^{138}Ba(p,2nγ) 1982Ko05

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 108,2173 (2007)	1-Oct-2006

Additional information 1.
E=19.6 MeV.
Measured: γ, $\gamma\gamma$, ce, $\gamma(\theta)$, γ(t), yield (1982Ko05), γ, $\gamma\gamma$, γ(t), $\gamma(\theta$,H,t) (1982KiZV).

^{137}La Levels

E(level)	J$^{\pi}$‡	T$_{1/2}$†	Comments
0.0	7/2$^+$		
10.6	5/2$^+$		
447.1	5/2$^+$		
493.1	(3/2)$^+$		
641.9	1/2$^+$		
709.3	(3/2)$^+$		
762.0	11/2$^+$		
781.3	(7/2)$^+$		
835.3	9/2$^+$		
917.4	9/2$^+$		
926.5	5/2$^+$		
1004.6	11/2$^-$		
1172.0	(1/2$^+$,3/2$^-$)		
1174.4			
1255.1			
1314.2			
1365.0			
1473.6	(7/2)$^+$		
1535.1			
1651.6	(9/2)$^-$		
1723.0	13/2$^+$		
1728.2	13/2$^-$		
1786.3	15/2$^-$		
1790.9	15/2$^+$		
1801.1			
1863.5	(15/2)		
1869.5	19/2$^-$	364 ns *5*	g=+0.246 *6* (1982KiZV) T$_{1/2}$: from 1982KiZV. Other: 360 ns *40* (1982Ko05).
1880.9			
1894.4			
1962.1			
1973.3			
2009.6			
2053.2			
2100.9			
2337.0			

† ≤1.5 ns for all levels, except 0.0, 1869.5.
‡ Adopted values.

^{138}Ba(p,2nγ) 1982Ko05 (continued)

$\gamma(^{137}La)$

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[‡]	Comments
(10.6)		10.6	$5/2^+$	0.0	$7/2^+$			
(54.0)		835.3	$9/2^+$	781.3	$(7/2)^+$			
58.07 *6*	19 *2*	1786.3	$15/2^-$	1728.2	$13/2^-$			
72.65 *7*	42 *4*	1863.5	(15/2)	1790.9	$15/2^+$			
83.16 *7*	19 *2*	1869.5	$19/2^-$	1786.3	$15/2^-$	E2	3.85	B(E2)(W.u.)=1.90 *6* α(K)=2.08 *3*; α(L)=1.395 *21*; α(M)=0.309 *5*; α(N+..)=0.0749 *11* α(N)=0.0655 *10*; α(O)=0.00924 *14*; α(P)=0.0001084 *16* Mult.: α=3.8 *4* from balance of Iγ.
87.25 *10*	31 *3*	1004.6	$11/2^-$	917.4	$9/2^+$			
94.58 *6*	67 *7*	1880.9		1786.3	$15/2^-$			
140.58 *10*	60 *5*	1863.5	(15/2)	1723.0	$13/2^+$	D		Mult.: A_2=−0.20 *1*, A_4=−0.05 *2*.
145.2 *1*	13 *2*	926.5	$5/2^+$	781.3	$(7/2)^+$			
146.1 *1*	63 *6*	2009.6		1863.5	(15/2)	D		Mult.: A_2=−0.16 *3*, A_4=−0.02 *4*.
149.0 *1*	20 *3*	641.9	$1/2^+$	493.1	$(3/2)^+$			
169.33 *5*	13.7×10^2 *10*	1004.6	$11/2^-$	835.3	$9/2^+$	E1	0.0549	α(K)=0.0471 *7*; α(L)=0.00624 *9*; α(M)=0.001288 *18*; α(N+..)=0.000328 *5* α(N)=0.000280 *4*; α(O)=4.46×10^{-5} *7*; α(P)=3.07×10^{-6} *5* Mult.: A_2=−0.164 *1*, A_4=−0.015 *2*; α(K)exp=0.052 *10*.
206.5 *1*	15 *3*	2100.9		1894.4				
217.2 *1*	12 *2*	926.5	$5/2^+$	709.3	$(3/2)^+$			
250.5 *1*	28 *4*	1255.1		1004.6	$11/2^-$			
262.3 *1*	17 *3*	2053.2		1790.9	$15/2^+$			
[x]283.70 *8*	160 *20*							Mult.: α(K)exp=0.039 *10*.
334.2 *1*	25 *4*	781.3	$(7/2)^+$	447.1	$5/2^+$			
433.4 *1*	65 *6*	926.5	$5/2^+$	493.1	$(3/2)^+$	M1+E2	0.018 *3*	α(K)=0.0152 *24*; α(L)=0.00218 *13*; α(M)=0.000455 *22*; α(N+..)=0.000116 *7* α(N)=9.9×10^{-5} *6*; α(O)=1.59×10^{-5} *12*; α(P)=1.12×10^{-6} *23* Mult.: A_2=−0.05 *1*, A_4=−0.02 *1*; α(K)exp=0.017 *4*.
436.6 *1*	100	447.1	$5/2^+$	10.6	$5/2^+$	E2	0.01508	α(K)=0.01254 *18*; α(L)=0.00201 *3*; α(M)=0.000424 *6*; α(N+..)=0.0001075 *15* α(N)=9.21×10^{-5} *13*; α(O)=1.444×10^{-5} *21*; α(P)=8.78×10^{-7} *13* Mult.: A_2=+0.19 *2*, A_4=−0.07; α(K)exp=0.011 *5*.
447.14 *8*	660 *50*	447.1	$5/2^+$	0.0	$7/2^+$	M1+E2	0.0165 *25*	α(K)=0.0140 *23*; α(L)=0.00199 *13*; α(M)=0.000416 *24*; α(N+..)=0.000107 *7* α(N)=9.1×10^{-5} *6*; α(O)=1.46×10^{-5} *12*; α(P)=1.04×10^{-6} *22* Mult.: A_2=+0.073 *4*, A_4=+0.00 *1*; α(K)exp=0.011 *4*.
456.1 *1*	24 *3*	2337.0		1880.9				
479.4 *1*	70 *6*	926.5	$5/2^+$	447.1	$5/2^+$	M1+E2	0.0137 *22*	α(K)=0.0117 *20*; α(L)=0.00164 *14*; α(M)=0.00034 *3*; α(N+..)=8.8×10^{-5} *8* α(N)=7.5×10^{-5} *6*; α(O)=1.20×10^{-5} *12*;

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^{138}Ba(p,2nγ) 1982Ko05 (continued)

γ(^{137}La) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[‡]	Comments
								α(P)=8.6×10^{-7} *19* Mult.: A_2=+0.19 *2*, A_4=+0.11 *3*; α(K)exp=0.021 *6*.
482.4 *1*	420 *40*	493.1	(3/2)$^+$	10.6	5/2$^+$	M1+E2	0.0135 *22*	α(K)=0.0115 *20*; α(L)=0.00161 *14*; α(M)=0.00034 *3*; α(N+..)=8.6×10^{-5} *8* α(N)=7.4×10^{-5} *6*; α(O)=1.18×10^{-5} *12*; α(P)=8.5×10^{-7} *18* Mult.: A_2=−0.08 *1*, A_4=+0.01 *1*; α(K)exp=0.012 *4*.
493.1 *1*	98 *10*	493.1	(3/2)$^+$	0.0	7/2$^+$	[E2]	0.01071	α(K)=0.00897 *13*; α(L)=0.001383 *20*; α(M)=0.000291 *4*; α(N+..)=7.39×10^{-5} *11* α(N)=6.33×10^{-5} *9*; α(O)=9.97×10^{-6} *14*; α(P)=6.35×10^{-7} *9* Mult.: α(K)exp=0.005 *1*.
631.3 *1*	120 *15*	641.9	1/2$^+$	10.6	5/2$^+$	E2	0.00558	α(K)=0.00472 *7*; α(L)=0.000682 *10*; α(M)=0.0001424 *20*; α(N+..)=3.64×10^{-5} *5* α(N)=3.11×10^{-5} *5*; α(O)=4.96×10^{-6} *7*; α(P)=3.40×10^{-7} *5* Mult.: α(K)exp=0.0046 *10*.
647.0 *1*	77 *10*	1651.6	(9/2)$^-$	1004.6	11/2$^-$	M1	0.00758	α(K)=0.00652 *10*; α(L)=0.000839 *12*; α(M)=0.0001736 *25*; α(N+..)=4.49×10^{-5} *7* α(N)=3.82×10^{-5} *6*; α(O)=6.24×10^{-6} *9*; α(P)=4.97×10^{-7} *7* Mult.: A_2=−0.27 *3*, A_4=−0.04 *5*; α(K)exp=0.0074 *10*.
681.3 *1*	52 *8*	1174.4		493.1	(3/2)$^+$			
698.7 *1*	210 *20*	709.3	(3/2)$^+$	10.6	5/2$^+$	M1	0.00629	α(K)=0.00542 *8*; α(L)=0.000695 *10*; α(M)=0.0001438 *21*; α(N+..)=3.72×10^{-5} *6* α(N)=3.16×10^{-5} *5*; α(O)=5.17×10^{-6} *8*; α(P)=4.13×10^{-7} *6* Mult.: A_2=−0.06 *2*, A_4≈+0.00.
709.3 *1*	7 *2*	709.3	(3/2)$^+$	0.0	7/2$^+$			
711.6 *1*	110 *15*	1473.6	(7/2)$^+$	762.0	11/2$^+$	E2	0.00415	α(K)=0.00353 *5*; α(L)=0.000496 *7*; α(M)=0.0001034 *15*; α(N+..)=2.65×10^{-5} *4* α(N)=2.26×10^{-5} *4*; α(O)=3.62×10^{-6} *5*; α(P)=2.56×10^{-7} *4* Mult.: A_2=+0.08 *2*, A_4=+0.03 *3*; α(K)exp=0.0039 *10*.
723.6 *1*	220 *30*	1728.2	13/2$^-$	1004.6	11/2$^-$	M1+E2	0.0049 *9*	α(K)=0.0042 *8*; α(L)=0.00056 *9*; α(M)=0.000115 *17*; α(N+..)=3.0×10^{-5} *5* α(N)=2.5×10^{-5} *4*; α(O)=4.1×10^{-6} *7*; α(P)=3.1×10^{-7} *7* Mult.: A_2=−0.57 *1*, A_4=+0.02 *1*; α(K)exp=0.0033 *12*.
724.9 *1*	50 *15*	1172.0	(1/2$^+$,3/2$^-$)	447.1	5/2$^+$			
[x]739.1 *2*	65 *15*							Mult.: A_2=+0.08 *2*, A_4=+0.06 *3*; α(K)exp=0.0041 *12*.
753.8 *2*	60 *10*	1535.1		781.3	(7/2)$^+$	D		Mult.: A_2=−0.35 *2*, A_4=+0.05 *3*.

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^{138}Ba(p,2nγ) 1982Ko05 (continued)

γ(^{137}La) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[‡]	Comments
761.97 *15*	12.2×10^2 *10*	762.0	11/2$^+$	0.0	7/2$^+$	E2	0.00353	α(K)=0.00300 *5*; α(L)=0.000416 *6*; α(M)=8.67×10^{-5} *13*; α(N+..)=2.22×10^{-5} *4* α(N)=1.90×10^{-5} *3*; α(O)=3.04×10^{-6} *5*; α(P)=2.18×10^{-7} *3* Mult.: A$_2$=+0.19 *1*, A$_4$=−0.01 *1*; α(K)exp=0.0031 *10*.
770.74 *15*	380 *40*	781.3	(7/2)$^+$	10.6	5/2$^+$	M1+E2	0.0042 *8*	α(K)=0.0036 *7*; α(L)=0.00048 *8*; α(M)=9.9×10^{-5} *15*; α(N+..)=2.5×10^{-5} *4* α(N)=2.2×10^{-5} *4*; α(O)=3.5×10^{-6} *6*; α(P)=2.7×10^{-7} *6* Mult.: A$_2$=−0.32 *2*, A$_4$=+0.0.03 *2*; α(K)exp=0.0032 *10*.
781.3 *2*	190 *20*	781.3	(7/2)$^+$	0.0	7/2$^+$			
781.7 *2*	360 *40*	1786.3	15/2$^-$	1004.6	11/2$^-$	E2	0.00332	α(K)=0.00283 *4*; α(L)=0.000390 *6*; α(M)=8.12×10^{-5} *12*; α(N+..)=2.08×10^{-5} *3* α(N)=1.778×10^{-5} *25*; α(O)=2.85×10^{-6} *4*; α(P)=2.06×10^{-7} *3* Mult.: A$_2$=+0.03 *1*, A$_4$=+0.01 *1*; α(K)exp=0.0033 *10*.
796.4 *2*	40 *6*	1801.1		1004.6	11/2$^-$			
824.7 *2*	15.7×10^2 *20*	835.3	9/2$^+$	10.6	5/2$^+$	E2	0.00293	α(K)=0.00250 *4*; α(L)=0.000342 *5*; α(M)=7.11×10^{-5} *10*; α(N+..)=1.83×10^{-5} *3* α(N)=1.557×10^{-5} *22*; α(O)=2.50×10^{-6} *4*; α(P)=1.82×10^{-7} *3* Mult.: A$_2$=+0.19 *1*, A$_4$=−0.01 *1*; α(K)exp=0.0023 *8*.
835.3 *2*	430 *50*	835.3	9/2$^+$	0.0	7/2$^+$	M1+E2	0.0035 *7*	α(K)=0.0030 *6*; α(L)=0.00039 *6*; α(M)=8.1×10^{-5} *13*; α(N+..)=2.1×10^{-5} *4* α(N)=1.8×10^{-5} *3*; α(O)=2.9×10^{-6} *5*; α(P)=2.2×10^{-7} *5* Mult.: A$_2$=−0.22 *1*, A$_4$=+0.04 *1*; α(K)exp=0.0018 *6*.
867.1 *2*	90 *20*	1314.2		447.1	5/2$^+$	Q		Mult.: A$_2$=+0.17 *7*, A$_4$=−0.08 *10*.
871.9 *2*	75 *10*	1365.0		493.1	(3/2)$^+$			
[x]883.6 *2*	50 *10*							
887.7 *2*	160 *20*	1723.0	13/2$^+$	835.3	9/2$^+$	E2	0.00248	α(K)=0.00212 *3*; α(L)=0.000286 *4*; α(M)=5.95×10^{-5} *9*; α(N+..)=1.528×10^{-5} *22* α(N)=1.303×10^{-5} *19*; α(O)=2.10×10^{-6} *3*; α(P)=1.549×10^{-7} *22* Mult.: A$_2$=+0.40 *5*, A$_4$=−0.03 *7*; α(K)exp(887.7γ+889.8γ)=0.0021 *6*.
889.8 *2*	110 *20*	1894.4		1004.6	11/2$^-$			Mult.: A$_2$=+0.13 *4*, A$_4$≈+0.00; α(K)exp(889.8γ+887.7γ)=0.0021 *6*.
906.7 *2*	80 *20*	917.4	9/2$^+$	10.6	5/2$^+$	Q		Mult.: A$_2$=+0.12 *2*, A$_4$=−0.04 *3*.
915.8 *3*	170 *20*	926.5	5/2$^+$	10.6	5/2$^+$			
917.4 *3*	480 *30*	917.4	9/2$^+$	0.0	7/2$^+$	M1+E2	0.0028 *5*	α(K)=0.0024 *5*; α(L)=0.00031 *5*; α(M)=6.5×10^{-5} *10*; α(N+..)=1.7×10^{-5}

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^{138}Ba(p,2nγ) 1982Ko05 (continued)

$\gamma(^{137}La)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[‡]	Comments
								3 α(N)=1.42×10^{-5} *22*; α(O)=2.3×10^{-6} *4*; α(P)=1.8×10^{-7} *4* Mult.: A_2=−0.22 *1*, A_4=+0.01 *1*; α(K)exp=0.0013 *5*.
926.5 *2*	130 *20*	926.5	5/2$^+$	0.0	7/2$^+$	M1+E2	0.0027 *5*	α(K)=0.0024 *5*; α(L)=0.00031 *5*; α(M)=6.3×10^{-5} *10*; α(N+..)=1.6×10^{-5} *3* α(N)=1.39×10^{-5} *22*; α(O)=2.3×10^{-6} *4*; α(P)=1.8×10^{-7} *4* Mult.: A_2=−0.21 *3*, A_4=−0.16 *4*.
[x]934.9 *2*	65 *15*							
[x]951.0 *2*	35 *10*							
957.5 *2*	90 *15*	1962.1		1004.6	11/2$^-$			
961.0 *2*	84 *15*	1723.0	13/2$^+$	762.0	11/2$^+$	D		Mult.: A_2=−0.45 *9*, A_4≈+0.00.
968.7 *2*	80 *15*	1973.3		1004.6	11/2$^-$			
[x]989.7 *2*	55 *5*					D		Mult.: A_2=−0.34 *6*, A_4≈+0.00.
994.0 *2*	5 *2*	1004.6	11/2$^-$	10.6	5/2$^+$	[E3]	0.00410	α(K)=0.00345 *5*; α(L)=0.000518 *8*; α(M)=0.0001087 *16*; α(N+..)=2.78×10^{-5} *4* α(N)=2.38×10^{-5} *4*; α(O)=3.79×10^{-6} *6*; α(P)=2.61×10^{-7} *4* Additional information 2.
1004.6 *2*	48 *5*	1004.6	11/2$^-$	0.0	7/2$^+$	M2	0.00661	α(K)=0.00565 *8*; α(L)=0.000757 *11*; α(M)=0.0001575 *22*; α(N+..)=4.08×10^{-5} *6* α(N)=3.47×10^{-5} *5*; α(O)=5.65×10^{-6} *8*; α(P)=4.46×10^{-7} *7* Mult.: A_2=+0.15 *7*, A_4=+0.07 *10*; α(K)exp=0.0061 *12*.
1028.9 *2*	200 *20*	1790.9	15/2$^+$	762.0	11/2$^+$	E2	0.00180	α(K)=0.001541 *22*; α(L)=0.000204 *3*; α(M)=4.22×10^{-5} *6*; α(N+..)=1.086×10^{-5} *16* α(N)=9.25×10^{-6} *13*; α(O)=1.496×10^{-6} *21*; α(P)=1.129×10^{-7} *16* Mult.: A_2=+0.19 *3*, A_4=+0.02 *4*; α(K)exp=0.0013 *5*.
[x]1038.8 *2*	130 *20*					(M1)	0.00247	α(K)=0.00213 *3*; α(L)=0.000270 *4*; α(M)=5.57×10^{-5} *8*; α(N+..)=1.442×10^{-5} *21* α(N)=1.226×10^{-5} *18*; α(O)=2.00×10^{-6} *3*; α(P)=1.610×10^{-7} *23* Mult.: α(K)exp=0.0025 *8*.
[x]1064.9 *2*	90 *20*							
1161.4 *2*	100 *20*	1172.0	(1/2$^+$,3/2$^-$)	10.6	5/2$^+$			
[x]1178.5 *2*	45 *15*							
[x]1312.7 *2*	110 *20*							
[x]1387.9 *2*	50 *15*							
[x]1473.9 *2*	95 *20*							Mult.: A_2=+0.15 *2*, A_4=+0.05 *3*.

[†] α(K)exp were normalized to α(K)(662γ,M4 in ^{137}Ba).

[‡] 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.

[x] γ ray not placed in level scheme.

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Level Scheme

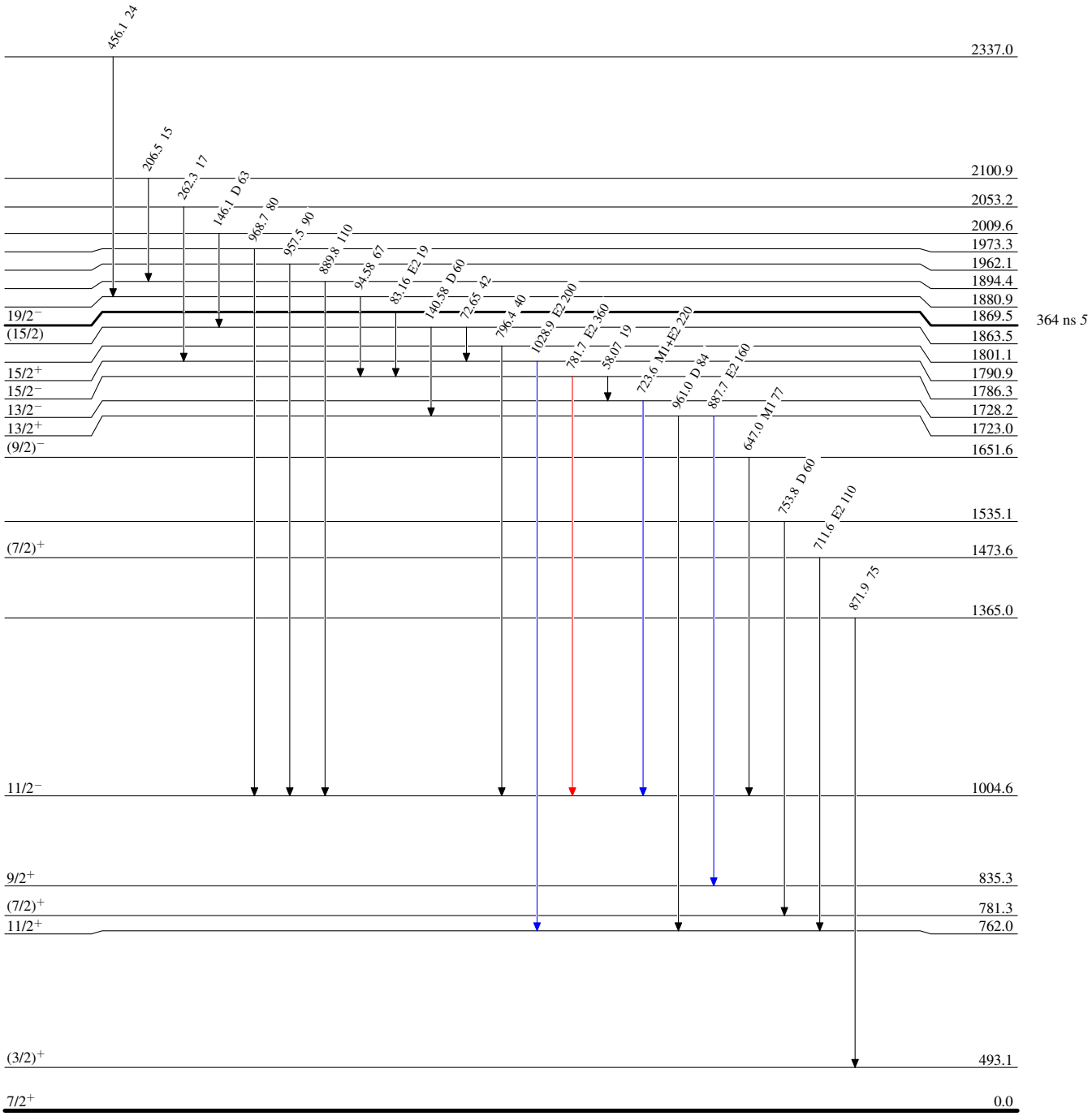
Intensities: Relative I_γ

Legend

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

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

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



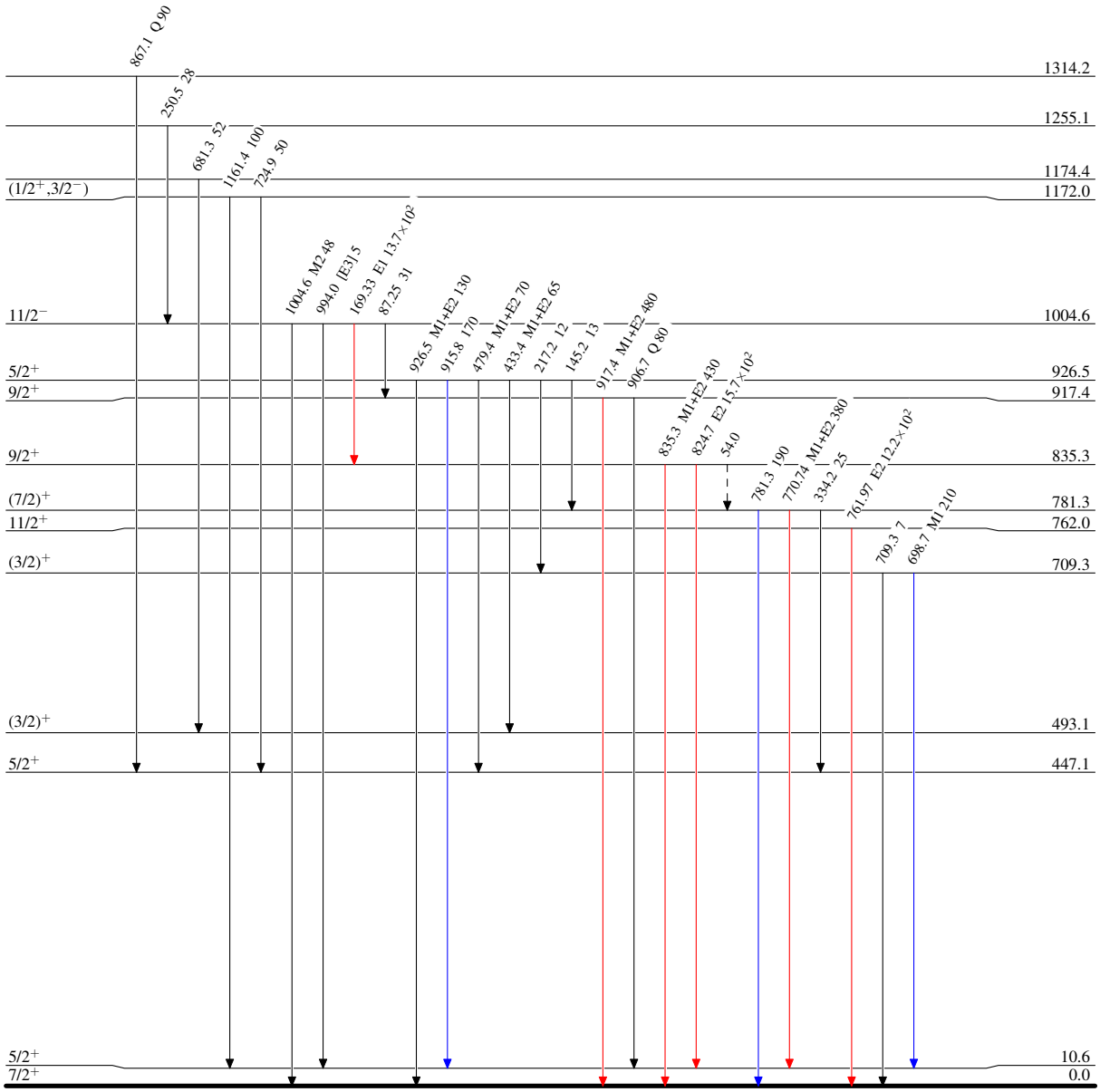
$^{137}_{57}La_{80}$

^{138}Ba(p,2nγ) 1982Ko05

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)



$^{137}_{57}La_{80}$

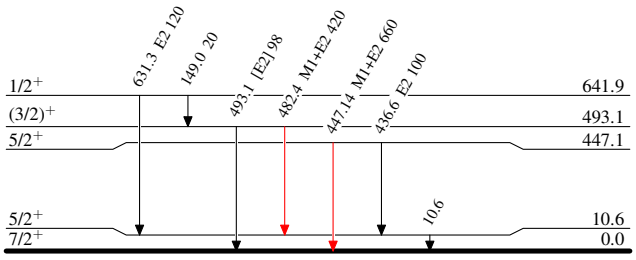
^{138}Ba(p,2nγ) 1982Ko05

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)



$^{137}_{57}La_{80}$