^{227}Th α decay 1990Br23,1972He18,1969Br27

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

Parent: ^{227}Th: E=0.0; $J^\pi=(1/2^+)$; $T_{1/2}$=18.68 d *9*; Q(α)=6146.43 *15*; %α decay=100.0

Additional information 1.

1998Jo08: measured Ag(θ), (α)(ce)(θ). Deduced γ-ray multipolarities and mixing ratios. Detectors:≥for γ rays, Si(Li) for electrons, pin diodes for alpha particles.

1993Ab01: measured Eγ, Iγ. Detector: high-purity germanium. Data quoted as from a private communication from G. Ardisson (unpublished).

1990Br23: measured Eγ, Iγ, Ag(θ), $\gamma\gamma(\theta)$, $\gamma(\theta$,H). Detectors: high-purity germanium, Si(Li).

1972He18: measured Eγ, Iγ, $\alpha\gamma$ coin. Detectors:Ge(Li), semi.

1969Br27: measured Eγ, Iγ,$\alpha\gamma$ coin. Detectors:Ge(Li), crystal spectrometer.

^{223}Ra Levels

E(level)[†]	J^π[‡#]	$T_{1/2}$	Comments
0.0[@]	3/2$^+$	11.43 d *2*	J^π: from Adopted Levels.
29.858[@] *8*	5/2$^+$		Additional information 2.
50.128[&] *9*	3/2$^-$	0.63 ns *7*	J^π: 50γ E1 to 3/2$^+$; $\gamma\gamma(\theta)$ for the 236γ-50γ cascade is consistent with J=3/2 (1957Pi31,1960Pe13,1961Br44,1965Cl05,1970Le13). $T_{1/2}$: Ag(t), $\gamma\gamma$(t) (1958Va29,1961Fo08). g-factor=+0.28 *4*, integral perturbed angular correlations, using $T_{1/2}$=0.63 ns *7* (1970Le13).
61.424[@] *10*	(7/2)$^+$	≈0.6 ns	$T_{1/2}$: nuclear recoil (1971Br29).
79.708[&] *13*	(5/2)$^-$	0.24 ns *8*	$T_{1/2}$: nuclear recoil (1971Br29).
104.60? *13*			
123.793[&] *18*	7/2$^-$	0.45 ns *+10−6*	Additional information 3. $T_{1/2}$: nuclear recoil (1971Br29).
130.141[@] *18*	9/2 $^+$	>0.3 ns	Additional information 4. $T_{1/2}$: Doppler broadening (1971Br29).
174.569[&] *24*	9/2$^-$	0.20 ns *6*	Additional information 5. $T_{1/2}$: Doppler broadening (1971Br29).
174.58[@] *4*	11/2$^+$	0.14 ns *5*	Additional information 6. $T_{1/2}$: Doppler broadening (1971Br29).
234.858[a] *19*	5/2$^+$		Additional information 7.
247.39[&] *4*	11/2$^-$	0.15 ns *5*	Additional information 8. $T_{1/2}$: nuclear recoil (1971Br29).
280.182[a] *22*	(7/2)$^+$	0.075 ns *25*	$T_{1/2}$: nuclear recoil (1971Br29).
286.087[c] *14*	1/2$^+$	0.77 ns *7*	J^π: 236γ E1 to 3/2$^-$; $\gamma\gamma(\theta)$ for the 236γ-50γ cascade is consistent with J=1/2 (1957Pi31,1960Pe13,1961Br44,1965Cl05,1970Le13). Isotropic Ag(θ) distributions for α(286)−236γ (1960Pe13,1990Br23), and for α(286)−256γ, −286γ (1990Br23) are also consistent with J=1/2. Nonisotropic Ag(θ) distribution for α(286)−236γ measured by 1972He18 disagrees with these results. $T_{1/2}$: Ag(t) (1958Va29,1961Fo08). Other value: 0.56 ns, Ag(t) (1965Co22).
315.99[&] *6*	(13/2$^-$)		
329.856[d] *14*	3/2$^-$	0.42 ns *4*	$T_{1/2}$: nuclear recoil (1971Br29).
334.370[c] *12*	5/2$^+$	0.28 ns *4*	$T_{1/2}$: nuclear recoil (1971Br29).
342.590[c] *19*	3/2$^+$	<0.050 ns	$T_{1/2}$: nuclear recoil (1971Br29).
342.654[a] *21*	(9/2)$^+$	<0.10 ns	$T_{1/2}$: nuclear recoil (1971Br29).
350.53[d] *6*	(1/2)$^-$		
369.36[b] *4*	(5/2)$^-$	0.20 ns *5*	$T_{1/2}$: Doppler broadening (1971Br29).

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^{227}Th α decay 1990Br23,1972He18,1969Br27 (continued)

^{223}Ra Levels (continued)

E(level)†	Jπ‡#	$T_{1/2}$	Comments
376.296[d] *11*	7/2−	<0.03 ns	Additional information 9. $T_{1/2}$: Doppler broadening (1971Br29).
405.07[b] *3*	(7/2)−		
424.12[a] *5*	(11/2+)		
432.24[d] *3*	(5/2)−		
442.35[c] *8*	(7/2+)		Jπ: other assignment: Jπ=9/2− member of Kπ=5/2− band (1988Le13,1986Sh02,1988Sh34).
445.071[c] *19*	9/2+		Additional information 10.
459.93[b] *5*	(9/2)−		Jπ: other assignment: Jπ=(7/2+) member of Kπ=1/2+ band (1988Le13,1986Sh02,1988Sh34).
514.25[b] *8*	(11/2−)		Jπ: other assignment: Jπ=11/2− member of Kπ=1/2− band (1988Le13,1986Sh02,1988Sh34).
537.16 *11*			
568 *2*			
590.3 *10*			
641 *3*			
685 *3*			
712.7 *4*			
729 *4*			
784.02 *17*			
786.90 *17*			
792.6 *6*			
803.44 *9*			
818.18 *18*			
823.03 *9*			
826.7 *3*	(3/2+)		Jπ: from Adopted Levels.
842.05 *8*			
859.07 *11*			
867.5 *4*			
879.41 *17*	(7/2+)		Jπ: from Adopted Levels.
884.2? *5*			
891? *1*			
904.4? *12*			
908.03 *22*			
926.48 *16*	(3/2,5/2−)		From Adopted Levels.
943.1 *10*	(3/2,5/2)		Jπ: from Adopted Levels.
971.31 *25*			
999.85 *17*			
1015.2? *7*			
1020.1 *3*			
1025.0 *10*			

† Deduced by evaluator from a least-squares fit to γ-ray energies.
‡ Parity doublet rotational band assignments are from 1986Sh02, 1988Sh34, 1988Le13, 1990Ja11, and 1990Br23. Spin and parity assignments are based on γ-ray multipolarities, γγ(θ), and Ag(θ), unless otherwise specified.
# Although octupole deformations are small in this region, nuclear states are no longer fully characterized by single Nilsson orbitals. This terminology, however, is used throughout this evaluation to label states rather than to accurately describe their nature.
@ Band(A): 3/2(631) parity doublet rotational band.
& Band(B): 3/2(761) parity doublet rotational band.
a Band(C): 5/2(633) parity doublet rotational band.
b Band(D): 5/2(752) parity doublet rotational band.

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^{227}Th α decay 1990Br23,1972He18,1969Br27 (continued)

^{223}Ra Levels (continued)

[c] Band(E): 1/2(640) parity doublet rotational band.
[d] Band(F): 1/2(770) parity doublet rotational band.

α radiations

Eα	E(level)	Iα[#&]	HF[@]	Comments
5033.5[‡] *40*	1025.0	0.00031 *2*	30	
5056.1[‡] *40*	999.85	0.00023 *2*	58	
5083.5[‡] *40*	971.31	0.000150 *15*	133	
5110.5[‡] *40*	943.1	0.00028 *2*	106	
5128.7[‡] *30*	926.48	0.00062 *5*	60	
5146.5[‡] *20*	908.03	0.00410 *8*	12	
5171.0[‡] *30*	884.2?	0.00170 *17*	39	
5180.6[‡] *40*	879.41	0.00120 *24*	60	
5193.7[‡] *25*	859.07	0.00380 *27*	25	
5210.2[‡] *20*	842.05	0.0070 *3*	17	
5229.2[‡] *20*	823.03	0.0098 *3*	16	
5248.3[‡] *20*	803.44	0.00320 *16*	61	
5264.3[‡] *20*	786.90	0.0026 *2*	94	
5321.8[‡] *40*	729	0.00024 *10*	2190	
5335.9[‡] *50*	712.7	0.0002 *1*	3240	
5365.0[‡] *25*	685	0.00066 *3*	1410	
5408.7[‡] *30*	641	0.00044 *7*	3700	
5458.6[‡] *20*	590.3	0.00270 *5*	1140	
5480.4[‡] *22*	568	0.0012 *1*	3400	
5509.9[‡] *20*	537.16	0.0166 *3*	362	
5531.7[‡] *18*	514.25	0.021 *2*	377	
5585.9[‡] *16*	459.93	0.176 *6*	87	
5600.6[‡] *18*	445.071	0.170 *17*	108	
5613.3[‡] *16*	432.24	0.216 *8*	99	
5622.0[‡] *17*	424.12	0.0070 *4*	3380	
5640.2[‡] *15*	405.07	0.0179 *15*	1660	
5668.0[‡] *15*	376.296	2.06 *12*	20	Other value: Eα=5670, Iα=1.9 (1957Pi31,1977Ma32).
5674.3[‡] *16*	369.36	0.0572 *35*	791	
5693.0[‡] *16*	350.53	1.50 *10*	38	Other value: Eα=5695, Iα=1.5 (1957Pi31,1977Ma32).
5700.8[‡] *16*	342.590	3.63 *20*	17	Other value: Eα=5702, Iα=4.0 (1957Pi31,1977Ma32).
5708.8 *16*	334.370	8.3 *3*	8.2	Eα,Iα: from 1964Ba33, recommended by 1991Ry01. Other value: Eα=5711, Iα=8.7 (1957Pi31,1977Ma32).
5713.2[‡] *16*	329.856	4.89 *20*	15	Other value: Eα=5715, Iα=5.0 (1957Pi31,1977Ma32).
5728.1[‡] *16*	315.99	0.0342 *25*	2490	
5756.87[†] *15*	286.087	20.4 *9*	5.9	Other values: Eα=5758, Iα=21 (1957Pi31,1977Ma32); Eα=5756.9 *15*, Iα=20.3 *10* (1964Ba33,1977Ma32).
5762.3[‡] *15*	280.182	0.228 *10*	561	Other value: Eα=5764, Iα=0.3 (1957Pi31,1977Ma32).
5795.5[‡] *15*	247.39	0.311 *5*	599	Other value: Eα=5796, Iα=0.3 (1957Pi31,1977Ma32).
5807.5[‡] *15*	234.858	1.27 *2*	169	Other value: Eα=5808, Iα=1.0 (1957Pi31,1977Ma32).
5866.6[‡]	174.569	2.42 *10*	175	Other value: Eα=5868, Iα=3.0 (1957Pi31,1977Ma32).

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^{227}Th α decay 1990Br23,1972He18,1969Br27 (continued)

α radiations (continued)

Eα	E(level)	Iα[#&]	HF[@]	Comments
5909.9[‡] *15*	130.141	0.174 *8*	4000	
5916.0[‡] *15*	123.793	0.775 *30*	963	Other value: Eα=5917, Iα=0.9 (1957Pi31,1977Ma32).
5959.7[‡] *15*	79.708	3.00 *15*	404	Other value: Eα=5961, Iα=3.5 (1957Pi31,1977Ma32).
5977.72[†] *10*	61.424	23.5 *9*	63	Other values: Eα=5979, Iα=24 (1957Pi31,1977Ma32); Eα=5978.0 *15*, Iα=23.4 *10* (1964Ba33,1977Ma32).
5989.4[‡] *20*	50.128	0.002 *3*	8.35×10^5	
6008.8[‡] *15*	29.858	2.90 *15*	717	Other value: Eα=6010, Iα=2.8 (1957Pi31,1977Ma32).
6038.01[†] *15*	0.0	24.2 *9*	118	Other values: Eα=6039 *1*, Iα=23 (1957Pi31,1977Ma32); Eα=6038.3 *15*, Iα=24.5 *10* (1964Ba33,1977Ma32).

[†] Eα from 1971Gr17, Iα from 1964Ba33, values recommended by 1991Ry01.

[‡] From 1964Ba33. Original energies have been increased by 1.7 keV to correct for systematic differences with α (g.s.), α (62), and α (286) of 1971Gr17 (1977Ma32).

[#] from 1964Ba33. Because of the abundance of low-energy γ rays, Iα values deduced from γ-ray transition intensity balances are very inaccurate, and therefore not shown here.

[@] Using $r_0(^{223}Ra)$=1.536, average of $r_0(^{222}Ra)$=1.5383 *8* and $r_0(^{224}Ra)$=1.5332 *8* (1998Ak04).

[&] Absolute intensity per 100 decays.

^{227}Th α decay 1990Br23,1972He18,1969Br27 (continued)

γ(^{223}Ra)

Iγ normalization: from Σ Ti(g.s. and 29.9)=72.9% 10, given Iα(g.s. and 29.9)=27.1% 10.
Others: 1971Br29, 1971Br28, 1970Ge02, 1969Pe17, 1968Wa09, 1968Br30, 1967Vi04, 1966Po02, 1966La10, 1965Tr02, 1960Pe13, 1960Wa16, 1957Pi31, 1955Fr25.

E_γ[†]	I_γ[‡c]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α[d]	Comments
6.5 *3*	0.7 *2*	130.141	9/2 $^+$	123.793	7/2$^-$	[E1]		41.2	E_γ: others: 1971Br29, 1969Br27, 1968Da10.
8.15# *20*	0.06# *2*	350.53	(1/2)$^-$	342.590	3/2$^+$				E_γ: other values: 8.3 keV *1* (1968Da10), 8.0 keV *2* (1969Br27).
20.25 *5*	1.84 *20*	50.128	3/2$^-$	29.858	5/2$^+$	[E1]		7.73	α(L)= 5.74; α(M)= 1.49 E_γ: other values: 20.3 (1971Br29,1966Fr07), 20.27 (1971Br28).
20.94# *5*	0.02# *5*	445.071	9/2$^+$	424.12	(11/2$^+$)				
x22.0# *2*	0.07# *7*								
x24.13# *5*	0.68# *5*								
x27.41 *9*	0.23 *4*								
29.60 *3*	≈0.04	79.708	(5/2)$^-$	50.128	3/2$^-$	[M1+E2]	≈1.3	≈2078	α(L)= 280; α(M)= 72 δ: from α(exp)=2070 *370*, deduced from γ-ray transition intensity balance at 79.7 level, and Iα=3.00 *15*. I_γ: from 1990Br23.
29.86 *1*	0.59 *8*	29.858	5/2$^+$	0.0	3/2$^+$	M1+E2	0.41 *10*	5.4×10^2 *15*	α(L)=4.3×10^2 *140*; α(M)=1.1×10^2 *4* α: α=5.4×10^2 *13* from γ-ray transition intensity balance at 29.9 level, and %α=2.90 *15* (1964Ba33). Mult.: δ=0.54, from ce(L1):ce(L2):ce(L3) exp=2.4:8.7:11 (1957Pi31); δ=0.29 *7*, from α(L)exp=270 *80* (1970Ge02,1977Ma32); δ=1.7 *4* from L x ray intensities (1972Sc44). δ=0.41 *10* from α(exp)=5.4×10^2 *13*, deduced from γ-ray transition intensity balance at 29.9 level.
31.58 *1*	0.53 *8*	61.424	(7/2)$^+$	29.858	5/2$^+$	M1+E2	0.28 *6*	272 *75*	α(L)= 203 *40*; α(M)= 52 *11* E_γ: other values: 31.63 *5* (1957Pi31,1977Ma32), 31.63 *2* (1970Ge02,1977Ma32). Mult.: from ce(L1):ce(L2):ce(L3):ce(M1):ce(M2):ce(M3) exp=3.6:4.1:5.4:1.5:2.5:2.1 (1957Pi31). δ: from ce(L1):ce(L2):ce(L3) exp=4.8 *3*:5.3 *3*:5.4 *3* (1971Br28). Other value: δ=0.28 *5*, from A_2=−0.88 *5*, A_4=0.10 *6*, Ag(θ) (1998Jo08).
33.39# *8*	0.06# *2*	376.296	7/2$^-$	342.654	(9/2)$^+$	[E1]		2.09	α(L)= 1.57; α(M)= 0.389
40.20# *3*	0.12# *3*	445.071	9/2$^+$	405.07	(7/2)$^-$				E_γ: other value: 40.2 *3* (1968Da10).
41.93 *5*	0.22 *10*	376.296	7/2$^-$	334.370	5/2$^+$	[E1]		1.12	α(L)= 0.846; α(M)= 0.208
43.77 *5*	1.65 *10*	329.856	3/2$^-$	286.087	1/2$^+$	E1		1.014	α(L)= 0.765; α(M)= 0.187 Mult.: from Ag(θ) (1990Br23); α(L1)exp≈0.26

$^{223}_{88}Ra_{135}$-5

γ(^{223}Ra) (continued)

E_γ [†]	I_γ [‡c]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α [d]	Comments
									(1971Br28,1977Ma32). A_2=−0.51 *4*, A_4=−0.02 *5*, Ag(θ) (1998Jo08).
									E_γ: other value: 43.7 *2* (1968Da10).
43.8[g] *5*	0.43 *17*	104.60?		61.424	(7/2)$^+$				
44.22 *12*	0.41 *10*	123.793	7/2$^-$	79.708	(5/2)$^-$	M1+E2	0.52 *4*	132 *12*	α(L)= 98 *6*; α(M)= 25.8 *17* δ: from ce(L1):ce(L2) exp=0.13 *1*:0.26 *3* (1971Br28).
44.40[f] *5*	0.03[f] *3*	174.569	9/2$^-$	130.141	9/2 $^+$	[E1]		0.978	α(L)= 0.737; α(M)= 0.181 I_γ: from exp Ice(L1) and α(L1) (E1, Theory).
44.40[f] *5*	0.10[f] *7*	174.58	11/2$^+$	130.141	9/2 $^+$	M1		35.2	α(L)= 26.7; α(M)= 6.39 I_γ: from Iγ=0.13 *6* and Iγ(44.G from 174.58 level)=0.03 *3*. Mult.: from α(L1)exp=23 *12* (1971Br28,1977Ma32).
46.45 *5*		376.296	7/2$^-$	329.856	3/2$^-$				E_γ: from 1990Ba23.
48.30 *3*	0.11 *4*	334.370	5/2$^+$	286.087	1/2$^+$	E2		313	α(L)= 231; α(M)= 62.3 E_γ: other value: 48.2 *1* (1957Pi31,1977Ma32). Mult.: from ce(L2):ce(L3) exp=1.1 *1*: 1.0 *1* (1971Br29).
49.82 *5*	3.3 *7*	79.708	(5/2)$^-$	29.858	5/2$^+$	E1		0.716	α(L)= 0.540; α(M)= 0.132 E_γ: other value: 49.9 *1* (1968Da10). Mult.: from ce(L1):ce(L3) exp=0.10 *1*:0.12 *1* (1971Br28).
50.13 *1*	65 *3*	50.128	3/2$^-$	0.0	3/2$^+$	E1		0.707	α(L)= 0.533; α(M)= 0.130; α(N+..)= 0.0438 E_γ: other value: 50.1 *1* (1968Da10). Mult.: from ce(L1):ce(L2):ce(L3) exp=1.4:1.4:1.7 (1971Br28); γ(θ,H) (1990Br23). I_γ: %Iγ=8.4 *6* (1969Pe17) and %Iγ=8.18 *17* (1990Ko40), both absolute intensity measurements, agree with %Iγ=8 *1*, from adopted Iγ and decay scheme normalization.
50.85 *5*	0.12 *5*	174.569	9/2$^-$	123.793	7/2$^-$	M1+E2	0.4 *1*	54 *14*	α(L)= 40 *8*; α(M)= 10.4 *21*; α(N+..)= 3.7 *10* Mult.,δ: from ce(L1):ce(L2):ce(L3) exp=≈0.027:≈0.027:≈0.025 (1971Br28).
54.19[e#] *4*	0.05[e#] *1*	334.370	5/2$^+$	280.182	(7/2)$^+$	(M1)		19.7	α(L)= 14.8; α(M)= 3.55; α(N+..)= 1.26 Mult.: from ce(L1)≈14 (1971Br28,1977Ma32).
54.19[e#] *10*	0.005[e#] *1*	514.25	(11/2$^-$)	459.93	(9/2)$^-$	(M1)		19.7	α(L)= 14.8; α(M)= 3.55; α(N+..)= 1.26 Mult.: from α(L1)exp≈14 (1971Br28,1977Ma32).
56.00[@] *6*	0.038[@]	432.24	(5/2)$^-$	376.296	7/2$^-$	M1		17.9	α(L)= 13.5; α(M)= 3.23; α(N+..)= 1.15 Mult.: from ce(L1):ce(L2) exp=0.05:≤0.005 (1971Br28), and α(L1)exp≈10 (1971Br28,1977Ma32).
56.42 *14*	0.07 *6*	342.590	3/2$^+$	286.087	1/2$^+$	M1+E2	0.47 *2*	40.8 *16*	α(L)= 30.2 *10*; α(M)= 7.82 *25*; α(N+..)= 2.80 *12* Mult.,δ: from ce(L1):ce(L2):ce(L3) exp=0.09 *1*:0.10 *1*:0.08 *1* (1971Br28).
[x]59.6[&] *5*	0.08[&] *3*								
61.441 *20*	0.70 *8*	61.424	(7/2)$^+$	0.0	3/2$^+$	E2		98.4	α(L)= 72.0; α(M)= 19.5; α(N+..)= 6.98 Mult.: from ce(L1):ce(L2):ce(L3) exp=0.09 *1*:3.5 *2*:3.0 *2* (1969Br27). A_2=0.49 *4*, A_4=−0.33 *5*, Ag(θ) (1998Jo08).
62.45[e] *5*	1.57[e] *20*	123.793	7/2$^-$	61.424	(7/2)$^+$	E1		0.393	α(L)= 0.296; α(M)= 0.0719; α(N+..)= 0.0242

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γ(^{223}Ra) (continued)

E_γ †	I_γ ‡ c	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α d	Comments
									Mult.: from Ag(θ) (1990Br23). A_2=0.44 *3*, A_4=−0.11 *5* Ag(θ) (1998Jo08).
62.45 e *5*	1.57 e *20*	342.654	(9/2)+	280.182	(7/2)+	M1+E2	0.29 *5*	19.0 *21*	E_γ: other value: 62.2 *1* (1968Da10). α(L)=14.2 *15*; α(M)=3.6 *4*; α(N+..)=1.27 *15* Mult.,δ: from A_2=0.29 *6*, A_4=−0.07 *8*, Ag(θ) (1998Jo08). Other value:≈0.2, from ce(L1):ce(L2) exp=0.07:0.023 *2* (1971Br28).
62.68 *3*	0.056 *20*	405.07	(7/2)−	342.654	(9/2)+	[E1]		0.40	α(L)= 0.302; α(M)= 0.0734; α(N+..)= 0.0247
64.35 *10*	0.20 *3*	350.53	(1/2)−	286.087	1/2+	[E1]		0.363	α(L)= 0.274; α(M)= 0.0665; α(N+..)= 0.0224
x66.2 & *5*	0.05 & *3*								
x66.4 & *5*	0.06 & *3*								
x68.70 @ *10*	0.046 @								
68.74 e *3*	0.45 e *8*	130.141	9/2 +	61.424	(7/2)+	M1+E2	0.45	17.8	α(L)= 13.2; α(M)= 3.39; α(N+..)= 1.21 E_γ: other value: 68.7 *1* (1968Da10). Mult.,δ: from ce(L1):ce(L2):ce(L3) exp=0.25 *3*:0.20 *2*:0.14 *1* (1971Br28).
68.74 e *3*	0.45 e *8*	445.071	9/2+	376.296	7/2−				
69.8 g *3*	0.08 *3*	174.569	9/2−	104.60?					E_γ: from 1972He18.
72.85 *5*	0.19 *15*	247.39	11/2−	174.569	9/2−				Possible doublet.
73.63 *5*	0.11 *4*	123.793	7/2−	50.128	3/2−	E2		41.3	α(L)= 30.2; α(M)= 8.19; α(N+..)= 2.94 Mult.: from ce(L1):ce(L2):ce(L3) exp≈0.0085:0.13 *1*:0.11 *1* (1971Br28).
75.01 g *5*	0.21 *8*	104.60?		29.858	5/2+				
x77.4 a *4*	0.08 a								
79.69 *2*	15.1 *5*	79.708	(5/2)−	0.0	3/2+	E1		0.205	α(L)= 0.155; α(M)= 0.0373; α(N+..)= 0.0127 E_γ: other value: 79.8 *1* (1968Da10). Mult.: from ce(L1):ce(L2):ce(L3) exp=0.13 *1*:0.08 *1*:0.085 (1969Br27); γ(θ,H) (1990Br23). A_2=−0.40 *2*, A_4=0.00 *3*, Ag(θ) (1998Jo08).
89.6 # *4*	0.03 # *1*	432.24	(5/2)−	342.590	3/2+				
93.88 *5*	11.71 *25*	123.793	7/2−	29.858	5/2+	E1		0.132	α(L)= 0.0999; α(M)= 0.0241; α(N+..)= 0.00825 E_γ: other values: 93.5 *10* (1966Po02), 94.0 *1* (1968Da10). Mult.: from ce(L1):ce(L2):ce(L3) exp=0.082 *8*:0.042 *4*:0.041 *4* (1971Br28). A_2=−0.34 *3*, A_4=0.01 *4*, Ag(θ) (1998Jo08).
94.97 e *5*	0.19 e *11*	174.569	9/2−	79.708	(5/2)−	E2		12.4	α(L)= 9.07; α(M)= 2.47; α(N+..)= 0.892 E_γ: other value: 95.2 *2* (1968Da10). Mult.: from ce(L2):ce(L3) exp=0.062 *6*:0.049 *5* (1971Br28). A_2=−0.38 *5*, A_4=−0.26 *5*, Ag(θ) (1998Jo08).
94.97 e *5*	0.19 e *11*	329.856	3/2−	234.858	5/2+				
96.03 *5*	0.54 *10*	376.296	7/2−	280.182	(7/2)+	(E1)		0.124	α(L)= 0.0940; α(M)= 0.0226; α(N+..)= 0.00777 Mult.: from α(L1)exp≤0.08 (1971Br28,1977Ma32).
99.58 # *10*	0.20 # *5*	334.370	5/2+	234.858	5/2+				
99.6 @ *2*	0.1 @	442.35	(7/2+)	342.590	3/2+				

$^{223}_{88}Ra_{135}$-7

γ(^{223}Ra) (continued)

E_γ †	I_γ ‡c	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α d	Comments
100.27 *3*	0.65 *12*	130.141	9/2 $^+$	29.858	5/2$^+$	E2	9.61	α(L)= 7.01; α(M)= 1.91; α(N+..)= 0.690 Mult.: from ce(L1):ce(L2):ce(L3) exp=0.015:0.34 *3*:0.26 *3* (1969Br27); γ(θ,H) (1990Br23). A_2=0.46 *8*, A_4=−0.27 *12*, Ag(θ) (1998Jo08).
102.50@ *10*	0.009@	432.24	(5/2)$^-$	329.856	3/2$^-$			
105.2 *1*		280.182	(7/2)$^+$	174.569	9/2$^-$			E_γ: from 1990Br23. Populates 174.569 ((9/2)$^-$) or 174.58 ((11/2)$^+$). Possible doublet.
107.76e *7*	0.060e *20*	342.590	3/2$^+$	234.858	5/2$^+$	(M1)	13.4	α(K)= 10.8; α(L)= 2.01; α(M)= 0.480; α(N+..)= 0.172 E_γ: other value: 108.4 *2* (1968Da10). Mult.: from α(L1)exp≈1.4 (1971Br28,1977Ma32).
107.76e *7*	0.060e *20*	342.654	(9/2)$^+$	234.858	5/2$^+$	[E2]	7.16	α(K)= 0.282; α(L)= 5.02; α(M)= 1.36; α(N+..)= 0.494 E_γ: other value: 108.4 *2* (1968Da10).
109.2g *4*	0.041 *12*	424.12	(11/2$^+$)	315.99	(13/2$^-$)			
110.65 *5*	0.025 *16*	445.071	9/2$^+$	334.370	5/2$^+$	E2	6.37	α(K)= 0.296; α(L)= 4.43; α(M)= 1.21; α(N+..)= 0.437 Mult.: from ce(L2):ce(L3) exp=0.024:0.016 *3* (1971Br28).
x112.6&b *5*	0.07& *3*							
113.11f *5*	4.2f	174.569	9/2$^-$	61.424	(7/2)$^+$	E1	0.362	α(K)= 0.281; α(L)= 0.0611; α(M)= 0.0147; α(N+..)= 0.00506 E_γ: other value: 113.1 *1* (1968Da10). I_γ: from 1971Br29. Iγ=6.6 *3* (1993Ab01). Mult.: from α(L1)exp=0.032 (1971Br29,1977Ma32). A_2=−0.18 *1*, A_4=−0.035 *15*, Ag(θ) (1998Jo08).
113.11f *5*	1.2f	174.58	11/2$^+$	61.424	(7/2)$^+$	E2	5.78	α(K)= 0.304; α(L)= 4.00; α(M)= 1.09; α(N+..)= 0.394 I_γ: from 1971Br29. Iγ=6.6 *3* (1993Ab01). Mult.: from ce(L2):ce(L3) exp=0.35:0.24 (1971Br27) and α(L)exp=3.99 (1971Br29,1977Ma32). A_2=−0.18 *1*, A_4=−0.035 *15*, Ag(θ) (1998Jo08).
117.20 *5*	1.54 *11*	247.39	11/2$^-$	130.141	9/2 $^+$	E1	0.332	α(K)= 0.258; α(L)= 0.0557; α(M)= 0.0134; α(N+..)= 0.00461 E_γ: other value: 117.2 *1* (1968Da10). Mult.: from ce(L1):ce(L2) exp=≈0.005:≈0.003 (1971Br28); γ(θ,H) (1990Br23). A_2=−0.27 *3*, A_4=−0.05 *4*, Ag(θ) (1998Jo08).
117.20 *5*		459.93	(9/2)$^-$	342.654	(9/2)$^+$	E1	0.332	α(K)= 0.258; α(L)= 0.0557; α(M)= 0.0134; α(N+..)= 0.00461 E_γ: other value: 117.2 *1* (1968Da10). Mult.: from ce(L1):ce(L2) exp=≈0.005:≈0.003 (1971Br28), and α(L1)exp≈0.029 (1971Br28,1977Ma32).
x117.5& *5*	0.10& *3*							
123.58 *10*	0.11 *4*	247.39	11/2$^-$	123.793	7/2$^-$			
124.44 *20*	0.032 *17*	405.07	(7/2)$^-$	280.182	(7/2)$^+$			
x128.02# *2*	0.025# *4*							
x129.4# *2*	0.010# *5*							
134.6 *1*	0.26 *5*	369.36	(5/2)$^-$	234.858	5/2$^+$	[E1]	0.238	α(K)= 0.186; α(L)= 0.0389; α(M)= 0.00930; α(N+..)= 0.00322 Mult.: A_2=0.40 *13*, A_4=−0.12 *19*, Ag(θ) (1990Jo08). E_γ: other value: 134.6 *1* (1968Da10).
x138.4# *1*	0.11# *2*							

$^{223}_{88}Ra_{135}$-8

γ(^{223}Ra) (continued)

E_γ [†]	I_γ [‡c]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α [d]	Comments
[x]140.6 *3*	0.17 *12*								
141.42[e] *5*	0.92[e] *18*	315.99	(13/2$^-$)	174.58	11/2$^+$				
141.42[e] *5*	0.92[e] *18*	376.296	7/2$^-$	234.858	5/2$^+$	E1		0.210	α(K)= 0.165; α(L)= 0.0340; α(M)= 0.00814; α(N+..)= 0.00282 E_γ: other values: 140.9 *10* (1966Po02), 141.2 *1* (1968Da10). Mult.: from α(K)exp≈0.15 (1971Br28,1977Ma32). A_2=−0.35 *4*, A_4=0.04 *6*, Ag(θ) (1998Jo08).
150.14 *20*	0.086 *24*	280.182	(7/2)$^+$	130.141	9/2 $^+$				
162.19 *10*	0.060 *20*	442.35	(7/2$^+$)	280.182	(7/2)$^+$				E_γ: other value: 162.2 *3* (1968Da10).
[x]164.52 *10*	0.113 *20*								
168.36 *10*	0.115 *20*	342.654	(9/2)$^+$	174.569	9/2$^-$				Possible doublet. E_γ: other value: 168.6 *3* (1968Da10).
169.95 *10*	0.043 *17*	405.07	(7/2)$^-$	234.858	5/2$^+$				
[x]171.5[#] *2*	0.03[#] *1*								
173.45 *3*	0.135 *20*	234.858	5/2$^+$	61.424	(7/2)$^+$	M1,E2			E_γ: other value: 173.4 *2* (1968Da10). Mult.: from ce(K):ce(L2):ce(L3) exp=15:5.4:8.6 (1957Pi31).
175.8[&g] *3*	0.16[&] *4*	280.182	(7/2)$^+$	104.60?					
[x]181.1[#] *3*	0.02[#] *1*								
[x]182.3[#] *2*	0.03[#] *1*								
184.65 *5*	0.28 *3*	234.858	5/2$^+$	50.128	3/2$^-$	E1		0.110	α(K)= 0.0876; α(L)= 0.0172; α(M)= 0.0041; α(N+..)= 0.00142 Mult.: from Ag(θ) (1990Br23). A_2=−0.44 *8*, A_4=−0.06 *13*, Ag(θ) (1998Jo08). E_γ: other value: 184.8 *2* (1968Da10).
197.56 *10*	0.10 *3*	445.071	9/2$^+$	247.39	11/2$^-$				
200.5 *1*	0.10 *7*	280.182	(7/2)$^+$	79.708	(5/2)$^-$				
201.64 *10*	0.184 *20*	376.296	7/2$^-$	174.569	9/2$^-$	M1+E2	1.59 *9*	1.05 *4*	α(K)=0.63 *4*; α(L)=0.314 *1*; α(M)=0.0818 *1*; α(N+..)=0.0292 Mult.,δ: from A_2=0.48 *11*, A_4=0.46 *17*, Ag(θ) (1998Jo08). E_γ: other value: 201.4 *3* (1968Da10).
[x]202.5[&] *5*	0.05[&] *2*								
204.14 *10*	1.76 *20*	334.370	5/2$^+$	130.141	9/2 $^+$	E2		0.553	α(K)= 0.158; α(L)= 0.289; α(M)= 0.0780; α(N+..)= 0.0279 E_γ: other value: 20.4 *3* (1968Da10). Mult.: from ce(K):ce(L1):ce(L2):ce(L3) exp=34:5.4 *10*:36 *4*:18 *4* (1971Br28); Ag(θ) (1990Br23). A_2=0.22 *4*, A_4=0.00 *6*, Ag(θ) (1998Jo08).
204.98 *10*	1.27 *20*	234.858	5/2$^+$	29.858	5/2$^+$	M1+E2	−0.12 *7*	2.13 *4*	α(K)=1.70 *4*; α(L)=0.320 *1*; α(M)=0.0765; α(N+..)=0.0270 Mult.: M1 from ce(K):ce(L1):ce(L2): exp=0.24:0.047 *5*:0.006 *1* (1971Br28). ce(L1)=47 given by 1971Br28 is probably a typographical error (1977Ma32). Ag(θ) (1990Br23). δ: from A_2=0.58 *4*, A_4=−0.05 *6*, Ag(θ) (1998Jo08).
206.08 *5*	1.97 *20*	329.856	3/2$^-$	123.793	7/2$^-$	E2		0.535	α(K)= 0.155; α(L)= 0.278; α(M)= 0.0750; α(N+..)=

γ(^{223}Ra) (continued)

E_γ †	I_γ ‡ c	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α d	Comments
									0.0269 E_γ: other value: 206.0 *2* (1968Da10). Mult.: from ce(K):ce(L1):ce(L2):ce(L3) exp=0.033:0.0067:0.036 *4*:0.020 *2* (1971Br28); A_2=0.12 *5*, A_4=0.04 *6*, Ag(θ) (1998Jo08). Ag(θ) (1990Br23).
x206.4 &b	0.02 & *2*								
210.62 *5*	9.7 *7*	334.370	5/2$^+$	123.793	7/2$^-$	E1		0.0805	α(K)= 0.0642; α(L)= 0.0123; α(M)= 0.00294; α(N+..)= 0.001018 E_γ: other values: 210.6 *1* (1968Da10), 211.4 *7* (1966Po02). Mult.: from ce(K):ce(L1) exp=77:8.5 *17* (1971Br28); γ(θ,H) (1990Br23). A_2=−0.12 *2*, A_4=0.03 *3*, Ag(θ) (1998Jo08).
212.70 *4*	0.61 *7*	342.654	(9/2)$^+$	130.141	9/2 $^+$	M1+E2	−0.4 *1*	1.74 *9*	α(K)= 1.36 *9*; α(L)= 0.283 *17*; α(M)= 0.069 *4*; α(N+..)= 0.0242 *6* E_γ: other value: 212.7 *2* (1968Da10). δ: sign is from Ag(θ) (1998Jo08). Mult.,δ: from ce(K):ce(L1):ce(L2): exp=10.5:1.8 *4*:0.35 *7* (1971Br28). Other value: δ=−0.35 *35*, from A_2=0.60 *7*, A_4=−0.05 *10*, Ag(θ) (1998Jo08).
212.7 &g *3*	0.15 & *4*	459.93	(9/2)$^-$	247.39	11/2$^-$				
x216.0 # *1*	0.002 # *1*								
218.90 e *5*	0.85 e *8*	280.182	(7/2)$^+$	61.424	(7/2)$^+$	M1		1.79	α(K)=1.44; α(L)=0.266; α(M)=0.0635; α(N+..)=0.0224 Mult.: from A_2=0.38 *19*, A_4=0.44 *30*, Ag(θ) (1998Jo08).
218.90 e *5*	0.85 e *8*	342.654	(9/2)$^+$	123.793	7/2$^-$				
x219.0 & *3*	0.39 & *9*								
x223.2 # *4*	0.04 # *1*								
225.5 #g *3*	0.07 # *2*	459.93	(9/2)$^-$	234.858	5/2$^+$				
229.9 # *5*	0.03 # *1*	405.07	(7/2)$^-$	174.58	11/2$^+$				
234.76 *10*	3.5 *4*	234.858	5/2$^+$	0.0	3/2$^+$	M1(+E2)	−0.07 *2*	1.47	α(K)=1.18; α(L)=0.219; α(M)=0.0522; α(N+..)=0.0184 Mult.: M1(+E2) from ce(K):ce(L1):ce(L2) exp=54:9.7 *10*:≈0.6 (1971Br28). δ: from A_2=−0.23 *3*, A_4=−0.05 *4*, Ag(θ) (1998Jo08).
235.96 *2*	100 *2*	286.087	1/2$^+$	50.128	3/2$^-$	E1		0.0615	α(K)= 0.0493; α(L)= 0.00930; α(M)= 0.00222; α(N+..)= 0.000769 E_γ: other value: 236.0 *1* (1968Da10). Mult.: from ce(K):ce(L1):ce(L2):ce(L3) exp=61:8.7 *9*:2.6 *3*:1.7 *3* (1971Br28). A_2=0.00 *2*, A_4=0.02 *3*, Ag(θ) (1998Jo08).
246.12 *10*	0.095 *7*	376.296	7/2$^-$	130.141	9/2 $^+$				
x248.1 # *1*	0.19 # *4*								
249.6 &g *5*	0.06 & *2*	424.12	(11/2$^+$)	174.569	9/2$^-$				Populates 174.569 ((9/2)$^-$) or 174.58 ((11/2)$^+$).
250.15 *5*	0.069 *13*	280.182	(7/2)$^+$	29.858	5/2$^+$	M1		1.23	α(K)= 0.99; α(L)= 0.183; α(M)= 0.0436; α(N+..)=

$^{223}_{88}Ra_{135}$-10

γ(^{223}Ra) (continued)

E_γ †	I_γ ‡ c	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α d	Comments
									0.0154 Mult.: from Ag(θ) (1990Br23). A_2=−0.40 *12*, A_4=0.19 *19*, Ag(θ) (1998Jo08).
250.27 *8*	3.5 *3*	329.856	3/2−	79.708	(5/2)−	M1+E2	−2.1 *4*	0.45 *5*	α(K)=0.27 *4*; α(L)=0.136 *3*; α(M)=0.0353 *5*; α(N+..)=0.0126 *2* δ: weighted average of 2.1 *4* (1990Br23), 4.1 *7* (1998Jo08), and 1.9 *2* (1971Br28, 1977Ma32). Negative sign is from 1998Jo08. δ=1.9 *2* from ce(K):ce(L1):ce(L2) exp=12:≈2:2.4 (1971Br28,1977Ma32). E_γ: other value: 250.1 *1* (1968Da10).
252.50 *5*	0.86 *12*	376.296	7/2−	123.793	7/2−	M1		1.20	α(K)= 0.966; α(L)= 0.179; α(M)= 0.0426; α(N+..)= 0.0150 Mult.: from ce(K):ce(L1) exp=8.5:1.5 *2* (1971Br28). A_2=0.48 *6*, A_4=0.11 *9*, Ag(θ) (1998Jo08).
254.63 *3*	5.5 *10*	334.370	5/2+	79.708	(5/2)−	E1		0.0515	α(K)= 0.0413; α(L)= 0.00772; α(M)= 0.00184; α(N+..)= 0.000638 E_γ: other value: 254.2 *2* (1968Da10). Mult.: from ce(K):ce(L1) exp=26:≈3.5 (1971Br28). A_2=0.40 *2*, A_4=0.02 *3*, Ag(θ) (1998Jo08).
256.23 *2*	54.3 *10*	286.087	1/2+	29.858	5/2+	E2		0.253	α(K)= 0.0990; α(L)= 0.113; α(M)= 0.0303; α(N+..)= 0.0108 E_γ: other values: 256.2 *1* (1968Da10); 256.25 *5* (1965Br23,1977Ma32); 256.36 *8* (1957Pi31). Mult.: from ce(K):ce(L1):ce(L2):ce(L3) exp=71:13 *1*:47 *5*:24 *2* (1971Br28). A_2=0.03 *2*, A_4=0.02 *3* (1998Jo08).
x260.6# *2*	0.04# *1*								
262.87 *5*	0.83 *6*	342.590	3/2+	79.708	(5/2)−	E1		0.0479	α(K)= 0.0384; α(L)= 0.00715; α(M)= 0.00170; α(N+..)= 0.000590 E_γ: other value: 262.9 *2* (1968Da10). Mult.: from α(K)exp=0.038 *15* (1971Br28,1977Ma32); γ(θ,H) (1990Br23). A_2=−0.17 *5*, A_4=0.02 *7*, Ag(θ) (1998Jo08).
x265.3# *2*	0.04# *1*								
267.05# *20*	0.08# *2*	514.25	(11/2−)	247.39	11/2−				
267.86 *20*	0.055 *20*	442.35	(7/2+)	174.569	9/2−				Possible doublet.
270.56 *20*	0.22 *7*	445.071	9/2+	174.569	9/2−				Populates 174.569 ((9/2)−) or 174.58 ((11/2)+).
272.91 *5*	3.94 *6*	334.370	5/2+	61.424	(7/2)+	M1+E2			E_γ: other values: 272.5 *2* (1968Da10); 272.9 *10* (1966Po02). Mult.: from α(K)exp=0.11 *2* (1971Br28,1977Ma32). δ=4.9+21-22 from ce data; δ=−29+20-29 γ(θ,H); δ=−28+10-34 Ag(θ); δ=8.5 *18*, from A_2=−0.16, A_4=0.08 *3*, Ag(θ) (1998Jo08).
279.80 *5*	0.42 *10*	329.856	3/2−	50.128	3/2−	M1+E2	0.12 *11*	0.90 *3*	α(K)=0.72 *2*; α(L)=0.134 *2*; α(M)=0.0319 *4*; α(N+..)=0.0112 *1* Mult.: from ce(K):ce(L1):ce(L3) exp=69:13 *2*:<0.003 (1971Br28). δ: from A_2=0.18 *10*, A_4=0.05 *15*, Ag(θ) (1998Jo08).
280.7# *3*	0.02# *1*	405.07	(7/2)−	123.793	7/2−				
281.42e *5*	1.38e *9*	342.590	3/2+	61.424	(7/2)+				E_γ: other value: 281.3 *1* (1968Da10).
281.42e *5*	1.38e *9*	342.654	(9/2)+	61.424	(7/2)+	M1+E2	0.53 *2*	0.738	α(K)= 0.578; α(L)= 0.120; α(M)= 0.0291; α(N+..)=

$^{223}_{88}Ra_{135}$-11

γ(^{223}Ra) (continued)

E_γ [†]	I_γ [‡c]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α [d]	Comments
									0.0103 E_γ: other value: 281.3 *1* (1968Da10). Mult.,δ: from ce(K):ce(L1):ce(L2) exp=97:17 *2*:≈3.4 (1971Br28). δ=−0.43+5-8, γ(θ,H) (1990Br23). A_2=−0.28 *7*, A_4=−0.14 *9*, Ag(θ) (1998Jo08).
284.24 *10*	0.31 *10*	334.370	$5/2^+$	50.128	$3/2^-$				E_γ: other value: 283.8 *3* (1968Da10).
285.52 *10*	0.34 *9*	459.93	$(9/2)^-$	174.58	$11/2^+$				Populates 174.569 ($(9/2)^-$) or 174.58 ($(11/2)^+$).
286.09 *20*	13.5 *12*	286.087	$1/2^+$	0.0	$3/2^+$	M1+E2			E_γ: other value: 286.1 *1* (1968Da10). Mult.: from ce(K):ce(L1):ce(L2) exp=77: 13.3 *8*:2.15 *20* (1971Br28). A_2=0.01 *2*, A_4=−0.01 *3*, Ag(θ) (1998Jo08).
289.59[#] *10*	15[#] *3*	369.36	$(5/2)^-$	79.708	$(5/2)^-$				
289.77[#] *10*	0.15[#] *3*	537.16		247.39	$11/2^-$				
292.41 *5*	0.51 *6*	342.590	$3/2^+$	50.128	$3/2^-$	E1		0.0375	α(K)= 0.0302; α(L)= 0.00554; α(M)= 0.00132; α(N+..)= 0.000457 E_γ: other value: 292.4 *2* (1968Da10). Mult.: from γ(θ,H) (1990Br23). A_2=0.36 *6*, A_4=−0.03 *9*, Ag(θ) (1998Jo08).
296.50 *5*	3.4 *3*	376.296	$7/2^-$	79.708	$(5/2)^-$	M1+E2	−0.13 *2*	0.762 *4*	α(K)=0.612 *3*; α(L)=0.114; α(M)=0.0271 *1*; α(N+..)=0.0095 δ: negative sign is from Ag(θ) (1998Jo08). δ: weighted average of δ=0.12+2−[1,]Ag(θ) (1990Br23), and δ=0.16 *2*, from A_2=−0.03 *2*, A_4=0.06 *3*, Ag(θ) (1998Jo08). δ$ other values: δ=0.04+7-8, γ(θ,H) (1990Br23). δ=0.25 *8* from ce(K):ce(L1):ce(L2) exp=30:5.2 *5*:0.67 *13* (1971Br28). Mult.: from ce(K):ce(L1):ce(L2) exp=30:5.2 *5*:0.67 *13* (1971Br28).
299.98 *3*	17.1 *5*	329.856	$3/2^-$	29.858	$5/2^+$	E1		0.0354	α(K)= 0.0285; α(L)= 0.00522; α(M)= 0.00124; α(N+..)= 0.000431 I_γ: from 1972He18. E_γ: other values: 299.8 *1* (1968Da10), 299.7 *6* (1966Po02). Mult.: from γ(θ,H) and Ag(θ) (1990Br23). A_2=−0.06 *2*, A_4=0.00 *3*, Ag(θ) (1998Jo08).
300.50[#] *16*	0.11[#] *2*	350.53	$(1/2)^-$	50.128	$3/2^-$	(M1+E2)			Mult.: A_2=−0.05 *2*, A_4=0.01 *3*, Ag(θ) (1998Jo08).
304.50 *2*	8.9 *10*	334.370	$5/2^+$	29.858	$5/2^+$	M1+E2(+E0)	0.26 *4*	1.1 *1*	E_γ: other values: 304.4 *2* (1968Da10), 304.5 *10* (1966Po02). Mult.,δ: from ce(K):ce(L1):ce(L2):ce(L3) exp=100:17:2.2 *3*:0.25 *8*; α(K)exp=0.95 *12* (1971Br28,1977Ma32) suggests an E0 component. δ=−0.22+5-7, γ(θ,H); δ=0.17+7−[5,]Ag(θ) (1990Br23). δ=−0.07 *4*, from A_2=0.52 *2*, A_4=0.01 *3*, Ag(θ) (1998Jo08). α: experimental value (1966Po02).
[x]306.1[#] *3*	0.08[#] *3*								
308.40 *3*	0.131 *20*	432.24	$(5/2)^-$	123.793	$7/2^-$	M1+E2			Mult.: from α(K)exp≈0.33 (1971Br28,1977Ma32).
312.69 *3*	4.0 *3*	342.590	$3/2^+$	29.858	$5/2^+$	M1+E2	0.16 *3*	0.654 *6*	α(K)=0.525 *5*; α(L)=0.098 *1*; α(M)=0.0233 *1*;

γ(^{223}Ra) (continued)

E_γ †	I_γ ‡c	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α d	Comments
									α(N+..)=0.00820 *4* E_γ: other values: 312.6 *2* (1968Da10), 313.5 *13* (1966Po02). Mult.,δ: weighted average of δ=−0.14 *3*, Ag(θ) (1990Br23); and δ=0.20 *4*, from A_2=0.12 *2*, A_4=−0.01 *3*, Ag(θ) (1998Jo08). Other value:δ=0.41+6-9, from α(K)exp=0.52 *8* (1971Br28,1977Ma32).
x314.75@ *10* 314.85e *4*	0.27@ 3.8e *3*	376.296	7/2−	61.424	(7/2)+	E1		0.0318	α(K)= 0.0256; α(L)= 0.00466; α(M)= 0.00111; α(N+..)= 0.000384 E_γ: other value: 314.8 *2* (1968Da10). Mult.: from α(K)exp≈0.024 (1971Br29,1977Ma32). A_2=0.52 *4*, A_4=−0.03 *6*, Ag(θ) (1998Jo08).
314.85e *4*	3.8e *3*	445.071	9/2+	130.141	9/2 +	M1		0.655	α(K)= 0.527; α(L)= 0.0969; α(M)= 0.0231; α(N+..)= 0.00812 Mult.: from α(K)exp=0.6 *2* (1971Br28,1977Ma32). A_2=0.34 *9*, A_4=0.18 *12*, Ag(θ) (1998Jo08).
318.46& *20* 319.24 *5*	0.052& *17* 0.25 *5*	442.35 369.36	(7/2+) (5/2)−	123.793 50.128	7/2− 3/2−	M1+E2	0.18 *3*	0.615	α(K)= 0.494; α(L)= 0.0919; α(M)= 0.0219; α(N+..)= 0.00771 E_γ: other values: 319.4 *2* (1968Da10), 317.7 *15* (1966Po02). Mult.,δ: from γ(θ,H) (1990Br23).
324.88# *20*	0.08# *2*	405.07	(7/2)−	79.708	(5/2)−	M1+E2			E_γ: other value: 323 *1* (1966Po02). Mult.: from α(K)exp=0.6 *2* (1971Br28,1977Ma32). B.
325.99 *18* 329.85 *2*	0.049 *20* 22.8 *12*	376.296 329.856	7/2− 3/2−	50.128 0.0	3/2− 3/2+	(E1)		0.0286	α(K)= 0.0231; α(L)= 0.00418; α(M)= 0.000993; α(N+..)= 0.000345 E_γ: other values: 329.7 *1* (1968Da10), 329.7 *8* (1966Po02). Mult.: from ce(K):ce(L1) exp=75:9 *2* (1971Br28). A_2=0.38 *3*, A_4=−0.02 *5*, Ag(θ) (1998Jo08).
x332.2# *2* 334.37 *2*	0.013# *4* 8.8 *6*	334.370	5/2+	0.0	3/2+	M1+E2	−0.61 *4*	0.435 *12*	α(K)=0.341 *11*; α(L)=0.0708 *11*; α(M)=0.0172 *2*; α(N+..)=0.00606 *8* E_γ: other value: 334.2 *1* (1968Da10), 333.7 *13* (1966Po02). Mult.,δ: weighted average of δ=0.58 *7*, from ce(K):ce(L1):ce(L2):ce(L3) exp=370:70 *10*:15 *3*:≈2 (1971Br28), and δ=0.62 *4*, from A_2=0.68 *2*, A_4=0.12 *3*, Ag(θ) (1998Jo08). Negative sign is from 1998Jo08.
339.76# *10* 342.55 *4*	0.03# *1* 2.7 *7*	514.25 342.590	(11/2−) 3/2+	174.58 0.0	11/2+ 3/2+	M1+E2	1.29 *2*	0.261	Populates 174.569 ((9/2)−) or 174.58 ((11/2)+). α(K)= 0.191; α(L)= 0.0520; α(M)= 0.0130; α(N+..)= 0.00457 E_γ: other values: 342.4 *1* (1968Da10), 342.4 *8* (1966Po02). Mult.,δ: from ce(K):ce(L1):ce(L2):ce(L3) exp=90:17 *3*:7 *1*:5 *2* (1971Br28). Original values of ce(L2) and ce(L3) reported

γ(^{223}Ra) (continued)

E_γ †	I_γ ‡ c	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α d	Comments
									by 1971Br28 seem to be incorrect. Values presented here have been corrected by 1977Ma32. δ=−0.43+12-16, γ(θ,H); δ=−0.62+13−22, Agθ) (1990Br23). δ=1.30 *25*, from A_2=−0.62 *3*, A_4=−0.03 *3*, Ag(θ) (1998Jo08).
346.45 *1*	0.093 *10*	376.296	7/2−	29.858	5/2+				E_γ: other value: 346.5 *2* (1968Da10).
x348.5& *5*	0.05& *2*								
350.54 *7*	0.85 *14*	350.53	(1/2)−	0.0	3/2+	E1		0.0251	α(K)= 0.0203; α(L)= 0.00364; α(M)= 0.000863; α(N+..)= 0.000300 E_γ: other value: 350.6 *2* (1968Da10). Mult.: from α(K)exp=0.023 *5* (1971Br28,1977Ma32). A_2=0.06 *4*, A_4=0.03 *5*, Ag(θ) (1998Jo08).
352.61& *10*	0.078& *17*	432.24	(5/2)−	79.708	(5/2)−	M1+E2			Mult.: from α(K)exp≈0.3 (1971Br28,1977Ma32).
362.63 *10*	0.393 *10*	424.12	(11/2+)	61.424	(7/2)+				E_γ: other value: 362.3 *3* (1968Da10).
369.35 *5*	0.048 *10*	369.36	(5/2)−	0.0	3/2+				E_γ: other value: 369.4 *3* (1968Da10).
370.93 *8*	0.031 *21*	432.24	(5/2)−	61.424	(7/2)+				E_γ: other value: 370.6 *13* (1966Po02).
374.80 *20*	0.012	405.07	(7/2)−	29.858	5/2+				
376.27# *10*	0.04# *1*	376.296	7/2−	0.0	3/2+				E_γ: other value: 376.0 *3* (1968Da10).
x379.4# *1*	0.08# *2*								
382.2 *3*	0.050 *10*	432.24	(5/2)−	50.128	3/2−				E_γ: other value: 382.2 *3* (1968Da10).
383.51 *4*	0.19 *18*	445.071	9/2+	61.424	(7/2)+	M1+E2	−0.46 *12*	0.33 *2*	α(K)=0.262 *21*; α(L)=0.051 *3*; α(M)=0.0122 *6*; α(N+..)=0.00431 *19* E_γ: other values: 383.3 *2* (1968Da10), 384.0 *8* (1966Po02). Mult.: from α(K)exp=0.28 *6* (1971Br28,1977Ma32). δ: from A_2=0.54 *10*, A_4=−0.03 *15*, Ag(θ) (1998Jo08).
x392.4& *5*	0.08& *2*								
x398.6@ *3*	0.011@ *3*								
398.6 *3*	0.011 *3*	459.93	(9/2)−	61.424	(7/2)+				E_γ: other value: 398.9 *5* (1968Da10).
402.2 *3*	0.06 *4*	432.24	(5/2)−	29.858	5/2+				
415.11 *10*	0.011 *5*	445.071	9/2+	29.858	5/2+				
432.33 *10*	0.032 *4*	432.24	(5/2)−	0.0	3/2+				E_γ: other value: 432.4 *3* (1968Da10).
x442.5a *10*	0.00046a								
x445ag	0.004a *4*								
448.0a *6*	0.0011a *6*	908.03		459.93	(9/2)−				
452.9#g *6*	0.002# *5*	786.90		334.370	5/2+				
457.5ag *1*	0.00054a	786.90		329.856	3/2−				
x462a *1*	0.00038a								
466.8#g *2*	0.0038# *2*	590.3		123.793	7/2−				
x469.0# *2*	0.007# *2*								
480ag *1*	0.0023a *7*	823.03		342.654	(9/2)+				
482ag *1*	0.0011a *3*	859.07		376.296	7/2−				
493.1a *2*	0.0042a *6*	823.03		329.856	3/2−				

$^{223}_{88}Ra_{135}$-14

^{227}Th α decay 1990Br23,1972He18,1969Br27 (continued)

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

E_γ [†]	I_γ [‡c]	E_i(level)	J_i^π	E_f	J_f^π	Comments
507.5 *1*	0.0051 *20*	842.05		334.370	$5/2^+$	
516.6 *3*	0.0022 *8*	859.07		342.590	$3/2^+$	Populates 342.590 ($3/2^+$) or 342.654 ($(9/2)^+$).
[x]521.8[#] *3*	0.003[#] *1*					
524.5 *4*	0.0015 *3*	859.07		334.370	$5/2^+$	
534.6[ag] *4*	0.00077[a] *23*	904.4?		369.36	$(5/2)^-$	
536.9[a] *1*	0.0085[a] *13*	823.03		286.087	$1/2^+$	
[x]540.2[#] *3*	0.002[#] *1*					
552.4[a] *5*	0.0018[a] *4*	786.90		234.858	$5/2^+$	
556.1 *2*	0.0029 *12*	842.05		286.087	$1/2^+$	
[x]565.4[#] *1*	0.011[#] *2*					
569.0[ag] *3*	0.0046[a] *7*	803.44		234.858	$5/2^+$	
576.0 *2*	0.0025 *15*	926.48	$(3/2,5/2^-)$	350.53	$(1/2)^-$	
579.0 *2*	0.0035 *25*	859.07		280.182	$(7/2)^+$	
[x]585.8[#] *1*	0.007[#] *1*					
589.0[ag] *6*	0.00046[a] *12*	823.03		234.858	$5/2^+$	Populates 174.569 ($(9/2)^-$) or 174.58 ($(11/2)^+$).
596[ag] *1*	0.00008[a] *4*	926.48	$(3/2,5/2^-)$	329.856	$3/2^-$	
[x]598.9[#] *2*	0.005[#] *1*					
607.7 *3*	0.0014 *3*	842.05		234.858	$5/2^+$	
621.4[a] *5*	0.00046[a] *12*	908.03		286.087	$1/2^+$	
623.8 *5*	0.0013 *3*	999.85		376.296	$7/2^-$	
632.3[a] *7*	0.0011[a] *2*	712.7		79.708	$(5/2)^-$	
641.0[a] *5*	0.00015[a] *5*	971.31		329.856	$3/2^-$	
644.3 *3*	0.0007 *3*	879.41	$(7/2^+)$	234.858	$5/2^+$	
[x]648.5[ab] *5*	0.00015[a] *5*					
662.8[a] *4*	0.00046[a] *14*	712.7		50.128	$3/2^-$	
692.0[a] *7*	0.00031[a] *9*	926.48	$(3/2,5/2^-)$	234.858	$5/2^+$	
704.3[ag] *5*	0.00062[a] *12*	879.41	$(7/2^+)$	174.569	$9/2^-$	Populates 174.569 ($(9/2)^-$) or 174.58 ($(11/2)^+$).
707.2[a] *7*	0.00031[a] *9*	786.90		79.708	$(5/2)^-$	
718.5[g] *10*	0.00023 *9*	842.05		123.793	$7/2^-$	
[x]722.1[a] *6*	0.0029[a] *9*					
722.1[a] *6*	0.0029[a] *9*	784.02		61.424	$(7/2)^+$	
723.5[a] *1*	0.0021[a] *8*	803.44		79.708	$(5/2)^-$	
734.4[a] *5*	0.0008[a] *3*	784.02		50.128	$3/2^-$	
735.4 *2*	0.0013 *4*	859.07		123.793	$7/2^-$	
738.4[ag] *10*	0.00054[a] *13*	786.90		50.128	$3/2^-$	
746.4[a] *7*	0.0008[a] *3*	826.7	$(3/2^+)$	79.708	$(5/2)^-$	
748.8[g] *4*	0.0032 *9*	879.41	$(7/2^+)$	130.141	$9/2^+$	
754.1[e] *2*	0.0019[e] *11*	784.02		29.858	$5/2^+$	
754.1[e] *2*	0.0019[e] *11*	803.44		50.128	$3/2^-$	

$^{223}_{88}Ra_{135}$-15

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

E_γ †	I_γ ‡ c	E_i(level)	J_i^π	E_f	J_f^π	E_γ †	I_γ ‡ c	E_i(level)	J_i^π	E_f	J_f^π
756.9 a 2	0.0015 a 4	786.90		29.858	5/2$^+$	842.5 3	0.0069 10	842.05		0.0	3/2$^+$
756.9 g 2	0.0015 4	818.18		61.424	(7/2)$^+$	846.7 a 5	0.00115 a 23	926.48	(3/2,5/2$^-$)	79.708	(5/2)$^-$
x757.3 4	0.0081 19					848.3 g 6	0.0021 6	879.41	(7/2$^+$)	29.858	5/2$^+$
762.2 5	0.0021 4	842.05		79.708	(5/2)$^-$	854.3 ag 5	0.00054 a 11	884.2?		29.858	5/2$^+$
x762.6 5	0.0021 4					857.3 a 7	0.00046 a 14	908.03		50.128	3/2$^-$
766.3 a 5	0.0023 a 5	826.7	(3/2$^+$)	61.424	(7/2)$^+$	858.9 2	0.0020 3	859.07		0.0	3/2$^+$
773.4 4	0.0012 3	823.03		50.128	3/2$^-$	863 ag 1	0.00015 a 6	943.1	(3/2,5/2)	79.708	(5/2)$^-$
775.8 5	0.012 1	826.7	(3/2$^+$)	50.128	3/2$^-$	867.3 5	0.0023 17	867.5		0.0	3/2$^+$
781.0 5	0.0025 5	842.05		61.424	(7/2)$^+$	876.3 4	0.0018 6	926.48	(3/2,5/2$^-$)	50.128	3/2$^-$
784.2 a 5	0.00077 a 19	784.02		0.0	3/2$^+$	878.2 a 4	0.0011 a 3	908.03		29.858	5/2$^+$
787.4 ea 5	0.00031 ea 18	786.90		0.0	3/2$^+$	891 ag 1	0.00015 a 5	891?		0.0	3/2$^+$
787.4 eag 5	0.00031 ea 18	818.18		29.858	5/2$^+$	893 a 1	0.00010 a 3	943.1	(3/2,5/2)	50.128	3/2$^-$
x787.6 5	0.00089 21					896.1 a 5	0.00085 a 21	926.48	(3/2,5/2$^-$)	29.858	5/2$^+$
792.6 g 6	0.00023 6	792.6		0.0	3/2$^+$	908.6 4	0.0185 25	908.03		0.0	3/2$^+$
792.6 ag 6	0.00031 a 8	823.03		29.858	5/2$^+$	910 a 1	0.00012 a 5	971.31		61.424	(7/2)$^+$
797.3 5	0.0071 9	859.07		61.424	(7/2)$^+$	920.0 a 5	0.00009 a 2	999.85		79.708	(5/2)$^-$
803.9 4	0.005 4	803.44		0.0	3/2$^+$	927 a 1	0.00005 a 2	926.48	(3/2,5/2$^-$)	0.0	3/2$^+$
808.6 # g 4	0.0006 # 2	859.07		50.128	3/2$^-$	938.0 a 8	0.00008 a 3	999.85		61.424	(7/2)$^+$
812.6 4	0.013 2	842.05		29.858	5/2$^+$	941.6 a 3	0.00055 a 8	971.31		29.858	5/2$^+$
x818.0 a 10	0.00023 a 9					958.7 a 3	0.00048 a 10	1020.1		61.424	(7/2)$^+$
818 eg 1	0.0013 e 6	818.18		0.0	3/2$^+$	970.0 2	0.0011 9	999.85		29.858	5/2$^+$
818.1 e 2	0.0013 e 6	879.41	(7/2$^+$)	61.424	(7/2)$^+$	971.7 ag 10	0.00008 a 4	971.31		0.0	3/2$^+$
823.4 4	0.020 2	823.03		0.0	3/2$^+$	990.0 a 7	0.00027 a 7	1020.1		29.858	5/2$^+$
826.7 a 5	0.0013 a 4	826.7	(3/2$^+$)	0.0	3/2$^+$	995 ag 1	0.00005 a 3	1025.0		29.858	5/2$^+$
828.5 eag 5	0.0015 ea 4	859.07		29.858	5/2$^+$	999.8 5	0.00023 6	999.85		0.0	3/2$^+$
828.5 eag 5	0.0015 ea 4	908.03		79.708	(5/2)$^-$	1015.2 ag 7	0.00012 a 3	1015.2?		0.0	3/2$^+$
x828.9 # 2	0.0060 # 2					1020 a 1	0.00015 a 5	1020.1		0.0	3/2$^+$
837.8 5	0.0041 9	867.5		29.858	5/2$^+$	1025 a 1	0.00012 a 3	1025.0		0.0	3/2$^+$

† Weighted average (lwm) from 1993Ab01, 1990Br23, 1972He18, and 1969Br27, unless otherwise specified.
‡ Weighted average (lwm) from 1993Ab01, 1972He18, and 1969Br27, unless otherwise specified.
# From 1993Ab03.
@ From 1990Br23.
& From 1972He18.
a From 1969Br27.
b Uncertain γ ray.
c For absolute intensity per 100 decays, multiply by 0.129 11.

$\gamma(^{223}\text{Ra})$ (continued)

[d] 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.
[e] Multiply placed with undivided intensity.
[f] Multiply placed with intensity suitably divided.
[g] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

$^{223}_{88}Ra_{135}$-17

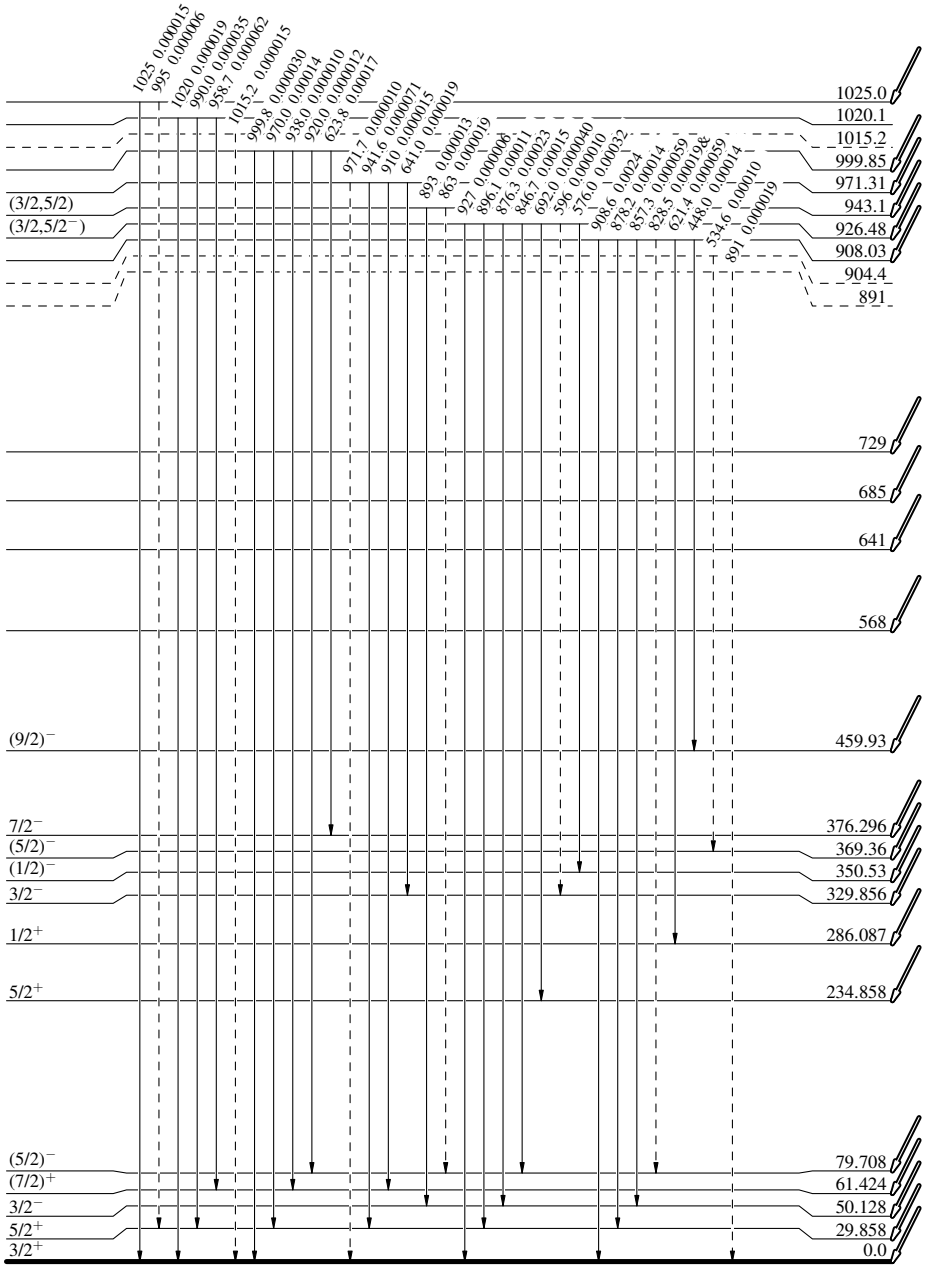
^{227}Th α decay 1990Br23,1972He18,1969Br27

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)

$(1/2^+)$ 0.0 18.68 d 9
Q_α=6146.43 15 %α=100
$^{227}_{90}Th_{137}$



		Eα	Iα	HF
1025.0		5033.5	0.00031	30
1020.1				
1015.2				
999.85		5056.1	0.00023	58
971.31		5083.5	0.000150	133
943.1		5110.5	0.00028	106
926.48		5128.7	0.00062	60
908.03		5146.5	0.00410	12
904.4				
891				
729		5321.8	0.00024	2190
685		5365.0	0.00066	1410
641		5408.7	0.00044	3700
568		5480.4	0.0012	3400
459.93		5585.9	0.176	87
376.296	<0.03 ns	5668.0	2.06	20
369.36	0.20 ns *5*	5674.3	0.0572	791
350.53		5693.0	1.50	38
329.856	0.42 ns *4*	5713.2	4.89	15
286.087	0.77 ns *7*	5756.87	20.4	5.9
234.858		5807.5	1.27	169
79.708	0.24 ns *8*	5959.7	3.00	404
61.424	≈0.6 ns	5977.72	23.5	63
50.128	0.63 ns *7*	5989.4	0.002	8.35×10^5
29.858		6008.8	2.90	717
0.0	11.43 d *2*	6038.01	24.2	118

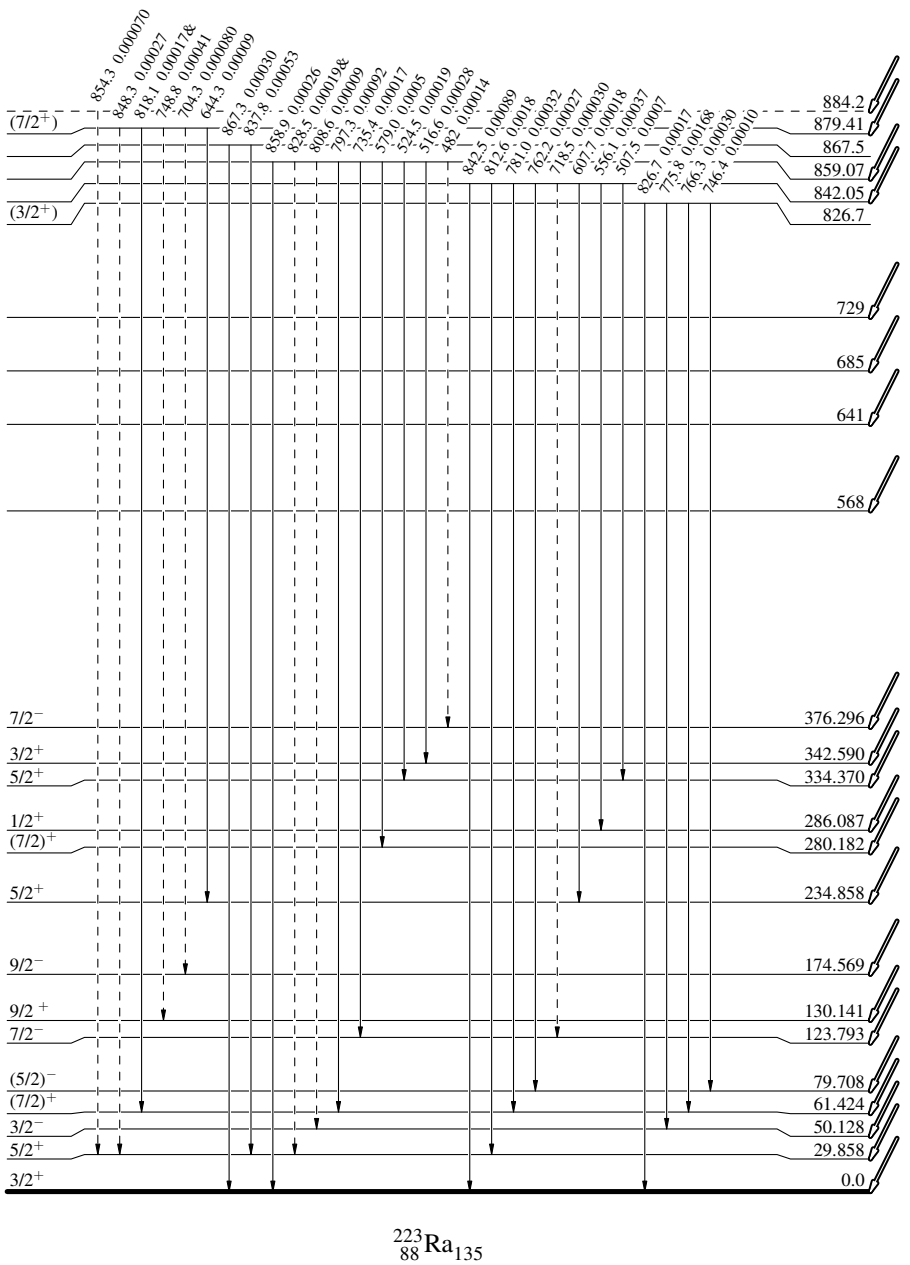
$^{223}_{88}Ra_{135}$

^{227}Th α decay 1990Br23,1972He18,1969Br27

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



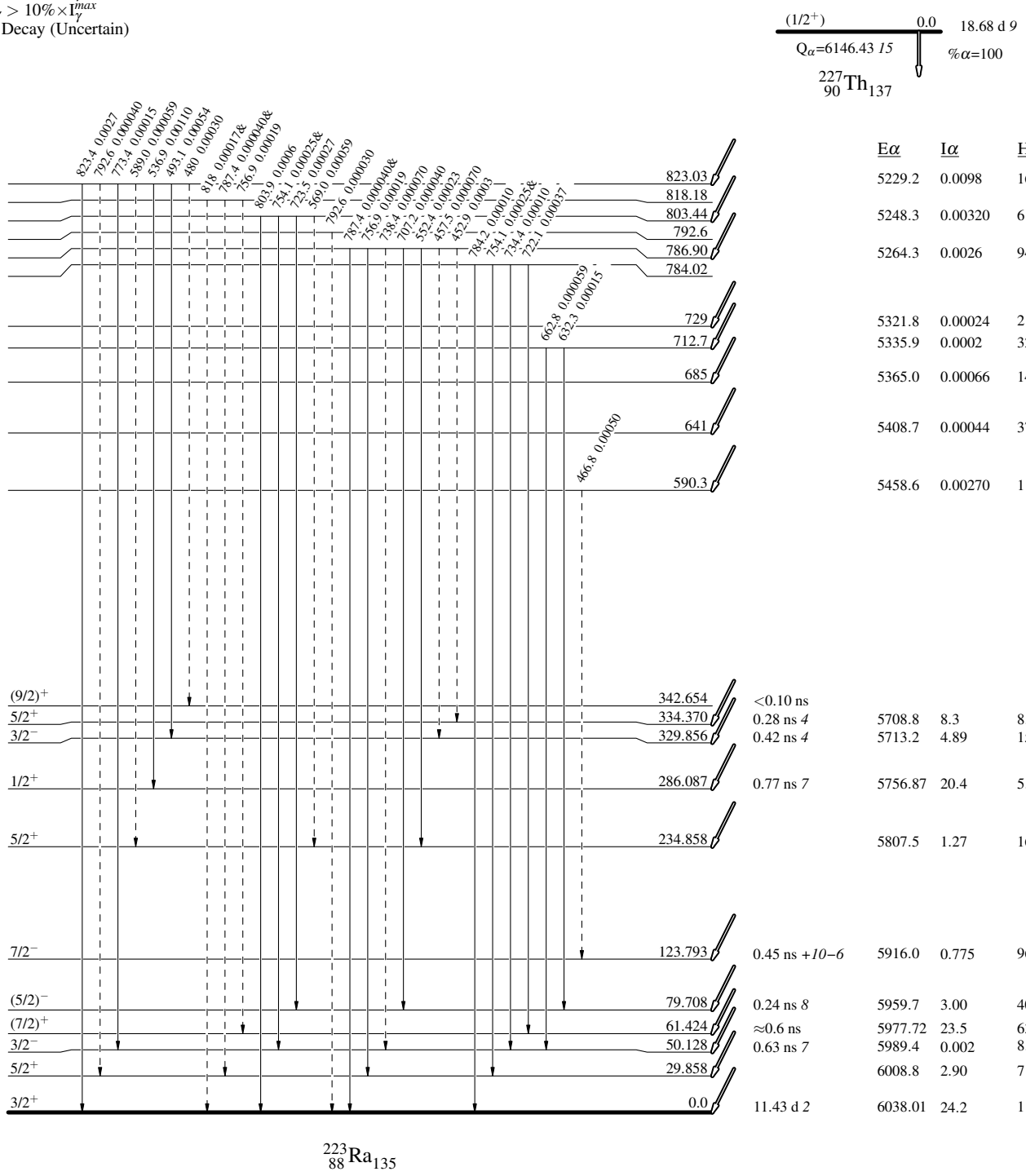
Eα	Iα	HF		
5171.0	0.00170	39		
5180.6	0.00120	60		
5193.7	0.00380	25		
5210.2	0.0070	17		
5321.8	0.00024	2190		
5365.0	0.00066	1410		
5408.7	0.00044	3700		
5480.4	0.0012	3400		
5668.0	2.06	20	376.296	<0.03 ns
5700.8	3.63	17	342.590	<0.050 ns
5708.8	8.3	8.2	334.370	0.28 ns *4*
5756.87	20.4	5.9	286.087	0.77 ns *7*
5762.3	0.228	561	280.182	0.075 ns *25*
5807.5	1.27	169	234.858	
5866.6	2.42	175	174.569	0.20 ns *6*
5909.9	0.174	4000	130.141	>0.3 ns
5916.0	0.775	963	123.793	0.45 ns *+10−6*
5959.7	3.00	404	79.708	0.24 ns *8*
5977.72	23.5	63	61.424	≈0.6 ns
5989.4	0.002	8.35×10^5	50.128	0.63 ns *7*
6008.8	2.90	717	29.858	
6038.01	24.2	118	0.0	11.43 d *2*

^{227}Th α decay 1990Br23,1972He18,1969Br27

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)

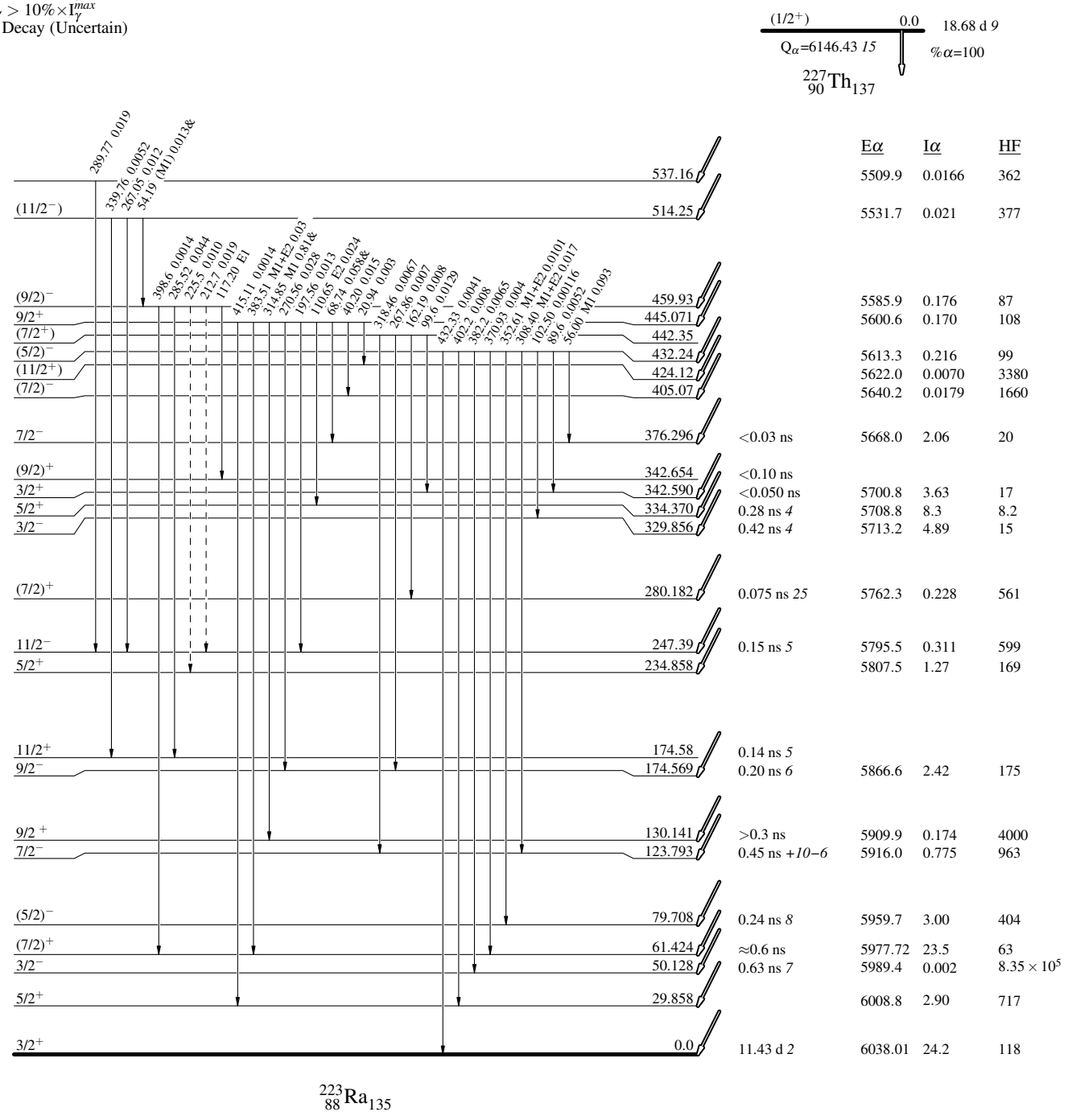


^{227}Th α decay 1990Br23,1972He18,1969Br27

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



	Eα	Iα	HF
	5509.9	0.0166	362
	5531.7	0.021	377
	5585.9	0.176	87
	5600.6	0.170	108
	5613.3	0.216	99
	5622.0	0.0070	3380
	5640.2	0.0179	1660
	5668.0	2.06	20
	5700.8	3.63	17
	5708.8	8.3	8.2
	5713.2	4.89	15
	5762.3	0.228	561
	5795.5	0.311	599
	5807.5	1.27	169
	5866.6	2.42	175
	5909.9	0.174	4000
	5916.0	0.775	963
	5959.7	3.00	404
	5977.72	23.5	63
	5989.4	0.002	8.35×10^5
	6008.8	2.90	717
	6038.01	24.2	118

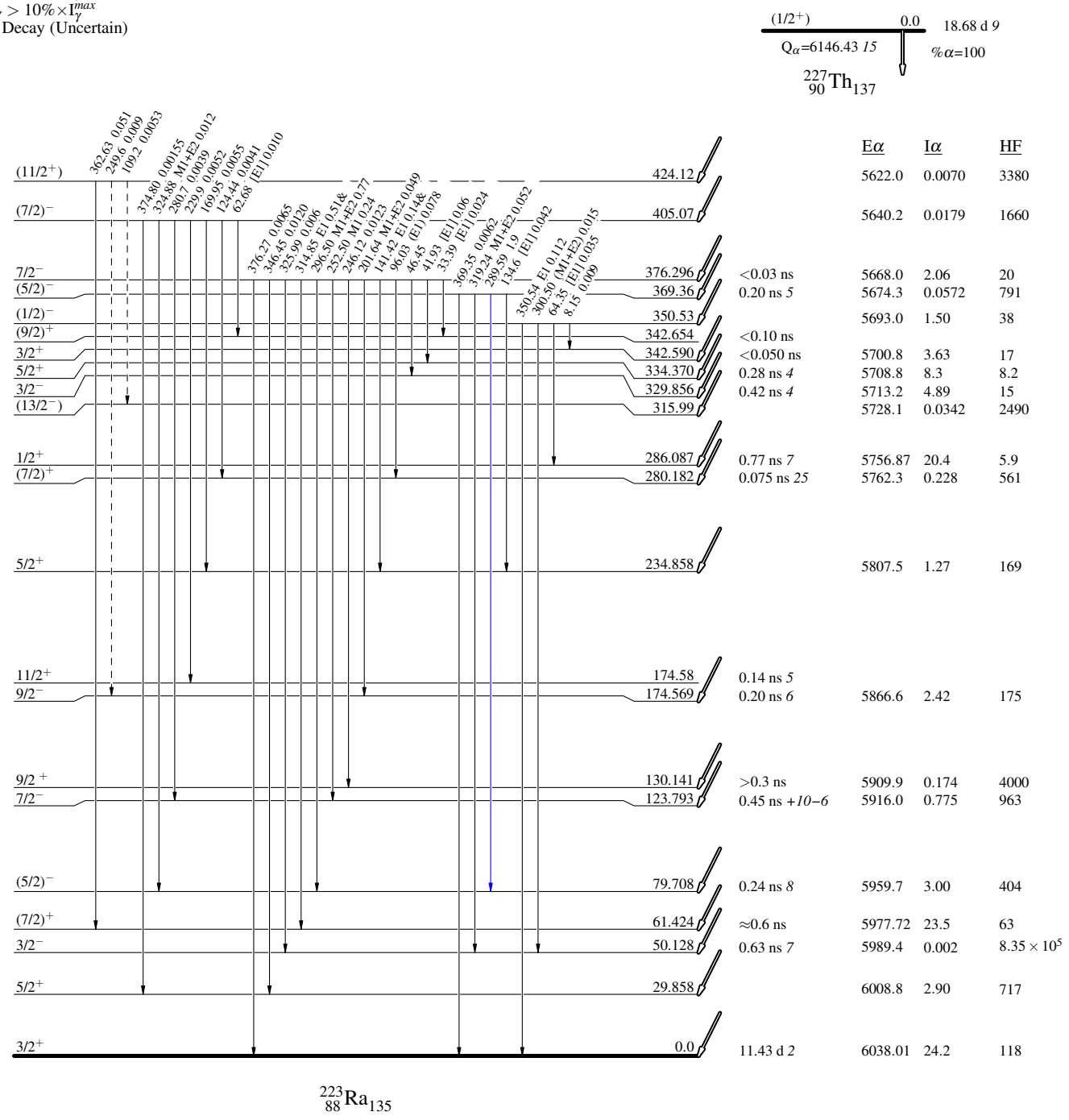
$^{223}_{88}Ra_{135}$

^{227}Th α decay 1990Br23,1972He18,1969Br27

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)

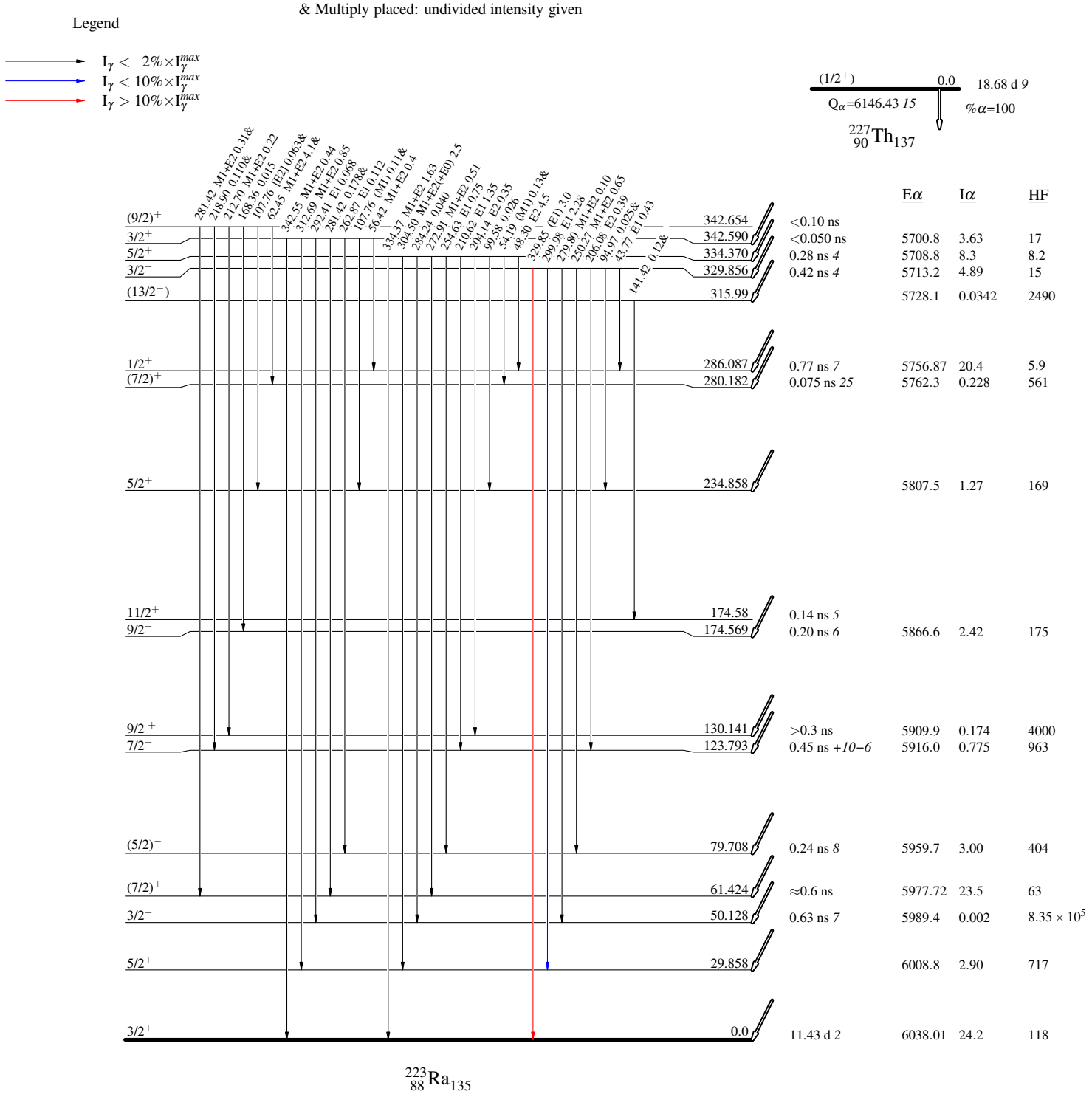


		Eα	Iα	HF
424.12		5622.0	0.0070	3380
405.07		5640.2	0.0179	1660
376.296	<0.03 ns	5668.0	2.06	20
369.36	0.20 ns *5*	5674.3	0.0572	791
350.53		5693.0	1.50	38
342.654	<0.10 ns			
342.590	<0.050 ns	5700.8	3.63	17
334.370	0.28 ns *4*	5708.8	8.3	8.2
329.856	0.42 ns *4*	5713.2	4.89	15
315.99		5728.1	0.0342	2490
286.087	0.77 ns *7*	5756.87	20.4	5.9
280.182	0.075 ns *25*	5762.3	0.228	561
234.858		5807.5	1.27	169
174.58	0.14 ns *5*			
174.569	0.20 ns *6*	5866.6	2.42	175
130.141	>0.3 ns	5909.9	0.174	4000
123.793	0.45 ns *+10−6*	5916.0	0.775	963
79.708	0.24 ns *8*	5959.7	3.00	404
61.424	≈0.6 ns	5977.72	23.5	63
50.128	0.63 ns *7*	5989.4	0.002	8.35×10^5
29.858		6008.8	2.90	717
0.0	11.43 d *2*	6038.01	24.2	118

^{227}Th α decay 1990Br23,1972He18,1969Br27

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given



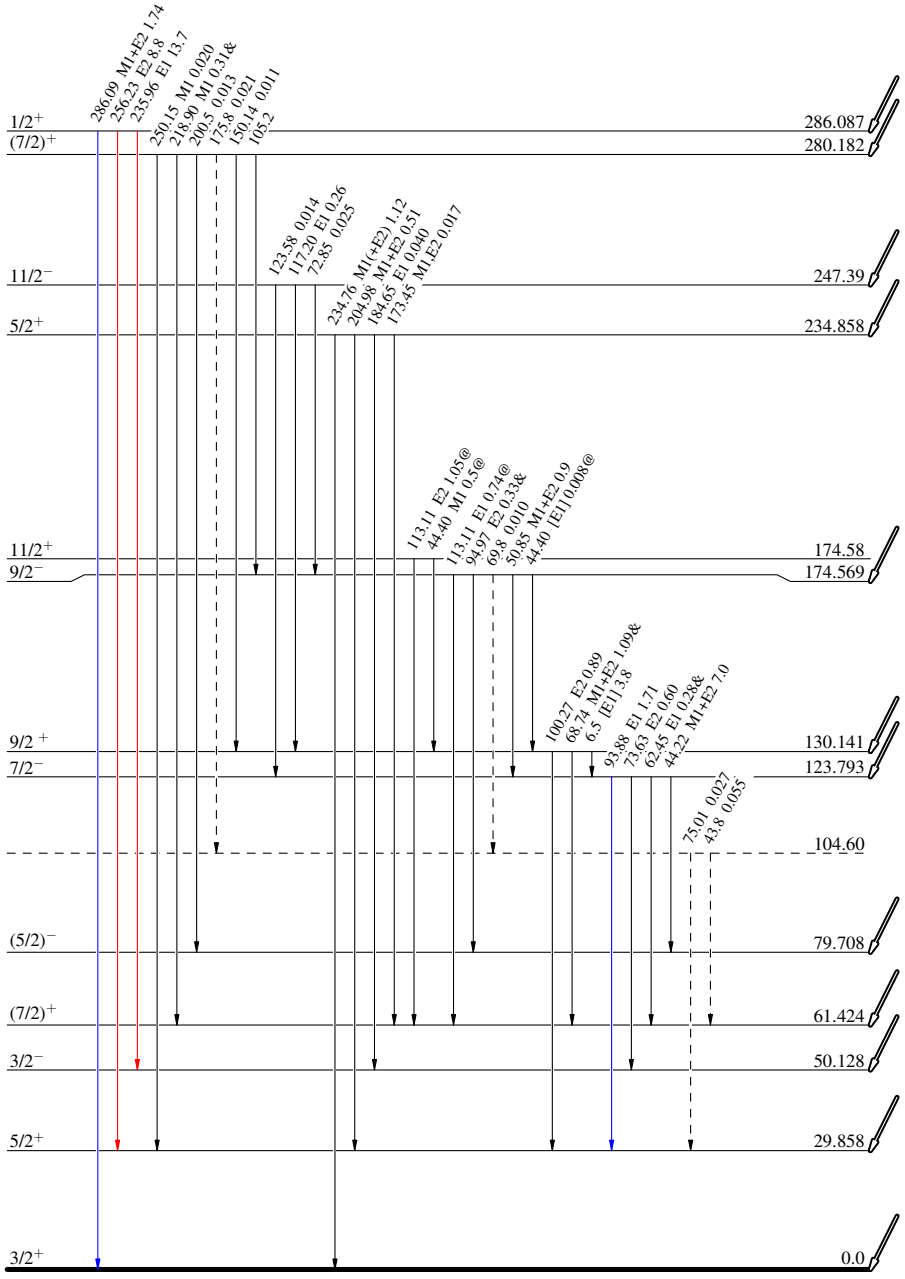
^{227}Th α decay 1990Br23,1972He18,1969Br27

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)

$(1/2^+)$ 0.0 18.68 d 9
Q_α=6146.43 15 %α=100
$^{227}_{90}Th_{137}$



			Eα	Iα	HF
1/2+	286.087	0.77 ns 7	5756.87	20.4	5.9
(7/2)+	280.182	0.075 ns 25	5762.3	0.228	561
11/2−	247.39	0.15 ns 5	5795.5	0.311	599
5/2+	234.858		5807.5	1.27	169
11/2+	174.58	0.14 ns 5			
9/2−	174.569	0.20 ns 6	5866.6	2.42	175
9/2+	130.141	>0.3 ns	5909.9	0.174	4000
7/2−	123.793	0.45 ns +10−6	5916.0	0.775	963
	104.60				
(5/2)−	79.708	0.24 ns 8	5959.7	3.00	404
(7/2)+	61.424	≈0.6 ns	5977.72	23.5	63
3/2−	50.128	0.63 ns 7	5989.4	0.002	8.35×10^5
5/2+	29.858		6008.8	2.90	717
3/2+	0.0	11.43 d 2	6038.01	24.2	118

$^{223}_{88}Ra_{135}$

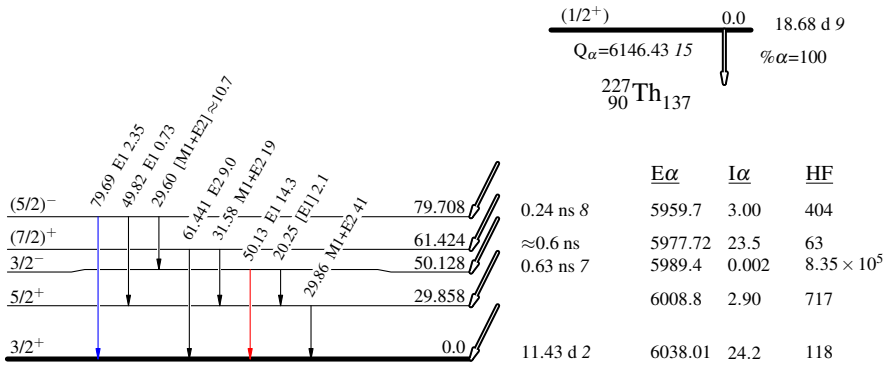
^{227}Th α decay 1990Br23,1972He18,1969Br27

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

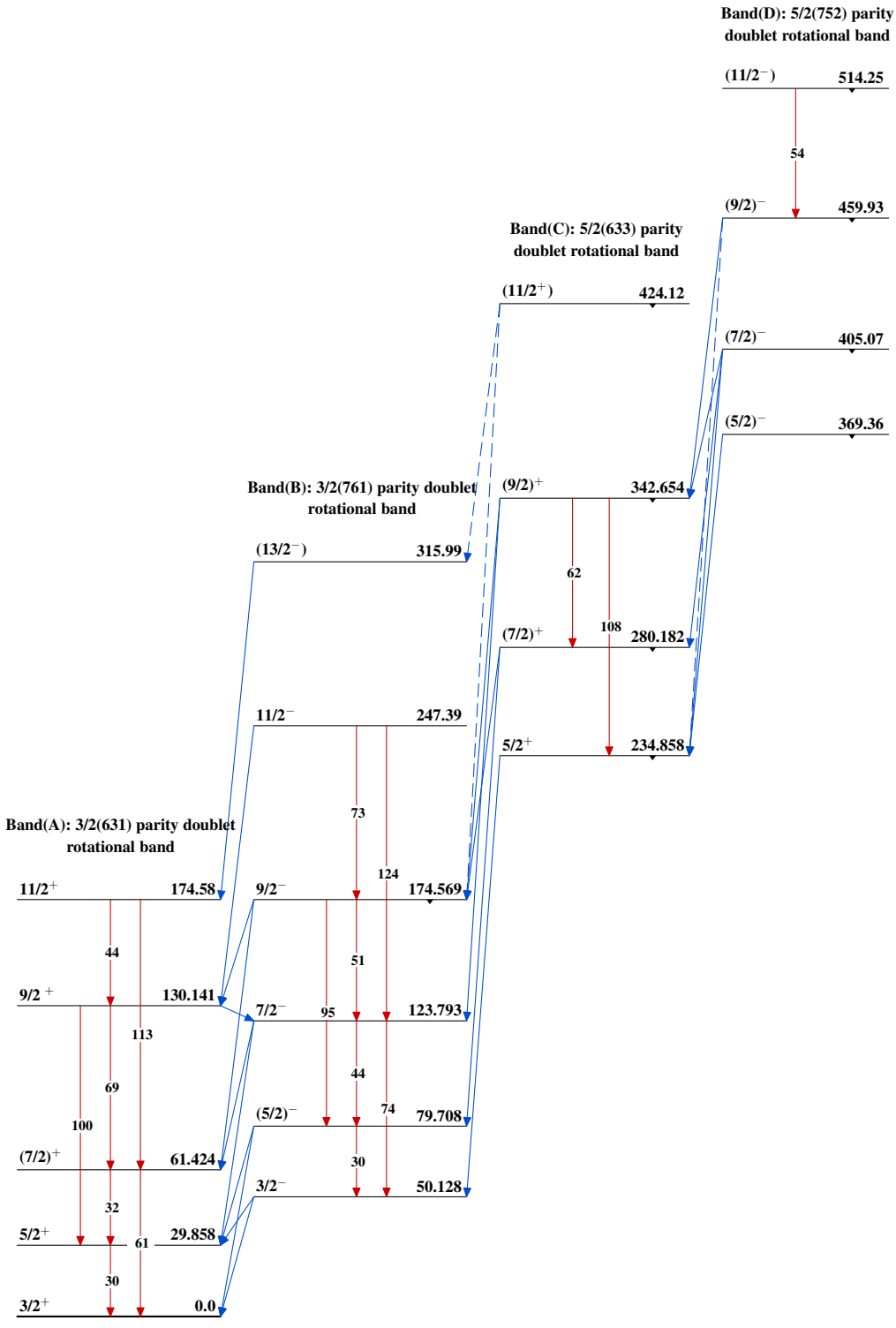
Legend

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



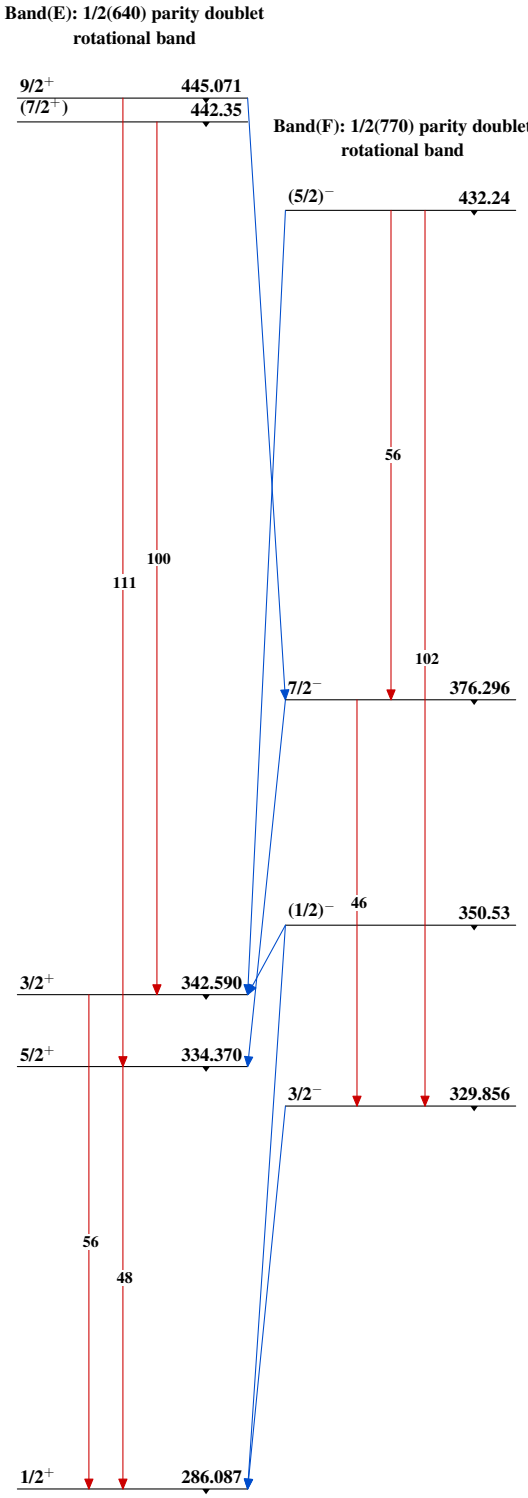
		Eα	Iα	HF
79.708	0.24 ns *8*	5959.7	3.00	404
61.424	≈0.6 ns	5977.72	23.5	63
50.128	0.63 ns *7*	5989.4	0.002	8.35×10^5
29.858		6008.8	2.90	717
0.0	11.43 d *2*	6038.01	24.2	118

^{227}Th α decay 1990Br23,1972He18,1969Br27



$^{223}_{88}Ra_{135}$

^{227}Th α decay 1990Br23,1972He18,1969Br27 (continued)



$^{223}_{88}Ra_{135}$