^{234}U α decay

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. Morse	NDS 197,259 (2024).	26-Sep-2023

Parent: ^{234}U: E=0.0; $J^{\pi}=0^+$; $T_{1/2}=2.455\times10^5$ y *6*; Q(α)=4857.5 *7*; %α decay=100

^{234}U-$T_{1/2}$: Recommended in 1989Ho24. Note that 2016Vi01 questions the assumption of secular equilibrium in 1989Ho24 and instead proposes 244,550<$T_{1/2}$ (y)<247,770 (2σ confidence level).

^{234}U-Q(α): From 2021Wa16.

^{230}Th Levels

E(level)†	J^{π}†	$T_{1/2}$‡
0.0	0^+	
53.20 *2*	2^+	0.354 ns *9*
174.10 *3*	4^+	0.166 ns *5*
508.16 *5*	1^-	
634.9 *1*	0^+	
677.6 *1*	2^+	

† Adopted values.

‡ From 1965Ne03.

α radiations

Number in parentheses following Iα, Eα gives energy of daughter level.

Eα†	E(level)	Iα#	HF‡	Comments
4108.6 *15*	677.6	≈0.7×10^{-5}	≈63	Eα: from level energy of 677.6 *1* and Eα(0)=4774.6 *14*. Eα(635+678)=4120 was measured by 1963Bj03. Iα: from I(4120α)=3.3×10^{-5}%, measured by 1963Bj03, for the α's populating the 635 and 678 levels, and deduced intensity of Iα(635)=2.6×10^{-5}%.
4150.6 *15*	634.9	2.6×10^{-5} *9*	39 *14*	Eα: from level energy of 634.9 *1* and Eα(0)=4774.6. Iα: from level scheme. Iα(635+678)=3.3×10^{-5}% was obtained by 1963Bj03 from (α)(γ) and (α)(ce) coincidences.
(4277.3 *9*)	508.16	4×10^{-5} *1*	287 *72*	Eα: from level adopted energy of 508.15 *1* and Eα(0). This α was not observed. Iα: from level scheme.
4603.5 *15*	174.10	0.20 *1*	21.1 *11*	Eα: from Eα(0)=4774.6 and level energy. The measured relative energies are: Eα(0)-Eα(174)=170 (1960Ba44), 170 *8* (1961Ko11). Iα: from 1987Bo25 and 1984Va41. Other measured intensities: I$\alpha\le$0.37% *11* (1960Ba44), Iα=0.3% (1961Ko11).
4722.4 *14*	53.20	28.42 *9*	1.076 *8*	Eα: recommended by 1991Ry01 from measured energies: 4722.7 *10* (1955Go57), 4724.5 *20* (1967Ba43). Iα: from 1987Bo25 and 1984Va41. Other measured Iα's: 28% (1955Go57), 27.5% *15* (1960Ba44), 27% (1961Ko11).
4774.6 *14*	0.0	71.38 *16*	1.000	Eα: recommended by 1991Ry01 from measured energies of 4774.2 *10* (1955Go57) and 4777.2 *20* (1967Ba43). Iα: from 1987Bo25 and 1984Va41. Other measured Iα's: 72% (1955Go57), 72.5% *30* (1960Ba44), 73% (1961Ko11).

† Reported measured energies of 1955Go57 and 1967Ba43 have been increased by 5.9 and 0.4 keV, respectively, as recommended by 1991Ry01, because of changes in calibration energies. Other measurements: 1953As40, 1953Va03, 1957Ha08, 1984Ac01, 1996Sa42.

‡ The nuclear radius parameter $r_0(^{230}Th)$=1.52224 *49* is deduced by assuming HF=1.0 for the ground-state to ground-state alpha

Continued on next page (footnotes at end of table)

^{234}U α decay (continued)

α radiations (continued)

decay branch.
[#] Absolute intensity per 100 decays.

^{234}U α decay (continued)

γ(^{230}Th)

E_γ †	I_γ d	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	α c	$I_{(\gamma+ce)}$ d	Comments
53.20 *2*	0.123# *2*	53.20	2+	0.0	0+	E2	227.9 *32*		α(L)=166.8 *24*; α(M)=45.7 *6*; α(N)=12.22 *17*; α(O)=2.72 *4*; α(P)=0.448 *6*; α(Q)=0.001240 *17* Iγ(53.2γ)=0.156% *6* was measured by 1990Ko40. Intensities of transitions feeding the ground-state sum to I(γ+ce)(53.20γ)+I(4722.7α)=100.1% *5* with Iγ=0.123 *2*; whereas Iγ=0.156 *6* yields 107.9% *15*. Mult.: α(L)exp=130 *65* by (α)(L x ray)/(α)(γ) (1957Vo26). See also ^{230}Pa ε decay.
120.90 *2*	0.0342# *5*	174.10	4+	53.20	2+	E2	4.94 *7*	0.21 *3*	α(K)=0.257 *4*; α(L)=3.42 *5*; α(M)=0.940 *13*; α(N)=0.2520 *35*; α(O)=0.0562 *8* α(P)=0.00936 *13*; α(Q)=5.21×10^{-5} *7*
454.95 *5*	2.5×10^{-5}@& *7*	508.16	1−	53.20	2+	E1	0.01527 *21*	2.5×10^{-5} *7*	α(K)=0.01237 *17*; α(L)=0.002202 *31*; α(M)=0.000525 *7*; α(N)=0.0001390 *19* α(O)=3.25×10^{-5} *5*; α(P)=6.15×10^{-6} *9*; α(Q)=5.10×10^{-7} *7* Eγ: from ^{230}Pa ε decay. Eγ=460 was measured by 1963Bj03 in ^{234}U α decay by αγ coincidences.
(503.5a *2*)	≈0.79×10^{-6}b	677.6	2+	174.10	4+	[E2]	0.0420 *6*	≈1.0×10^{-6}	α(K)=0.0266 *4*; α(L)=0.01142 *16*; α(M)=0.00296 *4*; α(N)=0.000792 *11*; α(O)=0.0001813 *25* α(P)=3.24×10^{-5} *5*; α(Q)=1.463×10^{-6} *21*
508.20 *5*	1.5×10^{-5}@& *4*	508.16	1−	0.0	0+	E1	0.01222 *17*	1.5×10^{-5} *4*	α(K)=0.00992 *14*; α(L)=0.001743 *24*; α(M)=0.000415 *6*; α(N)=0.0001099 *15* α(O)=2.57×10^{-5} *4*; α(P)=4.88×10^{-6} *7*; α(Q)=4.13×10^{-7} *6* Eγ: from ^{230}Pa ε decay. Eγ=510 was measured by 1963Bj03 in ^{234}U α decay by αγ coincidences.
581.7 *2*	1.2×10^{-5}@ *5*	634.9	0+	53.20	2+	E2	0.0302 *4*	1.2×10^{-5} *5*	α(K)=0.02029 *28*; α(L)=0.00734 *10*; α(M)=0.001884 *26*; α(N)=0.000503 *7* α(O)=0.0001158 *16*; α(P)=2.093×10^{-5} *29*; α(Q)=1.089×10^{-6} *15* Eγ: from ^{230}Ac β$^-$ decay and ^{230}Pa ε decay. Eγ=585 was measured by 1963Bj03 in ^{234}U α decay by αγ coincidences.
(624.4a *1*)	≈0.84×10^{-6}b	677.6	2+	53.20	2+	E0+E2+M1	0.07 *5*	≈5.0×10^{-6}	α(K)=0.06 *4*; α(L)=0.012 *6*; α(M)=0.0028 *13*; α(N)=7.5×10^{-4} *35*; α(O)=1.8×10^{-4} *8* α(P)=3.4×10^{-5} *17*; α(Q)=2.9×10^{-6} *19* α: deduced in ^{230}Pa ε decay.

$^{230}_{90}Th_{140}$-3

^{234}U α decay (continued)

$\gamma(^{230}Th)$ (continued)

E_γ [†]	I_γ [d]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	α [c]	$I_{(\gamma+ce)}$ [d]	Comments
(634.9 [a] 2)		634.9	0^+	0.0	0^+	E0		1.4×10^{-5} 7	E_γ: measured in ^{230}Pa ε decay. This transition was not observed in ^{234}U α decay. Total ce intensity is expected to be about 1.4×10^{-5}% from Iγ(581.8γ)/Ice(634γ) observed in ^{230}Pa ε decay.
(677.6 [a] 1)	$\approx1.0\times10^{-6}$ [b]	677.6	2^+	0.0	0^+	[E2]	0.02169 30	$\approx1.0\times10^{-6}$	α(K)=0.01533 21; α(L)=0.00475 7; α(M)=0.001204 17; α(N)=0.000322 5; α(O)=7.43×10^{-5} 10 α(P)=1.359×10^{-5} 19; α(Q)=8.03×10^{-7} 11

† Except where noted, energies given as recommended by 1986LoZT. These Eγ's were obtained from weighted average of the values measured by 1966Ah02, 1972Sc01, 1973Ta25, 1974HeYW, and 1984Va41. Other measurements: 1951Be97, 1953As40, 1971Cl03, 1963Bj03.

‡ From Adopted Levels. Multipolarities in square brackets are from the level scheme.

Recommended by 1986LoZT from measurements of 1966Ah02, 1974HeYW, and 1984Va41.

@ Photon intensity per 100 α decays, measured by 1963Bj03.

& Iγ(455γ+508γ)=4×10^{-5} 1 was measured; Iγ(455γ)=2.5×10^{-5} 7, Iγ(508γ)=1.5×10^{-5} 4 are calculated from intensity ratio of Iγ(508γ)/Iγ(455γ)=0.60 4, an average value of measured ratios in ^{230}Pa and ^{230}Ac decays.

[a] Transition was not observed in ^{234}U α decay; Eγ is from ^{230}Ac β^- decay.

[b] Calculated from Iγ(503γ):Iγ(624γ):Iγ(678γ)= 77 18:82 9:100 10, as observed in ^{230}Ac β^- decay, and the α population of 7×10^{-6}%.

[c] Additional information 1.

[d] Absolute intensity per 100 decays.

$^{230}_{90}Th_{140}$-4

^{234}U α decay

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays