^{139}La(^{3}He,3nγ) 1980Pi03

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

Measured: γ's, excitation functions (E(p)=14.9-20.2 MeV), $\gamma\gamma$-coincidences, $\gamma(\theta)$, and γ(t) (Ge(Li) and Ge) and ce's and ce(t) (mag spect, Si(Li)). See also ^{139}La(α,4nγ) and ^{140}Ce(p,2nγ).

^{139}Pr Levels

E(level)	J$^{\pi}$[†]	T$_{1/2}$	Comments
0.0	5/2$^+$		
113.93 *5*	7/2$^+$		
405.13 *8*	3/2$^+$		J$^{\pi}$: ≠5/2$^+$,7/2$^+$ from excit and syst of La, Pr, and Sm nuclei.
589.74 *11*	5/2$^+$		
821.99 *8*	11/2$^-$	43 ns *2*	
827.86 *10*	9/2$^+$[‡]		
851.87 *10*	11/2$^+$[#]		
1024.01 *18*	9/2$^+$		
1369.69 *22*	9/2$^-$,11/2$^-$		
1523.08 *12*	13/2$^-$		
1722.17 *11*	15/2$^-$		
1790.17 *23*	(13/2)$^+$[‡]		
1833.69 *18*	9/2$^-$,11/2$^-$		J$^{\pi}$: excit suggests 11/2$^-$.
1867.6 *4*	(15/2)$^+$[#]		
1941.50 *12*	(17/2)$^-$		
1942.0 *5*			J$^{\pi}$: (15/2$^+$) suggested by 1980Pi03 based on γ to 11/2$^+$ and excit.
2050.1 *4*			
2187.45 *13*	(19/2,15/2)$^-$		
2205.8 *5*			
2278.00 *16*	(19/2,15/2)$^-$		
2367.09 *14*	(21/2,17/2,13/2)$^-$		
2761.10 *24*	(15/2,19/2)$^-$		
2821.18 *23*	(21/2,17/2,13/2)$^+$		
3021.3 *4*	(23/2,19/2,15/2)$^+$		
3265.4 *4*	$^+$		J$^{\pi}$: 1980Pi03 suggest (23/2)$^+$ based on M1 γ to (21/2)$^+$.
3627.0?[@] *4*			
3694.4?[@] *7*			
4097.1?[@] *7*			

[†] From the Adopted Levels. Contributing arguments and other suggested spins and parities from this work given as comments or footnotes.
[‡] Stretched E2 cascade to 5/2$^+$.
[#] Stretched E2 cascade to 7/2$^+$.
[@] Suggested by evaluators based on (α,4nγ) data of 1988Ar07.

^{139}La(^{3}He,3nγ) 1980Pi03 (continued)

$\gamma(^{139}Pr)$

α(K)exp,α(L)exp: normalized to α(K)(487.1γ ^{140}Ce; E2).

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[†]	α[&]	Comments
113.94 *5*	106 *7*	113.93	$7/2^+$	0.0	$5/2^+$	M1		0.893	α(L)exp=0.093 *20* α(K)=0.760 *11*; α(L)=0.1047 *15*; α(M)=0.0221 *4* α(N)=0.00494 *7*; α(O)=0.000795 *12*; α(P)=5.84×10^{-5} *9*
179.64 *5*	7.8 *5*	2367.09	$(21/2,17/2,13/2)^-$	2187.45	$(19/2,15/2)^-$	M1		0.250	α(K)exp=0.241 *5* α(K)=0.213 *3*; α(L)=0.0291 *5*; α(M)=0.00613 *11* α(N)=0.001371 *24*; α(O)=0.000221 *4*; α(P)=1.631×10^{-5} *24*
184.5 *3*	1.8 *39*	589.74	$5/2^+$	405.13	$3/2^+$				
199.2 *4*	3.0 *5*	1722.17	$15/2^-$	1523.08	$13/2^-$	M1		0.188	α(K)exp=0.199 *4* α(K)=0.1606 *25*; α(L)=0.0219 *4*; α(M)=0.00461 *7* α(N)=0.001030 *16*; α(O)=0.0001660 *25*; α(P)=1.228×10^{-5} *19* α(K)exp: For 199.2γ+200.2γ.
200.2 *3*	4.7 *8*	3021.3	$(23/2,19/2,15/2)^+$	2821.18	$(21/2,17/2,13/2)^+$				
219.32 *5*	43 *3*	1941.50	$(17/2)^-$	1722.17	$15/2^-$	M1(+E2)	<0.1	0.1449	α(K)exp=0.130 *25* α(K)=0.1237 *18*; α(L)=0.0168 *3*; α(M)=0.00354 *6* α(N)=0.000791 *12*; α(O)=0.0001275 *19*; α(P)=9.44×10^{-6} *14* I_γ: 1980Pi03 give 42.9 *3*; probable typographical error since this would imply $\Delta I\gamma$=0.7%.
244.2 *3*	1.1 *3*	3265.4	$^+$	3021.3	$(23/2,19/2,15/2)^+$				
245.95 *5*	18.8 *15*	2187.45	$(19/2,15/2)^-$	1941.50	$(17/2)^-$	M1[‡]	[‡]	0.1064	α(K)exp=0.103 *20* α(K)=0.0908 *13*; α(L)=0.01230 *18*; α(M)=0.00259 *4* α(N)=0.000579 *9*; α(O)=9.35×10^{-5} *14*; α(P)=6.92×10^{-6} *10*
259.9 *3*	1.1 *2*	2050.1		1790.17	$(13/2)^+$				
336.51 *10*	11.8 *10*	2278.00	$(19/2,15/2)^-$	1941.50	$(17/2)^-$	M1		0.0464	α(K)exp=0.044 *7* α(K)=0.0397 *6*; α(L)=0.00532 *8*; α(M)=0.001119 *16* α(N)=0.000250 *4*; α(O)=4.04×10^{-5} *6*; α(P)=3.01×10^{-6} *5*
338.2 *3*	3.5 *7*	2205.8		1867.6	$(15/2)^+$				
402.7[#a] *2*	1.1 *2*	4097.1?		3694.4?					
405.12 *8*	13.3 *10*	405.13	$3/2^+$	0.0	$5/2^+$	M1		0.0288	α(K)exp=0.024 *3* α(K)=0.0246 *4*; α(L)=0.00328 *5*; α(M)=0.000689 *10*

$^{139}_{59}Pr_{80}$-2

^{139}La(^{3}He,3nγ) 1980Pi03 (continued)

$\gamma(^{139}Pr)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[†]	α[&]	Comments
									α(N)=0.0001541 *22*; α(O)=2.49×10^{-5} *4*; α(P)=1.86×10^{-6} *3*
418.8 *4*	1.4 *5*	1941.50	(17/2)$^-$	1523.08	13/2$^-$				
444.2 *3*	2.7 *5*	3265.4	$^+$	2821.18	(21/2,17/2,13/2)$^+$	M1		0.0227	α(K)exp=0.02 *5* α(K)=0.0195 *3*; α(L)=0.00259 *4*; α(M)=0.000543 *8* α(N)=0.0001215 *18*; α(O)=1.96×10^{-5} *3*; α(P)=1.470×10^{-6} *21*
454.0 *4*	1.0 *2*	2821.18	(21/2,17/2,13/2)$^+$	2367.09	(21/2,17/2,13/2)$^-$				
475.81 *10*	5.9 *9*	589.74	5/2$^+$	113.93	7/2$^+$	M1		0.0191	α(K)exp=0.016 *2* α(K)=0.01636 *23*; α(L)=0.00217 *3*; α(M)=0.000455 *7* α(N)=0.0001019 *15*; α(O)=1.646×10^{-5} *23*; α(P)=1.234×10^{-6} *18*
543.2 *2*	4.1 *6*	2821.18	(21/2,17/2,13/2)$^+$	2278.00	(19/2,15/2)$^-$	E1			α(K)exp=0.0023 *7*
547.7 *2*	5.2 *8*	1369.69	9/2$^-$,11/2$^-$	821.99	11/2$^-$	M1		0.01343	α(K)exp=0.0124 *25* α(K)=0.01151 *17*; α(L)=0.001518 *22*; α(M)=0.000319 *5* α(N)=7.13×10^{-5} *10*; α(O)=1.152×10^{-5} *17*; α(P)=8.66×10^{-7} *13*
589.8 *4*	1.8 *6*	589.74	5/2$^+$	0.0	5/2$^+$	[M1,E2]			
605.7[#a] *2*	0.8 *2*	3627.0?		3021.3	(23/2,19/2,15/2)$^+$				
701.12 *10*	16.9 *16*	1523.08	13/2$^-$	821.99	11/2$^-$	M1+E2	−0.6 +*2*−*6*		α(K)exp=0.0041 *12*
708.06 *6*	100	821.99	11/2$^-$	113.93	7/2$^+$	M2		0.0200	α(K)exp=0.0165 *15* α(K)=0.01690 *24*; α(L)=0.00241 *4*; α(M)=0.000510 *8* α(N)=0.0001142 *16*; α(O)=1.84×10^{-5} *3*; α(P)=1.350×10^{-6} *19*
737.96 *8*	52.1 *40*	851.87	11/2$^+$	113.93	7/2$^+$	E2[@]			α(K)exp=0.0038 *6* Mult.: discrepant with E2+M3, δ=+0.20 *4* from $\gamma(\theta)$, α(K)exp, and conversion electron ratios in 5.5-h ε decay.
809.5 *2*	8.3 *10*	1833.69	9/2$^-$,11/2$^-$	1024.01	9/2$^+$	E1			α(K)exp=0.0019 *6*
819.6 *2*	5.8 *10*	2761.10	(15/2,19/2)$^-$	1941.50	(17/2)$^-$				
821.9 *2*	6.5 *12*	821.99	11/2$^-$	0.0	5/2$^+$	E3			α(K)exp=0.0060 *6*
827.86 *10*	25.6 *25*	827.86	9/2$^+$	0.0	5/2$^+$	E2[@]			α(K)exp=0.0030 *6*
900.16 *8*	71.8 *50*	1722.17	15/2$^-$	821.99	11/2$^-$	E2			α(K)exp=0.0023 *2*
909.9 *2*	10.5 *10*	1024.01	9/2$^+$	113.93	7/2$^+$	E2			Mult.: 1980Pi03 give M1+E2 but α(K)exp=0.0019 *4* not consistent with any appreciable M1 admixture.
962.3 *2*	8.4 *13*	1790.17	(13/2)$^+$	827.86	9/2$^+$	E2[@]			α(K)exp=0.0016 *5*
982.0 *2*	5.6 *10*	1833.69	9/2$^-$,11/2$^-$	851.87	11/2$^+$	E1			α(K)exp=0.0007 *3*

$^{139}_{59}Pr_{80}$-3

^{139}La(^{3}He,3nγ) 1980Pi03 (continued)

$\gamma(^{139}Pr)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	Comments
1015.7 *3*	15.2 *30*	1867.6	$(15/2)^+$	851.87	$11/2^+$	E2[@]	α(K)exp=0.0018 *5*
1090.1 *4*	5.3 *11*	1942.0		851.87	$11/2^+$		
1327.3[#a] *6*	2.4 *5*	3694.4?		2367.09	$(21/2,17/2,13/2)^-$		

[†] From $\gamma(\theta)$ and α(exp)′s.
[‡] Discrepant with stretched dipole from $\gamma(\theta)$ in (α,4nγ).
[#] Placed by evaluators on the basis of the (α,4nγ) data of 1988Ar07.
[@] Stretched.
[&] 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] Placement of transition in the level scheme is uncertain.

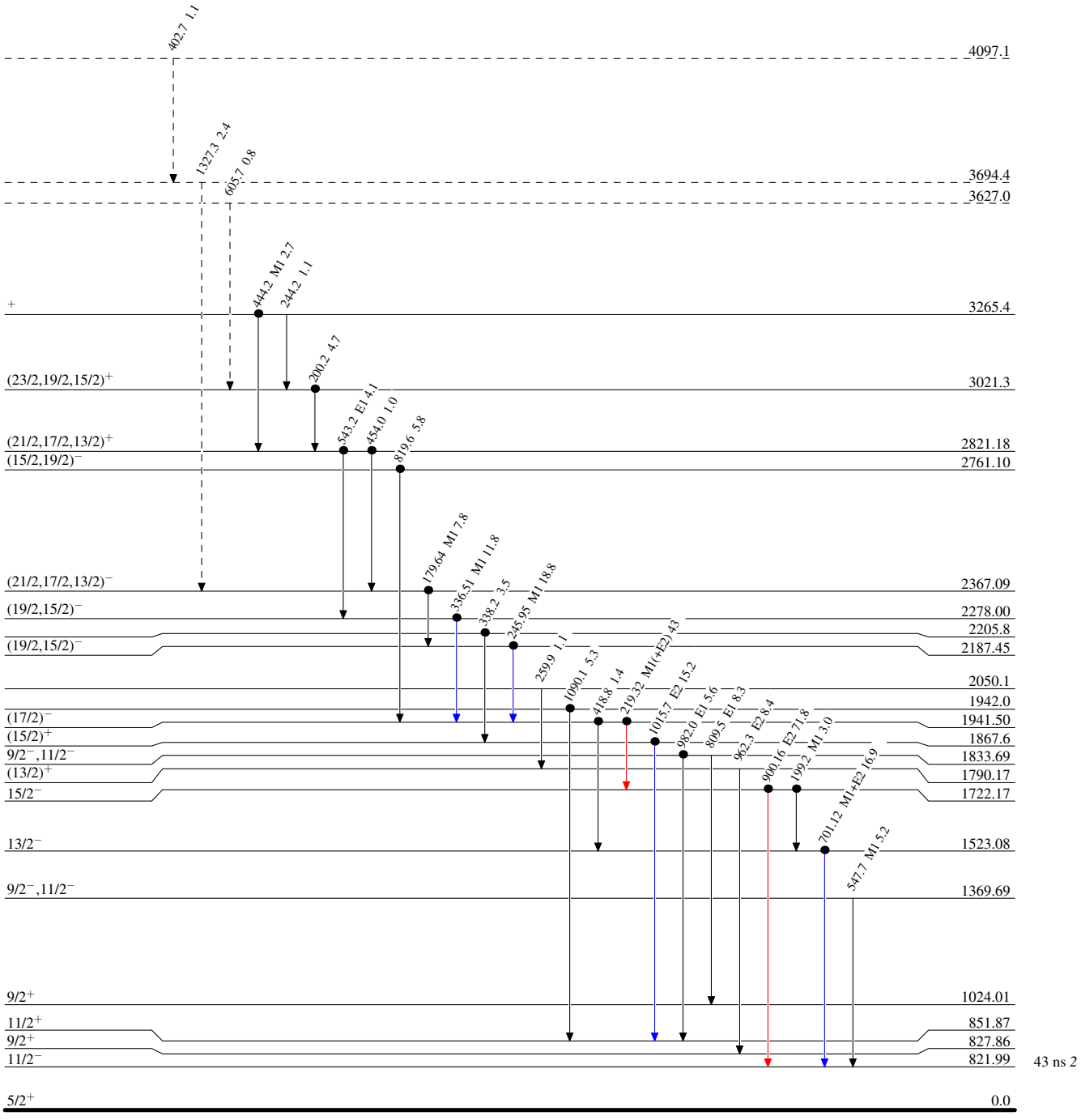
$^{139}_{59}Pr_{80}$-4

^{139}La(^{3}He,3nγ) 1980Pi03

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)
- Coincidence

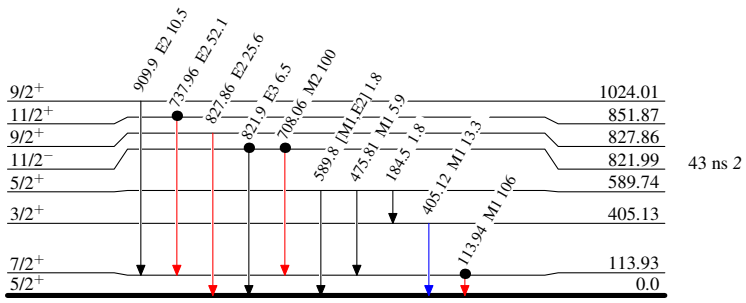


$^{139}_{59}Pr_{80}$

^{139}La(^{3}He,3nγ) 1980Pi03

Level Scheme (continued)

Intensities: Relative I_γ



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