$^{120}Sn(^{12}C,3n\gamma),^{116}Cd(^{18}O,5n\gamma)$ 1992By03,1978Gi04,2013Ka27

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Janos Timar and Zoltan Elekes, Balraj Singh	NDS 121, 143 (2014)	31-May-2014

1992By03 (also 1990Sc21): $^{120}Sn(^{12}C,3n\gamma)$, E=46-56 MeV, $^{116}Cd(^{18}O,5n\gamma)$ E=82,86 MeV; Ge γ, $\gamma\gamma$-coin, $\gamma(\theta)$, γ(t), $T_{1/2}$.

1978Gi04, 1977Gi02: $^{120}Sn(^{12}C,3n\gamma)$ E=45-54 MeV; Ge γ, linear polarization, excitation function, $\gamma\gamma$, $\gamma\gamma$(t), $\gamma(\theta)$, half-lives.

2000St07: $^{116}Cd(^{18}O,5n\gamma)$ E=76 MeV; Ge γ, $\gamma\gamma$-coin, recoil distance technique, differential decay curve method, $T_{1/2}$.

2013Ka27: $^{120}Sn(^{12}C,3n\gamma)$,E=52 MeV pulsed beam from 15UD Pelletron accelerator at IUAC, measured lifetimes and g factors of 182, 9/2$^-$ and 2463, 23/2$^+$ isomers by TDPAD method. Target=500 $\mu g/cm^2$ ^{120}Sn evaporated on 1 mg/cm^2 iron foil backed by tantalum foil. The internal magnetic field at Ba in iron was calibrated with respect to the g factor=−0.159 *5* (1996Da02) for 3116, 10$^+$ isomeric state in ^{132}Ba.

A_2 and A_4 values are from 1977Gi02; when only A_2 is given, it is from 1992By03. DCO values are from 1992By02. Polarization coefficients are from 1978Gi04.

^{129}Ba Levels

E(level)[†]	J^{π}[‡]	$T_{1/2}$[#]	Comments
0.0[l]	1/2$^+$	2.23[@] h *11*	
8.4[h] *2*	7/2$^+$	2.135[@] h *10*	
110.6[m] *2*	3/2$^+$		
182.04[a] *11*	9/2$^-$	15.2 ns *10*	g=−0.192 *6* (2013Ka27) $T_{1/2}$: from γ(t). Weighted average of 15 ns *1* (2013Ka27) and 16 ns *2* (1992By03). g: TDPAD method (2013Ka27).
263.1 *1*	9/2$^+$		
278.81[&] *12*	11/2$^-$		
318.4[l] *1*	(5/2$^+$)		
467.3[m] *1*	7/2$^+$		
544.74[h] *10*	11/2$^+$	10.6 ps *3*	
643.6[a] *1*	13/2$^-$		
797.4[&] *1*	15/2$^-$	6.5 ps *2*	
806.84[l] *20*	(9/2$^+$)		
864.1[i] *1*	13/2$^+$		
883.43[e] *13*	13/2$^-$		
999.1[m] *1*	11/2$^+$		
1210.0[d] *1*	15/2$^-$		
1210.5[h] *2*	15/2$^+$	1.68 ps *5*	
1318.4[a] *1*	17/2$^-$		
1438.4[l] *3*	(13/2$^+$)		
1475.4[&] *1*	19/2$^-$	1.0 ps *4*	
1545.3[e] *2*	(17/2$^-$)		
1590.2[i] *2*	17/2$^+$		
1654.6[m] *2*	15/2$^+$		
1845.0[d] *2*	19/2$^-$		
1989.9[h] *1*	19/2$^+$	0.82 ps *10*	
2146.3[a] *2*	21/2$^-$		
2171.4[l] *4*	(17/2$^+$)		
2281.2[&] *2*	23/2$^-$		
2336.7[e] *2*	21/2$^-$		
2340.2[m] *3*	19/2$^+$		
2387.4 *4*			
2412.9[i] *2*	21/2$^+$		
2429.7 *3*	19/2$^+$		

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$^{120}Sn(^{12}C,3n\gamma),^{116}Cd(^{18}O,5n\gamma)$ 1992By03,1978Gi04,2013Ka27 (continued)

^{129}Ba Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	Comments
2462.6[f] 2	23/2+	47 ns 1	g=−0.233 7 (2013Ka27) $T_{1/2}$: from γ(t). Weighted average of 47 ns 1 (2013Ka27) and 47 ns 2 (1992By03). g: TDPAD method (2013Ka27).
2509.9 3	(19/2+)		
2599.6[d] 2	23/2−		
2653.7 2	(21/2+)		
2674.7 2	21/2+		
2742.6 3			
2815.5[h] 2	23/2+		
2874.0 2	23/2+		
2903.1[m] 4	(23/2+)		
2913.7[g] 2	25/2+		
3044.2 3			
3079.1[k] 2	(25/2+)	1.2 ps 3	
3094.2[a] 2	25/2−		
3179.4[&] 2	27/2−		
3368.2[j] 2	(27/2+)		
3378.9[f] 2	27/2+		
3430.6[d] 2	(27/2−)		
3525.3 4			
3687.5 2	(27/2−)		
3704.5 2	(31/2−)		
3741.8[k] 2	(29/2+)		
3848.5 3			
3852.8 5			
3895.9[g] 2	29/2+		
3948.1[a] 2	(29/2−)		
4054.4[j] 2	(31/2+)		
4137.6[&] 2	31/2−		
4286.1[b] 2	(31/2−)		
4320.2 2	(31/2+)		
4333.6 3			
4351.4 3	(31/2−)		
4458.7[f] 3	(31/2+)		
4502.8[k] 2	(33/2+)		
4617.1[c] 2	(33/2−)		
4663.9 3			
4871.5[j] 2	(35/2+)		
4951.1[g] 6	(33/2+)		
5047.4[b] 2	(35/2−)		
5152.0[&] 4	(35/2−)		
5379.6[k] 3	(37/2+)		
5469.3[c] 3	(37/2−)		
5807.6[j] 3	(39/2+)		
5975.6[b] 3	39/2−		
6223.8[&] 6	(39/2−)		
6352.1[k] 4	(41/2+)		
6450.7[c] 3	41/2−		
6843.6[j] 4	(43/2+)		
6975.3[b] 4	(43/2−)		

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$^{120}Sn(^{12}C,3n\gamma),^{116}Cd(^{18}O,5n\gamma)$ 1992By03,1978Gi04,2013Ka27 (continued)

^{129}Ba Levels (continued)

E(level)†	Jπ‡
7434.0[k] 5	(45/2+)
7501.9[c] 6	(45/2−)
7964.1[j] 5	(47/2+)
9144.2[j] 7	(51/2+)
10388.3[j] 13	(55/2+)

† From least-squares fit to Eγ data from 1992By03.

‡ Band structures are constructed from the experimental results obtained by using standard in-beam techniques upon a few levels with known Jπ, and also interpreted on the basis of cranked-shell model and TRS analyses (1977Gi02,1978Gi04,1992By03).

From recoil distance (RDDS) technique (2000St07), unless otherwise stated.

@ From Adopted Levels.

& Band(A): ν9/2[514],α=−1/2.

[a] Band(B): ν9/2[514],α=+1/2.

[b] Band(c): ν9/2[514]⊗$\pi h^2_{11/2}$,α=−1/2.

[c] Band(b): ν9/2[514]⊗$\pi h^2_{11/2}$,α=+1/2.

[d] Band(C): Yrare $\nu h_{11/2}$ band,α=−1/2.

[e] Band(D): Yrare $\nu h_{11/2}$ band,α=+1/2.

[f] Band(E): ν7/2[404]⊗ν9/2[514]⊗ν7/2[523],α=−1/2.

[g] Band(F): ν7/2[404]⊗ν9/2[514]⊗ν7/2[523],α=+1/2.

[h] Band(G): ν7/2[404],α=−1/2.

[i] Band(H): ν7/2[404],α=+1/2.

[j] Band(g): ν7/2[404]⊗$\pi h^2_{11/2}$,α=−1/2.

[k] Band(h): ν7/2[404]⊗$\pi h^2_{11/2}$,α=+1/2.

[l] Band(I): ν(1/2[411]+1/2[400]),α=−1/2. Admixture of 1/2[411] and 1/2[400] neutron configurations.

[m] Band(J): ν(1/2[411]+1/2[400]),α=+1/2. Admixture of 1/2[411] and 1/2[400] neutron configurations.

γ(^{129}Ba)

Eγ†	Iγ†	Ei(level)	J^π_i	Ef	J^π_f	Mult.‡	α@	Comments
96.8 1	36.6 25	278.81	11/2−	182.04	9/2−	M1+E2#	1.6 6	α(K)=1.13 21; α(L)=0.4 3; α(M)=0.08 6 α(N)=0.017 12; α(O)=0.0024 16; α(P)=6.12×10^{-5} 9 A_2=−0.67 10; DCO=0.44 2 A_2=−0.48 3; A_4=+0.02 5 Mult.: large negative A_2 in γ(θ) data suggests significant quadrupole admixture, favoring M1+E2 over E1+M2.
110.6 2	14.0 25	110.6	3/2+	0.0	1/2+	(M1)	0.741	α(K)=0.634 10; α(L)=0.0851 13; α(M)=0.0176 3; α(N)=0.00379 6; α(O)=0.000579 9 A_2=−0.18 14; DCO=0.64 8
126.0 1	5.3 7	2462.6	23/2+	2336.7	21/2−	(E1)	0.1196	α(K)=0.1025 15; α(L)=0.01368 20; α(M)=0.00280 4 α(N)=0.000597 9; α(O)=8.83×10^{-5} 13; α(P)=5.49×10^{-6} 8 A_2=−0.03 41; DCO=0.74 9
x131.4 4	14 5							
x132.1 3	3 1							
149.0 2	1.3 3	467.3	7/2+	318.4	(5/2+)	[M1+E2]	0.40 8	α(K)=0.31 4; α(L)=0.07 4; α(M)=0.015 7

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^{120}Sn(^{12}C,3nγ),^{116}Cd(^{18}O,5nγ) 1992By03,1978Gi04,2013Ka27 (continued)

γ(^{129}Ba) (continued)

E_γ†	I_γ†	E_i(level)	J^π_i	E_f	J^π_f	Mult.‡	α@	Comments
								α(N)=0.0031 *15*; α(O)=0.00043 *19*; α(P)=1.77×10^{-5} *5* A_2=−0.05 *9*
153.8 *1*	7.4 *4*	797.4	15/2$^-$	643.6	13/2$^-$	M1+E2	0.36 *7*	α(K)=0.28 *3*; α(L)=0.06 *3*; α(M)=0.013 *6* α(N)=0.0027 *13*; α(O)=0.00039 *16*; α(P)=1.61×10^{-5} *5* A_2=−0.50 *10*; DCO=0.48 *1* A_2=−0.46 *5*; A_4=+0.07 *6*
157.0 *1*	5.3 *14*	1475.4	19/2$^-$	1318.4	17/2$^-$	(M1+E2)	0.34 *6*	α(K)=0.27 *3*; α(L)=0.056 *25*; α(M)=0.012 *6* α(N)=0.0025 *12*; α(O)=0.00036 *15*; α(P)=1.52×10^{-5} *5* A_2=−0.12 *17*; DCO=0.55 *16*
^{x}161.2 *4*	7 *3*							
164.9 *3*	1.6 *1*	2674.7	21/2$^+$	2509.9	(19/2$^+$)	(M1+E2)	0.261 *4*	A_2=−0.45 *19*
173.6 *1*	138.8 *10*	182.04	9/2$^-$	8.4	7/2$^+$	E1#	0.0493	α(K)=0.0424 *6*; α(L)=0.00555 *8*; α(M)=0.001137 *16* α(N)=0.000243 *4*; α(O)=3.63×10^{-5} *6*; α(P)=2.35×10^{-6} *4* A_2=−0.19 *3*; DCO=0.63 *2* A_2=−0.210 *13*; A_4=+0.03 *4* POL=+0.25 *6*.
192.4 *3*	0.3 *1*	999.1	11/2$^+$	806.84	(9/2$^+$)	[M1+E2]	0.178 *19*	α(K)=0.144 *8*; α(L)=0.027 *9*; α(M)=0.0057 *20* α(N)=0.0012 *4*; α(O)=0.00017 *5*; α(P)=8.4×10^{-6} *5*
199.3 *1*	5.6 *9*	2874.0	23/2$^+$	2674.7	21/2$^+$	(M1+E2)	0.159 *16*	α(K)=0.129 *6*; α(L)=0.024 *8*; α(M)=0.0050 *17* α(N)=0.0011 *4*; α(O)=0.00015 *5*; α(P)=7.6×10^{-6} *5* A_2=−0.37 *26*; DCO=0.47 *4*
205.1 *1*	16.3 *19*	3079.1	(25/2$^+$)	2874.0	23/2$^+$	(M1+E2)	0.146 *13*	α(K)=0.119 *5*; α(L)=0.021 *7*; α(M)=0.0045 *14* α(N)=0.0010 *3*; α(O)=0.00014 *4*; α(P)=7.0×10^{-6} *5* A_2=−0.46 *12*; DCO=0.51 *4*
^{x}205.6 *3*	2 *1*							
207.5 *3*	0.8 *4*	318.4	(5/2$^+$)	110.6	3/2$^+$	[M1+E2]	0.141 *12*	α(K)=0.115 *5*; α(L)=0.021 *6*; α(M)=0.0043 *14* α(N)=0.0009 *3*; α(O)=0.00013 *4*; α(P)=6.8×10^{-6} *5* A_2=−0.27 *41*
216.5 *3*	0.2 *1*	1654.6	15/2$^+$	1438.4	(13/2$^+$)	[M1+E2]	0.124 *9*	α(K)=0.101 *3*; α(L)=0.018 *5*; α(M)=0.0037 *11* α(N)=0.00079 *22*; α(O)=0.00012 *3*; α(P)=6.0×10^{-6} *5*
243.5 *2*	7.7 *4*	3948.1	(29/2$^-$)	3704.5	(31/2$^-$)	(M1+E2)	0.087 *3*	α(K)=0.0716 *12*; α(L)=0.0119 *25*; α(M)=0.0025 *6* α(N)=0.00053 *11*; α(O)=7.8×10^{-5} *13*; α(P)=4.3×10^{-6} *5* A_2=−0.30 *12*; DCO=0.37 *11*
245.1 *3*	3.1 *7*	2674.7	21/2$^+$	2429.7	19/2$^+$	(M1+E2)	0.085 *3*	α(K)=0.0702 *13*; α(L)=0.0117 *24*; α(M)=0.0024 *6* α(N)=0.00052 *11*; α(O)=7.6×10^{-5} *13*;

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^{120}Sn(^{12}C,3nγ),^{116}Cd(^{18}O,5nγ) 1992By03,1978Gi04,2013Ka27 (continued)

γ(^{129}Ba) (continued)

E_γ†	I_γ†	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	α@	Comments
								α(P)=4.2×10^{-6} 5 A_2=−0.34 28; DCO=0.39 22
254.7 1	43.0 24	263.1	9/2$^+$	8.4	7/2$^+$	M1+E2	0.0757 15	α(K)=0.0628 16; α(L)=0.0103 19; α(M)=0.0022 5 α(N)=0.00046 9; α(O)=6.7×10^{-5} 10; α(P)=3.8×10^{-6} 4 A_2=−0.76 7; DCO=0.42 4 A_2=−0.65 2; A_4=+0.16 4 POL=+0.208 29.
258.0 5	0.5 2	2429.7	19/2$^+$	2171.4	(17/2$^+$)			
260.6 1	13.2 6	3948.1	(29/2$^-$)	3687.5	(27/2$^-$)	(M1+E2)	0.0707 11	α(K)=0.0587 18; α(L)=0.0095 16; α(M)=0.0020 4 α(N)=0.00043 8; α(O)=6.2×10^{-5} 9; α(P)=3.6×10^{-6} 4 A_2=−0.49 12; DCO=0.51 8
263.5 1	21.0 20	3079.1	(25/2$^+$)	2815.5	23/2$^+$	(M1+E2)	0.0685	α(K)=0.0569 19; α(L)=0.0092 15; α(M)=0.0019 4 α(N)=0.00041 7; α(O)=6.0×10^{-5} 8; α(P)=3.4×10^{-6} 4 A_2=−0.56 7; DCO=0.49 4
^{x}272.8 3	7 4							
281.7 1	16.0 20	544.74	11/2$^+$	263.1	9/2$^+$	(M1+E2)#	0.0562 13	α(K)=0.0469 23; α(L)=0.0074 10; α(M)=0.00155 23 α(N)=0.00033 5; α(O)=4.9×10^{-5} 5; α(P)=2.9×10^{-6} 4 A_2=−0.73 18; DCO=0.36 5 A_2=−0.61 3; A_4=+0.32 10
289.1 1	40.0 22	3368.2	(27/2$^+$)	3079.1	(25/2$^+$)	(M1+E2)	0.0521 15	α(K)=0.0436 24; α(L)=0.0068 9; α(M)=0.00142 19 α(N)=0.00030 4; α(O)=4.5×10^{-5} 4; α(P)=2.7×10^{-6} 4 A_2=−0.52 10; DCO=0.50 3
301.6 2	1.2 4	3044.2		2742.6		D		A_2=−0.83
312.6 1	20.0 26	4054.4	(31/2$^+$)	3741.8	(29/2$^+$)	(M1+E2)	0.0416 21	α(K)=0.035 3; α(L)=0.0053 5; α(M)=0.00111 11 α(N)=0.000237 21; α(O)=3.52×10^{-5} 20; α(P)=2.1×10^{-6} 3 A_2=−0.52 7; DCO=0.45 9
316.3 1	1.8 4	2462.6	23/2$^+$	2146.3	21/2$^-$	[E1]	0.00995 14	α=0.00995 14; α(K)=0.00858 12; α(L)=0.001096 16; α(M)=0.000225 4 α(N)=4.82×10^{-5} 7; α(O)=7.28×10^{-6} 11; α(P)=5.02×10^{-7} 7 A_2=−0.40 41
318.3 2	6.7 9	318.4	(5/2$^+$)	0.0	1/2$^+$	[E2]	0.0375	α(K)=0.0306 5; α(L)=0.00542 8; α(M)=0.001141 17 α(N)=0.000242 4; α(O)=3.49×10^{-5} 5; α(P)=1.753×10^{-6} 25
319.4 1	4.1 11	864.1	13/2$^+$	544.74	11/2$^+$	(M1+E2)	0.0391 22	α(K)=0.033 3; α(L)=0.0050 4; α(M)=0.00104 9 α(N)=0.000222 18; α(O)=3.30×10^{-5} 16; α(P)=2.0×10^{-6} 3 A_2=−0.92 39; DCO=0.34 6
327.5 3	3.0 10	3852.8		3525.3				

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^{120}Sn(^{12}C,3nγ),^{116}Cd(^{18}O,5nγ) 1992By03,1978Gi04,2013Ka27 (continued)

γ(^{129}Ba) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	α[@]	Comments
330.4 *3*	0.4 *2*	4663.9		4333.6				
331.0 *1*	22.3 *12*	4617.1	(33/2$^-$)	4286.1	(31/2$^-$)	(M1+E2)	0.0353 *23*	α(K)=0.030 *3*; α(L)=0.0045 *3*; α(M)=0.00093 *7* α(N)=0.000199 *13*; α(O)=2.96×10^{-5} *11*; α(P)=1.8×10^{-6} *3* A_2=−0.78 *31*; DCO=0.45 *6*
334.5 *3*	0.9 *4*	2674.7	21/2$^+$	2340.2	19/2$^+$	(M1+E2)	0.0343 *23*	α(K)=0.029 *3*; α(L)=0.00432 *25*; α(M)=0.00090 *6* α(N)=0.000193 *12*; α(O)=2.87×10^{-5} *9*; α(P)=1.8×10^{-6} *3* A_2=−0.09 *25*; DCO=0.37 *22*
335.7 *3*	1.1 *2*	1545.3	(17/2$^-$)	1210.0	15/2$^-$	(M1+E2)	0.0340 *23*	α(K)=0.029 *3*; α(L)=0.00428 *24*; α(M)=0.00089 *6* α(N)=0.000190 *11*; α(O)=2.84×10^{-5} *9*; α(P)=1.8×10^{-6} *3* A_2=−0.77 *43*
338.1 *1*	18.6 *10*	4286.1	(31/2$^-$)	3948.1	(29/2$^-$)	(M1+E2)	0.0333 *23*	α(K)=0.028 *3*; α(L)=0.00419 *22*; α(M)=0.00087 *6* α(N)=0.000186 *10*; α(O)=2.78×10^{-5} *8*; α(P)=1.7×10^{-6} *3* A_2=−0.04 *30*; DCO=0.45 *5*
340.0 *5*	0.2 *1*	806.84	(9/2$^+$)	467.3	7/2$^+$			
345.9 *3*	2.5 *10*	3525.3		3179.4	27/2$^-$			
346.5 *2*	7.5 *9*	1210.5	15/2$^+$	864.1	13/2$^+$	(M1+E2)	0.0311 *24*	α(K)=0.026 *3*; α(L)=0.00389 *17*; α(M)=0.00081 *5* α(N)=0.000173 *8*; α(O)=2.58×10^{-5} *6*; α(P)=1.62×10^{-6} *25* A_2=−0.84 *13*; DCO=0.35 *6*
356.7 *1*	13.2 *20*	467.3	7/2$^+$	110.6	3/2$^+$	(E2)	0.0263	α(K)=0.0217 *3*; α(L)=0.00366 *6*; α(M)=0.000769 *11* α(N)=0.0001633 *23*; α(O)=2.37×10^{-5} *4*; α(P)=1.261×10^{-6} *18* A_2=+0.32 *47*; DCO=1.05 *14*
362.9 *1*	1.1 *2*	3741.8	(29/2$^+$)	3378.9	27/2$^+$	(M1+E2)	0.0287 *4*	A_2=+0.02 *32*; DCO=0.62 *28*
364.7 *1*	43.3 *17*	643.6	13/2$^-$	278.81	11/2$^-$	M1+E2[#]	0.0269 *24*	α(K)=0.0227 *25*; α(L)=0.00333 *9*; α(M)=0.000692 *23* α(N)=0.000148 *4*; α(O)=2.22×10^{-5} *4*; α(P)=1.41×10^{-6} *23* A_2=−0.68 *11*; DCO=0.36 *5* A_2=−0.70 *3*; A_4=+0.16 *5* POL=+0.07 *7*.
^{x}365.0 *5*	3 *1*							
368.6 *2*	7.5 *19*	4871.5	(35/2$^+$)	4502.8	(33/2$^+$)	(M1+E2)	0.0261 *24*	α(K)=0.0221 *24*; α(L)=0.00323 *7*; α(M)=0.000671 *20* α(N)=0.000144 *4*; α(O)=2.15×10^{-5} *4*; α(P)=1.37×10^{-6} *23* A_2=−0.61 *36*; DCO=0.54 *19*
373.6 *1*	21.0 *31*	3741.8	(29/2$^+$)	3368.2	(27/2$^+$)	(M1+E2)	0.0252 *24*	α(K)=0.0213 *24*; α(L)=0.00310 *6*; α(M)=0.000644 *16* α(N)=0.000138 *3*; α(O)=2.06×10^{-5} *4*; α(P)=1.32×10^{-6} *22* A_2=−0.35 *9*; DCO=0.48 *11*
379.8 *3*	3.7 *24*	1590.2	17/2$^+$	1210.5	15/2$^+$	[M1+E2]	0.0241 *23*	α(K)=0.0203 *24*; α(L)=0.00295 *5*; α(M)=0.000613 *13*

Continued on next page (footnotes at end of table)

^{120}Sn(^{12}C,3nγ),^{116}Cd(^{18}O,5nγ) 1992By03,1978Gi04,2013Ka27 (continued)

γ(^{129}Ba) (continued)

Eγ†	Iγ†	Ei(level)	J^π_i	Ef	J^π_f	Mult.‡	α@	Comments
								α(N)=0.0001314 21; α(O)=1.97×10^{-5} 5; α(P)=1.26×10^{-6} 21
x392.2 3	15 5							
400.0 3	5.0 11	1989.9	19/2+	1590.2	17/2+	[M1+E2]	0.0209 23	A$_2$=+0.07 11
402.7 3	3.2 6	2815.5	23/2+	2412.9	21/2+	(M1+E2)	0.0205 23	A$_2$=−1.1 11
412.6 1	2.9 6	1210.0	15/2−	797.4	15/2−	D		A$_2$=+0.13 56; DCO=0.54 10
421.9 1	7.2 7	5469.3	(37/2−)	5047.4	(35/2−)	(M1+E2)		A$_2$=−0.52 18; DCO=0.37 9
423.2 2	2.0 8	2412.9	21/2+	1989.9	19/2+	D		A$_2$=−0.56 53
424.4 2	0.6 3	4320.2	(31/2+)	3895.9	29/2+			
425.4 3	2.7 7	3079.1	(25/2+)	2653.7	(21/2+)	E2		A$_2$=−0.25 37; DCO=1.05 29
428.0 3	3.2 11	5807.6	(39/2+)	5379.6	(37/2+)	(M1+E2)		A$_2$=−0.64 37
430.2 1	12.3 9	5047.4	(35/2−)	4617.1	(33/2−)	(M1+E2)		A$_2$=−0.76 16; DCO=0.43 8
448.4 1	12.7 21	4502.8	(33/2+)	4054.4	(31/2+)	D		A$_2$=−0.17 10; DCO=0.44 11
451.0 2	10.4 10	2913.7	25/2+	2462.6	23/2+	(M1+E2)	0.0151 20	A$_2$=−0.67 11; DCO=0.37 5
453.6 2	2.9 5	2599.6	23/2−	2146.3	21/2−	(M1+E2)	0.0149 20	A$_2$=−1.1 4; DCO=0.60 29
454.4 1	2.5 4	3368.2	(27/2+)	2913.7	25/2+	(M1+E2)	0.0148 20	DCO=0.30 9
461.6 1	11.0 5	643.6	13/2−	182.04	9/2−	E2#	0.01232	A$_2$=+0.19 14; DCO=0.84 23 A$_2$=+0.22 2; A$_4$=+0.08 5 POL=+0.44 17.
465.5 3	5.1 6	3378.9	27/2+	2913.7	25/2+	(M1+E2)	0.0139 19	A$_2$=−0.91 18; DCO=0.39 8
471.5 3	1.9 10	4320.2	(31/2+)	3848.5				
472.8 1	15.9 11	2462.6	23/2+	1989.9	19/2+	(E2)	0.01151	A$_2$=+0.16 8; DCO=0.89 7 A$_2$=+0.03 1; A$_4$=−0.01 2
475.1 3	1.7 5	6450.7	41/2−	5975.6	39/2−			
480.3 3	8.8 10	3848.5		3368.2	(27/2+)			
485.1 3	3.0 10	4333.6		3848.5				
488.7 3	5.1 10	806.84	(9/2+)	318.4	(5/2+)	(E2)		A$_2$=+0.52 10
491.6 3	0.6 3	6843.6	(43/2+)	6352.1	(41/2+)			
492.3 3	4.0 6	2336.7	21/2−	1845.0	19/2−			
506.3 2	5.0 17	5975.6	39/2−	5469.3	(37/2−)	D		DCO=0.37 15
508.2& 2	4.7& 7	3687.5	(27/2−)	3179.4	27/2−	(D)		DCO=0.95 20
508.2& 2	4.3& 6	5379.6	(37/2+)	4871.5	(35/2+)	D		DCO=0.53 14
x513.8 3	2 1							
517.0 1	2.1 4	3895.9	29/2+	3378.9	27/2+	D		DCO=0.45 23
518.6 1	100.0 20	797.4	15/2−	278.81	11/2−	E2#		A$_2$=+0.23 4; DCO=1.03 5 A$_2$=+0.170 8; A$_4$=−0.07 2 POL=+0.300 26.
521.0 1	17.4 17	1318.4	17/2−	797.4	15/2−	(M1+E2)#	0.0103 16	A$_2$=−0.90 9; DCO=0.32 13 A$_2$=−0.45 4; A$_4$=−0.04 4
524.6 3	1.6 8	6975.3	(43/2−)	6450.7	41/2−			
525.1 2	2.4 5	3704.5	(31/2−)	3179.4	27/2−	(Q)		A$_2$=−0.33 26; DCO=0.98 35
526.6 1	11.7 11	1845.0	19/2−	1318.4	17/2−	(M1+E2)#	0.0101 16	A$_2$=−0.97 16; DCO=0.40 10 A$_2$=−0.70 6; A$_4$=+0.10 7
530.0 3	0.2 1	7964.1	(47/2+)	7434.0	(45/2+)			
531.7 1	11.6 22	999.1	11/2+	467.3	7/2+	(E2)		A$_2$=−0.02 16; DCO=0.95 21
536.3 1	57.1 17	544.74	11/2+	8.4	7/2+	E2#		A$_2$=+0.23 7; DCO=1.03 13 A$_2$=+0.22 1; A$_4$=−0.09 4 POL=+0.36 4.
544.4 3	1.3 8	6352.1	(41/2+)	5807.6	(39/2+)			
552.6 1	1.1 4	3368.2	(27/2+)	2815.5	23/2+			A$_2$=+0.10 7
562.7 2	0.7 2	4458.7	(31/2+)	3895.9	29/2+			
562.9 3	3.0 5	2903.1	(23/2+)	2340.2	19/2+	(Q)		A$_2$=−0.04 15; DCO=0.87 20
566.4 1	19.5 8	1210.0	15/2−	643.6	13/2−	(M1+E2)#		A$_2$=−0.44 5; DCO=0.26 5 A$_2$=−0.47 4; A$_4$=−0.08 4

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$^{120}Sn(^{12}C,3n\gamma),^{116}Cd(^{18}O,5n\gamma)$ 1992By03,1978Gi04,2013Ka27 (continued)

$\gamma(^{129}Ba)$ (continued)

E_γ †	I_γ †	E_i(level)	J^π_i	E_f	J^π_f	Mult.‡	Comments
590.3 3	0.2 1	7434.0	(45/2+)	6843.6	(43/2+)		
598.9 3	2.3 3	4286.1	(31/2−)	3687.5	(27/2−)		
600.7 2	31.0 15	864.1	13/2+	263.1	9/2+	E2#	A_2=+0.33 3; DCO=0.94 9 A_2=+0.14 3; A_4=−0.04 4 POL=+0.36 17.
604.7 1	7.3 9	883.43	13/2−	278.81	11/2−	(M1+E2)#	A_2=+0.09 7; DCO=0.53 11 A_2=+0.13 6; A_4=−0.02 7
609.5 3	3.5 10	4663.9		4054.4	(31/2+)		
631.7 3	4.5 10	1438.4	(13/2+)	806.84	(9/2+)	(Q)	A_2=+0.11 11
634.9 1	12.6 6	1845.0	19/2−	1210.0	15/2−	E2#	A_2=+0.37 11; DCO=1.07 20 A_2=+0.20 2; A_4=−0.08 5 POL=+0.41 16.
643.4 3	1.1 6	3687.5	(27/2−)	3044.2			
655.6 2	11.1 29	1654.6	15/2+	999.1	11/2+	(Q)	A_2=+0.09 9; DCO=0.97
656.9 3	1.2 6	3044.2		2387.4			
660.3 4	1.5 10	3704.5	(31/2−)	3044.2			
661.8 1	15.1 15	1545.3	(17/2−)	883.43	13/2−	Q	A_2=+0.36 11; DCO=1.05 26
662.8 2	10.5 14	3741.8	(29/2+)	3079.1	(25/2+)	(Q)	A_2=+0.27 8; DCO=0.81 19
665.8 1	72.1 36	1210.5	15/2+	544.74	11/2+	E2#	A_2=+0.31 4; DCO=1.00 4 A_2=+0.14 2; A_4=−0.05 5 POL=+0.24 9.
666.4 3	9.3 14	3079.1	(25/2+)	2412.9	21/2+	E2	A_2=+1.5 8; DCO=1.08 13
669.0 2	6.0 7	4617.1	(33/2−)	3948.1	(29/2−)	(Q)	A_2=+0.35 20; DCO=0.93 31
670.8 2	6.4 6	2146.3	21/2−	1475.4	19/2−	(M1+E2)	A_2=−0.62 27; DCO=0.34 9
674.8 1	16.4 8	1318.4	17/2−	643.6	13/2−	E2#	A_2=+0.33 9; DCO=1.34 42 A_2=+0.270 25; A_4=−0.03 4 POL=+0.39 9.
675.5 2	0.8 3	4054.4	(31/2+)	3378.9	27/2+		
678.0 1	79.6 16	1475.4	19/2−	797.4	15/2−	E2#	A_2=+0.26 5; DCO=0.98 8 A_2=+0.24 2; A_4=−0.14 5 POL=+0.30 9.
685.6 2	7.3 8	2340.2	19/2+	1654.6	15/2+	Q	A_2=+0.15 31; DCO=0.96 8
686.2 1	16.5 8	4054.4	(31/2+)	3368.2	(27/2+)	(Q)	A_2=+0.24 6; DCO=0.98 22
701.3 1	12.0 8	883.43	13/2−	182.04	9/2−	E2#	A_2=+0.12 8; DCO=1.06 12 A_2=+0.14 1; A_4=−0.02 3 POL=+0.26 7.
726.1 2	28.9 15	1590.2	17/2+	864.1	13/2+	E2#	A_2=+0.26 5; DCO=1.08 8 A_2=+0.10 2; A_4=−0.04 3 POL=+0.26 13.
733.0 3	1.7 10	2171.4	(17/2+)	1438.4	(13/2+)		
747.8 2	3.0 6	1545.3	(17/2−)	797.4	15/2−	D	A_2=−0.12 10
754.5 1	13.9 6	2599.6	23/2−	1845.0	19/2−	Q	A_2=+0.64 30; DCO=1.19 24
761.2 3	6.3 8	4502.8	(33/2+)	3741.8	(29/2+)	(Q)	A_2=+0.23 12
761.3 3	4.1 5	5047.4	(35/2−)	4286.1	(31/2−)		
x761.8 4	4 1						
768.7 1	4.7 7	3948.1	(29/2−)	3179.4	27/2−	D	A_2=−0.04 7; DCO=0.50 8
775.2 3	1.5 7	2429.7	19/2+	1654.6	15/2+	(Q)	DCO=1.05 38
779.3 1	79.6 35	1989.9	19/2+	1210.5	15/2+	E2#	A_2=+0.23 3; DCO=0.98 4 A_2=+0.22 2; A_4=−0.07 5
791.5 1	8.2 6	2336.7	21/2−	1545.3	(17/2−)	(Q)	A_2=+0.12 7; DCO=0.97 19
805.8 1	57.6 12	2281.2	23/2−	1475.4	19/2−	Q#	A_2=+0.27 9; DCO=1.07 6 A_2=+0.26 9; A_4=−0.04 4
812.9 3	3.9 6	3094.2	25/2−	2281.2	23/2−	D+Q	A_2=−0.08 30; DCO=0.36 10
817.1 1	16.3 8	4871.5	(35/2+)	4054.4	(31/2+)	Q	A_2=+0.31 11; DCO=1.08 19

Continued on next page (footnotes at end of table)

^{120}Sn(^{12}C,3nγ),^{116}Cd(^{18}O,5nγ) 1992By03,1978Gi04,2013Ka27 (continued)

γ(^{129}Ba) (continued)

E_γ †	I_γ †	E_i(level)	J^π_i	E_f	J^π_f	Mult.‡	Comments
822.7 *1*	23.2 *18*	2412.9	21/2+	1590.2	17/2+	E2#	A_2=+0.34 *6*; DCO=0.96 *9* A_2=+0.17 *4*; A_4=−0.11 *10* POL=+0.39 *24*.
825.6 *1*	31.9 *19*	2815.5	23/2+	1989.9	19/2+	E2#	A_2=+0.31 *4*; DCO=1.08 *6* A_2=+0.20 *6*; A_4=+0.11 *10* POL=+0.48 *14*.
827.9 *2*	13.7 *22*	2146.3	21/2−	1318.4	17/2−	(Q)	A_2=+0.25 *12*; DCO=0.95 *23*
830.9 *1*	10.3 *13*	3430.6	(27/2−)	2599.6	23/2−	(Q)	A_2=+0.36 *9*; DCO=0.80 *17*
852.2 *2*	9.2 *8*	5469.3	(37/2−)	4617.1	(33/2−)	Q	A_2=+0.41 *18*; DCO=1.05 *28*
854.0 *4*	4.9 *8*	3948.1	(29/2−)	3094.2	25/2−	(Q)	A_2=+0.59 *35*
855.4 *3*	1.1 *4*	2509.9	(19/2+)	1654.6	15/2+		
855.5 *1*	5.1 *7*	4286.1	(31/2−)	3430.6	(27/2−)	Q	A_2=+0.61 *20*; DCO=1.00 *20*
861.3 *2*	0.5 *3*	2336.7	21/2−	1475.4	19/2−		
876.4 *6*	2.8 *8*	5379.6	(37/2+)	4502.8	(33/2+)		
884.1 *1*	23.7 *11*	2874.0	23/2+	1989.9	19/2+	Q	A_2=+0.30 *6*; DCO=1.04 *10*
898.2 *1*	37.2 *11*	3179.4	27/2−	2281.2	23/2−	Q#	A_2=+0.26 *6*; DCO=1.01 *10* A_2=+0.13 *5*; A_4=+0.04 *10*
905.5 *1*	0.7 *2*	3368.2	(27/2+)	2462.6	23/2+	(Q)	DCO=0.80 *25*
x913.8 *4*	2 *1*						
916.3 *1*	1.8 *4*	3378.9	27/2+	2462.6	23/2+	(Q)	A_2=+0.32 *21*; DCO=0.79 *36*
920.9 *2*	2.3 *4*	4351.4	(31/2−)	3430.6	(27/2−)	Q	A_2=+0.42 *33*; DCO=1.13 *37*
928.1 *5*	2.5 *10*	5975.6	39/2−	5047.4	(35/2−)	(Q)	A_2=+1.1 *3*
935.9 *3*	8.9 *9*	5807.6	(39/2+)	4871.5	(35/2+)	(Q)	A_2=+0.12 *7*
941.2 *2*	1.0 *3*	4320.2	(31/2+)	3378.9	27/2+		
948.1 *2*	8.1 *6*	3094.2	25/2−	2146.3	21/2−	(Q)	A_2=+0.06 *18*; DCO=0.80 *33*
958.2 *1*	19.1 *8*	4137.6	31/2−	3179.4	27/2−	Q	A_2=+0.41 *6*; DCO=0.98 *9*
972.7 *3*	1.8 *7*	6352.1	(41/2+)	5379.6	(37/2+)	(Q)	A_2=+0.76 *26*
981.6 *3*	5.2 *8*	6450.7	41/2−	5469.3	(37/2−)	(Q)	A_2=−0.25 *20*; DCO=1.06 *40*
982.2 *1*	1.3 *2*	3895.9	29/2+	2913.7	25/2+	Q	DCO=1.30 *35*
999.6 *3*	0.9 *4*	6975.3	(43/2−)	5975.6	39/2−		
1014.4 *3*	8.3 *9*	5152.0	(35/2−)	4137.6	31/2−	(Q)	DCO=0.87 *14*
1035.6 *7*	7.6 *15*	6843.6	(43/2+)	5807.6	(39/2+)		A_2=−0.06 *9*
x1048.5 *4*	16 *4*						
1051.1 *5*	1.8 *7*	7501.9	(45/2−)	6450.7	41/2−		A_2=+0.05 *6*
1055.2 *5*	0.4 *2*	4951.1	(33/2+)	3895.9	29/2+		
1063.5 *2*	4.2 *6*	2653.7	(21/2+)	1590.2	17/2+	Q	A_2=+1.0 *3*; DCO=1.02 *17*
1069.7 *7*	2.1 *8*	2387.4		1318.4	17/2−		
1071.8 *4*	2.6 *6*	6223.8	(39/2−)	5152.0	(35/2−)	(Q)	A_2=+0.52 *25*; DCO=0.86 *33*
x1075.2 *4*	8 *3*						
1080.1 *3*	≤0.8	4458.7	(31/2+)	3378.9	27/2+		
1082.1 *5*	1.1 *5*	7434.0	(45/2+)	6352.1	(41/2+)		
1084.5 *2*	1.8 *5*	2674.7	21/2+	1590.2	17/2+	(Q)	DCO=1.00 *27*
x1110.3 *5*	20 *8*						
1120.7 *5*	4.1 *15*	7964.1	(47/2+)	6843.6	(43/2+)		
1124.3 *3*	2.5 *3*	2599.6	23/2−	1475.4	19/2−	(Q)	A_2=+0.15 *21*; DCO=0.95 *29*
1149.4 *3*	3.0 *4*	3430.6	(27/2−)	2281.2	23/2−	(Q)	DCO=1.31 *56*
1171.7 *5*	2.6 *9*	4351.4	(31/2−)	3179.4	27/2−		A_2=+0.12 *11*
1180.1 *5*	2.5 *9*	9144.2	(51/2+)	7964.1	(47/2+)		
1244.1 *10*	1.6 *8*	10388.3	(55/2+)	9144.2	(51/2+)		
1406.7 *3*	2.2 *5*	3687.5	(27/2−)	2281.2	23/2−	(Q)	A_2=−0.11 *7*; DCO=0.85 *30*
1424.2 *5*	1.2 *6*	2742.6		1318.4	17/2−		

† From 1992By03.

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^{120}Sn(^{12}C,3nγ),^{116}Cd(^{18}O,5nγ) 1992By03,1978Gi04,2013Ka27 (continued)

γ(^{129}Ba) (continued)

‡ From $\gamma(\theta)$, DCO and linear polarization data. All DCO values are from 1992By03 and POL values from 1978Gi04. When only one A_2 value is listed, it is from 1992By03. When A_2 and A_4 are listed together, these are from 1977Gi02. The γ rays with DCO≈1 and $A_2 \geq +0.2$ are expected to be stretched quadrupole (most likely E2), cascading γ rays with DCO≈0.5 and large negative A_2 as D+Q (most likely M1+E2). RUL is also used when level half-lives are known; and also with assumed resolving time of ≈10 ns in $\gamma\gamma$ experiments.

From $\gamma(\theta)$ and linear polarization (1977Gi02,1978Gi04).

@ δ(E2/M1)=0.5 assumed for M1+E2 transitions when δ not given.

& Multiply placed with intensity suitably divided.

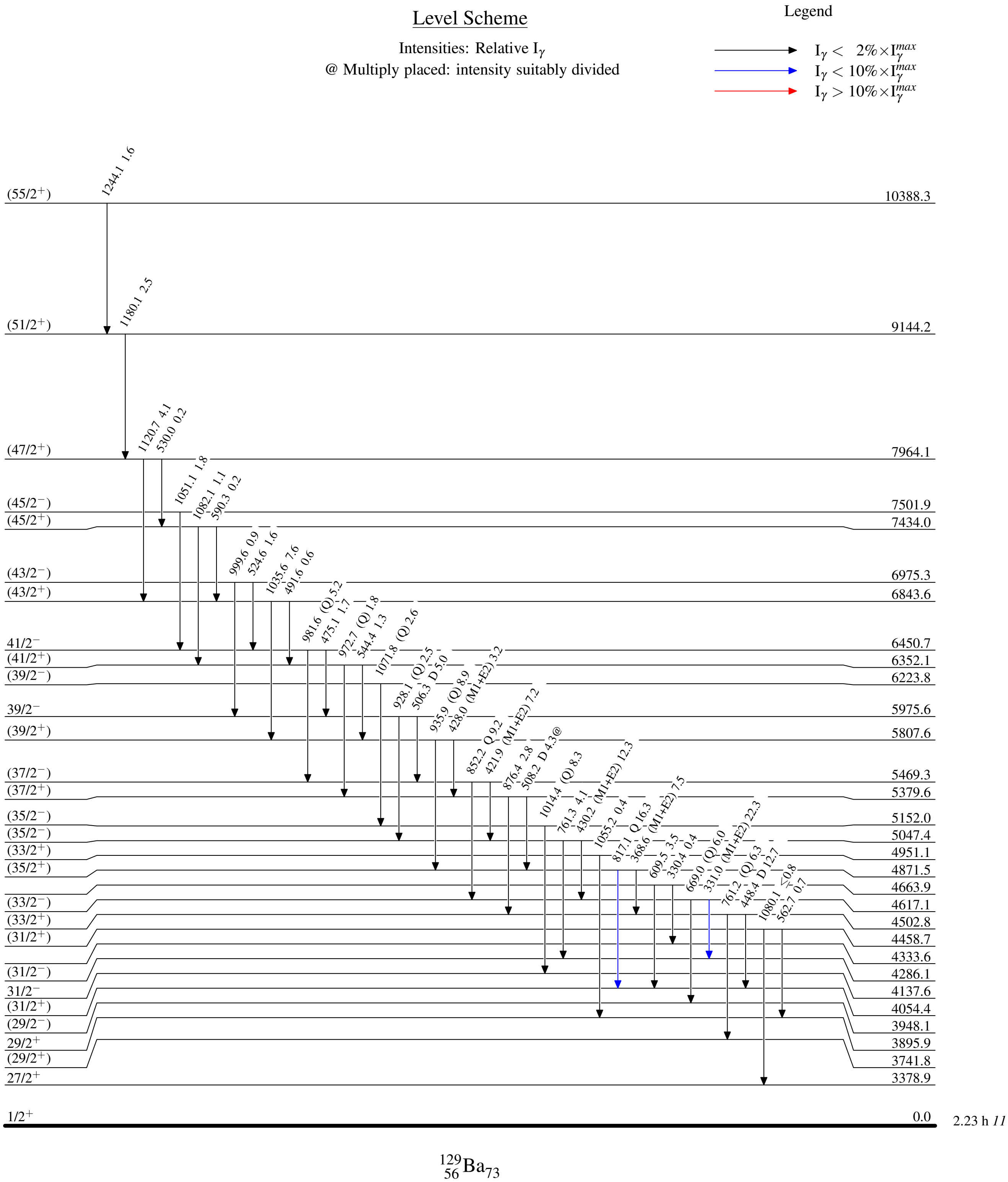
x γ ray not placed in level scheme.

$^{120}Sn(^{12}C,3n\gamma),^{116}Cd(^{18}O,5n\gamma)$ 1992By03,1978Gi04,2013Ka27

Level Scheme

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided



$^{120}Sn(^{12}C,3n\gamma),^{116}Cd(^{18}O,5n\gamma)$ 1992By03,1978Gi04,2013Ka27

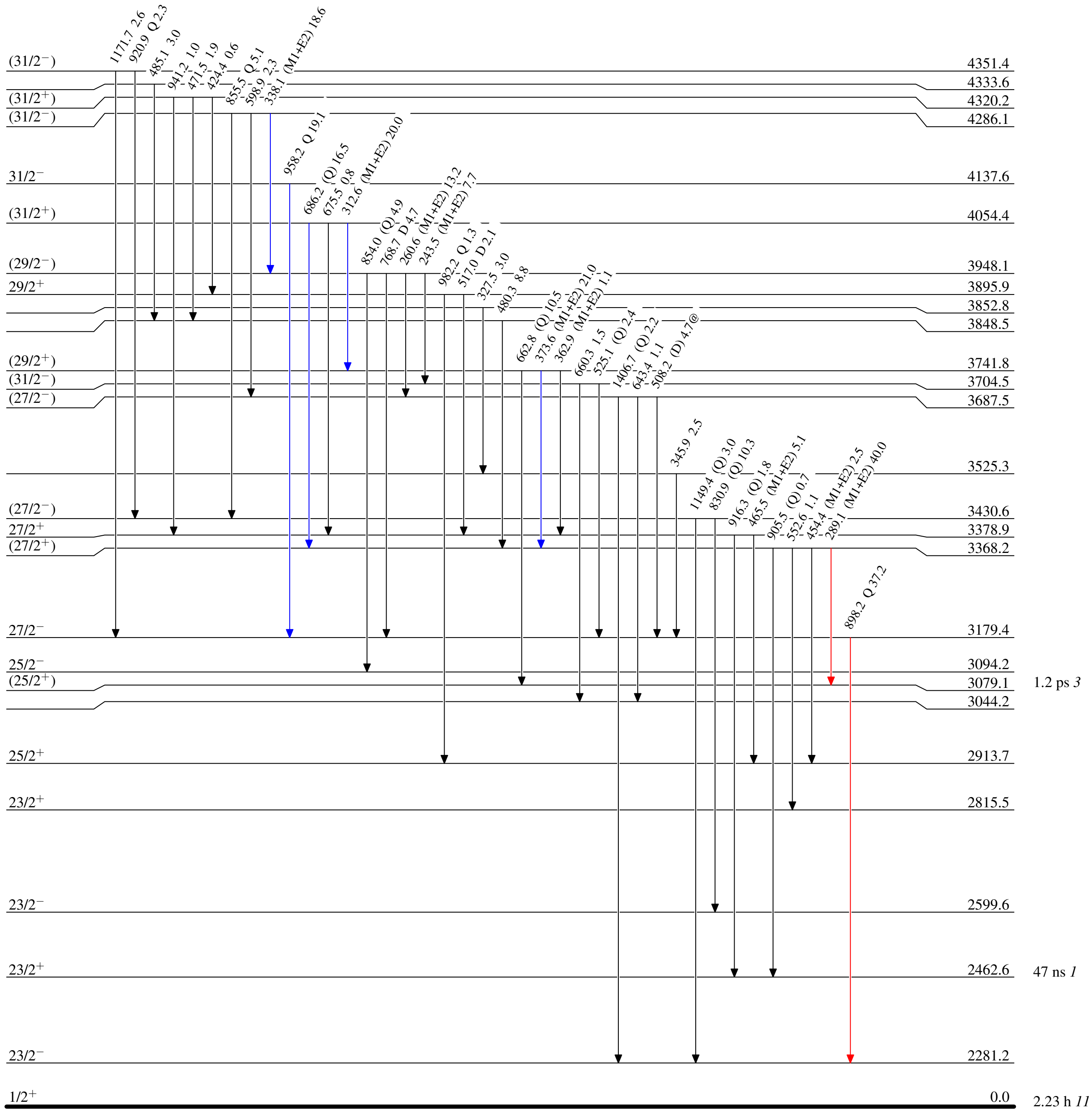
Level Scheme (continued)

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$



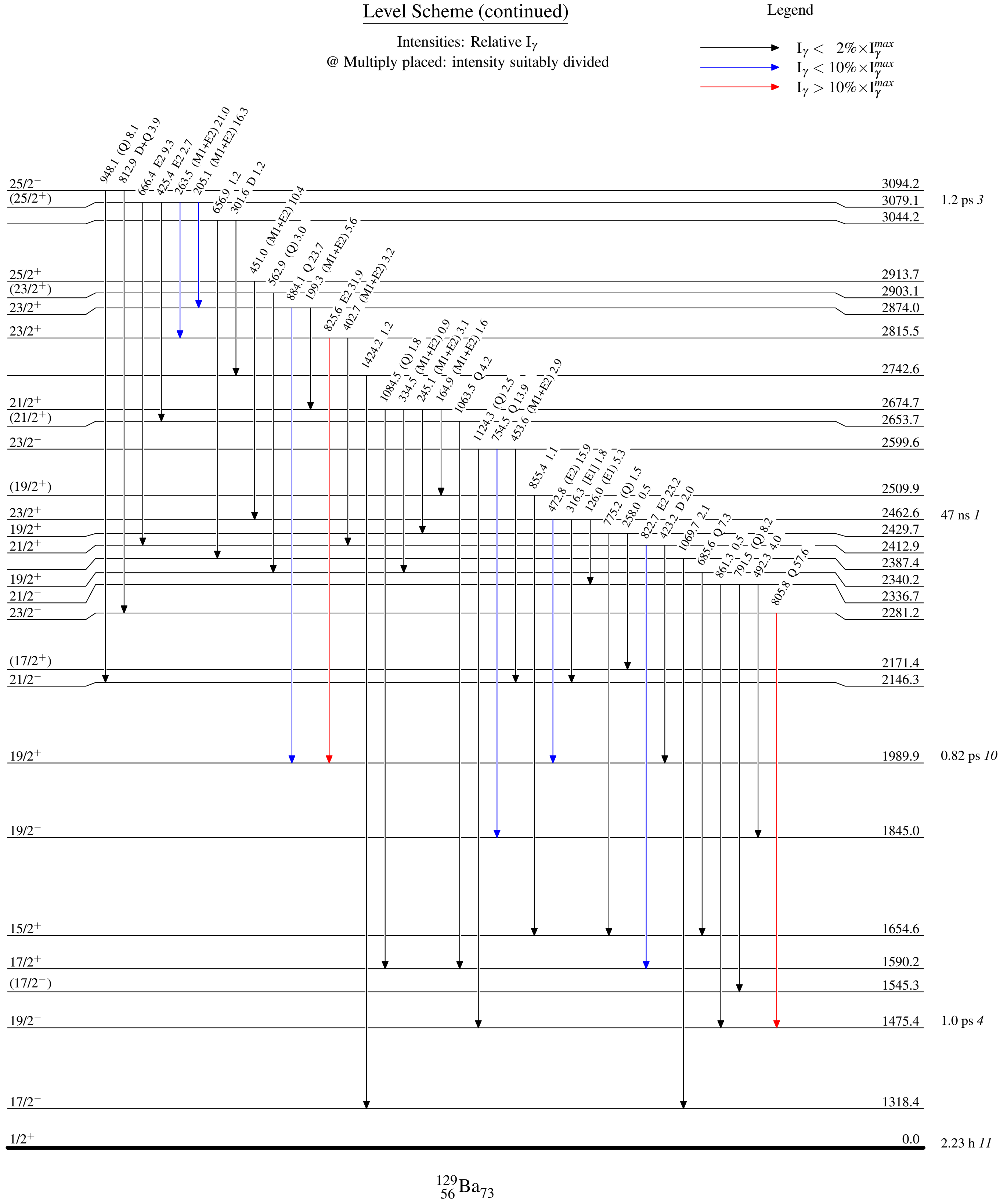
$^{129}_{56}Ba_{73}$

$^{120}Sn(^{12}C,3n\gamma),^{116}Cd(^{18}O,5n\gamma)$ 1992By03,1978Gi04,2013Ka27

Level Scheme (continued)

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided

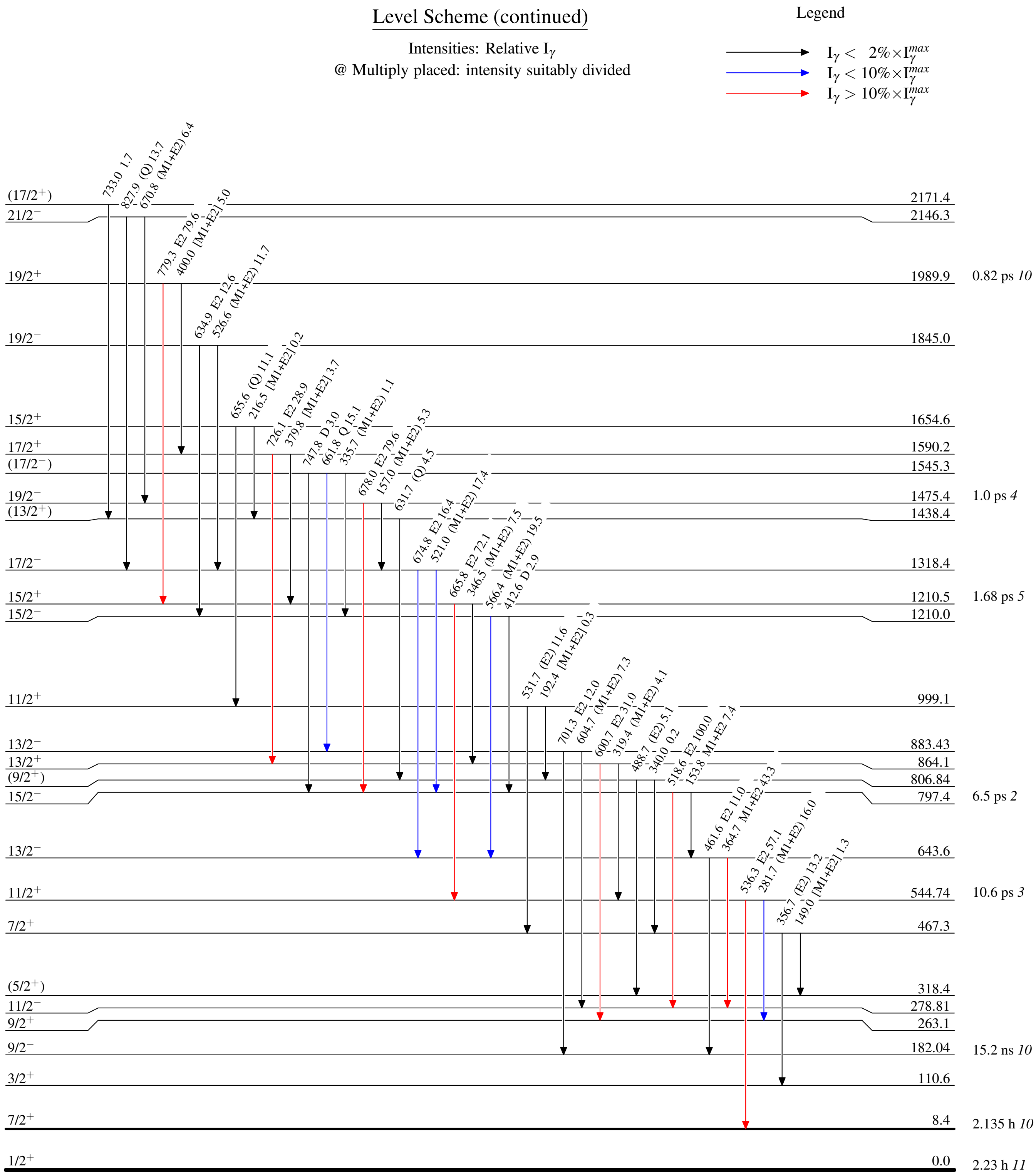


$^{120}Sn(^{12}C,3n\gamma),^{116}Cd(^{18}O,5n\gamma)$ 1992By03,1978Gi04,2013Ka27

Level Scheme (continued)

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided



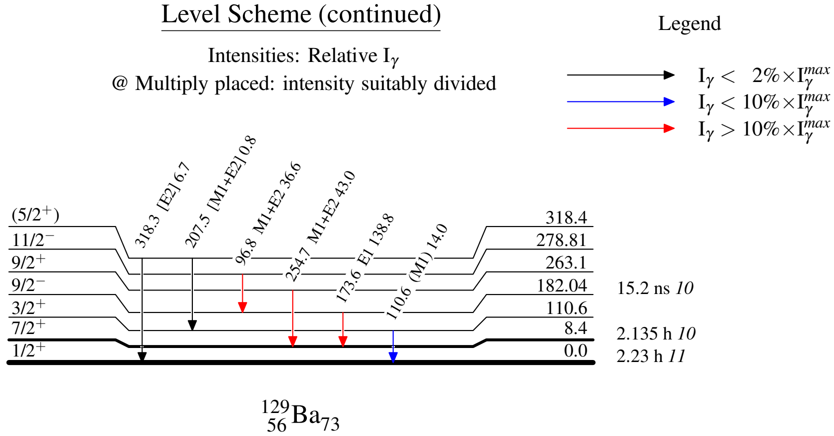
$^{129}_{56}Ba_{73}$

$^{120}Sn(^{12}C,3n\gamma),^{116}Cd(^{18}O,5n\gamma)$ 1992By03,1978Gi04,2013Ka27

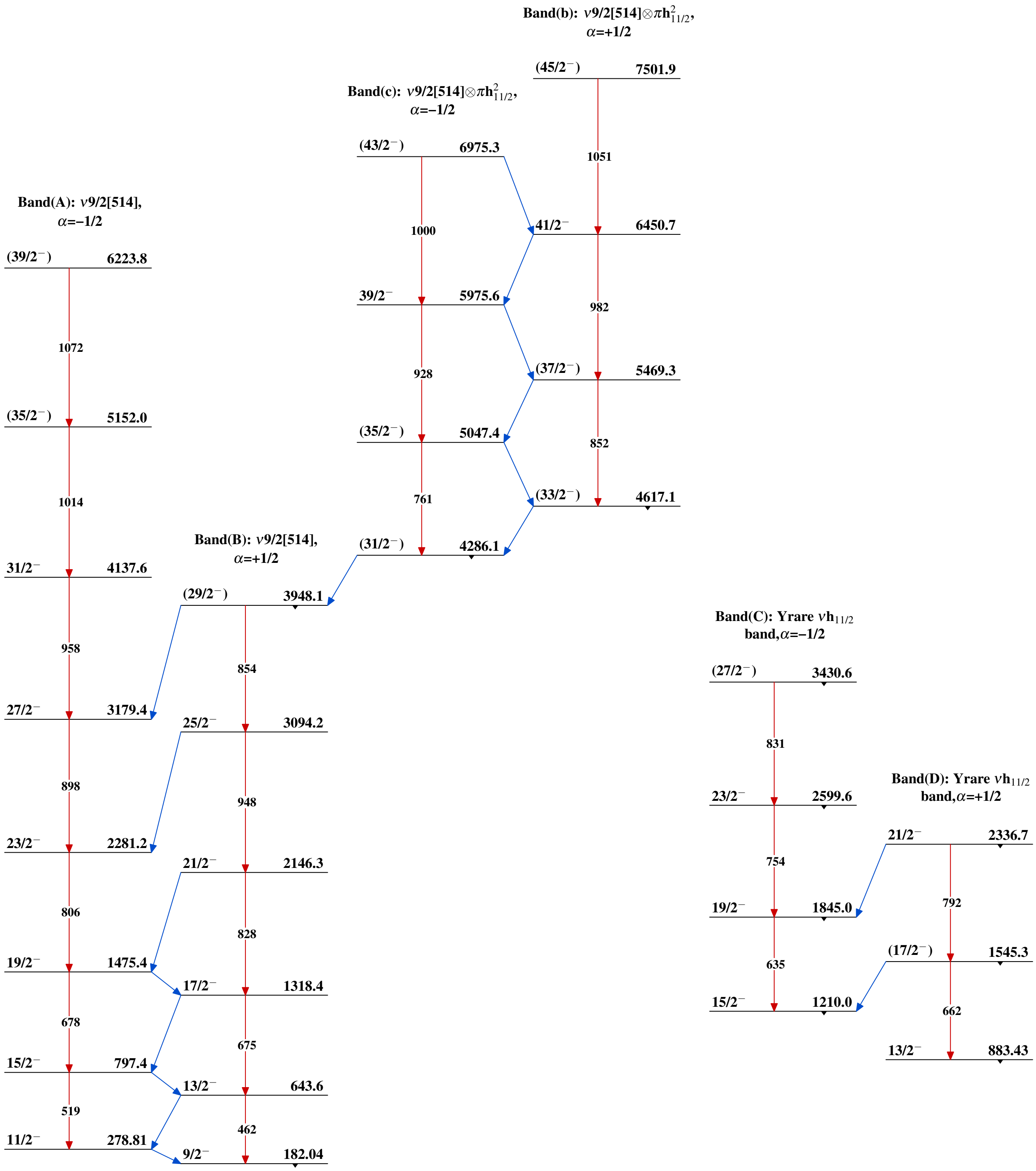
Level Scheme (continued)

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided

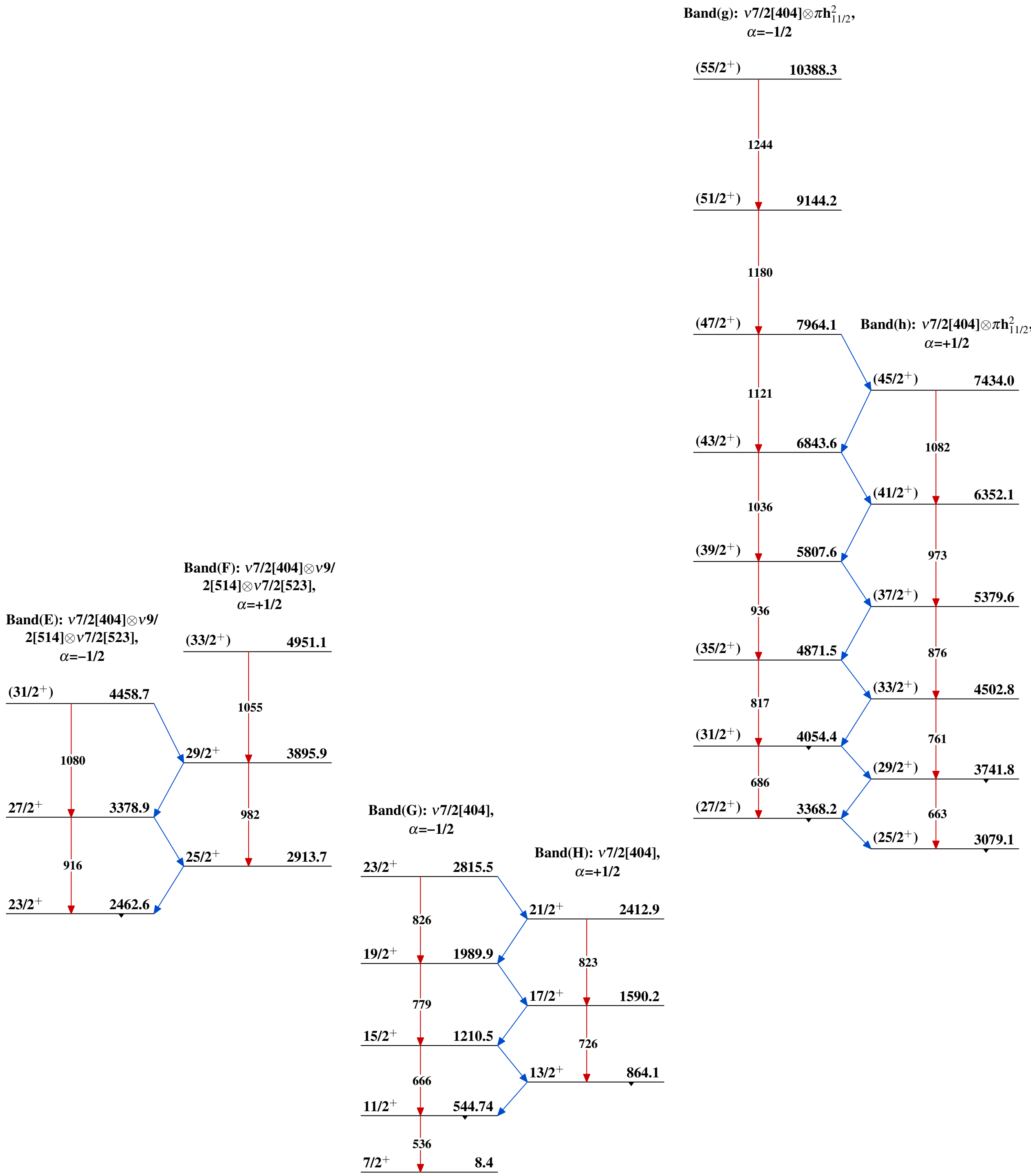


$^{120}Sn(^{12}C,3n\gamma),^{116}Cd(^{18}O,5n\gamma)$ 1992By03,1978Gi04,2013Ka27



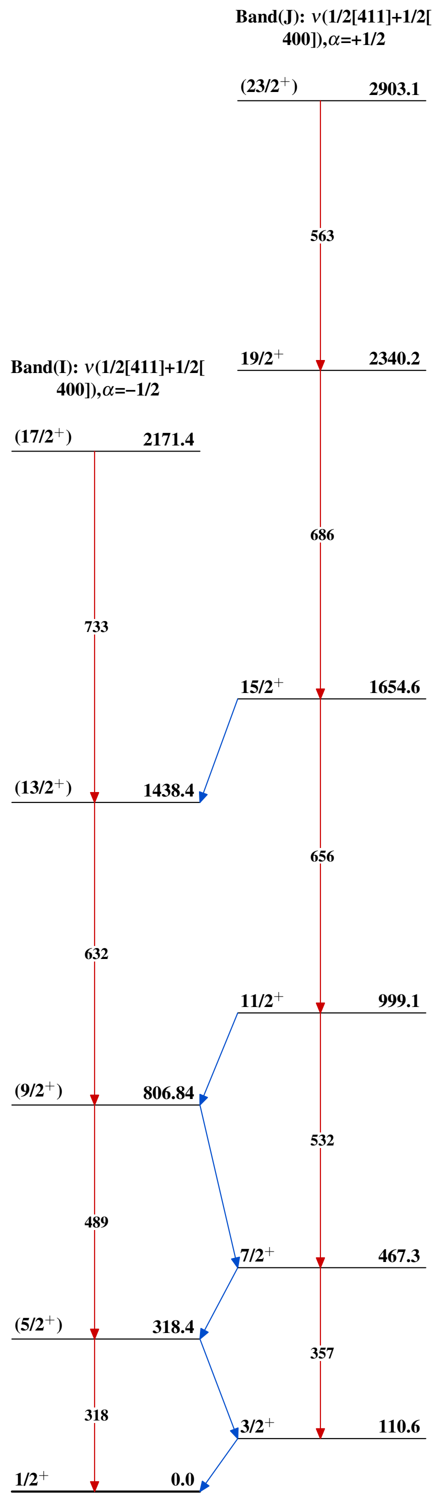
$^{129}_{56}Ba_{73}$

$^{120}Sn(^{12}C,3n\gamma),^{116}Cd(^{18}O,5n\gamma)$ 1992By03,1978Gi04,2013Ka27 (continued)



$^{129}_{56}Ba_{73}$

^{120}Sn(^{12}C,3nγ),^{116}Cd(^{18}O,5nγ) 1992By03,1978Gi04,2013Ka27 (continued)



$^{129}_{56}Ba_{73}$