^{139}La(γ,γ'):E=1.2-4.1 MeV 2007Sc18

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

2007Sc18: E(end-point)=4.1 MeV. Bremsstrahlung beam using 4.3 MV Stuttgart DYNAMITRON accelerator. Measured Eγ, Iγ using three HPGe detectors at angles of 90°, 127° and 150°.

^{139}La Levels

E(level)	J^{π}[@]	gΓ_0[#]	$I_{S,0}$ (eV b)[‡]	Comments
0.0	$7/2^+$			
165.9	$5/2^+$			
1216?[†]		0.41×10^{-3} eV *11*	1.1 *3*	B(E1)↑=0.22×10^{-5} *6*; B(M1)↑=0.020 *6*
1219		0.85×10^{-3} eV *14*	2.0 *4*	B(M1)↑=0.041 *7*
1381[†]		0.68×10^{-3} eV *18*	0	B(E1)↑=0.25×10^{-5} *7*; B(M1)↑=0.022 *6*
1420		1.67×10^{-3} eV *17*	2.9 *3*	B(M1)↑=0.050 *5*
1538		0.0075 eV *4*	8.2 *6*	B(M1)↑=0.179 *9* One peak likely consists of both transitions.
1578		0.0042 eV *3*	6.4 *5*	B(E1)↑=1.02×10^{-5} *8*; B(M1)↑=0.092 *7* Two states given in literature, peak is likely a combination of both.
1683		1.33×10^{-3} eV *20*	1.8 *3*	B(M1)↑=0.024 *4*
1714		1.01×10^{-3} eV *16*	0.85 *21*	B(M1)↑=0.017 *3*
1740		0.52×10^{-3} eV *15*	0.66 *19*	B(E1)↑=0.10×10^{-5} *3*; B(M1)↑=0.009 *2*
1854		0.84×10^{-3} eV *16*	0.94 *18*	B(E1)↑=0.13×10^{-5} *2*; B(M1)↑=0.011 *2*
1921		0.0027 eV *3*	0.90 *19*	B(E1)↑=0.36×10^{-5} *4*; B(M1)↑=0.033 *3*
1980		0.65×10^{-3} eV *18*	0.63 *17*	B(E1)↑=0.08×10^{-5} *2*; B(M1)↑=0.007 *2*
2059		0.0036 eV *3*	0.81 *15*	B(E1)↑=0.39×10^{-5} *3*; B(M1)↑=0.035 *3*
2136		0.85×10^{-3} eV *21*	0.72 *18*	B(E1)↑=0.08×10^{-5} *2*; B(M1)↑=0.008 *2*
2152		0.87×10^{-3} eV *17*	0.72 *14*	B(E1)↑=0.08×10^{-5} *2*; B(M1)↑=0.008 *2*
2276		1.19×10^{-3} eV *18*	0.88 *13*	B(E1)↑=0.10×10^{-5} *2*; B(M1)↑=0.009 *1*
2313		1.00×10^{-3} eV *18*	0.72 *13*	B(E1)↑=0.08×10^{-5} *1*; B(M1)↑=0.007 *1*
2357		0.75×10^{-3} eV *18*	0.52 *13*	B(E1)↑=0.06×10^{-5} *1*; B(M1)↑=0.005 *1*
2385		1.38×10^{-3} eV *19*	0.93 *13*	B(E1)↑=0.10×10^{-5} *1*; B(M1)↑=0.009 *1*
2440		0.61×10^{-3} eV *17*	0.40 *11*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.004 *1*
2448		0.88×10^{-3} eV *22*	0.56 *14*	B(E1)↑=0.06×10^{-5} *2*; B(M1)↑=0.005 *1*
2573		0.68×10^{-3} eV *18*	0.39 *11*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.003 *1*
2600		0.79×10^{-3} eV *22*	0.45 *12*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.004 *1*
2685		0.75×10^{-3} eV *19*	0.40 *10*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.003 *1*
2705		0.88×10^{-3} eV *21*	0.46 *11*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.004 *1*
2712?[†]		0.0012 eV *3*	0.63 *16*	B(E1)↑=0.06×10^{-5} *2*; B(M1)↑=0.005 *1*
2724		1.23×10^{-3} eV *21*	0.64 *11*	B(E1)↑=0.06×10^{-5} *1*; B(M1)↑=0.005 *1*
2747		1.38×10^{-3} eV *22*	0.70 *11*	B(E1)↑=0.06×10^{-5} *1*; B(M1)↑=0.006 *1*
2774		0.0025 eV *3*	1.25 *14*	B(E1)↑=0.11×10^{-5} *1*; B(M1)↑=0.010 *1*
2800		0.0021 eV *3*	0.48 *10*	B(E1)↑=0.09×10^{-5} *1*; B(M1)↑=0.008 *1*
2811		0.96×10^{-3} eV *21*	0.47 *10*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.004 *1*
2828		1.33×10^{-3} eV *21*	0.64 *10*	B(E1)↑=0.06×10^{-5} *1*; B(M1)↑=0.005 *1*
2862		17.7×10^{-3} eV *12*	7.6 *6*	B(E1)↑=0.72×10^{-5} *5*; B(M1)↑=0.065 *5*
2868		0.94×10^{-3} eV *23*	0.44 *11*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.003 *1*
2877?[†]		1.7×10^{-3} eV *3*	0.40 *12*	B(E1)↑=0.07×10^{-5} *1*; B(M1)↑=0.006 *1*
2928?[†]		1.13×10^{-3} eV *23*	0.51 *10*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.004 *1*
2964		0.88×10^{-3} eV *21*	0.38 *9*	B(E1)↑=0.03×10^{-5} *1*; B(M1)↑=0.003 *1*
2972		0.0010 eV *3*	0.42 *12*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.003 *1*
2990		0.0052 eV *4*	2.24 *19*	B(E1)↑=0.19×10^{-5} *2*; B(M1)↑=0.017 *1*

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^{139}La(γ,γ′):E=1.2-4.1 MeV 2007Sc18 (continued)

^{139}La Levels (continued)

E(level)	gΓ$_0$[#]	I$_{S,0}$ (eV b)[‡]	Comments
3043[†]	0.0027 eV *4*	0.72 *12*	B(E1)↑=0.09×10^{-5} *1*; B(M1)↑=0.008 *1* gΓ$_0$: 0.0017 eV *3* for alternative assignments. or B(E1)=0.06×10^{-5} *1*, B(M1)=0.005 *1*, depending on alternative placement of γ rays.
3053	0.0059 eV *5*	2.41 *20*	B(E1)↑=0.20×10^{-5} *2*; B(M1)↑=0.018 *2*
3077	1.17×10^{-3} eV *25*	0.48 *10*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.004 *1*
3095?[†]	3.1×10^{-3} eV *4*	0.65 *11*	B(E1)↑=0.10×10^{-5} *1*; B(M1)↑=0.009 *1* gΓ$_0$: 0.003 eV *4* for alternative assignments.
3114	0.0085 eV *7*	2.69 *23*	B(E1)↑=0.27×10^{-5} *2*; B(M1)↑=0.024 *2*
3196?[†]	0.0016 eV *3*	0.61 *11*	B(E1)↑=0.05×10^{-5} *1*; B(M1)↑=0.004 *1*
3221	27.0×10^{-3} eV *20*	10.0 *7*	B(E1)↑=0.77×10^{-5} *6*; B(M1)↑=0.070 *5*
3252	0.0011 eV *3*	0.40 *12*	B(E1)↑=0.03×10^{-5} *1*; B(M1)↑=0.003 *1*
3262[†]	0.0060 eV *5*	1.38 *15*	B(E1)↑=0.16×10^{-5} *2*; B(M1)↑=0.015 *1* gΓ$_0$: 0.0038 eV *4* for alternative assignments. or B(E1)=0.11×10^{-5} *1*, B(M1)=0.10 *1*, depending on alternative placements of γ rays.
3275	0.0019 eV *4*	0.69 *15*	B(E1)↑=0.05×10^{-5} *1*; B(M1)↑=0.005 *1*
3303	0.0017 eV *3*	0.59 *11*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.004 *1*
3351	0.0015 eV *4*	0.50 *12*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.004 *1*
3361?[†]	4.1×10^{-3} eV *5*	1.38 *15*	B(E1)↑=0.10×10^{-5} *1*; B(M1)↑=0.009 *1* I$_{S,0}$ (eV b): 0.64 *12* for alternative assignments.
3370	13.9×10^{-3} eV *11*	4.7 *4*	B(E1)↑=0.35×10^{-5} *3*; B(M1)↑=0.032 *3*
3401	0.0043 eV *6*	0.83 *15*	B(E1)↑=0.011×10^{-5} *1*; B(M1)↑=0.001 *1*
3445	0.0016 eV *5*	0.52 *15*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.003 *1*
3458	0.0062 eV *6*	0.80 *12*	B(E1)↑=0.14×10^{-5} *2*; B(M1)↑=0.013 *1*
3475	0.0015 eV *4*	0.47 *14*	B(E1)↑=0.03×10^{-5} *1*; B(M1)↑=0.003 *1*
3483	14.9×10^{-3} eV *11*	3.8 *3*	B(E1)↑=0.34×10^{-5} *3*; B(M1)↑=0.030 *2*
3523	0.0058 eV *7*	1.81 *22*	B(E1)↑=0.13×10^{-5} *2*; B(M1)↑=0.012 *1*
3527[†]	0.0057 eV *7*	0.95 *17*	B(E1)↑=0.12×10^{-5} *2*; B(M1)↑=0.011 *2* or B(E1)=0.07×10^{-5} *1*, B(M1)=0.006 *1*, depending on alternative placements of γ rays. gΓ$_0$: or 3.1×10^{-3} eV *6* for alternative assignments.
3544	0.0084 eV *7*	1.39 *16*	B(E1)↑=0.18×10^{-5} *2*; B(M1)↑=0.016 *1*
3557	0.034 eV *3*	9.8 *8*	B(E1)↑=0.73×10^{-5} *5*; B(M1)↑=0.066 *5*
3561	20.3×10^{-3} eV *19*	1.5 *3*	B(E1)↑=0.43×10^{-5} *4*; B(M1)↑=0.039 *4*
3573	0.050 eV *3*	14.1 *10*	B(E1)↑=1.04×10^{-5} *7*; B(M1)↑=0.094 *7*
3586	0.0083 eV *8*	2.49 *23*	B(E1)↑=0.17×10^{-5} *2*; B(M1)↑=0.016 *1*
3631	0.040 eV *3*	11.7 *9*	B(E1)↑=0.80×10^{-5} *6*; B(M1)↑=0.073 *5*
3664	0.0018 eV *5*	0.52 *13*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.003 *1*
3732	0.0021 eV *7*	0.57 *19*	B(E1)↑=0.04×10^{-5} *1*; B(M1)↑=0.003 *1*
3790	0.0050 eV *8*	1.35 *20*	B(E1)↑=0.09×10^{-5} *1*; B(M1)↑=0.008 *1*
3799	0.0031 eV *7*	0.83 *18*	B(E1)↑=0.05×10^{-5} *1*; B(M1)↑=0.005 *1*
3832	0.0043 eV *8*	1.12 *20*	B(E1)↑=0.07×10^{-5} *1*; B(M1)↑=0.007 *1*
3854	7.8×10^{-3} eV *10*	2.0 *3*	B(E1)↑=0.13×10^{-5} *2*; B(M1)↑=0.012 *2*
3878	0.0032 eV *9*	0.81 *22*	B(E1)↑=0.05×10^{-5} *1*; B(M1)↑=0.005 *1*
3886	2.8×10^{-3} eV *10*	0.7 *3*	B(E1)↑=0.05×10^{-5} *2*; B(M1)↑=0.004 *2*
3919	4.7×10^{-3} eV *11*	1.2 *3*	B(E1)↑=0.07×10^{-5} *2*; B(M1)↑=0.007 *2*
3931	15.4×10^{-3} eV *20*	3.8 *5*	B(E1)↑=0.24×10^{-5} *3*; B(M1)↑=0.022 *3*
3941	5.6×10^{-3} eV *14*	1.4 *3*	B(E1)↑=0.09×10^{-5} *2*; B(M1)↑=0.008 *2*
3963	7.6×10^{-3} eV *19*	1.9 *5*	B(E1)↑=0.12×10^{-5} *3*; B(M1)↑=0.011 *3*

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^{139}La(γ,γ′):E=1.2-4.1 MeV 2007Sc18 (continued)

^{139}La Levels (continued)

† Alternative assignments possible for γ transition(s).
‡ Integrated cross section.
# g=statistical weight factor.
@ From Adopted Levels.

γ(^{139}La)

E_i(level)	E_γ †	I_γ ‡	E_f	J^π_f	Comments
1216?	1216&	100	0.0	7/2+	
1219	1053	10	165.9	5/2+	
	1219	90@ *15*	0.0	7/2+	
1381	1216&#	95@	165.9	5/2+	
	1381	5@ *1*	0.0	7/2+	
1420	1254	9	165.9	5/2+	
	1420	91@ *9*	0.0	7/2+	
1538	1372	33	165.9	5/2+	
	1538	67@ *3*	0.0	7/2+	I_γ: transition width likely overestimated, should be treated as upper limit. Note that in 2001Bu16 evaluation, Γ_0/Γ=0.50 *7*, not 0.67 *3* as quoted by 2007Sc18.
1578	1578	100	0.0	7/2+	
1683	1517	2	165.9	5/2+	
	1683	98@ *15*	0.0	7/2+	
1714	294[a]	36	1420		E_γ: questionable γ taken from (n,n′γ); not included in Adopted Gammas.
	1714	64@ *10*	0.0	7/2+	
1740	1740	100	0.0	7/2+	
1854	1854	100	0.0	7/2+	
1921	1755	68	165.9	5/2+	
	1921	32@ *13*	0.0	7/2+	I_γ: note that in 2001Bu16 evaluation, Γ_0/Γ=0.55 *9*, not 0.32 *13* as quoted by 2007Sc18.
1980	1980	100	0.0	7/2+	
2059	1893	75	165.9	5/2+	
	2059	25@ *7*	0.0	7/2+	I_γ: Note that in 2001Bu16 evaluation, Γ_0/Γ=0.71 *36* not 0.25 *7* as quoted by 2007Sc18.
2136	2136	100	0.0	7/2+	
2152	2152	100	0.0	7/2+	
2276	2276	100	0.0	7/2+	
2313	2313	100	0.0	7/2+	
2357	2357	100	0.0	7/2+	
2385	2385	100	0.0	7/2+	
2440	2440	100	0.0	7/2+	
2448	2448	100	0.0	7/2+	
2573	2573	100	0.0	7/2+	
2600	2600	100	0.0	7/2+	
2685	2685	100	0.0	7/2+	
2705	2705	100	0.0	7/2+	
2712?	2712&	100	0.0	7/2+	
2724	2724	100	0.0	7/2+	
2747	2747	100	0.0	7/2+	
2774	2774	100	0.0	7/2+	
2800	2634	54	165.9	5/2+	
	2800	46 *14*	0.0	7/2+	
2811	2811	100	0.0	7/2+	
2828	2828	100	0.0	7/2+	

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^{139}La(γ,γ'):E=1.2-4.1 MeV 2007Sc18 (continued)

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

E_i(level)	E_γ[†]	I_γ[‡]	E_f	J^π_f	Comments
2862	2696	9	165.9	$5/2^+$	
	2862	91 *17*	0.0	$7/2^+$	
2868	2868	100	0.0	$7/2^+$	
2877?	2712[&]	48	165.9	$5/2^+$	
	2877[&#]	52 *10*	0.0	$7/2^+$	
2928?	2928[&]	100	0.0	$7/2^+$	
2964	2964	100	0.0	$7/2^+$	
2972	2972	100	0.0	$7/2^+$	
2990	2990	100	0.0	$7/2^+$	
3043	2877[&]	37	165.9	$5/2^+$	
	3043[#]	63 *9*	0.0	$7/2^+$	I_γ: other: 100 if 2877 has alternate placement.
3053	3053	100	0.0	$7/2^+$	
3077	3077	100	0.0	$7/2^+$	
3095?	2928[&]	48	165.9	$5/2^+$	
	3095[&]	52 *7*	0.0	$7/2^+$	
3114	2948	20	165.9	$5/2^+$	
	3114	80 *15*	0.0	$7/2^+$	
3196?	3196[&]	100	0.0	$7/2^+$	
3221	3221	100	0.0	$7/2^+$	
3252	3252	100	0.0	$7/2^+$	
3262	3095[&]	36	165.9	$5/2^+$	
	3262[#]	64 *13*	0.0	$7/2^+$	I_γ: other: 100 if 3096 has alternate placement.
3275	3275	100	0.0	$7/2^+$	
3303	3303	100	0.0	$7/2^+$	
3351	3351	100	0.0	$7/2^+$	
3361?	3196[&]	54	165.9	$5/2^+$	
	3361[&]	46 *6*	0.0	$7/2^+$	
3370	3370	100	0.0	$7/2^+$	
3401	3235	42	165.9	$5/2^+$	
	3401	58 *16*	0.0	$7/2^+$	
3445	3445	100	0.0	$7/2^+$	
3458	3292	60	165.9	$5/2^+$	
	3458	40 *8*	0.0	$7/2^+$	
3475	3475	100	0.0	$7/2^+$	
3483	3317	19	165.9	$5/2^+$	
	3483	81 *15*	0.0	$7/2^+$	
3523	3523	100	0.0	$7/2^+$	
3527	3361[&]	46	165.9	$5/2^+$	
	3527[#]	54 *14*	0.0	$7/2^+$	I_γ: other: 100 if 3361 has alternate placement.
3544	3378	46	165.9	$5/2^+$	
	3544	54 *10*	0.0	$7/2^+$	
3557	3391	6	165.9	$5/2^+$	
	3557	94 *30*	0.0	$7/2^+$	
3561	3395	76	165.9	$5/2^+$	
	3561	24 *5*	0.0	$7/2^+$	
3573	3407	6	165.9	$5/2^+$	
	3573	94 *19*	0.0	$7/2^+$	
3586	3586	100	0.0	$7/2^+$	
3631	3631	100	0.0	$7/2^+$	
3664	3664	100	0.0	$7/2^+$	
3732	3732	100	0.0	$7/2^+$	
3790	3790	100	0.0	$7/2^+$	

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^{139}La(γ,γ′):E=1.2-4.1 MeV 2007Sc18 (continued)

γ(^{139}La) (continued)

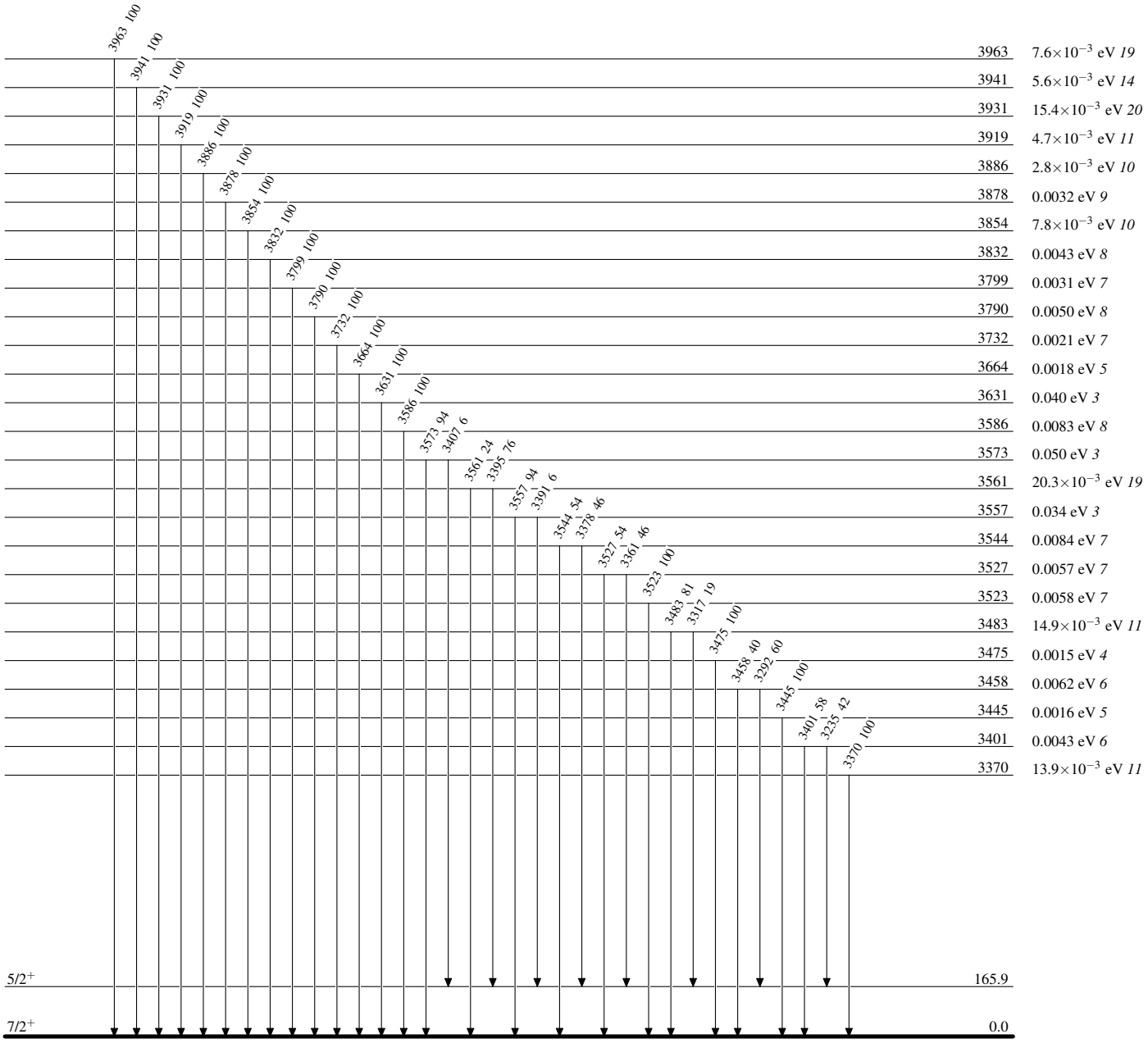
E_i(level)	E_γ †	I_γ ‡	E_f	J^π_f	E_i(level)	E_γ †	I_γ ‡	E_f	J^π_f	E_i(level)	E_γ †	I_γ ‡	E_f	J^π_f
3799	3799	100	0.0	$7/2^+$	3878	3878	100	0.0	$7/2^+$	3931	3931	100	0.0	$7/2^+$
3832	3832	100	0.0	$7/2^+$	3886	3886	100	0.0	$7/2^+$	3941	3941	100	0.0	$7/2^+$
3854	3854	100	0.0	$7/2^+$	3919	3919	100	0.0	$7/2^+$	3963	3963	100	0.0	$7/2^+$

† From level-energy differences.
‡ Branching ratios. Evaluators assume transitions to only the ground state and the first excited state at 165.9 keV, when branching ratios are deduced from Γ_0/Γ values in 2007Sc18.
# Alternative assignments possible.
@ 2007Sc18 state that Γ_0/Γ is from 2001Bu16 evaluation (Nuclear Data Sheets for A=139), but the evaluators note that in some cases, as noted, values do not match.
& Multiply placed.
a Placement of transition in the level scheme is uncertain.

^{139}La(γ,γ′):E=1.2-4.1 MeV 2007Sc18

Level Scheme

Intensities: % photon branching from each level

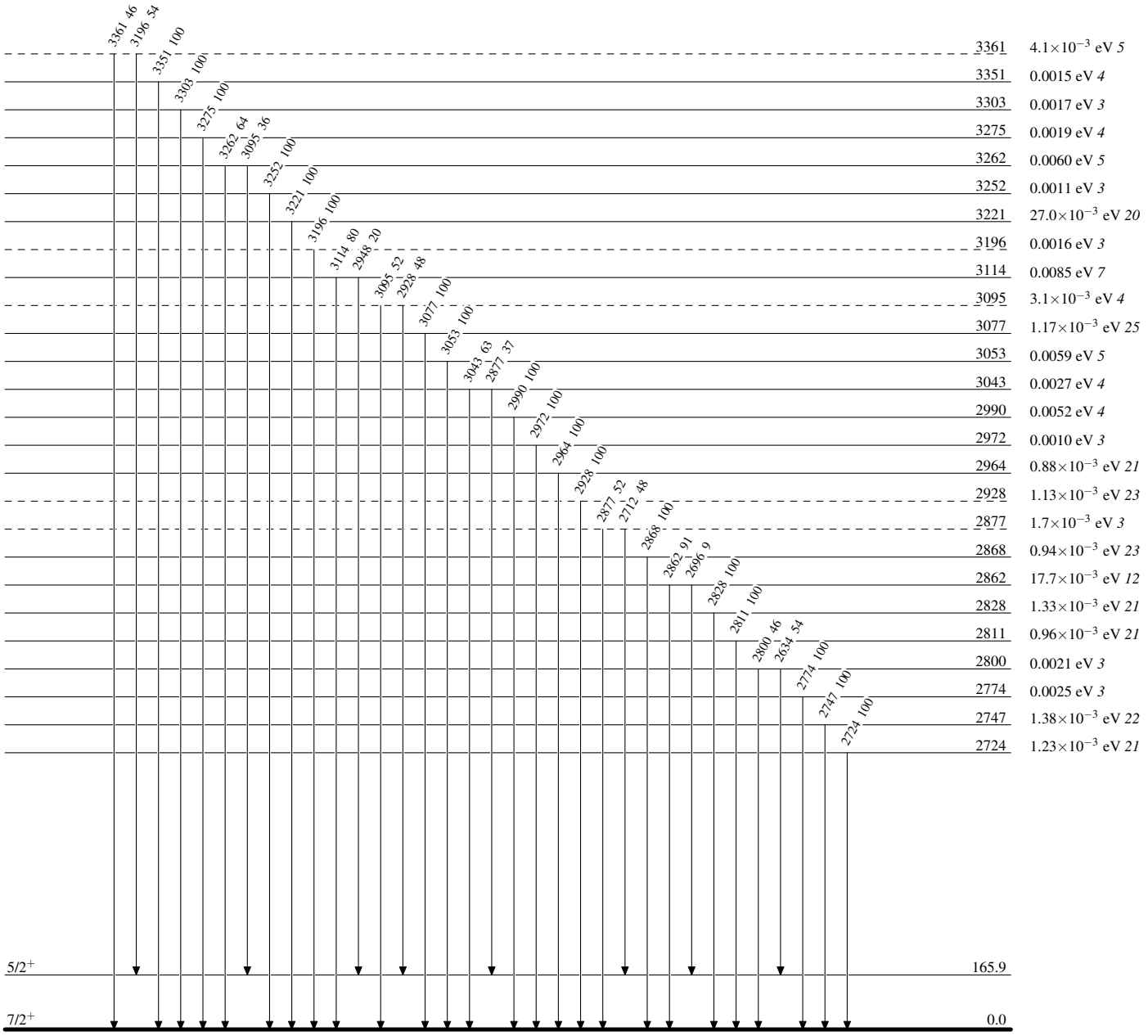


$^{139}_{57}La_{82}$

^{139}La(γ,γ′):E=1.2-4.1 MeV 2007Sc18

Level Scheme (continued)

Intensities: % photon branching from each level



$^{139}_{57}La_{82}$

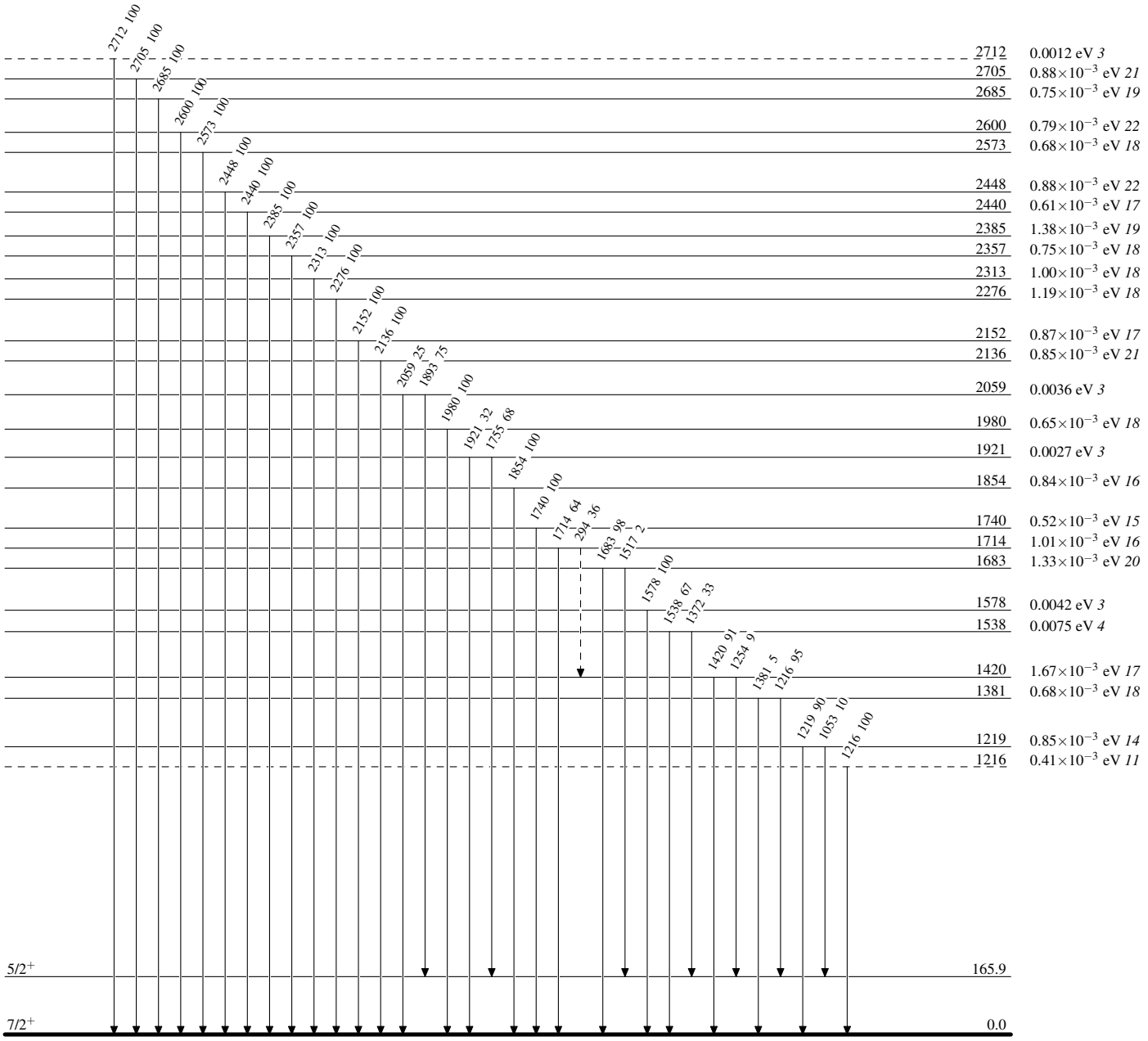
^{139}La(γ,γ′):E=1.2-4.1 MeV 2007Sc18

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

- - - - - - ► γ Decay (Uncertain)



$^{139}_{57}La_{82}$