^{111}Pd β^- decay (5.5 h) 1977Kr14,1969Be11,1969Sc12

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jean Blachot	NDS 110, 1239 (2009)	1-Feb-2008

Parent: ^{111}Pd: E=172.2; $J^\pi=11/2^-$; $T_{1/2}$=5.5 h *1*; Q(β^-)=2217 *11*; %β^- decay=27 *3*

^{111}Pd-%β^- decay: from Iγ(172γ,^{111}Pd)/Iγ(391γ,^{111}Ag)= 6.3 *6*; av of 6.5 *8* (1977Kr14), 6.1 *2* (1969Be11). Other: 8.7 *6* (1969Sc12).

Measured: γ, $\gamma\gamma$(1977Kr14,1969Be11,1969Sc12) γ angular correlations (1988Br31).

^{111}Ag Levels

E(level)	J^π	$T_{1/2}$	Comments
0.0	$1/2^-$	7.45 d *1*	
59.79 *4*	$7/2^+$	64.8 s *8*	E(level): %β^- feeding assumed negligible for 1U-transition %β^-= 0.7 *2* from 23.4-min ^{111}Pd decay data.
130.30 *7*	$9/2^+$		
289.64 *8*	$3/2^-$		
376.70† *10*	$3/2^+$		Branching: Iγ(377γ):Iγ(317γ):Iγ(87γ)=100:4.2:3.3 (1977Gl06).
391.29 *8*	$5/2^-$		
545.69† *10*	$7/2^+$		
682.97 *17*	$7/2^+$,$9/2^+$		
705.36 *11*	$(11/2^+)$		
710.3 *4*	$(5/2^+,7/2^+)$		
808.75 *13*	$5/2^-$		
824.48 *11*			E(level): (^{3}He,d) excitation at 817 with L=(4) probably corresponds.
845.75 *10*	$7/2^-$		
876.4 *4*			
959.0† *3*	$11/2^+$		
986.95 *23*	$5/2^-$		
1023.84 *11*	$9/2^-$		
1153.39 *11*	$7/2^-$		
1159.82 *21*			
1463.47 *12*	$(5/2^-,7/2^-)$		
1542.4† *5*	(13/2)		
1549.47 *13*	$9/2^-$,$11/2^-$		
1705.92 *17*	$(7/2^+,9/2^-)$		
1748.66 *11*			
1781.65 *15*	$(9/2^+,11/2^+)$		
1821.48 *10*	$(9/2^-,11/2^-)$		
1905.78 *18*	$(9/2^-,11/2^-)$		
1964.4 *5*			In (^{3}He,pnγ) a 1905.2γ deexcites a 1965.8 level. It is possible that the 1905γ assigned here to the 1964.4 level actually deexcite the higher-energy member of the 1965 doublet.
1987.87 *19*	$(13/2^-)$		
2069.3 *5*			
2087?			
2101.1 *3*	$(11/2^-)$		

† Band(A): 1/2+(431) band. For J=1/2,5/2 members, see 23-min ^{111}Pd β^- decay.

^{111}Pd β^- decay (5.5 h) 1977Kr14,1969Be11,1969Sc12 (continued)

β^- radiations

E(decay)	E(level)	Iβ^-[†]	Log *ft*	Comments
(288 *11*)	2101.1	0.8 *2*	5.8 *3*	av Eβ=74 *13*
(320 *11*)	2069.3	0.35 *12*	6.3 *3*	av Eβ=84 *13*
(401 *11*)	1987.87	1.5 *3*	6.03 *19*	av Eβ=111 *14*
(425 *11*)	1964.4	0.39 *12*	6.70 *21*	av Eβ=119 *14*
(483 *11*)	1905.78	1.2 *2*	6.41 *16*	av Eβ=139 *15*
(568 *11*)	1821.48	6.4 *8*	5.94 *14*	av Eβ=170 *15*
(608 *11*)	1781.65	1.2 *2*	6.77 *14*	av Eβ=184 *15*
(683 *11*)	1705.92	0.89 *15*	7.09 *13*	av Eβ=213 *16*
(840 *11*)	1549.47	2.1 *4*	7.04 *13*	av Eβ=273 *16*
(847 *11*)	1542.4	0.30 *8*	7.90 *15*	av Eβ=276 *16*
(1229 *11*)	1159.82	0.22 *13*	8.7 *3*	av Eβ=434 *18*
(1365 *11*)	1023.84	0.5 *4*	8.5 *4*	av Eβ=493 *18*
(1430 *11*)	959.0	1.6 *5*	8.05 *16*	av Eβ=521 *18*
(1565 *11*)	824.48	1.2 *3*	8.33 *13*	av Eβ=580 *18*
(1684 *11*)	705.36	0.4 *5*	8.9 *6*	av Eβ=633 *18*
(1844 *11*)	545.69	1.0 *7*	8.7 *4*	av Eβ=705 *18*
(2259 *11*)	130.30	7.4 *30*	8.19 *19*	av Eβ=894 *19*

[†] Absolute intensity per 100 decays.

^{111}Pd β^- decay (5.5 h) 1977Kr14,1969Be11,1969Sc12 (continued)

$\gamma(^{111}Ag)$

Iγ normalization: per 100 (it+β^-) decays of parent, if no direct β^- feeding to ^{111}Ag g.s. or 59.8 level.

E_γ [†]	I_γ [†#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α [&]	$I_{(\gamma+ce)}$ [@]	Comments
59.77 *4*	4.8 *3*	59.79	$7/2^+$	0.0	$1/2^-$	E3		186	903 *60*	α(K)= 43.0; α(L)= 115.2; α(M)= 23.68; α(N+..)= 4.26 E_γ: from 1978Sh08 (ce). Others: 59.9 *1* (1969Be11), 59.8 *1* (1969Sc12), 59.8 *3* (1977Kr14). $I_{(\gamma+ce)}$: calc to achieve intensity balance about 59.8 level. I_γ: from I(γ+ce) and α. Measured Iγ= 35 *8* (1969Be11,1977Kr14) for equilibrium 5.5-h + 23-min source. Mult.: from L1:L2:L3=7.0 *15*:100:130 *2*, K/L=0.64 *20* (1978Sh08).
70.44 *7*	378 *27*	130.30	$9/2^+$	59.79	$7/2^+$	M1+E2	≤0.12	1.18	3	α(K)= 1.030; α(L)= 0.1409; α(M)= 0.0268; α(N+..)=0.00530 E_γ: from 1976Sv04. Other: 70.4 *3* (1977Kr14). I_γ: from 1969Be11. Others: 414 *60* (1977Kr14), 486 *100* (1969Sc12). Mult.,δ: from L1:L2:L3= 100 *8*: 11 *8*: <8 (1976Sv04).
87.0	1.45	376.70	$3/2^+$	289.64	$3/2^-$	[E1]		0.22		α(K)= 0.2078; α(L)= 0.0255; α(M)=0.00479; α(N+..)=0.00091 E_γ: Eγ from 1977Gl06. I_γ: branching: Iγ(377γ):Iγ(317γ):Iγ(87γ)=100:4.2:3.3 (1977Gl06).
101.8 *1*	14 *2*	391.29	$5/2^-$	289.64	$3/2^-$	[M1]		0.41		α(K)= 0.349; α(L)= 0.0433; α(M)=0.00819; α(N+..)=0.00164
118.7 *6*	5 *3*	824.48		705.36	$(11/2^+)$					
166 *1*	5 *3*	876.4		710.3	$(5/2^+,7/2^+)$					E_γ: assigned by 1977Kr14 to the 1987 level. Reassigned by the evaluator to the 876 level, on the basis of branching in 23-min β^- decay and in (^{3}He,pnγ).
169.1 *5*	22 *7*	545.69	$7/2^+$	376.70	$3/2^+$	[E2]		0.22		α(K)= 0.1845; α(L)= 0.0325; α(M)=0.00625; α(N+..)=0.00117
272.0 *2*	8.3 *8*	1821.48	$(9/2^-,11/2^-)$	1549.47	$9/2^-,11/2^-$					
289.8 *1*	52 *5*	289.64	$3/2^-$	0.0	$1/2^-$	[M1]		0.024		α(K)=0.02076; α(L)=0.00250; α(M)=0.00047
308.1 *4*	7 *3*	1153.39	$7/2^-$	845.75	$7/2^-$					
316.9 *7*	1.85	376.70	$3/2^+$	59.79	$7/2^+$	[E2]		0.026		α(K)=0.02213; α(L)=0.00312; α(M)=0.00059; α(N+..)=0.00012 I_γ: from Iγ branching (1977Gl06). Others: 2 *1* (1977Kr14), 0.3 *1* (1969Be11).
357.9 *1*	21 *2*	1821.48	$(9/2^-,11/2^-)$	1463.47	$(5/2^-,7/2^-)$					

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^{111}Pd β^- decay (5.5 h) 1977Kr14,1969Be11,1969Sc12 (continued)

$\gamma(^{111}Ag)$ (continued)

E_γ[†]	I_γ[†#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[&]	Comments
376.7 *1*	44 *6*	376.70	$3/2^+$	0.0	$1/2^-$		0.004	α(K)=0.00354; α(L)=0.00041
391.3 *1*	270 *22*	391.29	$5/2^-$	0.0	$1/2^-$	[E2]	0.013	α(K)=0.01134; α(L)=0.00152; α(M)=0.00029
413.5 *3*	89 *21*	959.0	$11/2^+$	545.69	$7/2^+$			
415.5 *3*	81 *18*	545.69	$7/2^+$	130.30	$9/2^+$			
418[‡] *1*	2.7[‡] *13*	808.75	$5/2^-$	391.29	$5/2^-$			
439.3 *2*	12.1 *20*	1463.47	$(5/2^-,7/2^-)$	1023.84	$9/2^-$			
[x]444.2 *2*	6.3 *7*							
454.5[b] *2*	56[b] *9*	845.75	$7/2^-$	391.29	$5/2^-$	M1+E2		δ: from 1988Br31. δ=− 0.014 *46* or +8.1 +4.9-2.3. The measured $\gamma(\theta)$ gives a strong preference for the larger value. I_γ: 69 *6* doublet resolved via $\gamma\gamma$.
454.5[b] *2*	13[b] *5*	1159.82		705.36	$(11/2^+)$			
477 *1*	≤2	1463.47	$(5/2^-,7/2^-)$	986.95	$5/2^-$			
485.9 *1*	26 *4*	545.69	$7/2^+$	59.79	$7/2^+$			
[x]519.3[b] *2*	5.6[b] *11*							I_γ: from Iγ=7.5 *8* for observed γ and Iγ=1.9 *8* deduced for placement from the 809 level. Note that in (^{3}He,pnγ) there is a 519γ placed also from a 1202 level.
519.3[b] *2*	1.9[b] *8*	808.75	$5/2^-$	289.64	$3/2^-$			I_γ: Iγ from Iγ/Iγ(417γ)=0.71 *6* in (^{3}He,pnγ).
525.6 *1*	65 *7*	1549.47	$9/2^-,11/2^-$	1023.84	$9/2^-$	M1+E2		δ: 1988Br31 have not been able to discriminate among three choices of δ for J(1550)=9/2 or 11/2.
552.2 *2*	14 *3*	1705.92	$(7/2^+,9/2^-)$	1153.39	$7/2^-$			
552.6 *2*	1.2 *4*	682.97	$7/2^+,9/2^+$	130.30	$9/2^+$			I_γ: Iγ from Iγ(552.6γ)/Iγ(623γ)= 0.058 *10* (^{111}Pd g.s. decay). E_γ: Eγ from 23-min decay.
556.1 *1*	14 *2*	845.75	$7/2^-$	289.64	$3/2^-$			
575.0 *1*	159 *15*	705.36	$(11/2^+)$	130.30	$9/2^+$			
580.00 *8*	100	710.3	$(5/2^+,7/2^+)$	130.30	$9/2^+$			
583.4 *4*	13 *3*	1542.4	(13/2)	959.0	$11/2^+$			E_γ: weighted average: 583.2 *5* (1977Kr14), 583.5 *5* (1969Sc12); other: 584.0 (1969Be11).
595.4 *5*	6.3 *6*	986.95	$5/2^-$	391.29	$5/2^-$			
617.5 *3*	3.5 *20*	1463.47	$(5/2^-,7/2^-)$	845.75	$7/2^-$			
623.2 *3*	20 *6*	682.97	$7/2^+,9/2^+$	59.79	$7/2^+$			
632.8 *2*	178 *15*	1023.84	$9/2^-$	391.29	$5/2^-$			
645.6[‡] *5*	5[‡] *3*	705.36	$(11/2^+)$	59.79	$7/2^+$			
654.7 *2*	7.5 *8*	1463.47	$(5/2^-,7/2^-)$	808.75	$5/2^-$			
668.5 *2*	49 *5*	1821.48	$(9/2^-,11/2^-)$	1153.39	$7/2^-$	M1+E2		δ: 1988Br31 have not been able to discriminate among three choices of δ for J(1821)=9/2 or 11/2.
694.2 *1*	100	824.48		130.30	$9/2^+$			
697 *1*	7 *4*	986.95	$5/2^-$	289.64	$3/2^-$			I_γ: other: 2.7 13 (1969Be11).
703.8 *2*	33 *4*	1549.47	$9/2^-,11/2^-$	845.75	$7/2^-$			
[x]716[‡] *1*	2[‡] *1*							
718.9 *2*	9 *3*	1705.92	$(7/2^+,9/2^-)$	986.95	$5/2^-$			
724.82 *2*	14.0 *13*	1748.66		1023.84	$9/2^-$			E_γ: assigned to 1549.5 by 1974Bu15 and 1969Sc12; however, a 724.52 in

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^{111}Pd β^- decay (5.5 h) 1977Kr14,1969Be11,1969Sc12 (continued)

$\gamma(^{111}Ag)$ (continued)

E_γ [†]	I_γ [†#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	Comments
								(^{3}He,pnγ) is assigned to a 1748 level. This placement is consistent with the (724.8γ)(633γ) coin reported by 1977Kr14.
745.6 *5*	6.3 *11*	876.4		130.30	$9/2^+$			
753.0 *4*	6.0 *20*	1905.78	$(9/2^-,11/2^-)$	1153.39	$7/2^-$			
762.2 *1*	63 *5*	1153.39	$7/2^-$	391.29	$5/2^-$	M1+E2	−0.20 *3*	δ: other: δ=− 20 +*28*−*6*. The negative anisotropy favors the smaller value in agreement with 1987Ze04.
797.8 *1*	51 *3*	1821.48	$(9/2^-,11/2^-)$	1023.84	$9/2^-$	M1+E2		δ: 1988Br31 have not been able to discriminate among three choices of δ for J(1821)=9/2 or 11/2.
[x]808.5[b] *2*	3.0[b] *5*							I_γ: from Iγ=3.4 *5* for observed γ and Iγ=0.35 *17* deduced for placement from the 809 level. In (^{3}He,pnγ) there is an 809γ placed also from a 1768 level.
808.5[‡b] *2*	0.35[‡b] *17*	808.75	$5/2^-$	0.0	$1/2^-$			I_γ: Iγ from Iγ/Iγ(417γ)=0.13 *6* in (^{3}He,pnγ).
817 *1*	5 *3*	876.4		59.79	$7/2^+$			
828.3[b] *5*	2.8[b] *12*	959.0	$11/2^+$	130.30	$9/2^+$			I_γ: Iγ from Iγ/Iγ(413γ)=0.032 *11* in (^{3}He,pnγ).
828.3[b] *5*	5.9[b] *20*	1987.87	$(13/2^-)$	1159.82				I_γ: from Iγ=8.7 *16* for the doubly placed 828γ and value deduced for placement from the 959 level.
862.8 *5*	7.5 *20*	1153.39	$7/2^-$	289.64	$3/2^-$			
882.1[a] *3*	10.7[a] *10*	1705.92	$(7/2^+,9/2^-)$	824.48				
882.1[a] *3*	10.7[a] *10*	1905.78	$(9/2^-,11/2^-)$	1023.84	$9/2^-$			
894 *2*	≈3	1023.84	$9/2^-$	130.30	$9/2^+$			
916.2 *7*	5 *3*	2069.3		1153.39	$7/2^-$			
944.7 *5*	6.5 *20*	1821.48	$(9/2^-,11/2^-)$	876.4				
975.2 *5*	8 *2*	1821.48	$(9/2^-,11/2^-)$	845.75	$7/2^-$			
996.3 *4*	13 *3*	1821.48	$(9/2^-,11/2^-)$	824.48				
1001.2 *5*	5 *2*	1705.92	$(7/2^+,9/2^-)$	705.36	$(11/2^+)$			
1022.5 *5*	7 *4*	1153.39	$7/2^-$	130.30	$9/2^+$			
1029.0[b] *15*	2.3[b] *9*	1159.82		130.30	$9/2^+$			I_γ: Iγ from Iγ/Iγ(454γ)=0.18 *3* in (^{3}He,pnγ).
1029.0[b] *15*	<2.9[b]	1987.87	$(13/2^-)$	959.0	$11/2^+$			I_γ: Iγ=0.7 *22* from Iγ=3 *2* for the doubly placed 1029γ and Iγ=2.3 *9* deduced for placement from the 1159.5 level.
1045.2 *7*	5 *2*	2069.3		1023.84	$9/2^-$			
1063.4[c] *7*	7 *4*	2087?		1023.84	$9/2^-$			
[x]1076[‡] *1*	2[‡] *1*							
1088.0 *5*	10 *3*	1964.4		876.4				
1098.5[‡] *10*	6[‡] *3*	1781.65	$(9/2^+,11/2^+)$	682.97	$7/2^+,9/2^+$			
1115.9 *2*	55 *5*	1821.48	$(9/2^-,11/2^-)$	705.36	$(11/2^+)$			
1139.6 *7*	3 *2*	1964.4		824.48				
1142.4 *7*	6 *3*	2101.1	$(11/2^-)$	959.0	$11/2^+$			
1163.3 *3*	17 *2*	1987.87	$(13/2^-)$	824.48				
1200.1 *3*	16 *2*	1905.78	$(9/2^-,11/2^-)$	705.36	$(11/2^+)$			
1222.5 *5*	4.5 *30*	1905.78	$(9/2^-,11/2^-)$	682.97	$7/2^+,9/2^+$			
[x]1270 *1*	≤2							

^{111}Pd β^- decay (5.5 h) 1977Kr14,1969Be11,1969Sc12 (continued)

$\gamma(^{111}Ag)$ (continued)

E_γ [†]	I_γ [†#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
1282.5 *2*	52 *5*	1987.87	(13/2$^-$)	705.36	(11/2$^+$)		
[x]1309 *1*	≤3						
1381[c] *1*	2 *1*	2087?		705.36	(11/2$^+$)		
1418 *1*	3 *1*	2101.1	(11/2$^-$)	682.97	7/2$^+$,9/2$^+$		
1651.3 *2*	36 *4*	1781.65	(9/2$^+$,11/2$^+$)	130.30	9/2$^+$		
1691.1 *2*	64 *5*	1821.48	(9/2$^-$,11/2$^-$)	130.30	9/2$^+$		
1721.9 *2*	17 *2*	1781.65	(9/2$^+$,11/2$^+$)	59.79	7/2$^+$		
1775.2 *5*	23 *3*	1905.78	(9/2$^-$,11/2$^-$)	130.30	9/2$^+$		
1905 *1*	4 *3*	1964.4		59.79	7/2$^+$		E_γ: see comment on 1964.4 level.
1939 *1*	5 *3*	2069.3		130.30	9/2$^+$		
1970.8 *3*	31 *3*	2101.1	(11/2$^-$)	130.30	9/2$^+$	D	Mult.: δ<0.2 from (1971γ)(70γ)(θ) (1976Be34).
[x]2064.1[‡] *10*	1.4[‡] *8*						
[x]2086 *1*	≤2						

[†] Eγ,Iγ are from 1977Kr14, except as noted.
[‡] From 1969Be11.
[#] For absolute intensity per 100 decays, multiply by 0.021 *2*.
[@] For absolute intensity per 100 decays, multiply by 0.27 *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.
[a] Multiply placed with undivided intensity.
[b] Multiply placed with intensity suitably divided.
[c] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

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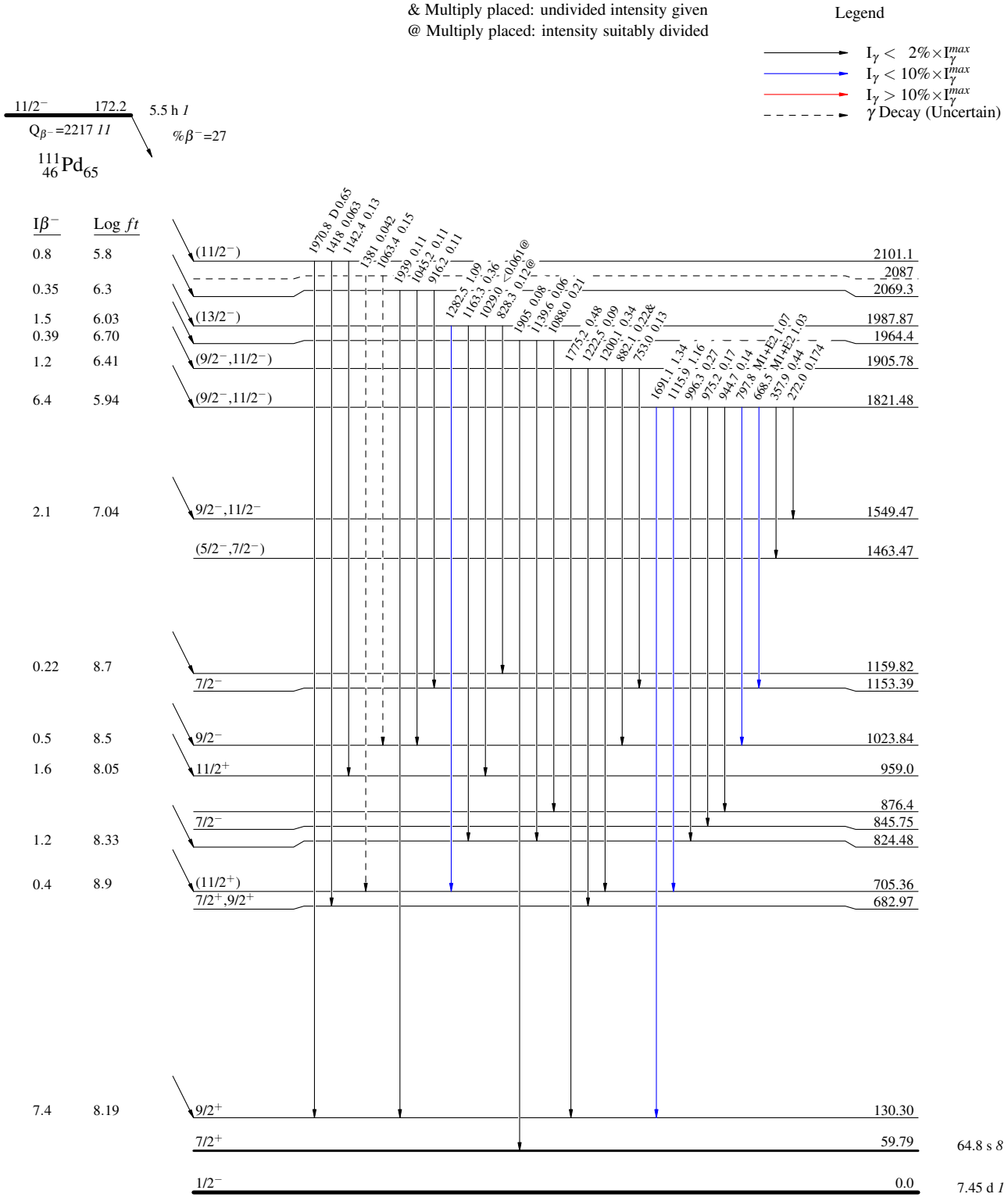
^{111}Pd β^- decay (5.5 h) 1977Kr14,1969Be11,1969Sc12

Decay Scheme

Intensities: I_γ per 100 parent decays
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



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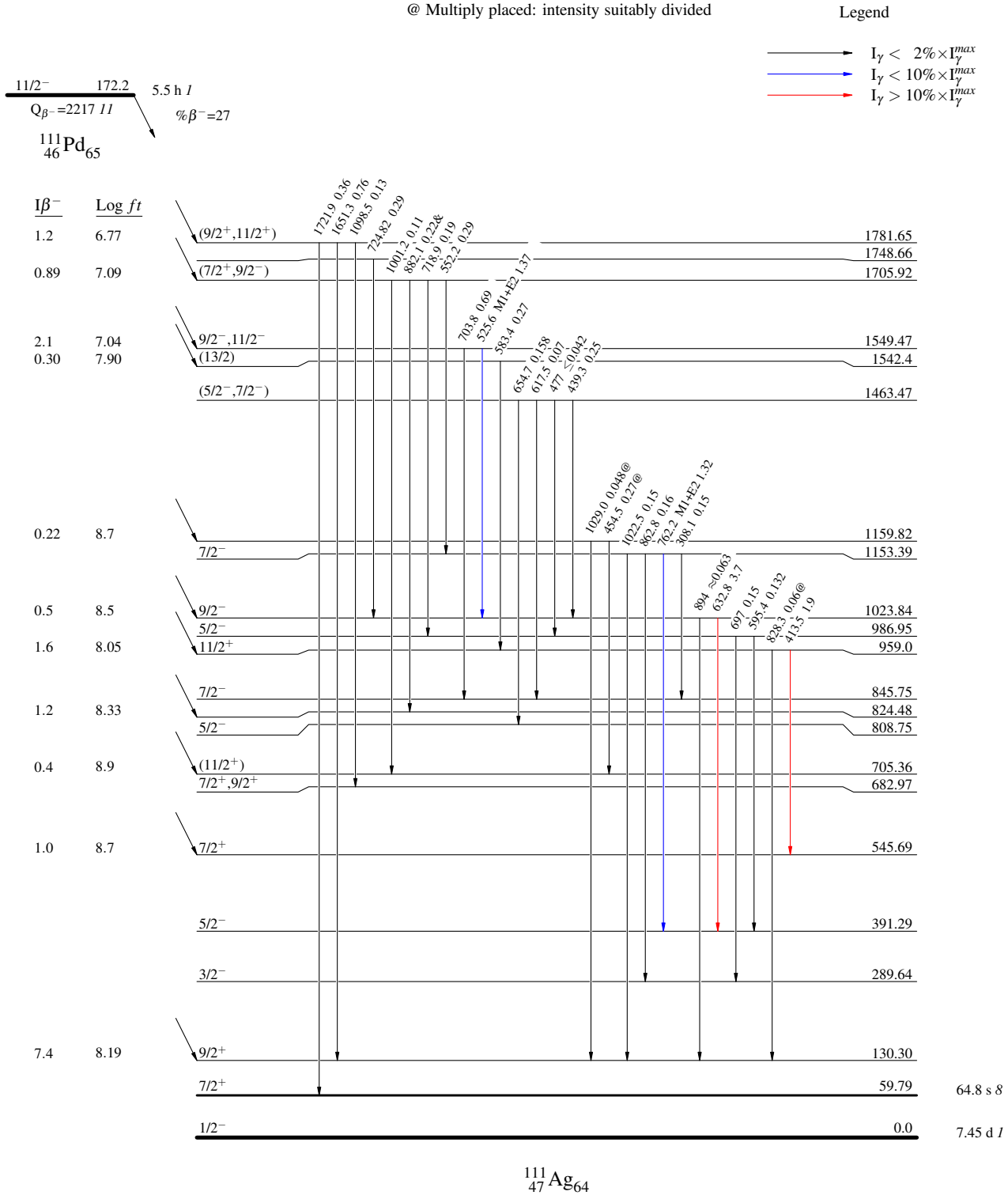
^{111}Pd β^- decay (5.5 h) 1977Kr14,1969Be11,1969Sc12

Decay Scheme (continued)

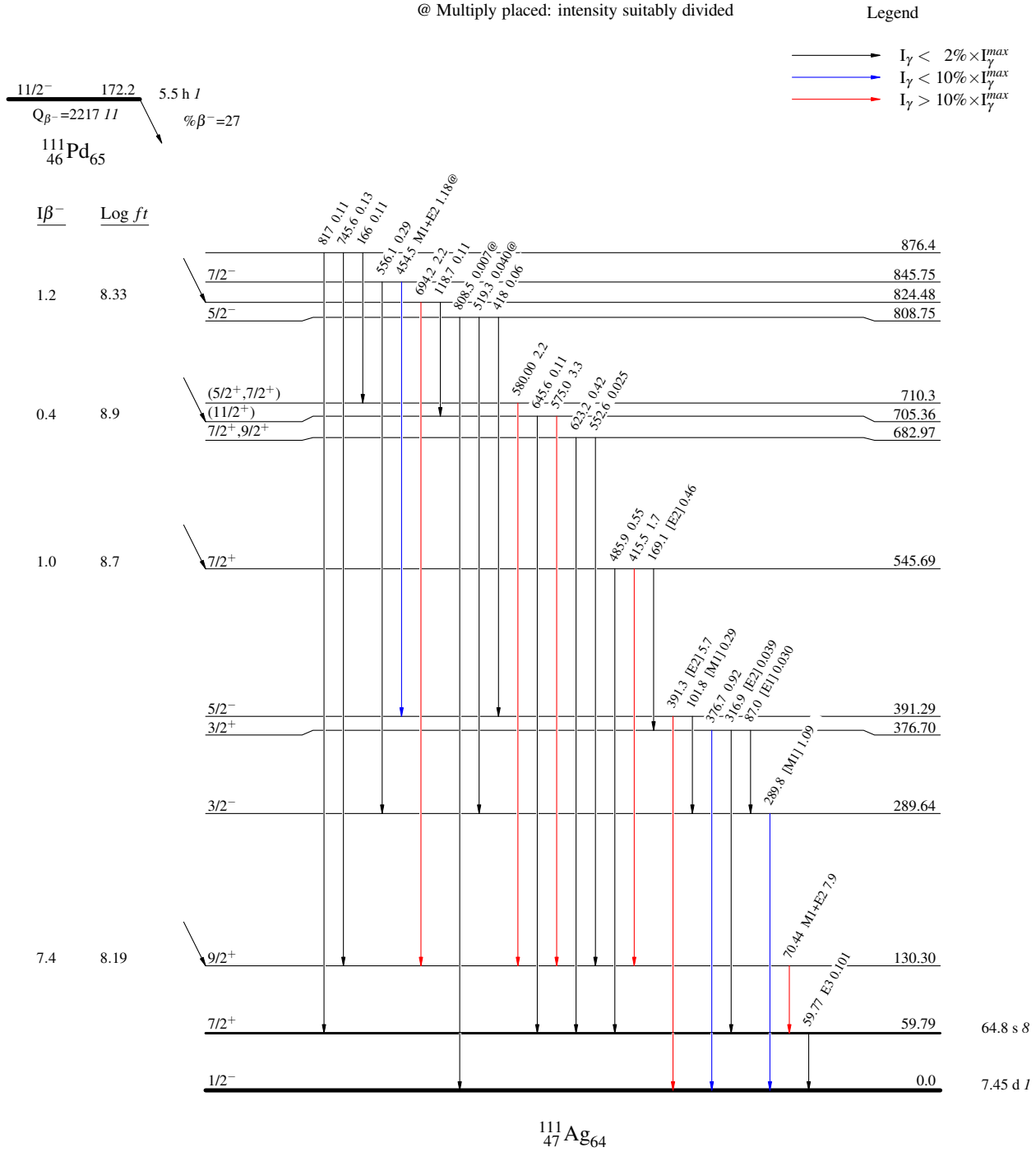
Intensities: I_γ per 100 parent decays
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



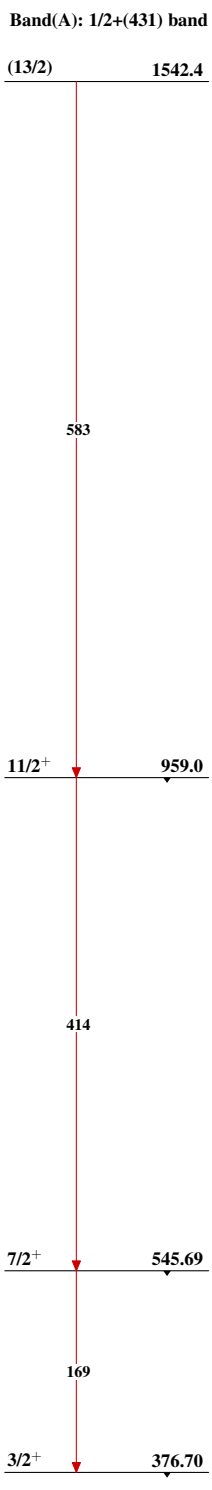
^{111}Pd β^- decay (5.5 h) 1977Kr14,1969Be11,1969Sc12

Decay Scheme (continued)

Intensities: I_γ per 100 parent decays
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



^{111}Pd β^- decay (5.5 h) 1977Kr14,1969Be11,1969Sc12



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