



1 Decay Scheme

U-234 disintegrates by alpha emission mostly to the 53.2-keV level and to the ground state level of Th-230. Branching of U-234 decay by spontaneous fission is $1,6(2) \times 10^{-9} \%$.

L'uranium 234 se désintègre par émission alpha, principalement vers le niveau excité de 53,20 keV et le fondamental du thorium 230. Le rapport de branchement de décroissance par fission spontanée est $1,6(2) \times 10^{-9} \%$.

2 Nuclear Data

$T_{1/2}(^{234}\text{U})$:	2,455	(6)	10^5	a
$T_{1/2}(^{230}\text{Th})$:	75,38	(30)	10^3	a
$Q^\alpha(^{234}\text{U})$:	4857,7	(7)	keV	

2.1 α Transitions

	Energy keV	Probability $\times 100$	F
$\alpha_{0,5}$	4180,1 (7)	0,000007	63
$\alpha_{0,4}$	4222,8 (7)	0,000026	39
$\alpha_{0,3}$	4349,6 (7)	0,00004 (1)	288
$\alpha_{0,2}$	4683,6 (7)	0,210 (2)	21
$\alpha_{0,1}$	4804,5 (7)	28,42 (2)	1,1
$\alpha_{0,0}$	4857,6 (7)	71,37 (2)	1

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy keV	$P_{\gamma+ce}$ $\times 100$	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{1,0}(\text{Th})$	53,20 (2)	28,7 (13)	E2		167 (5)	45,6 (14)	228 (7)
$\gamma_{2,1}(\text{Th})$	120,900 (36)	0,228 (48)	E2	0,244 (7)	3,42 (10)	0,940 (28)	4,92 (15)
$\gamma_{3,1}(\text{Th})$	454,96 (5)	0,000025 (6)	E1	0,01235 (37)	0,00220 (7)	0,000525 (16)	0,01526 (46)
$\gamma_{5,2}(\text{Th})$	503,5 (1)	0,00000095	[E2]	0,0264 (8)	0,01141 (34)	0,00296 (9)	0,0418 (13)
$\gamma_{3,0}(\text{Th})$	508,16 (5)	0,0000152 (39)	E1	0,00991 (30)	0,00174 (5)	0,000415 (12)	0,01221 (37)
$\gamma_{4,1}(\text{Th})$	581,7 (1)	0,000012 (5)	E2	0,0202 (6)	0,00734 (22)	0,00188 (6)	0,0300 (9)
$\gamma_{5,1}(\text{Th})$	624,4 (1)	0,00005	E0+E2+M1				5,1 (20)
$\gamma_{4,0}(\text{Th})$	634,9 (1)	0,000014 (7)	E0				
$\gamma_{5,0}(\text{Th})$	677,6 (1)	0,000001	[E2]	0,01526 (46)	0,00475 (14)	0,001204 (36)	0,0216 (6)

3 Atomic Data

3.1 Th

ω_K	:	0,969	(4)
$\bar{\omega}_L$:	0,476	(18)
n_{KL}	:	0,797	(5)

3.1.1 X Radiations

	Energy keV	Relative probability
X _K	K α_2	89,9566
	K α_1	93,3479
	K β_3	104,8172
	K β_1	105,602
	K β_5''	106,1564
	K β_5'	106,3149
	K β_2	108,581
	K β_4	108,953
	KO _{2,3}	109,442
X _L	L ℓ	11,118
	L α	12,808 – 12,967
	L η	14,509
	L β	14,972 – 16,4253
	L γ	18,363 – 19,504

3.1.2 Auger Electrons

	Energy keV	Relative probability
Auger K		
KLL	68,406 – 76,745	100
KLX	83,857 – 93,345	58,8
KXY	99,29 – 109,64	8,64
Auger L	5,8 – 20,3	

4 α Emissions

	Energy keV	Probability $\times 100$
$\alpha_{0,5}$	4108,6 (7)	0,000007
$\alpha_{0,4}$	4150,6 (7)	0,000026
$\alpha_{0,3}$	4275,2 (7)	0,00004 (1)
$\alpha_{0,2}$	4603,5 (7)	0,210 (2)
$\alpha_{0,1}$	4722,4 (7)	28,42 (2)
$\alpha_{0,0}$	4774,6 (7)	71,37 (2)

5 Electron Emissions

		Energy keV	Electrons per 100 disint.
e _{AL}	(Th)	5,8 - 20,3	10,8 (4)
e _{AK}	(Th)		0,00029 (5)
	KLL	68,406 - 76,745	}
	KLX	83,857 - 93,345	}
	KXY	99,29 - 109,64	}
ec _{1,0} L	(Th)	32,7 - 36,9	20,9 (12)
ec _{1,0} M	(Th)	48,0 - 49,9	5,70 (32)
ec _{1,0} N	(Th)	51,9 - 52,9	1,53 (9)
ec _{2,1} L	(Th)	100,4 - 104,6	0,132 (12)

6 Photon Emissions

6.1 X-Ray Emissions

		Energy keV	Photons per 100 disint.		
XL	(Th)	11,118 — 19,504	10,2 (4)		
XK α_2	(Th)	89,9566	0,00269 (25)	}	K α
XK α_1	(Th)	93,3479	0,0044 (4)	}	
XK β_3	(Th)	104,8172	}		
XK β_1	(Th)	105,602	}	0,00155 (15)	K' β_1
XK β_5''	(Th)	106,1564	}		
XK β_5'	(Th)	106,3149	}		
XK β_2	(Th)	108,581	}		
XK β_4	(Th)	108,953	}	0,00052 (5)	K' β_2
XKO _{2,3}	(Th)	109,442	}		

6.2 Gamma Emissions

	Energy keV	Photons per 100 disint.
$\gamma_{1,0}(\text{Th})$	53,20 (2)	0,1253 (40)
$\gamma_{2,1}(\text{Th})$	120,90 (4)	0,0386 (32)
$\gamma_{3,1}(\text{Th})$	454,96 (5)	0,000025 (6)
$\gamma_{5,2}(\text{Th})$	503,5 (1)	0,00000095
$\gamma_{3,0}(\text{Th})$	508,16 (5)	0,0000150 (39)
$\gamma_{4,1}(\text{Th})$	581,7 (1)	0,000012 (5)
$\gamma_{5,1}(\text{Th})$	624,4 (1)	0,00000082
$\gamma_{5,0}(\text{Th})$	677,6 (1)	0,000001

7 Main Production Modes

U – 238 decay

Pu – 238 decay

8 References

- A.O. NIER. Phys. Rev. 55 (1393) 150
(U-234 half-life.)
- M. CURIE, S. COTELLE. Comp. Rend. Acad. Sci. (Paris) 190 (1930) 1289
(Th-230 half-life.)
- O. CHAMBERLAIN, D. WILLIAMS, P. YUSTER. Phys. Rev. 70 (1946) 580
(U-234 half-life.)

- E.K. HYDE. NNES 14B (1949) 1435
(Th-230 half-life.)
- A.C. KIENBERGER. Phys. Rev. 76 (1949) 1561
(U-234 half-life.)
- A.S. GOLDIN, G.B. KNIGHT, P.A. MACKLIN, R.L. MACKLIN. Phys. Rev. 76 (1949) 336
(U-234 half-life.)
- E. BALDINGER, P. HUBER. Helv. Phys. Acta 22 (1949) 365
(U-234 half-life.)
- E.H. FLEMING JR., A. GHIORSO, B.B. CUNNINGHAM. Phys. Rev. 88 (1952) 642
(U-234 half-life.)
- A.C. KIENBERGER. Phys. Rev. 87 (1952) 520
(U-234 half-life.)
- A. GHIORSO, G.H. HIGGINS, A.E. LARSH, G.T. SEABORG, S.G. THOMPSON. Phys. Rev. 87 (1952) 163
(SF half-life.)
- S.A. BARANOV, A.G. ZELENKOV, V.M. KULAKOV. Bull. Acad. Sci. USSR, Phys. Ser. 24 (1960) 1045
(Alpha emission.)
- R.W. ATTREE, M.J. CABELL, R.L. CUSHING, J.J. PIERONI. Can. J. Phys. 40 (1961) 194
(Th-230 half-life.)
- G.E. KOCHAROV, G.A. KOROLEV. Bull. Acad. Sci. USSR, Phys. Ser. 25 (1961) 227
(Alpha emission.)
- S. BJORNHOLM, M. LEDERER, F. ASARO, I. PERLMAN. Phys. Rev. 130 (1963) 2000
(Alpha emission.)
- W.R. NEAL, H.W. KRANER. Phys. Rev. 137 (1965) B1164
(53- and 174-kev levels half-life.)
- P.H. WHITE, G.J. WALL, F.R. PONTET. J. Nucl. En. A/B 19 (1965) 33
(U-234 half-life.)
- I. AHMAD. UCRL 16888 (1966)
(Gamma energy and intensity.)
- G.C. HANNA, C.H. WESTCOTT, H.D. LEMMEL, B.R. LEONARD JR., J.S. STORY, P.M. ATTREE. At. Energy Rev. 7,4 (1969) 3
(U-234 half-life.)
- J.W. MEADOWS. ANL 7610 (1970) 44
(U-234 half-life.)
- P. DE BIEVRE, K.F. LAUER, Y. LE DUIGOU, H. MORET, G. MUSCHENBORN, J. SPAEPEN, A. SPERNOL, R. VANINBROUKX, V. VERDINGH. Chem. Nucl. Data, Canterbury (1971) 221
(U-234 half-life.)
- M. LOUNSBURY, R.W. DURHAM. Chem. Nucl. Data, Canterbury (1971) 215
(U-234 half-life.)
- M. SCHMORAK, C.E. BEMIS JR., M.J. ZENDER, N.B. GOVE, P.F. DITTNER. Nucl. Phys. A178 (1972) 410
(Gamma energy.)
- H.W. TAYLOR. Int. J. Appl. Radiat. Isotop. 24 (1973) 593
(Gamma energy.)
- R.L. HEATH. ANCR 1000-2 (1974) 14
(Gamma intensity and energy.)
- C.E. BEMIS JR., L. TUBBS. ORNL - 5297 (1977) 93
(X-ray emission.)
- A.M. GEIDEL'MAN, YU. S. EGOROV, A.V. LOVTSYUS, V.I. ORLOV, L.D. PREOBRAZHENSKAYA, M.V. RYZHINSKII, A.V. STEPANOV, A.A. LIPOVSKII, YU. V. KHOL'NOV, B.N. BELYAEV, M.K. ADBULLAKHATOV, G.A. AKOPOV, V.S. BELYKH, E.A. GROMOVA ET AL.. Bull. Acad. Sci. USSR, Phys. Ser. 44,5 (1980) 23
(U-234 half-life.)
- J.W. MEADOWS, R.J. ARMANI, E.L. CALLIS, A.M. ESSLING. Phys. Rev. C22 (1980) 750
(Th-230 half-life.)
- H.R. VON GUNTEN, A. GRÜTTER, H.W. REIST, M. BAGGENSTOS. Phys. Rev. C23 (1981) 1110
(SF half-life.)
- N.E. HOLDEN. BNL - NCS 51320 (1981)
(U-234 half-life.)
- Y.A. AKOVALI. Nucl. Data Sheets 40 (1983) 523
(Spin, parity, Energy level.)
- W.P. POENITZ, J.W. MEADOWS. ANL - NDM 84 (1983) 33
(U-234 half-life.)

- M. DIVADEENAM, J.R. STEHN. Ann. Nucl. Energy 11 (1984) 375
(U-234 half-life.)
- R. VANINBROUKX, G. BORTELS, B. DENECKE. Int. J. Appl. Radiat. Isotop. 35 (1984) 1081
(X-ray, alpha and gamma emission.)
- W.P. POENITZ, J.W. MEADOWS. IAEA - TECDOC 335 (1985) 485
(U-234 half-life.)
- E.J. AXTON. IAEA - TECDOC 335 (1985) 214
(U-234 half-life.)
- A. LORENTZ, A.L. NICHOLS. IAEA - Tech. Rep. 261 (1986) 63
(U-234 half-life, gamma et alpha intensity.)
- G. BORTELS, P. COLLAERS. Appl. Rad. Isotopes 38 (1987) 831
(Alpha emission.)
- S. WANG, P.B. BRICE, S.W. BARWICK, K.J. MOODY, E.K. HULET. Phys. Rev. C36 (1987) 2717
(SF half-life.)
- N.E. HOLDEN. Pure and Appl. Chem. 61 (1989) 1483
(U-234 half-life.)
- A. RYTZ. At. Data. Nucl. Data Tables 47 (1991) 205
(Alpha energy.)
- Y.A. AKOVALI. Nucl. Data Sheets 69 (1993) 155
(Spin, parity, Energy level.)
- Y.A. AKOVALI. Nucl. Data Sheets 71 (1994) 181
(Spin, parity, Energy level.)
- P.N. JOHNSTON, P.A. BURNS. Nucl. Instrum. Meth. Phys. Res. A361 (1995) 229
(X-ray emission.)
- E. SCHÖNFELD, H. JANSSEN. Nucl. Instrum. Meth. Phys. Res. A369 (1996) 527
(Atomic Data.)
- I.M. BAND, M.B. TRZHASKOVSKAYA, C.W. NESTOR JR., P.O. TIKKANEN, S. RAMAN. At. Data. Nucl. Data Tables 81 (2002) 1
(Alpha.)
- G. AUDI, A.H. WAPSTRA, C. THIBAULT. Nucl. Phys. A729 (2003) 129
(Q.)

