^{229}Fr β^- decay 1999Fr33

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 109, 2657 (2008)	1-Jun-2008

Parent: ^{229}Fr: E=0.0; J$^\pi$=(1/2$^+$); $T_{1/2}$=50.2 s *4*; Q(β^-)=3250 *40*; %β^- decay=100.0

^{229}Fr-$T_{1/2}$: From 1992Bo05.

Other: 1992Bo05.

^{229}Fr activity produced by spallation of 1-GeV protons on an uranium target. Source was produced and mass separated at the ISOLDE-psb mass separator and deposited on to a moving tape. Measured β^-, γ-ray singles and $\beta\gamma$ coin, $\beta\gamma\gamma$ coin, and $\beta\gamma\gamma\gamma$ coin. Detectors: plastic scintillator for β^- particles; high-purity germanium for γ rays. Measured conversion electrons in singles and γ-electron coincidence experiments. Detectors: a magnetic spectrometer coupled to a Si(Li) cooled detector for conversion electrons;high-purity germanium for γ rays. Measured conversion coefficients, deduced γ-ray multipolarities. Measured $\beta\gamma\gamma$(t) triple coincidences, determined levels half-life.

^{229}Ra Levels

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	Comments
0.0[b]	5/2$^+$		
41.25[b] *9*	(7/2)$^+$		
107.04 *6*	(5/2)$^+$		Iβ^-≤8.9% (1999Fr33), not confirmed by evaluators.
137.45[c] *6*	5/2$^-$	0.66 ns *4*	Iβ^-=0.8 *2* % (1999Fr33), not confirmed by evaluators.
142.67[@] *6*	1/2$^+$	17.23 ns *12*	Iβ^-≤6.7 %, combined limit for 143- and 169-keV levels (1999Fr33), not confirmed by evaluators.
168.74[@] *6*	3/2$^+$	106 ps *18*	Iβ^-≤6.7 %, combined limit for 143- and 169-keV levels (1999Fr33), not confirmed by evaluators.
212.91[&] *6*	3/2$^+$	18 ps *14*	Iβ^-=6.5 *23* % (1999Fr33), not confirmed by evaluators.
478.86[#] *7*	1/2$^-$	≤30 ps	
501.37 *7*	(5/2$^+$)		
518.18[#] *9*	(3/2)$^-$		
541.46[#] *8*	5/2$^-$		
550.85 *9*	3/2$^-$,5/2$^-$,7/2$^-$		
563.07 *9*			
565.64[a] *8*	3/2$^-$		
598.26 *10*			
665.07 *11*			
752.91 *9*	(1/2,3/2)$^-$		
773.2 *3*			
813.88 *14*			
835.90 *19*			
870.88 *11*			
934.62 *18*			
1042.0 *3*			
1322.64 *22*			
1340.01 *14*			
1376.12 *20*			
1410.09 *11*			
1424.87 *7*			
1437.02 *14*			
1461.30 *11*			
1608.76 *15*			
1696.84 *18*			
1720.54 *19*			

† Deduced by evaluators from least-squares fit to γ-ray energies.

Continued on next page (footnotes at end of table)

^{229}Fr β^- decay 1999Fr33 (continued)

^{229}Ra Levels (continued)

‡ Spin and parity assignments are based on γ-ray multipolarities and on rotational structure. Because of the high octupole components in the wave functions of low-energy states, rotational levels are seen with partners of the same K angular momentum projection and opposite parities ("parity doublets.") This interpretation has been confirmed by the enhanced E1 γ-ray transition probabilities between parity pair states.

\# Band(A): K^π=1/2$^-$ parity doublet band. 1/2[501].

@ Band(a): K^π=1/2$^+$ parity doublet band. 1/2[631].

& Band(B): K^π=3/2$^+$ parity doublet band. 3/2[631].

^{a} Band(b): K^π=3/2$^-$ parity doublet band. 3/2[761].

^{b} Band(C): K^π=5/2$^+$ parity doublet band. 5/2[633].

^{c} Band(c): K^π=5/2$^-$ parity doublet band. 5/2[752].

β^- radiations

E(decay)	E(level)	Iβ^- †‡	Log *ft*	Comments
(1.53×10^3 *4*)	1720.54	2.0 *7*	6.30 *16*	av Eβ=529 *16*
(1.55×10^3 *4*)	1696.84	0.62 *6*	6.84 *6*	av Eβ=539 *16*
(1.64×10^3 *4*)	1608.76	1.08 *9*	6.68 *6*	av Eβ=574 *17*
(1.79×10^3 *4*)	1461.30	3.62 *24*	6.30 *5*	av Eβ=634 *17*
(1.81×10^3 *4*)	1437.02	1.8 *3*	6.62 *8*	av Eβ=644 *17*
(1.83×10^3 *4*)	1424.87	7.2 *5*	6.03 *5*	av Eβ=649 *17*
(1.84×10^3 *4*)	1410.09	≤1.2	≥6.8	av Eβ=655 *17*
(1.87×10^3 *4*)	1376.12	0.33 *4*	7.41 *7*	av Eβ=668 *17*
(1.91×10^3 *4*)	1340.01	0.49 *6*	7.27 *7*	av Eβ=683 *17*
(1.93×10^3 *4*)	1322.64	0.42 *5*	7.35 *7*	av Eβ=690 *17*
(2.21×10^3 *4*)	1042.0	0.84 *11*	7.28 *7*	av Eβ=806 *17*
(2.32×10^3 *4*)	934.62	0.73 *15*	7.42 *10*	av Eβ=850 *17*
(2.38×10^3 *4*)	870.88	0.36 *10*	7.77 *13*	av Eβ=877 *17*
(2.41×10^3 *4*)	835.90	0.78 *16*	7.46 *10*	av Eβ=892 *17*
(2.44×10^3 *4*)	813.88	0.28 *13*	7.92 *21*	av Eβ=901 *17*
(2.48×10^3 *4*)	773.2	0.21 *5*	8.07 *11*	av Eβ=918 *17*
(2.50×10^3 *4*)	752.91	0.52 *9*	7.69 *8*	av Eβ=926 *17*
(2.58×10^3 *4*)	665.07	0.90 *8*	7.51 *5*	av Eβ=963 *17*
(2.65×10^3 *4*)	598.26	0.83 *6*	7.59 *4*	av Eβ=991 *17*
(2.68×10^3 *4*)	565.64	0.35 *11*	7.98 *14*	av Eβ=1005 *17*
(2.69×10^3 *4*)	563.07	0.90 *12*	7.57 *7*	av Eβ=1006 *17*
(2.70×10^3 *4*)	550.85	0.51 *6*	7.83 *6*	av Eβ=1011 *17*
(2.71×10^3 *4*)	541.46	0.51 *10*	7.83 *9*	av Eβ=1015 *17*
(2.73×10^3 *4*)	518.18	9.3 *4*	6.59 *4*	av Eβ=1025 *17*
(2.75×10^3 *4*)	501.37	≤0.4	≥8.0	av Eβ=1032 *17*
(2.77×10^3 *4*)	478.86	57 *2*	5.82 *3*	av Eβ=1041 *17*

† Deduced by evaluators from γ-ray transition intensity balance to levels in ^{229}Ra. Total β^- feeding to levels above 213 keV is 92% 3. The remaining 8% 2 feeds mostly the 142.7−(1/2$^+$), 168.8−(3/2$^+$), and 213.0-keV(3/2$^+$) levels. Evaluators have considered very imprecise and inconsistent with γ-ray data the individual values deduced for the β^- feeding to each of these levels.

‡ Absolute intensity per 100 decays.

$\gamma(^{229}Ra)$

Iγ normalization: Deduced by evaluators assuming Σ I(γ+ce) (γ rays to g.s. and 41-keV levels, excepting the 41.3-keV γ ray)= 100%. This value is in fair agreement with Iγ normalization=0.02087, reported in 1999Fr33.

E_γ	I_γ ‡	E_i(level)	J^π_i	E_f	J^π_f	Mult. †	δ †	α #	$I_{(\gamma+ce)}$ ‡	Comments
26.1		168.74	3/2+	142.67	1/2+				≤1.6	
35.6		142.67	1/2+	107.04	(5/2)+	(E2)			≤1.8	Mult.: From α(exp)≥516, deduced from decay scheme transition intensity balance.
41.3		41.25	(7/2)+	0.0	5/2+	M1(+E2)			≤2.2	Mult.: From α(exp)≥390, deduced from decay scheme transition intensity balance.
44.3 *2*	4.1 *5*	212.91	3/2+	168.74	3/2+	M1+E2	0.95 *33*	2.4×10^{2} *9*		α(L)=1.8×10^{2} *7*; α(M)=48 *18*; α(N+..)=16 *6* α(N)=13 *5*; α(O)=2.7 *10*; α(P)=0.39 *14*; α(Q)=0.0034 *7* Mult.: From α(L1)exp+α(L2)exp=100 *30*. δ deduced by evaluators.
61.8 *1*	20.5 *15*	168.74	3/2+	107.04	(5/2)+	M1		12.62		α(L)=9.57 *15*; α(M)=2.29 *4*; α(N+..)=0.768 *12* α(N)=0.604 *9*; α(O)=0.1378 *21*; α(P)=0.0240 *4*; α(Q)=0.00189 *3* Mult.: From α(L1)exp + α(L2)exp= 5.2 *8*, α(M)exp=3.2 *5*.
65.8 *1*	81 *6*	107.04	(5/2)+	41.25	(7/2)+	M1		10.51		α(L)=7.96 *12*; α(M)=1.91 *3*; α(N+..)=0.639 *10* α(N)=0.503 *8*; α(O)=0.1147 *17*; α(P)=0.0200 *3*; α(Q)=0.001572 *23* Mult.: From α(L1)exp + α(L2)exp=6.6 *9*, α(L3)exp≤0.26, α(M)exp=2.05 *14*.
70.3 *2*	2.6 *4*	212.91	3/2+	142.67	1/2+					
75.1@ *1*	3.1 *12*	212.91	3/2+	137.45	5/2−					
96.2 *1*	15.4 *11*	137.45	5/2−	41.25	(7/2)+	E1		0.1223		α(L)=0.0927 *14*; α(M)=0.0224 *4*; α(N+..)=0.00728 *11* α(N)=0.00581 *9*; α(O)=0.001264 *18*; α(P)=0.000197 *3*; α(Q)=9.69×10^{-6} *14* Mult.: From α(L1)exp + α(L2)exp≤0.31.
105.9 *1*	8.2 *7*	212.91	3/2+	107.04	(5/2)+					
107.1 *1*	46 *3*	107.04	(5/2)+	0.0	5/2+	M1		12.77		α(K)=10.22 *15*; α(L)=1.93 *3*; α(M)=0.462 *7*; α(N+..)=0.1550 *23* α(N)=0.1219 *18*; α(O)=0.0278 *4*; α(P)=0.00485 *7*; α(Q)=0.000381 *6* Mult.: From α(L1)exp + α(L2)exp=1.53 *22*, α(L3)exp≤0.25, α(M)exp=0.77 *11*, α(N)exp=0.28 *9*.
137.5 *1*	149 *7*	137.45	5/2−	0.0	5/2+	E1		0.222		α(K)=0.1746 *25*; α(L)=0.0363 *6*; α(M)=0.00871 *13*; α(N+..)=0.00285 *4* α(N)=0.00227 *4*; α(O)=0.000499 *7*; α(P)=7.99×10^{-5} *12*; α(Q)=4.35×10^{-6} *7* Mult.: From α(K)exp≤0.94, α(L1)exp + α(L2)exp= 0.017 *7*, α(L3)exp≤0.041.

From ENSDF

^{229}Fr β^- decay 1999Fr33 (continued)

$\gamma(^{229}Ra)$ (continued)

E_γ	I_γ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.†	δ†	α#	Comments
142.7 *1*	739 *25*	142.67	$1/2^+$	0.0	$5/2^+$	E2		2.14	α(K)=0.279 *4*; α(L)=1.369 *20*; α(M)=0.372 *6*; α(N+..)=0.1223 *18* α(N)=0.0982 *14*; α(O)=0.0209 *3*; α(P)=0.00306 *5*; α(Q)=1.83×10^{-5} *3* Mult.: From α(K)exp≤0.48, α(L1)exp + α(L2)exp = 0.72 *9*, α(L3)exp= 0.35 *4*, α(M)exp=0.26 *3*, α(N)exp=0.080 *10*.
149.4@ *2*	9.2 *6*	813.88		665.07					
168.8 *1*	70 *3*	168.74	$3/2^+$	0.0	$5/2^+$	M1		3.53	α(K)=2.83 *4*; α(L)=0.525 *8*; α(M)=0.1255 *18*; α(N+..)=0.0421 *6* α(N)=0.0331 *5*; α(O)=0.00755 *11*; α(P)=0.001317 *19*; α(Q)=0.0001032 *15* Mult.: From α(K)exp=3.1 *4*, α(L1)exp + α(L2)exp= 0.32 *5*, α(L3)exp=0.015 *8*, α(M)exp= 0.07 *4*.
211.5 *1*	5.9 *9*	752.91	$(1/2,3/2)^-$	541.46	$5/2^-$				
212.9 *1*	59 *4*	212.91	$3/2^+$	0.0	$5/2^+$	M1(+E2)		1.2 *7*	α(K)=0.8 *7*; α(L)=0.256 *18*; α(M)=0.0648 *10*; α(N+..)=0.0215 *5* α(N)=0.0171 *3*; α(O)=0.00378 *15*; α(P)=0.00061 *7*; α(Q)=3.0×10^{-5} *24* Mult.: From α(K)exp=1.05 *14*, α(L1)exp + α(L2)exp=0.27 *4*, α(M)exp=0.10 *3*.
^{x}217.6 *1*	9.8 *10*					M1+E2	1.0 *5*		Mult.: From α(K)exp=0.75 *25*, α(M)exp≤0.38. δ deduced by evaluators.
266.0 *1*	185 *6*	478.86	$1/2^-$	212.91	$3/2^+$	E1		0.0462	α(K)=0.0372 *6*; α(L)=0.00690 *10*; α(M)=0.001645 *23*; α(N+..)=0.000543 *8* α(N)=0.000430 *6*; α(O)=9.60×10^{-5} *14*; α(P)=1.593×10^{-5} *23*; α(Q)=1.008×10^{-6} *15* Mult.: From α(K)exp=0.046 *10*.
274.1 *1*	9.3 *6*	752.91	$(1/2,3/2)^-$	478.86	$1/2^-$	M1(+E2)	0.3 *5*	0.85 *22*	α(K)=0.68 *20*; α(L)=0.130 *16*; α(M)=0.031 *3*; α(N+..)=0.0105 *11* α(N)=0.0083 *8*; α(O)=0.00188 *20*; α(P)=0.00033 *5*; α(Q)=2.5×10^{-5} *7* Mult.: From α(K)exp=0.66 *15*. δ deduced by evaluators.
305.3 *3*	13.9 *12*	518.18	$(3/2)^-$	212.91	$3/2^+$				
310.1 *1*	1394 *56*	478.86	$1/2^-$	168.74	$3/2^+$	E1		0.0327	α(K)=0.0263 *4*; α(L)=0.00479 *7*; α(M)=0.001141 *16*; α(N+..)=0.000377 *6* α(N)=0.000299 *5*; α(O)=6.68×10^{-5} *10*; α(P)=1.116×10^{-5} *16*; α(Q)=7.27×10^{-7} *11* Mult.: From α(K)exp=0.020 *3*, α(L1)exp + α(L2)exp=0.0058 *13*.
310.3 *4*	75 *29*	1720.54		1410.09					
332.5 *1*	8.1 *11*	501.37	$(5/2^+)$	168.74	$3/2^+$				
334.3 *5*	18 *6*	835.90		501.37	$(5/2^+)$				
336.2 *1*	1000	478.86	$1/2^-$	142.67	$1/2^+$	E1		0.0273	α(K)=0.0221 *3*; α(L)=0.00397 *6*; α(M)=0.000945 *14*; α(N+..)=0.000313 *5* α(N)=0.000247 *4*; α(O)=5.54×10^{-5} *8*; α(P)=9.29×10^{-6} *13*; α(Q)=6.14×10^{-7} *9* Mult.: From α(K)exp=0.0172 *22*, α(L1)exp + α(L2)exp = 0.0039 *16*.

$^{229}_{88}Ra_{141}$-4

γ(^{229}Ra) (continued)

E_γ	I_γ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.†	δ†	α#	Comments
341.4 *1*	19.6 *9*	478.86	1/2⁻	137.45	5/2⁻	(E2)		0.1041	α(K)=0.0542 *8*; α(L)=0.0369 *6*; α(M)=0.00973 *14*; α(N+..)=0.00322 *5* α(N)=0.00257 *4*; α(O)=0.000558 *8*; α(P)=8.58×10^{-5} *12*; α(Q)=2.10×10^{-6} *3* Mult.: From α(K)exp= 0.10 *7*.
349.5 *1*	308 *12*	518.18	(3/2)⁻	168.74	3/2⁺	E1			From α(K)exp=0.024 *4*.
352.7 *1*	8.7 *5*	565.64	3/2⁻	212.91	3/2⁺				
358.7 *1*	53 *4*	501.37	(5/2⁺)	142.67	1/2⁺	(E2)			From α(K)exp=0.051 *23*.
363.9 *1*	4.8 *8*	501.37	(5/2⁺)	137.45	5/2⁻				
372.8 *2*	6.8 *8*	541.46	5/2⁻	168.74	3/2⁺				α(K)exp≤0.52.
375.5 *2*	153 *5*	518.18	(3/2)⁻	142.67	1/2⁺				
380.6 *4*	5.7 *15*	518.18	(3/2)⁻	137.45	5/2⁻				
394.8 *2*	25 *4*	563.07		168.74	3/2⁺				
398.7 *1*	30.2 *23*	541.46	5/2⁻	142.67	1/2⁺				
404.1 *1*	14.9 *16*	541.46	5/2⁻	137.45	5/2⁻	(M1)		0.315	α(K)=0.254 *4*; α(L)=0.0462 *7*; α(M)=0.01103 *16*; α(N+..)=0.00369 *6* α(N)=0.00291 *4*; α(O)=0.000663 *10*; α(P)=0.0001157 *17*; α(Q)=9.07×10^{-6} *13* Mult.: From α(K)exp=0.29 *15*.
413.6 *2*	8.4 *15*	550.85	3/2⁻,5/2⁻,7/2⁻	137.45	5/2⁻	M1(+E2)	0.2 *9*	0.29 *12*	α(K)=0.23 *11*; α(L)=0.042 *13*; α(M)=0.010 *3*; α(N+..)=0.0034 *10* α(N)=0.0027 *8*; α(O)=0.00061 *18*; α(P)=0.00011 *4*; α(Q)=8.E−6 *4* Mult.: From α(K)exp=0.23 *7*. δ deduced by evaluators.
428.1 *1*	40.1 *23*	565.64	3/2⁻	137.45	5/2⁻	M1(+E2)	0.41 *35*	0.24 *5*	α(K)=0.19 *4*; α(L)=0.036 *6*; α(M)=0.0087 *12*; α(N+..)=0.0029 *4* α(N)=0.0023 *3*; α(O)=0.00052 *7*; α(P)=9.0×10^{-5} *14*; α(Q)=6.8×10^{-6} *15* Mult.: From α(K)exp=0.19 *4*. δ deduced by evaluators.
441.5 *1*	15.4 *14*	1376.12		934.62					
455.6 *1*	17.7 *13*	598.26		142.67	1/2⁺				α(K)exp=0.05 *3*.
ˣ484.0 *1*	12.3 *25*								
522.4 *1*	18.9 *13*	665.07		142.67	1/2⁺				
525.6@ *1*	26.0 *17*	1461.30		934.62					α(K)exp≤0.18.
550.8 *1*	12.9 *13*	550.85	3/2⁻,5/2⁻,7/2⁻	0.0	5/2⁺				
560.3 *3*	9.9 *21*	773.2		212.91	3/2⁺				
562.9 *1*	35.7 *24*	563.07		0.0	5/2⁺				
ˣ574.1 *2*	9.1 *19*								
587.1 *1*	22.9 *23*	1340.01		752.91	(1/2,3/2)⁻				
590.0 *2*	31 *3*	1461.30		870.88					
598.2 *2*	20.7 *21*	598.26		0.0	5/2⁺				
601.0 *2*	5.1 *12*	813.88		212.91	3/2⁺				
ˣ606.6 *2*	17.0 *19*								

From ENSDF

^{229}Fr β^- decay 1999Fr33 (continued)

γ(^{229}Ra) (continued)

E$_\gamma$	I$_\gamma$‡	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$
611.1 *4*	22 *5*	1424.87		813.88	
615.1 *2*	24.0 *24*	752.91	(1/2,3/2)$^-$	137.45	5/2$^-$
^{x}623.7 *3*	15 *3*				
625.6 *3*	16.8 *19*	1461.30		835.90	
^{x}627.2 *3*	12.2 *16*				
^{x}633.1 *2*	11.3 *10*				
^{x}641.8 *3*	9 *3*				
645.4@ *2*	22.6 *19*	752.91	(1/2,3/2)$^-$	107.04	(5/2)$^+$
^{x}661.0 *2*	18.9 *19*				
665.1 *3*	23 *3*	665.07		0.0	5/2$^+$
667.7 *4*	17 *3*	835.90		168.74	3/2$^+$
671.2 *2*	30 *3*	813.88		142.67	1/2$^+$
693.2 *3*	18.3 *24*	835.90		142.67	1/2$^+$
^{x}699.2 *3*	16 *3*				
727.9 *2*	14.2 *14*	870.88		142.67	1/2$^+$
^{x}734.9 *2*	16.0 *17*				
757.0 *2*	19.6 *20*	1322.64		565.64	3/2$^-$
763.6 *2*	9.8 *14*	870.88		107.04	(5/2)$^+$
^{x}790.6 *3*	12 *3*				
792.1 *3*	24 *6*	934.62		142.67	1/2$^+$
827.5 *2*	25.4 *25*	934.62		107.04	(5/2)$^+$
844.3 *2*	8.4 *10*	1410.09		565.64	3/2$^-$
858.9 *2*	14.2 *23*	1424.87		565.64	3/2$^-$
861.6 *2*	18.8 *22*	1424.87		563.07	
871.0 *2*	23.8 *22*	870.88		0.0	5/2$^+$
883.3 *2*	27 *3*	1424.87		541.46	5/2$^-$
899.4 *3*	33 *4*	1042.0		142.67	1/2$^+$
908.6 *2*	28 *3*	1410.09		501.37	(5/2$^+$)
919.1 *2*	14 *3*	1437.02		518.18	(3/2)$^-$
923.1 *2*	13.9 *17*	1424.87		501.37	(5/2$^+$)

E$_\gamma$	I$_\gamma$‡	E$_i$(level)	E$_f$	J$^\pi_f$
^{x}928.5 *2*	14.6 *15*			
^{x}935.7 *2*	21.8 *25*			
^{x}938.7 *4*	17 *4*			
943.1 *2*	15.6 *16*	1461.30	518.18	(3/2)$^-$
^{x}959.0 *3*	20 *3*			
^{x}965.5 *2*	21.4 *21*			
^{x}983.6 *1*	36 *4*			
1041.7 *6*	6 *3*	1042.0	0.0	5/2$^+$
^{x}1080.7 *2*	19.1 *19*			
1178.6 *2*	17.9 *18*	1696.84	518.18	(3/2)$^-$
1197.3 *2*	21.3 *21*	1410.09	212.91	3/2$^+$
^{x}1212.3 *2*	10.1 *10*			
1248.4 *2*	8.9 *10*	1461.30	212.91	3/2$^+$
1256.2 *1*	172 *17*	1424.87	168.74	3/2$^+$
1267.5 *4*	28 *9*	1410.09	142.67	1/2$^+$
1267.9 *2*	60 *12*	1437.02	168.74	3/2$^+$
1282.3 *1*	61 *6*	1424.87	142.67	1/2$^+$
1288.0 *3*	6.5 *10*	1424.87	137.45	5/2$^-$
1292.8 *2*	90 *9*	1461.30	168.74	3/2$^+$
1300.1 *4*	4.7 *10*	1437.02	137.45	5/2$^-$
^{x}1318.6 *3*	11.2 *11*			
1324.0 *3*	6.1 *15*	1461.30	137.45	5/2$^-$
^{x}1373.5 *3*	6.0 *11*			
1395.7 *3*	5.3 *10*	1437.02	41.25	(7/2)$^+$
1410.3 *3*	2.5 *5*	1410.09	0.0	5/2$^+$
1440.0 *2*	29 *3*	1608.76	168.74	3/2$^+$
1466.1 *2*	21.3 *21*	1608.76	142.67	1/2$^+$
1554.3 *3*	10.9 *14*	1696.84	142.67	1/2$^+$
1577.9 *2*	15.9 *16*	1720.54	142.67	1/2$^+$

† From measured conversion coefficients.

‡ For absolute intensity per 100 decays, multiply by 0.0215 *6*.

\# 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.

@ Placement of transition in the level scheme is uncertain.

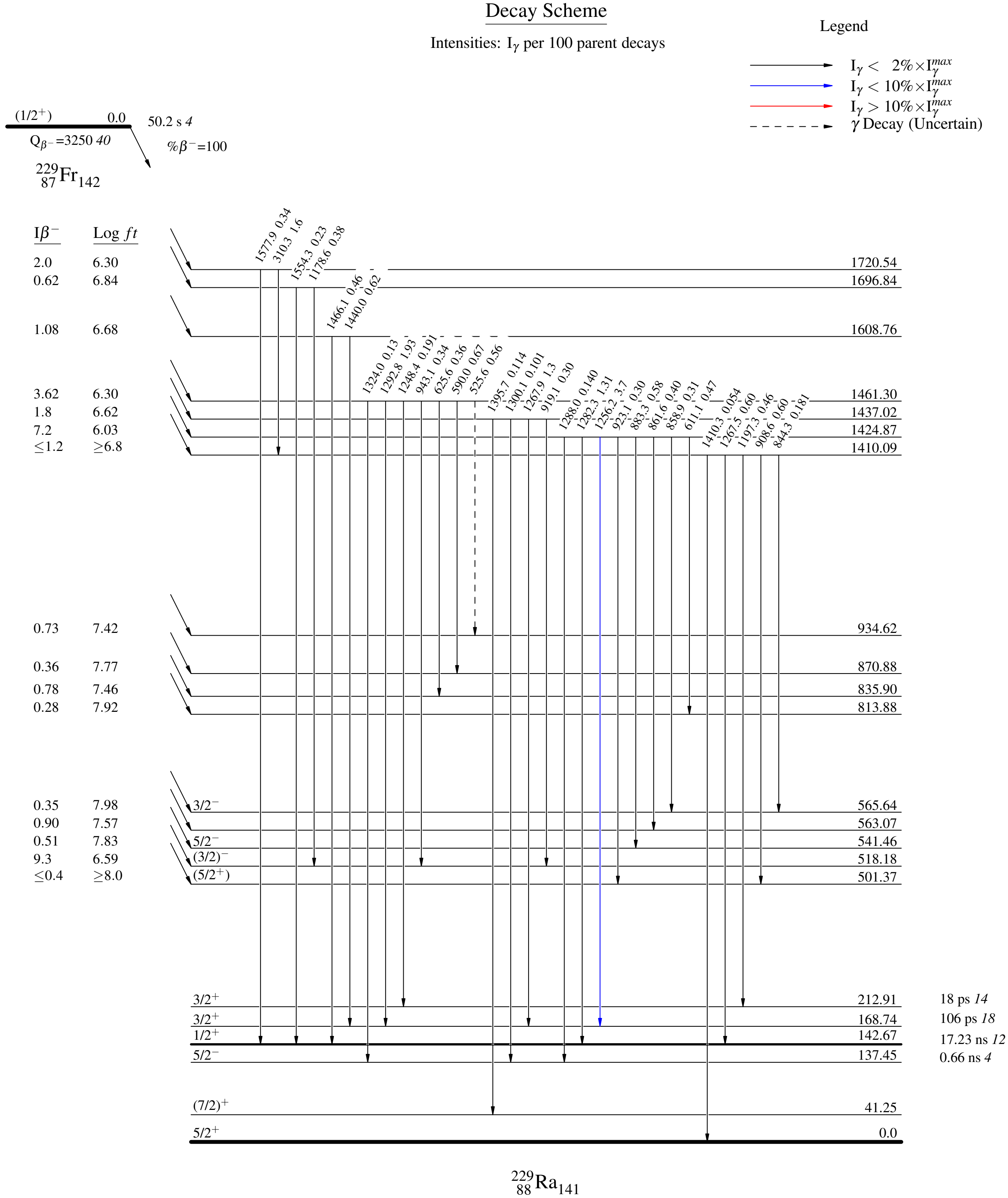
^{x} γ ray not placed in level scheme.

$^{229}_{88}$Ra$_{141}$-6

^{229}Fr β^- decay 1999Fr33

Decay Scheme

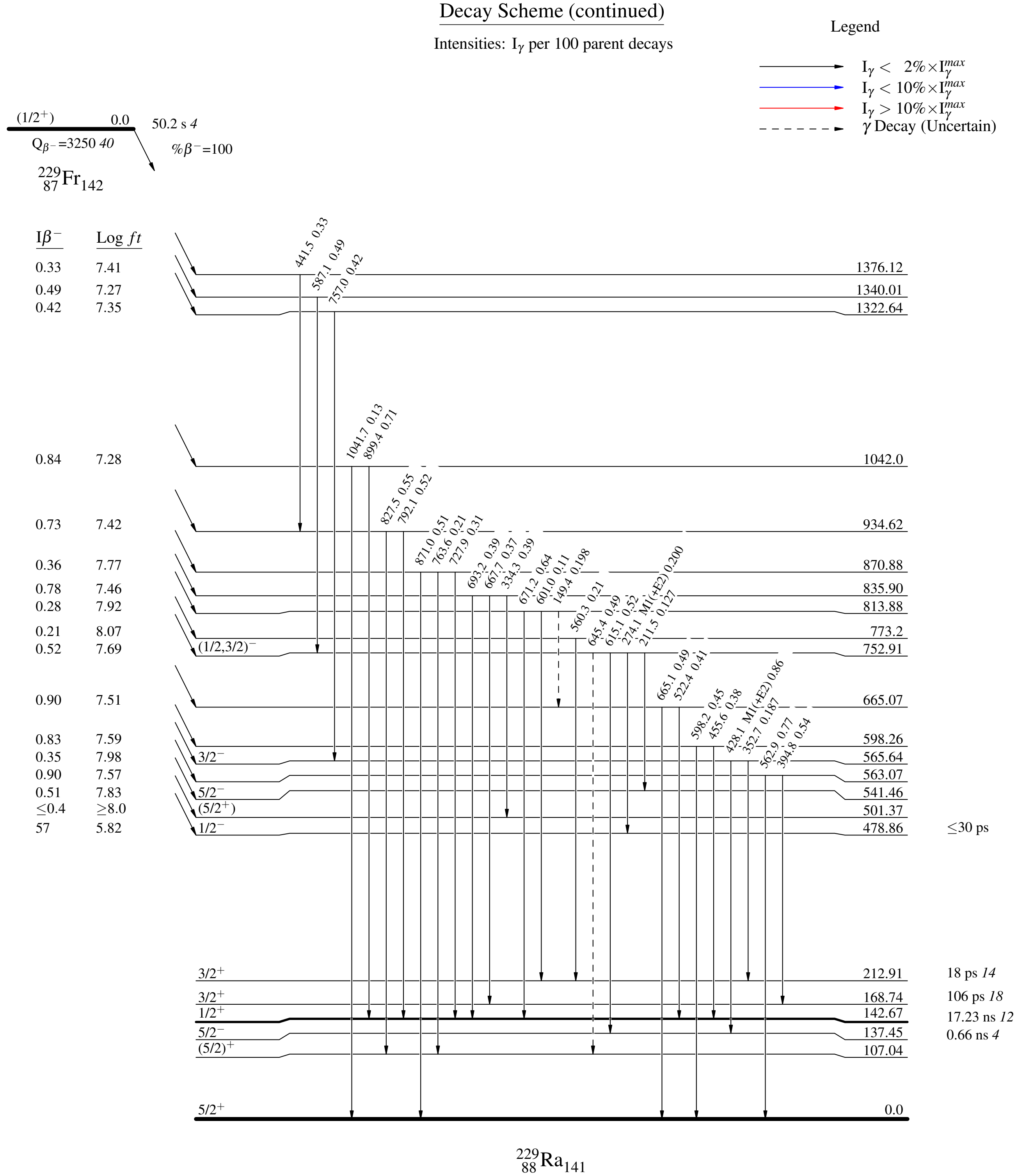
Intensities: I_γ per 100 parent decays



^{229}Fr β^- decay 1999Fr33

Decay Scheme (continued)

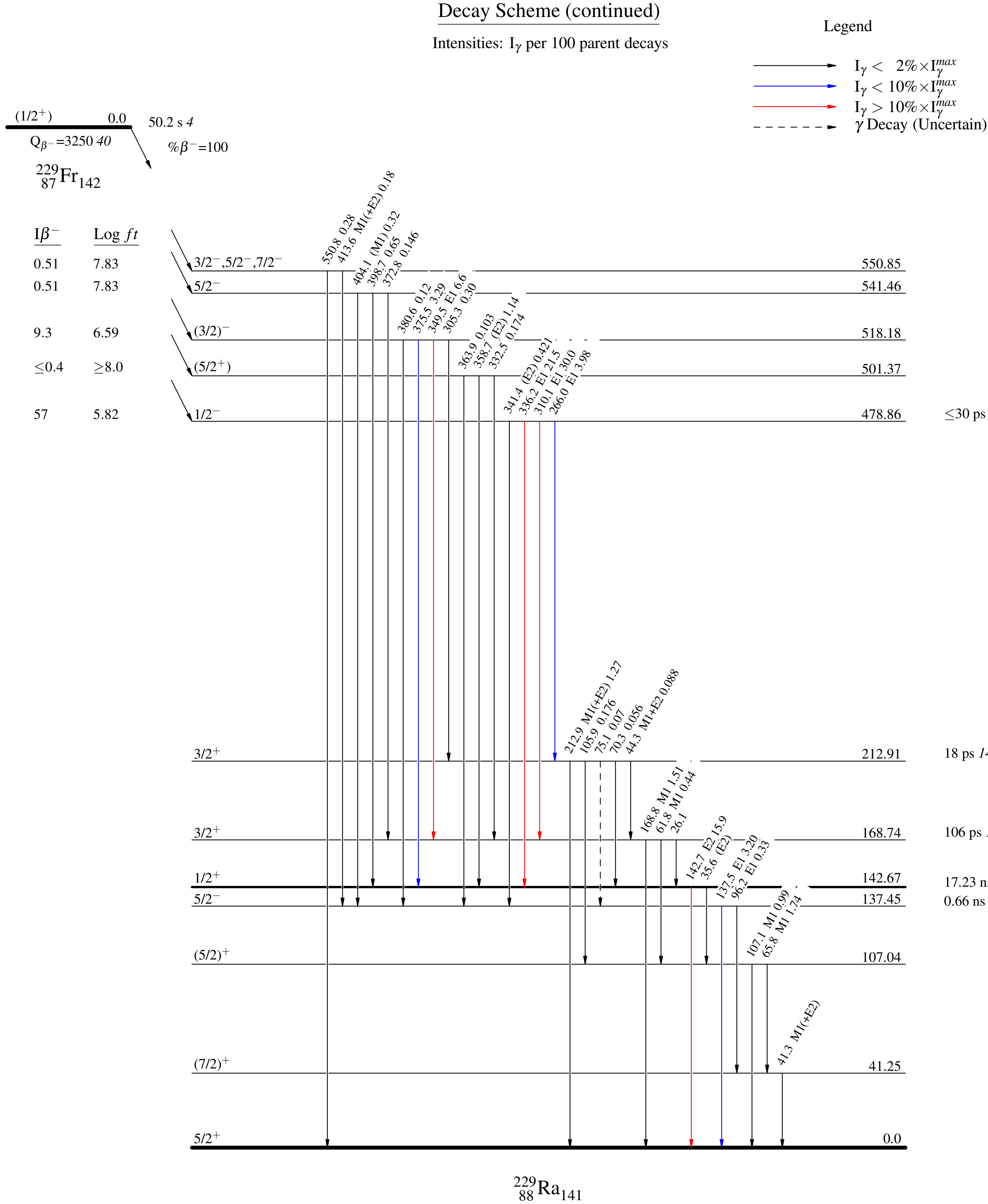
Intensities: I_γ per 100 parent decays



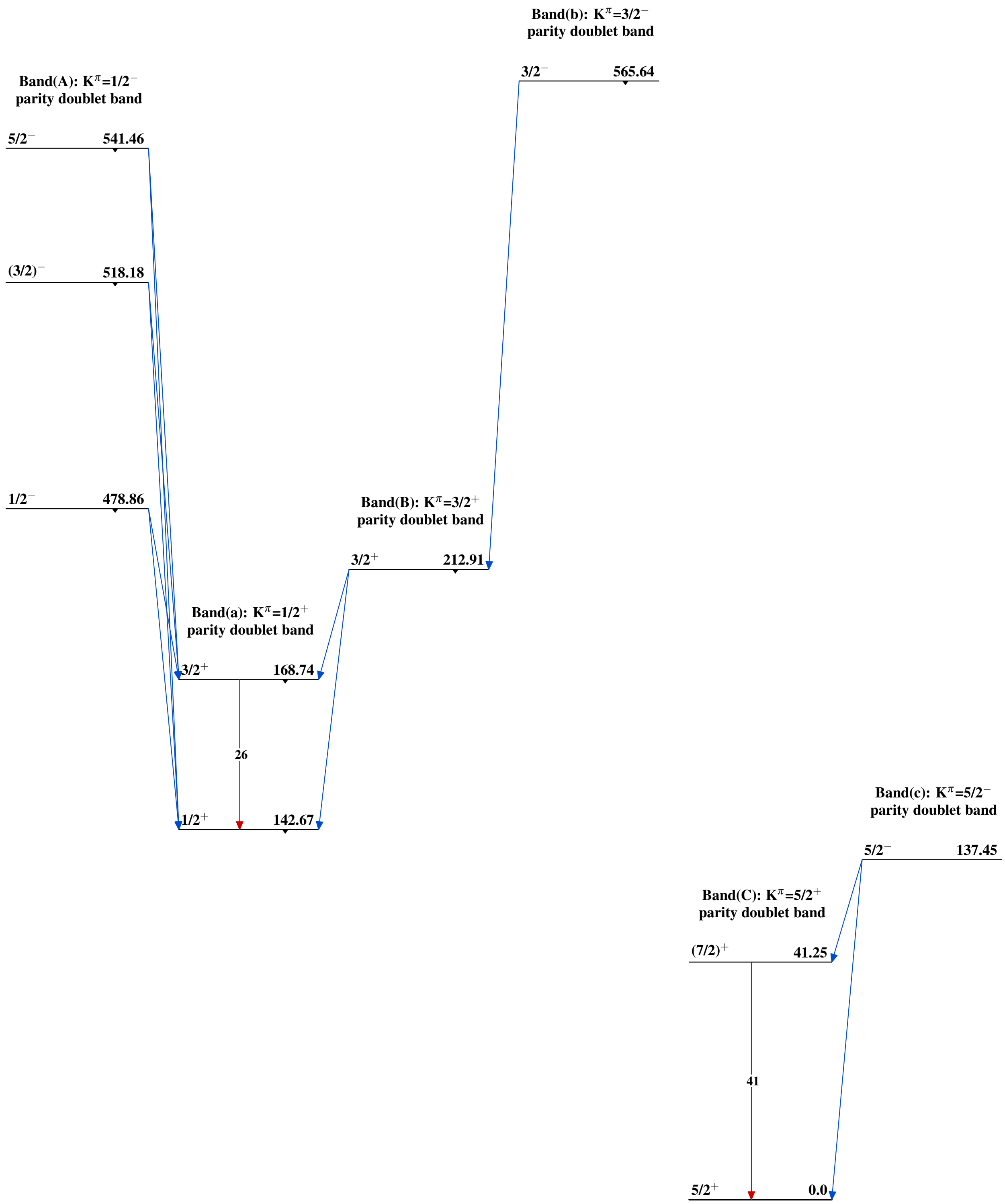
^{229}Fr β^- decay 1999Fr33

Decay Scheme (continued)

Intensities: I_γ per 100 parent decays



^{229}Fr β^- decay 1999Fr33



$^{229}_{88}Ra_{141}$