^{230}Th α decay

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Y. A. Akovali	NDS 77,433 (1996)	1-Feb-1996

Parent: ^{230}Th: E=0.0; J$^\pi$=0$^+$; $T_{1/2}$=7.538×10^4 y *30*; Q(α)=4770.0 *15*; %α decay=100.0

^{226}Ra Levels

E(level)	J$^\pi$	$T_{1/2}$
0.0[†]	0$^+$	
67.67[†] *1*	2$^+$	0.63 ns *2*
211.54[†] *2*	4$^+$	≈0.17 ns
253.73[‡] *1*	1$^-$	
321.54[‡] *6*	3$^-$	
416.5[†] *3*	6$^+$	
446.3[‡] *2*	5$^-$	
824.6[#] *1*	0$^+$	
873.7[#] *1*	2$^+$	

[†] Band(A): K=0 g.s. band.
[‡] Band(B): K=0$^-$ octupole vibrational band.
[#] Band(C): K=0 band.

α radiations

Eα[†]	E(level)	Iα[@a]	HF	Comments
(3829.4[#] *17*)	873.7	≈1.4×10^{-6}[&]	≈5.2	
(3877.8[#] *16*)	824.6	≈3.4×10^{-6}[&]	≈6.2	
(4248.5[#] *16*)	446.3	1.03×10^{-5}[&] *22*	4100	
(4278.3[#] *17*)	416.5	8.0×10^{-6}[&] *20*	8000	
(4371.8[#] *16*)	321.54	9.7×10^{-4}[&] *13*	360	
4438.4 *16*	253.73	0.030 *15*	38	Iα: 0.0214 *15* from level scheme.
4479.8 *16*	211.54	≈0.12	≈20	Iα: 0.151 *12* from level scheme.
4620.5[‡] *15*	67.67	23.4 *1*	1.1	
4687.0[‡] *15*	0.0	76.3 *3*	1.0	

[†] Unless otherwise indicated, energies have been calculated by the evaluator from level energies and Eα(g.s.)=4687.0 *15*. 1954Ro12 measured energies relative to Eα(g.s.) and gave ΔQ(α)′s. Additional α′s seen by 1954Ro12 at ΔQ(α)=142-, 328-, 399-, and 485-keV with Iα=0.07, 0.08, 0.07, and 0.06%, respectively, are not listed here. Other measurements: 1956Hu96, 1957Cl17, 1964Ca24, 1994Va40.
[‡] From 1966Ba14. The original energies of 1966Ba14 have been increased by 3.0 keV, as recommended by 1991Ry01, because of changes in calibration energies.
[#] α was not observed.
[@] From 1954Ro12, 1953Va01 unless otherwise noted.
[&] Deduced from intensity balance. Iα′s for the 3877.8-keV and the 3829.4-keV α′s are given as approximate values because of expected but unobserved transitions to the g.s. band.
[a] Absolute intensity per 100 decays.

^{230}Th α decay (continued)

$\gamma(^{226}Ra)$

Iγ normalization: Intensity balances at the 67.67-keV level and at the g.s. yield normalization factor of 1.00 *6* and 1.01 *6*, respectively, to convert photon intensities to absolute intensities per 100 α decays.

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γγ:        1978Ku08, 1957St92, 1956Bo85, 1953Ra13.
Ag(t):
   (α)(ce 68γ)(t) T1/2(67.67 level)=0.63 Ns 2   1960Be25
   (α)(68γ)(t)                     =0.63 Ns 7   1958Va02
                                   =0.49 Ns 9   1960Un02
                                   =0.62 Ns 7   1961Fo08
   (α)(142γ)(t) T1/2(211.54 level) ≈ 0.17 Ns    1961Fo08

Ag(θ):     see 1968Gr28, 1963Mu04, 1955Va06, 1955Fa24, 1953Te19, 153Ro14.
γγ(θ):     see 1955St16.

x-rays:       see 1973De50, 1956Bo85, 1953Bo45, 1949Cu37.
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E_γ[†]	I_γ[‡a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	α[b]	Comments
67.672 *2*	0.373 *21*	67.67	2^+	0.0	0^+	E2	61.9	α(L)=45.2; α(M)=12.2; α(N+..)=4.40 Iγ=0.463% 12 was measured by 1990Ko40. This is 23% higher than the intensity adopted here based on the intensity balance. Note that the Iγ's of 1990Ko40 for other nuclei are also consistently higher than the other available measurements. The intensity of the 53.2γ in ^{234}U α decay, for example, measured by 1990Ko40 is higher than the other measured Iγ's and 27% higher than the evaluator's adopted intensity (see 1993Ak02). Ice(L2)=9.1% 14 (1971Tr14); 9.2% 8 from Iγ and α(L2)=24.39. L2:L3:M:N:O=100:95:50:14:3 (1954Ro32), L1:L2:L3=<3:100:80 (1957De56), L2:L3:M:n=91:83:46:14 (1971Tr14).
(67.81[&] *20*)		321.54	3^-	253.73	1^-			
110.0 *1*	5.9×10^{-5} *5*	321.54	3^-	211.54	4^+	[E1]	0.388	
(124.8[&] *2*)	2.8×10^{-7} *14*	446.3	5^-	321.54	3^-	[E2]	3.81	I_γ: calculated from the branching measured in (HI,xnγ).
143.872 *4*	0.0483 *22*	211.54	4^+	67.67	2^+	E2	2.11	α(K)=0.280; α(L)=1.34; α(M)=0.363; α(N+..)=0.132 Ice(L2)=0.038% 15 (1971Tr14); 0.038 *3* from Iγ and α(L2)=0.785. K:L2:L3:M:N=10 *4*:38 *15*:23 *10*:16 *7*:5 *2* (1971Tr14).
186.053 *4*	0.0087 *4*	253.73	1^-	67.67	2^+	E1	0.108	α(K)=0.0860; α(L)=0.0169; α(M)=0.00402; α(N+..)=0.00139 Ice(K)=0.0008% 2 (1971Tr14); 0.00075 *6* from Iγ and α(K)=0.0860.
205.1[@] *5*	5.1×10^{-6} *12*	416.5	6^+	211.54	4^+	[E2]	0.545	
235.0[@] *1*	8.3×10^{-6} *18*	446.3	5^-	211.54	4^+	[E1]	0.0623	
253.729 *10*	0.0110 *5*	253.73	1^-	0.0	0^+	E1	0.0520	α(K)=0.0417; α(L)=0.00779; α(M)=0.00186; α(N+..)=0.00064 Ice(K)=0.00010% 2 (1971Tr14); 0.00046 *4* from Iγ and α(K)=0.0417.
253.8[@] *1*	84×10^{-5} *9*	321.54	3^-	67.67	2^+	[E1]	0.0519	

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^{230}Th α decay (continued)

$\gamma(^{226}$Ra) (continued)

E_γ [†]	I_γ [‡a]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [#]	α [b]
551.8[@] *5*	5.4×10^{-7} *8*	873.7	2^+	321.54	3^-		
570.5[@] *3*	3.3×10^{-6} *5*	824.6	0^+	253.73	1^-		
620.0[@] *5*	7.9×10^{-7} *12*	873.7	2^+	253.73	1^-		

[†] From 1978Ku08. See also 1971Tr14. Other measurements: 1949Cu37, 1953Bo45, 1953Ri23, 1954Ro32, 1955St97, 1956Al30, 1956Bo85, 1957St92.

[‡] From 1978Ku08. Others: 1953Bo45, 1955St97, 1956Bo85, 1957St92.

[#] From conversion-electron measurements of 1971Tr14, 1957De56, 1954Ro32. Ice′s given by 1971Tr14 were normalized such that Ti(67γ)=23.4%.

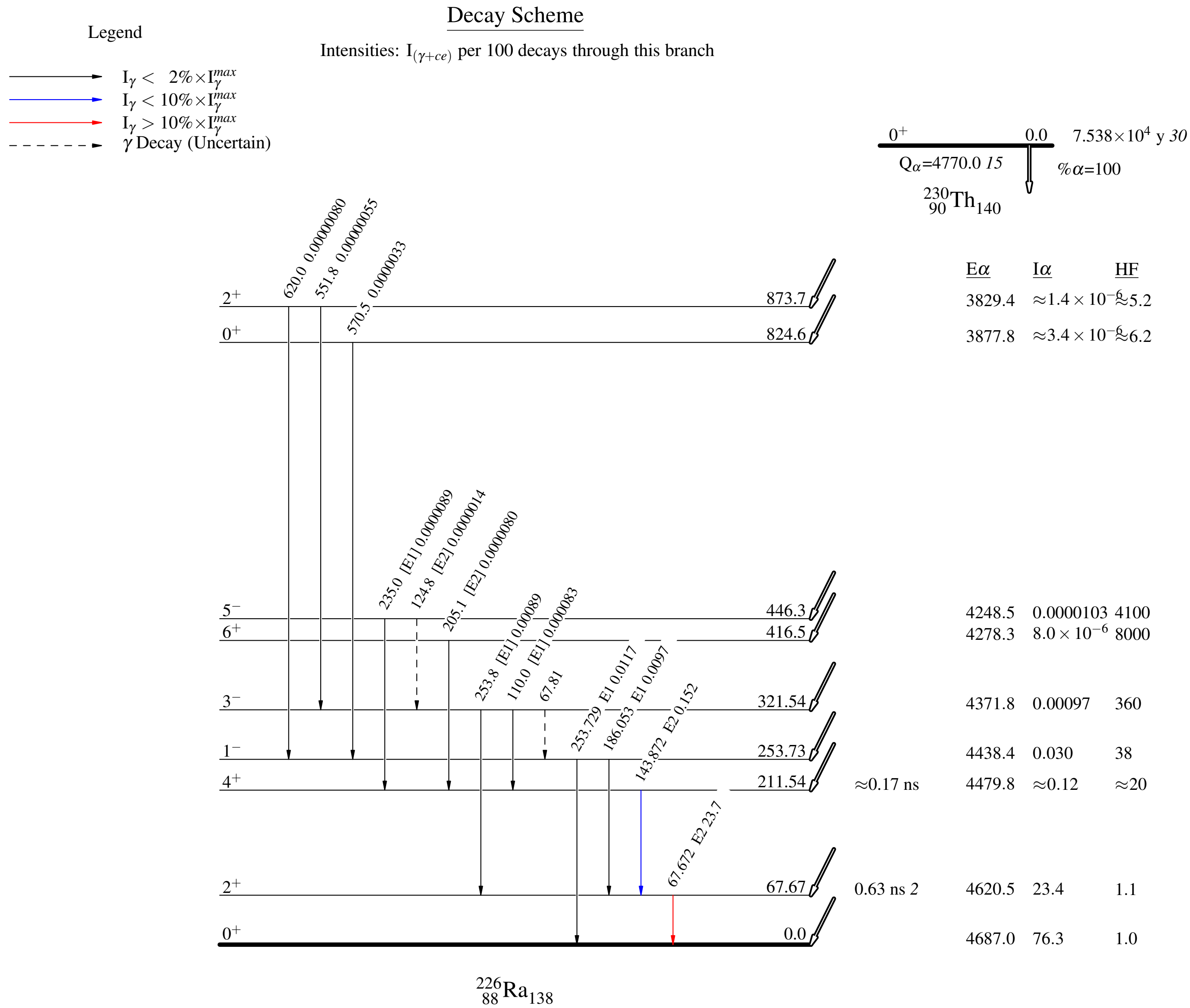
[@] γ observed only in coincidence spectra.

[&] From ^{226}Ra adopted gammas; this transition was not observed in ^{230}Th α decay.

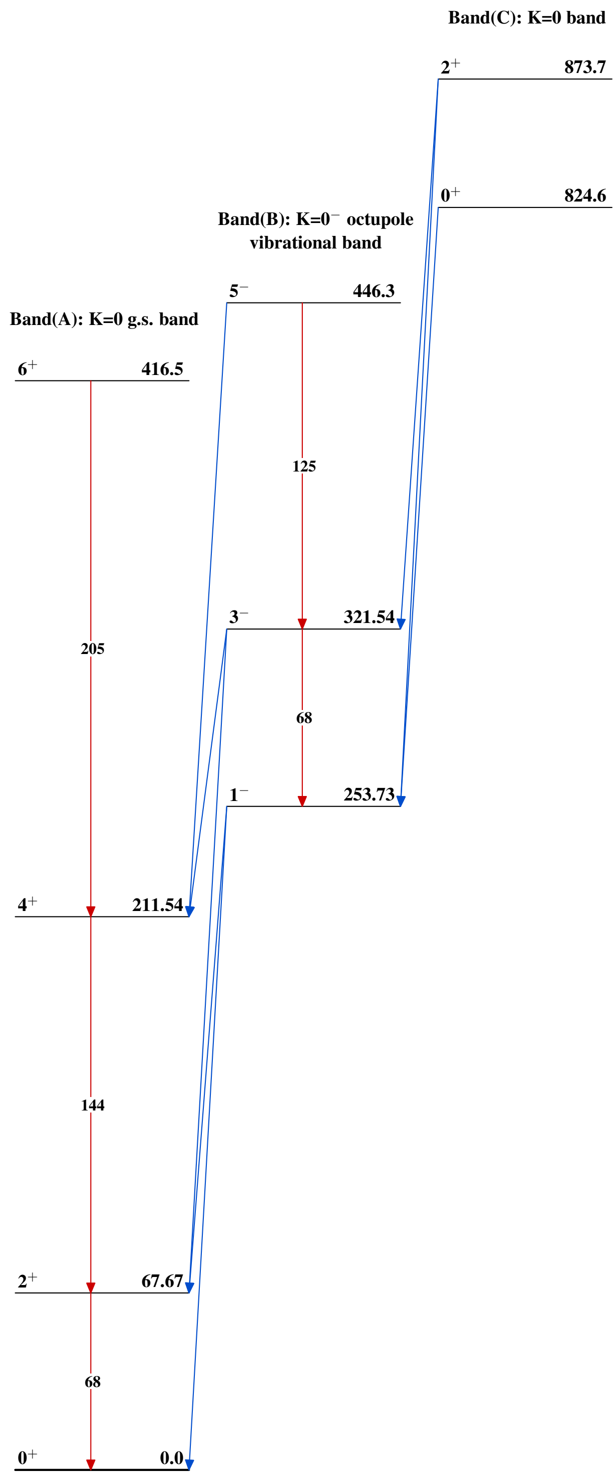
[a] For absolute intensity per 100 decays, multiply by 1.01 *6*.

[b] 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.

^{230}Th α decay



^{230}Th α decay



$^{226}_{88}Ra_{138}$