^{104}Tc β^- decay 1978Su03,1975Ti03,1970Pi08

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

Parent: ^{104}Tc: E=0.0; $J^\pi=(3^+)$; $T_{1/2}$=18.3 min *3*; Q(β^-)=5600 *50*; %β^- decay=100.0

Additional information 1.

Activity from ^{235}U(n,F) (1978Su03), ^{104}Ru(n,p) (1970Pi08,1975Ti03).

Measured: Eγ, Iγ, $\gamma\gamma$, $\beta\gamma$, $\gamma\gamma(\theta)$ (1978Su03); $\beta\gamma$ (1987Gr18); β branch to ^{104}Ru (g.s.) is small, if not negligible (1978Su03).

^{104}Ru Levels

E(level)	J^π†	$T_{1/2}$	E(level)	J^π†	E(level)	E(level)
0.0	0^+	stable	2034.8 *1*	2	2597.3 *2*	3507.3 *2*
358.02 *7*	2^+		2080.8 *1*		2619.0 *2*	3582.8 *2*
888.5 *1*	4^+		2269.0 *1*	(3,4)	2630.0 *2*	3583.9 *2*
893.1 *1*	2^+		2285.1 *1*	2^+	2760.0 *2*	3618.2 *2*
988.3 *2*	0^+		2329.2 *2*	1,2,3	2823.4 *2*	3676.7 *2*
1242.4 *1*	3^+		2373.7 *2*	(3,1)	3075.0 *2*	3875.4 *2*
1502.6 *1*	3		2429.8 *2*		3333.8 *3*	3919.5 *2*
1515.4 *1*	2		2481.9 *1*	3^-	3414.4 *2*	4170.1 *2*
1872.4 *2*			2489.9 *1*		3443.3 *2*	4263.7 *2*
1970.4 *1*	3^-		2524.3 *1*		3501.6 *2*	4267.7 *2*

† From $\gamma\gamma(\theta)$ (1978Su04) and Adopted Levels.

β^- radiations

E(decay)	E(level)	Iβ^-†	Log *ft*	Comments
(1.33×10^3 *5*)	4267.7	0.66 *7*	7.04 *8*	av Eβ=494 *20*
(1.34×10^3 *5*)	4263.7	0.46 *6*	7.21 *9*	av Eβ=496 *20*
(1.43×10^3 *5*)	4170.1	0.90 *9*	7.03 *7*	av Eβ=537 *21*
(1.68×10^3 *5*)	3919.5	0.62 *6*	7.47 *7*	av Eβ=648 *21*
(1.72×10^3 *5*)	3875.4	0.61 *12*	7.52 *10*	av Eβ=668 *21*
(1.92×10^3 *5*)	3676.7	0.93 *8*	7.52 *6*	av Eβ=758 *21*
(1.98×10^3 *5*)	3618.2	0.81 *8*	7.64 *6*	av Eβ=785 *21*
(2.02×10^3 *5*)	3583.9	1.12 *8*	7.53 *6*	av Eβ=801 *21*
(2.02×10^3 *5*)	3582.8	0.76 *8*	7.70 *7*	av Eβ=801 *21*
(2.09×10^3 *5*)	3507.3	2.52 *17*	7.24 *5*	av Eβ=836 *22*
(2.10×10^3 *5*)	3501.6	4.7 *3*	6.97 *5*	av Eβ=838 *22*
(2.16×10^3 *5*)	3443.3	1.75 *13*	7.45 *5*	av Eβ=865 *22*
(2.19×10^3 *5*)	3414.4	0.65 *7*	7.91 *6*	av Eβ=879 *22*
(2.27×10^3 *5*)	3333.8	0.52 *6*	8.07 *7*	av Eβ=916 *22*
(2.53×10^3 *5*)	3075.0	1.38 *11*	7.84 *5*	av Eβ=1036 *22*
(2.78×10^3 *5*)	2823.4	1.88 *12*	7.88 *5*	av Eβ=1154 *22*
(2.84×10^3 *5*)	2760.0	1.36 *17*	8.06 *7*	av Eβ=1183 *22*
(2.97×10^3 *5*)	2630.0	2.07 *21*	7.96 *6*	av Eβ=1245 *22*
(2.98×10^3 *5*)	2619.0	1.48 *16*	8.11 *6*	av Eβ=1250 *22*
(3.00×10^3 *5*)	2597.3	0.26 *8*	8.88 *14*	av Eβ=1260 *22*
(3.08×10^3 *5*)	2524.3	3.73 *24*	7.77 *4*	av Eβ=1294 *22* E(decay): Eβ=3140 *250* (1987Gr18).
(3.11×10^3 *5*)	2489.9	4.8 *5*	7.68 *6*	av Eβ=1311 *22* E(decay): Eβ=3045 *225* (1987Gr18).
(3.12×10^3 *5*)	2481.9	3.24 *22*	7.86 *4*	av Eβ=1314 *22*
(3.17×10^3 *5*)	2429.8	1.42 *12*	8.24 *5*	av Eβ=1339 *22*

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^{104}Tc β^- decay 1978Su03,1975Ti03,1970Pi08 (continued)

β^- radiations (continued)

E(decay)	E(level)	Iβ^-[†]	Log *ft*	Comments
(3.23×10^3 *5*)	2373.7	1.07 *25*	8.40 *11*	av Eβ=1366 *22*
(3.27×10^3 *5*)	2329.2	2.21 *23*	8.11 *6*	av Eβ=1387 *22*
(3.31×10^3 *5*)	2285.1	1.9 *4*	8.20 *10*	av Eβ=1407 *22*
(3.33×10^3 *5*)	2269.0	4.6 *3*	7.83 *4*	av Eβ=1415 *22*
(3.52×10^3 *5*)	2080.8	1.58 *15*	8.39 *5*	av Eβ=1504 *22*
(3.57×10^3 *5*)	2034.8	9.9 *9*	7.62 *5*	av Eβ=1526 *22* E(decay): Eβ=3610 *70* (1987Gr18).
(3.63×10^3 *5*)	1970.4	4.3 *7*	8.02 *8*	av Eβ=1557 *22*
(3.73×10^3 *5*)	1872.4	0.28 *21*	9.3 *4*	av Eβ=1603 *22*
(4.08×10^3 *5*)	1515.4	3.0 *4*	8.40 *7*	av Eβ=1773 *22*
(4.10×10^3 *5*)	1502.6	3.4 *4*	8.35 *6*	av Eβ=1779 *22*
(4.36×10^3 *5*)	1242.4	6.6 *15*	8.18 *10*	av Eβ=1903 *22*
(4.71×10^3 *5*)	893.1	10.0 *19*	8.14 *9*	av Eβ=2070 *22* E(decay): Eβ=4600 *100* (1987Gr18).
(4.71×10^3 *5*)	888.5	6.4 *13*	8.34 *9*	av Eβ=2072 *22*
(5.24×10^3 *5*)	358.02	18.0 *25*	8.10 *7*	av Eβ=2326 *22* E(decay): Eβ=4250 (1970Pi08), Eβ>5300 (1963Ki16), Eβ=5240 *90* (1987Gr18).

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

$\gamma(^{104}Ru)$

Iγ normalization: from Iγ(358γ)+Iγ(893γ)+Iγ(1515γ)=100, assuming no β^- to g.s., ΔJ>2.

The following γ's, seen by 1975Ti03 but not present in the 1978Su03 γ spectrum, seem to be contaminants: 622.0, 692.9, 711.0, 804.7, 1017.7, 1085.1, 1172.2, 1199.1, 1251.0, 1338.2, 1346.7, 1654.2, 1729.8, 1760.8, 1769.6, 1905.6, 2128.3, 2477.0, 2547.5, 2666.2, 3104.1, 3196.1. The evaluator has adopted some γ's of 1975Ti03 which were not seen by 1978Su03 as these were presumably masked by the γ-rays from ^{105}Tc and ^{101}Tc.

E$_\gamma$	I$_\gamma$[@]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$
[x]135.3[†] *8*	0.2 *1*				
[x]150.8[†] *7*	0.5 *1*				
[x]153.4[†] *8*	0.3 *1*				
[x]160.4[†] *3*	2.1 *4*				
[x]163.2[†] *8*	0.4 *1*				
[x]170.0[†] *7*	0.3 *1*				
[x]176.8[†] *4*	0.7 *2*				
[x]179.1[†] *7*	0.5 *2*				
[x]219.0[†] *6*	0.4 *2*				
[x]245.5[†] *6*	0.5 *2*				
[x]272.0[†] *10*	0.2 *1*				
[x]277.1[†] *10*	0.3 *1*				
[x]280.8[†] *10*	0.2 *1*				
[x]285.5[†] *5*	0.4 *3*				
[x]294.9[†] *5*	0.7 *4*				
298.6[‡] *2*	0.12 *3*	2269.0	(3,4)	1970.4	3$^-$
314.7[‡] *3*	0.21 *5*	2285.1	2$^+$	1970.4	3$^-$

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^{104}Tc β^- decay 1978Su03,1975Ti03,1970Pi08 (continued)

$\gamma(^{104}Ru)$ (continued)

E_γ	I_γ[@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#]	α[&]	Comments
333.8[‡] *3*	0.71 *10*	2619.0		2285.1	2^+				
349.1[‡] *3*	0.10 *5*	2429.8		2080.8					
349.3 *1*	2.8 *3*	1242.4	3^+	893.1	2^+				
353.7 *3*	1.1 *2*	1242.4	3^+	888.5	4^+				
358.0 *1*	100.0	358.02	2^+	0.0	0^+	E2		0.01502	α(K)=0.01298; α(L)=0.00168; α(M)=0.00031
[x]407.1[†] *7*	0.3 *1*								
[x]413.2[‡] *2*	0.13 *5*								
[x]421.8[†] *8*	0.3 *1*								
459.6[‡] *2*	0.12 *3*	2429.8		1970.4	3^-				
475.0[‡] *2*	0.28 *8*	2760.0		2285.1	2^+				
511.6[‡] *3*	0.16 *4*	2481.9	3^-	1970.4	3^-				
519.4 *1*	1.0 *1*	2034.8	2	1515.4	2				
527.2[‡] *2*	0.44 *8*	1515.4	2	988.3	0^+				
530.5 *1*	17.5 *12*	888.5	4^+	358.02	2^+	E2		0.00455	α(K)=0.00392; α(L)=0.00048
535.1 *1*	16.5 *12*	893.1	2^+	358.02	2^+	M1+E2	−36 *+14−5*	0.00444	α(K)=0.00382; α(L)=0.00047
[x]542.7[†] *6*	≤0.3								
553.8 *1*	0.34 *7*	2524.3		1970.4	3^-				
565.5[‡] *3*	0.1	2080.8		1515.4	2				
[x]581.2[†] *4*	0.3 *1*								
584.0[‡] *3*	0.70 *10*	2619.0		2034.8	2				
585.1 *3*	0.22 *6*	3075.0		2489.9					
[x]605.2[†] *6*	0.8 *2*								
609.5 *1*	2.2 *3*	1502.6	3	893.1	2^+				
614.2 *1*	1.3 *1*	1502.6	3	888.5	4^+	D+Q	0.09 *8*		δ: from (614γ)(530γ)(θ).
627.0[‡] *2*	0.25 *5*	1515.4	2	888.5	4^+				
630.0 *3*	0.5 *2*	1872.4		1242.4	3^+				
630.3 *1*	1.0 *5*	988.3	0^+	358.02	2^+				
648.7[‡] *3*	0.26 *5*	2619.0		1970.4	3^-				
659.3 *3*	0.1	2630.0		1970.4	3^-				
[x]668.0 *1*	0.39 *5*								
792.5 *1*	2.8 *3*	2034.8	2	1242.4	3^+				
795.4 *3*	0.19 *5*	3414.4		2619.0					
838.6 *1*	0.88 *9*	2080.8		1242.4	3^+				
884.4 *1*	12.3 *13*	1242.4	3^+	358.02	2^+	M1+E2	−3.2 *4*	0.00011 *3*	Mult.: D+Q from $\gamma\gamma(\theta)$. $T_{1/2}$ rules out large M2 admixture.
893.1 *1*	11.5 *12*	893.1	2^+	0.0	0^+				
919.0[‡] *2*	0.14 *5*	3443.3		2524.3					
[x]977.2 *2*	0.15 *3*								
[x]980.8 *2*	0.57 *7*								
984.0[‡] *2*	0.17 *3*	1872.4		888.5	4^+				
986.6 *2*	0.24 *4*	3583.9		2597.3					
1021.8 *1*	0.52 *5*	2524.3		1502.6	3				
1092.9 *1*	0.51 *5*	3582.8		2489.9					
[x]1119.4[‡] *1*	0.68 *7*								
1128.0[‡] *3*	0.35 *10*	3501.6		2373.7	(3,1)				
1133.4[‡] *3*	0.25 *10*	3507.3		2373.7	(3,1)				
[x]1142.3[‡] *2*	0.37 *5*								
1144.7[‡] *2*	0.46 *5*	1502.6	3	358.02	2^+				
1157.4 *1*	3.2 *3*	1515.4	2	358.02	2^+	D+Q	0.43 *11*		

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^{104}Tc β^- decay 1978Su03,1975Ti03,1970Pi08 (continued)

$\gamma(^{104}Ru)$ (continued)

E_γ	I_γ[@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#]	Comments
1187.7 *2*	0.38 *4*	2080.8		893.1	2^+			
x1201.6 *2*	0.49 *6*							
1210.0 *3*	0.33 *4*	3583.9		2373.7	(3,1)			
1239.6‡ *2*	0.20 *3*	2481.9	3^-	1242.4	3^+			
1247.6 *1*	0.63 *7*	2489.9		1242.4	3^+			
x1269.0 *2*	0.49 *6*							
1281.8 *1*	2.3 *2*	2524.3		1242.4	3^+			
x1343.9 *1*	0.75 *8*							
1363.3‡ *3*	0.27 *5*	3333.8		1970.4	3^-			
1376.1‡ *2*	0.41 *6*	2269.0	(3,4)	893.1	2^+			
1380.5 *1*	1.9 *2*	2269.0	(3,4)	888.5	4^+			δ: from (1380γ)(530γ)(θ),δ=0.10 *11* or 3.3 *+24−11*.
1396.6 *1*	2.7 *3*	2285.1	2^+	888.5	4^+			
1436.3‡ *3*	0.41 *10*	2329.2	1,2,3	893.1	2^+			
1466.7‡ *1*	1.0 *1*	3501.6		2034.8	2			
1472.5 *1*	0.78 *8*	3507.3		2034.8	2			
1515.5 *2*	0.89 *10*	1515.4	2	0.0	0^+			
1517.4 *2*	0.83 *10*	2760.0		1242.4	3^+			
1531.2‡ *3*	0.45 *9*	3501.6		1970.4	3^-			
1536.7‡ *4*	0.19 *5*	3507.3		1970.4	3^-			
1541.3 *1*	1.2 *1*	2429.8		888.5	4^+			
1580.9‡ *3*	0.33 *5*	2823.4		1242.4	3^+			
1593.6‡ *3*	0.38 *5*	2481.9	3^-	888.5	4^+			
1596.7 *1*	4.7 *4*	2489.9		893.1	2^+			
1601.5 *2*	0.21 *5*	2489.9		888.5	4^+			
1609.0‡ *3*	0.13 *4*	2597.3		988.3	0^+			
1612.4 *1*	6.5 *6*	1970.4	3^-	358.02	2^+	E1		δ=0.01 *+18−11* or 0.01 *5*.
1633.7‡ *2*	0.13 *4*	4263.7		2630.0				
1635.8 *2*	0.71 *8*	2524.3		888.5	4^+			
1676.8 *1*	8.8 *8*	2034.8	2	358.02	2^+	D+Q	−0.03 *4*	
x1708.9 *2*	0.40 *10*							
1722.7 *1*	0.78 *8*	2080.8		358.02	2^+			
1736.9 *1*	2.1 *2*	2630.0		893.1	2^+			
1840.5 *3*	0.20 *10*	3875.4		2034.8	2			
1871.6‡ *3*	0.25 *10*	2760.0		888.5	4^+			
1911.0 *1*	2.2 *2*	2269.0	(3,4)	358.02	2^+			
1927.9 *3*	0.47 *6*	3443.3		1515.4	2			
x1931.2 *3*	0.41 *6*							
1934.8‡ *3*	0.25 *4*	2823.4		888.5	4^+			
x1937.3‡ *3*	0.22 *4*							
1971.1 *2*	1.8 *2*	2329.2	1,2,3	358.02	2^+			
1986.2‡ *2*	0.20 *10*	3501.6		1515.4	2			
x1997.1 *2*	0.62 *7*							
2015.7 *1*	2.0 *2*	2373.7	(3,1)	358.02	2^+			δ=−3.7 *+17−14* or 0.17 *13*.
x2061.8‡ *2*	0.35 *5*							
2089.3‡ *2*	0.46 *5*	4170.1		2080.8				
x2095.3‡ *2*	0.61 *6*							
2123.8 *1*	2.5 *2*	2481.9	3^-	358.02	2^+	D+Q	0.05 *10*	
x2151.1‡ *2*	0.24 *3*							
2181.9‡ *1*	0.50 *5*	3075.0		893.1	2^+			
x2190.5 *1*	2.0 *2*							

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^{104}Tc β^- decay 1978Su03,1975Ti03,1970Pi08 (continued)

$\gamma(^{104}Ru)$ (continued)

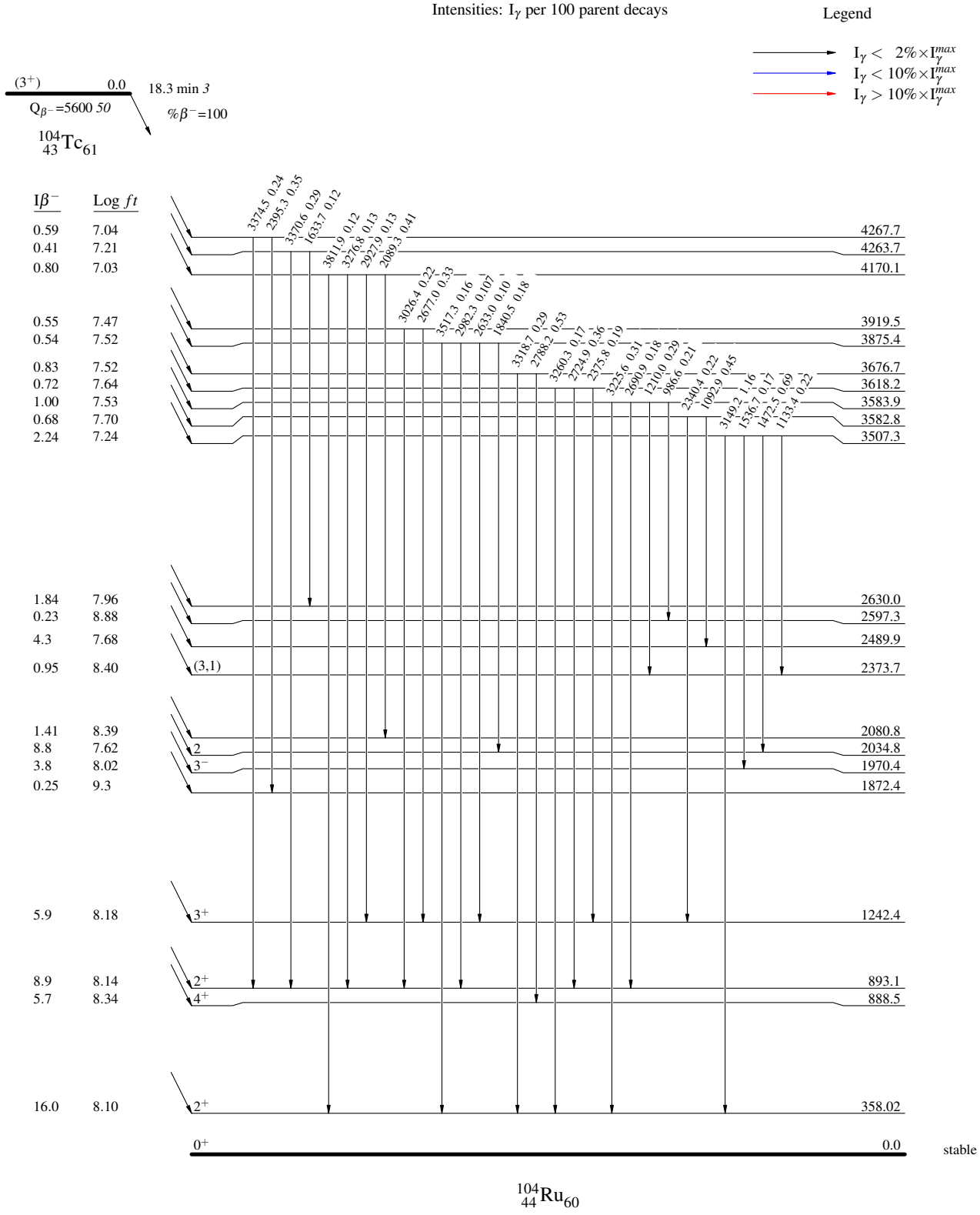
E_γ	I_γ [@]	E_i(level)	J_i^π	E_f	J_f^π	E_γ	I_γ [@]	E_i(level)	E_f	J_f^π
2239.3 *2*	0.37 *5*	2597.3		358.02	2^+	[x]2830.2[‡] *3*	0.24 *3*			
[x]2258.1 *2*	0.73 *7*					[x]2838.3[‡] *3*	0.42 *5*			
[x]2332.2 *2*	1.1 *1*					2927.9[‡] *5*	0.15 *5*	4170.1	1242.4	3^+
2340.4[‡] *5*	0.25 *6*	3582.8		1242.4	3^+	2975.8[‡] *3*	0.25 *3*	3333.8	358.02	2^+
2375.8[‡] *2*	0.21 *5*	3618.2		1242.4	3^+	2982.3[‡] *3*	0.12 *2*	3875.4	893.1	2^+
2395.3 *2*	0.39 *5*	4267.7		1872.4		[x]3007.0[‡] *3*	0.40 *5*			
2465.5 *2*	1.3 *1*	2823.4		358.02	2^+	3026.4[‡] *3*	0.25 *3*	3919.5	893.1	2^+
[x]2513.8 *2*	0.57 *6*					3056.5[‡] *3*	0.35 *4*	3414.4	358.02	2^+
2525.8[‡] *3*	0.11 *2*	3414.4		888.5	4^+	3085.4[‡] *3*	0.17 *3*	3443.3	358.02	2^+
[x]2532.9 *2*	0.97 *10*					3143.4 *2*	0.9 *1*	3501.6	358.02	2^+
[x]2544.3 *2*	0.78 *8*					3149.2 *2*	1.3 *1*	3507.3	358.02	2^+
2550.2 *2*	0.98 *9*	3443.3		893.1	2^+	[x]3187.3[‡] *3*	0.46 *5*			
2608.5 *2*	1.8 *2*	3501.6		893.1	2^+	3225.6 *3*	0.35 *4*	3583.9	358.02	2^+
2633.0[‡] *3*	0.11 *4*	3875.4		1242.4	3^+	3260.3[‡] *3*	0.19 *3*	3618.2	358.02	2^+
[x]2653.9[‡] *3*	0.26 *3*					3276.8[‡] *3*	0.15 *3*	4170.1	893.1	2^+
[x]2658.8[‡] *3*	0.28 *3*					3318.7[‡] *3*	0.33 *4*	3676.7	358.02	2^+
2677.0[‡] *2*	0.37 *5*	3919.5		1242.4	3^+	3370.6 *3*	0.33 *4*	4263.7	893.1	2^+
2690.9 *2*	0.20 *4*	3583.9		893.1	2^+	3374.5[‡] *3*	0.27 *4*	4267.7	893.1	2^+
[x]2705.9[‡] *2*	0.29 *3*					[x]3418.2 *3*	0.40 *8*			
2717.0[‡] *2*	0.66 *7*	3075.0		358.02	2^+	3517.3 *4*	0.18 *3*	3875.4	358.02	2^+
2724.9[‡] *2*	0.41 *5*	3618.2		893.1	2^+	[x]3637.7[‡] *4*	0.32 *4*			
2788.2 *2*	0.60 *6*	3676.7		888.5	4^+	[x]3704.3[‡] *4*	0.11 *2*			
[x]2813.2[‡] *3*	0.23 *3*					[x]3714.3 *4*	0.53 *6*			
[x]2816.8[‡] *3*	0.16 *3*					3811.9[‡] *4*	0.14 *4*	4170.1	358.02	2^+

[†] Seen only by 1975Ti03.
[‡] Seen only by 1978Su03.
[#] From $\gamma\gamma(\theta)$ 1978Su04.
[@] For absolute intensity per 100 decays, multiply by 0.89 *3*.
[&] 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.

^{104}Tc β^- decay 1978Su03,1975Ti03,1970Pi08

Decay Scheme

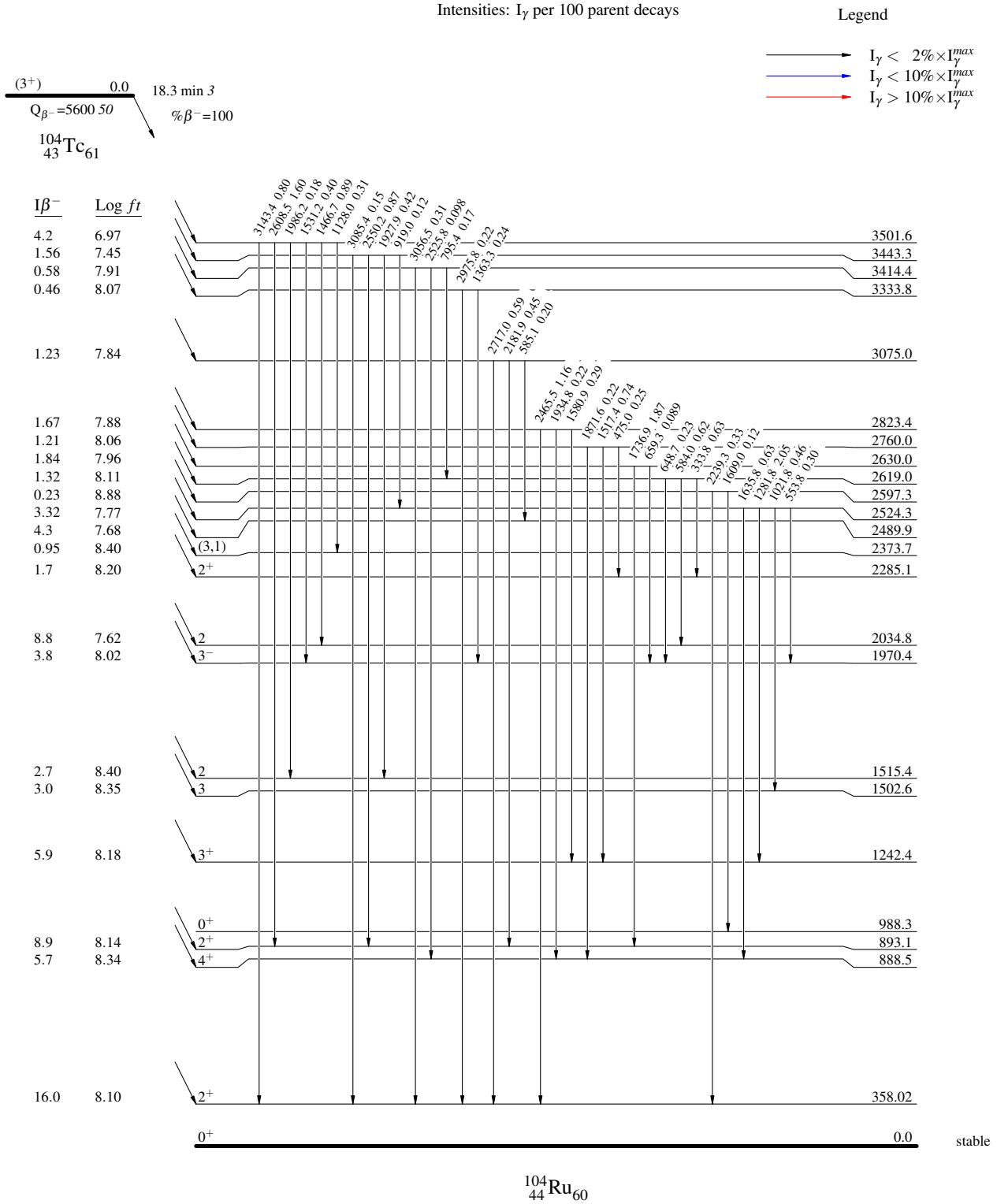
Intensities: I_γ per 100 parent decays



^{104}Tc β^- decay 1978Su03,1975Ti03,1970Pi08

Decay Scheme (continued)

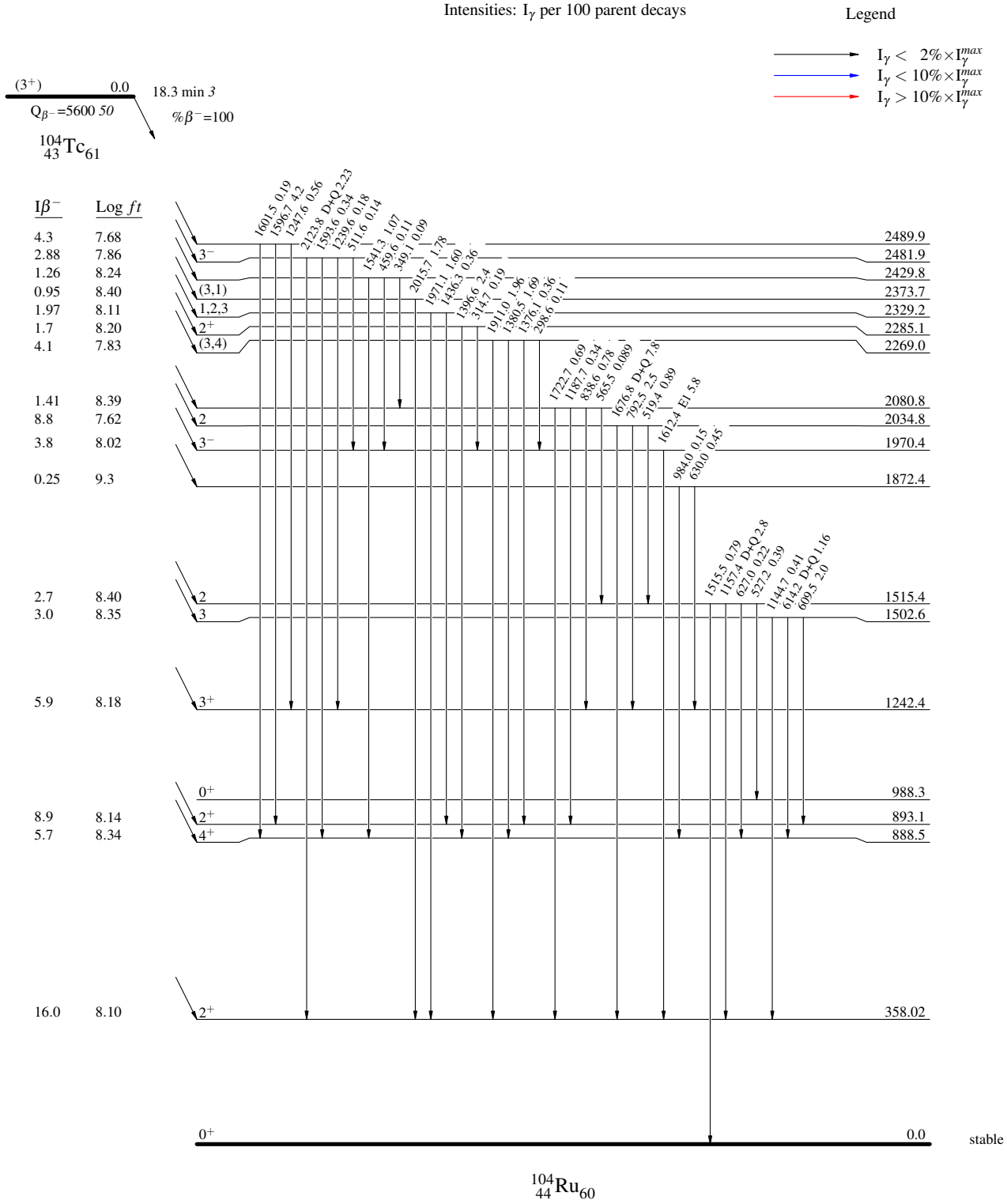
Intensities: I_γ per 100 parent decays



^{104}Tc β^- decay 1978Su03,1975Ti03,1970Pi08

Decay Scheme (continued)

Intensities: I_γ per 100 parent decays



^{104}Tc β^- decay 1978Su03,1975Ti03,1970Pi08

Decay Scheme (continued)

Intensities: I_γ per 100 parent decays