^{240}Pu α decay

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Shaofei Zhu	NDS 182, 2 (2022).	1-Apr-2022

Parent: ^{240}Pu: E=0.0; $J^\pi=0^+$; $T_{1/2}$=6561 y *7*; Q(α)=5255.82 *14*; %α decay=100.0
^{240}Pu-Q(α): From 2021Wa16.
^{240}Pu-$T_{1/2}$: From the Adopted Levels of ^{240}Pu (2008Si25).
E and I K x ray: from 1976GuZN.
α: Additional information 1.

K x ray: from 1976GuZN

Eγ	I(K x ray)1.×10^{-8}/α)		
94.658 *5*	63.6 *30*	Kα$_2$	x ray
98.422 *5*	0.2 *5*	Kα$_1$	x ray
110.421	11.8	Kβ$_3$	x ray
111.300	23	Kβ$_1$	x ray

^{236}U Levels

E(level)‡	J$^\pi$†	$T_{1/2}$	Comments
0	0$^+$		
45.2431 *20*	2$^+$	0.235 ns *6*	$T_{1/2}$: weighted average of 0.232 ns *20* (1960Be25) and 0.235 ns *6* (1970ToZZ).
149.480 *5*	4$^+$	0.142 ns *10*	$T_{1/2}$: from 1970ToZZ.
309.788 *5*	6$^+$		
522.26 *4*	8$^+$		
687.55 *4*	1$^-$		
744.2 *10*	3$^-$		
919.22 *12*	0$^+$		
958.00 *20*	2$^+$		
960.0 *10*	(2$^+$)		
967.0 *10*	(1$^-$)		

† From the Adopted Levels.
‡ Deduced by the evaluator from a least-squares fit to γ-ray energies.

α radiations

Eα†	E(level)	Iα#	HF‡	Comments
(4217.3)	967.0	<5×10^{-8}	>139	Iα: deduced from Iγ(967)<5×10^{-8}.
(4224.2)	960.0	<5×10^{-8}	>160	Iα: deduced from Iγ(960)<5×10^{-8}.
(4226.1)	958.00	<1×10^{-7}	>83	Iα: deduced from Iγ(958)<1×10^{-7}.
(4264.3)	919.22	5.9×10^{-7} *6*	30 *3*	Iα: deduced from Iγ(874)=5.8×10^{-7} *6*.
(4436.4)	744.2	<2.5×10^{-8}	>18416	Iα: deduced from Iγ(699)<2.5×10^{-8}.
4492.02 *14*	687.55	2.7×10^{-5} *7*	47 *13*	Iα: weighted average of 4.0×10^{-5} *10* (2010Si30), 3.2×10^{-5} *5* (2010Si30) and 2.1×10^{-5} *4* (1969Le05).
4654.60 *14*	522.26	1.72×10^{-6} *7*	1.287×10^4 *53*	Iα: from 2010Si30; other: 2.9×10^{-5} *4* (1972Sc01).
4863.53 *14*	309.788	0.00099 *9*	706 *65*	Iα: weighted average of 0.0012 *3* (1972Sc01) and 0.00097 *9* (2010Si30), other: 0.0032 *1* (1956Ko67), 0.002 *1* (1959Tr37), and 0.001 (1977Ba69). Eα: Measured: 4851 *5* (1956Ko67) and 4863.6 *5* (1977Ba69).
5021.17 *14*	149.480	0.0892 *23*	91.6 *24*	Iα: weighted average of 0.085 *15* (1956Go43), 0.091 *6* (1956Ko67), 0.096 *5* (1972Sc01), 0.090 *5* (1984Ah06), 0.10 *3* (1992Bl13), 0.08

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^{240}Pu α decay (continued)

α radiations (continued)

Eα†	E(level)	Iα#	HF‡	Comments
				1 (1994Ra27) and 0.085 *4* (2010Si30); other: 0.071 *1* (1977Ba69). Eα: Measured: 5014 *2* (1956Ko67) and 5021.5 *5* (1977Ba69).
5123.83 *17*	45.2431	27.14 *9*	1.397 *5*	Iα: weighted average of 26.39 *21* (1977Ba69), 27.1 *1* (1984Ah06), 27.2 *4* (1987Bo25), 27.35 *20* (1992Bl13) 27.0 *5* (1990An33), 26.82 *9* (1994Ra27), 27.35 *7* (2004Si03), and 27.21 *7* (2010Si30); others: 24 (1952As28) and 26 *2* (1996Vi07). Eα: weighted average of 5123.3 *7* (1962Le11), 5123.45 *23* (1972Go33,1991Ry01), 5123.62 *25* (1977Ba69), 5124.10 *15* (2004Si03); others: 5118 *4* (1952As28).
5168.32 *11*	0	72.76 *8*	1.000	Iα: weighted average of 73.51 *36* (1977Ba69), 72.8 *1* (1984Ah06), 72.7 *9* (1987Bo25), 73.0 *5* (1990An33), 72.55 *40* (1992Bl13), 73.11 *8* (1994Ra27), 72.56 *6* (2004Si03), and 72.70 *7* (2010Si30); others: 76 (1952As28) and 74 *2* (1996Vi07). Eα: weighted average of 5167.7 *7* (1962Le11), 5168.13 *15* (1972Go33,1991Ry01), 5168.30 *15* (1977Ba69), and 5168.54 *14* (2004Si03); others: 5162 *4* (1952As28).

† From Q(α) and level energies, unless otherwise noted.
‡ $r_0(^{236}U)$=1.51638 *11* is calculated from HF(5168α)=1.0.
# Absolute intensity per 100 decays.

γ(^{236}U)

E_γ†	I_γ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.†	α	Comments
45.243 *2*	0.0432 *3*	45.2431	2^+	0	0^+	E2	589 *8*	α(L)=429 *6*; α(M)=118.6 *17*; α(N)=32.1 *5*; α(O)=7.36 *10*; α(P)=1.191 *17*; α(Q)=0.00285 *4* I_γ: weighted average of 0.04315 *9* (1981He16,1986He12), 0.0453 *9* (1971GuZY,1976GuZN) and 0.0461 *9* (1976Um01). Mult.: from α(L2)/α(L3)=1.05 *5*, α(M2)/α(M3)=1.40 *5* and α(L)/α(M)=2.6 *2* (1958Sa21) and α(tot)exp=607 29 (1968Du06).
104.237 *4*	0.00714 *8*	149.480	4^+	45.2431	2^+	E2	10.99 *15*	α(L)=8.00 *11*; α(M)=2.220 *31*; α(N)=0.603 *8*; α(O)=0.1385 *19*; α(P)=0.02268 *32* α(Q)=9.41×10^{-5} *13* I_γ: weighted average of 0.00698 *14* (1976GuZY) and 0.00718 *7* (1981He16,1986He12).
160.308 *3*	4.058×10^{-4} *15*	309.788	6^+	149.480	4^+	E2	1.761 *25*	α(K)=0.2079 *29*; α(L)=1.132 *16*; α(M)=0.313 *4*; α(N)=0.0850 *12*; α(O)=0.01958 *27* α(P)=0.00325 *5*; α(Q)=2.327×10^{-5} *33* I_γ: weighted average of 0.000422 *21* (1975OtZX), 0.000402 *8* (1971GuZY,1976GuZY), 0.000402 *4* (1981He16,1986He12) and 0.0004065 *17* (1994Ba91); other: 0.00104 *14* (1972ClZS).
212.47 *4*	1.08×10^{-6} *4*	522.26	8^+	309.788	6^+	E2	0.599 *8*	α(K)=0.1400 *20*; α(L)=0.335 *5*;

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^{240}Pu α decay (continued)

γ(^{236}U) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α	Comments
								α(M)=0.0920 *13*; α(N)=0.02498 *35*; α(O)=0.00577 *8* α(P)=0.000968 *14*; α(Q)=1.068×10^{-5} *15*
								I_γ: deduced from Iα=1.72×10^{-6} *7*; other: 2.90×10^{-5} *23* (1975OtZX).
538.09 *7*	1.42×10^{-7} *12*	687.55	1$^-$	149.480	4$^+$	E3	0.20 *8*	α(K)exp=0.11 *5* α,α(K)exp: taken from the Adopted Gammas. I_γ: deduced using Iγ(538)/Iγ(642)=0.0114 *8* from Adopted Gammas; measured: 1.47×10^{-7} *12* (1975OtZX).
642.23 *7*	1.248×10^{-5} *11*	687.55	1$^-$	45.2431	2$^+$	E1(+M2+E3)	0.15 *2*	α(K)exp=0.111 *10*; α(L)exp=0.031 *9* α,α(K)exp,α(L)exp: from Adopted Gammas. I_γ: weighted average of 1.4×10^{-5} *2* (1969Le05), 1.26×10^{-5} *3* (1975OtZX) and 1.245×10^{-5} *12* (1976GuZN); other: 4.1×10^{-5} (1972ClZS).
687.59 *6*	3.42×10^{-6} *7*	687.55	1$^-$	0	0$^+$	E1	0.31 *2*	α(K)exp=0.219 *14*; α(L)exp=0.069 *9* α,α(K)exp,α(L)exp: from Adopted Gammas. I_γ: deduced using Iγ(688)/Iγ(642)=0.274 *5* from Adopted Gammas; measured: 3.8×10^{-6} *10* (1969Le05), 8.1×10^{-6} (1972ClZS), 3.30×10^{-6} *13* (1975OtZX) and 3.55×10^{-6} *5* (1976GuZN).
(699)	<2.5×10^{-8}	744.2	3$^-$	45.2431	2$^+$	[E1]	0.00711 *10*	α(K)=0.00578 *8*; α(L)=0.001005 *14*; α(M)=0.0002395 *34*; α(N)=6.42×10^{-5} *9* α(O)=1.548×10^{-5} *22*; α(P)=2.93×10^{-6} *4*; α(Q)=2.172×10^{-7} *30* E_γ,I_γ: from 1975OtZX.
873.98 *12*	5.8×10^{-7} *6*	919.22	0$^+$	45.2431	2$^+$	[E2]	0.01439 *20*	α(K)=0.01060 *15*; α(L)=0.00283 *4*; α(M)=0.000711 *10*; α(N)=0.0001917 *27* α(O)=4.58×10^{-5} *6*; α(P)=8.47×10^{-6} *12*; α(Q)=4.86×10^{-7} *7* E_γ,I_γ: from 1975OtZX.
(958.0 *2*)	<1×10^{-7}	958.00	2$^+$	0	0$^+$			I_γ: from 1975OtZX.
(960)	<5×10^{-8}	960.0	(2$^+$)	0	0$^+$			E_γ,I_γ: from 1975OtZX.
(967)	<5×10^{-8}	967.0	(1$^-$)	0	0$^+$	(E1)		E_γ,I_γ: from 1975OtZX.

[†] From Adopted Gammas, unless otherwise noted.
[‡] Absolute intensity per 100 decays.

^{240}Pu α decay

Decay Scheme

Intensities: I_γ per 100 parent decays