^{237}Pu ε decay 1983Ah02,1979El05,1958Ho02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia	NDS 107, 2323 (2006)	15-Mar-2006

Parent: ^{237}Pu: E=0.0; J^π=7/2$^-$; $T_{1/2}$=45.64 d *4*; Q(ε)=220.0 *13*; %ε decay=100.0

1983Ah02: Source prepared from ^{235}U (93% enriched) with 31-MeV α particles bombardments; Detector: Ge, Si(Li); Measured: Eγ, Iγ, α.

1979El05: Source prepared from ^{235}U (93% enriched) with ~30-MeV ^{4}He ions bombardments; Detector: an x-ray Ge(Li) and a 54-cm^3 Ge(Li); Measured: Eγ, Iγ, α.

1958Ho02: Source prepared from ^{235}U (enriched) with 26-29 MeV and 30-MeV ^{4}He ions; Detector: Na(I), Proportional counter; Measured: Eγ, $\gamma\gamma$ coin.

^{237}Np Levels

E(level)†	J^π‡	$T_{1/2}$	Comments
0.0	5/2$^+$	2.14×10^6 y *1*	$T_{1/2}$: From Adopted Levels.
33.207 *14*	7/2$^+$		
59.545 *15*	5/2$^-$		
75.91 *10*	9/2$^+$		
102.968 *16*	7/2$^-$		
158.517 *17*	9/2$^-$		

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

ε radiations

See 1966Bo08 for discussions on finite nuclear size effects on the log *ft* values.

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          See 1962Ve05 for theoretical calculations of the log ft values
for p 5/2⁻, 5/2[523] to n 7/2⁻, 7/2[743] allowed-hindered,
    p 5/2⁺, 5/2[642] to n 7/2⁻, 7/2[743] first-forbidden transitions.
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E(decay)	E(level)	Iε†	Log *ft*	Comments
(61.5 *13*)	158.517	<0.14	>8.0	εL=0.588 *5*; εM+=0.412 *5*
(117.0 *13*)	102.968	≈0.55	≈8.1	εL=0.6773 *9*; εM+=0.3227 *9* I(ε) to 102.9-keV level may be more than 0.55%, if there is a 27.03γ deexciting the level (see ^{241}Am α decay).
(144.1 *13*)	75.91	≈0.26	≈8.7	εK=0.131 *10*; εL=0.601 *6*; εM+=0.268 *4* I(ε) to the 75.88-keV level may be less than≈0.26%, if there is a 27.03γ feeding this level (see ^{241}Am α decay).
(160.5 *13*)	59.545	8.4 *8*	7.35 *5*	εK=0.242 *9*; εL=0.529 *6*; εM+=0.229 *3*
(186.8 *13*)	33.207	11.8 *14*	7.43 *6*	εK=0.377 *6*; εL=0.439 *4*; εM+=0.1837 *18*
(220.0 *13*)	0.0	79 *2*	6.845 *14*	εK=0.483 *4*; εL=0.3678 *22*; εM+=0.1490 *11*

† Absolute intensity per 100 decays.

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γ(^{237}Np)

Iγ normalization: The normalization factor of 0.0328 *15* for absolute intensities has been obtained by the evaluator by requiring the sum of ε feedings to be 100%. The ε feeding to the g.s. was obtained from the K x-ray intensity ratio of I(K x-ray)/I(59γ)=13.1 *4* (1979El05). The calculated L x-ray intensity ratio of I(L x-ray)/I(59.5γ)=12.3 *10* is in good agreement with the experimental value of 12.1 *4* (1979El05).

γγ: see 1958Ho02

X rays (Particle normalization):

E(x ray) 1983Ah02	I(x ray)/Iγ(59.54γ) 1983Ah02	1979El05	1958Ho02	
11.89 2	0.389 16			L_l x ray
13.90 2	6.05 19			L_α x ray
17.81 2	6.23 19			L_β x ray
20.82 2	1.45 5			L_γ x ray
	14.1 5	12.1 4	5.4 10	L x ray (total)
97.08 2	4.16 13			$K\alpha_2$ x ray
101.07 2	6.63 22			$K\alpha_1$ x ray
113.30 2	0.81 4			$K\beta_3$ x ray
114.24 2	1.56 5			$K\beta_1$ x ray
114.95 2	0.064 4			$K\beta_5$ x ray
117.51 3	0.64 3			$K\beta_2$ x ray+$K\beta_4$ x ray
118.45 5	0.195 13			KO_2 x ray+KO_3 x ray
	14.0 5	13.1 4	7.1 10	K x ray (total)

other measurements: 1953Ho49.

E_γ[†]	I_γ[‡d]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	δ	α[&]	Comments
26.3446 *2*	6.75 *20*	59.545	5/2⁻	33.207	7/2⁺	E1[#]		8[a] *2*	α(L)exp=6 *2*; α(M)exp=1.6 *2*
(27.020[c] *7*)		102.968	7/2⁻	75.91	9/2⁺				
33.196 *1*	2.27 *7*	33.207	7/2⁺	0.0	5/2⁺	M1+E2[@]	0.13 *3*	185 *23*	α(L)=138 *20*; α(M)=35 *5*
42.704 *5*	≈0.090	75.91	9/2⁺	33.207	7/2⁺	M1+E2[#]	≈0.13	≈80[b]	α(L)≈59; α(M)≈15 δ: From adopted gammas.
43.420 *3*	≈0.12	102.968	7/2⁻	59.545	5/2⁻	(M1+E2)[#]	0.41 *2*	167 *9*	α(L)=124 *7*; α(M)=32.8 *18*
55.56 *2*	<0.05	158.517	9/2⁻	102.968	7/2⁻	M1+E2[#]	0.46 *4*	67 *6*	E_γ: From ^{241}Am α decay.
59.5409 *1*	100 *3*	59.545	5/2⁻	0.0	5/2⁺	E1[@]		1.16[a] *7*	α(L)exp=0.84 *6*; α(M)exp=0.226 *7*; α(N+...)exp=0.094 *10*
(69.76[c] *3*)	≈0.0048	102.968	7/2⁻	33.207	7/2⁺	(E1)		0.336	α(L)=0.252; α(M)=0.0621; α(N+..)=0.0219 I_γ: calculated by the evaluator from Iγ(69.76γ)/Iγ(43.42γ)= 73 *8*/2.9 *4*, as measured in ^{241}Am α decay.
(75.8[c] *2*)	≈0.0096	75.91	9/2⁺	0.0	5/2⁺	[E2]		54.6	I_γ: calculated from Iγ(75.8γ)/Iγ(42.73γ)=3/28, Asmeasured in the Coulomb excitation of ^{237}Np.
(98.97[c] *2*)	<0.06	158.517	9/2⁻	59.545	5/2⁻	E2		15.6	I_γ: calculated by the evaluator from Iγ(98.97γ)/Iγ(55.56γ)= 203 *3*/181 *18*, as measured in ^{241}Am α decay.

Continued on next page (footnotes at end of table)

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$\gamma(^{237}Np)$ (continued)

E_γ [†]	I_γ [‡d]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	α [&]	Comments
(102.98[c] 2)	≈0.032	102.968	7/2⁻	0.0	5/2⁺	E1	0.121	α(L)=0.091; α(M)=0.022; α(N+..)=0.0080 I_γ: calculated by the evaluator from $I\gamma(102.98\gamma)/I\gamma(43.42\gamma)$=19.5 *1*/73 *8*, as measured in ^{241}Am α decay.
(125.30[c] 2)	<0.01	158.517	9/2⁻	33.207	7/2⁺	[E1]	0.306	I_γ: calculated by the evaluator from $I\gamma(125.3\gamma)/I\gamma(55.56\gamma)$=40.8 *3*/181 *18*, as measured in ^{241}Am α decay.

† From Adopted Levels and gammas, except otherwise noted.

‡ From 1979El05, unless noted otherwise. $I\gamma$ in 1983Ah02 and 1979El05 are in good agreement.

\# From ^{241}Am α decay.

@ From ce measurements in 1958Ho02 (s) and 1983Ah02 (semi).

& From ^{237}U β^- decay and ^{241}Am α decay.

a Anomalously converted. See ^{237}U β^- decay and ^{241}Am α decay.

b For $\delta\approx0.13$ which was calculated by the evaluator by using the strong coupling collective model and $\delta(33\gamma)=0.13$. Conversion electron data from ^{241}Am α decay for this transition suggest $\delta\approx0.86$ which is not consistent with the fact that the electron lines for the 42.7-keV transition were not seen in ^{237}Pu decay (1958Ho02): Ice(L 42.7γ) would be expected to be about 1.8 times of Ice(L 43.5γ), if $\delta(42.7\gamma)$ were about 0.86.

c not seen in ^{237}Pu ε decay.

d For absolute intensity per 100 decays, multiply by 0.0328 *15*.

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Decay Scheme

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