^{108}Pd(n,γ) E=2.96 eV 1980Ca02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	S. Kumar(a), J. Chen(b) and F. G. Kondev	NDS 137, 1 (2016)	31-May-2016

S(n)=6153.59 *15* from 2012Wa38.

1980Ca02: E=2.96 eV resonance neutrons were produced by the Brookhaven National Laboratory High Flux Beam Reactor (HFBR) via Bragg diffraction from a large Be crystal. Target is 5.52 g ^{108}Pd enriched to 98.11%. γ rays were detected with Ge(Li) detectors (FWHM=7 keV at Eγ=6 MeV). Measured Eγ, Iγ, $\gamma(\theta)$ at 90° and 135°. Deduced levels, J^π.

^{109}Pd Levels

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
0		426.2 *8*		847 *4*		1328.4 *16*	(3/2)
113.4 *6*	1/2	433.6 *6*	3/2,(5/2)	911.3 *8*	5/2	1359.1 *9*	
188.9 *13*		491.6 *7*		941.0 *9*		1371.1 *16*	5/2
245.0 *8*		540.8 *7*		945.0 *8*	3/2	1399.2 *16*	
266.4 *7*		604.4 *8*		954.3 *9*	1/2,5/2	1477.6 *16*	
276.3 *8*		623.5 *7*	3/2,5/2	981.8 *8*	5/2	1540.3 *16*	3/2
287.2 *14*		646.0 *16*		1053.8 *10*	5/2,(3/2)	1623.9 *16*	
291.4 *7*	3/2	673.4 *7*		1091.0 *16*	5/2	1647.9 *16*	
325.3 *6*		722.1 *7*		1134.6 *13*		6154.2 *6*	
326.9 *6*	3/2,5/2#	791.4 *7*	5/2	1232.8 *12*			
339.3 *8*		810.6 *10*		1269.8 *16*			

† From a least-squares fit to γ-ray energies.
‡ From 1980Ca02 based on $\gamma(\theta)$.
# 1980Ca02 suggests that the 326 level is populated, but the 325 level is not ruled out.

γ(^{109}Pd)

Eγ†	Iγ‡	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$
94.5 *15*	15.4 *15*	339.3		245.0	
98.3@ *15*	21.8 *22*	287.2		188.9	
106.7 *15*	0.8 *3*	433.6	3/2,(5/2)	326.9	3/2,5/2
108.3@ *15*	2.1 *3*	433.6	3/2,(5/2)	325.3	
113.4 *15*	187 *19*	113.4	1/2	0	
149.9 *15*	1.8 *2*	426.2		276.3	
152.9 *15*	42 *4*	266.4		113.4	1/2
166.3 *15*	1.9 *4*	491.6		325.3	
x170.6 *15*	2.9 *6*				
178.0 *15*	61 *6*	291.4	3/2	113.4	1/2
189.0 *15*	19.2 *19*	188.9		0	
189.9 *15*	2.6 *4*	623.5	3/2,5/2	433.6	3/2,(5/2)
197.3 *15*	0.6 *3*	623.5	3/2,5/2	426.2	
200.2 *15*	9.8 *10*	491.6		291.4	3/2
x203.0 *15*	0.7 *2*				
x207.7 *15*	0.7 *2*				
211.9 *15*	17.7 *18*	325.3		113.4	1/2
213.8 *15*	1.4 *2*	540.8		326.9	3/2,5/2
215.4 *15*	5.9 *6*	540.8		325.3	
x216.5 *15*	0.3 *2*				
222.9 *15*	0.8 *3*	945.0	3/2	722.1	
x228.2 *15*	1.7 *2*				
230.5 *15*	1.4 *2*	722.1		491.6	

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^{108}Pd(n,γ) E=2.96 eV 1980Ca02 (continued)

γ(^{109}Pd) (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J^π_i	E_f	J^π_f
245.1 *15*	83 *8*	245.0		0	
249.2 *15*	17.8 *18*	540.8		291.4	3/2
[x]263.4 *15*	0.6 *4*				
264.4 *15*	0.9 *8*	540.8		276.3	
265.0 *15*	5.6 *6*	604.4		339.3	
266.3 *15*	12.9 *13*	266.4		0	
274.3 *15*	0.7 *2*	540.8		266.4	
276.3 *15*	70 *7*	276.3		0	
288.5 *15*	1.3 *3*	722.1		433.6	3/2,(5/2)
291.4 *15*	50 *5*	291.4	3/2	0	
295.6 *15*	0.8 *2*	540.8		245.0	
298.2 *15*	10.6 *11*	623.5	3/2,5/2	325.3	
317.3[@] *15*	1.1 *3*	604.4		287.2	
320.2 *15*	17.2 *17*	433.6	3/2,(5/2)	113.4	1/2
325.3 *15*	71 *7*	325.3		0	
326.9 *15*	41 *4*	326.9	3/2,5/2	0	
332.1 *15*	3.2 *4*	623.5	3/2,5/2	291.4	3/2
334.0 *15*	25 *3*	673.4		339.3	
336.6 *15*	6.0 *6*	941.0		604.4	
[x]337.8 *15*	0.9 *5*				
339.5 *15*	50 *5*	339.3		0	
[x]343.9 *15*	1.5 *3*				
346.6 *15*	1.0 *2*	673.4		326.9	3/2,5/2
347.2 *15*	1.0 *2*	623.5	3/2,5/2	276.3	
359.4 *15*	32 *3*	604.4		245.0	
365.3 *15*	0.8 *2*	791.4	5/2	426.2	
[x]371.1 *15*	1.4 *3*				
377.0 *15*	0.6 *3*	810.6		433.6	3/2,(5/2)
378.2 *15*	17.7 *18*	491.6		113.4	1/2
395.2 *15*	1.8 *3*	722.1		326.9	3/2,5/2
396.8 *15*	5.1 *5*	722.1		325.3	
[x]407.1 *15*	1.6 *3*				
[x]414.3 *15*	4.0 *4*				
[x]416.7 *15*	1.4 *3*				
[x]418.3 *15*	3.5 *4*				
[x]421.0 *15*	3.2 *3*				
426.1 *15*	27 *3*	426.2		0	
428.4 *15*	7.1 *7*	673.4		245.0	
433.6 *15*	32 *3*	433.6	3/2,(5/2)	0	
[x]441.8 *15*	3.2 *5*				
455.7 *15*	4.2 *4*	722.1		266.4	
461.2 *15*	4.0 *4*	1134.6		673.4	
464.5 *15*	2.5 *4*	791.4	5/2	326.9	3/2,5/2
[x]466.5[#] *15*	3.2[#] *3*				
[x]467.3[#] *15*	3.2[#] *4*				
485.3 *15*	3.0 *4*	810.6		325.3	
491.6 *15*	7.0 *7*	491.6		0	
515.1 *15*	7.1 *7*	791.4	5/2	276.3	
520.6 *15*	6.7 *7*	954.3	1/2,5/2	433.6	3/2,(5/2)
525.1 *15*	2.6 *6*	791.4	5/2	266.4	
[x]526.4 *15*	1.7 *6*				
530.2 *15*	0.9 *6*	1134.6		604.4	
[x]539.4 *15*	1.7 *15*				
540.7 *15*	2.6 *14*	540.8		0	
[x]554.6[#] *15*	4.6[#] *5*				

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^{108}Pd(n,γ) E=2.96 eV 1980Ca02 (continued)

γ(^{109}Pd) (continued)

E_γ †	I_γ ‡	E_i(level)	J^π_i	E_f	J^π_f
555.6# 15	4.6# 5	981.8	5/2	426.2	
x579.9 15	1.3 3				
584.5# 15	2.7# 4	911.3	5/2	326.9	3/2,5/2
585.9# 15	2.7# 4	911.3	5/2	325.3	
601.6 15	3.9 4	941.0		339.3	
604.5 15	2.6 4	604.4		0	
x608.7 15	1.7 3				
x612.0 15	1.2 3				
619.9#@ 15	8.9# 9	911.3	5/2	291.4	3/2
x620.4# 15	8.9# 9				
623.5 15	5.0 5	623.5	3/2,5/2	0	
628.9 15	3.0 4	954.3	1/2,5/2	325.3	
x632.4 15	1.1 3				
x634.9 15	8.2 8				
646.0 15	1.4 4	646.0		0	
653.5 15	5.5 6	945.0	3/2	291.4	3/2
654.9# 15	5.5# 6	981.8	5/2	326.9	3/2,5/2
x655.5# 15	5.5# 6				
x657.6# 15	6.4# 6				
673.6#@ 15	1.3# 3	673.4		0	
674.7# 15	1.3# 3	941.0		266.4	
678.0# 15	4.1# 4	791.4	5/2	113.4	1/2
678.7# 15	4.1# 4	945.0	3/2	266.4	
x681.0 15	2.0 3				
685.9 15	3.4 3	1359.1		673.4	
690.3 15	15.3 15	981.8	5/2	291.4	3/2
696.0 15	0.8 3	941.0		245.0	
705.4 15	2.5 4	981.8	5/2	276.3	
x713.4 15	4.1 4				
722.0 15	6.8 7	722.1		0	
726.7 15	5.1 6	1053.8	5/2,(3/2)	326.9	3/2,5/2
754.9 15	3.2 4	1359.1		604.4	
x772.1 15	1.3 3				
787.3 15	1.5 3	1053.8	5/2,(3/2)	266.4	
791.4 15	4.8 5	791.4	5/2	0	
x793.6 15	1.8 3				
799.3@ 15	4.1 4	1232.8		433.6	3/2,(5/2)
810.5@ 15	7.4 7	810.6		0	
x815.2 15	2.8 3				
x820.2 15	1.8 3				
831.6 15	18.2 18	945.0	3/2	113.4	1/2
840.8 15	5.7 6	954.3	1/2,5/2	113.4	1/2
x846.3 15	15.8 16				
911.3 15	14.4 14	911.3	5/2	0	
966.4@ 15	1.9 4	1232.8		266.4	
1019.9 15	1.7 3	1359.1		339.3	
4506.2 15	6.3 10	6154.2		1647.9	
4530.1 15	9.1 10	6154.2		1623.9	
4613.7 15	12.1 10	6154.2		1540.3	3/2
4676.4 15	5.1 5	6154.2		1477.6	
4754.8 15	0.6 2	6154.2		1399.2	
4782.9 15	7.2 6	6154.2		1371.1	5/2
4795.5 15	4.4 13	6154.2		1359.1	

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^{108}Pd(n,γ) E=2.96 eV 1980Ca02 (continued)

γ(^{109}Pd) (continued)

Eγ†	Iγ‡	Ei(level)	J^π_i	Ef	J^π_f	Eγ†	Iγ‡	Ei(level)	Ef	J^π_f
4825.6 *15*	4.4 *5*	6154.2		1328.4	(3/2)	5508.0 *15*	1.0 *4*	6154.2	646.0	
4884.2 *15*	5.1 *6*	6154.2		1269.8		5530 *3*	12.8 *13*	6154.2	623.5	3/2,5/2
5063.0 *15*	15.7 *13*	6154.2		1091.0	5/2	5612.6 *15*	1.7 *4*	6154.2	540.8	
5100.0 *15*	9.1 *13*	6154.2		1053.8	5/2,(3/2)	5662.3 *15*	4.4 *5*	6154.2	491.6	
5172.2 *15*	30 *3*	6154.2		981.8	5/2	5720.3 *15*	4.7 *5*	6154.2	433.6	3/2,(5/2)
5199.7 *15*	17.8 *18*	6154.2		954.3	1/2,5/2	5815.0 *15*	2.1 *2*	6154.2	339.3	
5209.1 *15*	16.1 *16*	6154.2		945.0	3/2	5827.2 *15*	6.5 *7*	6154.2	326.9	3/2,5/2
5242.7 *15*	28.2 *23*	6154.2		911.3	5/2	5862.7 *15*	7.5 *8*	6154.2	291.4	3/2
5307 *4*	1.3 *6*	6154.2		847		6040.5 *15*	33.6	6154.2	113.4	1/2
5362.6 *15*	13.1 *13*	6154.2		791.4	5/2	6154 *4*	0.6 *2*	6154.2	0	
5480.6 *15*	4.7 *6*	6154.2		673.4						

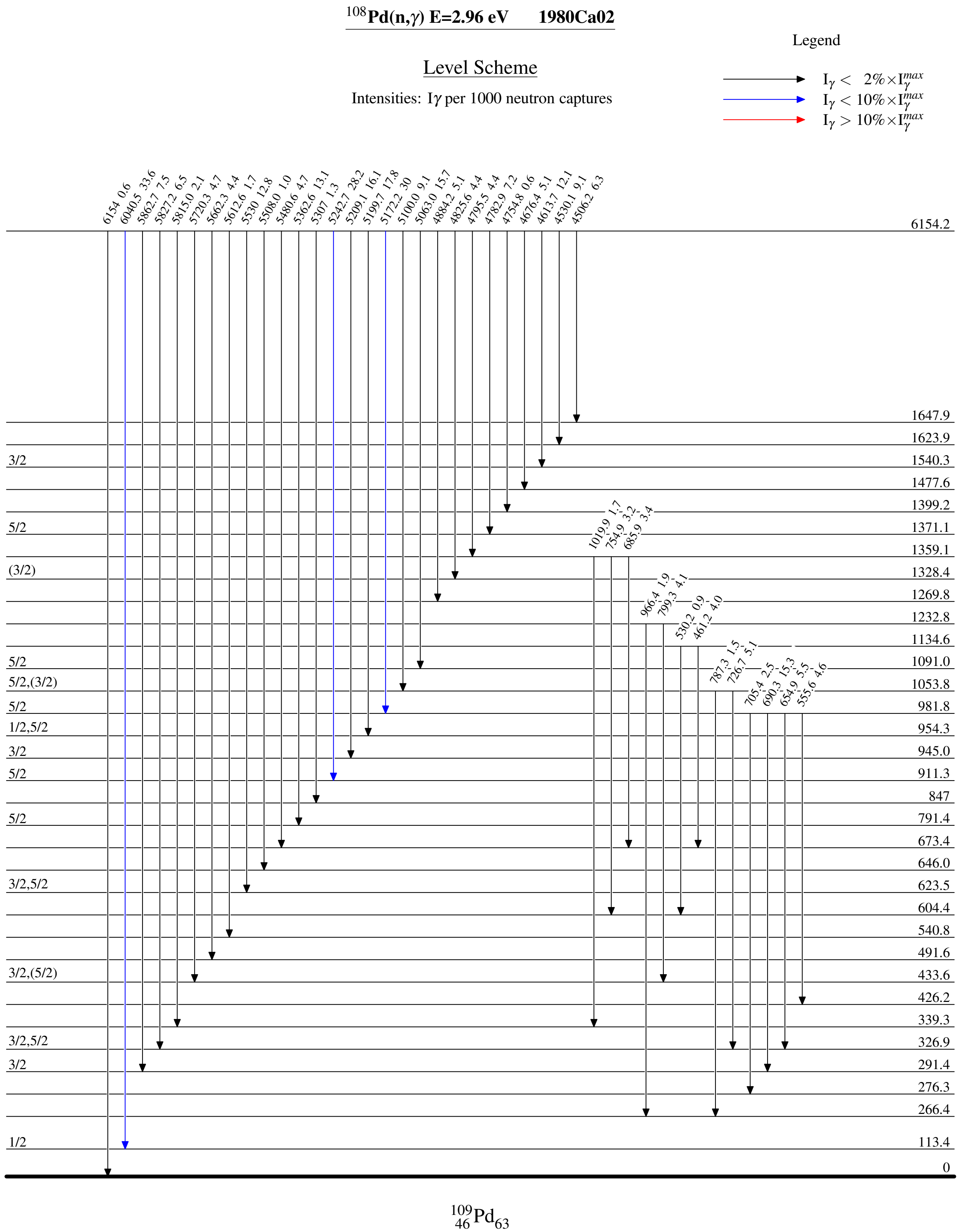
† 1980Ca02 only lists values for the primary γ rays for the measurement of E=2.96 eV resonance capture and assign ΔE=1.5 keV for most of them. For those low energy secondary γ rays also observed in this measurement, the evaluators have taken rounded-off values from the thermal capture measurement in 1980Ca02 and assign ΔE=1.5 keV.

‡ From 1980Ca02, normalized to I(6040.5γ)=33.6 per 1000 neutron captures (accurate to 24%), which is deduced by 1980Ca02 from the adopted absolute intensities Iγ=0.049, 0.32 and 0.244 per 1000 ^{109}Pd decays for 309.1, 311.4 and 647.3 keV γ rays, respectively.

Multiplet lines not resolved in this resonance capture but resolved in the thermal capture measurement (1980Ca02). Values of Eγ are taken as the average of the multiplet and values of Iγ are the sum of the multiplet.

@ Tentative placement by 1980Ca02.

x γ ray not placed in level scheme.

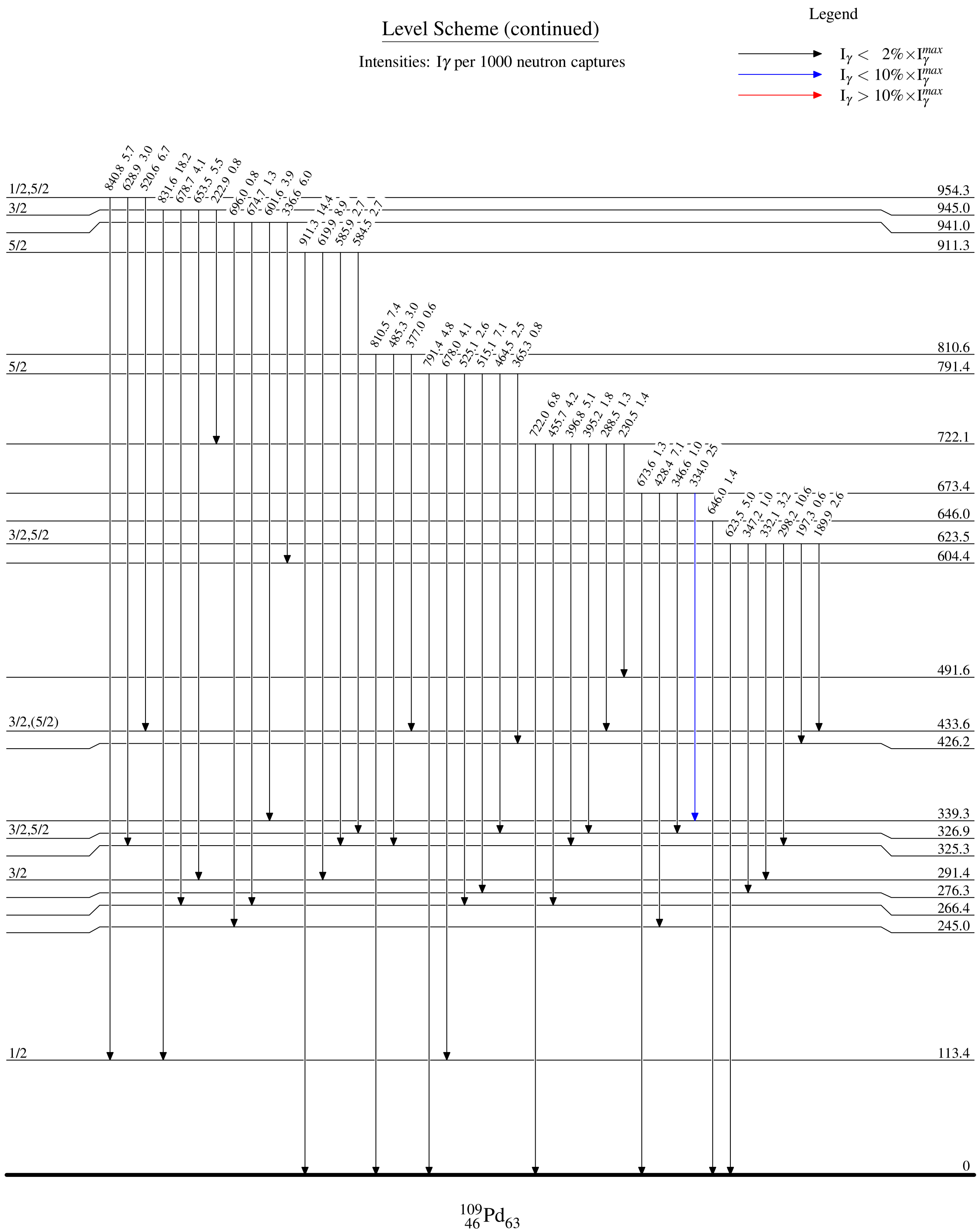


^{108}Pd(n,γ) E=2.96 eV 1980Ca02
Level Scheme
Intensities: Iγ per 1000 neutron captures
Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
6154 0.6
6040.5 33.6
5862.7 7.5
5827.2 6.5
5815.0 2.1
5720.3 4.7
5662.3 4.4
5612.6 1.7
5530 12.8
5508.0 1.0
5480.6 4.7
5362.6 13.1
5307 1.3
5242.7 28.2
5209.1 16.1
5199.7 17.8
5172.2 30
5100.0 9.1
5063.0 15.7
4884.2 5.1
4825.6 4.4
4795.5 4.4
4782.9 7.2
4754.8 0.6
4676.4 5.1
4613.7 12.1
4530.1 9.1
4506.2 6.3
1019.9 1.7
754.9 3.2
685.9 3.4
966.4 1.9
799.3 4.1
530.2 0.9
461.2 4.0
787.3 1.5
726.7 5.1
705.4 2.5
690.3 15.3
654.9 5.5
555.6 4.6
6154.2
1647.9
1623.9
3/2 1540.3
1477.6
1399.2
5/2 1371.1
1359.1
(3/2) 1328.4
1269.8
1232.8
1134.6
5/2 1091.0
5/2,(3/2) 1053.8
5/2 981.8
1/2,5/2 954.3
3/2 945.0
5/2 911.3
847
5/2 791.4
673.4
646.0
3/2,5/2 623.5
604.4
540.8
491.6
3/2,(5/2) 433.6
426.2
339.3
3/2,5/2 326.9
3/2 291.4
276.3
266.4
1/2 113.4
0
$^{109}_{46}Pd_{63}$

^{108}Pd(n,γ) E=2.96 eV 1980Ca02

Level Scheme (continued)

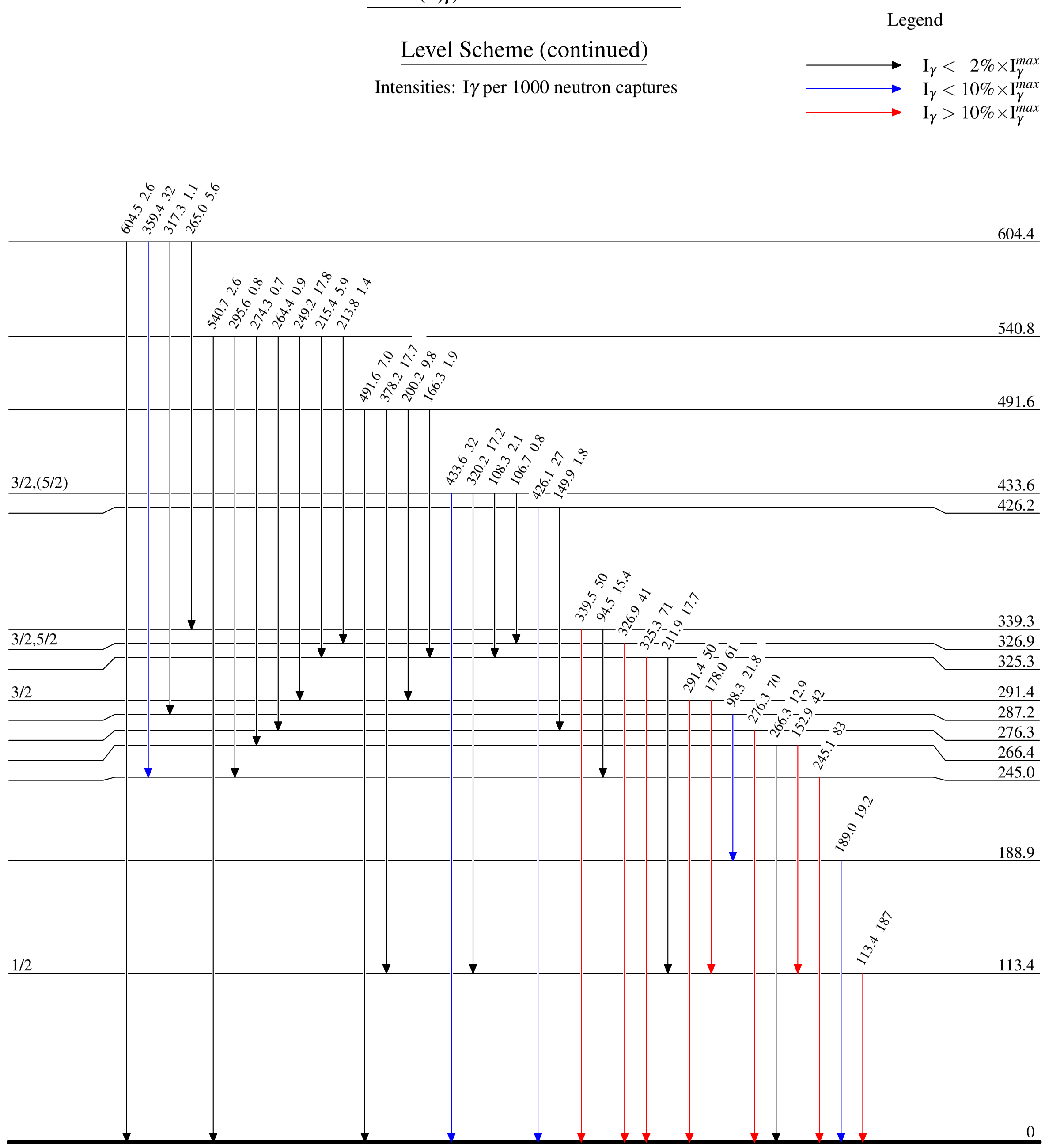
Intensities: Iγ per 1000 neutron captures



^{108}Pd(n,γ) E=2.96 eV 1980Ca02

Level Scheme (continued)

Intensities: Iγ per 1000 neutron captures



$^{109}_{46}Pd_{63}$