$^{148}_{61}\mathrm{Pm}_{87}$

1 Decay Scheme

Pm-148 decays via beta minus transitions to nine excited levels and the ground state of Sm-148.
Le prométhéum 148 se désintègre 100 % par émission bêta vers neuf niveaux excités et le niveau fondamental du samarium 148.

2 Nuclear Data

$T_{1/2}(^{148}\mathrm{Pm})$	:	5,370	(15)	d
$Q^-(^{148}\mathrm{Pm})$	:	2471	(6)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,10}$	157 (6)	0,0091 (15)	1st Forbidden	8,7
$\beta^-_{0,9}$	187 (6)	0,0965 (34)	Super Allowed Or Allowed	7,9
$\beta^-_{0,8}$	413 (6)	1,360 (22)	Allowed	7,9
$\beta^-_{0,7}$	549 (6)	0,0138 (14)	1st Forbidden	10,3
$\beta^-_{0,6}$	807 (6)	0,018 (3)	1st Forbidden	10,8
$\beta^-_{0,5}$	1006 (6)	33,3 (6)	Super Allowed Or Allowed	7,8
$\beta^-_{0,4}$	1017 (6)	0,093 (3)	1st Forbidden	10,4
$\beta^-_{0,3}$	1047 (6)	0,236 (9)	1st Forbidden	10,1
$\beta^-_{0,1}$	1921 (6)	9,3 (6)	1st Forbidden	9,5
$\beta^-_{0,0}$	2471 (6)	55,5 (7)	1st Forbidden	9,1

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-3})	α_L (10^{-4})	α_M (10^{-5})	α_T (10^{-3})	α_π (10^{-5})
$\gamma_{5,2}$(Sm)	303,592 (31)	0,0397 (47)	E2	42,3 (6)	93,1 (13)	207 (3)	54,2 (8)	
$\gamma_{8,6}$(Sm)	393,801 (30)	0,0155 (22)	E1	6,43 (9)	8,62 (12)	18,4 (3)	7,52 (11)	
$\gamma_{1,0}$(Sm)	550,274 (17)	22,7 (6)	E2	8,25 (12)	13,60 (19)	29,6 (5)	9,98 (14)	
$\gamma_{8,5}$(Sm)	592,832 (29)	0,355 (10)	M1	11,98 (17)	16,21 (23)	34,7 (5)	14,04 (20)	
$\gamma_{2,1}$(Sm)	611,263 (29)	1,043 (40)	E1+0,07%M2	2,39 (5)	3,15 (6)	6,70 (13)	2,79 (5)	
$\gamma_{9,5}$(Sm)	819,276 (28)	0,0134 (22)	M1	5,42 (8)	7,26 (11)	15,51 (22)	6,35 (9)	
$\gamma_{3,1}$(Sm)	874,186 (43)	0,241 (10)	E2	2,80 (4)	4,06 (6)	8,74 (13)	3,32 (5)	
$\gamma_{8,2}$(Sm)	896,424 (33)	0,984 (20)	M1+64%E2	3,28 (8)	4,56 (10)	9,77 (20)	3,86 (9)	
$\gamma_{4,1}$(Sm)	903,943 (29)	0,0422 (20)	M1+84%E2	2,87 (5)	4,06 (7)	8,72 (14)	3,39 (6)	
$\gamma_{5,1}$(Sm)	914,855 (25)	12,0 (5)	E1	1,050 (15)	1,354 (19)	2,88 (4)	1,221 (17)	
$\gamma_{6,1}$(Sm)	1113,886 (27)	0,0223 (23)	M1+24%E2	2,39 (4)	3,19 (5)	6,81 (10)	2,79 (5)	0,0565 (8)
$\gamma_{10,2}$(Sm)	1152,47 (15)	0,0029 (13)	E1+1%M2	0,73 (13)	0,95 (18)	2,0 (4)	0,86 (15)	0,98 (3)
$\gamma_{7,1}$(Sm)	1371,31 (20)	0,0138 (14)	E2	1,119 (16)	1,507 (22)	3,22 (5)	1,347 (19)	3,64 (6)
$\gamma_{4,0}$(Sm)	1454,217 (23)	0,0512 (25)	E2	1,000 (14)	1,338 (19)	2,86 (4)	1,230 (18)	6,03 (9)
$\gamma_{5,0}$(Sm)	1465,129 (19)	22,2 (5)	E1	0,449 (7)	0,570 (8)	1,208 (17)	0,704 (10)	18,3 (3)
$\gamma_{8,1}$(Sm)	1507,687 (28)	0,0056 (9)	E1	0,428 (6)	0,542 (8)	1,150 (17)	0,711 (10)	21,4 (3)
$\gamma_{6,0}$(Sm)	1664,160 (21)	0,0113 (11)	E2	0,775 (11)	1,024 (15)	2,18 (3)	1,042 (15)	13,75 (20)
$\gamma_{9,1}$(Sm)	1734,131 (27)	0,0386 (11)	E1	0,339 (5)	0,428 (6)	0,907 (13)	0,777 (11)	38,3 (6)
$\gamma_{10,1}$(Sm)	1763,74 (15)	0,0062 (7)	M1+83%E2	0,732 (22)	0,96 (3)	2,05 (6)	1,04 (3)	18,3 (3)
$\gamma_{9,0}$(Sm)	2284,405 (21)	0,0445 (24)	E1	0,219 (3)	0,274 (4)	0,581 (9)	1,027 (15)	77,4 (11)

3 Atomic Data

3.1 Sm

ω_K	:	0,926	(4)
$\bar{\omega}_L$	:	0,158	(6)
n_{KL}	:	0,857	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	39,5229	55,25
	$K\alpha_1$	40,1186	100
	$K\beta_3$	45,289	}
	$K\beta_1$	45,413	} 31,26
	$K\beta_5''$	45,731	}
	$K\beta_2$	46,575	}
	$K\beta_4$	46,705	} 8,07
	$KO_{2,3}$	46,813	}
X_L			
	$L\ell$	4,9909	
	$L\alpha$	5,6088 - 5,6376	
	$L\eta$	5,586	
	$L\beta$	6,1928 - 6,6557	
	$L\gamma$	6,9644 - 7,4871	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	31,190 - 33,218	100
KLX	37,302 - 40,097	50,7
KXY	43,39 - 46,79	6,42
Auger L	3,27 - 7,69	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Sm)	3,27 - 7,69	0,1883 (16)
e_{AK}	(Sm)		0,0163 (10)
	KLL	31,190 - 33,218	
	KLX	37,302 - 40,097	
	KXY	43,39 - 46,79	
$ec_{1,0\ K}$	(Sm)	503,440 (17)	0,186 (6)
$ec_{1,0\ L}$	(Sm)	542,537 - 543,558	0,0306 (9)
$ec_{5,1\ K}$	(Sm)	868,021 (25)	0,0126 (6)
$\beta^-_{0,10}$	max:	157 (6)	0,0091 (15)
	avg:	42,1 (18)	
$\beta^-_{0,9}$	max:	187 (6)	0,0965 (34)
	avg:	50,7 (18)	
$\beta^-_{0,8}$	max:	413 (6)	1,360 (22)
	avg:	121,9 (21)	
$\beta^-_{0,7}$	max:	549 (6)	0,0138 (14)
	avg:	169,0 (22)	
$\beta^-_{0,6}$	max:	807 (6)	0,018 (3)
	avg:	264,4 (23)	
$\beta^-_{0,5}$	max:	1006 (6)	33,3 (6)
	avg:	342,7 (24)	
$\beta^-_{0,4}$	max:	1017 (6)	0,093 (3)
	avg:	347,1 (25)	
$\beta^-_{0,3}$	max:	1047 (6)	0,236 (9)
	avg:	359,1 (25)	
$\beta^-_{0,1}$	max:	1921 (6)	9,3 (6)
	avg:	731,6 (27)	
$\beta^-_{0,0}$	max:	2471 (6)	55,5 (7)
	avg:	977,7 (28)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Sm)	4,9909 - 7,4871	0,0363 (8)	
$XK\alpha_2$	(Sm)	39,5229	0,0581 (16)	} $K\alpha$
$XK\alpha_1$	(Sm)	40,1186	0,1051 (28)	}
$XK\beta_3$	(Sm)	45,289	}	
$XK\beta_1$	(Sm)	45,413	} 0,0328 (10)	$K'\beta_1$
$XK\beta_5''$	(Sm)	45,731	}	
$XK\beta_2$	(Sm)	46,575	}	
$XK\beta_4$	(Sm)	46,705	} 0,00847 (30)	$K'\beta_2$
$XKO_{2,3}$	(Sm)	46,813	}	

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{5,2}$(Sm)	303,59 (3)	0,0377 (45)
$\gamma_{8,6}$(Sm)	393,80 (3)	0,0155 (22)
$\gamma_{1,0}$(Sm)	550,27 (3)	22,5 (6)
$\gamma_{8,5}$(Sm)	592,83 (3)	0,35 (1)
$\gamma_{2,1}$(Sm)	611,26 (3)	1,04 (4)
$\gamma_{9,5}$(Sm)	819,27 (3)	0,0133 (22)
$\gamma_{3,1}$(Sm)	874,18 (3)	0,24 (1)
$\gamma_{8,2}$(Sm)	896,42 (3)	0,98 (2)
$\gamma_{4,1}$(Sm)	903,94 (3)	0,042 (2)
$\gamma_{5,1}$(Sm)	914,85 (3)	12,0 (5)
$\gamma_{6,1}$(Sm)	1113,88 (3)	0,0222 (23)
$\gamma_{10,2}$(Sm)	1152,5 (2)	0,0029 (13)
$\gamma_{7,1}$(Sm)	1371,3 (2)	0,0138 (14)
$\gamma_{4,0}$(Sm)	1454,21 (3)	0,0511 (25)
$\gamma_{5,0}$(Sm)	1465,12 (3)	22,2 (5)
$\gamma_{8,1}$(Sm)	1507,68 (3)	0,0056 (9)
$\gamma_{6,0}$(Sm)	1664,15 (3)	0,0113 (11)
$\gamma_{9,1}$(Sm)	1734,12 (3)	0,0386 (11)
$\gamma_{10,1}$(Sm)	1763,7 (2)	0,0062 (7)
$\gamma_{9,0}$(Sm)	2284,39 (3)	0,0444 (24)

6 Main Production Modes

$^{148}Nd(p,n)^{148}Pm$
Possible impurities : ^{148m}Pm

$^{148}Nd(d,2n)^{148}Pm$
Possible impurities : ^{148m}Pm

$^{147}Pm(n,\gamma)^{148}Pm$ σ : 80 barns
Possible impurities : ^{148m}Pm (70 barns); $^{149,150}Pm$ from $^{148,149}Pm(n,\gamma)$

$^{238}U(p,f)^{148}Pm$
Possible impurities : ^{148m}Pm

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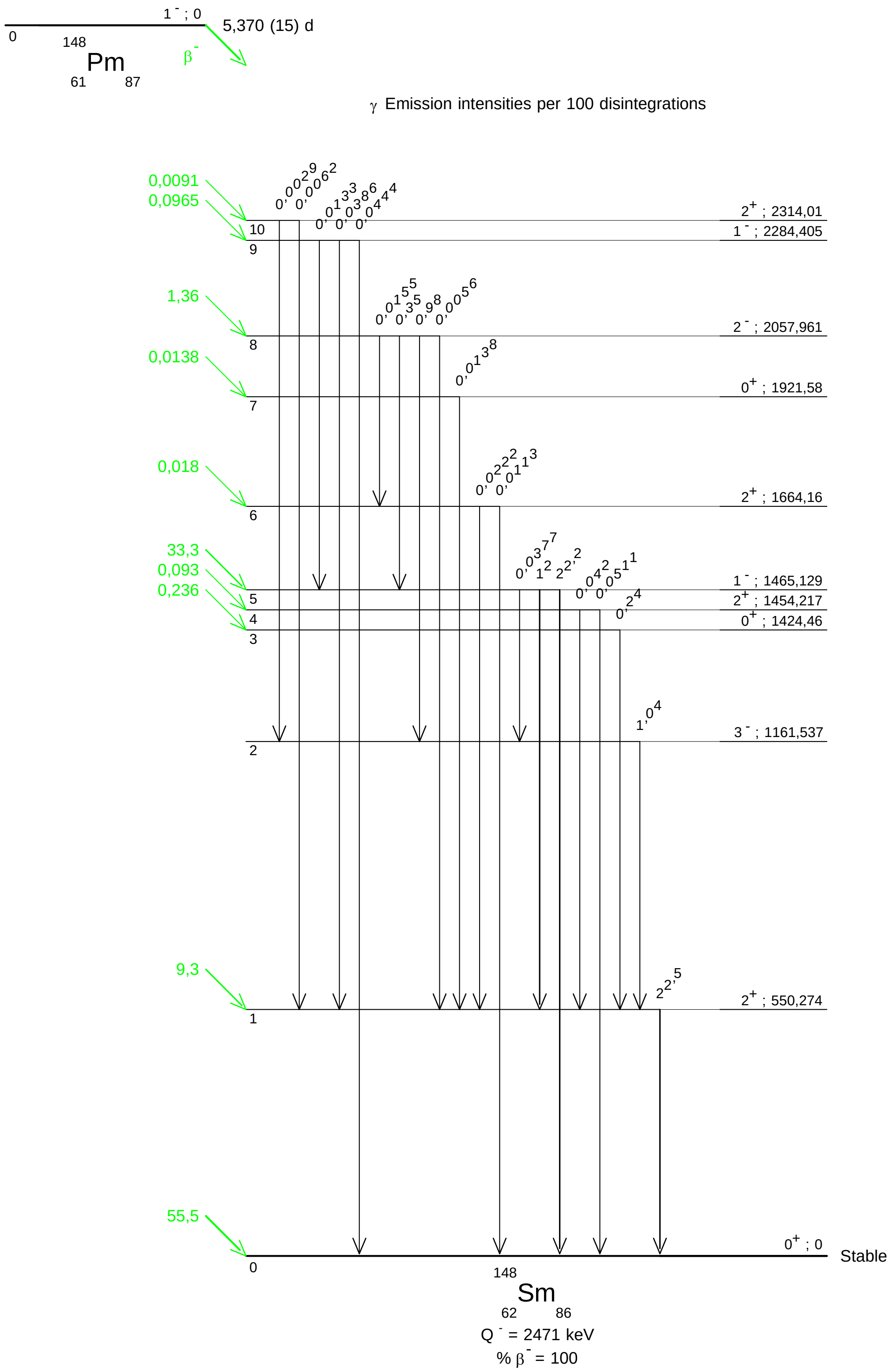
1 - ; 0
5,370 (15) d
0
148 Pm 61 87
β -
γ Emission intensities per 100 disintegrations
0,0091
0,0965
1,36
0,0138
0,018
33,3
0,093
0,236
9,3
55,5
2+ ; 2314,01
1 - ; 2284,405
2 - ; 2057,961
0+ ; 1921,58
2+ ; 1664,16
1 - ; 1465,129
2+ ; 1454,217
0+ ; 1424,46
3 - ; 1161,537
2+ ; 550,274
0+ ; 0
Stable
148 Sm 62 86
Q - = 2471 keV
% β - = 100