^{113}Ru β^- decay (0.51 s) 2002Ku18,2007Ku23

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

Parent: ^{113}Ru: E≈120; J^π=(7/2$^-$); $T_{1/2}$=0.51 s *3*; Q(β^-)=6480 *50*; %β^- decay=100.0

^{113}Ru-$T_{1/2}$: from 1998Ku17:

^{113}Ru-E,J^π: from 2007Ku23, probable 7/2[523] state.

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

Measured Eγ, $\gamma\gamma$ coin, Iβ using EUROGAM2 array and IGISOL mass separator. These data are re-interpreted by 2007Ku23.

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. The questionable and unplaced γ rays are not listed in this e-mail reply.

^{113}Rh Levels

E(level)†	J^π	$T_{1/2}$‡	E(level)†	J^π	$T_{1/2}$‡	E(level)†	J^π
0	(7/2$^+$)	2.80 s *12*	600.5 *3*	(3/2$^+$)	0.66 ns *14*	1843.4 *7*	
211.73 *18*	(9/2$^+$)	0.21 ns *13*	785.0 *4*	(9/2$^+$)		2058.4 *6*	(9/2$^-$)
263.10 *17*	(3/2$^+$)	0.38 ns *12*	786.3 *4*	(7/2$^+$)		2367.9 *4*	(9/2$^-$)
351.24 *20*	(5/2$^+$)		834.1 *3*	(5/2$^+$)		2417.6 *5*	(9/2$^-$)
444.12 *25*	(11/2$^+$)		1206.4 *6*				
578.80 *25*	(7/2$^+$)		1529.8? *6*				

† From least-squares fit to Eγ's.

‡ From centroid-shift in $\beta\gamma$(t).

β^- radiations

E(decay)	E(level)	Iβ^-†‡	Log *ft*	Comments
(4.18×10^3 *5*)	2417.6	13.9	4.4	av Eβ=1820 *28*
(4.23×10^3 *5*)	2367.9	13.5	4.5	av Eβ=1844 *28*
(4.54×10^3 *5*)	2058.4	3.6	5.2	av Eβ=1991 *28*
(4.76×10^3 *5*)	1843.4	6.5	5.0	av Eβ=2094 *28*
(5.07×10^3 *5*)	1529.8?	0.7	6.1	av Eβ=2244 *28*
(5.39×10^3 *5*)	1206.4	4.5	5.4	av Eβ=2398 *28*
(5.77×10^3 *5*)	834.1	12.3	5.1	av Eβ=2576 *28*
(5.81×10^3 *5*)	786.3	8.9	5.3	av Eβ=2599 *28*
(5.82×10^3 *5*)	785.0	2.4	5.8	av Eβ=2600 *28*
(6.02×10^3 *5*)	578.80	12.8	5.2	av Eβ=2698 *28*
(6.16×10^3 *5*)	444.12	1.4	6.2[1u]	av Eβ=2763 *28*
(6.25×10^3 *5*)	351.24	1.4	6.2	av Eβ=2807 *28*
(6.34×10^3 *5*)	263.10	2.4	6.0[1u]	av Eβ=2849 *28*
(6.39×10^3 *5*)	211.73	15.7	5.2	av Eβ=2874 *28*

† From 2007Ku23.

‡ Absolute intensity per 100 decays.

^{113}Ru β^- decay (0.51 s) 2002Ku18,2007Ku23 (continued)

$\gamma(^{113}Rh)$

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

E_γ	I_γ[@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[&]	Comments
48.1 *13*	0.2[‡] *2*	834.1	(5/2$^+$)	786.3	(7/2$^+$)	[M1]	2.8	
88.1 *3*	4.2[†] *4*	351.24	(5/2$^+$)	263.10	(3/2$^+$)	[M1]	0.49	I_γ: combined intensity from both isomers=13.1 *13*.
[x]181.0[#] *7*	0.8 *4*							Placement by 2002Ku18: 968-786 is omitted since 786 level is now associated to 0.51-s isomer decay only (2007Ku23). In coin with 168γ, 186γ, 263γ, 338γ.
185.8 *3*	5.9[‡] *8*	786.3	(7/2$^+$)	600.5	(3/2$^+$)	[E2]	0.147	
206.2 *4*	2.7[‡] *4*	785.0	(9/2$^+$)	578.80	(7/2$^+$)			
211.7 *2*	31.7[†] *8*	211.73	(9/2$^+$)	0	(7/2$^+$)	M1(+E2)	0.045	α(K)exp=0.06 *2* I_γ: combined intensity from both isomers=32.8 *8*.
[x]226.0 *7*	0.8 *4*							Tentative placement by 2002Ku18: 1061-834 is omitted since 834 level is now associated to 0.51-s isomer decay only (2007Ku23). In coin with 351γ, 263γ, 338γ.
227.6 *3*	8.2[‡] *4*	578.80	(7/2$^+$)	351.24	(5/2$^+$)			
232.3 *3*	7.4 *3*	444.12	(11/2$^+$)	211.73	(9/2$^+$)			
233.9 *4*	2.7[‡] *4*	834.1	(5/2$^+$)	600.5	(3/2$^+$)			
[x]247.0[#] *8*	0.6 *4*							Tentative placement by 2002Ku18: 1034-786 is omitted since 786 level is now associated to 0.51-s isomer decay only (2007Ku23). In coin with 186γ, 338γ and possibly with 263γ.
263.2 *2*	22.3[†] *2*	263.10	(3/2$^+$)	0	(7/2$^+$)	[E2]	0.044	I_γ: combined intensity from both isomers=100.0 *5*.
[x]274.7[#] *7*	0.9 *1*							Placement by 2002Ku18: 1061-786 is omitted since 786 level is now associated to 0.51-s isomer decay only (2007Ku23). In coin with 88γ, 161γ, 186γ, 190γ, 263γ, 338γ.
337.6 *3*	8.7[†] *2*	600.5	(3/2$^+$)	263.10	(3/2$^+$)			I_γ: combined intensity from both isomers=23.4 *4*.
351.2 *3*	3.7[†] *6*	351.24	(5/2$^+$)	0	(7/2$^+$)			I_γ: combined intensity from both isomers=11.8 *17*.
367.1 *5*	2.1[‡] *2*	578.80	(7/2$^+$)	211.73	(9/2$^+$)			
[x]401.0[#] *7*	1.1 *1*							In coin with 88, 117, 152, 186, 263 γ's; fits between levels 2368-1966.
[x]422.9[#] *5*	2.3 *1*							In coin with 88, 162, 263, 338 γ's; fits between levels 2368-1945.
443.9 *4*	5.5 *2*	444.12	(11/2$^+$)	0	(7/2$^+$)			
482.0 *8*	0.7[‡] *2*	834.1	(5/2$^+$)	351.24	(5/2$^+$)			
571.1 *4*	6.6[‡] *2*	834.1	(5/2$^+$)	263.10	(3/2$^+$)			
578.7 *6*	1.9[‡] *2*	578.80	(7/2$^+$)	0	(7/2$^+$)			
600.5 *5*	0.8[†] *1*	600.5	(3/2$^+$)	0	(7/2$^+$)			I_γ: combined intensity from both isomers=2.1 *3*.

Continued on next page (footnotes at end of table)

^{113}Ru β^- decay (0.51 s) 2002Ku18,2007Ku23 (continued)

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

E_γ	I_γ [@]	E_i(level)	J_i^π	E_f	J_f^π	Comments
785.0 *5*	2.7[‡] *2*	785.0	$(9/2^+)$	0	$(7/2^+)$	
888.1[a] *8*	0.9 *4*	2417.6	$(9/2^-)$	1529.8?		
[x]906.2[#] *8*	0.8 *1*					Tentative placement by 2002Ku18: 1485-578 is omitted since 578 level is now associated to 0.51-s isomer decay only (2007Ku23). In coin with 88γ.
994.7 *5*	3.3 *4*	1206.4		211.73	$(9/2^+)$	
[x]1123.0[#] *8*	0.9 *1*					Tentative placement by 2002Ku18: 1909-785 is omitted since 785 level is now associated to 0.51-s isomer decay only (2007Ku23). In possible coin with 212γ.
[x]1180.4[#] *7*	1.4 *7*					Tentative placement by 2002Ku18: 1966-785 is omitted since 785 level is now associated to 0.51-s isomer decay only (2007Ku23). In coin with 88γ, 190γ, 212γ, 263γ.
[x]1194.6[#] *6*	2.6 *2*					In coin with 135, 212, 263 γ's.
1225.0[a] *10*	0.6 *4*	2058.4	$(9/2^-)$	834.1	$(5/2^+)$	
1318.4 *7*	1.4 *1*	1529.8?		211.73	$(9/2^+)$	
1534.6[a] *11*	0.5 *1*	2367.9	$(9/2^-)$	834.1	$(5/2^+)$	
1583.1 *6*	3.6 *2*	2367.9	$(9/2^-)$	785.0	$(9/2^+)$	
1631.7 *6*	4.8 *3*	1843.4		211.73	$(9/2^+)$	
[x]1661.2[#] *10*	0.6 *1*					In coin with 88, 212 γ's.
1846.1 *8*	1.8 *1*	2058.4	$(9/2^-)$	211.73	$(9/2^+)$	
1922.9 *7*	3.6 *1*	2367.9	$(9/2^-)$	444.12	$(11/2^+)$	
1973.2 *6*	8.3 *2*	2417.6	$(9/2^-)$	444.12	$(11/2^+)$	
2058.4[a] *13*	0.3 *3*	2058.4	$(9/2^-)$	0	$(7/2^+)$	
2156.5 *11*	0.7 *1*	2367.9	$(9/2^-)$	211.73	$(9/2^+)$	
2368.0 *9*	1.6 *1*	2367.9	$(9/2^-)$	0	$(7/2^+)$	
2417.6 *10*	1.1 *1*	2417.6	$(9/2^-)$	0	$(7/2^+)$	

[†] Intensity divided based on β feeding proposed by 2007Ku23. Value is different in authors' earlier work (figure 2 of 2002Ku18).
[‡] 2007Ku23 assign all intensity with the decay of 0.51-s activity.
[#] The unplaced γ belongs to the decay of either or both the isomers.
[@] For absolute intensity per 100 decays, multiply by 1.35.
[&] 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.
[a] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{113}Ru β^- decay (0.51 s) 2002Ku18,2007Ku23

Decay Scheme

Intensities: Relative I_γ