



1 Decay Scheme

Tl-209 decays by 100 % beta minus to Pb-209. The strongest branch of 97.70 (15) % populates the 1/2⁻ excited state at 2149.29 keV.

Le thallium 209 se désintègre par émissions bêta. Le branchement de plus forte intensité peuple le niveau d'énergie 2149 keV du plomb 209.

2 Nuclear Data

$T_{1/2}(^{209}\text{Tl})$:	2,161	(7)	min
$T_{1/2}(^{209}\text{Pb})$:	3,277	(15)	h
$Q^-(^{209}\text{Tl})$:	3976	(8)	keV

2.1 β^- Transitions

	Energy keV	Probability × 100	Nature	lg ft
$\beta_{0,10}^-$	587 (8)	0,420 (22)		
$\beta_{0,9}^-$	615 (8)	0,10 (3)		
$\beta_{0,8}^-$	906 (8)	0,645 (16)	1st forbidden	6,3
$\beta_{0,7}^-$	1071 (8)	0,70 (9)	1st forbidden	6,5
$\beta_{0,6}^-$	1451 (8)	0,070 (15)	Allowed	8
$\beta_{0,5}^-$	1515 (8)	0,031 (16)	1st forbidden unique	9,2
$\beta_{0,4}^-$	1660 (8)	0,32 (11)	1st forbidden	7,5
$\beta_{0,3}^-$	1827 (8)	97,70 (15)	1st forbidden	5,2
$\beta_{0,2}^-$	1944 (8)	< 0,1	Allowed	> 8,3

		Energy keV	Relative probability
X _L	Kβ ₂	87,238	}
	Kβ ₄	87,58	
	KO _{2,3}	87,911	
			}
	Lℓ	9,186	
	Lα	10,4495 – 10,5512	
	Lη	11,3495	
	Lβ	12,1443 – 13,3763	
	Lγ	14,3078 – 15,2169	

3.1.2 Auger Electrons

		Energy keV	Relative probability
Auger K			
	KLL	56,028 – 61,669	100
	KLX	68,181 – 74,969	55,8
	KXY	80,3 – 88,0	7,78
Auger L		5,34 – 15,82	

4 Electron Emissions

		Energy keV	Electrons per 100 disint.
e _{AL}	(Pb)	5,34 - 15,82	13,23 (15)
e _{AK}	(Pb)		0,77 (9)
	KLL	56,028 - 61,669	}
	KLX	68,181 - 74,969	}
	KXY	80,3 - 88,0	}
ec _{3,2} K	(Pb)	29,22 (8)	17,51 (48)
ec _{3,2} L	(Pb)	101,36 - 104,18	3,39 (9)
ec _{3,2} M	(Pb)	113,37 - 114,74	0,799 (20)
ec _{3,2} N	(Pb)	116,33 - 117,08	0,200 (5)
ec _{2,1} K	(Pb)	377,13 (8)	2,34 (7)
ec _{2,1} L	(Pb)	449,27 - 452,09	0,786 (23)

		Energy keV	Electrons per 100 disint.
ec _{2,1} M	(Pb)	461,28 - 462,65	0,197 (6)
ec _{1,0} K	(Pb)	1478,94 (5)	0,2340 (42)
$\beta_{0,10}^-$	max:	587 (8)	0,420 (22)
$\beta_{0,10}^-$	avg:	177,8 (28)	
$\beta_{0,9}^-$	max:	615 (8)	0,10 (3)
$\beta_{0,9}^-$	avg:	187,4 (28)	
$\beta_{0,8}^-$	max:	906 (8)	0,645 (16)
$\beta_{0,8}^-$	avg:	292,9 (30)	
$\beta_{0,7}^-$	max:	1071 (8)	0,70 (9)
$\beta_{0,7}^-$	avg:	355,5 (31)	
$\beta_{0,6}^-$	max:	1451 (8)	0,070 (15)
$\beta_{0,6}^-$	avg:	505,9 (33)	
$\beta_{0,5}^-$	max:	1515 (8)	0,031 (16)
$\beta_{0,5}^-$	avg:	518,1 (31)	
$\beta_{0,4}^-$	max:	1660 (8)	0,32 (11)
$\beta_{0,4}^-$	avg:	591,2 (33)	
$\beta_{0,3}^-$	max:	1827 (8)	97,70 (15)
$\beta_{0,3}^-$	avg:	660,0 (34)	
$\beta_{0,2}^-$	max:	1944 (8)	< 0,1
$\beta_{0,2}^-$	avg:	709,0 (34)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy keV	Photons per 100 disint.	
XL	(Pb)	9,186 — 15,2169	8,04 (14)	
XK α_2	(Pb)	72,8049	5,85 (10)	} K α
XK α_1	(Pb)	74,97	9,84 (16)	
XK β_3	(Pb)	84,451	}	K' β_1
XK β_1	(Pb)	84,937	}	
XK β_5''	(Pb)	85,47	}	
XK β_2	(Pb)	87,238	}	K' β_2
XK β_4	(Pb)	87,58	}	
XKO _{2,3}	(Pb)	87,911	}	

5.2 Gamma Emissions

	Energy keV	Photons per 100 disint.
$\gamma_{3,2}(\text{Pb})$	117,224 (7)	77,22 (27)
$\gamma_{4,2}(\text{Pb})$	284,04 (23)	0,14 (7)
$\gamma_{5,3}(\text{Pb})$	311,5 (3)	0,028 (14)
$\gamma_{6,3}(\text{Pb})$	375,5 (2)	0,070 (15)
$\gamma_{2,1}(\text{Pb})$	465,128 (24)	96,62 (5)
$\gamma_{(-1,1)}(\text{Pb})$	469,7 (3)	0,12 (3)
$\gamma_{3,1}(\text{Pb})$	582,4 (2)	0,312 (24)
$\gamma_{4,1}(\text{Pb})$	748,3 (2)	0,080 (21)
$\gamma_{7,3}(\text{Pb})$	755,6 (3)	0,11 (2)
$\gamma_{(-1,2)}(\text{Pb})$	860,5 (3)	0,26 (4)
$\gamma_{7,2}(\text{Pb})$	873,5 (4)	0,59 (8)
$\gamma_{(-1,3)}(\text{Pb})$	890,0 (4)	0,12 (3)
$\gamma_{(-1,4)}(\text{Pb})$	902,8 (4)	0,10 (2)
$\gamma_{8,3}(\text{Pb})$	920,43 (11)	0,631 (15)
$\gamma_{(-1,5)}(\text{Pb})$	970,3	0,054 (15)
$\gamma_{10,3}(\text{Pb})$	1239,66 (11)	0,420 (22)
$\gamma_{9,2}(\text{Pb})$	1329,29 (16)	0,10 (3)
$\gamma_{1,0}(\text{Pb})$	1566,93 (5)	99,707 (5)
$\gamma_{(-1,6)}(\text{Pb})$	1661,1 (5)	0,10 (2)
$\gamma_{(-1,7)}(\text{Pb})$	1673,2 (4)	0,48 (4)
$\gamma_{(-1,8)}(\text{Pb})$	1781,7 (5)	0,04 (2)
$\gamma_{(-1,9)}(\text{Pb})$	2005,3 (2)	0,020 (5)
$\gamma_{(-1,10)}(\text{Pb})$	2032,1 (5)	0,001
$\gamma_{3,0}(\text{Pb})$	2149 (1)	0,015 (5)
$\gamma_{4,0}(\text{Pb})$	2315,80 (21)	0,0288 (21)
$\gamma_{(-1,11)}(\text{Pb})$	2548,2	0,015 (6)

6 Main Production Modes

Bi – 213(α)Tl – 209

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