



## 1 Decay Scheme

Tl-208 ground state ( $J^\pi = 5^+$ ) decays by beta minus emission to various excited levels of Pb-208.  
*Le thallium 208 se désintègre par émission bêta moins vers les niveaux excités du plomb 208.*

## 2 Nuclear Data

$$T_{1/2}({}^{208}\text{Tl}) : 3,058 \quad (6) \quad \text{min}$$

$$Q^-({}^{208}\text{Tl}) : 4999,0 \quad (17) \quad \text{keV}$$

### 2.1 $\beta^-$ Transitions

	Energy keV	Probability $\times 100$	Nature	lg $ft$
$\beta_{0,23}^-$	518,3 (17)	0,052 (5)	1st forbidden non-unique	6,67
$\beta_{0,21}^-$	615,7 (17)	0,017 (5)	1st forbidden non-unique	7,41
$\beta_{0,20}^-$	640,3 (17)	0,045 (4)	1st forbidden non-unique	7,04
$\beta_{0,19}^-$	675,1 (17)	0,005 (2)	allowed	8,1
$\beta_{0,18}^-$	702,4 (17)	0,102 (11)	1st forbidden non-unique	6,82
$\beta_{0,17}^-$	737,1 (17)	0,002 (1)	1st forbidden non-unique	8,6
$\beta_{0,13}^-$	818,6 (17)	0,231 (9)	1st forbidden non-unique	6,7
$\beta_{0,12}^-$	873,7 (17)	0,174 (9)	1st forbidden non-unique	6,92
$\beta_{0,8}^-$	1003,6 (17)	0,007 (3)	1st forbidden non-unique	8,5
$\beta_{0,7}^-$	1037,8 (17)	3,17 (4)	1st forbidden non-unique	5,92
$\beta_{0,6}^-$	1052,4 (17)	0,048 (3)	1st forbidden non-unique	7,76
$\beta_{0,5}^-$	1079,0 (17)	0,63 (4)	1st forbidden non-unique	6,68
$\beta_{0,4}^-$	1290,5 (17)	24,1 (2)	1st forbidden non-unique	5,38
$\beta_{0,3}^-$	1523,9 (17)	22,1 (5)	1st forbidden non-unique	5,69
$\beta_{0,2}^-$	1801,3 (17)	49,2 (6)	1st forbidden non-unique	5,61

## 2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy keV	$P_{\gamma+ce}$ $\times 100$	Multipolarity	$\alpha_K$	$\alpha_L$	$\alpha_M$	$\alpha_T$	$\alpha_{\pi}$ ( $10^{-4}$ )
$\gamma_{5,4}$ (Pb)	211,52 (2)	0,38 (2)	M1+3%E2	0,890 (14)	0,1570 (22)	0,0369 (6)	1,096 (17)	
$\gamma_{4,3}$ (Pb)	233,37 (2)	0,51 (2)	[M1+33%E2]	0,51 (3)	0,1136 (18)	0,0275 (4)	0,66 (3)	
$\gamma_{7,4}$ (Pb)	252,71 (2)	1,26 (3)	[M1+14%E2]	0,495 (14)	0,0926 (14)	0,0220 (4)	0,616 (15)	
$\gamma_{3,2}$ (Pb)	277,37 (2)	10,1 (5)	[M1+0,04%E2]	0,432 (6)	0,0739 (11)	0,01730 (25)	0,529 (8)	
$\gamma_{7,3}$ (Pb)	486,08 (2)	0,055 (4)	[M1]	0,0954 (14)	0,01608 (23)	0,00376 (6)	0,1164 (17)	
$\gamma_{4,2}$ (Pb)	510,74 (2)	24,8 (2)	[M1+0,25%E2]	0,0835 (13)	0,01406 (21)	0,00329 (5)	0,1019 (16)	
$\gamma_{2,1}$ (Pb)	583,187 (2)	86,7 (3)	E2	0,01509 (22)	0,00410 (6)	0,001009 (15)	0,0205 (3)	
$\gamma_{18,4}$ (Pb)	588,109 (18)	0,06 (1)	[M1]	0,0577 (8)	0,00968 (14)	0,00226 (4)	0,0704 (10)	
$\gamma_{12,3}$ (Pb)	650,27 (2)	0,043 (5)	[M1]	0,0444 (7)	0,00742 (11)	0,001733 (25)	0,0541 (8)	
$\gamma_{13,3}$ (Pb)	705,34 (2)	0,023 (4)	[M1]	0,0360 (5)	0,00599 (9)	0,001399 (20)	0,0438 (7)	
$\gamma_{5,2}$ (Pb)	722,26 (2)	0,25 (4)	M1+8,8%E2	0,0317 (6)	0,00534 (10)	0,001248 (22)	0,0387 (7)	
$\gamma_{6,2}$ (Pb)	748,87 (2)	0,048 (3)	[M1]	0,0308 (5)	0,00512 (8)	0,001196 (17)	0,0375 (6)	
$\gamma_{7,2}$ (Pb)	763,45 (2)	1,86 (2)	[M1+1,0%E2]	0,0291 (4)	0,00484 (7)	0,001130 (16)	0,0354 (5)	
$\gamma_{(-1,1)}$ (Pb)	808,32 (13)	0,030 (7)						
$\gamma_{18,3}$ (Pb)	821,48 (2)	0,042 (4)	M1	0,0242 (4)	0,00402 (6)	0,000939 (14)	0,0295 (5)	
$\gamma_{(-1,2)}$ (Pb)	835,90 (11)	0,076 (11)						
$\gamma_{3,1}$ (Pb)	860,53 (2)	12,7 (1)	[M1+0,02%E2]	0,0215 (3)	0,00356 (5)	0,000831 (12)	0,0262 (4)	
$\gamma_{20,3}$ (Pb)	883,59 (2)	0,032 (3)	[M1]	0,0201 (3)	0,00333 (5)	0,000776 (11)	0,0244 (4)	
$\gamma_{12,2}$ (Pb)	927,64 (2)	0,131 (7)	[M1]	0,01774 (25)	0,00293 (5)	0,000684 (10)	0,0216 (3)	
$\gamma_{13,2}$ (Pb)	982,70 (2)	0,208 (8)	[M1]	0,01530 (22)	0,00253 (4)	0,000589 (9)	0,0186 (3)	
$\gamma_{4,1}$ (Pb)	1093,90 (2)	0,44 (1)	E2	0,00449 (7)	0,000844 (12)	0,000200 (3)	0,00560 (8)	
$\gamma_{19,2}$ (Pb)	1126,24 (2)	0,005 (2)	E1	0,001691 (24)	0,000256 (4)	0,0000590 (9)	0,00203 (3)	0,0206 (3)
$\gamma_{20,2}$ (Pb)	1160,96 (2)	0,011 (3)	[M1]	0,01000 (14)	0,001641 (23)	0,000382 (6)	0,01214 (17)	0,0259 (4)
$\gamma_{21,2}$ (Pb)	1185,57 (2)	0,017 (5)	[M1]	0,00947 (14)	0,001555 (22)	0,000362 (5)	0,01151 (17)	0,0501 (7)
$\gamma_{23,2}$ (Pb)	1283,04 (2)	0,052 (5)	[M1]	0,00775 (11)	0,001269 (18)	0,000295 (5)	0,00943 (14)	0,232 (4)
$\gamma_{8,1}$ (Pb)	1380,89 (2)	0,007 (3)	[M1]	0,00643 (9)	0,001050 (15)	0,000245 (4)	0,00785 (11)	0,546 (8)
$\gamma_{17,1}$ (Pb)	1647,32 (2)	0,002 (1)	[M1]	0,00411 (6)	0,000669 (10)	0,0001556 (22)	0,00518 (8)	1,94 (3)
$\gamma_{20,12}$ (Pb)	1744,12 (2)	0,002 (1)	[M1]	0,00356 (5)	0,000578 (8)	0,0001344 (19)	0,00457 (7)	2,55 (4)
$\gamma_{1,0}$ (Pb)	2614,511 (10)	100	E3	0,001708 (24)	0,000292 (4)	0,0000685 (10)	0,00246 (4)	3,71 (6)

## 2.3 Pb

$\omega_K$	:	0,963	(4)
$\bar{\omega}_L$	:	0,379	(15)
$n_{KL}$	:	0,811	(5)

## 2.3.1 X Radiations

	Energy keV	Relative probability	
X <sub>K</sub>	K $\alpha_2$	72,8049	59,4
	K $\alpha_1$	74,97	100
	K $\beta_3$	84,451	}
	K $\beta_1$	84,937	}
	K $\beta_5''$	85,47	}
			34,2

	Energy keV	Relative probability
X <sub>L</sub>	K $\beta_2$	87,238
	K $\beta_4$	87,58
	KO <sub>2,3</sub>	87,911
	L $\ell$	9,184
	L $\alpha$	10,45 – 10,551
	L $\eta$	11,349
	L $\beta$	12,142 – 13,015
	L $\gamma$	14,765 – 15,216

### 2.3.2 Auger Electrons

	Energy keV	Relative probability
Auger K		
KLL	56,028 – 61,669	100
KLX	68,181 – 74,969	55,5
KXY	80,3 – 88,0	7,7
Auger L	5,262 – 10,398	2745

## 3 Electron Emissions

	Energy keV	Electrons per 100 disint.
e <sub>AL</sub>	(Pb) 5,262 - 10,398	4,50 (13)
e <sub>AK</sub>	(Pb)	0,27 (3)
	KLL 56,028 - 61,669	}
	KLX 68,181 - 74,969	}
	KXY 80,3 - 88,0	}
ec <sub>3,2</sub> T	(Pb) 189,36 - 277,37	3,50 (16)
ec <sub>3,2</sub> K	(Pb) 189,36 (2)	2,86 (13)
ec <sub>3,2</sub> L	(Pb) 261,51 - 264,33	0,49 (2)
ec <sub>3,2</sub> M+	(Pb) 273,52 - 277,37	0,15 (1)
ec <sub>4,2</sub> T	(Pb) 422,73 - 510,74	2,30 (2)
ec <sub>4,2</sub> K	(Pb) 422,73 (2)	1,88 (2)
ec <sub>4,2</sub> L	(Pb) 494,88 - 497,70	0,32
ec <sub>2,1</sub> T	(Pb) 495,18 - 583,19	1,70 (1)
ec <sub>2,1</sub> K	(Pb) 495,18 (2)	1,25 (1)
ec <sub>4,2</sub> M+	(Pb) 506,89 - 510,74	0,098

		Energy keV	Electrons per 100 disint.
ec <sub>2,1</sub> L	(Pb)	567,33 - 570,15	0,34
ec <sub>2,1</sub> M+	(Pb)	579,33 - 583,19	0,109
ec <sub>1,0</sub> α	(Pb)	1592,51 (1)	0,0369 (6)
ec <sub>1,0</sub> K	(Pb)	2526,51 (1)	0,170 (3)
ec <sub>1,0</sub> L	(Pb)	2598,65 - 2601,48	0,0291 (4)
$\beta_{0,23}^-$	max:	518,3 (17)	0,052 (5)
$\beta_{0,23}^-$	avg:	154,3 (6)	
$\beta_{0,21}^-$	max:	615,7 (17)	0,017 (5)
$\beta_{0,21}^-$	avg:	187,7 (6)	
$\beta_{0,20}^-$	max:	640,3 (17)	0,045 (4)
$\beta_{0,20}^-$	avg:	196,4 (6)	
$\beta_{0,19}^-$	max:	675,1 (17)	0,005 (2)
$\beta_{0,19}^-$	avg:	208,6 (6)	
$\beta_{0,18}^-$	max:	702,4 (17)	0,102 (11)
$\beta_{0,18}^-$	avg:	218,3 (6)	
$\beta_{0,17}^-$	max:	737,1 (17)	0,002 (1)
$\beta_{0,17}^-$	avg:	230,8 (6)	
$\beta_{0,13}^-$	max:	818,6 (17)	0,231 (9)
$\beta_{0,13}^-$	avg:	260,4 (6)	
$\beta_{0,12}^-$	max:	873,7 (17)	0,174 (9)
$\beta_{0,12}^-$	avg:	280,8 (6)	
$\beta_{0,8}^-$	max:	1003,6 (17)	0,007 (3)
$\beta_{0,8}^-$	avg:	329,7 (7)	
$\beta_{0,7}^-$	max:	1037,8 (17)	3,17 (4)
$\beta_{0,7}^-$	avg:	342,8 (7)	
$\beta_{0,6}^-$	max:	1052,4 (17)	0,048 (3)
$\beta_{0,6}^-$	avg:	348,4 (7)	
$\beta_{0,5}^-$	max:	1079,0 (17)	0,63 (4)
$\beta_{0,5}^-$	avg:	358,6 (7)	
$\beta_{0,4}^-$	max:	1290,5 (17)	24,1 (2)
$\beta_{0,4}^-$	avg:	441,5 (7)	
$\beta_{0,3}^-$	max:	1523,9 (17)	22,1 (5)
$\beta_{0,3}^-$	avg:	535,4 (7)	
$\beta_{0,2}^-$	max:	1801,3 (17)	49,2 (6)
$\beta_{0,2}^-$	avg:	649,5 (7)	

## 4 Photon Emissions

### 4.1 X-Ray Emissions

		Energy keV	Photons per 100 disint.	
XL	(Pb)	9,184 — 15,216	2,75 (12)	
XK $\alpha_2$	(Pb)	72,8049	2,03 (5)	} K $\alpha$
XK $\alpha_1$	(Pb)	74,97	3,42 (7)	}
XK $\beta_3$	(Pb)	84,451	}	
XK $\beta_1$	(Pb)	84,937	}	1,17 (3) K' $\beta_1$
XK $\beta_5''$	(Pb)	85,47	}	
XK $\beta_2$	(Pb)	87,238	}	
XK $\beta_4$	(Pb)	87,58	}	0,353 (11) K' $\beta_2$
XK $O_{2,3}$	(Pb)	87,911	}	

### 4.2 Gamma Emissions

	Energy keV	Photons per 100 disint.
$\gamma_{5,4}$ (Pb)	211,52 (2)	0,18 (1)
$\gamma_{4,3}$ (Pb)	233,37 (2)	0,31 (1)
$\gamma_{7,4}$ (Pb)	252,71 (2)	0,78 (2)
$\gamma_{3,2}$ (Pb)	277,37 (2)	6,6 (3)
$\gamma_{7,3}$ (Pb)	486,08 (2)	0,049 (4)
$\gamma_{4,2}$ (Pb)	510,74 (2)	22,5 (2)
$\gamma_{2,1}$ (Pb)	583,187 (2)	85,0 (3)
$\gamma_{18,4}$ (Pb)	588,108 (18)	0,06 (1)
$\gamma_{12,3}$ (Pb)	650,27 (2)	0,041 (5)
$\gamma_{13,3}$ (Pb)	705,34 (2)	0,022 (4)
$\gamma_{5,2}$ (Pb)	722,26 (2)	0,24 (4)
$\gamma_{6,2}$ (Pb)	748,87 (2)	0,046 (3)
$\gamma_{7,2}$ (Pb)	763,45 (2)	1,80 (2)
$\gamma_{(-1,1)}$ (Pb)	808,32 (13)	0,030 (7)
$\gamma_{18,3}$ (Pb)	821,48 (2)	0,041 (4)
$\gamma_{(-1,2)}$ (Pb)	835,90 (11)	0,076 (11)
$\gamma_{3,1}$ (Pb)	860,53 (2)	12,4 (1)
$\gamma_{20,3}$ (Pb)	883,59 (2)	0,031 (3)
$\gamma_{12,2}$ (Pb)	927,64 (2)	0,128 (7)
$\gamma_{13,2}$ (Pb)	982,70 (2)	0,204 (8)
$\gamma_{4,1}$ (Pb)	1093,90 (2)	0,44 (1)
$\gamma_{19,2}$ (Pb)	1126,24 (2)	0,005 (2)
$\gamma_{20,2}$ (Pb)	1160,96 (2)	0,011 (3)
$\gamma_{21,2}$ (Pb)	1185,57 (2)	0,017 (5)
$\gamma_{23,2}$ (Pb)	1283,04 (2)	0,052 (5)

	Energy keV	Photons per 100 disint.
$\gamma_{8,1}(\text{Pb})$	1380,89 (2)	0,007 (3)
$\gamma_{17,1}(\text{Pb})$	1647,32 (2)	0,002 (1)
$\gamma_{20,12}(\text{Pb})$	1744,12 (2)	0,002 (1)
$\gamma_{1,0}(\text{Pb})$	2614,511 (10)	99,755 (4)

## 5 Main Production Modes

Bi – 212( $\alpha$ )Tl – 208

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γ Emission intensities per 100 disintegrations

