^{139}La(p,nγ) 2006Bu04,1988Ch23

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	P. K. Joshi, B. Singh, S. Singh, A. K. Jain	NDS 138, 1 (2016)	15-Oct-2016

2006Bu04: 20 mg/cm^2 enriched ^{139}La target, E=5.0 and 6.0 MeV. Measured Eγ, γγ, Iγ, γn coin, lifetimes using Doppler shift method. Gamma rays were detected using two HPGe detectors and neutrons using a one-liter NE213 liquid scintillator.
1988Ch23: measured Eγ, Iγ, γγ coin.

^{139}Ce Levels

Levels at 2364.0 and 2484.0 were reported in 1988Ch23 only.

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	Comments
0.0	$3/2^+$		
254.9 *4*	$1/2^+$		
754.24 *8*	$11/2^-$	57.58 s *32*	%IT=100 $T_{1/2}$ and decay mode from Adopted Levels.
1320.3 *4*	$5/2^+$	<1.0 ps	
1347.4 *4*	$7/2^+$		
1579.1 *5*	$(7/2^-)$		
1596.7 *4*	$(3/2)^+$	<0.9 ps	
1630.8 *5*	$3/2^+$	<3.8 ps	
1818.4 *8*	$5/2^+$	0.45 ps *+11−8*	
1907.3 *6*	$(3/2)^+$	1.2 ps *6*	
1984.4 *9*	$(3/2^+,5/2^+)$		
2016.3 *10*	$(3/2^+)$	<4.3 ps	
2016.6 *7*			
2069.6 *8*			
2088.5 *7*	$3/2^+,5/2^+$	>0.8 ps	
2095.8 *11*			
2105.1 *6*			
2138.7 *8*	$3/2,5/2^+$		
2183.4 *7*			
2195.8 *8*			
2208.7 *8*			
2219.5 *11*			
2220.9 *7*			
2228.0 *8*			
2245.6 *8*	$(7/2^+)$		
2279.3 *7*			
2287.6 *6*	$(3/2^+,5/2,7/2^+)$		
2354.5 *8*			
2364.0 *7*	$(3/2^+,5/2^+)$		
2391.8 *11*			
2400.5 *6*			
2421.2 *11*	$3/2^+,5/2^+$	0.43 ps *+37−15*	
2441.5 *7*			
2484.9 *11*			
2489.6 *11*			
2499.9 *6*			
2541.3 *11*			
2551.2 *11*			
2553.6 *7*	$(3/2^+,5/2,7/2^+)$	0.50 ps *+37−15*	
2569.1 *6*			
2598.3 *11*			
2606.5 *11*			

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^{139}La(p,nγ) 2006Bu04,1988Ch23 (continued)

^{139}Ce Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$#	E(level)†	Jπ‡	$T_{1/2}$#
2634.2 *7*			2908.6 *8*	$(9/2)^+,3/2^+,5/2^+$	
2700.8 *6*			2951.6 *8*		
2752.7 *7*			3051.9 *11*		
2776.8 *8*			3114.0 *11*		0.79 ps *+42−21*
2797.3 *11*	$7/2^+$		3189.2 *8*	$(7/2^+,9/2^+)$	
2819.5 *7*	$11/2^-$		3212.5 *11*		
2832.0 *7*			3268.8 *11*		
2849.2 *7*		0.63 ps *+21−13*	3459.4 *11*		
2900.4 *6*			3523.6 *8*		

† From least-squares fitting to Eγ data, assuming ΔEγ=0.5 keV for each γ ray.
‡ From Adopted Levels.
# From DSA method (2006Bu04) for levels above 800 keV.

γ(^{139}Ce)

Eγ=586, 695, 1605.8 and 1729.4 were reported in 1988Ch23 but not seen in 2006Bu04.

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
231.4	2.0 *12*	1579.1	$(7/2^-)$	1347.4	$7/2^+$		
249.3	<0.10	1596.7	$(3/2)^+$	1347.4	$7/2^+$		
255.1	60 *4*	254.9	$1/2^+$	0.0	$3/2^+$		
258.4	7.6 *4*	1579.1	$(7/2^-)$	1320.3	$5/2^+$		
276.1	5.05 *19*	1596.7	$(3/2)^+$	1320.3	$5/2^+$		
283.7	0.33 *12*	1630.8	$3/2^+$	1347.4	$7/2^+$		
310.7	0.2 *4*	1630.8	$3/2^+$	1320.3	$5/2^+$		
336.9	1.0 *3*	2441.5		2105.1			
379.9	0.52 *19*	2287.6	$(3/2^+,5/2,7/2^+)$	1907.3	$(3/2)^+$		
483.5	0.44 *5*	2499.9		2016.6			
508.0		2138.7	$3/2,5/2^+$	1630.8	$3/2^+$		
553.4	0.99 *8*	2569.1		2016.6			
589.9	10.0 *8*	2220.9		1630.8	$3/2^+$		
600.2	3.9 *5*	2195.8		1596.7	$(3/2)^+$		
612.3	10.5 *6*	2208.7		1596.7	$(3/2)^+$		
624.2	0.7 *4*	2220.9		1596.7	$(3/2)^+$		
650.0†	0.69 *13*	2245.6	$(7/2^+)$	1596.7	$(3/2)^+$		
670.3	1.9 *4*	2016.6		1347.4	$7/2^+$		
690.3	0.37 *23*	2287.6	$(3/2^+,5/2,7/2^+)$	1596.7	$(3/2)^+$		
699.2	9.7 *8*	2279.3		1579.1	$(7/2^-)$		
722.4	<0.10	2069.6		1347.4	$7/2^+$		
727.7	1.10 *21*	2634.2		1907.3	$(3/2)^+$		
754.24 *8*		754.24	$11/2^-$	0.0	$3/2^+$	M4	E_γ,Mult.: From Adopted Gammas.
757.8		2354.5		1596.7	$(3/2)^+$		
758.0		2105.1		1347.4	$7/2^+$		
768.4		2752.7		1984.4	$(3/2^+,5/2^+)$		
768.8		2088.5	$3/2^+,5/2^+$	1320.3	$5/2^+$		
769.8		2400.5		1630.8	$3/2^+$		
775.7†	<0.10	2095.8		1320.3	$5/2^+$		
781.2†	<0.10	2797.3	$7/2^+$	2016.6			
785.3	0.7 *4*	2105.1		1320.3	$5/2^+$		

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^{139}La(p,nγ) 2006Bu04,1988Ch23 (continued)

γ(^{139}Ce) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Comments
793.7	1.62 *18*	2700.8		1907.3	$(3/2)^+$	
804.0	1.42 *13*	2400.5		1596.7	$(3/2)^+$	
824.2†		2421.2	$3/2^+,5/2^+$	1596.7	$(3/2)^+$	
824.9	45.8 *23*	1579.1	$(7/2^-)$	754.24	$11/2^-$	
835.5	<0.10	2183.4		1347.4	$7/2^+$	
845.7		2752.7		1907.3	$(3/2)^+$	
847.3		2195.8		1347.4	$7/2^+$	
861.1	1.7 *3*	2208.7		1347.4	$7/2^+$	
863.5	0.96 *11*	2183.4		1320.3	$5/2^+$	
873.6	<0.10	2220.9		1347.4	$7/2^+$	
888.1†	4.8 *4*	2484.9		1596.7	$(3/2)^+$	
898.1		2245.6	$(7/2^+)$	1347.4	$7/2^+$	
899.2		2219.5		1320.3	$5/2^+$	
902.5		2499.9		1596.7	$(3/2)^+$	
905.8	9.1 *4*	2484.9		1579.1	$(7/2^-)$	
907.5		2228.0		1320.3	$5/2^+$	
925.4	2.4 *4*	2245.6	$(7/2^+)$	1320.3	$5/2^+$	
932.1	2.7 *4*	2279.3		1347.4	$7/2^+$	
938.3	3.5 *4*	2569.1		1630.8	$3/2^+$	
941.2	1.05 *11*	2287.6	$(3/2^+,5/2,7/2^+)$	1347.4	$7/2^+$	
956.8	1.6 *4*	2553.6	$(3/2^+,5/2,7/2^+)$	1596.7	$(3/2)^+$	
960.8†	<0.10	2279.3		1320.3	$5/2^+$	
967.4	0.6 *17*	2287.6	$(3/2^+,5/2,7/2^+)$	1320.3	$5/2^+$	
971.8	1.5 *51*	2569.1		1596.7	$(3/2)^+$	
990.1	7.3 *7*	2569.1		1579.1	$(7/2^-)$	
1016.7	3.5 *5*	2364.0	$(3/2^+,5/2^+)$	1347.4	$7/2^+$	
1034.3	2.0 *8*	2354.5		1320.3	$5/2^+$	
1037.2	13.6 *7*	2634.2		1596.7	$(3/2)^+$	
1043.7	3.2 *4*	2364.0	$(3/2^+,5/2^+)$	1320.3	$5/2^+$	
1052.9	1.7 *4*	2400.5		1347.4	$7/2^+$	
1065.2	4.7 *5*	1320.3	$5/2^+$	254.9	$1/2^+$	
1073.8	2.7 *4*	2421.2	$3/2^+,5/2^+$	1347.4	$7/2^+$	
1080.2	3.3 *4*	2400.5		1320.3	$5/2^+$	
1093.5	1.4 *4*	2441.5		1347.4	$7/2^+$	
1104.1	5.6 *8*	2700.8		1596.7	$(3/2)^+$	
1121.4	2.39 *25*	2441.5		1320.3	$5/2^+$	
1142.2	10.7 *12*	2489.6		1347.4	$7/2^+$	
1152.7	0.8 *3*	2499.9		1347.4	$7/2^+$	
1155.5		2752.7		1596.7	$(3/2)^+$	
1173.5	3.4 *4*	2752.7		1579.1	$(7/2^-)$	
1180.0	<0.10	2499.9		1320.3	$5/2^+$	
1193.9	17.0 *8*	2541.3		1347.4	$7/2^+$	
1206.3	4.0 *5*	2553.6	$(3/2^+,5/2,7/2^+)$	1347.4	$7/2^+$	
1221.4	3.5 *4*	2569.1		1347.4	$7/2^+$	
1233.2	2.0 *4*	2553.6	$(3/2^+,5/2,7/2^+)$	1320.3	$5/2^+$	
1236.0		2832.0		1596.7	$(3/2)^+$	
1240.1	18.8 *11*	2819.5	$11/2^-$	1579.1	$(7/2^-)$	
1248.6	0.69 *23*	2569.1		1320.3	$5/2^+$	
1250.9	1.5 *3*	2598.3		1347.4	$7/2^+$	
1259.1	2.1 *3*	2606.5		1347.4	$7/2^+$	
1270.6	2.3 *3*	2849.2		1579.1	$(7/2^-)$	
1313.6	19.7 *11*	2634.2		1320.3	$5/2^+$	
1320.3	72.1 *25*	1320.3	$5/2^+$	0.0	$3/2^+$	In 255.3γ gate: A_2=+0.031 *9*, A_4=−0.015 *10* (1988Ch23).
1321.3†		2900.4		1579.1	$(7/2^-)$	
1341.6	4.5 *5*	1596.7	$(3/2)^+$	254.9	$1/2^+$	

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^{139}La(p,nγ) 2006Bu04,1988Ch23 (continued)

γ(^{139}Ce) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Comments
1347.4	100	1347.4	$7/2^+$	0.0	$3/2^+$	In 255.3γ gate: A_2=+0.16 *1*, A_4=−0.01 *1* (1988Ch23).
1353.3	2.6 *6*	2700.8		1347.4	$7/2^+$	
1375.7	9.1 *7*	1630.8	$3/2^+$	254.9	$1/2^+$	In 255.3γ gate: A_2=+0.64 *8*, A_4=+0.05 *8* (1988Ch23).
1380.4	3.1 *5*	2700.8		1320.3	$5/2^+$	
1429.7	2.1 *3*	2776.8		1347.4	$7/2^+$	
1431.9†		2752.7		1320.3	$5/2^+$	
1449.9	1.1 *3*	2797.3	$7/2^+$	1347.4	$7/2^+$	
1456.3	1.5 *4*	2776.8		1320.3	$5/2^+$	
1472.5		2819.5	$11/2^-$	1347.4	$7/2^+$	
1484.1	<0.10	2832.0		1347.4	$7/2^+$	
1502.2		2849.2		1347.4	$7/2^+$	
1511.5	0.9 *4*	2832.0		1320.3	$5/2^+$	
1528.0	14.0 *7*	2849.2		1320.3	$5/2^+$	
1561.8		2908.6	$(9/2)^+$,$3/2^+$,$5/2^+$	1347.4	$7/2^+$	
1563.4	5.6 *6*	1818.4	$5/2^+$	254.9	$1/2^+$	
1587.8	<0.10	2908.6	$(9/2)^+$,$3/2^+$,$5/2^+$	1320.3	$5/2^+$	
1596.6	34.8 *17*	1596.7	$(3/2)^+$	0.0	$3/2^+$	In 255.3γ gate: A_2=+0.01 *9*, A_4=−0.004 *14* (1988Ch23).
1604.2		2951.6		1347.4	$7/2^+$	
1610.0	7.5 *9*	3189.2	$(7/2^+,9/2^+)$	1579.1	$(7/2^-)$	
1630.7	21.8 *13*	1630.8	$3/2^+$	0.0	$3/2^+$	In 255.3γ gate: A_2=−0.03 *3*, A_4=−0.03 *3* (1988Ch23).
1631.4		2951.6		1320.3	$5/2^+$	
1633.4		3212.5		1579.1	$(7/2^-)$	
1652.6	19.4 *12*	1907.3	$(3/2)^+$	254.9	$1/2^+$	In 255.3γ gate: A_2=−0.06 *3*, A_4=+0.10 *4* (1988Ch23).
1704.5		3051.9		1347.4	$7/2^+$	
1729.7	17.1 *10*	1984.4	$(3/2^+,5/2^+)$	254.9	$1/2^+$	
1732.0†		3051.9		1320.3	$5/2^+$	
1793.7	8.8 *7*	3114.0		1320.3	$5/2^+$	
1814.5		2069.6		254.9	$1/2^+$	
1818.4	4 *3*	1818.4	$5/2^+$	0.0	$3/2^+$	
1833.2	0.6 *4*	2088.5	$3/2^+$,$5/2^+$	254.9	$1/2^+$	
1840.9		2095.8		254.9	$1/2^+$	
1841.9		3189.2	$(7/2^+,9/2^+)$	1347.4	$7/2^+$	
1880.3	2.6 *4*	3459.4		1579.1	$(7/2^-)$	
1883.6	4.0 *5*	2138.7	$3/2,5/2^+$	254.9	$1/2^+$	
1907.7	11.0 *7*	1907.3	$(3/2)^+$	0.0	$3/2^+$	
1928.6	<0.10	2183.4		254.9	$1/2^+$	
1948.5	3.4 *7*	3268.8		1320.3	$5/2^+$	
1973.2	4.7 *9*	2228.0		254.9	$1/2^+$	
2016.3	19.4 *9*	2016.3	$(3/2^+)$	0.0	$3/2^+$	In 255.3γ gate: A_2=−0.01 *4*, A_4=+0.07 *5* (1988Ch23).
2025.3	0.6 *3*	2279.3		254.9	$1/2^+$	
2065.1	2.7 *6*	2819.5	$11/2^-$	754.24	$11/2^-$	
2088.4	7.0 *7*	2088.5	$3/2^+$,$5/2^+$	0.0	$3/2^+$	
2104.9	8.6 *7*	2105.1		0.0	$3/2^+$	
2109.0†		2364.0	$(3/2^+,5/2^+)$	254.9	$1/2^+$	
2136.9	3.7 *6*	2391.8		254.9	$1/2^+$	
2175.5	4.1 *5*	3523.6		1347.4	$7/2^+$	
2203.9	1.8 *3*	3523.6		1320.3	$5/2^+$	
2244.9	11.8 *9*	2499.9		254.9	$1/2^+$	
2296.3	2.1 *4*	2551.2		254.9	$1/2^+$	
2363.8	8.6 *11*	2364.0	$(3/2^+,5/2^+)$	0.0	$3/2^+$	

† Placement of transition in the level scheme is uncertain.

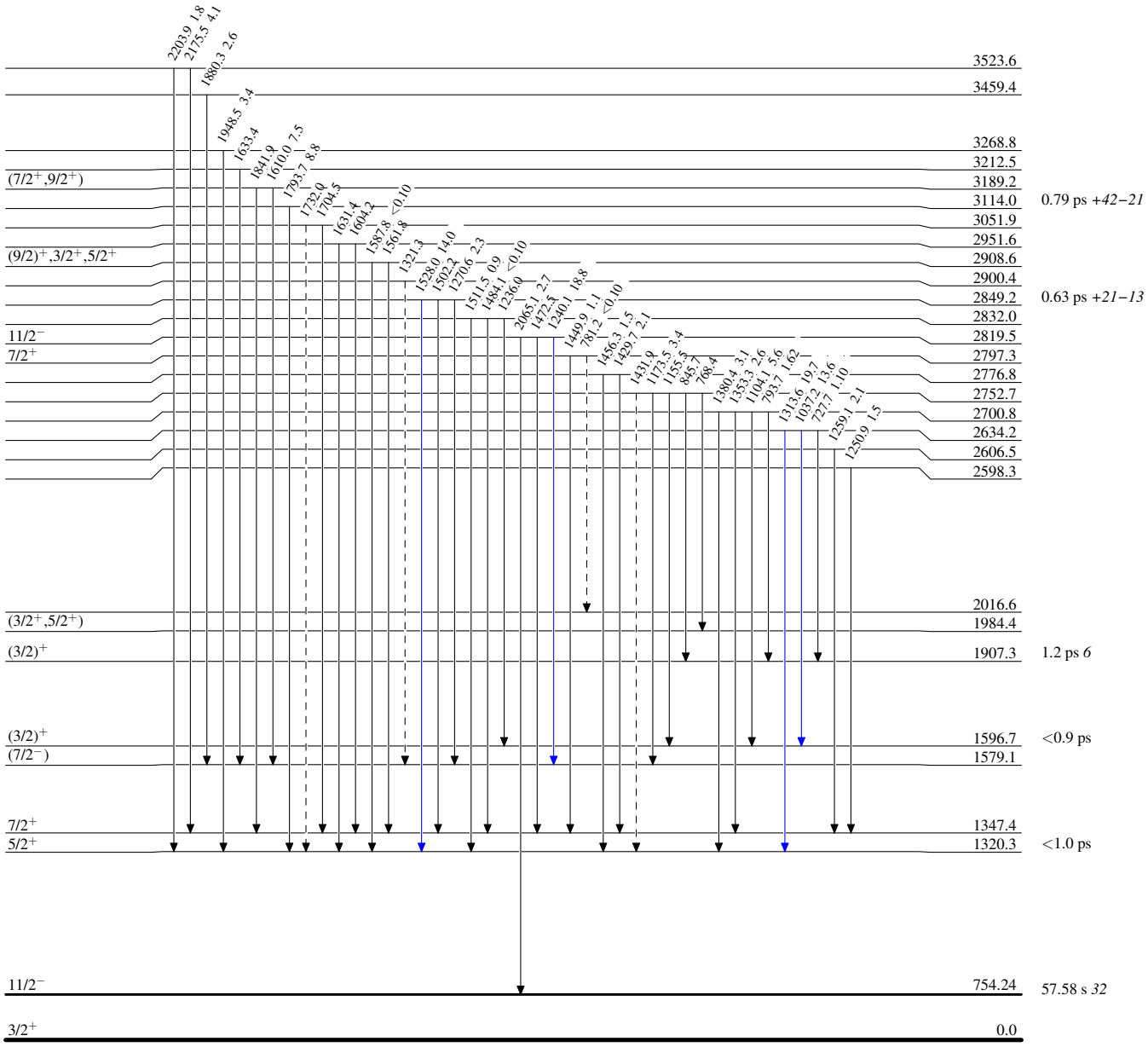
^{139}La(p,nγ) 2006Bu04,1988Ch23

Level Scheme

Intensities: Relative I_γ

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



$^{139}_{58}Ce_{81}$

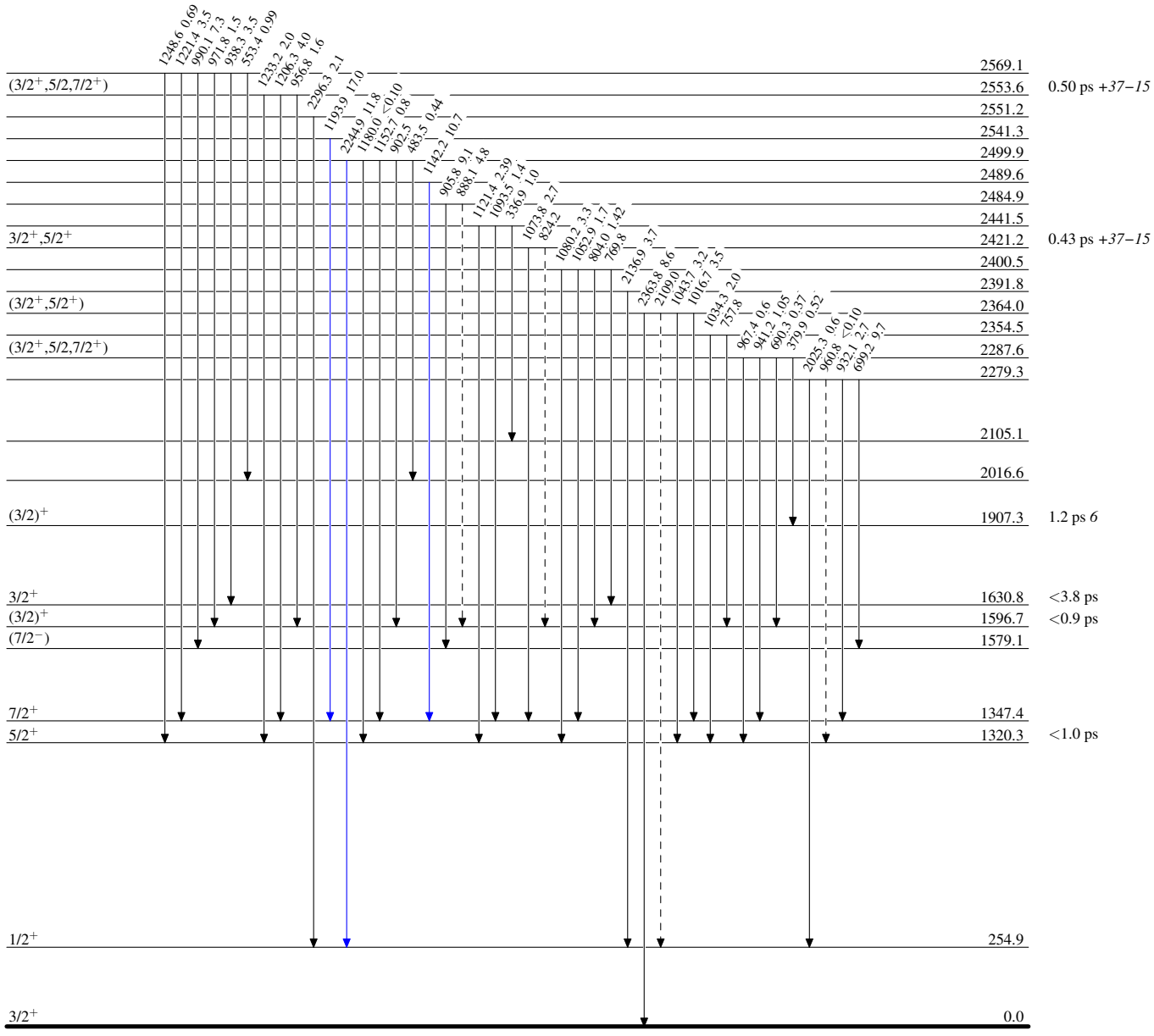
^{139}La(p,nγ) 2006Bu04,1988Ch23

Level Scheme (continued)

Intensities: Relative I_γ

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



$^{139}_{58}Ce_{81}$

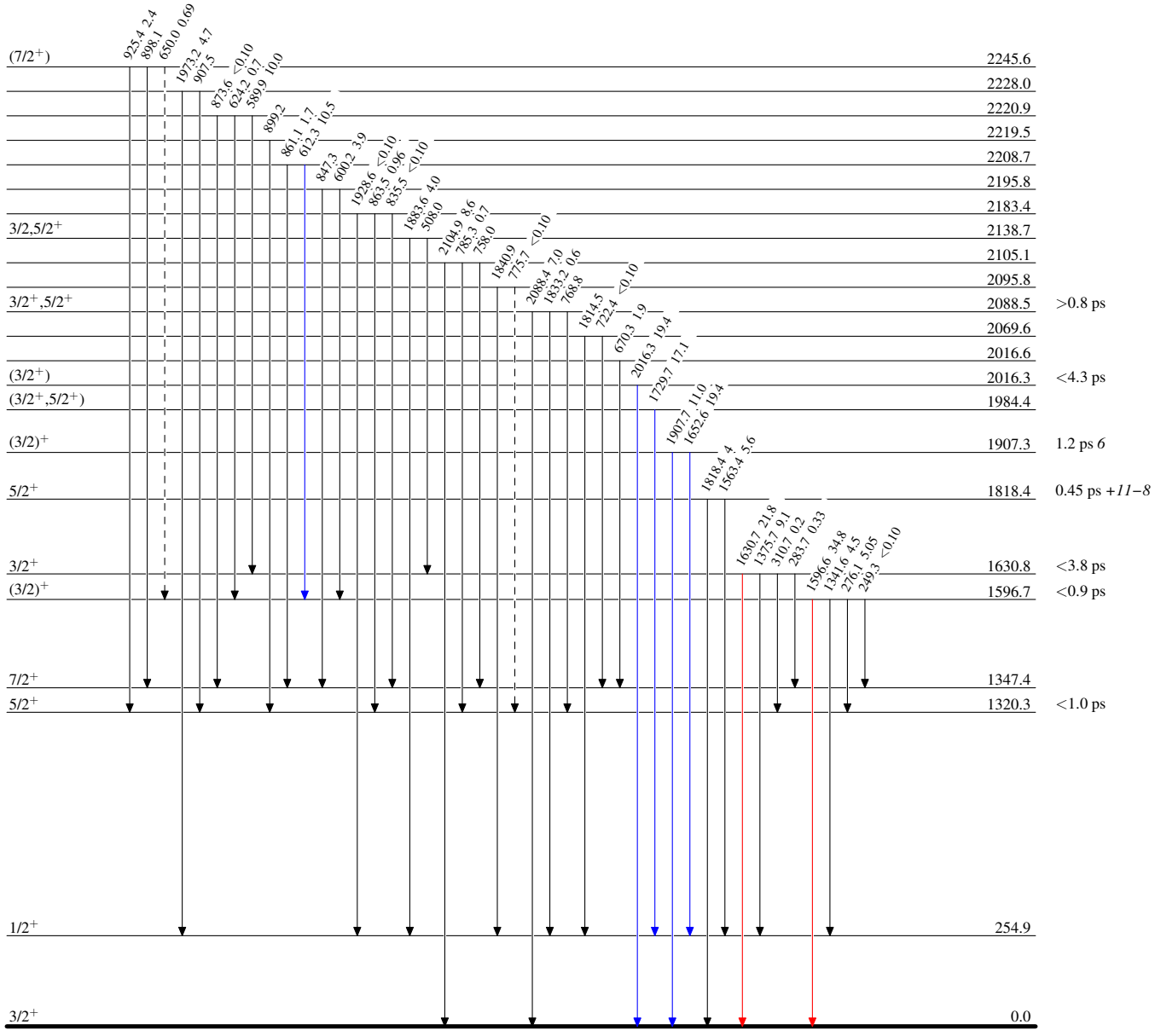
^{139}La(p,nγ) 2006Bu04,1988Ch23

Level Scheme (continued)

Intensities: Relative I_γ

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)

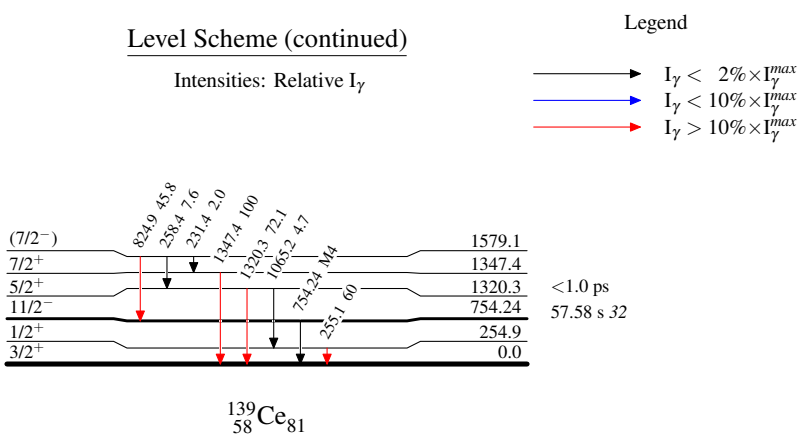


$^{139}_{58}Ce_{81}$

^{139}La(p,nγ) 2006Bu04,1988Ch23

Level Scheme (continued)

Intensities: Relative I_γ



$^{139}_{58}Ce_{81}$