^{97}Pd ε decay 1980Go11

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 111, 525 (2010)	19-Nov-2009

Parent: ^{97}Pd: E=0.0; J$^{\pi}$=(5/2$^+$); $T_{1/2}$=3.10 min *9*; Q(ε)=4.79×10^3 *30*; %ε+%β^+ decay=100.0
^{97}Pd-E,J$^{\pi}$,$T_{1/2}$: ADOPTED values for ^{97}Pd.
^{97}Pd-Q(ε): From 2003Au03.

^{97}Rh Levels

E(level)†	J$^{\pi}$‡	$T_{1/2}$‡
0.0	9/2$^+$	30.7 min *6*
258.76	1/2$^-$	46.2 min *16*
265.40 *9*	(7/2$^+$)	
475.12 *10*	(5/2$^+$,7/2)	
1004.7 *7*	(3/2$^-$)	
1058.07 *12*	(5/2$^+$)	
1199.2 *4*	(5/2$^+$,7/2)	
1415.5 *3*	(3/2$^+$,5/2,7/2)	
1528.7 *5*	(3/2,5/2,7/2)	
1619.1 *5*	(3/2$^+$,5/2,7/2)	
1759.59 *9*	(5/2$^+$,7/2$^+$)	
1906.5 *4*	(3/2,5/2,7/2)	
1994.5 *3*	(5/2$^+$,7/2$^+$)	
2068.0 *5*	(3/2,5/2,7/2)	
2113.32 *19*	(5/2$^+$,7/2$^+$)	
2187.2 *8*	(3/2,5/2,7/2)	
2229.7 *3*	(5/2$^+$,7/2$^+$)	
2295.4 *4*	(3/2$^+$,5/2$^+$,7/2$^+$)	
2903.7 *5*	(5/2$^+$,7/2$^+$)	
2950.1 *7*	(5/2$^+$,7/2$^+$)	
3091.3 *4*	(3/2$^+$,5/2$^+$,7/2$^+$)	
3240.1 *5*	(5/2$^+$,7/2$^+$)	
3607.2 *5*	(3/2$^+$,5/2$^+$,7/2$^+$)	

† From least squares fit to Eγ. Normalized χ^2=1.88 greater than critical χ^2=1.77.
‡ From Adopted Levels.

ε,β^+ radiations

E(decay)	E(level)	Iβ^+ ‡	Iε‡	Log *ft*	I($\varepsilon+\beta^+$)†‡	Comments
(1.2×10^3 *3*)	3607.2		1.90 *17*	4.4 *3*	1.90 *17*	εK=0.864 *11*; εL=0.1093 *21*; εM+=0.0261 *6*
(1.5×10^3 *3*)	3240.1	0.06 *23*	2.7 *3*	4.46 *21*	2.81 *21*	av Eβ=2.4×10^2 *13*; εK=0.85 *7*; εL=0.106 *10*; εM+=0.0253 *23*
(1.7×10^3 *3*)	3091.3	0.1 *3*	2.1 *4*	4.66 *21*	2.22 *23*	av Eβ=3.0×10^2 *13*; εK=0.82 *10*; εL=0.102 *13*; εM+=0.024 *3*
(1.8×10^3 *3*)	2950.1	0.15 *22*	1.3 *3*	4.92 *22*	1.50 *10*	av Eβ=3.6×10^2 *14*; εK=0.78 *13*; εL=0.097 *16*; εM+=0.023 *4*
(1.9×10^3 *3*)	2903.7	0.4 *6*	3.3 *7*	4.56 *22*	3.74 *25*	av Eβ=3.8×10^2 *14*; εK=0.76 *14*; εL=0.095 *17*; εM+=0.023 *4*
(2.5×10^3 *3*)	2295.4	2.2 *8*	2.7 *10*	4.89 *24*	4.84 *25*	av Eβ=6.5×10^2 *14*; εK=0.48 *15*; εL=0.060 *19*; εM+=0.014 *5*
(2.6×10^3 *3*)	2229.7	1.3 *5*	1.5 *6*	5.18 *25*	2.8 *5*	av Eβ=6.8×10^2 *14*; εK=0.45 *15*; εL=0.056 *18*; εM+=0.013 *5*
(2.6×10^3 *3*)	2187.2	0.8 *4*	0.7 *4*	5.48 *24*	1.50 *8*	av Eβ=7.0×10^2 *14*; εK=0.43 *15*; εL=0.054 *18*; εM+=0.013 *5*
(2.7×10^3 *3*)	2113.32	7 *3*	6 *3*	4.59 *24*	13.3 *6*	av Eβ=7.4×10^2 *14*; εK=0.40 *14*; εL=0.050 *18*; εM+=0.012 *4*
(2.7×10^3 *3*)	2068.0	0.9 *3*	0.7 *3*	5.55 *24*	1.61 *10*	av Eβ=7.6×10^2 *14*; εK=0.38 *14*; εL=0.047 *17*; εM+=0.011 *4*
(2.8×10^3 *3*)	1994.5	2.3 *8*	1.6 *8*	5.22 *24*	3.85 *20*	av Eβ=7.9×10^2 *14*; εK=0.35 *13*; εL=0.044 *16*; εM+=0.010 *4*
(2.9×10^3 *3*)	1906.5	2.1 *6*	1.2 *6*	5.36 *24*	3.3 *4*	av Eβ=8.3×10^2 *14*; εK=0.32 *12*; εL=0.040 *15*; εM+=0.010 *4*
(3.0×10^3 *3*)	1759.59	7.1 *15*	3.3 *15*	4.97 *23*	10.4 *6*	av Eβ=9.0×10^2 *14*; εK=0.28 *11*; εL=0.034 *13*;

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^{97}Pd ε decay 1980Go11 (continued)

ϵ,β^+ radiations (continued)

E(decay)	E(level)	Iβ^+ ‡	Iε‡	Log *ft*	I($\varepsilon+\beta^+$)†‡	Comments
						εM+=0.008 *3*
(3.2×10^3 *3*)	1619.1	0.29 *14*	0.11 *7*	6.5 *3*	0.40 *18*	av Eβ=9.6×10^2 *14*; εK=0.24 *9*; εL=0.030 *11*; εM+=0.007 *3*
(3.3×10^3 *3*)	1528.7	1.5 *6*	0.5 *3*	5.9 *3*	2.0 *8*	av Eβ=1.00×10^3 *14*; εK=0.22 *8*; εL=0.027 *10*; εM+=0.0064 *24*
(3.4×10^3 *3*)	1415.5	3.7 *5*	1.1 *4*	5.55 *22*	4.8 *3*	av Eβ=1.06×10^3 *14*; εK=0.19 *7*; εL=0.024 *9*; εM+=0.0057 *21*
(3.6×10^3 *3*)	1199.2	2.1 *3*	0.47 *19*	5.97 *22*	2.6 *3*	av Eβ=1.16×10^3 *14*; εK=0.16 *6*; εL=0.019 *7*; εM+=0.0046 *17*
(3.7×10^3 *3*)	1058.07	5.5 *9*	1.0 *4*	5.66 *22*	6.5 *10*	av Eβ=1.22×10^3 *14*; εK=0.14 *5*; εL=0.017 *6*; εM+=0.0040 *14*
(3.8×10^3 *3*)	1004.7	0.58 *10*	0.10 *4*	6.68 *21*	0.68 *11*	av Eβ=1.25×10^3 *14*; εK=0.13 *5*; εL=0.016 *6*; εM+=0.0038 *13*
(4.3×10^3 *3*)	475.12	10.5 *16*	1.1 *4*	5.76 *19*	11.6 *17*	av Eβ=1.50×10^3 *15*; εK=0.082 *24*; εL=0.010 *3*; εM+=0.0024 *7*
(4.5×10^3 *3*)	265.40	15.9 *12*	1.4 *4*	5.70 *17*	17.3 *12*	av Eβ=1.59×10^3 *15*; εK=0.069 *19*; εL=0.0085 *24*; εM+=0.0020 *6* E(decay): Eβ+=3.5 *3* MeV in coincidence with the 265.3γ.
(4.5×10^3# *3*)	258.76	<0.92	<0.079	>6.9	<1.0	av Eβ=1.60×10^3 *15*; εK=0.069 *19*; εL=0.0085 *24*; εM+=0.0020 *6*

† From Iγ balance in the level scheme.
‡ Absolute intensity per 100 decays.
# Existence of this branch is questionable.

γ(^{97}Rh)

Iγ normalization: Σ Iγ((to g.s.)+Iγ(258.76-keV level))=100.Nodirect $\varepsilon+\beta^+$ decay to ^{97}Rh g.s. or to the 258.76-keV level.
Production: ^{96}Ru(^{3}He,2n) E(^{3}He)=18, 20, 28 MeV. Measured t, Eγ, Iγ, $\gamma\gamma$, $\beta^-\gamma$;Ge(Li) detectors (2.1keV FWHM) and plastic scintillators. Ru target and ion chem was used for absolute intensity measurements.
Others: 1980Za11, 1969At01.
All data are from 1980Go11.
From comparison of I(188.9γ) (mainly from ^{97}Rh isomeric state decay) to I(421.8γ) (from ^{97}Rh g.s. decay) it was deduced that 2.5% 15 ^{97}Pd decays to ^{97}Rh 258.76 keV isomeric state. In view of the number of unplaced gammas (Σ Iγ=12.5 *7*) it is assumed that there is no direct $\varepsilon+\beta^+$ decay to the ^{97}Rh 258.76 keV isomeric state. An $\varepsilon+\beta^+$ group with I=1% would have log $f^{1u}t$=8.5, the allowed limit for first forbidden unique transition.
From I(475.2γ ^{97}Pd decay)/I(421.8γ ^{97}Rh g.s. decay)=0.33 *4* and I(421.8γ)=75 per 100 ^{97}Rh g.s. decays I(475.2γ)=25 *3* per 100 ^{97}Pd decay. I(475.2γ)=26.5 *15* from internal normalization (assuming no direct $\varepsilon+\beta^+$ decay to ^{97}Rh g.s.).

E$_\gamma$	I$_\gamma$#	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Mult.	α@	Comments
209.3 *5*	3.97 *24*	475.12	(5/2$^+$,7/2)	265.40	(7/2$^+$)			
265.3 *1*	100.00	265.40	(7/2$^+$)	0.0	9/2$^+$	(M1+E2)	0.034 *9*	α(K)=0.029 *8*; α(L)=0.0038 *13*; α(M)=0.00072 *25*; α(N+..)=0.00012 *4* α(N)=0.00012 *4*; α(O)=5.0×10^{-6} *11*
354.4 *5*	2.14 *15*	2113.32	(5/2$^+$,7/2$^+$)	1759.59	(5/2$^+$,7/2$^+$)			
475.2 *1*	47.7 *25*	475.12	(5/2$^+$,7/2)	0.0	9/2$^+$			

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^{97}Pd ε decay 1980Go11 (continued)

γ(^{97}Rh) (continued)

E_γ	I_γ[#]	E_i(level)	J^π_i	E_f	J^π_f
[x]556.4[†] *5*	0.56 *3*				
583.0 *5*	2.43 *22*	1058.07	(5/2+)	475.12	(5/2+,7/2)
[x]590.7 *5*	3.6 *4*				
614.4 *5*	0.85 *4*	1619.1	(3/2+,5/2,7/2)	1004.7	(3/2−)
658.5 *5*	2.67 *14*	2187.2	(3/2,5/2,7/2)	1528.7	(3/2,5/2,7/2)
[x]685.5[†] *5*	3.13 *24*				
745.7 *5*	2.07 *19*	1004.7	(3/2−)	258.76	1/2−
792.7 *1*	24.7 *13*	1058.07	(5/2+)	265.40	(7/2+)
862.7 *5*	1.8 *3*	3091.3	(3/2+,5/2+,7/2+)	2229.7	(5/2+,7/2+)
[x]896.6 *5*	1.13 *14*				
933.7 *5*	4.4 *4*	1199.2	(5/2+,7/2)	265.40	(7/2+)
940.3 *3*	6.7 *4*	1415.5	(3/2+,5/2,7/2)	475.12	(5/2+,7/2)
[x]947.4[†] *5*	0.89 *15*				
976.7 *5*	0.95 *20*	3091.3	(3/2+,5/2+,7/2+)	2113.32	(5/2+,7/2+)
[x]1034.4 *5*	1.9 *3*				
1053.6 *5*	6.3 *13*	1528.7	(3/2,5/2,7/2)	475.12	(5/2+,7/2)
1055.4 *5*	10.1 *7*	2113.32	(5/2+,7/2+)	1058.07	(5/2+)
1058.5 *5*	4.8 *4*	1058.07	(5/2+)	0.0	9/2+
1150.3 *5*	1.9 *3*	1415.5	(3/2+,5/2,7/2)	265.40	(7/2+)
1171.8 *3*	6.6 *8*	2229.7	(5/2+,7/2+)	1058.07	(5/2+)
1199.2 *5*	1.58 *17*	1199.2	(5/2+,7/2)	0.0	9/2+
1237.8 *5*	3.63 *19*	2295.4	(3/2+,5/2+,7/2+)	1058.07	(5/2+)
1285.0 *5*	2.50 *21*	2903.7	(5/2+,7/2+)	1619.1	(3/2+,5/2,7/2)
1354.1 *5*	2.36 *24*	1619.1	(3/2+,5/2,7/2)	265.40	(7/2+)
1377.4 *5*	0.75 *11*	3607.2	(3/2+,5/2+,7/2+)	2229.7	(5/2+,7/2+)
1480.5 *5*	2.22 *19*	3240.1	(5/2+,7/2+)	1759.59	(5/2+,7/2+)
1494.2 *2*	10.9 *6*	1759.59	(5/2+,7/2+)	265.40	(7/2+)
1519.8 *5*	4.0 *3*	1994.5	(5/2+,7/2+)	475.12	(5/2+,7/2)
1592.9 *5*	2.87 *17*	2068.0	(3/2,5/2,7/2)	475.12	(5/2+,7/2)
1638.7 *3*	6.7 *4*	2113.32	(5/2+,7/2+)	475.12	(5/2+,7/2)
1641.1 *3*	5.9 *6*	1906.5	(3/2,5/2,7/2)	265.40	(7/2+)
1729.1 *5*	0.75 *6*	1994.5	(5/2+,7/2+)	265.40	(7/2+)
1759.6 *1*	12.1 *8*	1759.59	(5/2+,7/2+)	0.0	9/2+
[x]1788.6[†] *5*	1.55 *8*				
[x]1797.2[†] *5*	2.02 *10*				
1846.8[‡] *3*	5.1 *4*	2113.32	(5/2+,7/2+)	265.40	(7/2+)
[x]1952.2[†] *5*	1.3 *3*				
[x]1979.1[†] *5*	1.19 *6*				
1993.9 *5*	2.12 *18*	1994.5	(5/2+,7/2+)	0.0	9/2+
2029.5 *5*	5.0 *4*	2295.4	(3/2+,5/2+,7/2+)	265.40	(7/2+)
2111.4 *10*	0.71 *6*	2113.32	(5/2+,7/2+)	0.0	9/2+
[x]2132.2 *10*	1.09 *11*				
2231.3 *10*	1.01 *5*	2229.7	(5/2+,7/2+)	0.0	9/2+
2408.0 *10*	1.32 *15*	3607.2	(3/2+,5/2+,7/2+)	1199.2	(5/2+,7/2)
2428.4 *10*	2.01 *25*	2903.7	(5/2+,7/2+)	475.12	(5/2+,7/2)
[x]2497.2 *10*	1.57 *15*				
2637.1 *10*	0.93 *17*	2903.7	(5/2+,7/2+)	265.40	(7/2+)
2684.4 *10*	2.07 *16*	2950.1	(5/2+,7/2+)	265.40	(7/2+)
[x]2777.7 *10*	0.57 *13*				
2826.3 *10*	1.22 *17*	3091.3	(3/2+,5/2+,7/2+)	265.40	(7/2+)
2903.3 *10*	1.24 *25*	2903.7	(5/2+,7/2+)	0.0	9/2+
2950.3 *10*	0.61 *3*	2950.1	(5/2+,7/2+)	0.0	9/2+
2974.6 *10*	2.0 *3*	3240.1	(5/2+,7/2+)	265.40	(7/2+)
[x]3017.0 *10*	0.35 *3*				

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^{97}Pd ε decay 1980Go11 (continued)

γ(^{97}Rh) (continued)

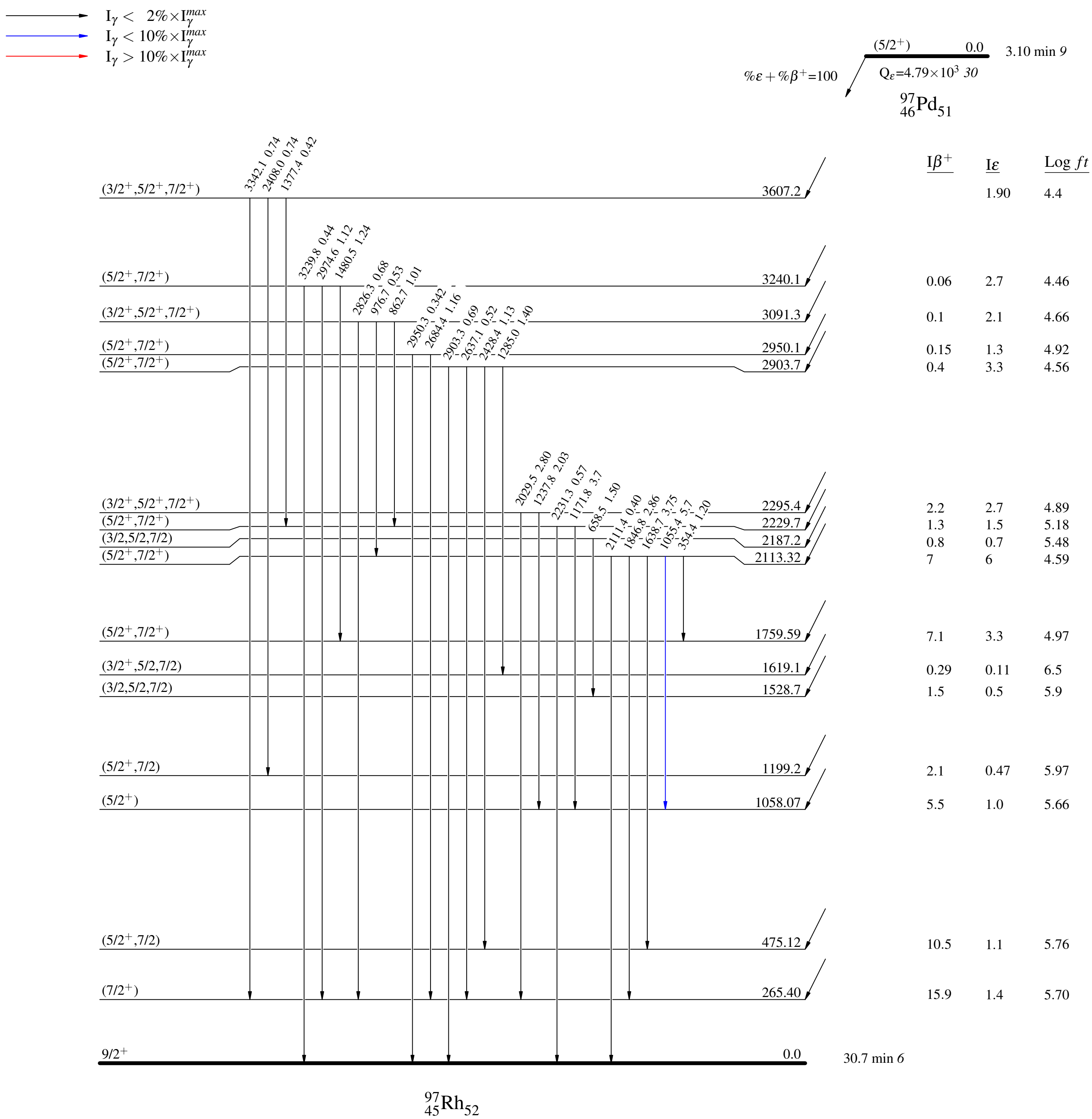
E_γ	I_γ[#]	E_i(level)	J^π_i	E_f	J^π_f
[x]3100.9 *10*	0.26 *5*				
[x]3155.1[†] *10*	0.69 *5*				
3239.8 *10*	0.79 *10*	3240.1	$(5/2^+,7/2^+)$	0.0	$9/2^+$
3342.1 *10*	1.32 *24*	3607.2	$(3/2^+,5/2^+,7/2^+)$	265.40	$(7/2^+)$
[x]3397.8 *10*	0.51 *4*				

[†] Assignment to ^{97}Pd decay uncertain.
[‡] Differ by 3σ or more from calculated value.
[#] For absolute intensity per 100 decays, multiply by 0.5603.
[@] 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.

^{97}Pd ε decay 1980Go11

Decay Scheme

Intensities: I_γ per 100 parent decays



^{97}Pd ε decay 1980Go11

Decay Scheme (continued)

Intensities: I_γ per 100 parent decays