^{227}Ac α decay 1995Sh03,1966Ba29,1986Ry04

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	E. Browne	NDS 93, 846 (2001)	1-May-2001

Parent: ^{227}Ac: E=0.0; $J^\pi=3/2^-$; $T_{1/2}$=21.772 y *3*; Q(α)=5042.19 *14*; %α decay=1.380 *4*

1995Sh03: chemically purified ^{227}Ac. Measured Eγ, Iγ, $\alpha\gamma$ coin, a ce coin. Detectors: hyperpure germanium for γ rays; ion-implanted silicon for α particles; Si(Li) placed inside an axially increasing magnetic field for conversion electrons.

^{223}Fr Levels

The structure of ^{223}Fr has been interpreted in terms of the reflection-asymmetric rotor model by coupling octupole deformations to Nilsson quasiparticle states (1995Sh03).

E(level)[†]	J^π[d]	Comments
0.0[#]	$3/2^{(-)}$	
12.89[#] *5*	$(5/2^-)$	
54.97[&] *7*	$1/2^{(-)}$	
82.13[#] *6*	$(7/2^-)$	
99.63[&] *6*	$(3/2^-)$	
101.00[&] *6*	$(5/2^-)$	
134.51[a] *6*	$(3/2^+)$	
149.3?[a] *3*	$(1/2^+)$	
160.48[@] *7*	$(3/2^+)$	
172.08[@] *6*	$(5/2^+)$	
187.18 *10*	$(5/2^-)$	
189.10[&] *7*	$(7/2^-)$	
219.61[a] *9*	$(7/2^+)$	
222.75[@] *10*	$(7/2^+)$	
242.63 *7*	(5/2)	
243.85 *13*	(5/2)	J^π: $J^\pi=(7/2^-)$ assigned by 1995Sh03. See Adopted Levels.
244.66 *15*	$(7/2^-)$	J^π: $J^\pi=(9/2^+)$ assigned by 1995Sh03. See Adopted Levels.
298.7 *3*	$(9/2^-)$	
365.47 *10*		
371[‡] *4*		
379[‡] *7*		
449[‡] *5*		
503[‡b] *7*		
515.20[c] *22*	$3/2^-$	J^π: populated by favored (HF=2.0) α-particle group from ^{227}Ac ($J^\pi=3/2^-$) decay.
540.74[b] *25*	$(5/2^+)$	J^π: $J^\pi=(5/2^-)$ assigned by 1995Sh03.
601[‡c] *7*	$(5/2^-)$	

[†] Deduced by evaluator from a least-squares fit to γ-ray energies, unless otherwise specified.
[‡] From α-particle energies.
[#] Band(A): $K^\pi=3/2^-$ parity doublet band.
[@] Band(a): $K^\pi=3/2^+$ parity doublet band.
[&] Band(B): $K^\pi=1/2^-$ parity doublet band.
[a] Band(b): $K^\pi=1/2^+$ parity doublet band.
[b] Band(C): $K^\pi=3/2^+$ parity doublet band.
[c] Band(c): $K^\pi=3/2^-$ parity doublet band.
[d] From Adopted Levels.

^{227}Ac α decay 1995Sh03,1966Ba29,1986Ry04 (continued)

α radiations

Eα[†‡]	E(level)	Iα[#b]	HF[a]	Comments
4363 *7*	601	≈0.003[&]	8	
4423 *5*	540.74	0.006[&]	12	Iα: 0.009% 4, from γ-ray transition intensity balance.
4445 *4*	515.20	0.05[&]	2.1	Iα: 0.038% 13, from γ-ray transition intensity balance.
4459 *7*	503	≈0.005[&]	26	
4512 *5*	449	≈0.003[&]	108	Eα=4522 keV *10*, Iα≈0.2 (1959No41).
4581 *7*	379	≈0.003[&]	340	
4589 *4*	371	0.01[&]	116	
4594 *4*	365.47	0.02[&]	65	Iα: ≤0.3%, from γ-ray transition intensity balance.
4715 *4*	242.63	0.4 *2*	23	Eα=4709 keV *8* (1959No41), Iα=0.31 (1966Ba19). Multiplet. Iα: 0.54% 20, from γ-ray transition intensity balance to 243 *24*444 *24*545 levels.
4738 *4*	219.61	0.09[&]	142	Iα: 0.13% 4, from γ-ray transition intensity balance to 220 *223*23 levels. Eα=4733 keV *8*, Iα≈0.1 (1959No41). Doublet.
4768 *3*	189.10	1.8 *5*	11	Eα=4764 keV *5* (1959No41), Iα=1.4 (1966Ba19). Doublet. Iα: 2.0% 7, from γ-ray transition intensity balance to 187 *18*989 levels.
4785 *4*	172.08	0.08[&]	329	
4796 *3*	160.48	1.0 *5*	31	Eα=4791 keV *5* (1959No41), Iα=0.81 (1966Ba19). Iα: 0.65% 19, from γ-ray transition intensity balance.
4822 *4*	134.51	0.07[&]	663	Iα: 0.29% 9, from γ-ray transition intensity balance.
4855 *2*	99.63	6 *1*	13	Eα,Iα: values deduced from data of 1959No41 and 1966Ba19. Doublet. Iα: 7% 4, from γ-ray transition intensity balance.
4872.7[@] *2*	82.13	6.3[@] *5*	16	Iα: 6.3 *20*, from γ-ray transition intensity balance.
4898.8 *30*	54.97	0.11[&]	1360	
4940.7[@] *8*	12.89	39.6[@] *12*	7.0	Iα: 46% 13, from γ-ray transition intensity balance.
4953.26[@] *14*	0.0	47.7[@] *10*	7.0	Iα: 35% 18, from γ-ray transition intensity balance.

[†] α-particle energies presented here have been adjusted for changes in the energies of the calibration standards: +3.5 keV correction for values from 1966Ba19, +5 keV correction for values from 1959No41 (1986Ry04,1991Ry01). Other measurements: 1972GaZA.
[‡] From 1966Ba19, unless otherwise specified.
[#] From 1959No41, unless otherwise specified.
[@] Recommended by 1991Ry01.
[&] From 1966Ba19.
[a] Using $r_0(^{223}Fr)$=1.538, from $r_0(^{222}Rn)$=1.5397 *4*, $r_0(^{222}Ra)$=1.5383 *8*, and $r_0(^{224}Ra)$=1.5332 *8* (1998Ak04).
[b] For absolute intensity per 100 decays, multiply by 0.01380 *4*.

γ(^{223}Fr)

Iγ normalization: from Σ I(γ+ce) (to g.s. and 12.7 levels)=12.7 *16* per 100 α′s (from α-decay data).
An experimental Fr K x ray intensity of 8.5 *10* compares to 7 *3* deduced by evaluator (using RADLST) from the γ-ray intensities and K-conversion coefficients presented here, using a K-fluorescence yield of 0.967 *4* (1996Sc06).

E_γ [†]	I_γ [†a]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	δ	α [#]	Comments
12.9 *1*	<0.01	12.89	(5/2$^-$)	0.0	3/2$^{(-)}$	(E2)		5.11×10^4	α(M)=3.84×10^4 Mult.: from ce(M1)+ce(M2):ce(M3):ce(N) exp=130:130:180 (1959No41).
25.95[&]	≈0.0004[&]	160.48	(3/2$^+$)	134.51	(3/2$^+$)				
33.5 *1*	0.08 *2*	134.51	(3/2$^+$)	101.00	(5/2$^-$)	[E1]		2.02	α(L)=1.52; α(M)=0.376
35.0 *2*	0.02 *1*	134.51	(3/2$^+$)	99.63	(3/2$^-$)	[E1]		1.80	α(L)=1.36; α(M)=0.334
37.47[&]	≈0.002[&]	172.08	(5/2$^+$)	134.51	(3/2$^+$)				
44.7 *1*	0.08 *2*	99.63	(3/2$^-$)	54.97	1/2$^{(-)}$	[M1+E2]		2.3×10^2 *20*	α(L)=1.7×10^2 *15*; α(M)=4.E1 4
51.06[&]	≈0.0002[&]	222.75	(7/2$^+$)	172.08	(5/2$^+$)				
52.32[&]	≈0.001[&]	187.18	(5/2$^-$)	134.51	(3/2$^+$)				
53.7 *2*	0.03 *1*	242.63	(5/2)	189.10	(7/2$^-$)	[E1]		0.573	α(L)=0.433; α(M)=0.105; α(N+..)=0.0348
55.0 *1*	0.32 *6*	54.97	1/2$^{(-)}$	0.0	3/2$^{(-)}$	M1+E2	0.05 *4*	17.4 *8*	α(L)=13.1 *6*; α(M)=3.14 *16*; α(N+..)=1.11 *6* Mult.,δ: from ^{223}Rn β$^-$ decay.
55.80[&] *5*	0.0028[&]	244.66	(7/2$^-$)	189.10	(7/2$^-$)				
57.56[&] *5*	0.0023[&]	244.66	(7/2$^-$)	187.18	(5/2$^-$)				
59.4 *2*	0.03 *1*	160.48	(3/2$^+$)	101.00	(5/2$^-$)	[E1]		0.437	α(L)=0.330; α(M)=0.0799; α(N+..)=0.0265
60.6 *3*	0.03 *1*	160.48	(3/2$^+$)	99.63	(3/2$^-$)	[E1]		0.414	α(L)=0.313; α(M)=0.0757; α(N+..)=0.0251
69.28 *8*	2.8 *4*	82.13	(7/2$^-$)	12.89	(5/2$^-$)	M1+E2	0.57	19.0	α(L)=14.1; α(M)=3.65; α(N+..)=1.28 Mult.,δ: from ce(L1)+ce(L2)/ce(L3) (1995Sh03). Other value: δ=0.33, from ce(L1):ce(L2):ce(L3) exp=11:6:7 (1959No41), consistent with M1+10% E2, or E1.
70.6 *2*	0.06 *2*	242.63	(5/2)	172.08	(5/2$^+$)	[M1+E2]		27 *19*	α(L)=20 *14*; α(M)=5 *4*; α(N+..)=1.9 *14*
72.5[b] *2*	0.05[b] *2*	172.08	(5/2$^+$)	99.63	(3/2$^-$)	[E1]		0.256	α(L)=0.194; α(M)=0.0466; α(N+..)=0.0156
72.5[b] *2*	0.05[b] *2*	244.66	(7/2$^-$)	172.08	(5/2$^+$)	[E1]		0.256	α(L)=0.194; α(M)=0.0466; α(N+..)=0.0156
79.54 *8*	0.8 *1*	134.51	(3/2$^+$)	54.97	1/2$^{(-)}$	E1[@]		0.200	α(L)=0.151; α(M)=0.0363; α(N+..)=0.0122
82.2 *1*	0.6 *1*	82.13	(7/2$^-$)	0.0	3/2$^{(-)}$	E2		22.5	α(L)=16.5; α(M)=4.45; α(N+..)=1.57
83.0[&] *1*	≈0.001[&]	243.85	(5/2)	160.48	(3/2$^+$)				
85.0[&] *5*	≈0.008[&]	219.61	(7/2$^+$)	134.51	(3/2$^+$)				
86.1[&] *1*	0.34[&]	187.18	(5/2$^-$)	101.00	(5/2$^-$)				
86.7 *2*	2.0 *3*	99.63	(3/2$^-$)	12.89	(5/2$^-$)	[M1+E2]		11 *7*	α(L)=8 *5*; α(M)=2.1 *14*; α(N+..)=0.8 *5*
88.1[b] *1*	0.5[b] *1*	101.00	(5/2$^-$)	12.89	(5/2$^-$)	[M1+E2]		10 *6*	α(L)=8 *5*; α(M)=2.0 *13*; α(N+..)=0.7 *5*
88.1[b] *1*	0.5[b] *1*	189.10	(7/2$^-$)	101.00	(5/2$^-$)	[M1+E2]		10 *6*	α(L)=8 *5*; α(M)=2.0 *13*; α(N+..)=0.7 *5*
88.5[&] *6*	≈0.0007[&]	222.75	(7/2$^+$)	134.51	(3/2$^+$)				

$^{223}_{87}Fr_{136}$-3

^{227}Ac α decay 1995Sh03,1966Ba29,1986Ry04 (continued)

$\gamma(^{223}Fr)$ (continued)

E_γ [†]	I_γ [†a]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	α [#]	Comments
90.0 *1*	0.13 *5*	172.08	(5/2$^+$)	82.13	(7/2$^-$)	[E1]	0.144	α(L)=0.109; α(M)=0.0261; α(N+..)=0.0088
99.6 *1*	3.7 *5*	99.63	(3/2$^-$)	0.0	3/2$^{(-)}$	M1+E2	6 *3*	α(L)=4.5 *22*; α(M)=1.2 *7*; α(N+..)=0.42 *23*
101.0 *1*	0.5 *2*	101.00	(5/2$^-$)	0.0	3/2$^{(-)}$	[M1+E2]	6 *3*	α(L)=4.2 *21*; α(M)=1.1 *6*; α(N+..)=0.39 *21*
105.0 *2*	0.25 *7*	187.18	(5/2$^-$)	82.13	(7/2$^-$)	M1	13.3	α(K)=5 *6*; α(L)=3.6 *17*; α(M)=0.9 *5*; α(N+..)=0.33 *17* Mult.: from ^{223}Rn β^- decay.
106.85 *10*	0.8 *1*	189.10	(7/2$^-$)	82.13	(7/2$^-$)	M1(+E2)	10 *3*	α(K)=5 *5*; α(L)=3.3 *15*; α(M)=0.9 *5*; α(N+..)=0.31 *16*
108.0 *3*	0.03 *1*	242.63	(5/2)	134.51	(3/2$^+$)	[M1+E2]	9 *3*	α(K)=5 *5*; α(L)=3.2 *14*; α(M)=0.8 *4*; α(N+..)=0.30 *15*
118.7 *4*	0.03 *1*	219.61	(7/2$^+$)	101.00	(5/2$^-$)	[E1]	0.317	α(K)=0.248; α(L)=0.0522; α(M)=0.0125; α(N+..)=0.00426
121.6[b] *1*	0.9[b] *2*	134.51	(3/2$^+$)	12.89	(5/2$^-$)	[E1]	0.299	α(K)=0.234; α(L)=0.0490; α(M)=0.0117; α(N+..)=0.00399
121.6[b] *1*	0.9[b] *2*	365.47		243.85	(5/2)	[E1]	0.299	α(K)=0.234; α(L)=0.0490; α(M)=0.0117; α(N+..)=0.00399
134.5 *1*	0.4 *1*	134.51	(3/2$^+$)	0.0	3/2$^{(-)}$	E1[@]	0.233	α(K)=0.184; α(L)=0.0376; α(M)=0.0090; α(N+..)=0.00306
137.4 *1*	0.3 *1*	219.61	(7/2$^+$)	82.13	(7/2$^-$)	[E1]	0.221	α(K)=0.174; α(L)=0.0356; α(M)=0.0085; α(N+..)=0.00289
140.9 *1*	0.15 *4*	222.75	(7/2$^+$)	82.13	(7/2$^-$)	[E1]	0.208	α(K)=0.164; α(L)=0.0333; α(M)=0.00794; α(N+..)=0.00271
143.0[b] *1*	0.20[b] *4*	242.63	(5/2)	99.63	(3/2$^-$)	[E1]	0.201	α(K)=0.159; α(L)=0.0321; α(M)=0.00764; α(N+..)=0.00261 Mult.: M1 from ^{223}Rn β^- decay. γ ray possibly deexcites the 244.6 (7/2$^-$) level. See adopted gammas.
143.0[b] *1*	0.20[b] *4*	365.47		222.75	(7/2$^+$)	[M1+E2]	3.7 *18*	α(K)=2.3 *21*; α(L)=1.04 *24*; α(M)=0.27 *8*; α(N+..)=0.09 *3*
143.65[&] *5*	0.019[&]	244.66	(7/2$^-$)	101.00	(5/2$^-$)	M1	5.38	
146.0 *2*	0.0064	365.47		219.61	(7/2$^+$)			
147.61 *8*	1.8 *2*	160.48	(3/2$^+$)	12.89	(5/2$^-$)	E1[@]	0.186	α(K)=0.147; α(L)=0.0295; α(M)=0.00704; α(N+..)=0.00240
149.3[c] *3*	≈0.01	149.3?	(1/2$^+$)	0.0	3/2$^{(-)}$			
159.2 *1*	0.4 *1*	172.08	(5/2$^+$)	12.89	(5/2$^-$)	[E1]	0.155	α(K)=0.123; α(L)=0.0243; α(M)=0.00578; α(N+..)=0.00197
160.49 *10*	3.2 *3*	160.48	(3/2$^+$)	0.0	3/2$^{(-)}$	E1[@]	0.152	α(K)=0.120; α(L)=0.0238; α(M)=0.00566; α(N+..)=0.00193
161.4 *4*	0.10 *3*	243.85	(5/2)	82.13	(7/2$^-$)	[M1+E2]	2.6 *13*	α(K)=1.7 *15*; α(L)=0.66 *9*; α(M)=0.17 *4*; α(N+..)=0.059 *12*
162.6 *2*	0.04 *2*	244.66	(7/2$^-$)	82.13	(7/2$^-$)	M1,E2	2.5 *13*	α(K)=1.7 *12*; α(L)=0.6 *5*; α(M)=0.16 *10*; α(N+..)=0.057 *30* Mult.: from adopted gammas.
172.0 *1*	0.7 *1*	172.08	(5/2$^+$)	0.0	3/2$^{(-)}$	E1[@]	0.128	α(K)=0.102; α(L)=0.0199; α(M)=0.00474; α(N+..)=0.00161
174.3 *1*	0.20 *4*	187.18	(5/2$^-$)	12.89	(5/2$^-$)	[M1+E2]	2.0 *11*	α(K)=1.4 *12*; α(L)=0.49 *4*; α(M)=0.126 *17*; α(N+..)=0.044 *6*
176.1[b] *1*	0.24[b] *4*	189.10	(7/2$^-$)	12.89	(5/2$^-$)	M1,E2	2.0 *11*	α(K)=1.3 *11*; α(L)=0.47 *3*; α(M)=0.121 *15*; α(N+..)=0.043 *6*
176.1[b] *1*	0.24[b] *4*	365.47		189.10	(7/2$^-$)	[E1]	0.121	α(K)=0.096; α(L)=0.0187; α(M)=0.00446; α(N+..)=0.00152 Mult.: M1,E2 in adopted gammas.
206.8 *1*	0.7 *1*	219.61	(7/2$^+$)	12.89	(5/2$^-$)	E1[@]	0.0821	α(K)=0.0656; α(L)=0.0125; α(M)=0.00296; α(N+..)=0.00101
216.6 *3*	0.04 *2*	298.7	(9/2$^-$)	82.13	(7/2$^-$)	[M1+E2]	1.1 *7*	α(K)=0.8 *7*; α(L)=0.229 *20*; α(M)=0.0575 *18*; α(N+..)=0.0202 *6*
[x]219.2 *4*	≈0.01							
229.7 *1*	0.30 *5*	242.63	(5/2)	12.89	(5/2$^-$)	[E1]	0.0639	α(K)=0.0513; α(L)=0.0096; α(M)=0.00228; α(N+..)=0.00078
230.9 *5*	≈0.01	243.85	(5/2)	12.89	(5/2$^-$)	[M1+E2]	0.9 *6*	α(K)=0.6 *5*; α(L)=0.184 *24*; α(M)=0.046 *4*; α(N+..)=0.0162 *12*
231.79[&] *5*	0.0052[&]	244.66	(7/2$^-$)	12.89	(5/2$^-$)			
242.6 *2*	0.20 *5*	242.63	(5/2)	0.0	3/2$^{(-)}$	[E1]	0.0562	α(K)=0.0451; α(L)=0.0084; α(M)=0.00199; α(N+..)=0.00068
243.9 *4*	≈0.02	243.85	(5/2)	0.0	3/2$^{(-)}$	[E2]	0.283	α(K)=0.110; α(L)=0.128; α(M)=0.0340; α(N+..)=0.0120
283.4 *3*	0.04 *2*	365.47		82.13	(7/2$^-$)	[E1]	0.0392	α(K)=0.0317; α(L)=0.00574; α(M)=0.00136; α(N+..)=0.00047

$^{223}_{87}Fr_{136}$-4

^{227}Ac α decay 1995Sh03,1966Ba29,1986Ry04 (continued)

$\gamma(^{223}Fr)$ (continued)

E_γ †	I_γ †a	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	α#	Comments
351.7 *3*	0.04 *2*	540.74	$(5/2^+)$	189.10	$(7/2^-)$	[E1]	0.0241	α(K)=0.020; α(L)=0.003; α(M)=0.0008; α(N+..)=0.0003
415.6 *3*	0.15 *4*	515.20	$3/2^-$	99.63	$(3/2^-)$	[M1+E2]	0.17 *12*	α(K)=0.13 *10*; α(L)=0.029 *12*; α(M)=0.007 *3*; α(N+..)=0.0025 *10*
439.60& *5*	0.025&	540.74	$(5/2^+)$	101.00	$(5/2^-)$			
441.0 *4*	0.04 *2*	540.74	$(5/2^+)$	99.63	$(3/2^-)$	[E1]	0.0148	α(K)=0.012; α(L)=0.0021; α(M)=0.00049; α(N+..)=0.00017
460.2 *3*	0.15 *4*	515.20	$3/2^-$	54.97	$1/2^{(-)}$	[M1+E2]	0.13 *9*	α(K)=0.10 *8*; α(L)=0.022 *10*; α(M)=0.0053 *22*; α(N+..)=0.0019 *8*
527.60& *10*	0.021&	540.74	$(5/2^+)$	12.89	$(5/2^-)$			
540.40& *5*	0.051&	540.74	$(5/2^+)$	0.0	$3/2^{(-)}$			

† From 1995Sh03. Others: 1981Va28, 1975VyZS, 1959No41.
‡ From conversion electron subshell ratios (1995Sh03), unless otherwise specified.
# Conversion coefficients for [M1+E2] multipolarities are for δ=1.0.
@ From γ-ray transition intensity balance.
& From ^{223}Rn β^- decay. Not seen in ^{227}Ac α decay.
a For absolute intensity per 100 decays, multiply by 0.0015 *4*.
b Multiply placed with undivided intensity.
c Placement of transition in the level scheme is uncertain.
x γ ray not placed in level scheme.

$^{223}_{87}Fr_{136}$-5

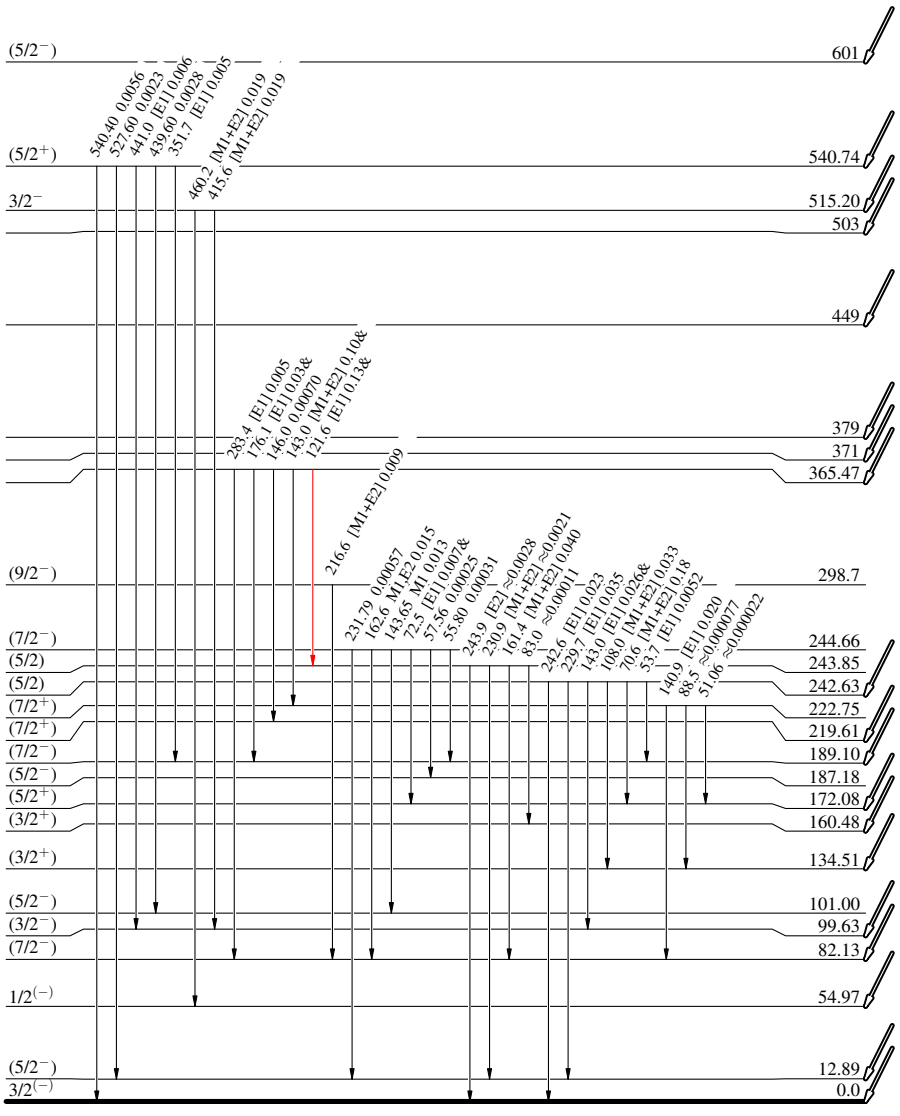
^{227}Ac α decay 1995Sh03,1966Ba29,1986Ry04

Decay Scheme

Intensities: Per 100 α decays. Iα per 100 α decays.Iα per 100 α decays.
& Multiply placed: undivided intensity given

Legend

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



	Eα	Iα	HF
601	4363	≈0.000041	8
540.74	4423	0.00008280	12
515.20	4445	0.0006900	2.1
503	4459	≈0.000069	26
449	4512	≈0.000041	108
379	4581	≈0.000041	340
371	4589	0.0001380	116
365.47	4594	0.0002760	65
298.7			
244.66			
243.85			
242.63	4715	0.006	23
222.75			
219.61	4738	0.001242	142
189.10	4768	0.025	11
187.18			
172.08	4785	0.001104	329
160.48	4796	0.014	31
134.51	4822	0.000966	663
101.00			
99.63	4855	0.083	13
82.13	4872.7	0.087	16
54.97	4898.8	0.001518	1360
12.89	4940.7	0.546	7.0
0.0	4953.26	0.658	7.0

$^{223}_{87}Fr_{136}$

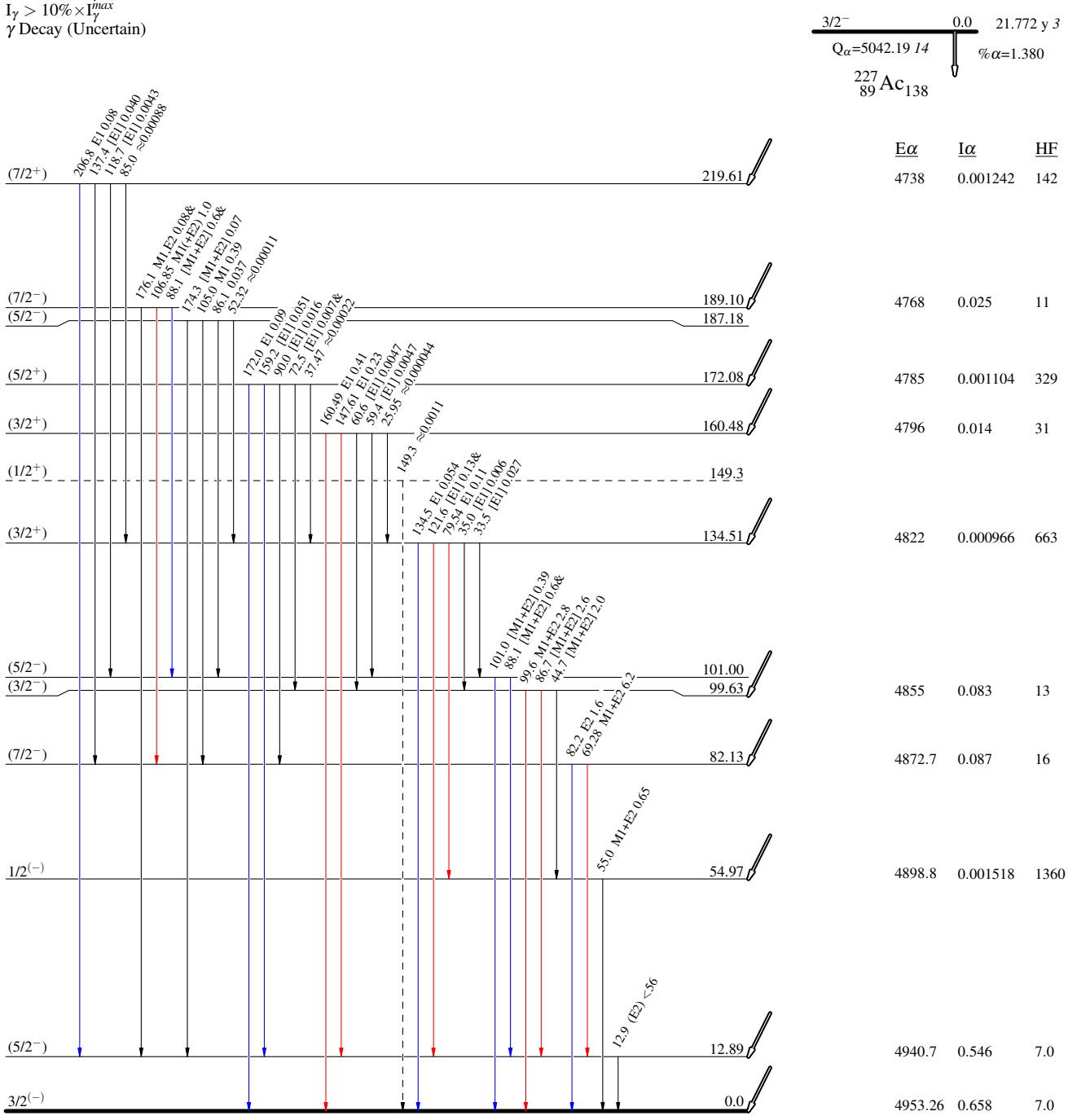
^{227}Ac α decay 1995Sh03,1966Ba29,1986Ry04

Decay Scheme (continued)

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)

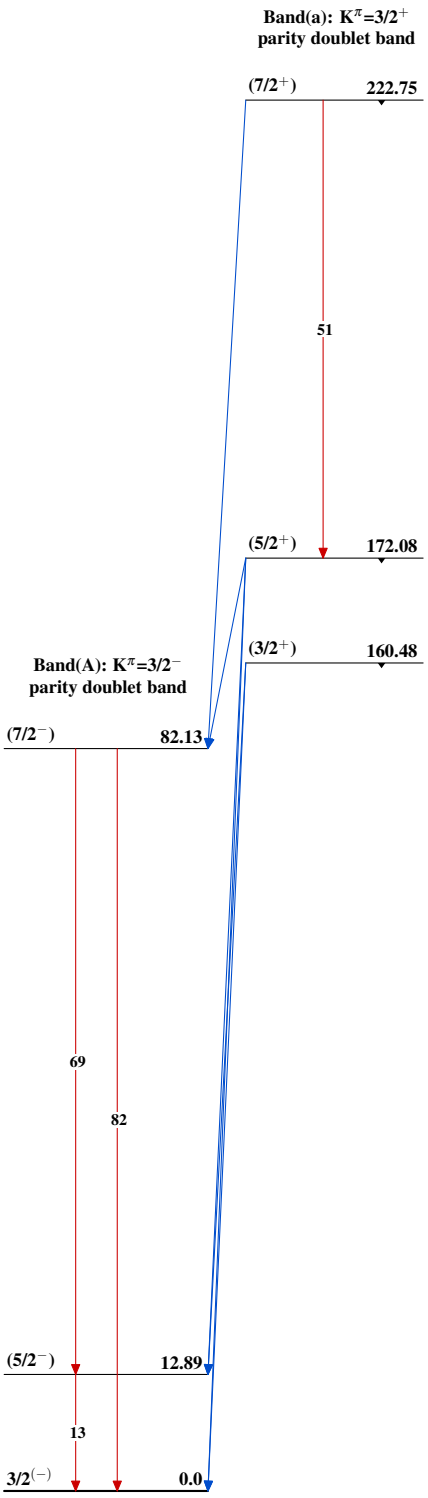
Intensities: Per 100 α decays. Iα per 100 α decays.Iα per 100 α decays.
& Multiply placed: undivided intensity given



	Eα	Iα	HF
	4738	0.001242	142
	4768	0.025	11
	4785	0.001104	329
	4796	0.014	31
	4822	0.000966	663
	4855	0.083	13
	4872.7	0.087	16
	4898.8	0.001518	1360
	4940.7	0.546	7.0
	4953.26	0.658	7.0

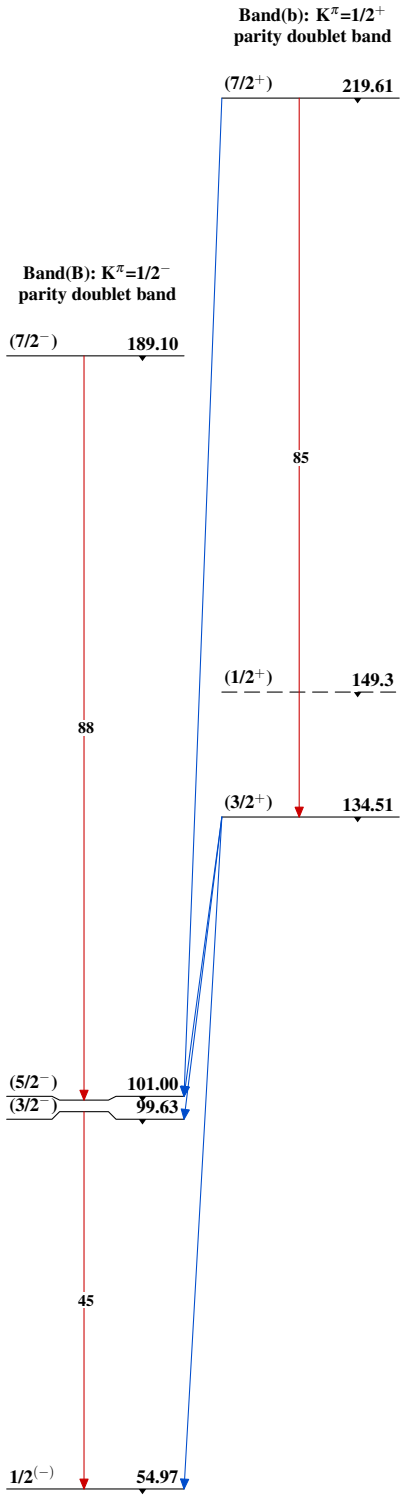
$^{223}_{87}Fr_{136}$

^{227}Ac α decay 1995Sh03,1966Ba29,1986Ry04



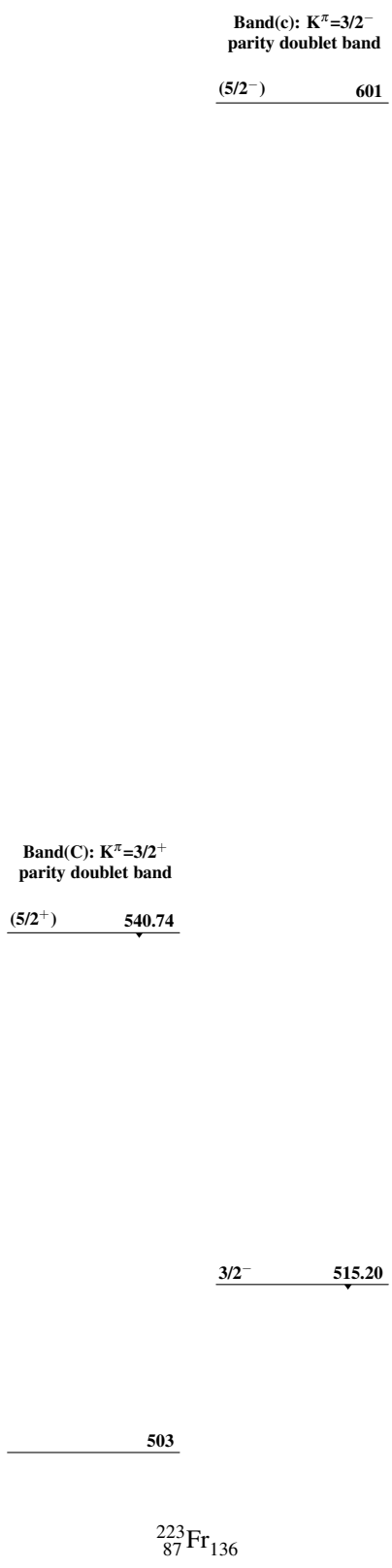
$^{223}_{87}Fr_{136}$

^{227}Ac α decay 1995Sh03,1966Ba29,1986Ry04 (continued)



$^{223}_{87}Fr_{136}$

^{227}Ac α decay 1995Sh03,1966Ba29,1986Ry04 (continued)



$^{223}_{87}Fr_{136}$