^{139}La(p,2nγ) 1987Lo12

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 146, 1 (2017)	30-Sep-2017

1987Lo12: E=17 MeV proton beam was produced from the Cologne FN tandem accelerator. Target was 2 mg/cm^2 thick natural lanthanum, 99.9% in ^{139}La (E=16 MeV, target thickness of 0.5 mg/cm^2 on a 12 μg/cm^2 carbon backing for ce measurement). γ rays were detected with Ge detectors and conversion electrons were detected with a spectrometer. Measured ce, Eγ, Iγ, $\gamma\gamma$-coin, γ(t). Deduced levels, J, π, γ-ray multipolarities, conversion coefficients. Comparisons with shell-model calculations. 1987Lo12 also reports data from ^{136}Ba(α,2nγ) measurement. Refer to that dataset for details. 1987Lo12 supersedes 1984Lo14.

Others: 1970Sm05, 1973Wy01.

All data are from 1987Lo12, unless otherwise noted.

Others: 1965Ej01, 1966Ej02.

^{138}Ce Levels

E(level)†	J$^\pi$‡	T$_{1/2}$#	E(level)†	J$^\pi$‡
0.0	0$^+$		2765.0 *4*	6$^-$
788.82 *16*	2$^+$#		2899.2 *3*	6$^-$
1476.8 *3*	0$^+$#		2907.2 *3*	(3,4,5)
1510.90 *16*	2$^+$#		2950.4 *4*	(2$^-$,3$^-$,4$^-$)
1826.50 *23*	4$^+$#		2995.7 *3*	(2,4,6)$^+$
2129.18 *25*	7$^-$	8.73 ms *20*	3109.0 *3*	8$^+$
2136.94 *23*	4$^+$		3176.1 *3*	
2177.46 *20*	(3$^-$)		3214.0 *3*	(5,6,7)
2217.34 *24*	5$^-$		3229.6 *4*	
2293.75 *23*	6$^+$		3430.4 *4*	(7)$^+$
2393.8 *4*	(3$^-$)		3539.1 *4*	10$^+$
2396.1 *3*	6$^+$		3942.2 *4*	11$^+$
2444.0 *3*	4$^+$		4050.0?	
2471.5 *3*	(4$^+$,5$^+$,6$^+$)		4359.7 *5*	12$^+$
2733.3 *3*	6$^+$		5214.3 *5*	13$^-$
2748.6 *3*	5$^+$			

† From a least-squares fit to γ-ray energies.

‡ From 1987Lo12, based on deduced γ-ray multipolarities, unless otherwise noted.

From Adopted Levels.

γ(^{138}Ce)

E$_\gamma$†	I$_\gamma$†	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.‡	α#	Comments
76.4 *2*		2293.75	6$^+$	2217.34	5$^-$			
80.4 *2*		2217.34	5$^-$	2136.94	4$^+$			
156.8 *2*	0.40 *2*	2293.75	6$^+$	2136.94	4$^+$			
164.6 *2*	5.0 *2*	2293.75	6$^+$	2129.18	7$^-$			
176.5 *2*	2.5 *1*	2393.8	(3$^-$)	2217.34	5$^-$			
177.8 *2*	1.20 *5*	2471.5	(4$^+$,5$^+$,6$^+$)	2293.75	6$^+$			
302.7 *2*	19.1 *7*	2129.18	7$^-$	1826.50	4$^+$			
334.6 *2*	2.1 *1*	2471.5	(4$^+$,5$^+$,6$^+$)	2136.94	4$^+$	(M1,E2)	0.039 *5*	α(K)exp=0.005 *1* α(K)=0.033 *5*; α(L)=0.00504 *14*; α(M)=0.00107 *4* α(N)=0.000235 *8*; α(O)=3.70×10^{-5} *6*; α(P)=2.4×10^{-6} *5*

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^{139}La(p,2nγ) 1987Lo12 (continued)

γ(^{138}Ce) (continued)

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	α [#]	Comments
390.8 *2*	15.3 *6*	2217.34	5^-	1826.50	4^+			
403.1 *2*	0.84 *4*	3942.2	11^+	3539.1	10^+			
417.5 *2*	0.25 *2*	4359.7	12^+	3942.2	11^+			
430.1 *2*	1.13 *5*	3539.1	10^+	3109.0	8^+	E2	0.01643	α(K)exp=0.013 *2* α(K)=0.01359 *20*; α(L)=0.00224 *4*; α(M)=0.000477 *7* α(N)=0.0001046 *15*; α(O)=1.626×10^{-5} *23*; α(P)=9.41×10^{-7} *14*
439.5 *2*	0.43 *3*	2733.3	6^+	2293.75	6^+	M1+E2	0.018 *3*	α(K)exp=0.016 *2* α(K)=0.016 *3*; α(L)=0.00226 *17*; α(M)=0.00048 *4* α(N)=0.000105 *8*; α(O)=1.67×10^{-5} *16*; α(P)=1.1×10^{-6} *3*
454.9 *2*	0.80 *6*	2748.6	5^+	2293.75	6^+	M1+E2	0.017 *3*	α(K)exp=0.010 *1* α(K)=0.014 *3*; α(L)=0.00205 *18*; α(M)=0.00043 *4* α(N)=9.5×10^{-5} *8*; α(O)=1.52×10^{-5} *16*; α(P)=1.05×10^{-6} *24*
467.2 *2*	1.8 *1*	2293.75	6^+	1826.50	4^+	E2	0.01300	α(K)exp=0.0100 *1* α(K)=0.01081 *16*; α(L)=0.001733 *25*; α(M)=0.000368 *6* α(N)=8.07×10^{-5} *12*; α(O)=1.261×10^{-5} *18*; α(P)=7.55×10^{-7} *11*
547.7 *2*	1.72 *2*	2765.0	6^-	2217.34	5^-	M1	0.01238	α(K)exp=0.011 *1* α(K)=0.01063 *15*; α(L)=0.001388 *20*; α(M)=0.000289 *4* α(N)=6.42×10^{-5} *9*; α(O)=1.044×10^{-5} *15*; α(P)=8.06×10^{-7} *12*
556.6 *2*	0.84 *5*	2950.4	$(2^-,3^-,4^-)$	2393.8	(3^-)	M1	0.01189	α(K)exp=0.011 *1* α(K)=0.01021 *15*; α(L)=0.001333 *19*; α(M)=0.000278 *4* α(N)=6.17×10^{-5} *9*; α(O)=1.003×10^{-5} *14*; α(P)=7.74×10^{-7} *11*
569.6 *2*	1.2 *1*	2396.1	6^+	1826.50	4^+	E2	0.00762	α(K)exp=0.007 *1* α(K)=0.00640 *9*; α(L)=0.000965 *14*; α(M)=0.000204 *3* α(N)=4.48×10^{-5} *7*; α(O)=7.07×10^{-6} *10*; α(P)=4.54×10^{-7} *7*
611.7 *2*	1.15 *7*	2748.6	5^+	2136.94	4^+	M1	0.00943	α(K)exp=0.009 *1* α(K)=0.00810 *12*; α(L)=0.001054 *15*; α(M)=0.000220 *3* α(N)=4.87×10^{-5} *7*; α(O)=7.93×10^{-6} *12*; α(P)=6.13×10^{-7} *9*
666.6 *2*	0.68 *4*	2177.46	(3^-)	1510.90	2^+			
681.8 *2*	0.64 *4*	2899.2	6^-	2217.34	5^-			
688.0 *2*	0.80 *4*	1476.8	0^+	788.82	2^+			
697.1 *2*	0.78 *4*	3430.4	$(7)^+$	2733.3	6^+	M1	0.00686	α(K)exp=0.006 *9* α(K)=0.00589 *9*; α(L)=0.000763 *11*; α(M)=0.0001590 *23* α(N)=3.53×10^{-5} *5*; α(O)=5.74×10^{-6} *8*; α(P)=4.45×10^{-7} *7*
722.1 *2*	5.0 *2*	1510.90	2^+	788.82	2^+	M1	0.00630	α(K)exp=0.0054 *7* α(K)=0.00541 *8*; α(L)=0.000700 *10*;

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^{139}La(p,2nγ) 1987Lo12 (continued)

γ(^{138}Ce) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α[#]	Comments
								α(M)=0.0001459 *21* α(N)=3.24×10^{-5} *5*; α(O)=5.27×10^{-6} *8*; α(P)=4.09×10^{-7} *6*
758.1 *2*	1.12 *5*	3229.6		2471.5	(4$^+$,5$^+$,6$^+$)			
770.0 *2*	1.47 *7*	2899.2	6$^-$	2129.18	7$^-$	M1	0.00540	α(K)exp=0.0042 *6* α(K)=0.00464 *7*; α(L)=0.000599 *9*; α(M)=0.0001248 *18* α(N)=2.77×10^{-5} *4*; α(O)=4.51×10^{-6} *7*; α(P)=3.50×10^{-7} *5*
788.8 *2*	100.0 *29*	788.82	2$^+$	0.0	0$^+$			
815.3 *2*	2.3 *1*	3109.0	8$^+$	2293.75	6$^+$	E2	0.00317	α(K)exp=0.0025 *3* α(K)=0.00270 *4*; α(L)=0.000375 *6*; α(M)=7.85×10^{-5} *11* α(N)=1.734×10^{-5} *25*; α(O)=2.77×10^{-6} *4*; α(P)=1.95×10^{-7} *3*
854.6 *2*		5214.3	13$^-$	4359.7	12$^+$			
882.3 *2*	0.55 *3*	3176.1		2293.75	6$^+$			
906.9 *2*	2.6 *1*	2733.3	6$^+$	1826.50	4$^+$	E2	0.00250	α(K)exp=0.0020 *1* α(K)=0.00213 *3*; α(L)=0.000290 *4*; α(M)=6.07×10^{-5} *9* α(N)=1.341×10^{-5} *19*; α(O)=2.15×10^{-6} *3*; α(P)=1.541×10^{-7} *22*
920.2 *2*	0.74 *4*	3214.0	(5,6,7)	2293.75	6$^+$			
933.1 *2*	3.0 *1*	2444.0	4$^+$	1510.90	2$^+$			
941.0[@] *2*		4050.0?		3109.0	8$^+$			
979.8 *2*	1.14 *6*	3109.0	8$^+$	2129.18	7$^-$	E1	8.78×10^{-4}	α(K)exp=0.0008 *1* α(K)=0.000759 *11*; α(L)=9.46×10^{-5} *14*; α(M)=1.96×10^{-5} *3* α(N)=4.34×10^{-6} *6*; α(O)=7.04×10^{-7} *10*; α(P)=5.39×10^{-8} *8*
1037.7 *2*	63.4 *31*	1826.50	4$^+$	788.82	2$^+$			
1080.7 *2*	1.26 *7*	2907.2	(3,4,5)	1826.50	4$^+$			
1169.2 *2*	1.63 *8*	2995.7	(2,4,6)$^+$	1826.50	4$^+$			
1348.1 *2*	12.3 *7*	2136.94	4$^+$	788.82	2$^+$	E2	1.12×10^{-3}	α(K)exp=0.0009 *2* α(K)=0.000937 *14*; α(L)=0.0001213 *17*; α(M)=2.52×10^{-5} *4* α(N)=5.59×10^{-6} *8*; α(O)=9.05×10^{-7} *13*; α(P)=6.81×10^{-8} *10*; α(IPF)=3.17×10^{-5} *5*
1388.6 *2*	2.3 *1*	2177.46	(3$^-$)	788.82	2$^+$			
1510.9 *2*	6.2 *22*	1510.90	2$^+$	0.0	0$^+$			

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^{139}La(p,2nγ) 1987Lo12 (continued)

γ(^{138}Ce) (continued)

† From 1987Lo12. Values of Eγ are from combination with data from ^{136}Ba(α,2nγ) measurement in 1987Lo12.
‡ Deduced by 1987Lo12 based on α(K)exp.
# Additional information 1.
@ Placement of transition in the level scheme is uncertain.

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Level Scheme

Intensities: Relative I_γ

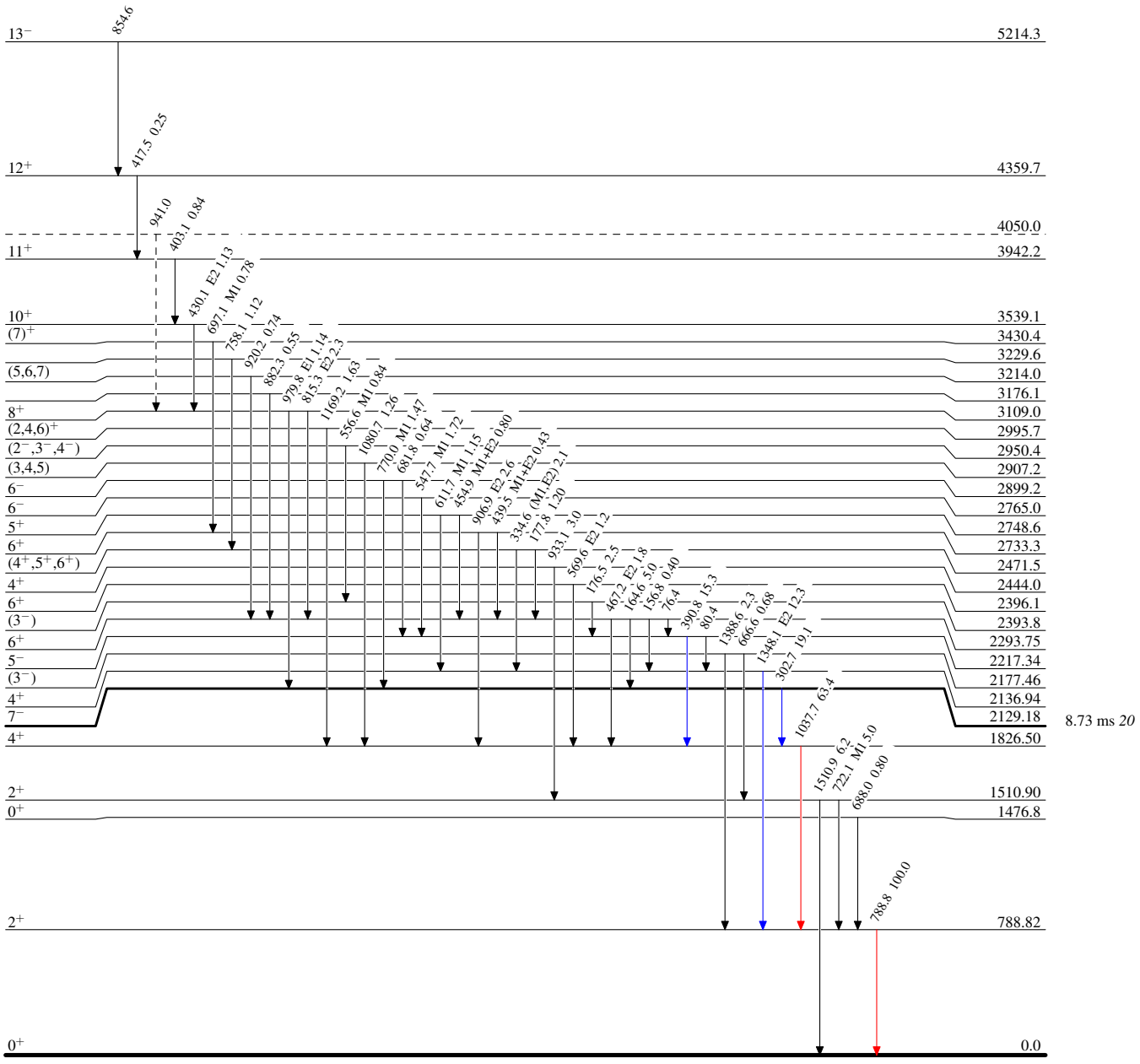
Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$

γ Decay (Uncertain)



$^{138}_{58}Ce_{80}$