^{111}Pd β^- decay (23.4 min) 1977Kr14,1969Be11,1969Sc12

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

Parent: ^{111}Pd: E=0.0; $J^\pi=5/2^+$; $T_{1/2}$=23.4 min *2*; Q(β^-)=2217 *11*; %β^- decay=100.0

1987Ze04 propose two levels at 568.5 and 568.8 instead of 568.8 based on coincidence.

Measured: γ, $\gamma\gamma$(1977Kr14, 1969Be11, 1969Sc12).

^{111}Ag Levels

E(level)	J^π	$T_{1/2}$	Comments
0.0	$1/2^-$	7.45 d *1*	%β^-=100 $T_{1/2}$: from 7.45 d *1* (1960Ba49), 7.450 d *17* (1974Ro18).
59.87 *7*	$7/2^+$	64.8 s *8*	%IT=99.3; %β^-=0.7 *2* E(level): from Iγ(245γ,^{111}Cd)/Iγ(580γ)= 0.58 *4* (1977Kr14).
130.29 *9*	$9/2^+$	1.22 ns *2*	$T_{1/2}$: from β(ce(K) 70γ)(t): 1976Sv04.
289.76 *10*	$3/2^-$		
376.66† *7*	$3/2^+$	16 ns *1*	$T_{1/2}$: from 1977Gl06 (377γ)(t); branching: Iγ(377γ)/Iγ(317γ)/Iγ(87γ)=100/4.2/3.33 (1977Gl06).
391.20 *10*	$5/2^-$		
404.77† *16*	$1/2^+$		
545.84† *14*	$7/2^+$		
568.5 *2*	$5/2^+$		
568.8 *1*	$5/2^+$		
606.93† *9*	$5/2^+$		
641.73 *19*	$3/2^-$		E(level): weakly populated in decay; enhanced in pickup and stripping reactions.
683.04 *11*	$7/2^+$,$9/2^+$		
710.28 *10*	$(5/2^+,7/2^+)$		
809.04 *21*	$5/2^-$		
876.1 *5*			
1062.20 *16*	$(3/2^+,5/2^+)$		
1085.6 *4*	$(7/2^+)$		
1086.47 *20*	$(3/2^+,5/2^+)$		
1119.3 *4*	$(3/2^+)$		
1170.3 *6*	$(3/2^+,5/2^+)$		
1180.29 *15*	$3/2^+$,$5/2^+$		
1210.44 *17*	$3/2^+$		
1506.1? *7*			
1518.80 *14*	$5/2^+$,$7/2^+$		
1602.5 *4*	$5/2^+$		E(level): based on $\gamma\gamma$-anticoincidence spectra (1974Bu15).
1621.9 *8*	$3/2^+$		E(level): (^{3}He,d) excitation with L=2 probably corresponds.
1674.3 *4*	$3/2^-$		
1704.8 *4*	$(5/2^+,7/2^+)$		

† Band(A): (K=1/2(431)) band In analogy with similar configurations populated in ^{107}In-^{119}In. α=18.7, a=−1.5 calc from 1/2,3/2,7/2 E(levels). Other interpretation given by 1977Gl06.

β^- radiations

E(decay)	E(level)	Iβ^-†	Log *ft*	Comments
(512 *11*)	1704.8	≈0.06	≈6.7	av Eβ= 153 *19*
(543 *11*)	1674.3	≈0.021	≈7.2	av Eβ= 164 *19*
(595 *11*)	1621.9	≈0.013	≈7.6	av Eβ= 183 *19*
(615 *11*)	1602.5	≈0.029	≈7.3	av Eβ= 190 *19*

Continued on next page (footnotes at end of table)

^{111}Pd β^- decay (23.4 min) 1977Kr14,1969Be11,1969Sc12 (continued)

β^- radiations (continued)

E(decay)	E(level)	Iβ^-[†]	Log *ft*	Comments
(698 *11*)	1518.80	1.4 *2*	5.8 *1*	av Eβ= 222 *20*
(1007 *11*)	1210.44	0.10	7.5	av Eβ= 345 *21*
(1037 *11*)	1180.29	0.17	7.4	av Eβ= 358 *21*
(1047 *11*)	1170.3	≈0.034	≈8.1	av Eβ= 362 *21*
(1098 *11*)	1119.3	0.10	7.7	av Eβ= 383 *21*
(1131 *11*)	1086.47	0.16	7.5	av Eβ= 397 *22*
(1131 *11*)	1085.6	≈0.07	≈7.9	av Eβ= 397 *22*
(1155 *11*)	1062.20	0.16	7.6	av Eβ= 407 *22*
(1341 *11*)	876.1	≈0.022	≈8.7	av Eβ= 487 *22*
(1408 *11*)	809.04	≈0.018	≈8.8	av Eβ= 516 *22*
(1507 *11*)	710.28	1.36 *14*	7.1 *1*	av Eβ= 559 *22*
(1610 *11*)	606.93	0.39	7.7	av Eβ= 605 *23*
(1648 *11*)	568.8	0.10	8.2	av Eβ= 622 *23*
(1649 *11*)	568.5	0.05	8.2	av Eβ= 622 *23*
(1671 *11*)	545.84	≈0.08	≈8.5	av Eβ= 632 *23*
(1826 *11*)	391.20	≈0.027	≈9.1	av Eβ= 701 *23*
(1840 *11*)	376.66	0.18	8.3	av Eβ= 708 *23*
(2157 *11*)	59.87	95.3 *4*	5.85 *5*	av Eβ= 852 *23*
				E(decay): 2130 *50* (1957Kn38) s. Others: 2150 *100* (1952Mc34), 2100 *100* (1960Pr07).
				Iβ^-: using Iγ(59.8γ)= 63 *5*(1969Be11) gives Iβ= 95.3 *4*; other Iγ(59.8γ)= 43 *5*(1977Kr14) would give Iβ=95.1.

[†] Absolute intensity per 100 decays.

^{111}Pd β^- decay (23.4 min) 1977Kr14,1969Be11,1969Sc12 (continued)

$\gamma(^{111}Ag)$

Iγ normalization: if no direct β^- feeding to ^{111}Ag g.s. and if %β^-=0.7 for 59.8 level (^{111}Ag).

E_γ †	I_γ †&	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α [b]	$I_{(\gamma+ce)}$ [a]	Comments
59.82 *8*	63 *5*	59.87	$7/2^+$	0.0	$1/2^-$	E3		181		α(K)= 42.9; α(L)= 114.6; α(M)= 23.56; α(N+..)= 4.23 Iγ: from 1969Be11. Others: 43 *5* (1977Kr14), 79 *21* (1969Sc12). Mult.: from L1/L2/L3=7.0 *15*/100/130 *2*, K/L=0.64 *20* (1978Sh08) HF(E3,59.8γ)=21 W.u.
70.43 *8*	90 *3*	130.29	$9/2^+$	59.87	$7/2^+$	M1+(E2)	≤0.12	1.18	197 *5*	α(K)= 1.030; α(L)= 0.1410; α(M)= 0.0268; α(N+..)=0.00531 Iγ: from I(γ+ce) and α. Others: 80 *5* (1969Be11), 106 *21* (1969Sc12), 50 *8* (1977Kr14). δ≤0.12 deduced by 1976Sv04 from L-subshell ratios. $I_{(\gamma+ce)}$: from an intensity balance at the 130 level.
87.0	1.8	376.66	$3/2^+$	289.76	$3/2^-$	[E1]		0.22		α(K)= 0.2078; α(L)= 0.0255; α(M)=0.00479; α(N+..)=0.00091 Eγ,Iγ: from 1977Gl06.
101.4 *7*	0.6 *3*	391.20	$5/2^-$	289.76	$3/2^-$					
141.8‡ *5*	0.05‡ *2*	710.28	$(5/2^+,7/2^+)$	568.8	$5/2^+$					
166 *1*	1.5 *10*	876.1		710.28	$(5/2^+,7/2^+)$					
169.4 *2*	4.0 *17*	545.84	$7/2^+$	376.66	$3/2^+$					
202.2 *4*	1.2 *3*	606.93	$5/2^+$	404.77	$1/2^+$					
230.3 *2*	2.8 *3*	606.93	$5/2^+$	376.66	$3/2^+$					
279.0 *2*	1.2 *4*	568.5	$5/2^+$	289.76	$3/2^-$					Eγ: the placement of this γ and the two levels (568.5,568.8) are based on coincidence work of 1987Ze04 in (^{3}He,pnγ).
289.8 *1*	12.2 *9*	289.76	$3/2^-$	0.0	$1/2^-$	[M1]		0.024		α(K)=0.02076; α(L)=0.00250; α(M)=0.00047
308.4 *2*	1.1 *1*	1518.80	$5/2^+,7/2^+$	1210.44	$3/2^+$					
316.8 *2*	2.4 *3*	376.66	$3/2^+$	59.87	$7/2^+$	[E2]		0.026		α(K)=0.02216; α(L)=0.00312; α(M)=0.00060; α(N+..)=0.00012 Iγ: av of 2.2 (1977Gl06), 3.2 *4* (1977Kr14), 1.8 *2* (1969Be11), 2.6 *4* (1969Sc12).
352.2 *6*	0.7 *3*	641.73	$3/2^-$	289.76	$3/2^-$					
376.68 *8*	53 *3*	376.66	$3/2^+$	0.0	$1/2^-$	[E1]		0.004		α(K)=0.00354; α(L)=0.00041
391.2 *1*	3.1 *1*	391.20	$5/2^-$	0.0	$1/2^-$					
404.8 *2*	10.0 *6*	404.77	$1/2^+$	0.0	$1/2^-$					
x414 *1*	3 *1*									
415.5# *3*	8.8 *3*	545.84	$7/2^+$	130.29	$9/2^+$					Iγ: av of: 10 *2* (1969Be11), 7 *2* (1969Sc12), <15 (1977Kr14).

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^{111}Pd β^- decay (23.4 min) 1977Kr14,1969Be11,1969Sc12 (continued)

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

E_γ[†]	I_γ[†&]	E_i(level)	J_i^π	E_f	J_f^π	Comments
418[‡] *1*	0.5[‡] *3*	809.04	5/2$^-$	391.20	5/2$^-$	
438.5 *1*	5.8 *6*	568.8	5/2$^+$	130.29	9/2$^+$	
476.7 *1*	6.9 *6*	606.93	5/2$^+$	130.29	9/2$^+$	
478.9 *6*	2.3 *13*	1085.6	(7/2$^+$)	606.93	5/2$^+$	
485.8 *2*	3.1 *6*	545.84	7/2$^+$	59.87	7/2$^+$	
494.1 *4*	1.0 *5*	1062.20	(3/2$^+$,5/2$^+$)	568.5	5/2$^+$	
509.1[c] *6*	25[c@] *3*	568.5	5/2$^+$	59.87	7/2$^+$	E_γ: see the 279γ.
509.1[c] *6*	25[c@] *3*	568.8	5/2$^+$	59.87	7/2$^+$	
516.4 *6*	3.1 *7*	1085.6	(7/2$^+$)	568.8	5/2$^+$	I_γ: assigned also to 1062.2 level; however, branching in (^{3}He,pnγ) suggests that all the intensity belongs with the 1085.7 level.
519.3[#] *2*	1.2 *6*	809.04	5/2$^-$	289.76	3/2$^-$	
540.7 *6*	3.1 *6*	1086.47	(3/2$^+$,5/2$^+$)	545.84	7/2$^+$	
547.00 *8*	44 *3*	606.93	5/2$^+$	59.87	7/2$^+$	
552.6 *2*	1.9 *3*	683.04	7/2$^+$,9/2$^+$	130.29	9/2$^+$	
580.00 *8*	100	710.28	(5/2$^+$,7/2$^+$)	130.29	9/2$^+$	
603.1 *5*	2.7 *13*	1210.44	3/2$^+$	606.93	5/2$^+$	I_γ: Iγ:Iγ(834γ):Iγ(921γ)=1.09 *24*: 1.0 *7*: 2.90 *12* in (^{3}He,pnγ) suggests that only part of the 603γ should be assigned as deexciting the 1210 level.
611.3 *4*	2.1 *5*	1180.29	3/2$^+$,5/2$^+$	568.8	5/2$^+$	
623.2 *1*	33 *2*	683.04	7/2$^+$,9/2$^+$	59.87	7/2$^+$	
624[‡] *1*	2.0[‡] *5*	1170.3	(3/2$^+$,5/2$^+$)	545.84	7/2$^+$	I_γ: from Iγ/Iγ(794γ) in (^{3}He,pnγ) one expects Iγ=0.4 *7*.
635 *1*	2.5 *20*	1180.29	3/2$^+$,5/2$^+$	545.84	7/2$^+$	
641.7[d] *2*	2.0[d] *9*	641.73	3/2$^-$	0.0	1/2$^-$	I_γ: from Iγ/Iγ(352.2γ)=2.80 *21* in (^{3}He,pnγ).
641.7[d] *2*	5.0[d] *10*	1210.44	3/2$^+$	568.8	5/2$^+$	E_γ: placement from 1974Bu15; deexcites 1705 and/or 1519 levels (1969Be11,1969Sc12), placement in (^{3}He,pnγ) is from 1210 and 642 levels. I_γ: from Iγ=7.0 *5* for the doubly placed 641.9γ and Iγ deduced for placement from the 642 level.
650.4 *1*	66 *3*	710.28	(5/2$^+$,7/2$^+$)	59.87	7/2$^+$	
657.3 *6*	2.8 *3*	1062.20	(3/2$^+$,5/2$^+$)	404.77	1/2$^+$	
685.4 *2*	6.0 *7*	1062.20	(3/2$^+$,5/2$^+$)	376.66	3/2$^+$	
709.8 *2*	15.0 *15*	1086.47	(3/2$^+$,5/2$^+$)	376.66	3/2$^+$	
742.6 *4*	2.0 *5*	1119.3	(3/2$^+$)	376.66	3/2$^+$	
745.7 *6*	1.7 *7*	876.1		130.29	9/2$^+$	
773[‡] *1*	0.5[‡] *2*	1062.20	(3/2$^+$,5/2$^+$)	289.76	3/2$^-$	
775.5 *3*	5.0 *5*	1180.29	3/2$^+$,5/2$^+$	404.77	1/2$^+$	
793.8 *6*	2.1 *4*	1170.3	(3/2$^+$,5/2$^+$)	376.66	3/2$^+$	
803.8 *3*	4.1 *7*	1180.29	3/2$^+$,5/2$^+$	376.66	3/2$^+$	
808.5[d]	0.14[d] *9*	809.04	5/2$^-$	0.0	1/2$^-$	I_γ: from Iγ(519γ)/Iγ(519γ+809γ)=0.08 *4* in (^{3}He,pnγ).
808.5[d]	3.1[d] *4*	1518.80	5/2$^+$,7/2$^+$	710.28	(5/2$^+$,7/2$^+$)	I_γ: from Iγ=3.2 *4* for the doubly placed 809γ (weighted average of 3.4 *5* (1977Kr14), 3.0 *15* (1969Be11), 2.6 *8* (1969Sc12) and Iγ deduced for placement from the 809 level.
816.5[‡] *10*	0.9[‡] *5*	876.1		59.87	7/2$^+$	

$^{111}_{47}Ag_{64}$-4

^{111}Pd β^- decay (23.4 min) 1977Kr14,1969Be11,1969Sc12 (continued)

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

E_γ [†]	I_γ [†&]	E_i(level)	J_i^π	E_f	J_f^π	Comments
833[‡] *1*	1.0[‡] *5*	1210.44	$3/2^+$	376.66	$3/2^+$	
835.7 *2*	32 *2*	1518.80	$5/2^+$,$7/2^+$	683.04	$7/2^+$,$9/2^+$	
890[‡] *1*	0.5[‡] *2*	1180.29	$3/2^+$,$5/2^+$	289.76	$3/2^-$	
921.4 *6*	2.9 *6*	1210.44	$3/2^+$	289.76	$3/2^-$	
937.3[‡] *10*	0.8[‡] *4*	1506.1?		568.8	$5/2^+$	
950.0[‡] *10*	1.0[‡] *4*	1518.80	$5/2^+$,$7/2^+$	568.8	$5/2^+$	
955.5 *6*	4.5 *4*	1085.6	$(7/2^+)$	130.29	$9/2^+$	
1002.3 *3*	7.3 *13*	1062.20	$(3/2^+,5/2^+)$	59.87	$7/2^+$	
1015[‡] *1*	1.0[‡] *5*	1621.9	$3/2^+$	606.93	$5/2^+$	
1022[‡] *1*	0.8[‡] *4*	1704.8	$(5/2^+,7/2^+)$	683.04	$7/2^+$,$9/2^+$	
1026.6[‡] *10*	1.0[‡] *5*	1086.47	$(3/2^+,5/2^+)$	59.87	$7/2^+$	
1053[‡] *1*	0.5[‡] *3*	1621.9	$3/2^+$	568.8	$5/2^+$	
1059.8[‡] *10*	1.5[‡] *5*	1119.3	$(3/2^+)$	59.87	$7/2^+$	
1067.1[‡] *5*	1.5[‡] *5*	1674.3	$3/2^-$	606.93	$5/2^+$	
1098[‡] *1*	0.8[‡] *4*	1704.8	$(5/2^+,7/2^+)$	606.93	$5/2^+$	
1120.4 *2*	16.0 *15*	1180.29	$3/2^+$,$5/2^+$	59.87	$7/2^+$	I_γ: assigned also to 1120 level by 1969Be11 but branching in (^{3}He,pnγ) is consistent with placement entirely from 1190 level.
[x]1246[‡] *1*	0.4[‡] *2*					
1269.7[‡] *5*	1.0[‡] *3*	1674.3	$3/2^-$	404.77	$1/2^+$	
1311.2[‡] *10*	0.9[‡] *5*	1602.5	$5/2^+$	289.76	$3/2^-$	
[x]1348 *2*	2 *1*					
1388.5 *2*	64 *5*	1518.80	$5/2^+$,$7/2^+$	130.29	$9/2^+$	
[x]1395[‡] *1*	0.5[‡] *3*					
1459.0 *3*	67 *5*	1518.80	$5/2^+$,$7/2^+$	59.87	$7/2^+$	
1506[‡] *1*	0.1[‡] *1*	1506.1?		0.0	$1/2^-$	
1542.9 *4*	2.6 *3*	1602.5	$5/2^+$	59.87	$7/2^+$	
[x]1549[‡] *1*	0.6[‡] *3*					
1574.5 *5*	3.1 *5*	1704.8	$(5/2^+,7/2^+)$	130.29	$9/2^+$	
1644.3[‡] *10*	2.3[‡] *5*	1704.8	$(5/2^+,7/2^+)$	59.87	$7/2^+$	
[x]1863.2[‡] *10*	0.3[‡] *2*					

[†] Eγ, Iγ are from 1977Kr14, unless otherwise indicated.
[‡] From 1969Be11.
[#] From 1977Kr14 (5.5-h ^{111}Pd decay).
[@] From branching in (^{3}He,pnγ), one expects Iγ(509γ from 568.5)=24 *13*, and Iγ(509γ from 568.8)=23 *7*, nearly twice the observed intensity.

$^{111}_{47}Ag_{64}$-5

γ(^{111}Ag) (continued)

[&] For absolute intensity per 100 decays, multiply by 0.0087 *7*.
[a] Absolute intensity per 100 decays.
[b] 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.
[c] Multiply placed with undivided intensity.
[d] Multiply placed with intensity suitably divided.
[x] γ ray not placed in level scheme.

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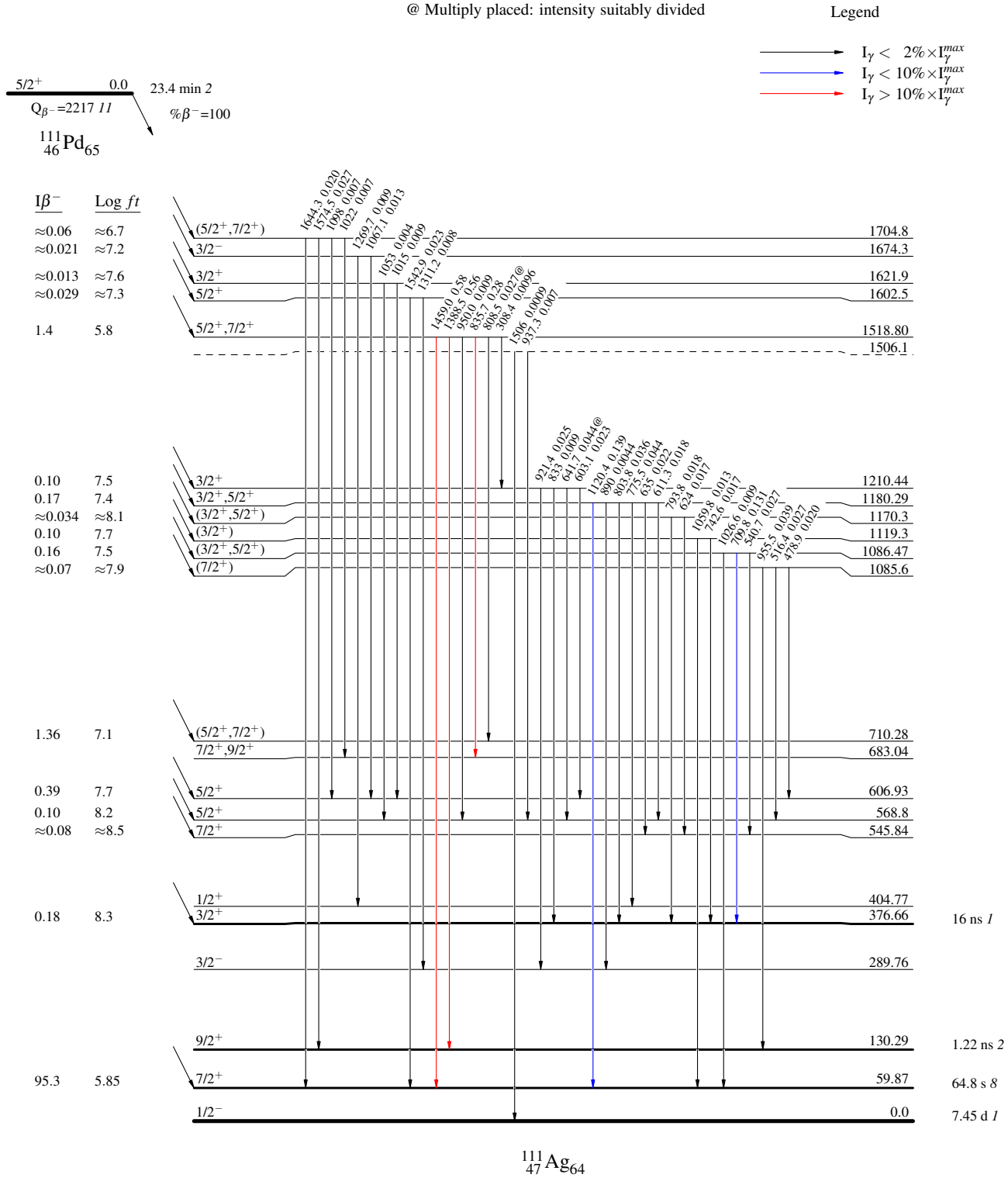
Decay Scheme

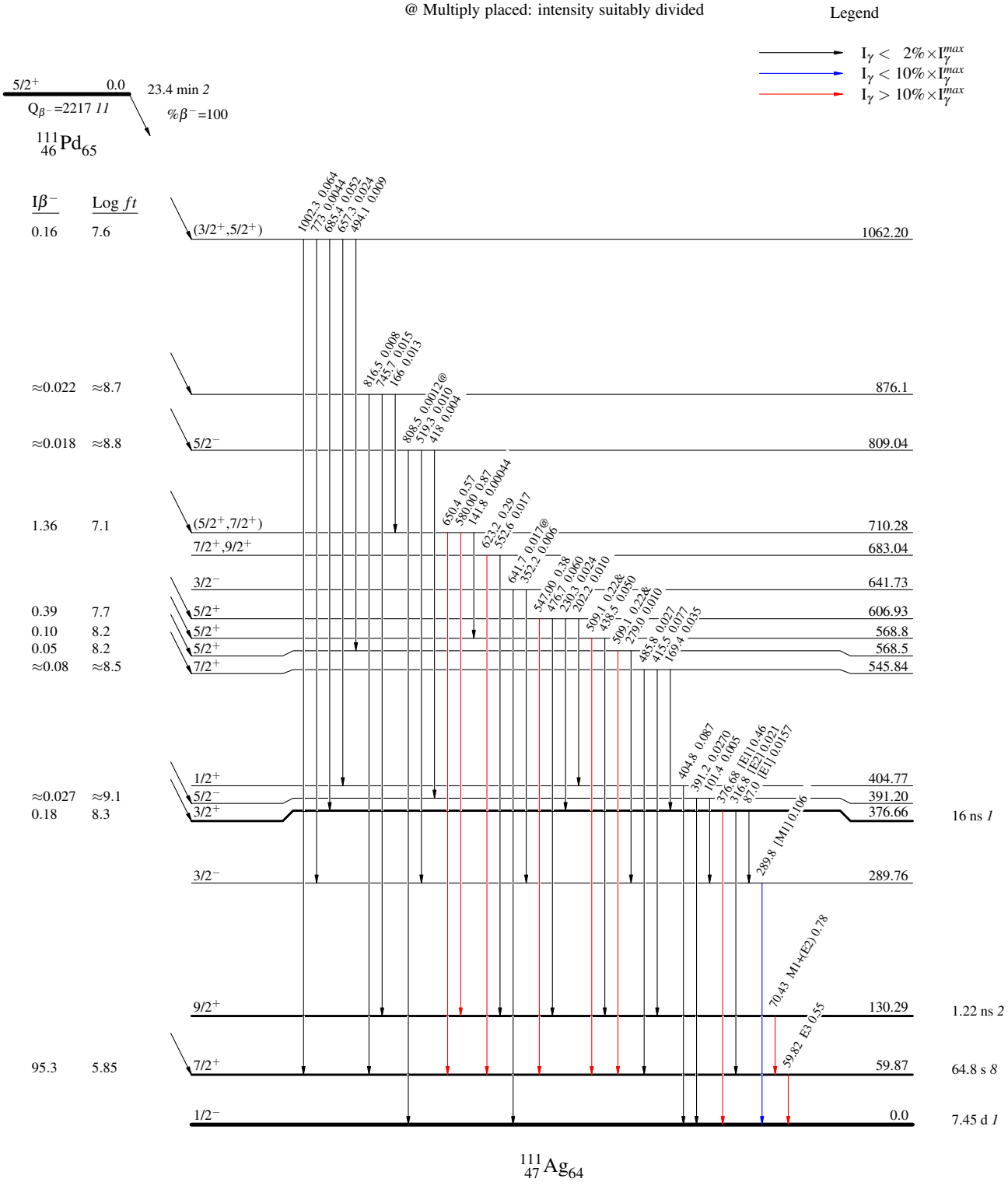
Intensities: I_γ per 100 parent decays
@ Multiply placed: intensity suitably divided



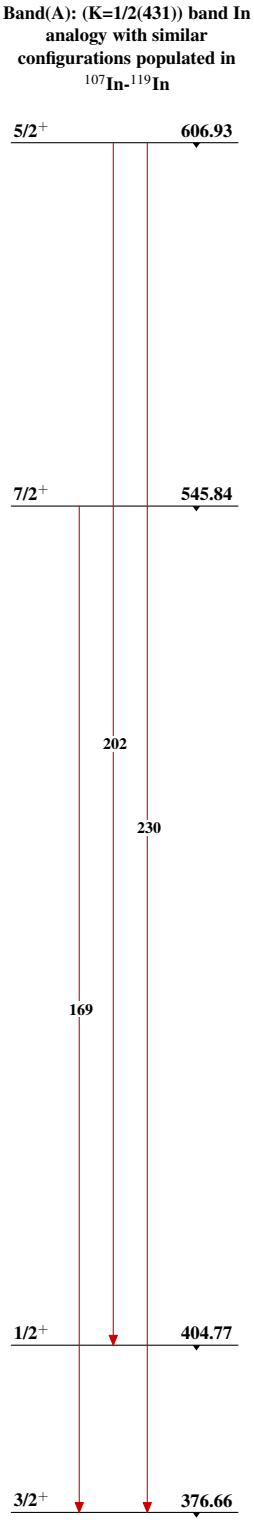
^{111}Pd β^- decay (23.4 min) 1977Kr14,1969Be11,1969Sc12

Decay Scheme (continued)

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



^{111}Pd β^- decay (23.4 min) 1977Kr14,1969Be11,1969Sc12



$^{111}_{47}Ag_{64}$