Coulomb excitation

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	M. J. Martin	NDS 122, 377 (2014)	1-Sep-2014

1971Fo17	(α,α')	E=17, 18 MeV
1973Be44	(α,α')	E=17 MeV
1974Mc15	(α,α')	E=17 MeV
1986Cz02	$(^{136}Xe,^{136}Xe'\gamma)$	E=641 MeV
	$(^{58}Ni,^{58}Ni'\gamma)$	E=260 MeV
1993Pi07	$(^{208}Pb,^{208}Pb'\gamma)$	E=1100 MeV
1998Ha08	$(^{208}Pb,^{208}Pb'\gamma)$	E=1300 MeV
2002AbZV	$(^{209}Bi,^{209}Bi'\gamma)$	E=1450 MeV

^{248}Cm Levels

The B(E2) values for the 6^+ and higher levels are weighted averages of values from 1986Cz02 and 1993Pi07, except for the 26^+ and 28^+ which are reported only by 1993Pi07.

E(level)[†]	J^π	$T_{1/2}$[‡]	Comments
0.0[#]	0^+		
43.40[#]	2^+	122.5 ps *25*	Additional information 1. B(E2)=14.99 *19* (1973Be44). An earlier value of 15.0 *6* from this same group was published In 1971Fo17. Other: 13.7 *9* (1986Cz02).
143.80[#] *20*	4^+	80 ps *+14−19*	B(E2)(2^+ to 4^+)=6.4 *+19−9* (1986Cz02). B(E4)=0.00 *+36−0* (1973Be44).
298.9[#] *3*	6^+	34 ps *+11−3*	B(E2)(4^+ to 6^+)=7.3 *+5−18*.
506.4[#] *4*	8^+	16.0 ps *+31−23*	B(E2)(6^+ to 8^+)=6.5 *11*.
762.8[#] *4*	10^+	7.5 ps *+7−6*	B(E2)(8^+ to 10^+)=6.0 *5*.
1050[&] *2*	(2^+)	1.23 ps *+18−16*	B(E2)=0.180 *23* (1974Mc15).
1050[@] *2*	1^-		
1064.1[#] *4*	12^+	3.71 ps *+22−18*	B(E2)(10^+ to 12^+)=5.9 *3*.
1084[a]	0^+		
1095[@] *2*	3^-		B(E3)=0.41 *10* (1974Mc15).
1131[a] *3*	2^+		
1144[&] *2*	4^+		
1172[@] *3*	5^-		
1222[a] *3*	4^+		
1284.4[&] *8*	6^+		
1295.1[@] *5*	7^-		
1406.2[#] *5*	14^+	1.75 ps *+9−7*	B(E2)(12^+ to 14^+)=6.9 *3*.
1452.3[&] *6*	8^+		
1465.9[@] *5*	9^-		
1466.1[a] *4*	8^+		
1651.8[a] *5*	10^+		
1669.3[&] *5*	10^+		
1682.4[@] *4*	11^-		
1784.0[#] *5*	16^+	1.43 ps *+9−11*	B(E2)(14^+ to 16^+)=5.2 *+4−3*.
1880.2[a] *5*	12^+		
1929.1[&] *5*	12^+		

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Coulomb excitation (continued)

^{248}Cm Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$[‡]	Comments
1942.1[@] *5*	13^-		
2150.1[a] *5*	14^+		
2192.6[#] *5*	18^+	0.87 ps *+9−7*	B(E2)(16^+ to 18^+)=5.8 *5*.
2229.4[&] *5*	14^+		
2242.1[@] *5*	15^-		
2460.6[a] *6*	16^+		
2566.8[&] *5*	16^+		
2578.2[@] *5*	17^-		
2627.1[#] *5*	20^+	0.76 ps *+11−8*	B(E2)(18^+ to 20^+)=4.9 *6*.
2808.6[a] *8*	18^+		
2937.1[&] *6*	18^+		
2947.2[@] *6*	19^-		
3083.5[#] *6*	22^+	0.44 ps *4*	B(E2)(20^+ to 22^+)=6.7 *+6−5*.
3190.1[a] *9*	20^+		
3331.7[&] *6*	20^+		
3347.2[@] *7*	21^-		
3559.6[#] *6*	24^+	0.41 ps *+9−6*	B(E2)(22^+ to 24^+)=5.7 *10*.
3601.9[a] *11*	22^+		
3738.3[&] *7*	22^+		
3775.2[@] *8*	23^-		
4041.0[a] *12*	24^+		
4055.4[#] *7*	26^+	0.32 ps *+9−6*	B(E2)(24^+ to 26^+)=6.1 *+14−13*.
4158.1[&] *9*	24^+		
4229.6[@] *9*	25^-		
4572.4[#] *8*	28^+	0.27 ps *+18−9*	B(E2)(26^+ to 28^+)=5.8 *+29−23*.
4599.5[&] *10*	26^+		
4709.5[@] *10*	27^-		
5114.0[#] *10*	30^+		
5216.1[@] *12*	29^-		
5680.7?[#] *11*	(32^+)		

[†] No γ decay from the lower members of the $K^\pi=1^-$ octupole- vibrational band up to 5^-, or from the $K^\pi=2^+$ γ-vibrational and $K^\pi=0^+$ bands up to 6^+ has been observed. Energies for these levels have been taken from Adopted Levels, but note that the 6^+ member of the $K^\pi=0^+$ band has not been seen In any dataset.

[‡] From B(E2).

[#] Band(A): $K^\pi=0^+$ g.s. band.

[@] Band(B): $K^\pi=1^-$ octupole-vibrational band.

[&] Band(C): $K^\pi=2^+$ γ-vibrational band.

[a] Band(D): $K^\pi=0^+$ band.

Coulomb excitation (continued)

$\gamma(^{248}Cm)$

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	α[&]	Iγ[#]	Comments
43.40		43.40	2^+	0.0	0^+	E2	1000 *15*		E_γ: rounded-off value from Adopted Gammas. The transition was obscured In this reaction.
100.4 *2*	32.7 *20*	143.80	4^+	43.40	2^+	E2	18.4 *3*		E_γ: other: 100.8 *6* (1986Cz02). The line was obscured In 1993Pi07.
155.1 *2*	75 *6*	298.9	6^+	143.80	4^+	E2	2.71 *4*		E_γ: others: 154.5 *2* (1993Pi07), 155.3 *5* (1986Cz02).
167.9 *5*	≤0.32	1452.3	8^+	1284.4	6^+				I_γ: the authors report Iγ≤0.13 *19*.
171.2 *5*	0.6 *5*	1465.9	9^-	1295.1	7^-			0.57 *12*	
185.9 *4*	0.44 *32*	1651.8	10^+	1466.1	8^+			0.48 *10*	
207.4 *2*	72 *5*	506.4	8^+	298.9	6^+	E2	0.858 *12*		E_γ: others: 206.9 *1* (1993Pi07), 207.4 *4* (1986Cz02).
216.4 *4*	0.49 *23*	1682.4	11^-	1466.1	8^+			0.39 *17*	
217.1 *5*	<0.43	1669.3	10^+	1452.3	8^+			0.08 *11*	I_γ: the authors report Iγ=0.17 *26*.
228.4 *4*	0.33 *22*	1880.2	12^+	1651.8	10^+			1.65 *15*	
256.4 *2*	100 *3*	762.8	10^+	506.4	8^+	E2	0.401 *6*		E_γ: others: 255.7 *1* (1993Pi07), 256.1 *3* (1986Cz02).
259.6 *3*	1.37 *25*	1942.1	13^-	1682.4	11^-			1.76 *21*	
259.9 *4*	0.56 *22*	1929.1	12^+	1669.3	10^+			0.50 *12*	
263.5[a] *5*	≤0.073	3347.2	21^-	3083.5	22^+				I_γ: the authors report Iγ≤0.058 *15*.
270.0 *5*	0.16 *16*	2150.1	14^+	1880.2	12^+			1.26 *4*	
300.0 *3*	7 *4*	2242.1	15^-	1942.1	13^-			4.1 *11*	
300.8 *4*	0.6 *4*	2229.4	14^+	1929.1	12^+			1.0 *6*	
301.3 *2*	84 *11*	1064.1	12^+	762.8	10^+	E2	0.236 *4*		E_γ: others: 300.6 *1* (1993Pi07), 301.0 *3* (1986Cz02.
310.2 *5*	<0.19	2460.6	16^+	2150.1	14^+			1.06 *12*	I_γ: the authors report Iγ=0.094 *96*.
320.1 *5*	0.078 *20*	2947.2	19^-	2627.1	20^+			0.39 *13*	
336.2 *3*	4.8 *7*	2578.2	17^-	2242.1	15^-			9.8 *4*	
337.4 *3*	1.0 *6*	2566.8	16^+	2229.4	14^+			2.49 *20*	
342.0 *2*	76 *5*	1406.2	14^+	1064.1	12^+	E2	0.1608 *23*		E_γ: others: 341.2 *2* (1993Pi07), 1986Cz02).
348.0 *5*	0.08 *8*	2808.6	18^+	2460.6	16^+				
369.4 *4*	0.92 *8*	2947.2	19^-	2578.2	17^-			4.25 *24*	
370.3 *3*	1.2 *7*	2937.1	18^+	2566.8	16^+			0.93 *11*	
377.8 *2*	60 *4*	1784.0	16^+	1406.2	14^+	E2	0.1210 *17*		E_γ: others: 377.1 *2* (1993Pi07), 377.4 *3* (1986Cz02).
381.5 *5*	0.03 *3*	3190.1	20^+	2808.6	18^+				
385.7 *3*	1.15 *10*	2578.2	17^-	2192.6	18^+			2.59 *23*	
394.6 *4*	0.41 *26*	3331.7	20^+	2937.1	18^+			0.51 *10*	
400.0 *4*	0.64 *7*	3347.2	21^-	2947.2	19^-				
406.6 *4*	0.23 *16*	3738.3	22^+	3331.7	20^+				
408.6 *2*	41 *3*	2192.6	18^+	1784.0	16^+	E2	0.0978 *14*		E_γ: others: 408.0 *2* (1993Pi07), 407.9 *3* (1986Cz02).
411.8 *5*	0.008 *8*	3601.9	22^+	3190.1	20^+				
419.8 *5*	0.05 *4*	4158.1	24^+	3738.3	22^+				
428.0 *4*	0.34 *4*	3775.2	23^-	3347.2	21^-				
434.4 *2*	23.6 *14*	2627.1	20^+	2192.6	18^+	E2	0.0834 *12*		E_γ: others: 433.8 *2* (1993Pi07), 433.9 *3* (1986Cz02).
439.1 *5*	0.004 *4*	4041.0	24^+	3601.9	22^+				
441.4 *5*	≤0.064	4599.5	26^+	4158.1	24^+				I_γ: the authors report Iγ≤0.036 *28*.

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Coulomb excitation (continued)

$\gamma(^{248}Cm)$ (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	α[&]	$I\gamma$[#]	Comments
454.4 *4*	0.120 *17*	4229.6	25^-	3775.2	23^-				
456.4 *2*	13.5 *11*	3083.5	22^+	2627.1	20^+	E2	0.0735 *11*		E_γ: others: 455.7 *3* (1993Pi07), 456.0 *5* (1986Cz02).
458.1 *3*	5.8 *26*	2242.1	15^-	1784.0	16^+			4.6 *3*	
476.1 *2*	4.1 *5*	3559.6	24^+	3083.5	22^+	E2	0.0662 *10*		E_γ: other: 475.2 *2* (1993Pi07).
479.9 *5*	0.036 *8*	4709.5	27^-	4229.6	25^-				
495.8 *3*	2.2 *3*	4055.4	26^+	3559.6	24^+	E2	0.0601 *9*		E_γ: other: 495.8 *5* (1993Pi07).
506.6 *5*	≤0.033	5216.1	29^-	4709.5	27^-				I_γ: the authors report $I\gamma \le 0.027$ *6*.
517.0 *4*	0.50 *10*	4572.4	28^+	4055.4	26^+	E2	0.0544 *8*		E_γ: other: 516.3 *7* (1993Pi07).
535.9 *3*	2.8 *4*	1942.1	13^-	1406.2	14^+			4.46 *27*	
541.6 *5*	0.06 *4*	5114.0	30^+	4572.4	28^+				
566.7[a] *5*	≤0.065	5680.7?	(32^+)	5114.0	30^+				I_γ: the authors report $I\gamma \le 0.042$ *23*.
618.3 *3*	2.1 *3*	1682.4	11^-	1064.1	12^+			2.42 *23*	
703.1 *4*	1.23 *25*	1465.9	9^-	762.8	10^+			2.56 *19*	
704.5 *5*	≤0.07	3331.7	20^+	2627.1	20^+			0.04 *5*	I_γ: the authors report $I\gamma = 0.03$ *4*.
719.6[a] *5*	≤0.063	3347.2	21^-	2627.1	20^+				I_γ: the authors report $I\gamma \le 0.045$ *18*.
744.6 *4*	0.39 *19*	2937.1	18^+	2192.6	18^+			0.29 *9*	
754.0 *5*	0.060 *24*	2947.2	19^-	2192.6	18^+			0.31 *12*	
782.7 *4*	0.36 *19*	2566.8	16^+	1784.0	16^+			0.95 *15*	
789.0 *5*	≤0.55	1295.1	7^-	506.4	8^+				I_γ: the authors give $I\gamma \le 0.46$ *9*.
794.3 *4*	0.33 *10*	2578.2	17^-	1784.0	16^+			0.90 *21*	
822.9 *4*	0.52 *16*	2229.4	14^+	1406.2	14^+			0.93 *15*	
835.9 *4*	0.56 *16*	2242.1	15^-	1406.2	14^+			0.33 *14*	
865.2 *4*	0.95 *25*	1929.1	12^+	1064.1	12^+			1.06 *15*	
877.9 *4*	0.24 *14*	1942.1	13^-	1064.1	12^+			0.39 *16*	
906.6 *4*	0.54 *23*	1669.3	10^+	762.8	10^+			0.37 *12*	
919.6 *4*	0.15 *15*	1682.4	11^-	762.8	10^+			0.17 *18*	
946.1 *5*	0.21 *21*	1452.3	8^+	506.4	8^+				
959.0 *5*	0.06 *6*	1465.9	9^-	506.4	8^+			0.13 *12*	
996.4 *5*	≤0.045	1295.1	7^-	298.9	6^+				I_γ: the authors give $I\gamma \le 0.023$ *22*.
1054.7 *5*	<0.014	2460.6	16^+	1406.2	14^+			0.06 *7*	I_γ: the authors report $I\gamma = 0.006$ *8*.
1085.5 *5*	<0.018	2150.1	14^+	1064.1	12^+			0.08 *7*	I_γ: the authors report $I\gamma = 0.008$ *10*.
1117.4 *5*	0.022 *18*	1880.2	12^+	762.8	10^+			0.16 *8*	
1145.4 *4*	0.11 *9*	1651.8	10^+	506.4	8^+			0.21 *9*	
1167.3 *4*	0.297 *17*	1466.1	8^+	298.9	6^+				

[†] From 2002AbZV, except where noted otherwise. The authors state that the uncertainties are 0.2 keV for the strongest transitions and 0.5 keV for the weakest. The evaluator has assigned uncertainties As follows: 0.2 for $I\gamma > 10$, 0.3 for $I\gamma = 1$ to 10, 0.4 for $I\gamma = 0.1$ to 1, and 0.5 for $I\gamma < 0.1$. Others: 1993Pi07 and 1986Cz02 report values for the g.s. band. Some values of 1993Pi07 are quoted with uncertainties of 0.1 keV; however, except for the 495.8γ from the 26^+ level, where the energies are the same, the values from 1993Pi07 are all lower than those of 2002AbZV by 0.5 to 0.9 keV. For consistency among the several bands, values from 2002AbZV are adopted here and In Adopted Gammas.

[‡] Relative photon intensities (2002AbZV) normalized to $I\gamma = 100$ for the 256γ In the g.s. band.

[#] Relative photon branching from each level (2002AbZV). In addition to the relative photon intensities, the authors give photon branching ratios for some of the levels As deduced from using double coincidence gates above the level of interest.

[@] From $\gamma(\theta)$ (1986Cz02,1993Pi07) with the assumption that quadrupole transitions are E2.

[&] 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.

Coulomb excitation

Level Scheme

Intensities: Type not specified

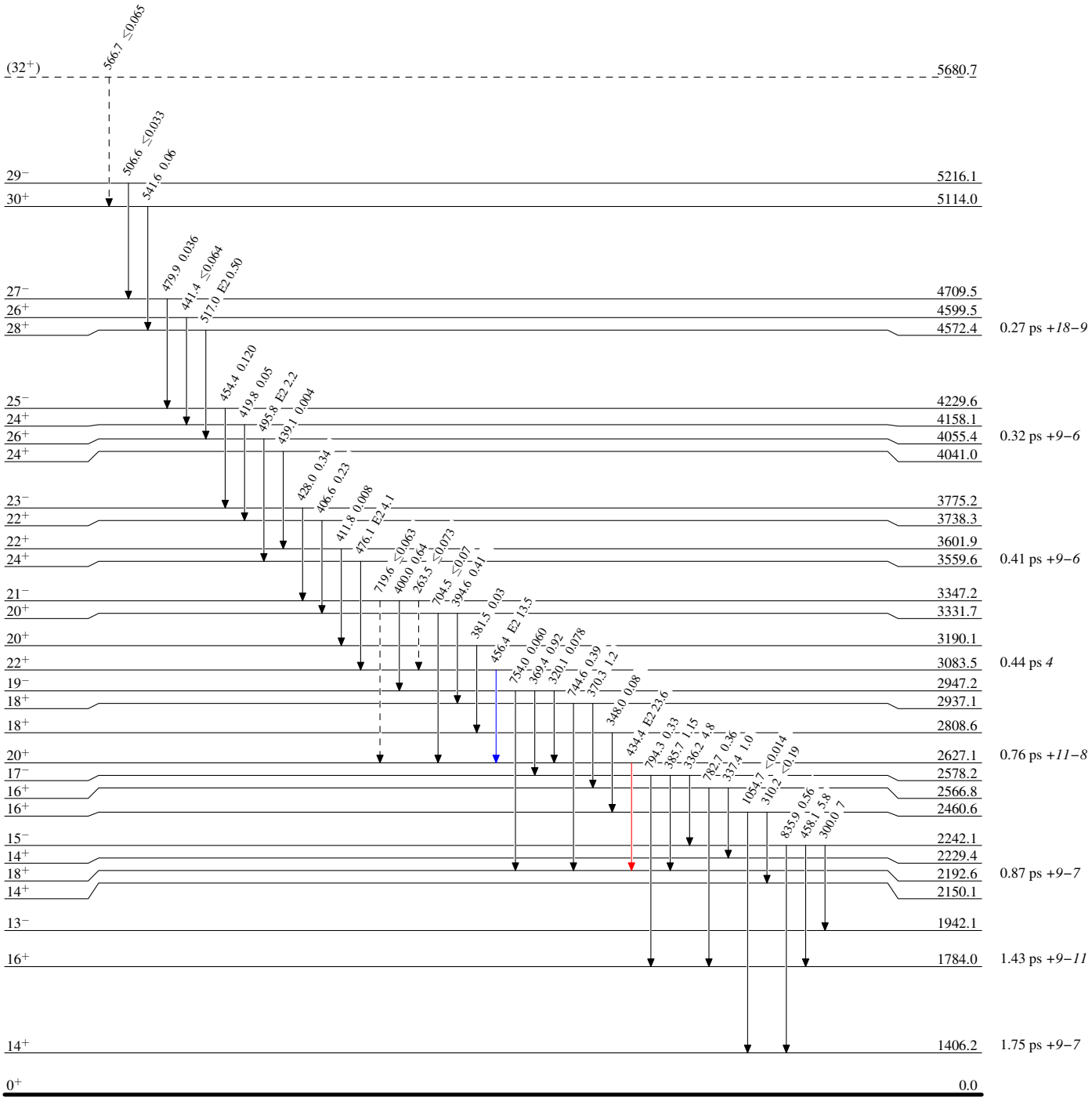
Legend

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

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

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

γ Decay (Uncertain)

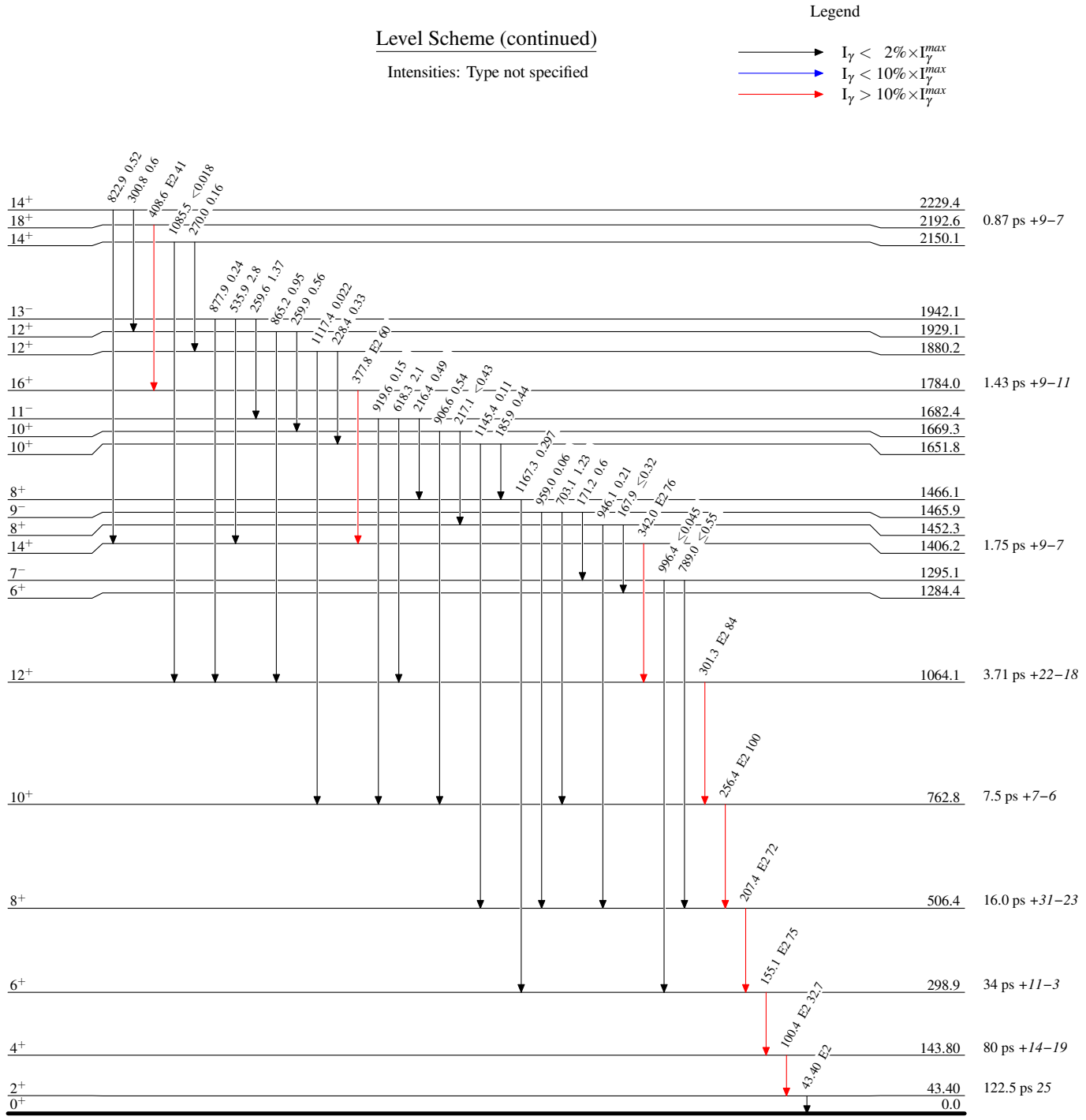


$^{248}_{96}Cm_{152}$

Coulomb excitation

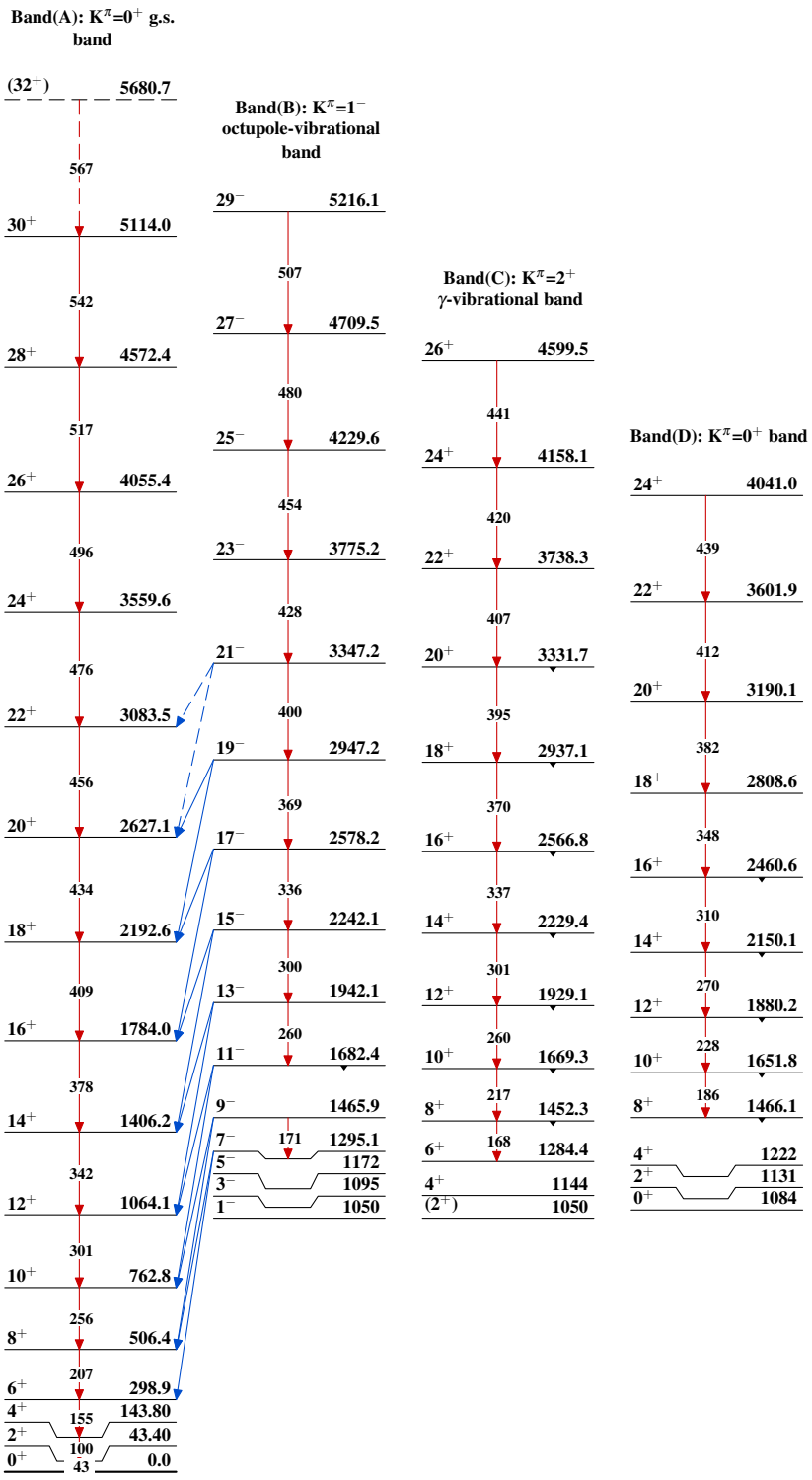
Level Scheme (continued)

Intensities: Type not specified



$^{248}_{96}Cm_{152}$

Coulomb excitation



$^{248}_{96}Cm_{152}$