^{58}Ni(^{23}Na,2pnγ) 1996Ka24

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Ameenah R. Farhan, Balraj Singh	NDS 110, 1917 (2009)	30-Jun-2009

1996Ka24: E(^{23}Na)=65, 70 MeV. Measured Eγ,Iγ, $\gamma\gamma$, $\gamma\gamma$(t), $\gamma(\theta)$, $\gamma\gamma(\theta)$(DCO), γ (lin pol), level lifetimes by DSAM. The Pitt-FSU detector array with ten Compton-suppressed HPGe detectors and one LEPS Ge detector were used for γ rays.

1998Ka56: E=70 MeV. Measured level lifetimes by recoil-distance method using Pitt-FSU detector array. Comparisons with particle- rotor model calculations.

^{78}Rb Levels

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]
0.0[h]	0^+	
46.80[f] *16*	1^-	0.42[a] μs *7*
103.20[h] *15*	1^+	
111.19[@c] *24*	4^-	
114.9[b] *4*	4^+	
119.70 *23*	(3^+)	
134.10[f] *19*	2^-	
160.70[j] *18*	2^+	
232.40[h] *21*	$2^{(+)}$	
263.79[c] *25*	5^-	122[&] ps *18*
270.1[b] *4*	5^+	77[&] ps *11*
274.40[f] *21*	3^-	
289.90 *20*		
315.4 *3*	(2^+)	
327.49[h] *22*	$3^{(+)}$	
334.19[i] *21*	$3^{(+)}$	
351.00[j] *25*	3^+	
395.59[e] *25*	$4^{(-)}$	
398.9[d] *4*	$4^{(+)}$	
422.8[b] *4*	6^+	67[&] ps *11*
440.09[f] *23*	4^-	
475.9[g] *3*	4^-	
488.79[c] *24*	6^-	26.3[&] ps *35*
504.0 *5*		
528.80[j] *25*	4^+	
538.3[i] *3*	$4^{(+)}$	
595.29[e] *24*	$5^{(-)}$	
663.5[f] *3*	5^-	
667.3[b] *4*	7^+	9.7[&] ps *21*
688.9[d] *4*	$5^{(+)}$	
699.5[g] *3*	5^-	
736.8[d] *4*	$6^{(+)}$	
767.1[c] *3*	7^-	9.0[&] ps *21*
785.9[i] *4*	$5^{(+)}$	
824.9[j] *4*	(5^+)	
852.9[b] *4*	8^+	20.8[&] ps *35*
872.19[e] *25*	$6^{(-)}$	
949.3[f] *4*	6^-	
1017.4[g] *4*	(6^-)	
1080.9[j] *5*	(6^+)	
1114.4[c] *3*	8^-	3.5[&] ps *14*
1114.6[d] *4*	$7^{(+)}$	
1165.8[e] *3*	$7^{(-)}$	
1219.7[b] *4*	9^+	2.1[&] ps *7*
1239.8[f] *4*	7^-	
1350.7[d] *4*	$8^{(+)}$	
1357.7[g] *7*	(7^-)	
1454.2 *5*	(8^+)	
1474.3[c] *4*	9^-	2.8[&] ps *14*
1603.6[e] *4*	$8^{(-)}$	
1625.5[b] *4*	10^+	1.23 ps *+28−21*
1678.0[f] *5*	(8^-)	
1744.8[d] *4*	$9^{(+)}$	
1941.6[c] *4*	10^-	0.61 ps *+11−9*
1984.5[e] *4*	(9^-)	
2023.6[b] *4*	11^+	0.63 ps *+12−10*
2043.6[f] *7*	(9^-)	
2369.2[c] *4*	11^-	0.39 ps *+7−6*
2651.1[b] *5*	12^+	
2955.4[c] *7*	12^-	0.28 ps *+7−6*
3042.0[b] *5*	13^+	0.28 ps *+8−6*
3452.8[c] *8*	(13^-)	0.17 ps *+6−5*
3897.1[b] *21*	(14^+)	<0.21 ps
4151.4[c] *13*	(14^-)	<0.24 ps
4253.7[b] *10*	(15^+)	0.14 ps *+5−4*
4730.8[c] *22*	(15^-)	<0.18 ps
5638.7[b] *14*	(17^+)	<0.12 ps
7191.8[b] *25*	(19^+)	

† From least-squares fit to Eγ′s.

‡ As proposed by 1996Ka24 based on $\gamma\gamma(\theta)$, γ(lin pol) data and band associations. Systematics of neighboring nuclides are also used for assignments to bandheads. The assignments are mostly the same in 'Adopted Levels', except that most assignments are

Continued on next page (footnotes at end of table)

^{58}Ni(^{23}Na,2pnγ) 1996Ka24 (continued)

^{78}Rb Levels (continued)

given in parentheses there due to lack of strong supporting arguments.
[#] From Doppler-shift attenuation method (DSAM) (1996Ka24), unless otherwise stated.
[@] Corresponds to 5.74-min isomer.
[&] From recoil-distance Doppler-shift (RDDS) method (1998Ka56).
[a] From $\gamma\gamma$(t).
[b] Band(A): Yrast πi=+ band. Possible configuration=$\pi g_{9/2} \otimes \nu g_{9/2}$ (1996Ka24) as for neighboring nuclides.
[c] Band(B): Yrast π=− band.
[d] Band(C): Band based on 399, $4^{(+)}$.
[e] Band(D): Band based on 395, $4^{(-)}$.
[f] Band(E): Band based on 47, 1^{-}.
[g] Band(F): Band based on 476, 4^{-}.
[h] Band(G): g.s. band.
[i] Band(H): Band based on 334, $3^{(+)}$.
[j] Band(I): Band based on 161, 2^{+}.

γ(^{78}Rb)

DCO data are for angles of 35° (or 145°) and 90°. Gates were set on ΔJ=2, quadrupole or ΔJ=1, dipole transitions. Only in a few cases the gates were set on ΔJ=0, dipole transitions. Expected values of DCO′s for gate on ΔJ=2, quadrupole transitions are: 1.0 for ΔJ=2, quadrupole or ΔJ=0, dipole and 0.5 for ΔJ=1, dipole transitions. For gates on ΔJ=1, dipole transitions, expected DCO′s are: 1.0 for ΔJ=1, dipole and 2.0 for ΔJ=2, quadrupole transitions. The values of DCO′s listed here correspond to gates on ΔJ=2, quadrupole transitions unless otherwise indicated.

E_γ[†]	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[‡]	Comments
(4)		114.9	4^+	111.19	4^-			
5[a]		119.70	(3^+)	114.9	4^+			
46.8 *2*		46.80	1^-	0.0	0^+			
47.9 *3*		736.8	$6^{(+)}$	688.9	$5^{(+)}$			
57.5 *2*	5.4 *8*	160.70	2^+	103.20	1^+	D[#]		DCO=0.90 *7*
(64.2)		111.19	4^-	46.80	1^-			
68.1 *3*	0.4 *2*	395.59	$4^{(-)}$	327.49	$3^{(+)}$			
87.3 *2*	16 *1*	134.10	2^-	46.80	1^-	D[#]		DCO=1.05 *10*; A_2=−0.06 *5*; A_4=−0.09 *5*
95.1 *3*	4.8 *4*	327.49	$3^{(+)}$	232.40	$2^{(+)}$	D[#]		DCO=0.99 *10*
98.3 *2*	1.0 *3*	232.40	$2^{(+)}$	134.10	2^-			
103.2 *2*	21 *5*	103.20	1^+	0.0	0^+	D[#]		DCO=0.93 *6*
112.6 *3*	4.2 *5*	440.09	4^-	327.49	$3^{(+)}$	D[#]		DCO=0.92 *12*
112.7 *2*	1.2 *3*	232.40	$2^{(+)}$	119.70	(3^+)			
128.8 *2*	2.8 *3*	398.9	$4^{(+)}$	270.1	5^+	D[#]		DCO=1.16 *8*
129.2 *3*	10 *1*	232.40	$2^{(+)}$	103.20	1^+	D[#]		DCO=1.06 *8*
131.8 *2*	2.2 *3*	395.59	$4^{(-)}$	263.79	5^-	D[#]		DCO=1.25 *16*
140.3 *2*	11 *1*	274.40	3^-	134.10	2^-	D[#]		DCO=0.94 *8*
148.4 *3*	1.0 *3*	475.9	4^-	327.49	$3^{(+)}$	D[#]		DCO=1.0 *3*
148.9 *3*	≈2	263.79	5^-	114.9	4^+	D		
152.6 *1*	≈65	263.79	5^-	111.19	4^-	D		DCO=0.40 *4*
152.7 *1*	79 *2*	422.8	6^+	270.1	5^+	D		DCO=0.43 *5*
155.2 *1*	100	270.1	5^+	114.9	4^+	D+Q	+0.11 *5*	DCO=0.44 *5*; A_2=−0.31 *4*; A_4=−0.04 *4*
155.2 *2*	2.6 *3*	595.29	$5^{(-)}$	440.09	4^-	D[#]		DCO=1.04 *12*
160.7 *3*	2.7 *3*	160.70	2^+	0.0	0^+			
165.7 *2*	3.9 *4*	440.09	4^-	274.40	3^-	D[#]		DCO=1.08 *10*
173.5 *2*	2.6 *3*	334.19	$3^{(+)}$	160.70	2^+	D[#]		DCO=1.26 *22*
177.8 *2*	1.8 *3*	528.80	4^+	351.00	3^+	D[#]		DCO=1.2 *3*
181.3 *4*	0.8 *2*	315.4	(2^+)	134.10	2^-			
185.6 *2*	29 *1*	852.9	8^+	667.3	7^+	D+Q	+0.07 *3*	DCO=0.45 *6*; A_2=−0.31 *4*; A_4=−0.08 *4*
186.7 *3*	2.1 *6*	289.90		103.20	1^+			
187.3 *2*	2.8 *4*	538.3	$4^{(+)}$	351.00	3^+	D[#]		DCO=1.02 *9*

γ(^{78}Rb) (continued)

E_γ[†]	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[‡]	α[&]	Comments
190.3 2	5.5 6	351.00	3^+	160.70	2^+	(M1+E2)[#]	+0.30 20	0.031 8	DCO=1.11 8; A_2=−0.30 6; A_4=−0.01 7 α(K)=0.027 7; α(L)=0.0031 9; α(M)=0.00052 15; α(N+..)=6.1×10^{-5} 16 α(N)=5.8×10^{-5} 16; α(O)=2.4×10^{-6} 6
193.4 3	0.4 2	327.49	$3^{(+)}$	134.10	2^-				
194.6 3	0.7 2	528.80	4^+	334.19	$3^{(+)}$	D[@]			DCO=0.51 12
199.7 2	4.1 3	595.29	$5^{(-)}$	395.59	$4^{(-)}$	D(+Q)[#]	+0.03 5		DCO=0.96 27; A_2=−0.27 5; A_4=+0.06 5
201.5 3	2.4 4	475.9	4^-	274.40	3^-	D[#]			DCO=1.16 12
204.1 3	2.2 4	538.3	$4^{(+)}$	334.19	$3^{(+)}$	D[@]			DCO=0.51 9
207.8 3	1.8 5	327.49	$3^{(+)}$	119.70	(3^+)				
212.2 3	6 1	315.4	(2^+)	103.20	1^+				
214.1 4	2 1	504.0		289.90					
214.5 3	2.9 4	334.19	$3^{(+)}$	119.70	(3^+)	D[#]			DCO=2.0 3; A_2=+0.22 8; A_4=−0.02 10 Mult.: ΔJ=0 transition.
216.3 3	1.5 4	327.49	$3^{(+)}$	111.19	4^-				
218.7 4	1.2 3	488.79	6^-	270.1	5^+	D[#]			DCO=1.26 18
223.0 4	0.8 3	334.19	$3^{(+)}$	111.19	4^-	D[#]			DCO=1.2 3
223.4 3	3.2 7	663.5	5^-	440.09	4^-	D[#]			DCO=0.95 12
223.6 3	1.7 4	699.5	5^-	475.9	4^-	D[#]			DCO=1.06 14
225.0 1	27 1	488.79	6^-	263.79	5^-	M1+E2	+0.38 11	0.0209 23	DCO=0.37 6; A_2=−0.41 4; A_4=−0.08 5 α(K)=0.0184 20; α(L)=0.0021 3; α(M)=0.00035 5; α(N+..)=4.0×10^{-5} 5 α(N)=3.9×10^{-5} 5; α(O)=1.59×10^{-6} 16 POL=−0.29 11.
227.6 3	1.8 5	274.40	3^-	46.80	1^-				
236.1 2	1.9 4	1350.7	$8^{(+)}$	1114.6	$7^{(+)}$	D[#]			DCO=1.12 12
243.1 3	4 1	289.90		46.80	1^-				
244.5 1	45 1	667.3	7^+	422.8	6^+	M1+E2	+0.07 5	0.0136 3	DCO=0.47 6; A_2=−0.29 4; A_4=−0.09 5 α(K)=0.0121 3; α(L)=0.00133 3; α(M)=0.000220 5; α(N+..)=2.60×10^{-5} 6 α(N)=2.49×10^{-5} 6; α(O)=1.069×10^{-6} 22 POL=−0.06 9.
247.6 5	1.8 4	785.9	$5^{(+)}$	538.3	$4^{(+)}$	D[@]			DCO=0.40 16
247.8[a] 3	<0.4	351.00	3^+	103.20	1^+				
257.1 3	1.3 3	785.9	$5^{(+)}$	528.80	4^+				
261.7 3	1.1 3	1114.6	$7^{(+)}$	852.9	8^+	D[#]			DCO=1.15 16
266.1 4	0.8 2	688.9	$5^{(+)}$	422.8	6^+				
276.9 1	4.6 4	872.19	$6^{(-)}$	595.29	$5^{(-)}$	D			DCO=0.59 10
278.3 2	14 1	767.1	7^-	488.79	6^-	D			DCO=0.37 4; A_2=−0.17 5; A_4=+0.01 5

γ(^{78}Rb) (continued)

E_γ[†]	I_γ	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	δ[‡]	α[&]	Comments
284.0 *2*	4.6 *6*	398.9	$4^{(+)}$	114.9	4^+				
284.4 *2*	8 *1*	395.59	$4^{(-)}$	111.19	4^-	D[#]			DCO=1.76 *24*; A_2=+0.23 *4*; A_4=−0.09 *6* Mult.: ΔJ=0 transition.
285.8 *4*	1.1 *3*	949.3	6^-	663.5	5^-	D[#]			DCO=1.0 *3*
286.6[a] *3*	<0.6	824.9	(5^+)	538.3	$4^{(+)}$				
289.9 *3*	1.3 *5*	289.90		0.0	0^+				
290.0 *3*	3.2 *4*	688.9	$5^{(+)}$	398.9	$4^{(+)}$	D[#]			DCO=1.07 *15*
290.5 *3*	0.7 *2*	1239.8	7^-	949.3	6^-	D[#]			DCO=1.0 *3*
293.6 *1*	2.6 *4*	1165.8	$7^{(-)}$	872.19	$6^{(-)}$	D			DCO=0.51 *12*; A_2=−0.14 *6*; A_4=+0.03 *7*
295.0 *4*	2.1 *4*	1080.9	(6^+)	785.9	$5^{(+)}$				
296.1[a] *4*	<0.4	824.9	(5^+)	528.80	4^+				
306.0 *3*	0.5 *3*	440.09	4^-	134.10	2^-				
307.9 *1*	22 *1*	422.8	6^+	114.9	4^+	E2		0.01657	DCO=1.06 *8*; A_2=+0.41 *5*; A_4=−0.11 *7* α(K)=0.01456 *21*; α(L)=0.001704 *24*; α(M)=0.000281 *4*; α(N+..)=3.22×10^{-5} *5* α(N)=3.10×10^{-5} *5*; α(O)=1.211×10^{-6} *17* POL=+1.10 *12*.
313.8 *3*	2.4 *5*	736.8	$6^{(+)}$	422.8	6^+	(D)			DCO=0.8 *4* Mult.: ΔJ=0 transition.
317.9 *4*	0.6 *2*	1017.4	(6^-)	699.5	5^-				
331.5 *2*	4.8 *4*	595.29	$5^{(-)}$	263.79	5^-	D[#]			DCO=1.93 *34*; A_2=+0.26 *8*; A_4=−0.06 *8* Mult.: ΔJ=0 transition.
337.9 *3*	2.3 *6*	736.8	$6^{(+)}$	398.9	$4^{(+)}$	Q[#]			DCO=1.76 *25*
339.6 *3*	1.3 *3*	1454.2	(8^+)	1114.6	$7^{(+)}$	(D)[#]			DCO=0.63 *16*
340.3[a] *4*	<0.4	1357.7	(7^-)	1017.4	(6^-)				
341.8 *4*	1.6 *4*	475.9	4^-	134.10	2^-	Q[#]			DCO=1.9 *3*
344.3 *4*	0.7 *3*	767.1	7^-	422.8	6^+	(D)[#]			DCO=0.9 *3*
347.3 *3*	7.2 *9*	1114.4	8^-	767.1	7^-	(M1+E2)	+0.16 *7*	0.00579 *16*	DCO=0.38 *9*; A_2=−0.44 *6*; A_4=+0.01 *6* α(K)=0.00512 *14*; α(L)=0.000561 *17*; α(M)=9.3×10^{-5} *3*; α(N+..)=1.09×10^{-5} *3* α(N)=1.05×10^{-5} *3*; α(O)=4.52×10^{-7} *12*
359.9 *3*	3.8 *6*	1474.3	9^-	1114.4	8^-	(M1+E2)	+0.23 *7*	0.00542 *17*	DCO=0.47 *1*; A_2=−0.48 *9*; A_4=−0.07 *9* α(K)=0.00479 *15*; α(L)=0.000526 *18*; α(M)=8.7×10^{-5} *3*; α(N+..)=1.02×10^{-5} *4* α(N)=9.8×10^{-6} *4*; α(O)=4.22×10^{-7} *12*
365.6[a] *4*	<0.4	2043.6	(9^-)	1678.0	(8^-)				
366.8 *1*	30 *1*	1219.7	9^+	852.9	8^+	M1+E2	+0.12 *5*	0.00501 *10*	DCO=0.45 *8*; A_2=−0.40 *6*; A_4=−0.09 *6* α(K)=0.00444 *8*; α(L)=0.000485 *10*; α(M)=8.00×10^{-5} *16*;

γ(^{78}Rb) (continued)

Eγ[†]	Iγ	Ei(level)	J^π_i	Ef	J^π_f	Mult.[‡]	δ[‡]	α[&]	Comments
									α(N+..)=9.46×10^{-6} *18* α(N)=9.07×10^{-6} *17*; α(O)=3.92×10^{-7} *7* POL=−0.11 *8*.
368.1 *4*	1.5 *4*	528.80	4$^+$	160.70	2$^+$	Q[#]			DCO=1.95 *23*
377.6 *1*	19 *1*	488.79	6$^-$	111.19	4$^-$	E2		0.00834	DCO=1.08 *12*; A_2=+0.25 *6*; A_4=−0.10 *8* α(K)=0.00735 *11*; α(L)=0.000842 *12*; α(M)=0.0001388 *20*; α(N+..)=1.604×10^{-5} *23* α(N)=1.542×10^{-5} *22*; α(O)=6.18×10^{-7} *9* POL=+0.40 *8*.
377.8 *2*	4.1 *6*	1114.6	7$^{(+)}$	736.8	6$^{(+)}$	D[#]			DCO=1.02 *9*
380.9 *4*	0.3 *1*	1984.5	(9$^-$)	1603.6	8$^{(-)}$				
383.4 *2*	3.0 *3*	872.19	6$^{(-)}$	488.79	6$^-$	D			DCO=0.84 *14*; A_2=+0.46 *9*; A_4=−0.35 *10* Mult.: ΔJ=0 transition.
389.1 *4*	0.5 *3*	663.5	5$^-$	274.40	3$^-$				
390.9 *3*	1.7 *4*	3042.0	13$^+$	2651.1	12$^+$	D			DCO=0.17 *35*
394.1 *2*	2.8 *5*	1744.8	9$^{(+)}$	1350.7	8$^{(+)}$	D[#]			DCO=1.19 *17*
397.2 *3*	6 *1*	667.3	7$^+$	270.1	5$^+$	(E2)		0.00707	DCO=1.2 *5* α(K)=0.00623 *9*; α(L)=0.000711 *11*; α(M)=0.0001172 *17*; α(N+..)=1.356×10^{-5} *20* α(N)=1.303×10^{-5} *19*; α(O)=5.26×10^{-7} *8*
398.1 *2*	13 *2*	2023.6	11$^+$	1625.5	10$^+$	D			DCO=0.30 *10*
398.7 *4*	0.4 *2*	1165.8	7$^{(-)}$	767.1	7$^-$				
399.7 *3*	4 *1*	663.5	5$^-$	263.79	5$^-$	D[#]			DCO=2.0 *7* Mult.: ΔJ=0 transition.
405.8 *2*	6 *1*	1625.5	10$^+$	1219.7	9$^+$	M1+E2	+0.07 *5*	0.00390	DCO=0.40 *9*; A_2=−0.39 *5*; A_4=+0.06 *6* α(K)=0.00345 *6*; α(L)=0.000375 *6*; α(M)=6.20×10^{-5} *10*; α(N+..)=7.34×10^{-6} *12* α(N)=7.03×10^{-6} *11*; α(O)=3.04×10^{-7} *5* POL=−0.35 *15*.
425.1 *3*	1.8 *4*	699.5	5$^-$	274.40	3$^-$	Q[#]			DCO=2.0 *7*
427.6 *3*	0.7 *2*	2369.2	11$^-$	1941.6	10$^-$				
430.1 *2*	51 *2*	852.9	8$^+$	422.8	6$^+$	E2		0.00548	DCO=1.04 *7*; A_2=+0.48 *4*; A_4=−0.21 *7* α(K)=0.00483 *7*; α(L)=0.000547 *8*; α(M)=9.02×10^{-5} *13*; α(N+..)=1.047×10^{-5} *15* α(N)=1.006×10^{-5} *15*; α(O)=4.09×10^{-7} *6*
437.8 *3*	0.8 *2*	1603.6	8$^{(-)}$	1165.8	7$^{(-)}$	D[#]			DCO=1.06 *22*
438.2 *4*	0.4 *2*	1678.0	(8$^-$)	1239.8	7$^-$				
447.3 *3*	0.9 *3*	1114.6	7$^{(+)}$	667.3	7$^+$	(D)[#]			DCO=0.72 *35* Mult.: ΔJ=0 transition.
466.7 *3*	6 *1*	736.8	6$^{(+)}$	270.1	5$^+$	(D)[#]			DCO=0.87 *5*
467.3 *3*	2.8 *7*	1941.6	10$^-$	1474.3	9$^-$	D			DCO=0.46 *11*
473.9 *4*	0.4 *2*	824.9	(5$^+$)	351.00	3$^+$				

γ(^{78}Rb) (continued)

E_γ†	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	δ‡	α&	Comments
476.6 *4*	0.9 *2*	872.19	$6^{(-)}$	395.59	$4^{(-)}$				
484.1 *3*	0.9 *3*	595.29	$5^{(-)}$	111.19	4^-				
503.3 *3*	25 *1*	767.1	7^-	263.79	5^-	E2		0.00336	DCO=1.10 *17*; A_2=+0.41 *4*; A_4=−0.15 *6* α(K)=0.00297 *5*; α(L)=0.000332 *5*; α(M)=5.48×10^{-5} *8*; α(N+..)=6.39×10^{-6} *9* α(N)=6.13×10^{-6} *9*; α(O)=2.53×10^{-7} *4*
509.2 *5*	0.4 *2*	949.3	6^-	440.09	4^-				
528.6 *5*	1.2 *4*	1017.4	(6^-)	488.79	6^-				
541.5 *5*	1.1 *4*	1017.4	(6^-)	475.9	4^-				
552.1 *5*	0.6 *3*	1080.9	(6^+)	528.80	4^+				
552.4 *2*	7 *1*	1219.7	9^+	667.3	7^+	E2		0.00255	DCO=0.90 *19*; A_2=+0.34 *6*; A_4=−0.08 *8* α(K)=0.00225 *4*; α(L)=0.000250 *4*; α(M)=4.13×10^{-5} *6*; α(N+..)=4.82×10^{-6} *7* α(N)=4.63×10^{-6} *7*; α(O)=1.93×10^{-7} *3*
570.5 *3*	1.4 *4*	1165.8	$7^{(-)}$	595.29	$5^{(-)}$	Q#			DCO=2.0 *4*; A_2=+0.40 *7*; A_4=−0.01 *9*
576.3 *5*	0.4 *1*	1239.8	7^-	663.5	5^-				
613.9 *3*	1.4 *4*	1350.7	$8^{(+)}$	736.8	$6^{(+)}$				
625.6 *3*	19 *1*	1114.4	8^-	488.79	6^-	E2		0.00178	DCO=1.07 *15*; A_2=+0.36 *5*; A_4=−0.04 *7* α(K)=0.001576 *23*; α(L)=0.0001740 *25*; α(M)=2.87×10^{-5} *4*; α(N+..)=3.36×10^{-6} *5* α(N)=3.23×10^{-6} *5*; α(O)=1.353×10^{-7} *19*
627.5 *3*	1.6 *6*	2651.1	12^+	2023.6	11^+	D			DCO=0.4 *3*
658.2 *6*	1.4 *5*	1357.7	(7^-)	699.5	5^-				
683.4 *3*	5.2 *8*	1350.7	$8^{(+)}$	667.3	7^+	D(+Q)#	+0.07 *11*		DCO=0.66 *7*; A_2=−0.38 *9*; A_4=+0.03 *10*
707.2 *2*	18 *2*	1474.3	9^-	767.1	7^-	E2		1.27×10^{-3}	DCO=0.95 *7*; A_2=+0.50 *6*; A_4=−0.02 *8* α(K)=0.001127 *16*; α(L)=0.0001236 *18*; α(M)=2.04×10^{-5} *3*; α(N+..)=2.39×10^{-6} *4* α(N)=2.30×10^{-6} *4*; α(O)=9.71×10^{-8} *14*
717.4 *4*	0.8 *2*	1454.2	(8^+)	736.8	$6^{(+)}$				
728.7 *6*	1.3 *5*	1678.0	(8^-)	949.3	6^-				
731.4 *6*	0.7 *3*	1603.6	$8^{(-)}$	872.19	$6^{(-)}$				
772.6 *2*	32 *3*	1625.5	10^+	852.9	8^+	E2		1.01×10^{-3}	DCO=0.99 *13*; A_2=+0.37 *6*; A_4=−0.02 *7* α(K)=0.000894 *13*; α(L)=9.76×10^{-5} *14*; α(M)=1.608×10^{-5} *23*; α(N+..)=1.89×10^{-6} *3* α(N)=1.82×10^{-6} *3*; α(O)=7.72×10^{-8} *11*
803.8 *5*	0.5 *2*	2043.6	(9^-)	1239.8	7^-				
803.9 *3*	15 *2*	2023.6	11^+	1219.7	9^+	E2		9.12×10^{-4}	DCO=0.84 *16*; A_2=+0.17 *6*; A_4=+0.02 *7* α(K)=0.000807 *12*; α(L)=8.80×10^{-5} *13*; α(M)=1.450×10^{-5} *21*; α(N+..)=1.707×10^{-6} *24* α(N)=1.638×10^{-6} *23*; α(O)=6.98×10^{-8} *10*
818.7 *4*	1.2 *4*	1984.5	(9^-)	1165.8	$7^{(-)}$				

γ(^{78}Rb) (continued)

E_γ †	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	α &	Comments
827.2 2	13 2	1941.6	10^-	1114.4	8^-	E2	8.48×10^{-4}	DCO=0.89 8; A_2=+0.27 7; A_4=+0.04 9 α(K)=0.000751 11; α(L)=8.17×10^{-5} 12; α(M)=1.348×10^{-5} 19; α(N+..)=1.587×10^{-6} 23 α(N)=1.522×10^{-6} 22; α(O)=6.49×10^{-8} 10
891.9 4	2.2 8	1744.8	$9^{(+)}$	852.9	8^+	D		DCO=0.49 23
894.9 4	7 2	2369.2	11^-	1474.3	9^-	E2	6.98×10^{-4}	DCO=1.00 18; A_2=+0.48 9; A_4=+0.04 12 α(K)=0.000619 9; α(L)=6.71×10^{-5} 10; α(M)=1.106×10^{-5} 16; α(N+..)=1.304×10^{-6} 19 α(N)=1.251×10^{-6} 18; α(O)=5.35×10^{-8} 8
1013.8 6	6 2	2955.4	12^-	1941.6	10^-	E2	5.19×10^{-4}	DCO=1.06 23 α(K)=0.000460 7; α(L)=4.97×10^{-5} 7; α(M)=8.19×10^{-6} 12; α(N+..)=9.67×10^{-7} 14 α(N)=9.27×10^{-7} 13; α(O)=3.99×10^{-8} 6
1018.4 5	11 3	3042.0	13^+	2023.6	11^+	E2	5.14×10^{-4}	DCO=1.20 21 α(K)=0.000456 7; α(L)=4.91×10^{-5} 7; α(M)=8.10×10^{-6} 12; α(N+..)=9.57×10^{-7} 14 α(N)=9.17×10^{-7} 13; α(O)=3.95×10^{-8} 6
1025.6 6	9 3	2651.1	12^+	1625.5	10^+			DCO=0.73 22
1077.5 3	3 1	1744.8	$9^{(+)}$	667.3	7^+	Q #		DCO=2.2 4
1083.6 7	5 2	3452.8	(13^-)	2369.2	11^-			
1196 1	1.5 7	4151.4	(14^-)	2955.4	12^-			
1211.7 8	4 2	4253.7	(15^+)	3042.0	13^+			
1246 2	2 1	3897.1	(14^+)	2651.1	12^+			
1278 2	1.7 8	4730.8	(15^-)	3452.8	(13^-)			
1385 1	1.2 5	5638.7	(17^+)	4253.7	(15^+)			
1553 2	0.8 4	7191.8	(19^+)	5638.7	(17^+)			

† 1996Ka24 give average values determined from two reactions: ^{58}Ni(^{23}Na,2pnγ) and ^{54}Fe(^{28}Si,3pnγ).

‡ The assignments are generally from γγ(θ)(DCO) data. In some cases γ(θ) and linear polarization data are also available for definite assignments. The mult=D refers to ΔJ=1 and mult=Q to ΔJ=2 transitions As suggested by γγ(θ)(DCO) data. Selected cases have mult=D for ΔJ=0 transitions. In cases where level lifetimes are known, RUL for E2 and M2 transitions is used to assign E2 or M1+E2 as opposed to M2 or E1+M2.

From DCO, gate is on ΔJ=1, dipole transition.

@ From DCO, gate is on ΔJ=0, dipole transition.

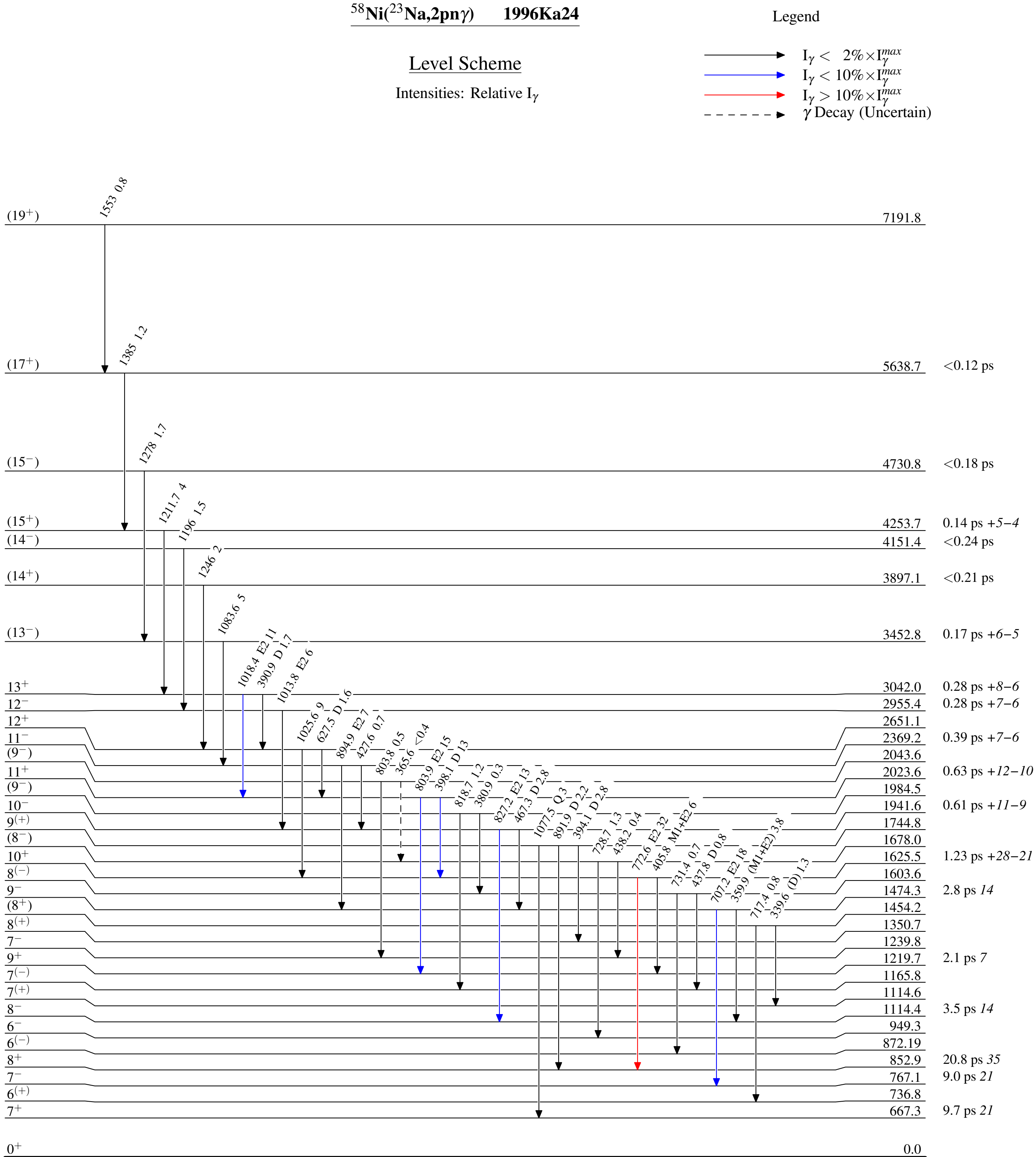
& Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

^{a} Placement of transition in the level scheme is uncertain.

$^{58}Ni(^{23}Na,2pn\gamma)$ 1996Ka24

Level Scheme

Intensities: Relative I_γ

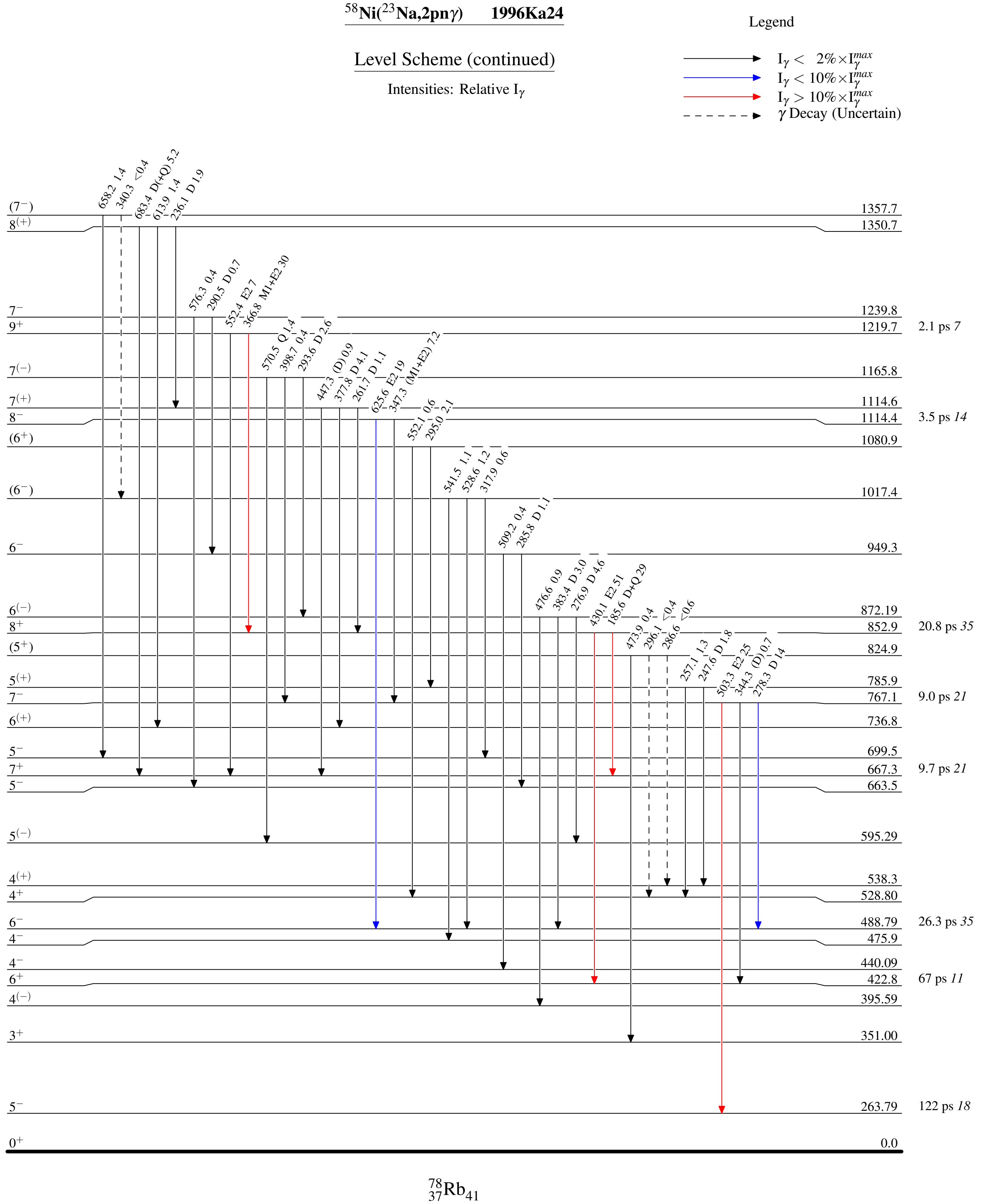


$^{78}_{37}Rb_{41}$

^{58}Ni(^{23}Na,2pnγ) 1996Ka24

Level Scheme (continued)

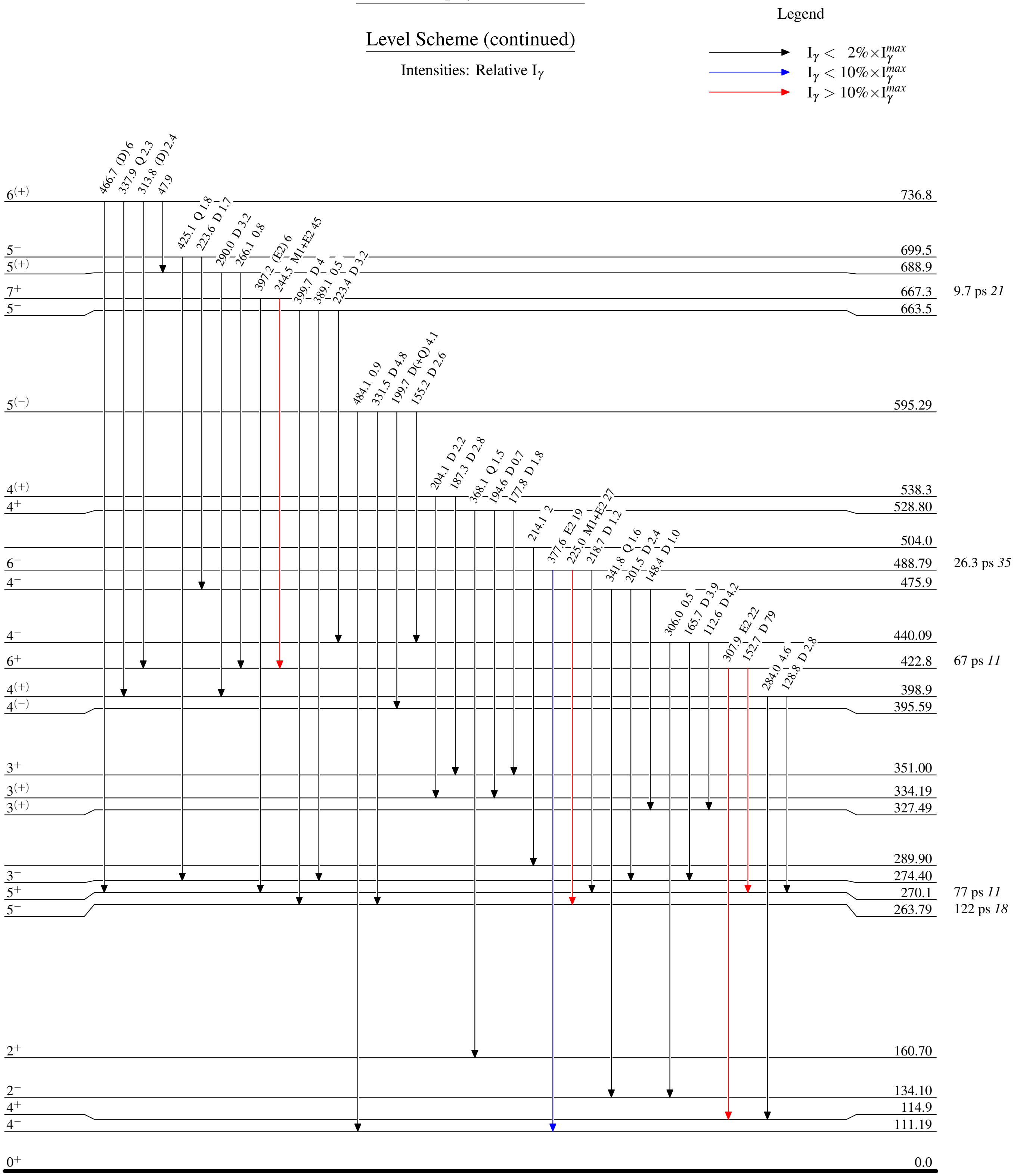
Intensities: Relative I_γ



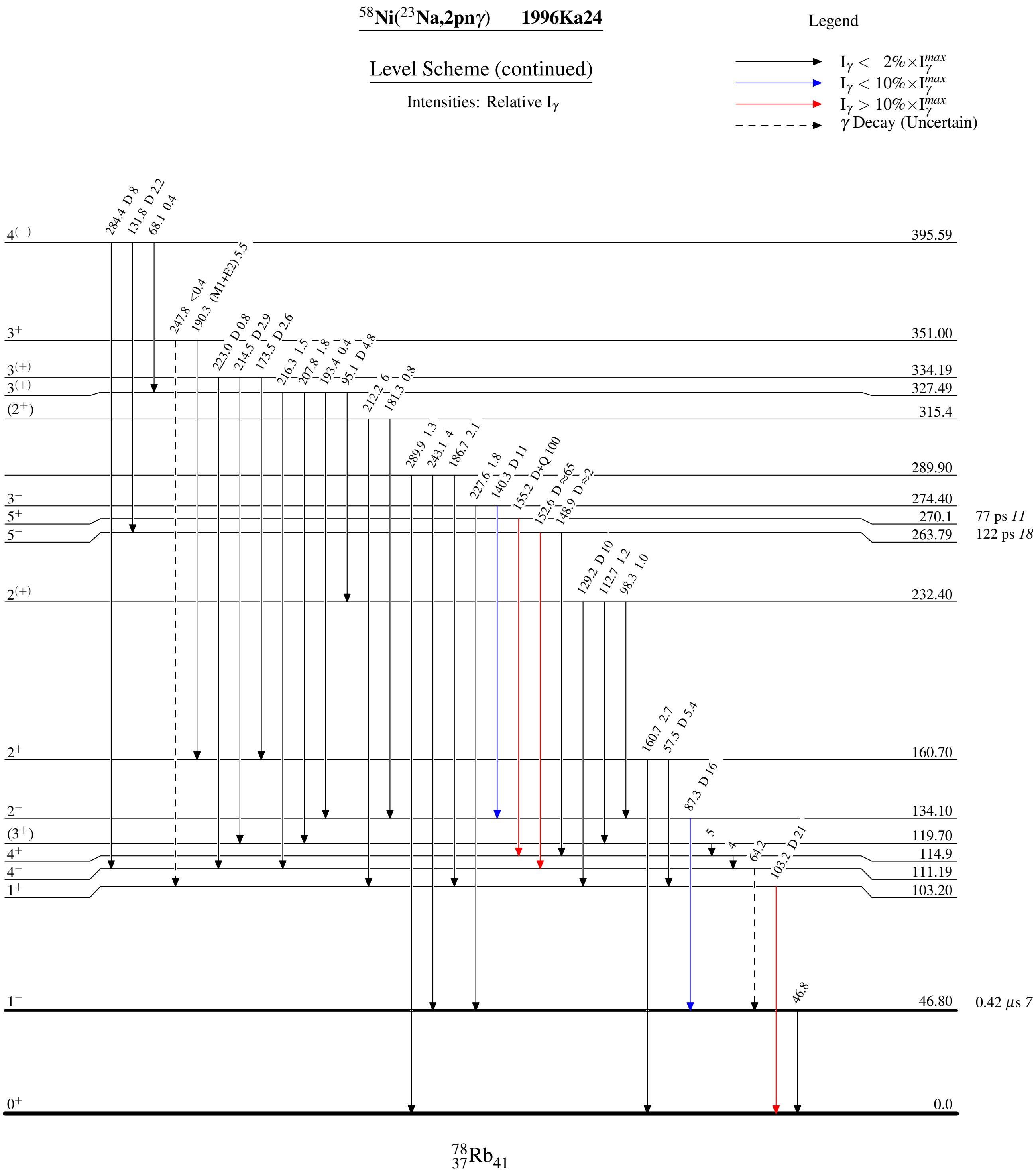
$^{58}Ni(^{23}Na,2pn\gamma)$ 1996Ka24

Level Scheme (continued)

Intensities: Relative I_γ

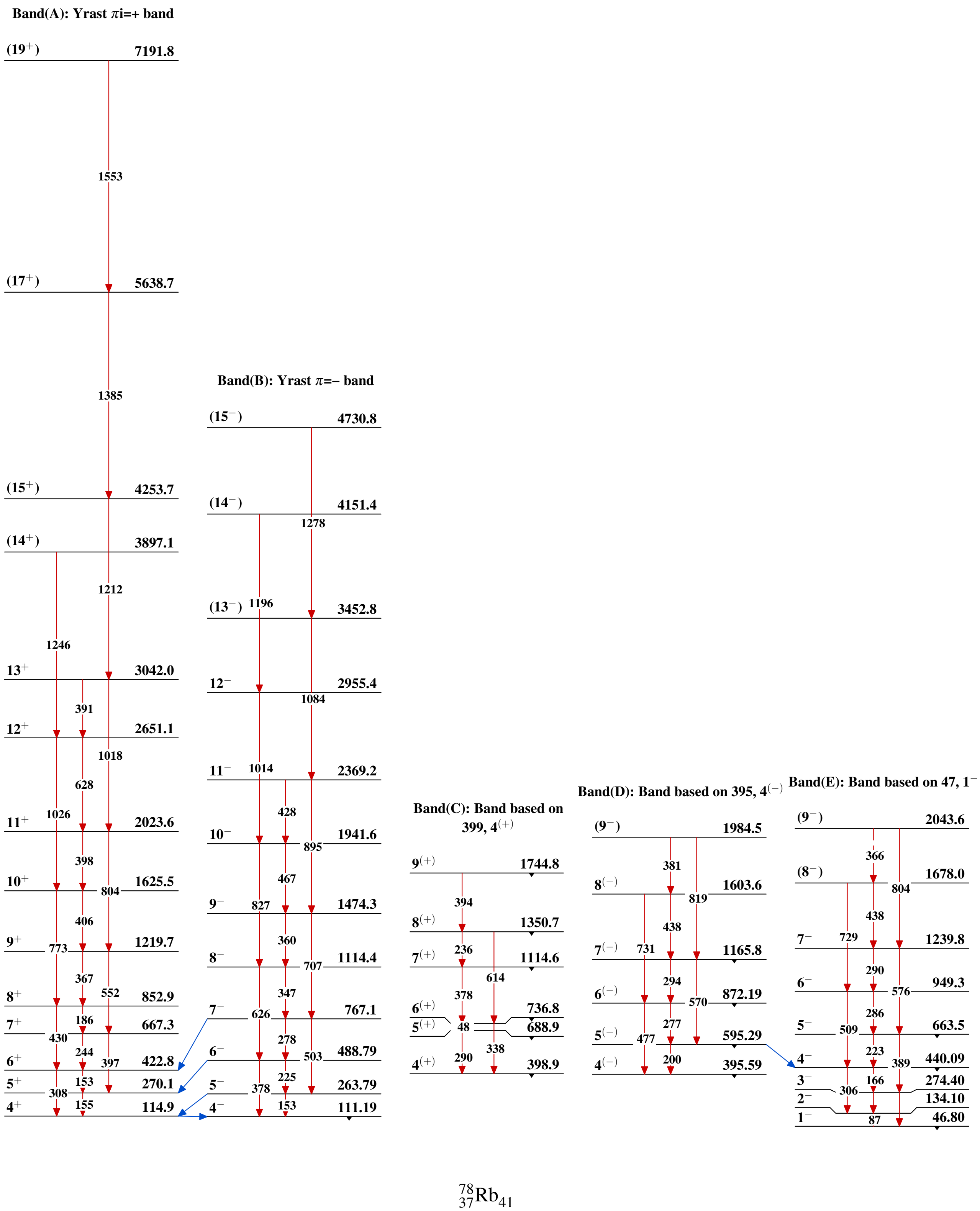


$^{78}_{37}Rb_{41}$

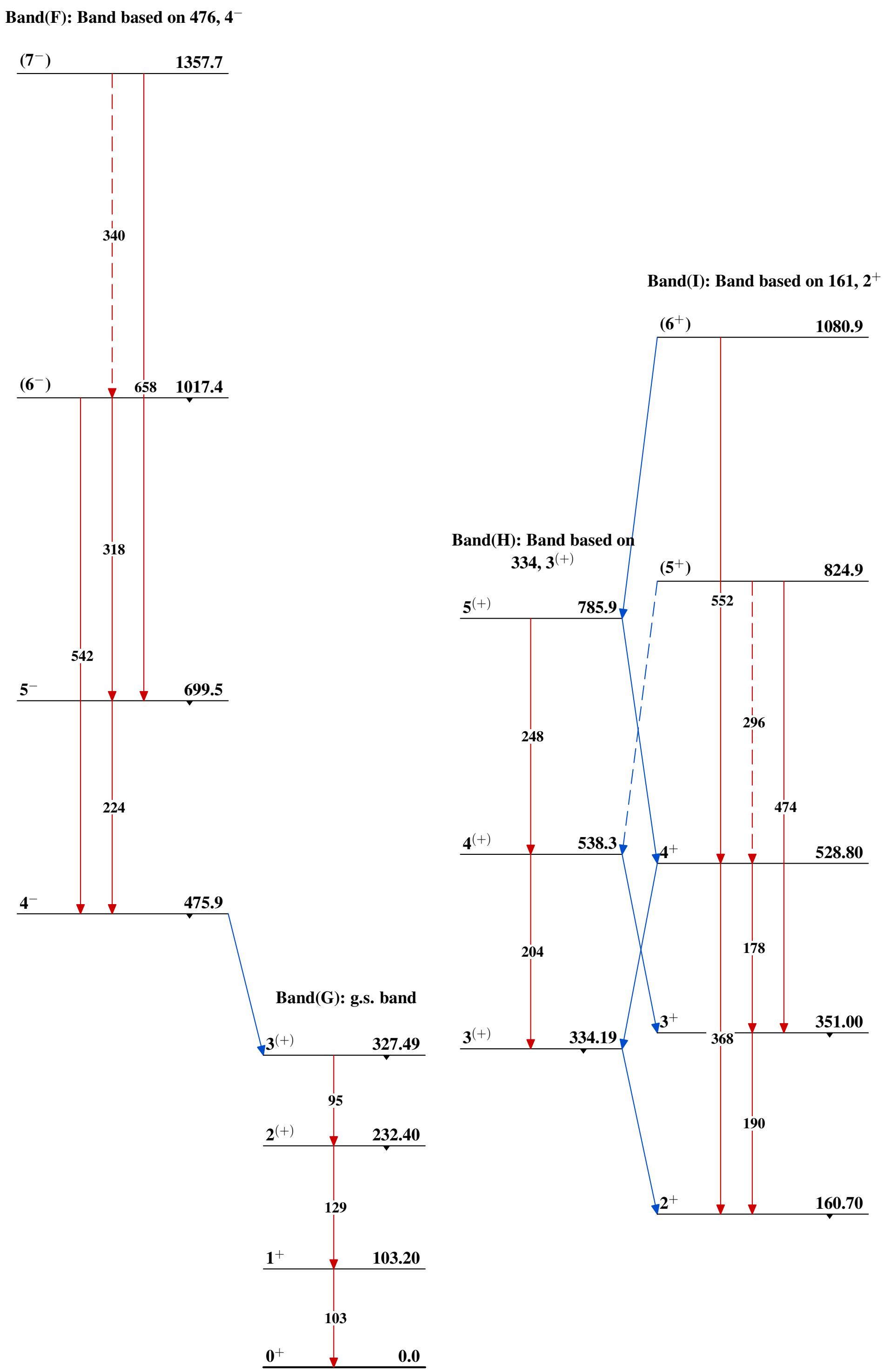


^{58}Ni(^{23}Na,2pnγ) 1996Ka24
Level Scheme (continued)
Intensities: Relative Iγ
Legend
Iγ < 2%×Iγ max
Iγ < 10%×Iγ max
Iγ > 10%×Iγ max
γ Decay (Uncertain)
4(−) 395.59
3+ 351.00
3(+) 334.19
3(+) 327.49
(2+) 315.4
289.90
3− 274.40
5+ 270.1 77 ps 11
5− 263.79 122 ps 18
2(+) 232.40
2+ 160.70
2− 134.10
(3+) 119.70
4+ 114.9
4− 111.19
1+ 103.20
1− 46.80 0.42 μs 7
0+ 0.0
$^{78}_{37}Rb_{41}$

$^{58}Ni(^{23}Na,2pn\gamma)$ 1996Ka24



^{58}Ni(^{23}Na,2pnγ) 1996Ka24 (continued)



$^{78}_{37}Rb_{41}$