Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	A. A. Sonzogni	NDS 93,599 (2001)	1-Dec-2000

Q(β^-)=5582 *14*; S(n)=4750 *15*; S(p)=8202 *15*; Q(α)=−224 *16* 2012Wa38
Note: Current evaluation has used the following Q record 5541 56 *4780* 58 *8244* 57 −269 56 1995Au04.
All data are from ^{144}Ba β^- decay.
Fission yields: 1987Ch16, 1986Di09.

^{144}La Levels

E(level)†	J^π‡	$T_{1/2}$	Comments
0.0	(3⁻)	40.8 s *4*	%β^-=100 $T_{1/2}$: weighted av: 40.6 s *10* (1979Ik07), 40 s *4* (1979En02), 42.1 s *7* (1977Sk02), 39.9 s *5* (1974Gr29), 40 s *3* (1974Ar17), 42.4 s *6* (1972Oh12), 39.8 s *6* (1969WiZX), 41 s *3* (1967Am01). J^π: log *ft* of ≈7 to 2⁺ 397, and 4⁺ 939, levels gives J^π=2⁻,3,4⁻. It is fed by 1⁻ levels making 4⁻ unlikely. None of the higher lying 1⁺ levels feeds the g.s. which makes it unlikely to be 2⁻ or 3⁺.
16.231 *10*	(4⁻)		J^π: E2 feeding from (2⁻) state, M1 γ to (3⁻) g.s., bypassed by most other γ transitions from higher states.
103.855 *6*	(2⁻)		J^π: 103γ is M1(+E2) which gives J^π=(2⁻,3⁻,4⁻). J^π=4⁻ is eliminated as it is fed by M1+E2 transition from (2⁻) 172, level. 3⁻ is unlikely as it is fed by 1⁺ 603, level.
172.830 *7*	(2⁻)		J^π: (430γ)(172γ)(θ) with mult(172)=M1+E2 to (3⁻) is consistent only with (2⁻).
181.84 *6*	(3⁻)		J^π: no direct β feeding and not fed by 1⁺ levels. J^π=1⁻,2⁻ not ruled out.
185.681 *6*	(1⁻)		J^π: 81γ to (2⁻) is M1+E2.
215.167 *6*	(1⁻)		J^π: 111γ to (2⁻) is M1+E2 and fed from 1⁺ level.
294.72 *4*	(2⁻,1⁻)		J^π: fed from 1⁺ and feeds (3⁻) g.s.
300.68 *4*	(0⁻)		J^π: log *ft*=6.1 from 0⁺ suggests J^π=0⁻,1; it feeds a (1⁻) state through M1+E2 γ.
311.483 *15*			
382.94 *4*	(1⁻,2⁻)		J^π: fed from 1⁺ state and feeds (3⁻) g.s.
401.23 *4*	(2⁻)		J^π: (202γ)(228γ)(θ) is consistent with 1+(E1)J−(M1+E2)3⁻ for J=1,2 but J=2 is preferred due to strong feeding of the g.s.
474.57 *3*	(1⁻)		J^π: log *ft*=6.2 from 0⁺ gives J^π=0⁻,1. (515γ+514γ)(259γ+260γ)(θ) is consistent with 1+(E1)1−(M1)1⁻ suggesting 1⁻ for both 474 and 475 levels.
475.47 *4*	(1⁻)		J^π: log *ft*=5.9 from 0⁺ gives J^π=0⁻,1. (515γ+514γ)(259γ+260γ)(θ) is consistent with 1+(E1)1−(M1)1⁻ suggesting 1⁻ for both 474 and 475 levels.
477.45 *6*			
549.98 *9*			J^π: 1982Ch22 suggest it to be 2⁺ as it is not fed by β^- and is fed from π=+ levels.
603.37 *3*	1⁺		J^π: log *ft*=4.6 from 0⁺.
655.18 *5*			J^π: 1982Ch22 suggest it to be 2⁺ as it is not fed by β^- and is fed from π=+ levels.
669.88 *5*			J^π: 1982Ch22 suggest it to be 2⁺ as it is not fed by β^- and is fed from π=+ levels.
740.60 *6*			
756.18 *4*	1⁺		J^π: log *ft*=4.8 from 0⁺.
990.61 *5*	1⁺		J^π: log *ft*=4.9 from 0⁺.
1085.82 *7*	1⁺		J^π: log *ft*=5.4 from 0⁺.
1117.05 *9*			
1223.86 *8*			
1240.19 *10*			

† Level energies have been calculated by the evaluator using least-squares fit to Eγ.
‡ Many of the J^π assignments are based upon γ(mult) and $\gamma\gamma(\theta)$ analysis of 1982Ch22 in β^- decay. The authors have assumed that the transitions from 1⁺ levels at 756, 991 and 1086 to levels <500 are predominantly E1. Supporting many J^π assignments, calculations of levels configurations in terms of shell-model and Nilsson orbitals can be seen in 1982Ch22.

γ(^{144}La)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.	δ	α†	Comments
16.231	(4⁻)	16.33 *5*	100.0	0.0	(3⁻)	M1		38.8 *16*	
103.855	(2⁻)	103.855 *6*	100.0	0.0	(3⁻)	M1(+E2)		1.4 *4*	α(K)=0.97 *13*; α(L)=0.31 *21*; α(M)=0.07 *5*; α(N+..)=0.018 *12*
172.830	(2⁻)	68.93 *4*	18.0 *5*	103.855	(2⁻)	M1(+E2)		5.5 *23*	α(K)=3.1 *4*; α(L)=1.9 *15*; α(M)=0.4 *4*; α(N+..)=0.11 *9*
		156.600 *7*	98.5 *23*	16.231	(4⁻)	E2		0.414	α(K)=0.301 *9*; α(L)=0.088 *3*; α(M)=0.0191 *6*; α(N+..)=0.00506 *16*
		172.828 *7*	100.0 *23*	0.0	(3⁻)	M1+E2		0.27 *3*	α(K)=0.211 *9*; α(L)=0.043 *16*; α(M)=0.009 *4*; α(N+..)=0.0025 *10*
181.84	(3⁻)	(8.9)	0.7	172.830	(2⁻)				γ not observed, Iγ from coincidence spectrum and assuming M1 multipolarity.
		181.79 *8*	100 *5*	0.0	(3⁻)	[M1,E2]		0.227 *21*	α(K)=0.181 *6*; α(L)=0.036 *13*; α(M)=0.008 *3*; α(N+..)=0.0020 *7*
185.681	(1⁻)	81.826 *2*	100 *3*	103.855	(2⁻)	M1+E2		3.0 *11*	α(K)=1.9 *3*; α(L)=0.9 *7*; α(M)=0.19 *15*; α(N+..)=0.05 *4*
		185.72 *9*	1.3 *6*	0.0	(3⁻)	[E2]		0.230	α(K)=0.174 *6*; α(L)=0.0441 *14*; α(M)=0.0095 *3*; α(N+..)=0.00251 *8*
215.167	(1⁻)	29.49 *5*	4.03 *17*	185.681	(1⁻)				
		42.27 *4*	25.0 *7*	172.830	(2⁻)	M1(+E2)		33 *20*	α(K)=9.3 *22*; α(L)=18 *17*; α(M)=4 *4*
		111.312 *2*	100.0 *21*	103.855	(2⁻)	M1+E2		1.1 *3*	α(K)=0.79 *10*; α(L)=0.24 *15*; α(M)=0.05 *4*; α(N+..)=0.014 *9*
		215.18 *13*	3.8 *9*	0.0	(3⁻)	[E2]		0.140	α(K)=0.109 *4*; α(L)=0.0247 *8*; α(M)=0.00527 *16*; α(N+..)=0.00140 *5*
294.72	(2⁻,1⁻)	109.10 *5*	31.5 *15*	185.681	(1⁻)				
		190.9 *1*	36.5 *25*	103.855	(2⁻)				
		294.66 *13*	100.0 *25*	0.0	(3⁻)	[M1,E2]		0.053 *3*	α(K)=0.044 *4*; α(L)=0.0070 *7*; α(M)=0.00146 *15*; α(N+..)=0.00040 *4*
300.68	(0⁻)	115.00 *4*	100.0	185.681	(1⁻)	M1+E2	1.09 *11*	1.00 *3*	α(K)=0.722 *10*; α(L)=0.218 *13*; α(M)=0.047 *3*; α(N+..)=0.0125 *8*
311.483		138.68 *5*	72 *6*	172.830	(2⁻)				
		207.614 *16*	100.0 *20*	103.855	(2⁻)				
382.94	(1⁻,2⁻)	71.46 *6*	37.1 *9*	311.483					
		167.79 *5*	74 *6*	215.167	(1⁻)				
		197.45 *13*	50 *5*	185.681	(1⁻)				
		210.14 *13*	36.6 *18*	172.830	(2⁻)				
		382.85 *11*	100 *6*	0.0	(3⁻)				
401.23	(2⁻)	215.5 *4*	5 *3*	185.681	(1⁻)				
		219.36 *12*	59.1 *16*	181.84	(3⁻)				
		228.48 *6*	100.0 *11*	172.830	(2⁻)	M1+E2		0.113 *2*	α(K)=0.092 *2*; α(L)=0.016 *4*; α(M)=0.0034 *8*; α(N+..)=0.00091 *20*
		401.20 *12*	51 *4*	0.0	(3⁻)				
474.57	(1⁻)	163.12 *5*	19.7 *17*	311.483					
		259.38 *4*	100.0 *17*	215.167	(1⁻)				
		288.79 *15*	20.1 *17*	185.681	(1⁻)				
475.47	(1⁻)	74.29 *6*	10.9 *7*	401.23	(2⁻)				
		92.62 *9*	2.8 *5*	382.94	(1⁻,2⁻)				

$^{144}_{57}La_{87}$-2

Adopted Levels, Gammas (continued)

$\gamma(^{144}La)$ (continued)

E_i(level)	J^{π}_i	E_γ	I_γ	E_f	J^{π}_f
475.47	(1^-)	180.83 *9*	28 *4*	294.72	$(2^-,1^-)$
		260.26 *15*	94 *7*	215.167	(1^-)
		289.71 *15*	100 *4*	185.681	(1^-)
		293.54 *13*	68.8 *16*	181.84	(3^-)
		302.52[‡] *15*	33[‡] *5*	172.830	(2^-)
		371.50 *14*	9 *7*	103.855	(2^-)
477.45		165.90 *7*	98 *17*	311.483	
		291.72[‡] *15*	74[‡] *17*	185.681	(1^-)
		304.94 *14*	100 *8*	172.830	(2^-)
549.98		334.78 *14*	100.0	215.167	(1^-)
603.37	1^+	202.17 *12*	6.79 *12*	401.23	(2^-)
		291.72[‡] *15*	12.8[‡] *4*	311.483	
		302.52[‡] *15*	1.4[‡] *4*	300.68	(0^-)
		308.70 *15*	0.89 *11*	294.72	$(2^-,1^-)$
		388.19 *6*	73.7 *3*	215.167	(1^-)
		417.69 *7*	17.0 *4*	185.681	(1^-)
		430.48[‡] *12*	100.0[‡] *19*	172.830	(2^-)
		499.59 *12*	1.1 *3*	103.855	(2^-)
655.18		440.15 *12*	48.5 *20*	215.167	(1^-)
		473.35 *12*	100 *3*	181.84	(3^-)
		482.44 *12*	67.3 *20*	172.830	(2^-)
		551.47 *13*	19.1 *24*	103.855	(2^-)
669.88		66.55 *5*	100 *4*	603.37	1^+
		496.97 *13*	47 *5*	172.830	(2^-)
740.60		137.14 *5*	$5.\times10^{1}$ *3*	603.37	1^+
		525.95 *12*	100 *4*	215.167	(1^-)
756.18	1^+	101.11 *8*	12.2 *4*	655.18	
		152.85 *5*	18.9 *9*	603.37	1^+
		206.10 *15*	4.5 *3*	549.98	
756.18	1^+	281.38 *13*	3.3 *8*	474.57	(1^-)
		354.97 *11*	13.0 *3*	401.23	(2^-)
		373.30 *14*	32.0 *4*	382.94	$(1^-,2^-)$
		444.73 *12*	6.7 *4*	311.483	
		455.64 *12*	28.2 *5*	300.68	(0^-)
		541.06 *12*	100 *3*	215.167	(1^-)
		570.50 *12*	67.1 *9*	185.681	(1^-)
		583.29 *12*	54.5 *9*	172.830	(2^-)
		651.94 *12*	4.5 *9*	103.855	(2^-)
990.61	1^+	320.84 *11*	13.0 *4*	669.88	
		335.77 *14*	7.1 *12*	655.18	
		515.43 *14*	100 *6*	475.47	(1^-)
		516.30 *14*	76 *6*	474.57	(1^-)
		589.40 *12*	8.2 *7*	401.23	(2^-)
		678.56 *12*	5.0 *8*	311.483	
		689.90 *17*	7.5 *5*	300.68	(0^-)
		817.55 *12*	10.7 *5*	172.830	(2^-)
1085.82	1^+	430.48[‡] *12*	39[‡] *12*	655.18	
		702.85 *12*	100 *3*	382.94	$(1^-,2^-)$
		785.12 *12*	94.3 *21*	300.68	(0^-)
		791.32 *12*	40 *4*	294.72	$(2^-,1^-)$
		870.6 *4*	23.5 *21*	215.167	(1^-)
1117.05		805.57 *12*	100 *6*	311.483	
		822.33 *13*	64 *5*	294.72	$(2^-,1^-)$
1223.86		233.30 *11*	45.1 *15*	990.61	1^+
		467.57 *12*	100 *6*	756.18	1^+
		673.97 *16*	32 *8*	549.98	
1240.19		249.52 *11*	100 *4*	990.61	1^+
		484.14 *17*	32 *5*	756.18	1^+

[†] 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.

[‡] Multiply placed with intensity suitably divided.

$^{144}_{57}La_{87}$-3

Adopted Levels, Gammas

Level Scheme

Intensities: Type not specified

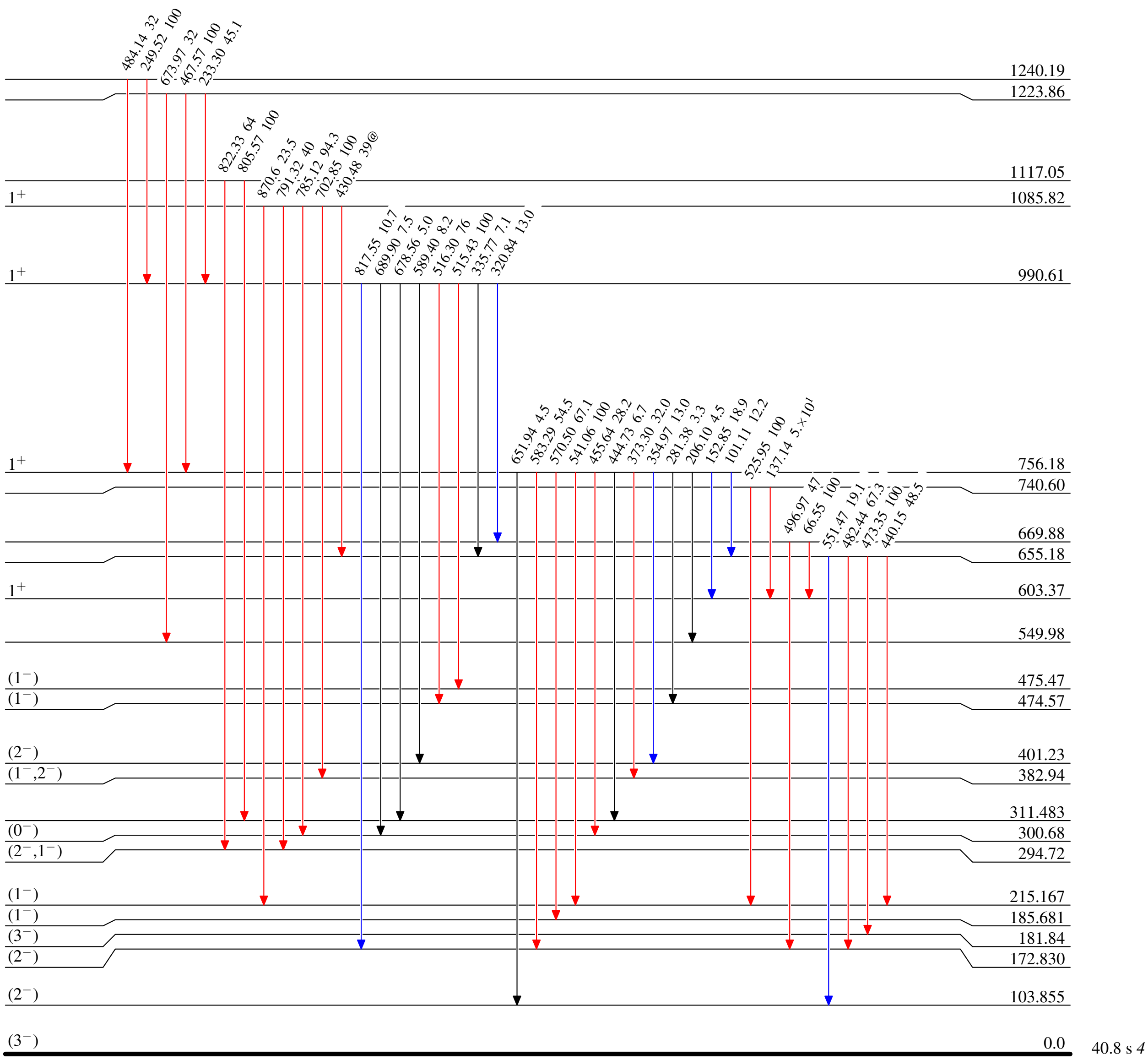
@ Multiply placed: intensity suitably divided

Legend

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

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

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



$^{144}_{57}La_{87}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

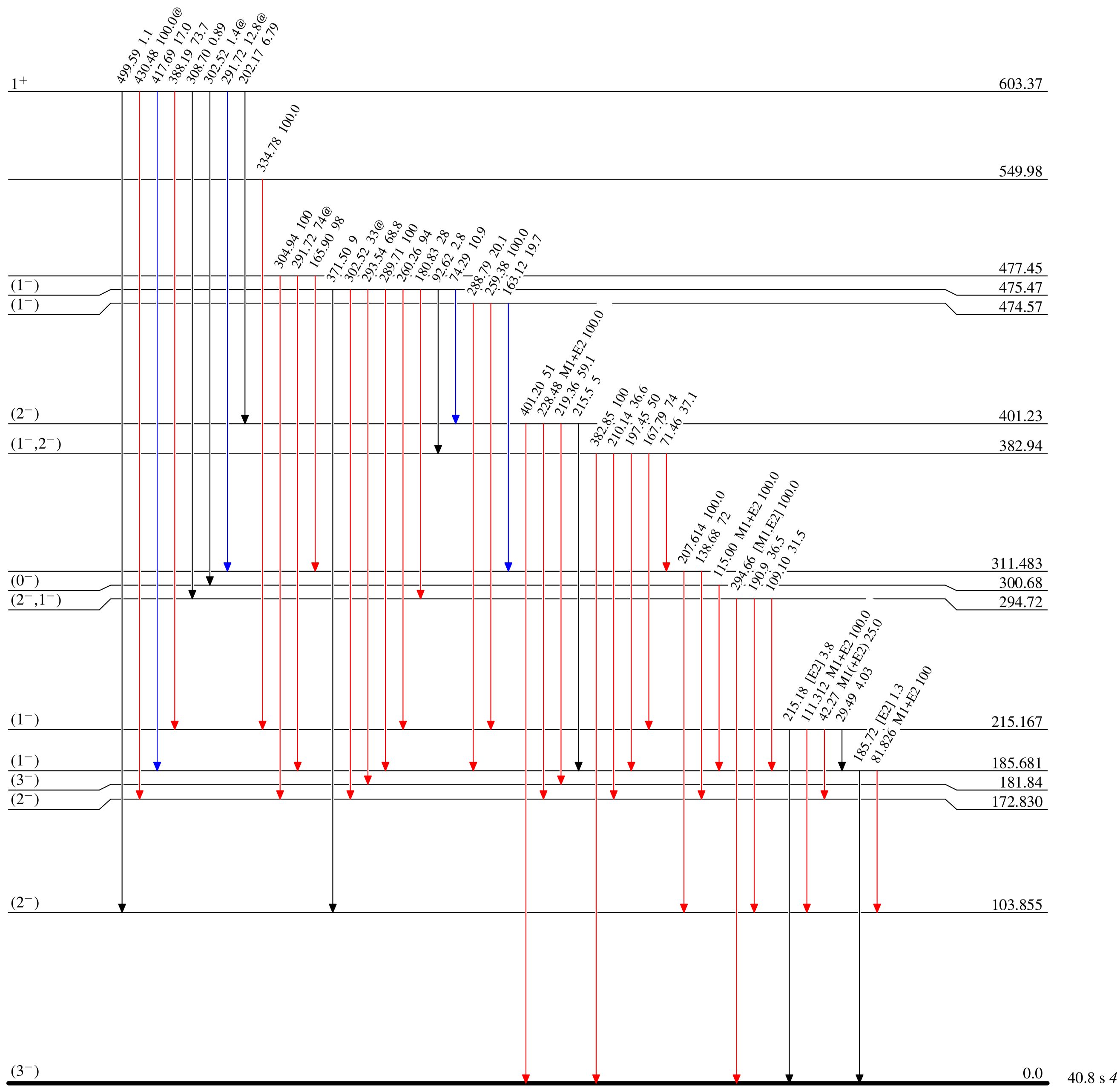
@ Multiply placed: intensity suitably divided

Legend

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

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

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



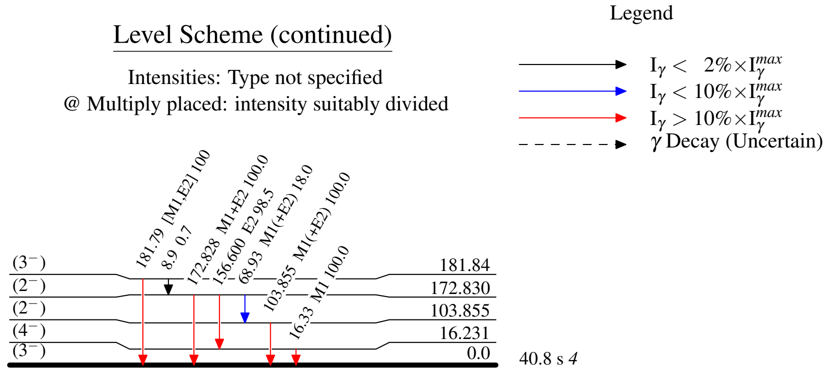
$^{144}_{57}La_{87}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

@ Multiply placed: intensity suitably divided



$^{144}_{57}La_{87}$