^{242}Am α decay (141 y) 1990Ho02,1979Ba67

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 127,191 (2015)	1-Jun-2014

Parent: ^{242}Am: E=48.63 *5*; $J^{\pi}=5^-$; $T_{1/2}$=141 y *2*; Q(α)=5588.50 *25*; %α decay=0.459 *12*

^{242}Am-Q(α): From 2012Wa38.

^{242}Am-Additional information 2.

^{242}Am-%α decay: %α=0.459 *12*.

Additional information 3.

The α decay branching of ^{242m}Am is 0.459% *12*; 98.54% decays by an isomeric transition (IT).

^{238}Np Levels

E(level)†	J^{π}@	$T_{1/2}$	Comments
0	2^+		
26.450# *16*	3^+		
62.344# *22*	4^+		
86.651# *15*	3^+		
106.13# *3*	5^+		
121.659# *23*	4^+		
136.021 *14*	3^-	6.0 ns	$T_{1/2}$: from $\alpha\gamma$(t) of 1966As06.
161.68 *4*	6^+		
165.518 *23*	5^+		
179.145 *18*	4^-		
182.885 *16*	2^-		
215.503 *16*	3^-		
218.7 *6*	(6^+)		
232.82 *3*	5^-		
250.33 *3*	(1^+)		
258.83 *3*	4^-		
275.505 *23*	5^+		
297.01 *5*	(6^-)	&	
299.25 *6*	(3^+)	&	
300.726 *25*	(6^-)	&	
300.79 *5*	1^-,2,3,4^-	&	
312.75 *5*	5^-		
328.77? *3*	6^+		
334.8?‡	1^- to 3^-		
342.390 *18*	5^-		
374.7? *10*	(5^+)		E(level): from (d,p). Additional information 4.
376.68 *7*	(6^-)		
389.2 *6*	7^+		
397.3‡ *15*			
407.58 *7*	6^-		
459.6‡ *6*	(6^+)		
470‡ *2*	1^- to 4^-		
484‡ *3*	7^-		
525.3‡ *15*	(7^+)		
578.7‡			

Continued on next page (footnotes at end of table)

^{242}Am α decay (141 y) 1990Ho02,1979Ba67 (continued)

^{238}Np Levels (continued)

† From a least-squares fit to the Eγ data, except where noted otherwise.
‡ From Eα and Q(α).
# Rounded-off values from Adopted Levels.
@ From Adopted Levels.
& 1966As06 report $T_{1/2}$=50 ns for a level at 300 keV from an αγ(t) experiment. No details are given, in particular the γ transition selected is not given, so which of the four levels at 300 keV is involved cannot be determined.

α radiations

Additional information 5.

Eα[&]	E(level)	Iα[‡b]	HF[†]	Comments
4974.7[#]	578.7	≈0.002[#]	≈2400	Eα: from 1979Ba67. Not reported in 1990Ho02. HF: HF=2.4×10^3 *3*.
5027.2 *15*	525.3	0.02 *1*	≈700	Eα: weighted average of 5026.9 keV *15* from 1979Ba67, and 5031 keV *5* from 1990Ho02. HF: symmetrized uncertainty. HF=540 *+509−210*.
5068 *3*	484	0.25 *7*	88 *30*	Eα: unweighted average of 5064.0 keV *15* from 1979Ba67, and 5072 keV *3* from 1990Ho02.
5082[#] *2*	470	0.03[#]	8.3×10^2 *11*	Eα: from 1979Ba67. Not reported in 1990Ho02.
5091.8 *6*	459.6	0.21 *7*	158 *60*	Eα: weighted average of 5088.2 keV *15* from 1979Ba67 and 5093 keV *4* from 1990Ho02.
5143.0 *13*	407.58	5.6 *2*	11.1 *16*	Eα: 5141.4 keV *5* (1979Ba67), 5144.4 keV *9* (1990Ho02).
5153.1[#] *15*	397.3	0.02[#]	3.6×10^3 *5*	Eα: from 1979Ba67. Not reported in 1990Ho02.
5173.31[@] *26*	376.68	≤0.04[@]	≥2000	
5175.3[@] *10*	374.7?	≤0.04[@]	≥2100	
5207.06 *25*	342.390	89.0 *7*	1.79 *24*	Eα: 5206.6 keV *5* (1979Ba67), 5208.4 keV *8* (1990Ho02).
5214.5[#c]	334.8?	0.03[#]	5.9×10^3 *8*	Eα: reported only in 1979Ba67 as a questionable line.
5248.12[a] *26*	300.79	≤1.1[a]	≥220	
5248.01[a] *25*	300.726	≤1.1[a]	≥220	
5249.50[a] *26*	299.25	≤0.04[a]	≥6100	
5251.67[a] *26*	297.01	≤0.04[a]	≥6300	Eα: 4251.67 corrected to 5251.67.
5272.85 *25*	275.505	1.1 *1*	420 *41*	Eα: ≈5273 keV (1979Ba67), 5271 keV *3* (1990Ho02).
5314.83 *25*	232.82	0.6 *1*	376 *70*	Eα: 5313.3 keV *10* (1979Ba67), 5313.6 keV *10* (1990Ho02).
5331.85 *25*	215.503	0.15 *10*	≈11×10^3	Eα: 5331 keV *5* (1990Ho02). Not reported in 1979Ba67. HF: symmetrized uncertainties. HF=6×10^3 *+14−3*.
5367.61 *25*	179.145	1.1 *2*	1.5×10^3 *4*	Eα: 5367.0 keV *10* (1979Ba67), 5369.1 keV *18* (1990Ho02).
5410.03 *25*	136.021	1.0 *2*	2.9×10^3 *8*	Eα: 5409.1 keV *10* (1979Ba67), 5412.4 keV *21* (1990Ho02).
5458.58[#] *25*	86.651	0.14[#]	3.9×10^4 *5*	Eα: 1979Ba67 report 5458.1 keV *15*. Not reported in 1990Ho02. HF: uncertainty in HF does not include the contribution from Iα.
5517.79[#]	26.450	≤0.006[#]	≥1.7×10^6	Eα,Iα: 1979Ba67 report 5517.1 keV but this α peak may include a contribution from ^{242}Cm α decay not reported in 1990Ho02. Eα: uncertainty of 0.25 keV omitted in view of general footnote for Iα.

† r_0=1.508 *5*.
‡ From 1990Ho02, except where noted otherwise. Uncertainties are not given in 1979Ba67; however,their values agree well with those given in 1990Ho02, except for the branch to the 300-keV level (or doublet).
# From 1979Ba67, not reported in 1990Ho02.
@ 1979Ba67 report a doublet with E≈5173 and 5173.5 *15* with Iα=0.04. One of these lines corresponds to the 376.71 *6* level. The other may correspond to a 374.7 keV *10* level reported in (d,p).

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^{242}Am α decay (141 y) 1990Ho02,1979Ba67 (continued)

α radiations (continued)

[&] From Q(α) and E(level), except where noted otherwise. Experimental values have been measured in 1990Ho02 and 1979Ba67 and are given in comments. Note that for 1979Ba67, the authors′ original values have been decreased by 0.2 keV, as recommended in 1991Ry01, to account for changes in calibration energies. The authors assign Δ(Eα)=0.5 keV to the two most intense lines, and state that uncertainties do not exceed 1.0- to 1.5 keV for most of the other lines. Based on this statement, the evaluators have assigned uncertainties of 1.0 keV for lines with Iα between 0.6- and 1.2%, and 1.5 keV for lines with Iα between 0.02 and 0.2. No uncertainties have been assigned to the two lines with Iα<0.01%.

[a] Eα=5249.8 keV *15* (with %Iα=0.04) in 1979Ba67 gives E(level)=298.9 keV *15*. Based just on energy, this α branch could correspond to those to the 299.24 keV and possibly to the 297.04- or 300.65 keV levels. The branch with E=5248.1 keV *12*, is a weighted average of 5248.0 keV *15*, from 1979Ba67, and 5248.4 keV *22* from 1990Ho02, gives E(level)=300.7 keV *12* which could correspond to the the 299.24 level. 1979Ba67 give I$\alpha\approx$0.11% and 1990Ho02 give 1.0% *1* for this branch. 1990Ho02 assign the first branch to the 297.04 level, and the second to the 299.24 and 300.65 levels. Evaluators suggest that the 300.755-keV level also may be fed.

[b] For absolute intensity per 100 decays, multiply by 4.59×10^{-3} *12*.

[c] Existence of this branch is questionable.

^{242}Am α decay (141 y) 1990Ho02,1979Ba67 (continued)

$\gamma(^{238}Np)$

Iγ normalization, I(γ+ce) normalization: Additional information 1.
Additional information 6.

E_γ[‡]	I_γ[‡e]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[†]	α[f]	Comments
(24.31[c])		86.651	3^+	62.344	4^+				
[x]26.32 *3*	1.36 *10*					E1(+M2)			Additional information 7. I_γ: It probably contains contribution from contamination with ^{241}Am alpha decay. Mult.: the multipolarity is mainly E1 since I(γ+ce) should be <100. This limit gives δ(M2/E1)<0.05.
(26.44[c])		26.450	3^+	0	2^+				
(32.62[c])		215.503	3^-	182.885	2^-				
(35.01[c])		121.659	4^+	86.651	3^+				
(35.89[c])		62.344	4^+	26.450	3^+				
(43.12[c])		179.145	4^-	136.021	3^-				
(43.33[c])		258.83	4^-	215.503	3^-				
(43.79[c])		106.13	5^+	62.344	4^+				
(43.86[c])		165.518	5^+	121.659	4^+				
(46.87[c])		182.885	2^-	136.021	3^-				
49.35 *2*	29.1 *9*	136.021	3^-	86.651	3^+	E1		0.828	
(53.2[c])		218.7	(6^+)	165.518	5^+				
53.69 *3*	0.45 *6*	232.82	5^-	179.145	4^-	M1+E2	0.271 *4*	50.1 *4*	
(53.92[c])		312.75	5^-	258.83	4^-				
57.54[d] *6*	0.21 *5*	179.145	4^-	121.659	4^+				
(59.32[c])		121.659	4^+	62.344	4^+				
60.13 *6*	1.19 *11*	86.651	3^+	26.450	3^+	M1+E2	0.08 *2*	24.5 *3*	
(62.34[c])		62.344	4^+	0	2^+				
66.89 *2*	3.25 *10*	342.390	5^-	275.505	5^+	E1		0.369	Additional information 8.
67.93 *3*	0.87 *7*	300.726	(6^-)	232.82	5^-				E_γ: duplicated γ ray, the unplaced one has been omitted.
73.66 *2*	1.71 *12*	136.021	3^-	62.344	4^+	E1		0.290	
(75.95[c])		258.83	4^-	182.885	2^-				
(79.48[c])		215.503	3^-	136.021	3^-				
(79.68[c])		106.13	5^+	26.450	3^+				
84.9 *2*	0.21 *7*	300.79	1^-,2,3,4^-	215.503	3^-				
86.65 *2*	4.97 *15*	86.651	3^+	0	2^+	M1+E2	0.112 *3*	8.56 *1*	
[x]89.60 *5*	0.29 *7*								
92.52 *3*	0.61 *7*	179.145	4^-	86.651	3^+				
93.82 *3*	0.79 *9*	215.503	3^-	121.659	4^+				
(95.21[c])		121.659	4^+	26.450	3^+				

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^{242}Am α decay (141 y) 1990Ho02,1979Ba67 (continued)

$\gamma(^{238}Np)$ (continued)

E_γ[‡]	I_γ[‡e]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[†]	α[f]
95.7 *6*		182.885	2^-	86.651	3^+			
(96.80[c])		232.82	5^-	136.021	3^-			
98.0 *6*		312.75	5^-	215.503	3^-			
109.59[h] *2*	≤4.3[h#]	136.021	3^-	26.450	3^+	E1+M2	0.026 *7*	0.142 *20*
109.59[h]	≤4.3[h#]	342.390	5^-	232.82	5^-			
111.16 *5*	0.55 *9*	232.82	5^-	121.659	4^+	(E1)		0.099
113.7 *6*		389.2	7^+	275.505	5^+			
[x]114.3 *6*								
117.2[g] *6*		300.79	1^-,2,3,4^-	182.885	2^-			
117.2[g] *6*		459.6	(6^+)	342.390	5^-			
117.8 *6*		376.68	(6^-)	258.83	4^-			
121.3 *6*		300.726	(6^-)	179.145	4^-			
(121.66[c])		121.659	4^+	0	2^+			
122.5 *6*		258.83	4^-	136.021	3^-			
126.83[d] *5*	0.028 *14*	342.390	5^-	215.503	3^-			
131.49 *8*	0.059 *31*	297.01	(6^-)	165.518	5^+			
132.6 *6*		407.58	6^-	275.505	5^+			
135.19 *2*	1.47 *8*	300.726	(6^-)	165.518	5^+			
136.03 *2*	2.05 *6*	136.021	3^-	0	2^+	E1		0.251
139.05[h] *2*	≤0.031[h&]	165.518	5^+	26.450	3^+			
139.05[h] *2*	≤0.031[h&]	300.726	(6^-)	161.68	6^+			
151.07 *4*	0.018 *4*	312.75	5^-	161.68	6^+			
152.69[h] *2*	≤0.158[h@]	179.145	4^-	26.450	3^+			
152.69[h] *2*	≤0.158[h@]	258.83	4^-	106.13	5^+			
(153.16[c])		215.503	3^-	62.344	4^+			
153.85 *2*	0.721 *22*	275.505	5^+	121.659	4^+			
156.46 *2*	0.059 *10*	182.885	2^-	26.450	3^+	E1		0.181
[x]160.61 *2*	0.09 *4*							
163.25[ij] *2*	≤0.33[ia]	328.77?	6^+	165.518	5^+			
163.25[i] *2*	3.34[ia] *19*	342.390	5^-	179.145	4^-	M1+E2	6.6 *+24−12*	1.90 *5*
164.67 *7*		300.79	1^-,2,3,4^-	136.021	3^-			
[x]165.97 *15*	0.010 *5*							
170.50 *1*	0.136 *10*	389.2	7^+	218.7	(6^+)			
174.76 *6*	0.038 *10*	407.58	6^-	232.82	5^-			
176.68 *15*	0.006 *3*	312.75	5^-	136.021	3^-			
182.86 *2*	0.199 *7*	182.885	2^-	0	2^+	E1		0.125
189.01 *3*	0.059 *10*	215.503	3^-	26.450	3^+	E1		0.116
190.88 *5*	0.023 *5*	297.01	(6^-)	106.13	5^+			
194.61 *2*	0.308 *10*	300.726	(6^-)	106.13	5^+			

^{242}Am α decay (141 y) 1990Ho02,1979Ba67 (continued)

γ(^{238}Np) (continued)

E_γ ‡	I_γ ‡ e	E_i(level)	J_i^π	E_f	J_f^π	Mult. †	α f	Comments
196.46 *10*	0.021 *10*	258.83	4^-	62.344	4^+			E_γ: not seen in (n,γ), but assigned to this level in 1990Ho02.
206.37 *2*	0.34 *4*	342.390	5^-	136.021	3^-			
213.20 d *14*	0.012 *4*	275.505	5^+	62.344	4^+			
215.52 *2*	0.129 *21*	215.503	3^-	0	2^+	E1	0.085	
232.40 *3*	0.122 *7*	258.83	4^-	26.450	3^+	E1	0.0719	
x233.69 *10*	0.028 *7*							
237.02 *10*	0.010 *5*	299.25	(3^+)	62.344	4^+			
238.53 d *5*	0.0035 *18*	300.79	1^-,2,3,4^-	62.344	4^+			
250.33 ib *3*	0.110 ib *6*	250.33	(1^+)	0	2^+			
250.33 ib	≤0.024 ib	312.75	5^-	62.344	4^+			
270.55 *6*	0.0063 *18*	376.68	(6^-)	106.13	5^+			
272.75 *7*	0.0081 *18*	299.25	(3^+)	26.450	3^+			
280.04 d *5*	0.0130 *14*	342.390	5^-	62.344	4^+			
299.20 *14*	0.006 *3*	299.25	(3^+)	0	2^+			

† From adopted gammas.

‡ From 1990Ho02, except where noted otherwise. The Iγ are per 100 α decays, obtained by measuring the intensity ratio at saturation for the 984.45-keVγ in ^{238}Np β^- decay and the 163.25-keVγ in ^{242}Am (141y) α decay. The uncertainties given are relative values. For absolute uncertainties add 14.3% in quadrature.

1990Ho02 report Iγ=4.0 *3* for a 109.59 keV *2* transition doubly placed from the 136- and 342-keV levels.

@ 1990Ho02 report Iγ=0.150 *8* for a 152.79-keV *2* transition doubly placed from the 179- and 259-keV levels. The energy is probably a misprint. The authors report E=152.69 keV *3* for the same transition in (n,γ). From E(level) differences, excluding this transition, one obtains Eγ=152.733 keV *9* for placement from the 179-keV level,and 152.67 keV *4* for placement from the 259-keV level.

& 1990Ho02 report Iγ=0.024 *7* for a 139.05 keV *2* transition doubly placed from the 166- and 300.755 keV levels.

a 1990Ho02 report Iγ=3.50 *10* for a 163.25 keV *2* transition doubly placed from the 329- and 342-keV levels. From Iγ/Iγ(66.9γ) in (n,γ), one expects Iγ(163γ)=4.0 *8* for placement from the 342-keV level. This leaves Iγ≤0.32 for placement from the 329-keV level. Evaluators adopt Iγ(163.25γ)=3.34 *19* and ≤0.32 for each placement, respectively.

b 1990Ho02 report Iγ=0.122 *10* for a 250.33 keV *3* transition doubly placed from the 250.3- and 313-keV levels. From Iγ/Iγ(176γ)≤2.6 from the 313-keV level in (n,γ), one obtains Iγ(250γ from 313)≤0.024,and thus Iγ(250γ from 250)=0.110 *16*.

c γ transition included on the basis of (n,γ) results in 1990Ho02. Eγ is from level-energy difference.

d This γ unplaced in 1990Ho02.

e For absolute intensity per 100 decays, multiply by 4.59×10^{-3} *12*.

f 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.

g Multiply placed.

h Multiply placed with undivided intensity.

i Multiply placed with intensity suitably divided.

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γ(^{238}Np) (continued)

[j] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

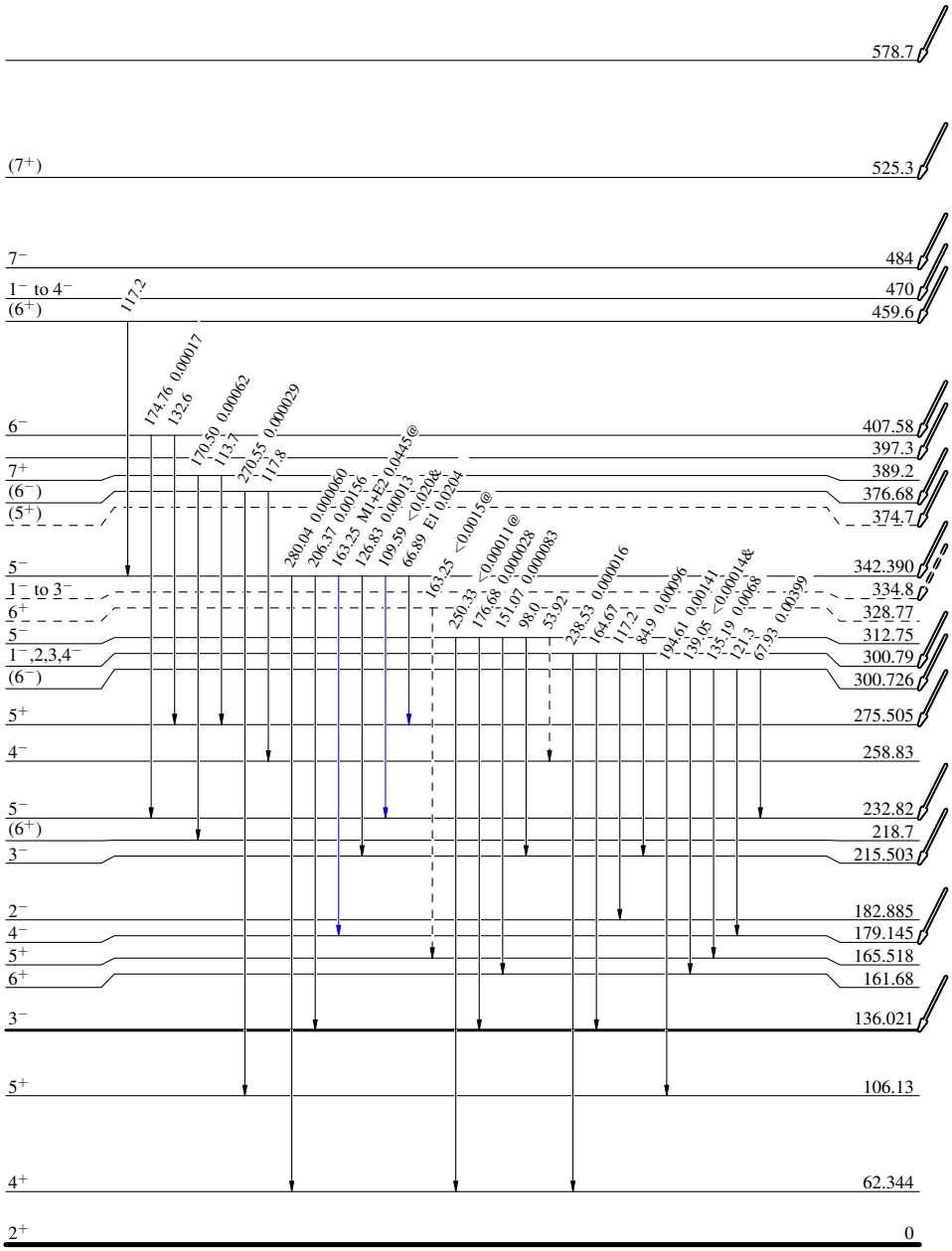
^{242}Am α decay (141 y) 1990Ho02,1979Ba67

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)

5^- 48.63 141 y 2
Q_α=5588.50 25 $\%\alpha$=0.459
$^{242}_{95}Am_{147}$



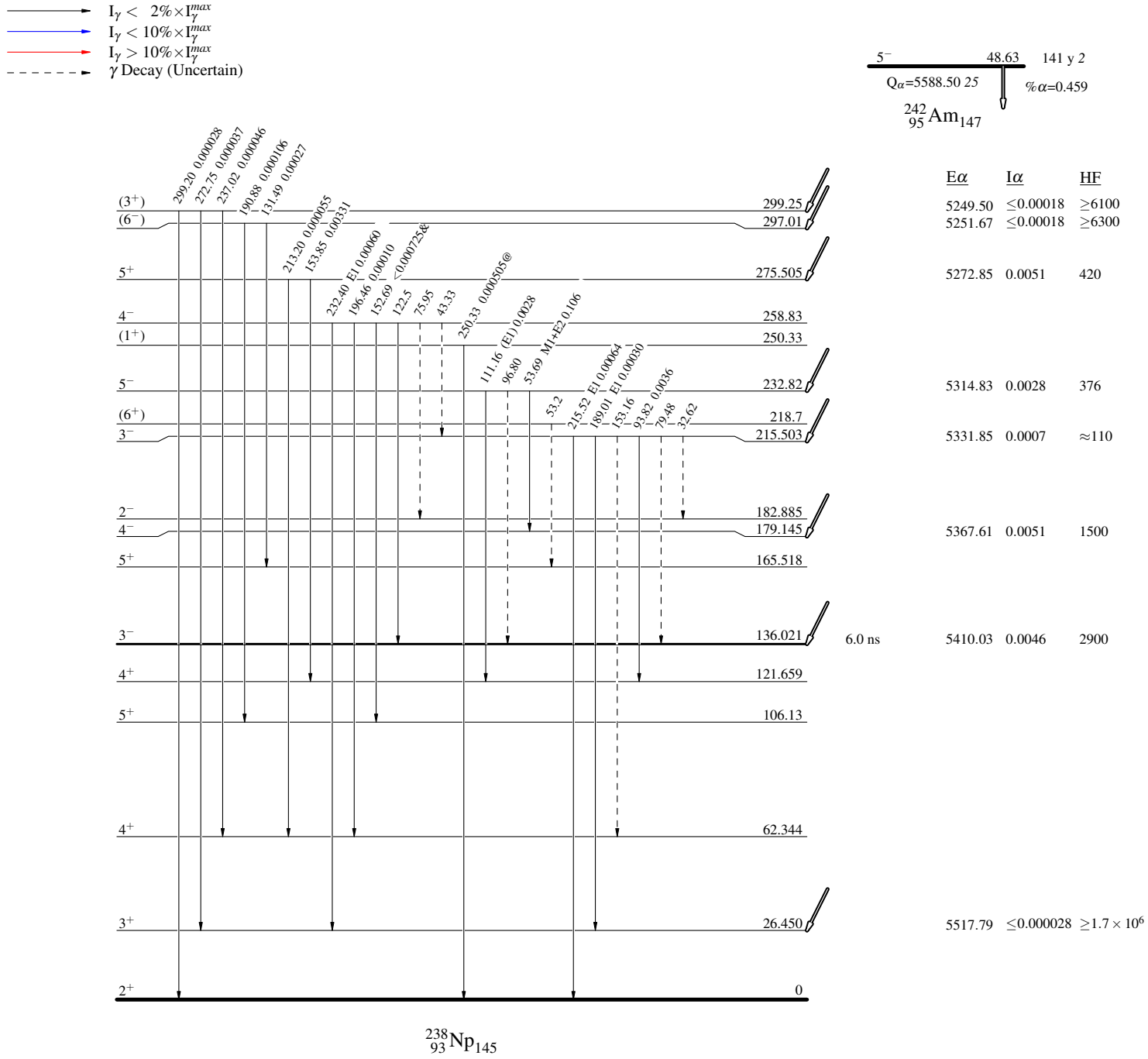
	Eα	Iα	HF
578.7	4974.7	9.18×10^{-6}	≈2400
525.3	5027.2	0.0000009	≈700
484	5068	0.00115	88
470	5082	0.000138	830
459.6	5091.8	0.00096	158
407.58	5143.0	0.0257	11.1
397.3	5153.1	0.0000918	3600
389.2			
376.68	5173.31	≤0.00018	≥2000
374.7	5175.3	≤0.00018	≥2100
342.390	5207.06	0.409	1.79
334.8	5214.5	0.000138	5900
328.77			
312.75			
300.79	5248.12	≤0.0051	≥220
300.726	5248.01	≤0.0051	≥220
275.505	5272.85	0.0051	420
258.83			
232.82	5314.83	0.0028	376
218.7			
215.503	5331.85	0.0007	≈110
182.885			
179.145	5367.61	0.0051	1500
165.518			
161.68			
136.021	5410.03	0.0046	2900
106.13			
62.344			
0			

$^{238}_{93}Np_{145}$

^{242}Am α decay (141 y) 1990Ho02,1979Ba67

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



^{242}Am α decay (141 y) 1990Ho02,1979Ba67

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided