

1 Decay Scheme

Pa-234m disintegrates 99.85(1)% by beta minus emissions to levels in U-234 and 0.15(1)% through isomeric transition to the Pa-234 ground state.

Le protactinium metastable se désintègre par émissions bêta moins vers des niveaux excités de l'uranium 234 et par transition isomère vers le niveau fondamental du protactinium.

2 Nuclear Data

$T_{1/2}(^{234}\text{Pa}^m)$:	1,159	(11)	min
$T_{1/2}(^{234}\text{Pa})$:	6,70	(5)	h
$Q^-(^{234}\text{Pa}^m)$:	2269	(4)	keV + x keV (x < 10)
$Q^{IT}(^{234}\text{Pa}^m)$:	73,92	(2)	keV + x keV (x < 10)

2.1 β^- Transitions

	Energy keV	Probability × 100	Nature	lg ft
$\beta_{0,30}^-$	299 (4)	0,00389 (22)		6,8
$\beta_{0,29}^-$	332 (4)	0,0108 (3)		6,6
$\beta_{0,28}^-$	358 (4)	0,0452 (8)		6
$\beta_{0,27}^-$	394 (4)	0,0258 (3)		6,4
$\beta_{0,26}^-$	406 (4)	0,00311 (19)		7,4
$\beta_{0,25}^-$	460 (4)	0,0146 (7)		6,9
$\beta_{0,24}^-$	473 (4)	0,0021 (3)		7,7
$\beta_{0,23}^-$	488 (4)	0,0357 (18)		6,6
$\beta_{0,22}^-$	575 (4)	0,0024 (3)		8
$\beta_{0,21}^-$	602 (4)	0,0061 (3)		7,6
$\beta_{0,20}^-$	667 (4)	0,00127 (23)		8,5
$\beta_{0,19}^-$	677 (4)	0,0249 (5)		7,2
$\beta_{0,18}^-$	698 (4)	0,00231 (19)		8,4
$\beta_{0,17}^-$	715 (4)	0,0320 (6)		7,2

	Energy keV	Probability × 100	Nature	lg <i>ft</i>
$\beta_{0,16}^-$	768 (4)	0,0131 (6)		7,7
$\beta_{0,14}^-$	834 (4)	0,0092 (11)		7,9
$\beta_{0,13}^-$	1032 (4)	0,0121 (11)		8,2
$\beta_{0,12}^-$	1095 (4)	0,0046 (3)		8,7
$\beta_{0,9}^-$	1224 (4)	1,006 (13)		6,5
$\beta_{0,4}^-$	1459 (4)	0,945 (12)		6,8
$\beta_{0,3}^-$	1483 (4)	0,049 (3)		8
$\beta_{0,0}^-$	2269 (4)	97,599 (24)	Allowed	5,5

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy keV	P _{$\gamma+ce$} × 100	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{2,1}$ (Pa)	< 10	0,15 (1)					
$\gamma_{6,4}$ (U)	41,82	0,0136 (7)					
$\gamma_{1,0}$ (U)	43,49 (2)	1,414 (26)	E2		520 (8)	143,7 (21)	713 (11)
$\gamma_{8,7}$ (U)	62,70 (1)	0,0019 (6)	E1		0,320 (5)	0,0791 (11)	0,426 (6)
$\gamma_{1,0}$ (Pa)	73,92 (2)	0,15 (1)	(M1+E2)		7,96 (25)	1,94 (7)	10,6 (4)
$\gamma_{2,1}$ (U)	99,86 (2)	0,0082 (7)	E2		9,77 (14)	2,71 (4)	13,42 (19)
$\gamma_{18,14}$ (U)	135,32 (8)	0,0000052 (6)	[E1]	0,190 (3)	0,0428 (6)	0,01043 (15)	0,247 (4)
$\gamma_{11,8}$ (U)	137,23 (5)	0,000059 (21)	[E1]	0,184 (3)	0,0413 (6)	0,01006 (15)	0,239 (4)
$\gamma_{8,5}$ (U)	140,1 (10)	<0,008	M1+E2	2,9 (22)	1,76 (25)	0,47 (9)	5,3 (18)
$\gamma_{20,14}$ (U)	166,5 (1)	0,000000273 (6)	[E1]	0,1179 (17)	0,0253 (4)	0,00613 (9)	0,1514 (22)
$\gamma_{12,8}$ (U)	185,0 (4)	0,00172 (15)					
$\gamma_{9,6}$ (U)	193,4 (8)	0,00133 (28)	[E2]	0,163 (3)	0,500 (12)	0,138 (4)	0,847 (18)
$\gamma_{14,13}$ (U)	197,91 (15)	0,000081 (39)	[M1,E2]	1,3 (12)	0,473 (22)	0,122 (4)	2,0 (12)
$\gamma_{11,7}$ (U)	199,9 (10)	0,0017 (8)	(E0+E2+M1)	1,3 (12)	0,473 (22)	0,122 (4)	1,9 (12)
$\gamma_{8,3}$ (U)	203,3 (8)	0,0029 (5)	M1+E2	0,8 (4)	0,420 (12)	0,1109 (23)	1,4 (4)
$\gamma_{23,18}$ (U)	209,9 (4)	0,00132 (15)					
$\gamma_{10,6}$ (U)	233,6 (2)	~ 0,00085					
$\gamma_{10,5}$ (U)	235,9 (3)	0,000096 (43)	[E1]	0,0532 (8)	0,01067 (16)	0,00258 (4)	0,0673 (10)
$\gamma_{9,4}$ (U)	236 (1)	0,074 (8)	E0				
$\gamma_{13,8}$ (U)	247,7 (8)	0,0019 (8)	[M1,E2]	0,7 (7)	0,22 (5)	0,056 (8)	1,0 (7)
$\gamma_{9,3}$ (U)	258,227 (3)	0,0778 (8)	(E1)	0,0434 (6)	0,00859 (12)	0,00207 (3)	0,0548 (8)
$\gamma_{11,6}$ (U)	275,5 (8)	0,00056 (22)	[M1,E2]	0,5 (5)	0,16 (4)	0,039 (8)	0,8 (6)
$\gamma_{10,3}$ (U)	299 (1)	0,00067 (14)	[E1]	0,0315 (5)	0,00608 (10)	0,001467 (24)	0,0395 (7)
$\gamma_{13,7}$ (U)	311 (1)	0,00054 (11)	[E1]	0,0289 (5)	0,00556 (9)	0,001339 (22)	0,0363 (6)
$\gamma_{11,4}$ (U)	316,7 (1)	0,00022 (6)	[E2]	0,0677 (10)	0,0674 (10)	0,0182 (3)	0,1597 (23)
$\gamma_{24,15}$ (U)	338,1 (8)	0,00113 (23)					
$\gamma_{11,3}$ (U)	340,2 (1)	0,000074 (22)	[E1]	0,0239 (4)	0,00453 (7)	0,001090 (16)	0,0298 (5)
$\gamma_{28,17}$ (U)	357,5 (10)	0,00080 (17)					
$\gamma_{24,14}$ (U)	362,8 (10)	0,00069 (15)					
$\gamma_{13,5}$ (U)	387,6 (8)	0,000512 (44)	[E2]	0,0463 (7)	0,0321 (5)	0,00858 (14)	0,0899 (14)
$\gamma_{12,3}$ (U)	387,6 (8)	0,00097 (15)					
$\gamma_{13,4}$ (U)	427,4 (2)	0,000020 (5)	[E1]	0,01488 (21)	0,00274 (4)	0,000657 (10)	0,0185 (3)
$\gamma_{14,8}$ (U)	445,91 (10)	0,000037 (9)	[M1,E2]	0,15 (12)	0,036 (16)	0,009 (4)	0,20 (14)
$\gamma_{13,3}$ (U)	450,98 (10)	0,00385 (16)	M1+E2	0,187 (3)	0,0400 (6)	0,00979 (14)	0,241 (4)
$\gamma_{28,15}$ (U)	453,58 (10)	0,00282 (16)	[M1]	0,258 (4)	0,0495 (7)	0,01193 (17)	0,324 (5)
$\gamma_{22,13}$ (U)	456,7 (10)	0,00095 (20)	[M1]	0,253 (4)	0,0485 (8)	0,01171 (18)	0,318 (5)

	Energy keV	$P_{\gamma+ce}$ $\times 100$	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{17,10}(\text{U})$	468,43 (10)	0,00206 (12)					
$\gamma_{28,14}(\text{U})$	475,74 (10)	0,00305 (17)	[M1]	0,227 (4)	0,0434 (6)	0,01048 (15)	0,285 (4)
$\gamma_{18,10}(\text{U})$	485,44 (7)	0,0000217 (28)	[M1,E2]	0,12 (10)	0,028 (13)	0,007 (3)	0,16 (11)
$\gamma_{19,10}(\text{U})$	507,6 (10)	0,00158 (15)					
$\gamma_{17,9}(\text{U})$	509,3 (8)	0,0022 (3)					
$\gamma_{20,10}(\text{U})$	516,74 (6)	0,000015 (2)	(M1)	0,182 (3)	0,0347 (5)	0,00837 (12)	0,228 (4)
$\gamma_{18,9}(\text{U})$	526,16 (10)	0,0000110 (12)	[M1]	0,1732 (25)	0,0331 (5)	0,00797 (12)	0,217 (3)
$\gamma_{23,13}(\text{U})$	544,14 (10)	0,00349 (15)					
$\gamma_{20,9}(\text{U})$	557,41 (6)	0,0000098 (13)	(M1)	0,1485 (21)	0,0283 (4)	0,00682 (10)	0,186 (3)
$\gamma_{25,13}(\text{U})$	572,2 (10)	0,00102 (20)	[M1]	0,1384 (21)	0,0264 (4)	0,00636 (10)	0,173 (3)
$\gamma_{18,8}(\text{U})$	581,37 (10)	0,000081 (9)	[E1]	0,00815 (12)	0,001445 (21)	0,000345 (5)	0,01006 (14)
$\gamma_{14,4}(\text{U})$	624,8 (10)	0,000117 (12)	[E1]	0,00712 (11)	0,001252 (18)	0,000299 (5)	0,00877 (13)
$\gamma_{14,3}(\text{U})$	649,2 (10)	0,000064 (9)	[M1,E2]	0,06 (4)	0,012 (7)	0,0031 (15)	0,08 (5)
$\gamma_{16,6}(\text{U})$	649,2 (10)	0,0010 (3)					
$\gamma_{23,11}(\text{U})$	655,5 (10)	0,00139 (15)					
$\gamma_{15,3}(\text{U})$	671 (1)	0,0004 (1)	[M1,E2]	0,05 (4)	0,011 (6)	0,0028 (14)	0,07 (5)
$\gamma_{28,13}(\text{U})$	674,1 (10)	0,00071 (14)	[M1]	0,0894 (13)	0,01695 (25)	0,00408 (6)	0,1118 (17)
$\gamma_{25,11}(\text{U})$	683,7 (10)	0,00058 (12)	[E1]	0,00603 (9)	0,001050 (15)	0,000250 (4)	0,00741 (11)
$\gamma_{16,4}(\text{U})$	691,3 (3)	0,00898 (19)					
$\gamma_{23,10}(\text{U})$	695,8 (10)	0,00164 (14)					
$\gamma_{29,13}(\text{U})$	699,28 (10)	0,0058 (3)					
$\gamma_{17,6}(\text{U})$	702,26 (10)	0,00721 (16)					
$\gamma_{5,2}(\text{U})$	706,20 (12)	0,0052 (6)	[E1]	0,00568 (8)	0,000987 (14)	0,000235 (4)	0,00698 (10)
$\gamma_{6,2}(\text{U})$	708,5 (10)	<0,00072	[E2]	0,01537 (22)	0,00489 (7)	0,001247 (19)	0,0219 (4)
$\gamma_{18,6}(\text{U})$	719,29 (7)	0,0000271 (24)	[M1+E2]	0,05 (3)	0,009 (5)	0,0023 (12)	0,06 (4)
$\gamma_{30,13}(\text{U})$	732,8 (10)	0,00130 (15)					
$\gamma_{19,6}(\text{U})$	740,40 (8)	0,0118 (3)					
$\gamma_{3,1}(\text{U})$	743,115 (5)	0,0946 (30)	E1	0,00518 (8)	0,000895 (13)	0,000213 (3)	0,00636 (9)
$\gamma_{20,6}(\text{U})$	750,42 (6)	0,0000184 (22)	(M1)	0,0672 (10)	0,01272 (18)	0,00306 (5)	0,0841 (12)
$\gamma_{18,4}(\text{U})$	760,84 (15)	0,0000046 (10)	[M1]	0,0648 (9)	0,01226 (18)	0,00295 (5)	0,0811 (12)
$\gamma_{4,1}(\text{U})$	766,708 (20)	0,3290 (41)	(E2)	0,01336 (19)	0,00396 (6)	0,001004 (14)	0,0187 (3)
$\gamma_{19,4}(\text{U})$	782,05 (10)	0,00782 (18)					
$\gamma_{7,2}(\text{U})$	783,7 (1)	0,000040 (7)	[E2]	0,01285 (18)	0,00374 (6)	0,000946 (14)	0,0179 (3)
$\gamma_{3,0}(\text{U})$	786,573 (22)	0,0539 (7)	E1+M2	0,00467 (7)	0,000804 (12)	0,000191 (3)	0,00573 (8)
$\gamma_{20,4}(\text{U})$	792,25 (5)	0,0000106 (14)	[M1]	0,0582 (9)	0,01100 (16)	0,00265 (4)	0,0728 (11)
$\gamma_{5,1}(\text{U})$	806,05 (10)	0,0062 (8)	[E1]	0,00447 (7)	0,000768 (11)	0,000183 (3)	0,00549 (8)
$\gamma_{6,1}(\text{U})$	808,52 (10)	0,00281 (17)					
$\gamma_{4,0}(\text{U})$	810,3 (7)	0,72	E0	0,00447 (7)	0,000768 (11)	0,000183 (3)	0,00549 (8)
$\gamma_{21,5}(\text{U})$	818,6 (5)	0,0010 (3)					
$\gamma_{28,10}(\text{U})$	825,9 (2)	0,0014 (4)					
$\gamma_{22,5}(\text{U})$	844,5 (8)	0,00109 (23)					
$\gamma_{6,0}(\text{U})$	852,0 (1)	0,00707 (15)	[E2]	0,01109 (16)	0,00302 (5)	0,000760 (11)	0,01514 (22)
$\gamma_{28,9}(\text{U})$	867,2 (10)	0,00116 (16)					
$\gamma_{21,3}(\text{U})$	880,93 (4)	0,00392 (5)					
$\gamma_{7,1}(\text{U})$	883,65 (3)	0,00386 (5)	E2	0,01040 (15)	0,00276 (4)	0,000692 (10)	0,01409 (20)
$\gamma_{28,8}(\text{U})$	922,13 (10)	0,01275 (20)					
$\gamma_{7,0}(\text{U})$	927,05 (10)	0,00127 (13)	(E2)	0,00956 (14)	0,00245 (4)	0,000613 (9)	0,01284 (18)
$\gamma_{26,7}(\text{U})$	936,75 (100)	0,00102 (17)					
$\gamma_{10,2}(\text{U})$	942,39 (10)	0,00253 (9)	[E2]	0,00929 (13)	0,00236 (4)	0,000589 (9)	0,01244 (18)
$\gamma_{8,1}(\text{U})$	946,362 (16)	0,01064 (14)	(E1)	0,00337 (5)	0,000571 (8)	0,0001355 (19)	0,00412 (6)
$\gamma_{25,5}(\text{U})$	960,4 (10)	0,0009 (3)					
$\gamma_{23,3}(\text{U})$	996,5 (20)	0,0059 (17)					
$\gamma_{9,1}(\text{U})$	1001,441 (18)	0,856 (8)	E2	0,00835 (12)	0,00204 (3)	0,000507 (8)	0,01107 (16)
$\gamma_{10,1}(\text{U})$	1042,1 (1)	0,00122 (8)	[E2,M1]	0,018 (11)	0,0036 (18)	0,0009 (4)	0,023 (13)
$\gamma_{28,6}(\text{U})$	1059,9 (8)	0,00111 (22)					
$\gamma_{28,5}(\text{U})$	1062,46 (10)	0,00224 (9)					
$\gamma_{11,1}(\text{U})$	1082,5 (10)	0,00094 (20)	(M1)	0,0255 (4)	0,00478 (7)	0,001151 (17)	0,0318 (5)
$\gamma_{10,0}(\text{U})$	1084,84 (10)	0,00081 (40)	[E2]	0,00726 (11)	0,001694 (24)	0,000419 (6)	0,00952 (14)
$\gamma_{30,5}(\text{U})$	1121,2 (8)	0,00173 (15)					

	Energy keV	$P_{\gamma+ce}$ $\times 100$	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{28,3}(\text{U})$	1125,54 (10)	0,00347 (9)					
$\gamma_{11,0}(\text{U})$	1125,54 (10)	0,00039 (9)	[E2]	0,00681 (10)	0,001558 (22)	0,000385 (6)	0,00888 (13)
$\gamma_{12,0}(\text{U})$	1174,8 (10)	0,00192 (19)					
$\gamma_{13,1}(\text{U})$	1194,51 (3)	0,01363 (18)	E1	0,00226 (4)	0,000377 (6)	0,0000892 (13)	0,00277 (4)
$\gamma_{13,0}(\text{U})$	1237,93 (10)	0,00529 (11)	E1	0,00213 (3)	0,000354 (5)	0,0000838 (12)	0,00262 (4)
$\gamma_{14,1}(\text{U})$	1393,5 (9)	0,0029 (11)	E1	0,001743 (25)	0,000288 (4)	0,0000682 (10)	0,00221 (4)
$\gamma_{15,1}(\text{U})$	1414,87 (10)	0,00229 (8)	[E1]	0,001700 (24)	0,000281 (4)	0,0000664 (10)	0,00217 (3)
$\gamma_{14,0}(\text{U})$	1435,05 (10)	0,00975 (16)	E1	0,001660 (24)	0,000274 (4)	0,0000648 (9)	0,00213 (3)
$\gamma_{16,1}(\text{U})$	1459,6 (15)	0,0019 (5)					
$\gamma_{16,0}(\text{U})$	1501,8 (20)	0,0013					
$\gamma_{17,1}(\text{U})$	1511,29 (10)	0,01308 (19)					
$\gamma_{18,1}(\text{U})$	1528,42 (10)	0,00237 (8)	M1+E2	0,007 (4)	0,0014 (6)	0,00033 (14)	0,009 (4)
$\gamma_{19,1}(\text{U})$	1551,4 (10)	0,00137 (15)					
$\gamma_{17,0}(\text{U})$	1554,52 (10)	0,00826 (14)					
$\gamma_{20,1}(\text{U})$	1559,7 (10)	0,00074 (9)	M1	0,00971 (14)	0,00181 (3)	0,000434 (7)	0,01228 (18)
$\gamma_{18,0}(\text{U})$	1571,93 (10)	0,00111 (8)	M1	0,00951 (14)	0,001769 (25)	0,000425 (6)	0,01204 (17)
$\gamma_{19,0}(\text{U})$	1594,8 (1)	0,00235 (12)					
$\gamma_{20,0}(\text{U})$	1603,1 (15)	0,00048 (22)	(M1)	0,00902 (13)	0,001679 (24)	0,000403 (6)	0,01146 (17)
$\gamma_{21,0}(\text{U})$	1668,9 (10)	0,00118 (6)					
$\gamma_{22,0}(\text{U})$	1695,4 (10)	0,00038 (2)					
$\gamma_{23,1}(\text{U})$	1739,36 (10)	0,0214 (3)					
$\gamma_{25,1}(\text{U})$	1767,14 (10)	0,0084 (6)					
$\gamma_{24,0}(\text{U})$	1798,0 (9)	0,00031 (5)					
$\gamma_{25,0}(\text{U})$	1810,77 (10)	0,00376 (7)					
$\gamma_{26,1}(\text{U})$	1821,58 (10)	0,00089 (5)					
$\gamma_{27,1}(\text{U})$	1833,13 (10)	0,01759 (23)					
$\gamma_{26,0}(\text{U})$	1864,81 (10)	0,00120 (5)					
$\gamma_{28,1}(\text{U})$	1869,6 (1)	0,00932 (12)					
$\gamma_{27,0}(\text{U})$	1876,8 (1)	0,00819 (14)					
$\gamma_{29,1}(\text{U})$	1895,55 (11)	0,00218 (6)					
$\gamma_{28,0}(\text{U})$	1913,20 (11)	0,00628 (9)					
$\gamma_{30,1}(\text{U})$	1928,5 (10)	0,00045 (4)					
$\gamma_{29,0}(\text{U})$	1939,01 (13)	0,00285 (5)					
$\gamma_{30,0}(\text{U})$	1972,4 (8)	0,00041 (4)					

3 Atomic Data

3.1 U

ω_K	:	0,970	(4)
$\bar{\omega}_L$:	0,500	(19)
n_{KL}	:	0,794	(5)

3.1.1 X Radiations

	Energy keV	Relative probability
X_K		
$K\alpha_2$	94,666	62,47
$K\alpha_1$	98,44	100
$K\beta_3$	110,421	}
$K\beta_1$	111,298	}
$K\beta_5''$	111,964	}
		36,08
$K\beta_2$	114,407	}
$K\beta_4$	115,012	}
$KO_{2,3}$	115,377	}
X_L		
$L\ell$	11,6185	
$L\alpha$	13,4382 – 13,6146	
$L\eta$	15,399	
$L\beta$	15,7268 – 18,2061	
$L\gamma$	19,5072 – 20,7141	

3.1.2 Auger Electrons

	Energy keV	Relative probability
Auger K		
KLL	71,776 – 80,954	100
KLX	88,153 – 98,429	59,6
KXY	104,51 – 115,59	8,88
Auger L	5,9 – 21,6	

4 Electron Emissions

		Energy keV	Electrons per 100 disint.
e _{AL}	(U)	5,9 - 21,6	0,856 (19)
e _{AK}	(U)		0,0203 (3)
	KLL	71,776 - 80,954	}
	KLX	88,153 - 98,429	}
	KXY	104,51 - 115,59	}
e _{AL}	(Pa)	5,9 - 20,9	0,048 (4)
e _{AK}	(Pa)		
ec _{1,0 L}	(U)	21,73 - 26,32	1,030 (19)
ec _{1,0 M}	(U)	37,94 - 39,94	0,285 (5)
ec _{1,0 N}	(U)	42,05 - 43,11	0,0770 (14)
ec _{1,0 L}	(Pa)	52,82 - 57,19	0,103 (8)
ec _{1,0 M}	(Pa)	68,56 - 70,48	0,025 (2)
ec _{4,0 T}	(U)	694,4 - 789,0	0,72
$\beta_{0,30}^-$	max:	299 (4)	0,00389 (22)
$\beta_{0,30}^-$	avg:	83,0 (13)	
$\beta_{0,29}^-$	max:	332 (4)	0,0108 (3)
$\beta_{0,29}^-$	avg:	93,0 (13)	
$\beta_{0,28}^-$	max:	358 (4)	0,0452 (8)
$\beta_{0,28}^-$	avg:	101,0 (13)	
$\beta_{0,27}^-$	max:	394 (4)	0,0258 (3)
$\beta_{0,27}^-$	avg:	112,3 (13)	
$\beta_{0,26}^-$	max:	406 (4)	0,00311 (19)
$\beta_{0,26}^-$	avg:	116,0 (13)	
$\beta_{0,25}^-$	max:	460 (4)	0,0146 (7)
$\beta_{0,25}^-$	avg:	133,3 (13)	
$\beta_{0,24}^-$	max:	473 (4)	0,0021 (3)
$\beta_{0,24}^-$	avg:	137,4 (14)	
$\beta_{0,23}^-$	max:	488 (4)	0,0357 (18)
$\beta_{0,23}^-$	avg:	142,3 (14)	
$\beta_{0,22}^-$	max:	575 (4)	0,0024 (3)
$\beta_{0,22}^-$	avg:	171,2 (14)	
$\beta_{0,21}^-$	max:	602 (4)	0,0061 (3)
$\beta_{0,21}^-$	avg:	180,1 (14)	
$\beta_{0,20}^-$	max:	667 (4)	0,00127 (23)
$\beta_{0,20}^-$	avg:	202,5 (14)	
$\beta_{0,19}^-$	max:	677 (4)	0,0249 (5)
$\beta_{0,19}^-$	avg:	205,8 (14)	
$\beta_{0,18}^-$	max:	698 (4)	0,00231 (19)

		Energy keV	Electrons per 100 disint.
$\beta_{0,18}^-$	avg:	213,3 (14)	
$\beta_{0,17}^-$	max:	715 (4)	0,0320 (6)
$\beta_{0,17}^-$	avg:	219,2 (14)	
$\beta_{0,16}^-$	max:	768 (4)	0,0131 (6)
$\beta_{0,16}^-$	avg:	237,6 (15)	
$\beta_{0,14}^-$	max:	834 (4)	0,0092 (11)
$\beta_{0,14}^-$	avg:	261,1 (15)	
$\beta_{0,13}^-$	max:	1032 (4)	0,0121 (11)
$\beta_{0,13}^-$	avg:	333,1 (15)	
$\beta_{0,12}^-$	max:	1095 (4)	0,0046 (3)
$\beta_{0,12}^-$	avg:	356,7 (15)	
$\beta_{0,9}^-$	max:	1224 (4)	1,006 (13)
$\beta_{0,9}^-$	avg:	405,6 (16)	
$\beta_{0,4}^-$	max:	1459 (4)	0,945 (12)
$\beta_{0,4}^-$	avg:	496,0 (16)	
$\beta_{0,3}^-$	max:	1483 (4)	0,049 (3)
$\beta_{0,3}^-$	avg:	505,3 (16)	
$\beta_{0,0}^-$	max:	2269 (4)	97,599 (24)
$\beta_{0,0}^-$	avg:	820,5 (17)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy keV	Photons per 100 disint.	
XL	(U)	11,6185 — 20,7141	0,856 (19)	
XK α_2	(U)	94,666	0,1973 (25)	} K α
XK α_1	(U)	98,44	0,316 (4)	}
XK β_3	(U)	110,421	}	
XK β_1	(U)	111,298	}	K' β_1
XK β_5''	(U)	111,964	}	
XK β_2	(U)	114,407	}	
XK β_4	(U)	115,012	}	K' β_2
XK $\alpha_{2,3}$	(U)	115,377	}	
XL	(Pa)	11,3676 — 20,1126	0,046 (4)	

5.2 Gamma Emissions

	Energy keV	Photons per 100 disint.
$\gamma_{1,0}(\text{U})$	43,49 (2)	0,00198 (2)
$\gamma_{8,7}(\text{U})$	62,70 (1)	0,0013 (4)
$\gamma_{1,0}(\text{Pa})$	73,92 (2)	0,0129 (9)
$\gamma_{2,1}(\text{U})$	99,86 (2)	0,00057 (5)
$\gamma_{18,14}(\text{U})$	135,32 (8)	0,0000042 (5)
$\gamma_{11,8}(\text{U})$	137,23 (5)	0,000048 (17)
$\gamma_{8,5}(\text{U})$	140,1 (10)	<0,00127
$\gamma_{20,14}(\text{U})$	166,5 (1)	0,000000237 (5)
$\gamma_{12,8}(\text{U})$	185,0 (4)	0,00172 (15)
$\gamma_{9,6}(\text{U})$	193,4 (8)	0,00072 (15)
$\gamma_{14,13}(\text{U})$	197,91 (15)	0,000027 (7)
$\gamma_{11,7}(\text{U})$	199,9 (10)	0,00058 (12)
$\gamma_{8,3}(\text{U})$	203,3 (8)	0,00119 (9)
$\gamma_{23,18}(\text{U})$	209,9 (4)	0,00132 (15)
$\gamma_{10,5}(\text{U})$	235,9 (3)	0,00009 (4)
$\gamma_{(-1,1)}(\text{U})$	243,5 (8)	0,00050 (9)
$\gamma_{13,8}(\text{U})$	247,7 (8)	0,00097 (22)
$\gamma_{9,3}(\text{U})$	258,227 (3)	0,0738 (8)
$\gamma_{11,6}(\text{U})$	275,5 (8)	0,00031 (6)
$\gamma_{10,3}(\text{U})$	299 (1)	0,00064 (13)
$\gamma_{13,7}(\text{U})$	311 (1)	0,00052 (11)
$\gamma_{11,4}(\text{U})$	316,7 (1)	0,00019 (5)
$\gamma_{24,15}(\text{U})$	338,1 (8)	0,00113 (23)
$\gamma_{11,3}(\text{U})$	340,2 (1)	0,000072 (21)
$\gamma_{28,17}(\text{U})$	357,5 (10)	0,00080 (17)
$\gamma_{24,14}(\text{U})$	362,8 (10)	0,00069 (15)
$\gamma_{12,3}(\text{U})$	387,6 (8)	0,00097 (15)
$\gamma_{13,5}(\text{U})$	387,6 (8)	0,00047 (4)
$\gamma_{13,4}(\text{U})$	427,4 (2)	0,000020 (5)
$\gamma_{14,8}(\text{U})$	445,91 (10)	0,000031 (7)
$\gamma_{13,3}(\text{U})$	450,98 (10)	0,00310 (13)
$\gamma_{28,15}(\text{U})$	453,58 (10)	0,00213 (12)
$\gamma_{22,13}(\text{U})$	456,7 (10)	0,00072 (15)
$\gamma_{17,10}(\text{U})$	468,43 (10)	0,00206 (12)
$\gamma_{28,14}(\text{U})$	475,74 (10)	0,00237 (13)
$\gamma_{18,10}(\text{U})$	485,44 (7)	0,0000187 (17)
$\gamma_{19,10}(\text{U})$	507,5 (10)	0,00158 (15)
$\gamma_{17,9}(\text{U})$	509,2 (8)	0,0022 (3)
$\gamma_{20,10}(\text{U})$	516,60 (6)	0,0000122 (16)
$\gamma_{18,9}(\text{U})$	526,02 (10)	0,000009 (1)
$\gamma_{23,13}(\text{U})$	543,98 (10)	0,00349 (15)
$\gamma_{20,9}(\text{U})$	557,24 (6)	0,0000083 (11)
$\gamma_{(-1,2)}(\text{U})$	557,3 (10)	0,00072 (17)
$\gamma_{25,13}(\text{U})$	572 (1)	0,00087 (17)
$\gamma_{18,8}(\text{U})$	581,19 (10)	0,000080 (9)

	Energy keV	Photons per 100 disint.
$\gamma_{14,4}(\text{U})$	624,6 (10)	0,000116 (12)
$\gamma_{(-1,3)}(\text{U})$	647,7 (8)	0,00158 (15)
$\gamma_{14,3}(\text{U})$	649 (1)	0,000059 (8)
$\gamma_{16,6}(\text{U})$	649 (1)	0,0010 (3)
$\gamma_{23,11}(\text{U})$	655,3 (10)	0,00139 (15)
$\gamma_{15,3}(\text{U})$	670,8 (10)	0,00037 (9)
$\gamma_{28,13}(\text{U})$	673,9 (10)	0,00064 (13)
$\gamma_{25,11}(\text{U})$	683,4 (10)	0,00058 (12)
$\gamma_{16,4}(\text{U})$	691,0 (3)	0,00898 (19)
$\gamma_{23,10}(\text{U})$	695,5 (10)	0,00164 (14)
$\gamma_{29,13}(\text{U})$	699,02 (10)	0,0058 (3)
$\gamma_{17,6}(\text{U})$	702,0 (1)	0,00721 (16)
$\gamma_{5,2}(\text{U})$	705,94 (12)	0,0052 (6)
$\gamma_{6,2}(\text{U})$	708,2 (10)	<0,0007
$\gamma_{18,6}(\text{U})$	719,01 (7)	0,0000256 (20)
$\gamma_{30,13}(\text{U})$	732,5 (10)	0,00130 (15)
$\gamma_{19,6}(\text{U})$	740,10 (8)	0,0118 (3)
$\gamma_{3,1}(\text{U})$	742,813 (5)	0,094 (3)
$\gamma_{20,6}(\text{U})$	750,12 (6)	0,000017 (2)
$\gamma_{(-1,4)}(\text{U})$	760,3 (10)	0,00158 (15)
$\gamma_{18,4}(\text{U})$	760,53 (15)	0,0000043 (9)
$\gamma_{4,1}(\text{U})$	766,361 (20)	0,323 (4)
$\gamma_{19,4}(\text{U})$	781,75 (10)	0,00782 (18)
$\gamma_{7,2}(\text{U})$	783,4 (1)	0,000039 (7)
$\gamma_{3,0}(\text{U})$	786,272 (22)	0,0536 (7)
$\gamma_{20,4}(\text{U})$	791,94 (5)	0,0000099 (13)
$\gamma_{5,1}(\text{U})$	805,75 (10)	0,0062 (8)
$\gamma_{6,1}(\text{U})$	808,2 (1)	0,00281 (17)
$\gamma_{21,5}(\text{U})$	818,2 (5)	0,0010 (3)
$\gamma_{28,10}(\text{U})$	825,5 (2)	0,0014 (4)
$\gamma_{22,5}(\text{U})$	844,1 (8)	0,00109 (23)
$\gamma_{6,0}(\text{U})$	851,6 (1)	0,00696 (15)
$\gamma_{28,9}(\text{U})$	866,8 (10)	0,00116 (16)
$\gamma_{21,3}(\text{U})$	880,52 (4)	0,00392 (5)
$\gamma_{7,1}(\text{U})$	883,24 (3)	0,00381 (5)
$\gamma_{(-1,5)}(\text{U})$	887,29 (100)	0,00708 (14)
$\gamma_{28,8}(\text{U})$	921,72 (10)	0,01275 (20)
$\gamma_{7,0}(\text{U})$	926,61 (10)	0,00125 (13)
$\gamma_{26,7}(\text{U})$	936,3 (10)	0,00102 (17)
$\gamma_{10,2}(\text{U})$	941,96 (10)	0,00250 (9)
$\gamma_{8,1}(\text{U})$	945,961 (16)	0,01060 (14)
$\gamma_{25,5}(\text{U})$	960 (1)	0,0009 (3)
$\gamma_{23,3}(\text{U})$	996,1 (20)	0,0059 (17)
$\gamma_{9,1}(\text{U})$	1001,026 (18)	0,847 (8)
$\gamma_{10,1}(\text{U})$	1041,7 (1)	0,00119 (8)
$\gamma_{28,6}(\text{U})$	1059,4 (8)	0,00111 (22)
$\gamma_{28,5}(\text{U})$	1061,86 (10)	0,00224 (9)

	Energy keV	Photons per 100 disint.
$\gamma_{11,1}(\text{U})$	1081,9 (10)	0,00091 (19)
$\gamma_{10,0}(\text{U})$	1084,25 (10)	0,0008 (4)
$\gamma_{30,5}(\text{U})$	1120,6 (8)	0,00173 (15)
$\gamma_{28,3}(\text{U})$	1124,93 (10)	0,00347 (9)
$\gamma_{11,0}(\text{U})$	1124,93 (10)	0,00039 (9)
$\gamma_{12,0}(\text{U})$	1174,2 (10)	0,00192 (19)
$\gamma_{13,1}(\text{U})$	1193,77 (3)	0,01359 (18)
$\gamma_{(-1,6)}(\text{U})$	1220,37 (10)	0,00091 (9)
$\gamma_{13,0}(\text{U})$	1237,28 (10)	0,00528 (11)
$\gamma_{(-1,7)}(\text{U})$	1353,0 (15)	0,0015 (5)
$\gamma_{14,1}(\text{U})$	1392,6 (9)	0,0029 (11)
$\gamma_{15,1}(\text{U})$	1413,89 (10)	0,00229 (8)
$\gamma_{14,0}(\text{U})$	1434,16 (10)	0,00973 (16)
$\gamma_{16,1}(\text{U})$	1458,5 (15)	0,0019 (5)
$\gamma_{16,0}(\text{U})$	1501 (2)	0,0013
$\gamma_{17,1}(\text{U})$	1510,22 (10)	0,01308 (19)
$\gamma_{18,1}(\text{U})$	1527,28 (10)	0,00235 (8)
$\gamma_{19,1}(\text{U})$	1550,1 (10)	0,00137 (15)
$\gamma_{17,0}(\text{U})$	1553,77 (10)	0,00826 (14)
$\gamma_{20,1}(\text{U})$	1558,4 (10)	0,00073 (9)
$\gamma_{18,0}(\text{U})$	1570,67 (10)	0,00110 (8)
$\gamma_{19,0}(\text{U})$	1593,5 (6)	0,00235 (12)
$\gamma_{20,0}(\text{U})$	1601,8 (15)	0,00047 (22)
$\gamma_{21,0}(\text{U})$	1667,6 (10)	0,00118 (6)
$\gamma_{22,0}(\text{U})$	1694,1 (10)	0,00038 (2)
$\gamma_{(-1,8)}(\text{U})$	1720,5 (15)	0,00033 (15)
$\gamma_{(-1,9)}(\text{U})$	1732,2 (15)	0,0019 (3)
$\gamma_{23,1}(\text{U})$	1737,77 (10)	0,0214 (3)
$\gamma_{(-1,10)}(\text{U})$	1759,81 (10)	0,00146 (5)
$\gamma_{25,1}(\text{U})$	1765,44 (10)	0,0084 (6)
$\gamma_{24,0}(\text{U})$	1796,3 (9)	0,00031 (5)
$\gamma_{25,0}(\text{U})$	1809,05 (10)	0,00376 (7)
$\gamma_{26,1}(\text{U})$	1819,69 (10)	0,00089 (5)
$\gamma_{27,1}(\text{U})$	1831,37 (10)	0,01759 (23)
$\gamma_{26,0}(\text{U})$	1863,09 (10)	0,00120 (5)
$\gamma_{28,1}(\text{U})$	1867,7 (1)	0,00932 (12)
$\gamma_{27,0}(\text{U})$	1874,9 (1)	0,00819 (14)
$\gamma_{29,1}(\text{U})$	1893,51 (11)	0,00218 (6)
$\gamma_{28,0}(\text{U})$	1911,20 (11)	0,00628 (9)
$\gamma_{30,1}(\text{U})$	1926,5 (10)	0,00045 (4)
$\gamma_{29,0}(\text{U})$	1937,01 (13)	0,00285 (5)
$\gamma_{30,0}(\text{U})$	1970,3 (8)	0,00041 (4)
$\gamma_{(-1,11)}(\text{U})$	2022,24 (12)	0,000186 (3)
$\gamma_{(-1,12)}(\text{U})$	2041,23 (13)	0,00011 (1)
$\gamma_{(-1,13)}(\text{U})$	2065,80 (13)	0,00007
$\gamma_{(-1,14)}(\text{U})$	2093,19 (38)	0,00002
$\gamma_{(-1,15)}(\text{U})$	2102,14 (15)	0,00006

	Energy keV	Photons per 100 disint.
$\gamma_{(-1,16)}(\text{U})$	2136,69 (14)	0,00007

6 Main Production Modes

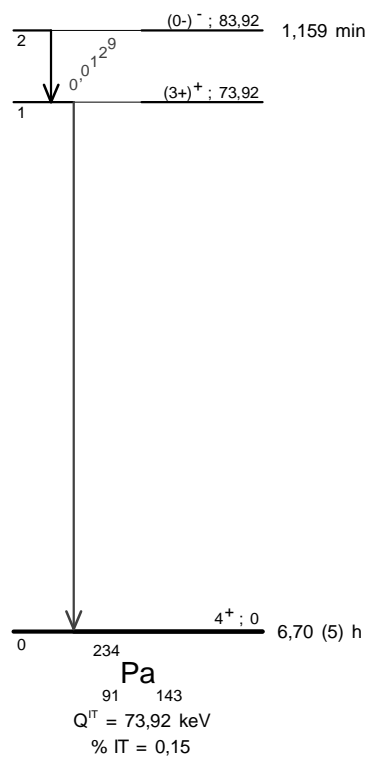
U – 238 natural decay chain member

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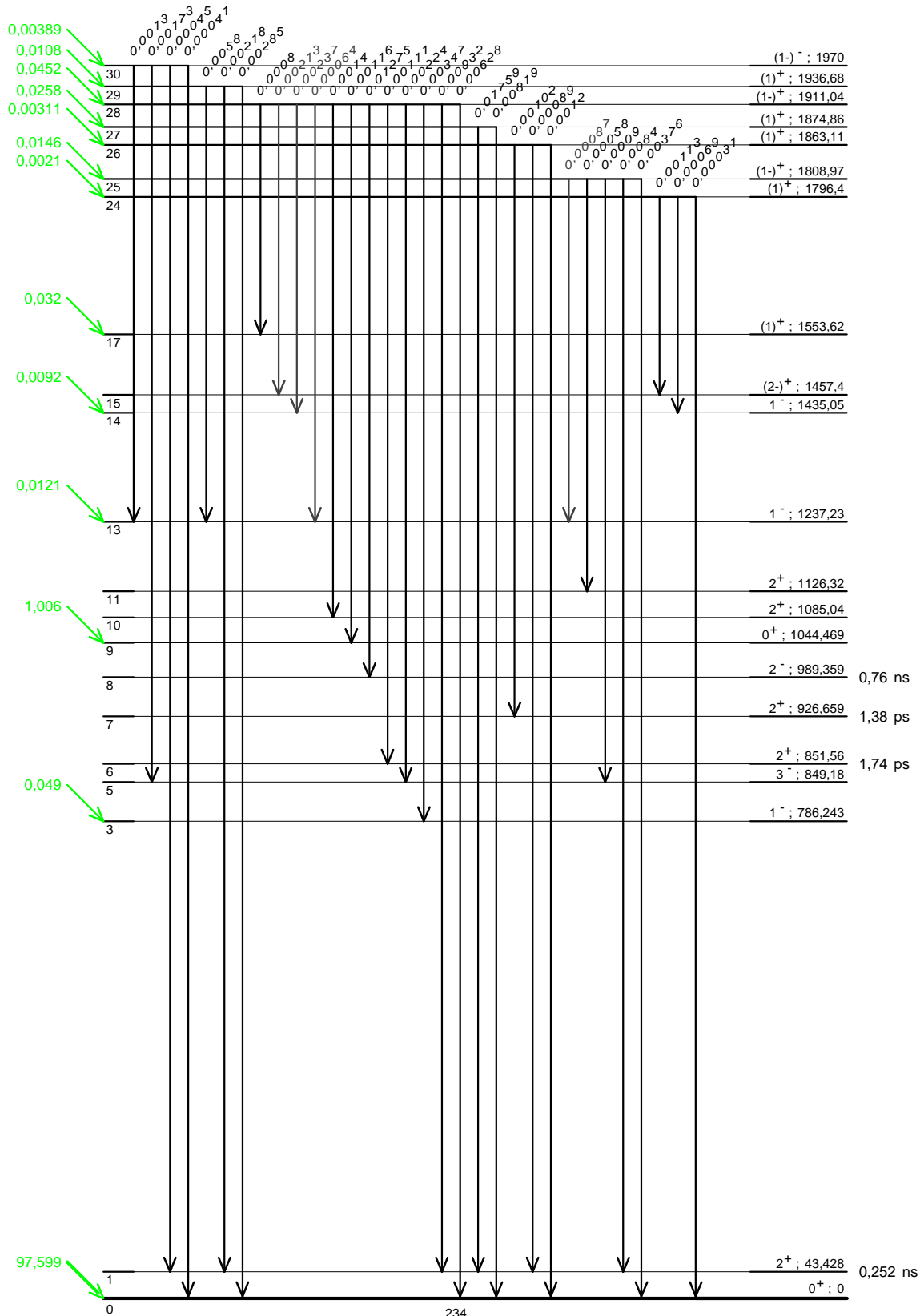
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γ Emission intensities
per 100 disintegrations



²³⁴Pa₁₄₃^m (0⁻)⁺; 0
 1,159 (11) min
 β⁻

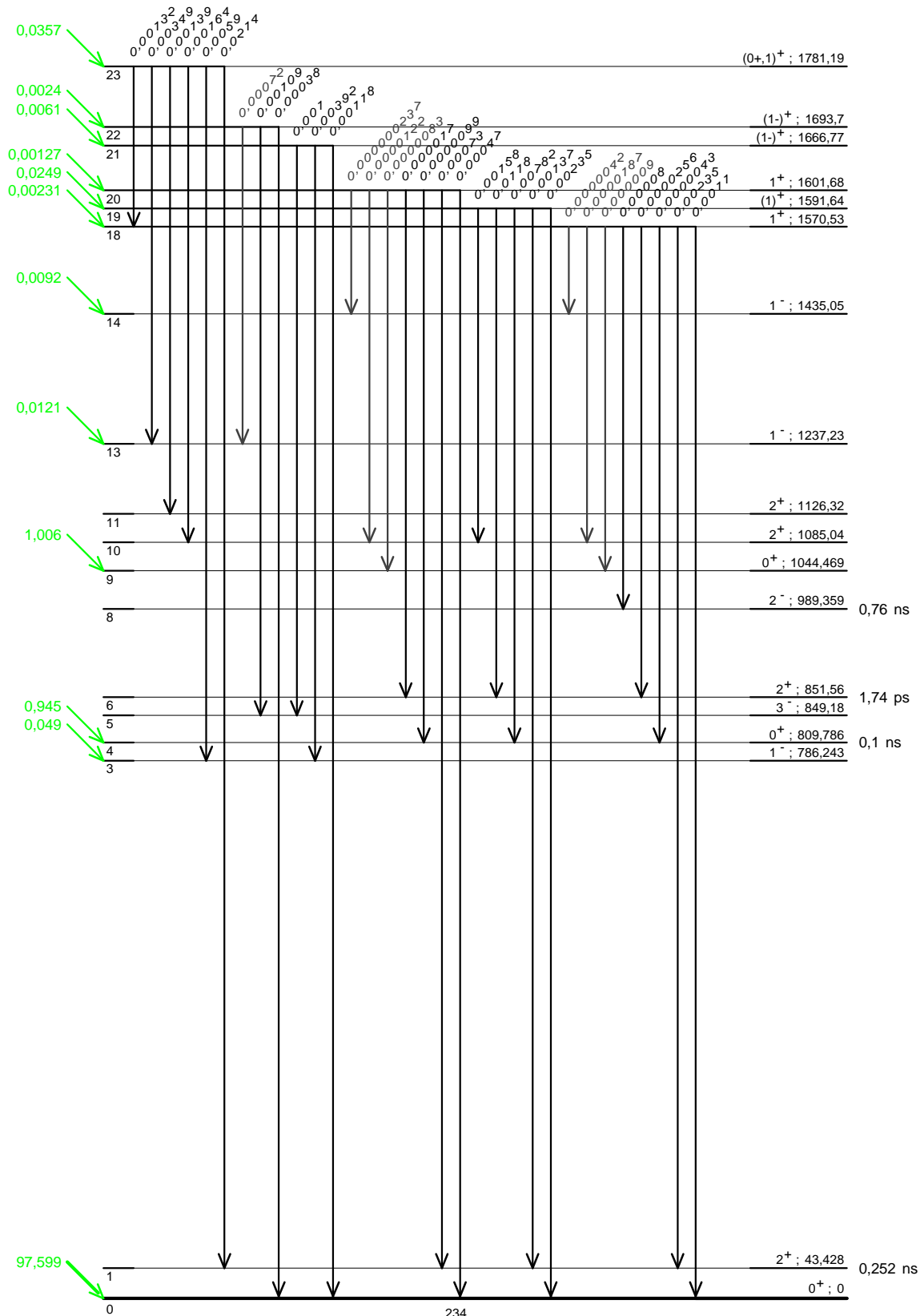
γ Emission intensities per 100 disintegrations

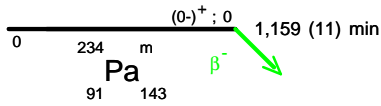


²³⁴U
 92 142
 Q⁻ = 2269 keV
 % β⁻ = 99,85

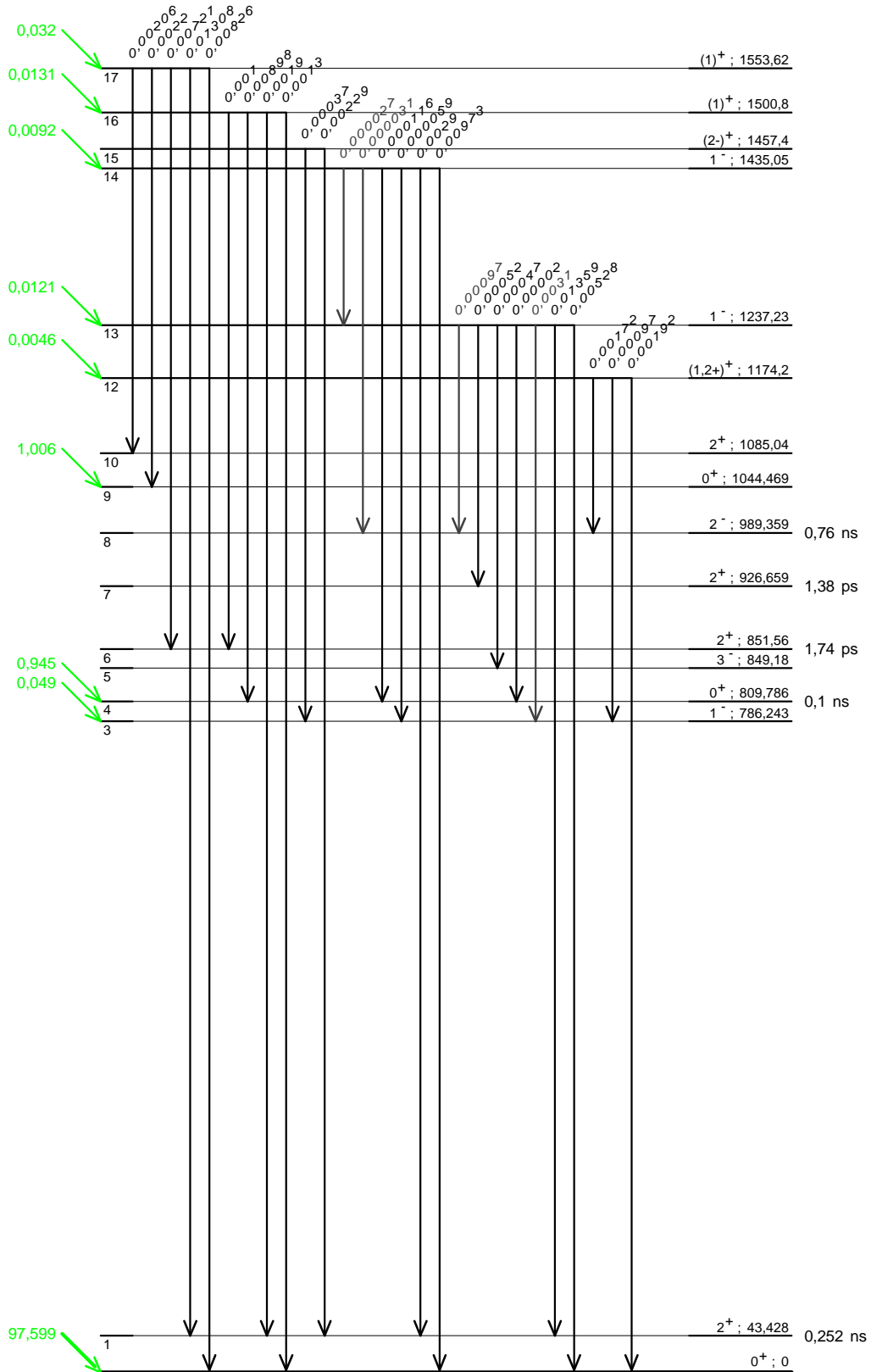
(0⁻)⁺; 0
1,159 (11) min
²³⁴m Pa
91 143
β⁻

γ Emission intensities per 100 disintegrations





γ Emission intensities per 100 disintegrations



²³⁴U
 92 142
 Q⁻ = 2269 keV
 % β⁻ = 99,85

²³⁴Pa₉₁^m₁₄₃ (0⁻)⁺; 0
 1,159 (11) min
 β⁻

γ Emission intensities per 100 disintegrations

