^{239}Am ε decay 1972Po04

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 122, 293 (2014)	30-Jun-2013

Parent: ^{239}Am: E=0; J^π=(5/2)$^-$; $T_{1/2}$=11.9 h *1*; Q(ε)=802.1 *17*; %ε decay=99.990 *1*
Additional information 1.
Other measurements: 1957Sm77, 1960Gl01, 1972Po12.

^{239}Pu Levels

E(level)‡	J^π†	Comments
0	1/2$^+$	
7.860 *3*	3/2$^+$	
57.273 *4*	5/2$^+$	
75.701 *8*	7/2$^+$	
163.76 *2*	9/2$^+$	
285.46 *1*	5/2$^+$	$T_{1/2}$: 1.09 ns *6*, from $\gamma\gamma(\theta$,H,t) (1973PaYM).
330.12 *1*	7/2$^+$	
387.42 *1*	9/2$^+$	
391.60 *1*	7/2$^-$	
505.7 *2*	(5/2$^-$)	
511.84 *1*	7/2$^+$	

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

ε radiations

E(decay)	E(level)	Iε†‡	Log *ft*	Comments
(290.3 *17*)	511.84	18.1 *21*	5.9 *1*	εK=0.5842 *19*; εL=0.2984 *13*; εM+=0.1173 *6*
(296.4 *17*)	505.7	0.0033 *6*	9.7 *1*	εK=0.5908 *18*; εL=0.2940 *13*; εM+=0.1153 *6*
(410.5 *17*)	391.60	0.065 *10*	8.8 *1*	εK=0.6649 *7*; εL=0.2431 *5*; εM+=0.09204 *22*
(472.0 *17*)	330.12	≈3.5	≈7.2	εK=0.6857 *5*; εL=0.2287 *4*; εM+=0.08561 *15*
(516.6 *17*)	285.46	71 *8*	6.0 *1*	εK=0.6968 *4*; εL=0.2210 *3*; εM+=0.08217 *12*
(726.4# *17*)	75.701	≈3.4	≈7.7	εK=0.7274 *2*; εL=0.1998 *2*; εM+=0.07281 *5*
(744.8# *17*)	57.273	≈2.4	≈7.8	εK=0.7291 *2*; εL=0.1986 *1*; εM+=0.07229 *5*

† Deduced by evaluator from γ-ray transition intensity balance.
‡ For absolute intensity per 100 decays, multiply by 0.99990 *1*.
# Existence of this branch is questionable.

γ(^{239}Pu)

Iγ normalization: assuming negligible ε feeding to g.s. and first excited state; this assumption is consistent with the measured x-ray intensities (Iε<1% to g.s. from log $f^{1u}t$>8.5).

Kα₂ x ray= 35.5% , Kα₁ x ray= 56.2% , and Kβ x ray= 27.8% calculated by evaluator (RADLST) agree well with experimental Kα₂ x ray= 35.0% *15*, Kα₁ x ray= 53.9% *23*, and Kβ x ray= 27.0% *12* (1972Po04), respectively. This agreement suggests negligible ε feeding to g.s. and 7.86-keV levels.

E_γ	I_γ[@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[‡]	α[†]	$I_{(\gamma+ce)}$[@]	Comments
(4.2 *CA*)		391.60	7/2⁻	387.42	9/2⁺	[E1]				
7.860 *3*		7.860	3/2⁺	0	1/2⁺	M1+E2	0.055 *3*	5.7×10³ *4*	≈88	α(M)=4.2×10³ *3*; α(N+..)=1.49×10³ *10* α(N)=1.16×10³ *8*; α(O)=280 *18*; α(P)=48 *3*; α(Q)=1.632 *23*
(18.4)		75.701	7/2⁺	57.273	5/2⁺	[M1+E2]			<3	
44.663 *5*	0.09 *1*	330.12	7/2⁺	285.46	5/2⁺	M1+E2	0.20 *3*	86 *8*		α(L)=64 *6*; α(M)=16.2 *17*; α(N+..)=5.7 *6* α(N)=4.4 *5*; α(O)=1.08 *11*; α(P)=0.193 *17*; α(Q)=0.00902 *15*
49.412 *4*	0.11 *1*	57.273	5/2⁺	7.860	3/2⁺	M1+E2	0.50 *3*	126 *8*		α(L)=92 *6*; α(M)=24.8 *17*; α(N+..)=8.7 *6* α(N)=6.8 *5*; α(O)=1.62 *11*; α(P)=0.269 *17*; α(Q)=0.00592 *13*
57.273 *4*	≈0.09	57.273	5/2⁺	0	1/2⁺	E2		222		α(L)=161.1 *23*; α(M)=45.0 *7*; α(N+..)=15.73 *22* α(N)=12.36 *18*; α(O)=2.91 *4*; α(P)=0.457 *7*; α(Q)=0.001109 *16* I_γ: from Iγ= 0.170 *17* after subtracting ≈0.08 for 57.3γ deexciting the 387 level. Iγ(57γ)≈0.09 disagrees with Iγ(57γ, 57 level) in ^{243}Cm α decay and ^{239}Np β⁻ Decay.
57.3 *CA*	≈0.08	387.42	9/2⁺	330.12	7/2⁺	M1(+E2)		27.9		α: for M1. I_γ: from Iγ(57γ, 387 level)/Iγ(311γ)≈4.7 in ^{243}Cm α decay, and Iγ(311γ) 0.017 *2*.
(61.480 *4*)	0.0020 *4*	391.60	7/2⁻	330.12	7/2⁺	E1		0.472		α(L)=0.354 *5*; α(M)=0.0880 *13*; α(N+..)=0.0300 *5* α(N)=0.0236 *4*; α(O)=0.00553 *8*; α(P)=0.000870 *13*; α(Q)=2.87×10⁻⁵ *4*
67.841 *7*	0.130 *13*	75.701	7/2⁺	7.860	3/2⁺	E2		98.5		α(L)=71.5 *10*; α(M)=20.0 *3*; α(N+..)=6.99 *10* α(N)=5.50 *8*; α(O)=1.293 *19*; α(P)=0.204 *3*; α(Q)=0.000543 *8*
88.06 *3*	≈0.0008	163.76	9/2⁺	75.701	7/2⁺	(M1+E2)	0.50	12.26		α(L)=9.07 *13*; α(M)=2.36 *4*; α(N+..)=0.830 *12* α(N)=0.645 *9*; α(O)=0.1563 *22*; α(P)=0.0274 *4*; α(Q)=0.001050 *15* I_γ: from ^{239}Np β⁻ decay Iγ(88.06γ)/Iγ(106.50γ)= 0.12 *5*, and Iγ(106.50γ)= 0.007 *1*.
101.965 *13*	≈0.008	387.42	9/2⁺	285.46	5/2⁺	E2		14.42		α(L)=10.46 *15*; α(M)=2.93 *5*; α(N+..)=1.025 *15* α(N)=0.805 *12*; α(O)=0.190 *3*; α(P)=0.0302 *5*; α(Q)=0.0001088 *16*

From ENSDF

$^{239}_{94}Pu_{145}$-2

γ(^{239}Pu) (continued)

E_γ	I_γ@	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	δ‡	α†	Comments
106.1 2	0.043 5	391.60	7/2⁻	285.46	5/2⁺	E1(+M2)		0.26 3	α(L)exp=0.19 3; α(M)exp=0.050 8; α(N+...)exp=0.017 3 I_γ: from Iγ(106γ doublet)= 0.05 1 after subtracting Iγ(106γ, 163-keV level)= 0.007 1. α: anomalous E1 conversion (from ^{239}Np β^- of 1959Ew90).
106.50 3	0.007 1	163.76	9/2⁺	57.273	5/2⁺	E2		11.78	α(L)=8.55 12; α(M)=2.39 4; α(N+..)=0.838 12 α(N)=0.658 10; α(O)=0.1551 22; α(P)=0.0247 4; α(Q)=9.28×10^{-5} 13 I_γ: from intensity balance at 163-keV level.
124.416 15	0.10 1	511.84	7/2⁺	387.42	9/2⁺	M1(+E2)	<0.26	13.8 4	α(K)=10.7 4; α(L)=2.32 7; α(M)=0.570 22; α(N+..)=0.201 8 α(N)=0.155 6; α(O)=0.0385 14; α(P)=0.00725 19; α(Q)=0.000451 15
(166.39 6)	≈0.009	330.12	7/2⁺	163.76	9/2⁺	M1		6.22	α(K)=4.91 7; α(L)=0.984 14; α(M)=0.239 4; α(N+..)=0.0846 12 α(N)=0.0651 10; α(O)=0.01621 23; α(P)=0.00308 5; α(Q)=0.000202 3 I_γ: deduced from Iγ(166.39γ)/Iγ(254.4γ)= 0.111 23, using I(ce(L1))(166.39γ)/I(ce(K))(254.4γ)= 7 1/ 105 15 from ^{239}Am ε decay (1959Ew90), the following theoretical conversion coefficients: α(L1)(166.39γ; M1)=0.932, and α(K)(254.4γ; M1+E2)=1.556, and Iγ(254.4γ)= 0.084 6.
181.715 10	1.08 6	511.84	7/2⁺	330.12	7/2⁺	M1+E2	−0.12 6	4.80 10	α(K)=3.78 9; α(L)=0.766 11; α(M)=0.187 3; α(N+..)=0.0660 10 α(N)=0.0508 8; α(O)=0.01264 18; α(P)=0.00240 4; α(Q)=0.000155 4 δ: from 1972Kr07, 1972Po04, 1959Ew90.
209.8 1	3.5 2	285.46	5/2⁺	75.701	7/2⁺	M1+E2	0.37# 8	2.93 13	α(K)=2.27 12; α(L)=0.499 9; α(M)=0.1231 18; α(N+..)=0.0435 7 α(N)=0.0335 5; α(O)=0.00830 13; α(P)=0.00155 3; α(Q)=9.3×10^{-5} 5
226.383 12	3.3 2	511.84	7/2⁺	285.46	5/2⁺	M1+E2	0.55 10	2.13 14	α(K)=1.61 13; α(L)=0.387 9; α(M)=0.0964 17; α(N+..)=0.0340 6 α(N)=0.0263 5; α(O)=0.00648 13; α(P)=0.00120 3; α(Q)=6.7×10^{-5} 5
228.184 12	11.3 6	285.46	5/2⁺	57.273	5/2⁺	M1+E2	0.28# 7	2.41 9	α(K)=1.88 8; α(L)=0.395 7; α(M)=0.0967 15; α(N+..)=0.0342 6 α(N)=0.0263 4; α(O)=0.00653 11; α(P)=0.001232 23; α(Q)=7.7×10^{-5} 3
254.4 1	0.084 6	330.12	7/2⁺	75.701	7/2⁺	M1+E2	−0.12 6	1.86 4	α(K)=1.47 4; α(L)=0.295 5; α(M)=0.0718 11; α(N+..)=0.0254 4 α(N)=0.0195 3; α(O)=0.00486 8; α(P)=0.000924 15; α(Q)=5.98×10^{-5} 13
272.8 1	0.064 5	330.12	7/2⁺	57.273	5/2⁺	M1		1.553	α(K)=1.229 18; α(L)=0.244 4; α(M)=0.0593 9; α(N+..)=0.0210 3 α(N)=0.01614 23; α(O)=0.00402 6; α(P)=0.000764 11; α(Q)=4.98×10^{-5} 7
277.604 16	15.0 7	285.46	5/2⁺	7.860	3/2⁺	M1+E2	0.23# 10	1.42 7	α(K)=1.12 6; α(L)=0.228 6; α(M)=0.0555 13; α(N+..)=0.0196 5 α(N)=0.0151 4; α(O)=0.00375 9; α(P)=0.000711 19; α(Q)=4.53×10^{-5} 22
285.5 1	0.80 5	285.46	5/2⁺	0	1/2⁺	E2		0.247	α(K)=0.0843 12; α(L)=0.1189 17; α(M)=0.0326 5;

$^{239}_{94}Pu_{145}$-3

γ(^{239}Pu) (continued)

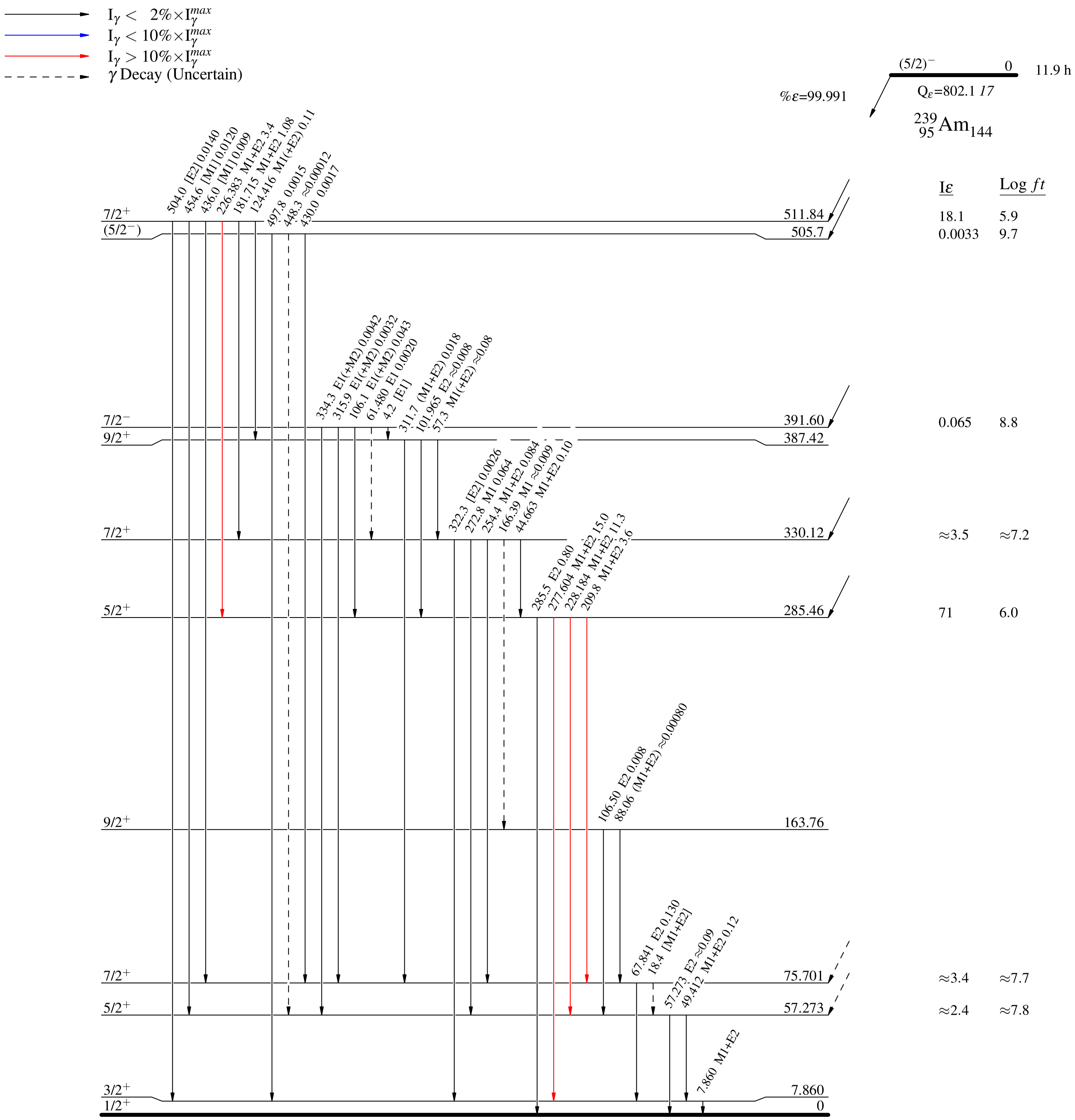
E_γ	I_γ[@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[‡]	α[†]	Comments
									α(N+..)=0.01145 *17* α(N)=0.00895 *13*; α(O)=0.00213 *3*; α(P)=0.000356 *5*; α(Q)=4.98×10^{-6} *7*
311.7 *2*	0.017 *2*	387.42	9/2$^+$	75.701	7/2$^+$	(M1+E2)		0.6 *5*	α(K)=0.5 *4*; α(L)=0.13 *5*; α(M)=0.032 *9*; α(N+..)=0.011 *4* α(N)=0.0087 *24*; α(O)=0.0021 *7*; α(P)=0.00039 *14*; α(Q)=1.9×10^{-5} *16*
315.9 *2*	0.0032 *5*	391.60	7/2$^-$	75.701	7/2$^+$	E1(+M2)	−0.10 *12*	0.07 *12*	α(K)=0.05 *9*; α(L)=0.01 *3*; α(M)=0.003 *7*; α(N+..)=0.0011 *24* α(N)=0.0009 *19*; α(O)=0.0002 *5*; α(P)=4.E−5 *9*; α(Q)=2.E−6 *6* I_γ: from ^{239}Np β^- decay, the value Iγ= 0.0170 *15* in 1972Po04 is probably a typographical error.
322.3 *2*	0.0026 *3*	330.12	7/2$^+$	7.860	3/2$^+$	[E2]		0.1699	α(K)=0.0679 *10*; α(L)=0.0745 *11*; α(M)=0.0203 *3*; α(N+..)=0.00713 *11* α(N)=0.00557 *8*; α(O)=0.001329 *19*; α(P)=0.000224 *4*; α(Q)=3.73×10^{-6} *6*
334.3 *2*	0.0042 *5*	391.60	7/2$^-$	57.273	5/2$^+$	E1(+M2)	+0.02 *3*	0.034 *6*	α(K)=0.027 *4*; α(L)=0.0053 *13*; α(M)=0.0013 *4*; α(N+..)=0.00045 *12* α(N)=0.00035 *9*; α(O)=8.6×10^{-5} *22*; α(P)=1.6×10^{-5} *4*; α(Q)=8.3×10^{-7} *25*
430.0 *3*	0.0017 *3*	505.7	(5/2$^-$)	75.701	7/2$^+$				
436.0 *3*	0.008 *1*	511.84	7/2$^+$	75.701	7/2$^+$	[M1]		0.428	α(K)=0.339 *5*; α(L)=0.0669 *10*; α(M)=0.01623 *23*; α(N+..)=0.00573 *8* α(N)=0.00441 *7*; α(O)=0.001098 *16*; α(P)=0.000209 *3*; α(Q)=1.361×10^{-5} *20*
(448.3 *5*)	≈0.00012	505.7	(5/2$^-$)	57.273	5/2$^+$				From ^{239}Np β^- decay.
454.6 *3*	0.0120 *12*	511.84	7/2$^+$	57.273	5/2$^+$	[M1]		0.382	α(K)=0.303 *5*; α(L)=0.0597 *9*; α(M)=0.01447 *21*; α(N+..)=0.00511 *8* α(N)=0.00394 *6*; α(O)=0.000979 *14*; α(P)=0.000186 *3*; α(Q)=1.214×10^{-5} *18*
497.8 *3*	0.0015 *3*	505.7	(5/2$^-$)	7.860	3/2$^+$				
504.0 *3*	0.0140 *14*	511.84	7/2$^+$	7.860	3/2$^+$	[E2]		0.0516	α(K)=0.0304 *5*; α(L)=0.01561 *22*; α(M)=0.00413 *6*; α(N+..)=0.001451 *21* α(N)=0.001130 *16*; α(O)=0.000272 *4*; α(P)=4.75×10^{-5} *7*; α(Q)=1.387×10^{-6} *20*

[†] Additional information 2.
[‡] Based on ce data of 1957Sm77,1972Po04 and $\gamma(\theta)$ of 1972Kr07, unless otherwise specified.
[#] Deduced by evaluator from conversion electron data of 1991Sh06 in ^{243}Cm α decay.
[@] Absolute intensity per 100 decays.

^{239}Am ε decay 1972Po04

Decay Scheme

Intensities: I_γ per 100 parent decays



$^{239}_{94}Pu_{145}$