^{110}Rh β^- decay (28.0 s) 1999Lh01,1988Ay02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	G. Gürdal and F. G. Kondev	NDS 113, 1315 (2012)	1-Aug-2011

Parent: ^{110}Rh: E=0.0+y; J$^\pi$=(6$^+$); $T_{1/2}$=28.0 s *13*; Q(β^-)=5505 *18*; %β^- decay=100.0

1999Lh01: Source: ^{238}U(p,F), E(p) = 25 MeV. The parent ^{110}Rh was mass separated on-line at the IGISOL facility. The ion beams of the separated activities were implanted on a moving tape. The γ-rays were detected by four Ge detectors of the EUROGAM phase-1 type. They were positioned in a plane around the collection spot at a distance of 10cm and at angles of 80°, 110° and 155° with respect to each other. The beta-rays were detected by two 0.9mm thick plastic scintillator detectors positioned at one on each side of the source. Measured: Eγ, $\gamma\gamma$, $\beta\gamma$t. Deduced: ^{110}Pd levels, J^π.

1988Ay02: Source: ^{238}U(p,F), E(p) = 20 MeV. IGISOL on-line mass separator facility was used to separate the parent ^{110}Rh nucleus. The ^{110}Rh production rate was ≈2×10^3 ions/μC. The ion beams of the separated activities were implanted on a 6 mm wide moving tape. The γ-rays were detected by 25% and 23% coaxial Ge detectors. A 1.4 cm^3 planar Ge detector was used to detect the low-energy γ-rays. The conversion electrons were detected by a 3 mm thick, LN-cooled Si(Li) detector. β-rays were detected with a 1 mm thick NE102 plastic ΔE detector in a combination with a 6.0 cm long and 7.5 cm in diameter NEE102 plastic scintillator. Measured: Eγ, Iγ, $\gamma\gamma$, $\beta\gamma$, ce. Deduced: Levels, Mult., J$^\pi$.

Others: 2000Wa14, 1973FrYO, 1970Pi01 and 1970Wa28.

^{110}Pd Levels

E(level)†	J$^\pi$‡	E(level)†	J$^\pi$‡	E(level)†	J$^\pi$‡
0.0	0$^+$	1212.10 *21*	(3$^+$)	1987.21 *24*	(6$^+$)
373.80 *20*	2$^+$	1398.33 *22*	4$^+$	2260.6 *3*	(5$^+$)
813.60 *18*	2$^+$	1574.0 *3*	6$^+$	2447.8 *4*	(2$^+$)
920.66 *21*	4$^+$	1900.07 *22*	(4$^+$)	2790.64 *24*	(6$^+$)
				2804.95 *23*	(6$^+$)

† From least-squares fit to Eγ.
‡ From Adopted Levels.

β^- radiations

E(decay)	E(level)	Iβ^-†#	Log *ft*†‡	Comments
(2700 *18*)	2804.95	45 *4*	4.88 *5*	av Eβ=1112.8 *84*
(2714 *18*)	2790.64	22.9 *20*	5.19 *5*	av Eβ=1119.5 *85*
(3244 *18*)	2260.6	3.4 *19*	6.34 *25*	av Eβ=1368.4 *85*
(3518 *18*)	1987.21	0.9 *7*	7.1 *4*	av Eβ=1497.6 *86*
(3605 *18*)	1900.07			Iβ^-: a significant feeding is calculated to this level from intensity balance considerations, which is inconsistent with the corresponding transition being second forbidden. This is most likely due to pandemonium effect.
(3931 *18*)	1574.0	7.2 *21*	6.38 *13*	av Eβ=1693.5 *86*

† From intensity balances and the level scheme by the evaluators.
‡ Since the energy of the isomeric level is not known and the decay scheme is incomplete, the values are approximate.
# Absolute intensity per 100 decays.

γ(^{110}Pd)

Iγ normalization: From Σ Ti(g.s.)=100. ^{110}Rh (J^π=(6$^+$)) to ^{110}Pd (J^π=0$^+$) g.s. β^- feeding is assumed to be negligible.

E$_\gamma$[‡]	I$_\gamma$[‡a]	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Mult.[@]	δ[&]	α[†]	Comments
291.6[#] *2*	2.0 *4*	1212.10	(3$^+$)	920.66	4$^+$	[M1]		0.0213	α(K)=0.0186 *3*; α(L)=0.00222 *4*; α(M)=0.000417 *6*; α(N+..)=7.03×10^{-5} *10* α(N)=7.03×10^{-5} *10*
373.8 *2*	100 *4*	373.80	2$^+$	0.0	0$^+$	E2		0.01448	α(K)=0.01245 *18*; α(L)=0.001661 *24*; α(M)=0.000314 *5*; α(N+..)=5.17×10^{-5} *8* α(N)=5.17×10^{-5} *8* Mult.: From adopted gammas. I$_\gamma$: The authors give 100 *38* (1999Lh01), but the quoted uncertainty may be a typo.
398.6 *2*	22.2 *12*	1212.10	(3$^+$)	813.60	2$^+$	[M1]		0.00969	α(K)=0.00847 *12*; α(L)=0.001002 *14*; α(M)=0.000188 *3*; α(N+..)=3.17×10^{-5} *5* α(N)=3.17×10^{-5} *5*
439.8 *2*	32.9 *21*	813.60	2$^+$	373.80	2$^+$	E2+M1	−4.6 *+19−12*	0.00870 *15*	α(K)=0.00751 *13*; α(L)=0.000970 *20*; α(M)=0.000183 *4*; α(N+..)=3.03×10^{-5} *6* α(N)=3.03×10^{-5} *6* δ: From adopted gammas.
477.8 *2*	8.1 *6*	1398.33	4$^+$	920.66	4$^+$	[M1]		0.00622	α(K)=0.00544 *8*; α(L)=0.000640 *9*; α(M)=0.0001202 *17*; α(N+..)=2.03×10^{-5} *3* α(N)=2.03×10^{-5} *3*
501.9[#] *2*	3.6 *10*	1900.07	(4$^+$)	1398.33	4$^+$	[M1]		0.00552	α(K)=0.00483 *7*; α(L)=0.000568 *8*; α(M)=0.0001066 *15*; α(N+..)=1.80×10^{-5} *3* α(N)=1.80×10^{-5} *3*
544.4[#] *2*	6.8 *12*	2804.95	(6$^+$)	2260.6	(5$^+$)	[M1]		0.00455	α(K)=0.00398 *6*; α(L)=0.000466 *7*; α(M)=8.75×10^{-5} *13*; α(N+..)=1.477×10^{-5} *21* α(N)=1.477×10^{-5} *21*
546.9 *2*	43 *3*	920.66	4$^+$	373.80	2$^+$	E2		0.00462	α(K)=0.00401 *6*; α(L)=0.000503 *7*; α(M)=9.46×10^{-5} *14*; α(N+..)=1.576×10^{-5} *23* α(N)=1.576×10^{-5} *23*
584.6 *2*	15.2 *12*	1398.33	4$^+$	813.60	2$^+$	[E2]		0.00384	α(K)=0.00333 *5*; α(L)=0.000415 *6*; α(M)=7.80×10^{-5} *11*; α(N+..)=1.300×10^{-5} *19* α(N)=1.300×10^{-5} *19*
588.8[#] *2*	4.1 *4*	1987.21	(6$^+$)	1398.33	4$^+$	[E2]		0.00376	α(K)=0.00327 *5*; α(L)=0.000406 *6*; α(M)=7.64×10^{-5} *11*; α(N+..)=1.274×10^{-5} *18* α(N)=1.274×10^{-5} *18*
653.3 *2*	18.3 *16*	1574.0	6$^+$	920.66	4$^+$	[E2]		0.00285	α(K)=0.00247 *4*; α(L)=0.000304 *5*; α(M)=5.71×10^{-5} *8*; α(N+..)=9.53×10^{-6} *14* α(N)=9.53×10^{-6} *14*

γ(^{110}Pd) (continued)

E_γ[‡]	I_γ[‡a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[@]	α[†]	Comments
687.7 *2*	32.6 *24*	1900.07	(4$^+$)	1212.10	(3$^+$)	[M1]	0.00263	α(K)=0.00230 *4*; α(L)=0.000268 *4*; α(M)=5.02×10^{-5} *7*; α(N+..)=8.48×10^{-6} *12* α(N)=8.48×10^{-6} *12*
803.5[#] *2*	1.1 *3*	2790.64	(6$^+$)	1987.21	(6$^+$)	[M1]	0.00184	α(K)=0.001612 *23*; α(L)=0.000187 *3*; α(M)=3.50×10^{-5} *5*; α(N+..)=5.91×10^{-6} *9* α(N)=5.91×10^{-6} *9*
813.6 *2*	11.5 *14*	813.60	2$^+$	0.0	0$^+$	[E2]	1.63×10^{-3}	α(K)=0.001423 *20*; α(L)=0.0001707 *24*; α(M)=3.20×10^{-5} *5*; α(N+..)=5.37×10^{-6} *8* α(N)=5.37×10^{-6} *8*
817.6[#] *2*	2.0 *6*	2804.95	(6$^+$)	1987.21	(6$^+$)	[M1]	1.77×10^{-3}	α(K)=0.001549 *22*; α(L)=0.000180 *3*; α(M)=3.37×10^{-5} *5*; α(N+..)=5.68×10^{-6} *8* α(N)=5.68×10^{-6} *8*
838.2[#] *3*	23.9 *19*	1212.10	(3$^+$)	373.80	2$^+$	[M1]	1.67×10^{-3}	α(K)=0.001465 *21*; α(L)=0.0001697 *24*; α(M)=3.18×10^{-5} *5*; α(N+..)=5.37×10^{-6} *8* α(N)=5.37×10^{-6} *8*
890.5 *3*	10.0 *12*	2790.64	(6$^+$)	1900.07	(4$^+$)	[E2]	1.31×10^{-3}	α(K)=0.001148 *16*; α(L)=0.0001366 *20*; α(M)=2.56×10^{-5} *4*; α(N+..)=4.30×10^{-6} *6* α(N)=4.30×10^{-6} *6*
904.5 *3*	19.5 *20*	2804.95	(6$^+$)	1900.07	(4$^+$)	[E2]	1.27×10^{-3}	α(K)=0.001107 *16*; α(L)=0.0001315 *19*; α(M)=2.47×10^{-5} *4*; α(N+..)=4.14×10^{-6} *6* α(N)=4.14×10^{-6} *6*
979.2 *3*	3.2 *6*	1900.07	(4$^+$)	920.66	4$^+$	[M1]	1.18×10^{-3}	α(K)=0.001036 *15*; α(L)=0.0001195 *17*; α(M)=2.24×10^{-5} *4*; α(N+..)=3.78×10^{-6} *6* α(N)=3.78×10^{-6} *6*
1048.5[#] *3*	7.8 *16*	2260.6	(5$^+$)	1212.10	(3$^+$)	[E2]	9.05×10^{-4}	α(K)=0.000792 *11*; α(L)=9.31×10^{-5} *13*; α(M)=1.744×10^{-5} *25*; α(N+..)=2.93×10^{-6} *5* α(N)=2.93×10^{-6} *5*
1049.5 *3*	1.6 *6*	2447.8	(2$^+$)	1398.33	4$^+$			E_γ: 1048.3 keV in 1988Ay02.
1086.5[#] *3*	7.0 *24*	1900.07	(4$^+$)	813.60	2$^+$	[E2]	8.37×10^{-4}	α(K)=0.000732 *11*; α(L)=8.59×10^{-5} *12*; α(M)=1.609×10^{-5} *23*; α(N+..)=2.71×10^{-6} *4* α(N)=2.71×10^{-6} *4*
1216.5 *3*	2.2 *6*	2790.64	(6$^+$)	1574.0	6$^+$	[M1]	7.45×10^{-4}	α(K)=0.000647 *9*; α(L)=7.42×10^{-5} *11*; α(M)=1.390×10^{-5} *20*; α(N+..)=1.038×10^{-5} *15* α(N)=2.35×10^{-6} *4*; α(IPF)=8.03×10^{-6} *12*
1230.9 *3*	8.1 *15*	2804.95	(6$^+$)	1574.0	6$^+$	[M1]	7.29×10^{-4}	α(K)=0.000631 *9*; α(L)=7.24×10^{-5} *11*; α(M)=1.355×10^{-5} *19*; α(N+..)=1.220×10^{-5} *18* α(N)=2.29×10^{-6} *4*; α(IPF)=9.91×10^{-6} *15*
1340.0[#] *3*	2.8 *6*	2260.6	(5$^+$)	920.66	4$^+$	[M1]	6.29×10^{-4}	α(K)=0.000527 *8*; α(L)=6.03×10^{-5} *9*; α(M)=1.129×10^{-5} *16*; α(N+..)=3.08×10^{-5} *5* α(N)=1.91×10^{-6} *3*; α(IPF)=2.89×10^{-5} *4*

$^{110}_{46}Pd_{64}$-3

$\gamma(^{110}Pd)$ (continued)

E_γ[‡]	I_γ[‡a]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	α[†]	Comments
1392.1[#] *3*	9.3 *10*	2790.64	(6$^+$)	1398.33	4$^+$	[E2]	5.45×10^{-4}	α(K)=0.000436 *7*; α(L)=5.04×10^{-5} *7*; α(M)=9.43×10^{-6} *14*; α(N+..)=4.90×10^{-5} *7* α(N)=1.588×10^{-6} *23*; α(IPF)=4.74×10^{-5} *7*
1406.6 *3*	4.7 *7*	2804.95	(6$^+$)	1398.33	4$^+$	[E2]	5.38×10^{-4}	α(K)=0.000427 *6*; α(L)=4.93×10^{-5} *7*; α(M)=9.23×10^{-6} *13*; α(N+..)=5.32×10^{-5} *8* α(N)=1.555×10^{-6} *22*; α(IPF)=5.16×10^{-5} *8*
1579.2 *4*	1.1 *5*	2790.64	(6$^+$)	1212.10	(3$^+$)	[M3]	1.61×10^{-3}	α(K)=0.001393 *20*; α(L)=0.0001670 *24*; α(M)=3.14×10^{-5} *5*; α(N+..)=2.30×10^{-5} *4* α(N)=5.30×10^{-6} *8*; α(IPF)=1.77×10^{-5} *3* E_γ: 1577 keV in 1988Ay02.
1593.6[#] *3*	4.0 *9*	2804.95	(6$^+$)	1212.10	(3$^+$)	[M3]	1.58×10^{-3}	α(K)=0.001361 *19*; α(L)=0.0001629 *23*; α(M)=3.06×10^{-5} *5*; α(N+..)=2.43×10^{-5} *4* α(N)=5.17×10^{-6} *8*; α(IPF)=1.91×10^{-5} *3*
1869.5[#] *5*	2.0 *4*	2790.64	(6$^+$)	920.66	4$^+$	[E2]	5.21×10^{-4}	α(K)=0.000246 *4*; α(L)=2.81×10^{-5} *4*; α(M)=5.26×10^{-6} *8*; α(N+..)=0.000242 *4* α(N)=8.88×10^{-7} *13*; α(IPF)=0.000241 *4*
1884.1[#] *4*	5.1 *9*	2804.95	(6$^+$)	920.66	4$^+$	[E2]	5.24×10^{-4}	α(K)=0.000243 *4*; α(L)=2.77×10^{-5} *4*; α(M)=5.18×10^{-6} *8*; α(N+..)=0.000248 *4* α(N)=8.75×10^{-7} *13*; α(IPF)=0.000248 *4*

[†] Additional information 1.
[‡] From 1999Lh01.
[#] Observed in 1999Lh01, but not in 1988Ay02.
[@] From adopted gammas.
[&] If No value given it was assumed δ=0.00 for E2/M1, δ=1.00 for E3/M2 and δ=0.10 for the other multipolarities.
[a] For absolute intensity per 100 decays, multiply by 0.89 *4*.

^{110}Rh β^- decay (28.0 s) 1999Lh01,1988Ay02

Decay Scheme

Intensities: Relative I_γ