3			
989.4 3			
1017.5 3	1^+		

† From Adopted Levels.

 β^- radiations

E(decay)	E(level)	$I\beta^-^\dagger$	Log ft	Comments
(1.14×10^3 3)	1017.5	1.0 3	5.47 11	av $E\beta^- = 429.15$ 13
(1.17×10^3 3)	989.4	0.70 25	5.95	av $E\beta^- = 441.20$ 13
(1.25×10^3 3)	908.5	0.70 25	5.95	av $E\beta^- = 476.14$ 13
(1.38×10^3 3)	778.9	0.39 10	6.19 7	av $E\beta^- = 532.79$ 13
(1.39×10^3 3)	765.1	0.30 12	6.33 16	av $E\beta^- = 538.91$ 13
(1.43×10^3 3)	728.8	3.0 6	5.43 11	av $E\beta^- = 554.80$ 13
(1.45×10^3 3)	710.6	0.28 9	6.41 8	av $E\beta^- = 562.94$ 13
(1.52×10^3 3)	642.0	5.9 14	5.12 8	av $E\beta^- = 593.41$ 13
				E(decay): $E\beta^- = 1940$ 40 (1987Gr18).
(1.54×10^3 3)	613.9	1.3 4	5.82 8	av $E\beta^- = 605.94$ 13
				E(decay): $E\beta^- = 1530$ 40 (1987Gr18).
(1.76×10^3 3)	399.1	0.52 14	6.43 8	av $E\beta^- = 702.57$ 14
(1.79×10^3 3)	363.9	0.9 3	6.29 6	av $E\beta^- = 718.44$ 14
				E(decay): $E\beta^- = 1695$ 80 (1987Gr18).
(1.85×10^3 3)	306.9	1.0 3	6.22 20	av $E\beta^- = 744.45$ 14
(1.94×10^3 3)	220.8	22 6		av $E\beta^- = 783.45$ 14

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^{104}Mo β^- decay **1981TiZZ** (continued) β^- radiations (continued)

E(decay)	E(level)	$I\beta^-^\dagger$	Log ft	Comments
(1.98×10^3 3)	174.8	86 21	4.35 10	av $E\beta = 804.81$ 14 E(decay): $E\beta = 1955$ 50 (1987Gr18).

† For absolute intensity per 100 decays, multiply by 0.89.

 $\gamma(^{104}\text{Tc})$

I_γ normalization: $\Sigma I(\gamma + \text{ce})$ to g.s.=100, assuming no $I\beta$ to g.s. ($\Delta J > 3$).

E_γ	$I_\gamma^{\ddagger\#}$	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. †	$\alpha^@$	Comments
36.3 2	14 2	106.1	($^+$)	69.7	($^+$)	[M1]	5.22	$\alpha(\text{K}) = 4.54$; $\alpha(\text{L}) = 0.549$; $\alpha(\text{M}) = 0.0997$ $\text{B}(\text{M1})(\text{W.u.}) = 0.000185$ 11
46.0 2	8 1	220.8	($0^+, 1^+, 2^+$)	174.8	1^+	[M1]	2.60	$\alpha(\text{K}) = 2.261$; $\alpha(\text{L}) = 0.274$; $\alpha(\text{M}) = 0.0497$
50.0 2	3.9 4	119.7	($^+$)	69.7	($^+$)	[M1]	2.03	$\alpha(\text{K}) = 1.77$; $\alpha(\text{L}) = 0.22$; $\alpha(\text{M}) = 0.04$; $\alpha(\text{N}+..) = 0.008$
55.0 2	8.6 9	174.8	1^+	119.7	($^+$)	[M1]	1.54 3	$\alpha(\text{K}) = 1.346$; $\alpha(\text{L}) = 0.1626$; $\alpha(\text{M}) = 0.0295$; $\alpha(\text{N}+..) = 0.00570$
68.8 2	55 6	174.8	1^+	106.1	($^+$)	[M1]	0.811	$\alpha(\text{K}) = 0.707$; $\alpha(\text{L}) = 0.0851$; $\alpha(\text{M}) = 0.01542$; $\alpha(\text{N}+..) = 0.00298$
69.7 2	17.8 20	69.7	($^+$)	0	(3^+)	E2	4.62	$\alpha(\text{K}) = 3.44$; $\alpha(\text{L}) = 0.974$; $\alpha(\text{M}) = 0.1801$; $\alpha(\text{N}+..) = 0.0303$ $\text{B}(\text{E2})(\text{W.u.}) = 0.60$ 6 Mult.: from comparison with Tc K x rays in $\gamma\gamma(t)$.
86.0 2	≈ 2	306.9		220.8	($0^+, 1^+, 2^+$)			
87.0 2	> 3	728.8	1^+	642.0	1^+			
91.0 2	4.9 5	265.8		174.8	1^+			
92.0 2	0.09 2	399.1		306.9				
98.0 2	< 0.1	363.9		265.8				
101.0 2	0.26 6	220.8	($0^+, 1^+, 2^+$)	119.7	($^+$)			
105.2 2	0.88 20	174.8	1^+	69.7	($^+$)	[M1]	0.2440	$\alpha(\text{K}) = 0.2130$; $\alpha(\text{L}) = 0.0254$; $\alpha(\text{M}) = 0.00461$; $\alpha(\text{N}+..) = 0.00089$
114.6 2	0.07 2	220.8	($0^+, 1^+, 2^+$)	106.1	($^+$)			
115.0 & 2	1 2	728.8	1^+	613.9	1^+			
132.0 8	< 0.06	399.1		265.8				
151.0 2	0.73 25	220.8	($0^+, 1^+, 2^+$)	69.7	($^+$)			
159.5 2	0.44 12	265.8		106.1	($^+$)			
178.3 6	0.37 8	399.1		220.8	($0^+, 1^+, 2^+$)			
189.3 2	0.75 20	363.9		174.8	1^+			
196.1 2	0.37 8	265.8		69.7	($^+$)			
199.1 2	0.22 5	642.0	1^+	442.6				
221.7 2	0.3 1	442.6		220.8	($0^+, 1^+, 2^+$)			
335.0 2	0.6 2	642.0	1^+	306.9				
376.0 2	4.7 5	642.0	1^+	265.8				
393.1 2	1.3 2	613.9	1^+	220.8	($0^+, 1^+, 2^+$)			
421.0 2	2.6 3	642.0	1^+	220.8	($0^+, 1^+, 2^+$)			
444.8 2	0.28 6	710.6		265.8				
467.2 2	0.7 2	642.0	1^+	174.8	1^+			
535.0 8	< 0.1	642.0	1^+	106.1	($^+$)			
604.1 2	0.39 5	778.9		174.8	1^+			

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^{104}Mo β^- decay [1981TiZZ](#) (continued) $\gamma(^{104}\text{Tc})$ (continued)

E_γ	I_γ ^{†‡}	$E_i(\text{level})$	J_i^π	E_f	J_f^π
659.0 2	0.3 1	765.1		106.1	(⁺)
710.4 2	0.33	1017.5	1 ⁺	306.9	
733.7 2	0.7 2	908.5		174.8	1 ⁺
768.6 2	0.7 2	989.4		220.8	(0 ⁺ , 1 ⁺ , 2 ⁺)
796.7 2	0.7 2	1017.5	1 ⁺	220.8	(0 ⁺ , 1 ⁺ , 2 ⁺)

[†] The authors assigned M1 to those γ 's which had half-lives < 1 μs .

[‡] Uncertainty estimated by evaluator as being 10% when $I_\gamma > 1$ and 20% for others.

For absolute intensity per 100 decays, multiply by 1.0 2.

@ 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.

& Placement of transition in the level scheme is uncertain.

^{104}Mo β^- decay 1981TiZZ

Decay Scheme

Intensities: I_γ per 100 parent decays

Legend

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

