^{113}Ru β^- decay (0.80 s) 2002Ku18,2007Ku23

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jean Blachot	NDS 111, 1471 (2010)	1-May-2009

Parent: ^{113}Ru: E=0; $J^\pi=(1/2^+)$; $T_{1/2}$=0.80 s *5*; Q(β^-)=6480 *50*; %β^- decay=100.0

2002Ku18: Measured Eγ, Iγ, $\gamma\gamma$, $\beta\gamma$ coin, lifetimes by $\beta\gamma$(t) using a LEGe-detector and a 37% Ge-detector operated with two plastic scintillators and in anti-coincidence with a BGO shield.

2007Ku23: Re-interpretation of the β feedings.

All data are from 2002Ku18, except for intensities of some of the γ rays, β feedings and associated log *ft* values. Revised division (amongst two activities of ^{113}Ru) of γ-ray intensities and β feedings are from 2007Ku23 and e-mail reply of Oct 15, 2007 from the first author of 2007Ku23 to the evaluator.The questionable and unplaced γ rays are not listed in this e-mail reply.

The 578, 785, 786 and 834 levels and deexciting γ rays have been removed by 2007Ku23 and associated with only the decay of the 0.51-s isomer.

^{113}Rh Levels

E(level)[†]	J^π	$T_{1/2}$[#]	E(level)[†]	E(level)[†]
0	(7/2$^+$)	2.80 s *12*	1034.1 *6*	2191.2 *4*
211.66 *20*	(9/2$^+$)	0.21 ns *13*	1060.9 *4*	2221.4 *4*
263.18 *16*	(3/2$^+$)	0.38 ns *12*	1463.9 *8*	2287.4?[‡] *5*
351.27 *19*	(5/2$^+$)		1485.2 *9*	2297.4 *7*
600.7 *3*	(3/2$^+$)	0.66 ns *14*	1711.6? *10*	2525.6?[‡] *5*
823.4 *4*			1908.9 *8*	2623.6?[‡] *10*
968.0 *4*			1945.0[‡] *7*	2675.3?[‡] *14*
978.0 *4*			1966.0 *9*	
1008.9 *3*			2121.9 *4*	

[†] From least-squares fit to Eγ's.
[‡] Level not shown in figure 1 of 2002Ku18.
[#] From centroid-shift method in $\beta\gamma$(t).

β^- radiations

E(decay)	E(level)	Iβ^-[†#]	Log *ft*	Comments
(3.80×10^3[@] *5*)	2675.3?	0.3[‡] *1*	6.2	av Eβ=1636 *24*
(3.86×10^3[@] *5*)	2623.6?	1.7[‡] *2*	5.5	av Eβ=1660 *24*
(3.95×10^3[@] *5*)	2525.6?	4.4[‡] *5*	5.1	av Eβ=1707 *24*
(4.18×10^3 *5*)	2297.4	2.4	5.5	av Eβ=1816 *24*
(4.19×10^3[@] *5*)	2287.4?	5.1[‡] *5*	5.1	av Eβ=1820 *24*
(4.26×10^3 *5*)	2221.4	7.6	5.0	av Eβ=1852 *24*
(4.29×10^3 *5*)	2191.2	14.9	4.7	av Eβ=1866 *24*
(4.36×10^3 *5*)	2121.9	7.6	5.0	av Eβ=1899 *24* Iβ^-: Compilers deduce 5.3 *6* from intensity balance.
(4.51×10^3 *5*)	1966.0	1.3	5.9	av Eβ=1973 *24*
(4.54×10^3 *5*)	1945.0	1.7	5.8	av Eβ=1983 *24* Iβ^-: 2.0 (obtained by compilers from intensity balance).
(4.57×10^3 *5*)	1908.9	2.6	5.6	av Eβ=2001 *24*
(4.77×10^3[@] *5*)	1711.6?	<1.6[‡]	>5.9	av Eβ=2095 *24*
(4.99×10^3 *5*)	1485.2	1.1	6.1	av Eβ=2203 *24*
(5.02×10^3 *5*)	1463.9	1.2	6.1	av Eβ=2213 *24*
(5.42×10^3 *5*)	1060.9	6.5	5.5	av Eβ=2406 *24* Iβ^-: Compilers deduce 3.0 *3* from intensity balance.

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^{113}Ru β^- decay (0.80 s) 2002Ku18,2007Ku23 (continued)

β^- radiations (continued)

E(decay)	E(level)	Iβ^-[†#]	Log *ft*	Comments
(5.45×10^3 *5*)	1034.1	1.8	6.1	av Eβ=2418 *24*
(5.47×10^3 *5*)	1008.9	6.2	5.6	av Eβ=2431 *24*
(5.50×10^3 *5*)	978.0	7.8	5.5	av Eβ=2445 *24* Iβ^-: Compilers deduce 6.14 *17* from intensity balance.
(5.51×10^3 *5*)	968.0	2.0	6.1	av Eβ=2450 *24*
(5.66×10^3 *5*)	823.4	2.1	6.1	av Eβ=2519 *24*
(5.88×10^3 *5*)	600.7	12.6	5.4	av Eβ=2626 *24*
(6.22×10^3 *5*)	263.18	20.5	5.3	av Eβ=2787 *24* Iβ^-: Compilers deduce 16.1 *23* from intensity balance.

† From 2007Ku23.
‡ Deduced from intensity balance.
# Absolute intensity per 100 decays.
@ Existence of this branch is questionable.

$\gamma(^{113}Rh)$

Iγ normalization: From comparison of β feedings given by 2007Ku23 and γ intensities from 2002Ku18, assuming no β feeding to the g.s.

E$_\gamma$	I$_\gamma$[#]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.	α[@]	Comments
88.1 *3*	9.0[‡] *13*	351.27	(5/2$^+$)	263.18	(3/2$^+$)	[M1]	0.490 *9*	α(K)=0.427 *8*; α(L)=0.0522 *9*; α(M)=0.00972 *17*; α(N)=0.00161 *3*; α(O)=8.00×10^{-5} *14* α(N+..)=0.00169 *3* I$_\gamma$: combined intensity from both isomers=13.1 *13*.
[x]181.0[†] *7*	0.8 *4*							
211.7 *2*	1.1[‡] *1*	211.66	(9/2$^+$)	0	(7/2$^+$)	M1	0.0444	α(K)=0.0388 *6*; α(L)=0.00464 *7*; α(M)=0.000862 *13*; α(N)=0.0001431 *21*; α(O)=7.22×10^{-6} *11* α(N+..)=0.0001503 *22* I$_\gamma$: combined intensity from both isomers=32.8 *8*.
[x]226.0 *7*	0.8 *4*							
246.4[&] *11*	0.3 *2*	2191.2		1945.0				I$_\gamma$: total transition intensity is listed as 0.6 *2* in e-mail reply of Oct 15, 2007 from the first author of 2007Ku23.
[x]247.0[†] *8*	0.6 *4*							
263.2 *2*	78.6[‡] *4*	263.18	(3/2$^+$)	0	(7/2$^+$)	[E2]	0.0439	α(K)=0.0374 *6*; α(L)=0.00529 *8*; α(M)=0.000989 *15*; α(N)=0.0001592 *23*; α(O)=6.23×10^{-6} *9* α(N+..)=0.0001655 *24* I$_\gamma$: combined intensity from both isomers=100.0 *5*.
[x]274.7[†] *7*	0.9 *1*							
337.6 *3*	14.7[‡] *3*	600.7	(3/2$^+$)	263.18	(3/2$^+$)			I$_\gamma$: combined intensity from both isomers=23.4 *4*.

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^{113}Ru β^- decay (0.80 s) 2002Ku18,2007Ku23 (continued)

$\gamma(^{113}Rh)$ (continued)

E_γ	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Comments
351.2 *3*	8.1[‡] *13*	351.27	(5/2$^+$)	0	(7/2$^+$)	I_γ: combined intensity from both isomers=11.8 *17*.
367.2 *5*	2.9 *4*	968.0		600.7	(3/2$^+$)	
[x]401.0[†] *7*	1.1 *1*					
403.4[&] *5*	2.4 *5*	2525.6?		2121.9		
[x]422.9[†] *5*	2.3 *1*					
560.1 *4*	5.1 *2*	823.4		263.18	(3/2$^+$)	
600.5 *5*	1.3[‡] *2*	600.7	(3/2$^+$)	0	(7/2$^+$)	I_γ: combined intensity from both isomers=2.1 *3*.
626.8 *5*	2.3 *1*	978.0		351.27	(5/2$^+$)	
657.8 *5*	2.5 *1*	1008.9		351.27	(5/2$^+$)	
682.8[&] *8*	0.7 *2*	1034.1		351.27	(5/2$^+$)	
704.9 *7*	0.9 *1*	968.0		263.18	(3/2$^+$)	
709.4 *5*	2.7 *1*	1060.9		351.27	(5/2$^+$)	
715.1 *4*	5.8 *1*	978.0		263.18	(3/2$^+$)	
745.9 *5*	2.4 *1*	1008.9		263.18	(3/2$^+$)	
770.9 *7*	1.2 *1*	1034.1		263.18	(3/2$^+$)	
797.8 *6*	2.3 *1*	1060.9		263.18	(3/2$^+$)	
[x]906.2[†] *8*	0.8 *1*					
1008.7[&] *6*	2.9 *2*	1008.9		0	(7/2$^+$)	
1061.2[&] *6*	2.5 *2*	1060.9		0	(7/2$^+$)	
1112.2 *10*	0.5 *4*	1463.9		351.27	(5/2$^+$)	
[x]1123.0[†] *8*	0.9 *1*					
1133.9 *8*	1.1 *3*	1485.2		351.27	(5/2$^+$)	
1160.8[&] *9*	0.7 *1*	2221.4		1060.9		
[x]1180.4[†] *7*	1.4 *7*					
[x]1194.6[†] *6*	2.6 *2*					
1213.1[&] *7*	1.3 *1*	2221.4		1008.9		
1223.3[&] *7*	1.7 *2*	2191.2		968.0		
1226.6[&] *6*	3.7 *1*	2287.4?		1060.9		
1367.6 *6*	2.9 *1*	2191.2		823.4		E_γ: other placement from 1945-578 level (2002Ku18) is now omitted since 578 level is populated only in the decay of 0.51-s isomer according to 2007Ku23.
1448.4[&] *9*	0.8 *8*	1711.6?		263.18	(3/2$^+$)	E_γ: placement not shown in figure 1; also fits between levels 2417-968, the 2417 level is populated in the decay of 0.51-s isomer.
1464.3[&] *10*	0.7 *1*	1463.9		0	(7/2$^+$)	
1548.9[&] *7*	1.7 *1*	2525.6?		978.0		
1593.8 *7*	2.4 *2*	1945.0		351.27	(5/2$^+$)	
1614.7 *8*	1.4 *1*	1966.0		351.27	(5/2$^+$)	
1645.7 *7*	2.7 *2*	1908.9		263.18	(3/2$^+$)	
[x]1661.2[†] *10*	0.6 *1*					
1770.2 *7*	2.7 *3*	2121.9		351.27	(5/2$^+$)	
1840.8 *7*	2.9 *2*	2191.2		351.27	(5/2$^+$)	
1858.1 *7*	3.4 *2*	2121.9		263.18	(3/2$^+$)	
1869.7 *7*	2.3 *2*	2221.4		351.27	(5/2$^+$)	
1911.0 *9*	1.1 *1*	2121.9		211.66	(9/2$^+$)	
1927.6 *7*	4.5 *2*	2191.2		263.18	(3/2$^+$)	
1936.3[&] *10*	0.7 *3*	2287.4?		351.27	(5/2$^+$)	
1957.8 *7*	3.6 *3*	2221.4		263.18	(3/2$^+$)	
2023.9[&] *10*	0.9 *4*	2287.4?		263.18	(3/2$^+$)	
2034.5 *10*	0.8 *1*	2297.4		263.18	(3/2$^+$)	

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^{113}Ru β^- decay (0.80 s) 2002Ku18,2007Ku23 (continued)

$\gamma(^{113}Rh)$ (continued)

E_γ	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π
2121.8[&] *11*	0.7 *1*	2121.9		0	$(7/2^+)$
2173.6[&] *8*	0.5 *1*	2525.6?		351.27	$(5/2^+)$
2191.0 *8*	2.9 *1*	2191.2		0	$(7/2^+)$
2297.1 *9*	1.7 *3*	2297.4		0	$(7/2^+)$
2324.0[&] *13*	0.3 *1*	2675.3?		351.27	$(5/2^+)$
2360.4[&] *9*	1.8 *2*	2623.6?		263.18	$(3/2^+)$

[†] The unplaced γ belongs to the decay of either or both the isomers.
[‡] Intensity divided based on β feeding proposed by 2007Ku23. Value is different in authors′ earlier work (figure 1 of 2002Ku18).
[#] For absolute intensity per 100 decays, multiply by 0.89.
[@] 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.
[x] γ ray not placed in level scheme.

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Decay Scheme

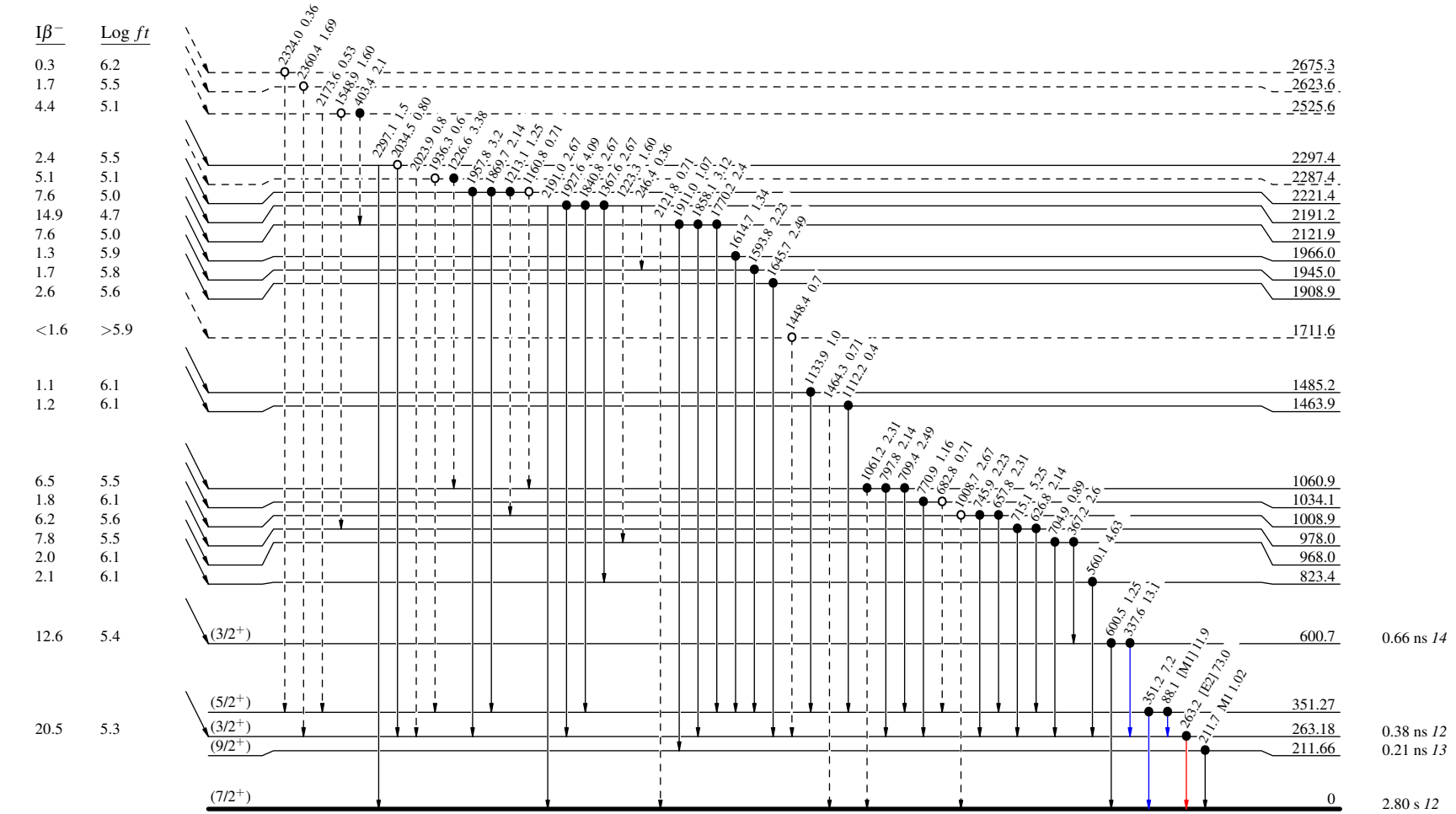
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays

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)

$(1/2^+)$ 0 — 0.80 s 5

Q_{β^-}=6480 50 ; $\%\beta^-$=100.0

$^{113}_{44}Ru_{69}$



$^{113}_{45}Rh_{68}$

$^{113}_{45}Rh_{68}$-5