



## 1 Decay Scheme

Eu-154 disintegrates by 99.982 % beta decay via excited levels of Gd-154 and by 0.018 % electron capture via excited levels of Sm-154. Transitions to the ground states of Gd-154 and Sm-154 have not been observed. *L'euporium 154 se désintègre par émission bêta vers les niveaux excités de gadolinium 154 (99,982%) et par capture électronique vers les niveaux excités de samarium 154 (0,02%). Des transitions vers les niveaux fondamentaux du gadolinium 154 et du samarium 154 n'ont pas été observées.*

## 2 Nuclear Data

$T_{1/2}({}^{154}\text{Eu})$	:	8,601	(4)	a
$Q^+({}^{154}\text{Eu})$	:	717,3	(11)	keV
$Q^-({}^{154}\text{Eu})$	:	1968,4	(11)	keV

### 2.1 Electron Capture Transitions

	Energy keV	Probability × 100	Nature	lg $ft$	$P_K$	$P_L$	$P_M$
$\epsilon_{0,2}$	450,6 (11)	0,0047 (8)	1st forbidden	12,9	0,8205 (16)	0,1393 (11)	0,0322 (6)
$\epsilon_{0,1}$	635,3 (11)	0,013 (13)	1st forbidden	12,7	0,8289 (16)	0,1330 (11)	0,0305 (6)

### 2.2 $\beta^-$ Transitions

	Energy keV	Probability × 100	Nature	lg $ft$
$\beta_{0,33}^-$	73,7 (11)	0,0035 (6)	1 st forbidden	10,92
$\beta_{0,32}^-$	89,4 (11)	0,0042 (3)		
$\beta_{0,31}^-$	107,2 (11)	0,034 (3)	allowed	10,44
$\beta_{0,30}^-$	130,1 (12)	0,017 (5)	1 st forbidden	10,99
$\beta_{0,29}^-$	171,7 (12)	0,060 (6)	allowed	10,8

	Energy keV	Probability × 100	Nature	lg <i>ft</i>
$\beta_{0,28}^-$	178,1 (11)	0,022 (1)	1 st forbidden	11,31
$\beta_{0,27}^-$	197,9 (11)	0,0022 (4)	1 st forbidden	12,46
$\beta_{0,26}^-$	248,8 (11)	28,32 (22)	allowed	8,66
$\beta_{0,25}^-$	270,2 (11)	0,0100 (4)	(1 st forbidden)	12,33
$\beta_{0,24}^-$	307,5 (11)	0,849 (9)	1 st forbidden	10,48
$\beta_{0,23}^-$	322,6 (11)	0,148 (4)	1 st forbidden	11,31
$\beta_{0,22}^-$	351,3 (11)	1,78 (3)	allowed	10,34
$\beta_{0,21}^-$	408,8 (12)	0,100 (4)	allowed	11,81
$\beta_{0,20}^-$	437,1 (11)	0,330 (13)	1 st forbidden	11,39
$\beta_{0,19}^-$	458,3 (11)	0,021 (2)	(2nd forbidden)	12,66
$\beta_{0,18}^-$	550,0 (11)	0,075 (2)	1 st forbidden	12,23
$\beta_{0,16}^-$	570,9 (11)	36,06 (35)	allowed	9,74
$\beta_{0,13}^-$	704,6 (11)	0,707 (7)	1 st forbidden	11,76
$\beta_{0,12}^-$	716,8 (11)	0,289 (6)	allowed	12,18
$\beta_{0,8}^-$	840,6 (11)	17,33 (18)	1 st forbidden	10,64
$\beta_{0,7}^-$	920,8 (11)	0,108 (18)	1 st forbidden	13
$\beta_{0,6}^-$	972,1 (11)	2,82 (18)	1 st forbidden	11,66
$\beta_{0,5}^-$	1152,9 (11)	0,33 (3)	1 st forbidden	12,8
$\beta_{0,2}^-$	1597,4 (11)	0,31 (7)	1 st forbidden	13,43
$\beta_{0,1}^-$	1845,3 (11)	10,3 (5)	1 st forbidden	12,4

### 2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy keV	$P_{\gamma+ce}$ × 100	Multipolarity	$\alpha_K$	$\alpha_L$	$\alpha_M$	$\alpha_T$
$\gamma_{26,24}(\text{Gd})$	58,4	0,0087 (9)	(E1)				1,23 (3)
$\gamma_{8,7}(\text{Gd})$	80,4	0,016 (13)	(M1,E2)				4,8 (10)
$\gamma_{1,0}(\text{Sm})$	81,99 (2)	0,018 (13)	E2	1,98 (4)	2,28 (5)	0,532 (11)	4,93 (10)
$\gamma_{1,0}(\text{Gd})$	123,0707 (9)	88,8 (13)	E2	0,653 (13)	0,418 (9)	0,096 (2)	1,197 (19)
$\gamma_{18,15}(\text{Gd})$	125,39 (5)	0,007 (2)					
$\gamma_{24,20}(\text{Gd})$	129,5	0,028 (4)	(M1,E2)				0,99 (3)
$\gamma_{8,6}(\text{Gd})$	131,58 (5)	0,0216 (11)	M1+E2				0,95 (4)
$\gamma_{5,3}(\text{Gd})$	134,84	0,0134 (8)	E2				0,868 (18)
$\gamma_{16,12}(\text{Gd})$	146,05 (5)	0,044 (2)	(M1,E2)				0,68 (2)
$\gamma_{16,11}(\text{Gd})$	156,2	0,0152 (6)	(M1,E2)				0,55 (3)
$\gamma_{(-1,1)}(\text{Gd})$	159,9	0,0010 (5)					
$\gamma_{21,16}(\text{Gd})$	162,09 (5)	0,0016 (6)	(E2)				0,457 (9)
$\gamma_{15,8}(\text{Gd})$	165,90 (21)	0,0025 (5)					
$\gamma_{6,5}(\text{Gd})$	180,7	0,0054 (7)	(M1,E2)				0,35 (4)
$\gamma_{2,1}(\text{Sm})$	184,72	0,0047 (8)	E2	0,193 (4)	0,0642 (13)	0,0146 (3)	0,275 (6)
$\gamma_{26,20}(\text{Gd})$	188,24 (2)	0,252 (6)	E1	0,0453 (9)	0,0065 (2)		0,0536 (11)
$\gamma_{(-1,2)}(\text{Gd})$	195,5 (5)	0,002 (1)					
$\gamma_{(-1,3)}(\text{Gd})$	197	0,0016 (2)					
$\gamma_{22,17}(\text{Gd})$	202,50 (16)	0,03 (1)					
$\gamma_{26,19}(\text{Gd})$	209,4 (4)	0,0025 (6)					

	Energy keV	$P_{\gamma+ce}$ $\times 100$	Multipolarity	$\alpha_K$	$\alpha_L$	$\alpha_M$	$\alpha_T$
$\gamma_{22,16}$ (Gd)	219,4	0,0028 (6)	(M1,E2)				0,20 (4)
$\gamma_{14,7}$ (Gd)	229,01 (13)	0,0024 (8)					
$\gamma_{7,5}$ (Gd)	232,01 (5)	0,0270 (11)	E2				0,137 (3)
$\gamma_{20,15}$ (Gd)	237	0,006 (3)					0,018 (7)
$\gamma_{2,1}$ (Gd)	247,9290 (7)	7,65 (8)	E2	0,0810 (16)	0,0228 (5)		0,110 (2)
$\gamma_{16,9}$ (Gd)	260,9	0,0022 (7)					
$\gamma_{20,13}$ (Gd)	267,44	0,0148 (8)	(E2)				0,087 (2)
$\gamma_{16,8}$ (Gd)	269,8	0,0071 (11)	E1+M2				0,0209 (4)
$\gamma_{(-1,4)}$ (Gd)	274,0 (5)	0,0039 (2)					
$\gamma_{20,12}$ (Gd)	279,9	0,0030 (2)	(E1)				0,0190 (4)
$\gamma_{20,11}$ (Gd)	290	0,0033 (2)	(E1)				0,0174 (3)
$\gamma_{21,13}$ (Gd)	295,7	0,0024 (2)	(E1)				0,0166 (3)
$\gamma_{(-1,5)}$ (Gd)	296 (1)	0,0014 (9)					0,0166 (3)
$\gamma_{26,18}$ (Gd)	301,25	0,0102 (4)	(E2)				0,0158 (3)
$\gamma_{26,17}$ (Gd)	305,1	0,0187 (8)	(M1,E2)				0,075 (18)
$\gamma_{(-1,6)}$ (Gd)	308,2	0,0024 (6)					
$\gamma_{8,5}$ (Gd)	312,3	0,019 (2)	(M1,E2)				0,07 (2)
$\gamma_{6,3}$ (Gd)	315,4	0,007 (2)	(E2)				0,052 (1)
$\gamma_{(-1,7)}$ (Gd)	320 (1)	0,0010 (7)					
$\gamma_{26,16}$ (Gd)	322,02 (5)	0,070 (3)	(M1,E2)				0,065 (17)
$\gamma_{7,4}$ (Gd)	329,9 (7)	0,0095 (5)	E2				0,0454 (9)
$\gamma_{4,2}$ (Gd)	346,72 (5)	0,030 (1)	E2				0,0391 (8)
$\gamma_{23,14}$ (Gd)	368,21	0,0030 (2)					
$\gamma_{18,7}$ (Gd)	370,71	0,0058 (14)	E2				0,0321 (7)
$\gamma_{22,11}$ (Gd)	375,2 (5)	0,0021 (8)	(E2)				0,0310 (6)
$\gamma_{23,13}$ (Gd)	382,00 (5)	0,0100 (4)	(E2,M1)				0,034 (11)
$\gamma_{24,13}$ (Gd)	397,1	0,030 (1)	(M1,E2)				0,036 (10)
$\gamma_{16,6}$ (Gd)	401,260 (14)	0,202 (4)	(E1,M2,E3)				0,07 (2)
$\gamma_{20,8}$ (Gd)	403,55 (5)	0,027 (1)	(M1,E2)				0,035 (10)
$\gamma_{(-1,8)}$ (Gd)	414,3	0,0049 (6)					
$\gamma_{24,11}$ (Gd)	419,4	0,0039 (23)	M2				0,140 (3)
$\gamma_{(-1,9)}$ (Gd)	422,1	0,0022 (9)					
$\gamma_{(-1,10)}$ (Gd)	435,9	0,0038 (10)					
$\gamma_{5,2}$ (Gd)	444,4931 (19)	0,570 (6)	E2	0,0154 (3)	0,00295 (6)	0,000650 (13)	0,0192 (4)
$\gamma_{32,17}$ (Gd)	463,9	0,0042 (3)					
$\gamma_{26,12}$ (Gd)	467,84 (5)	0,0618 (24)	(M1,E2)				0,024 (7)
$\gamma_{26,11}$ (Gd)	478,27 (5)	0,230 (2)	M1	0,0245 (5)	0,00341 (7)	0,00074 (2)	0,0287 (6)
$\gamma_{22,9}$ (Gd)	480,61	0,0048 (3)					
$\gamma_{20,7}$ (Gd)	483,74	0,0051 (3)	(E2)				0,0153 (3)
$\gamma_{(-1,11)}$ (Gd)	484,64	0,0039 (2)					
$\gamma_{22,8}$ (Gd)	488,26	0,007 (3)	(E1)				0,00498 (10)
$\gamma_{27,13}$ (Gd)	506,4	0,0064 (14)	E2				0,0136 (3)
$\gamma_{(-1,12)}$ (Gd)	510	0,059 (7)					
$\gamma_{(-1,13)}$ (Gd)	512	0,032 (7)					
$\gamma_{23,8}$ (Gd)	518,00 (5)	0,047 (2)	(E2,M1)				0,013 (1)
$\gamma_{29,13}$ (Gd)	533,1	0,004 (3)	E1				0,00412 (8)
$\gamma_{24,8}$ (Gd)	533,1	0,007 (2)					
$\gamma_{13,4}$ (Gd)	545,6	0,014 (2)	(E2)				0,0112 (2)
$\gamma_{3,1}$ (Gd)	557,58 (5)	0,270 (5)	E2	0,0087 (2)	0,0015 (3)		0,0106 (2)
$\gamma_{21,6}$ (Gd)	563,4	0,0030 (7)	(M2)				0,058 (1)
$\gamma_{22,7}$ (Gd)	569,23	0,0100 (8)	(E1)				0,0036 (1)
$\gamma_{16,5}$ (Gd)	582,01 (5)	0,889 (11)	E1	0,00288 (6)	0,000385 (8)		0,00339 (7)
$\gamma_{26,8}$ (Gd)	591,755 (3)	4,97 (5)	E1+(M2)	0,0028 (6)	0,000374 (8)	0,0000372 (8)	0,00329 (10)
$\gamma_{31,13}$ (Gd)	597,5	0,0055 (3)	(E1)				0,00321 (7)
$\gamma_{23,7}$ (Gd)	598,3	0,0062 (7)	M1+2,8%E2				0,014 (1)
$\gamma_{17,5}$ (Gd)	600,0 (5)	0,006 (4)	(E1)				0,00318 (7)
$\gamma_{18,5}$ (Gd)	602,81 (5)	0,0035 (2)	E0+M1+E2				0,048 (6)
$\gamma_{24,7}$ (Gd)	613,26 (5)	0,094 (4)	(E2,M1)				0,012 (4)
$\gamma_{22,6}$ (Gd)	620,52	0,091 (5)	(E1)				0,00296 (6)

	Energy keV	$P_{\gamma+ce}$ $\times 100$	Multipolarity	$\alpha_K$	$\alpha_L$	$\alpha_M$	$\alpha_T$
$\gamma_{6,2}$ (Gd)	625,2570 (24)	0,319 (5)	E2	0,00658 (13)	0,00109 (2)		0,00797 (16)
$\gamma_{27,8}$ (Gd)	642,4	0,0044 (17)	(M1,E2)				0,011 (4)
$\gamma_{23,6}$ (Gd)	649,44 (5)	0,079 (3)	E2				0,0073 (2)
$\gamma_{25,7}$ (Gd)	650,6	0,0100 (4)	(E0,M1,E2)				0,026 (8)
$\gamma_{24,6}$ (Gd)	664,68 (5)	0,029 (1)	(M1,E2)				0,010 (3)
$\gamma_{29,8}$ (Gd)	668,9	0,013 (2)	E1				0,00253 (5)
$\gamma_{7,2}$ (Gd)	676,598 (12)	0,166 (11)	E0+M1+E2	0,049 (5)	0,0080 (8)		0,059 (6)
$\gamma_{3,0}$ (Gd)	680,72 (10)	0,0052 (7)	E0				
$\gamma_{5,1}$ (Gd)	692,4222 (18)	1,88 (3)	E0+M1+E2	0,040 (4)	0,0070 (7)		0,049 (6)
$\gamma_{20,5}$ (Gd)	715,77 (3)	0,19 (1)	(E0,M1,E2)				0,013 (4)
$\gamma_{26,6}$ (Gd)	723,3032 (22)	20,09 (21)	E1+0,05%M2	0,00184 (4)	0,000244 (5)		0,00215 (5)
$\gamma_{(-1,14)}$ (Gd)	737,6	0,0063 (24)					
$\gamma_{8,2}$ (Gd)	756,8040 (23)	4,55 (5)	E1+2,8%M2	0,00431 (9)	0,00067 (2)		0,0051 (12)
$\gamma_{27,6}$ (Gd)	774,4	0,008 (4)	(M3)				0,053 (2)
$\gamma_{30,7}$ (Gd)	790,2	0,010 (3)	(E2)				0,00462 (9)
$\gamma_{29,6}$ (Gd)	800,2	0,032 (5)	E1				0,00175 (4)
$\gamma_{22,5}$ (Gd)	801,21 (4)	0,012 (3)	(E1)				0,00175 (4)
$\gamma_{5,0}$ (Gd)	815,53 (5)	0,514 (7)	E2	0,00360 (7)	0,000548 (11)		0,00430 (9)
$\gamma_{(-1,15)}$ (Gd)	830,3	0,008 (3)					
$\gamma_{24,5}$ (Gd)	845,418 (7)	0,588 (9)	E2	0,00333 (7)	0,000502 (10)		0,00397 (8)
$\gamma_{20,3}$ (Gd)	850,64 (3)	0,242 (4)	E2				0,00392 (8)
$\gamma_{6,1}$ (Gd)	873,1860 (23)	12,22 (12)	E2+1,55%M1+E0	0,00313 (6)	0,00047 (1)		0,00373 (8)
$\gamma_{12,2}$ (Gd)	880,60 (3)	0,081 (4)	E1+0,05%M2				0,00153 (8)
$\gamma_{13,2}$ (Gd)	892,778 (6)	0,516 (7)	E0+E2+M1				0,00369 (8)
$\gamma_{33,6}$ (Gd)	898,36	0,0020 (5)	(M1,E2)				0,0048 (13)
$\gamma_{26,5}$ (Gd)	904,067 (3)	0,891 (11)	E1(+M2)	0,00118 (4)	0,000156 (3)		0,00138 (3)
$\gamma_{14,2}$ (Gd)	906,1	0,0118 (6)					
$\gamma_{(-1,16)}$ (Gd)	919,24	0,012 (1)					
$\gamma_{7,1}$ (Gd)	924,63 (5)	0,062 (2)	E2				0,00327 (7)
$\gamma_{(-1,17)}$ (Gd)	928,4	0,0045 (21)					
$\gamma_{29,5}$ (Gd)	981,3 (5)	0,0084 (17)	(E1)				0,00118 (3)
$\gamma_{(-1,18)}$ (Gd)	984,5	0,0094 (21)					
$\gamma_{6,0}$ (Gd)	996,25 (5)	10,53 (10)	E2	0,00236 (5)	0,000342 (7)		0,00279 (6)
$\gamma_{8,1}$ (Gd)	1004,722 (7)	17,91 (18)	E1+1,35%M2	0,00232 (5)	0,000336 (7)		0,00276 (6)
$\gamma_{9,1}$ (Gd)	1012,8 (2)	0,003 (1)					
$\gamma_{30,5}$ (Gd)	1023 (1)	0,0066 (25)	(M1,E2)				
$\gamma_{(-1,19)}$ (Gd)	1033,4	0,0117 (8)					
$\gamma_{18,2}$ (Gd)	1047,4 (1)	0,049 (3)	E2				0,00251 (5)
$\gamma_{(-1,20)}$ (Gd)	1049,4 (1)	0,0172 (8)					
$\gamma_{(-1,21)}$ (Gd)	1072,2	0,0035 (14)					
$\gamma_{10,1}$ (Gd)	1110	0,003 (2)					
$\gamma_{11,1}$ (Gd)	1118,53 (6)	0,108 (14)	E1	0,000798 (16)	0,000103 (20)		0,00093 (2)
$\gamma_{(-1,22)}$ (Gd)	1124,2	0,0069 (10)					
$\gamma_{12,1}$ (Gd)	1128,556 (7)	0,317 (5)	E1	0,000785 (16)	0,000101 (2)		0,000915 (18)
$\gamma_{9,0}$ (Gd)	1136,1	0,007 (1)					
$\gamma_{13,1}$ (Gd)	1140,707 (6)	0,235 (4)	E2				0,00211 (4)
$\gamma_{(-1,23)}$ (Gd)	1153,1 (5)	0,011 (4)					
$\gamma_{20,2}$ (Gd)	1160,37 (8)	0,0437 (21)	(E2)				0,00204 (4)
$\gamma_{15,1}$ (Gd)	1170,7 (5)	0,0036 (10)					
$\gamma_{21,2}$ (Gd)	1188,35 (17)	0,093 (7)	(E1)				0,00083 (2)
$\gamma_{(-1,25)}$ (Gd)	1216,8	0,0035 (10)					
$\gamma_{(-1,24)}$ (Gd)	1232,1 (5)	0,008 (5)					
$\gamma_{11,0}$ (Gd)	1241,44 (10)	0,133 (6)	E1+(M2)	0,000662 (13)	0,0000849 (17)		0,000771 (15)
$\gamma_{22,2}$ (Gd)	1246,126 (4)	0,863 (11)	E1	0,000658 (13)	0,0000843 (17)		0,000766 (15)
$\gamma_{16,1}$ (Gd)	1274,435 (4)	34,9 (3)	E1+0,1%M2	0,000632 (13)	0,0000810 (16)		0,000737 (15)
$\gamma_{24,2}$ (Gd)	1290,51 (10)	0,025 (3)	(M1,E2)				0,0021 (5)
$\gamma_{17,1}$ (Gd)	1292,0 (2)	0,0127 (5)	E1				0,00072 (2)
$\gamma_{18,1}$ (Gd)	1295,5 (2)	0,0091 (10)					
$\gamma_{(-1,26)}$ (Gd)	1316,4 (3)	0,017 (4)					

	Energy keV	$P_{\gamma+ce}$ $\times 100$	Multipolarity	$\alpha_K$	$\alpha_L$	$\alpha_M$	$\alpha_T$
$\gamma_{19,1}$ (Gd)	1387,0 (5)	0,019 (2)	(E1)				0,00063 (2)
$\gamma_{27,2}$ (Gd)	1397,35 (5)	0,0031 (8)	(M1,E2)				0,0018 (4)
$\gamma_{20,1}$ (Gd)	1408,5 (2)	0,023 (3)	(E0,M1,E2)				0,0037 (14)
$\gamma_{17,0}$ (Gd)	1415,0 (5)	0,040 (2)	E1				0,00061 (1)
$\gamma_{18,0}$ (Gd)	1418,6 (2)	0,011 (2)	E2				0,00138 (3)
$\gamma_{28,2}$ (Gd)	1419,0 (2)	0,0020 (1)	(M1,E2)				0,0017 (4)
$\gamma_{29,2}$ (Gd)	1425,9 (5)	0,0012 (7)	(E1)				0,00060 (1)
$\gamma_{31,2}$ (Gd)	1489,6 (2)	0,0029 (4)	(E1)				0,00056 (1)
$\gamma_{22,1}$ (Gd)	1494,056 (4)	0,699 (9)	E1	0,000481 (10)	0,0000611 (12)		0,00056 (1)
$\gamma_{19,0}$ (Gd)	1510,0 (5)	0,0048 (10)	(E1)				0,00047 (1)
$\gamma_{33,2}$ (Gd)	1522 (1)	0,0006 (3)	(E2)				0,00102 (2)
$\gamma_{20,0}$ (Gd)	1531,5 (2)	0,0060 (4)	(E2)				0,00101 (2)
$\gamma_{24,1}$ (Gd)	1537,82 (4)	0,053 (2)	(M1,E2)				0,0012 (3)
$\gamma_{(-1,27)}$ (Gd)	1554	0,0011 (5)					
$\gamma_{26,1}$ (Gd)	1596,4892 (28)	1,784 (17)	E1(+M2)	0,000430 (9)	0,0000546 (11)		0,00049 (1)
$\gamma_{28,1}$ (Gd)	1667,3 (2)	0,0019 (3)	(E2)				
$\gamma_{29,1}$ (Gd)	1674,0 (5)	0,0017 (4)	(E1)				
$\gamma_{30,1}$ (Gd)	1716,9 (5)	0,0006 (3)	(M1,E2)				
$\gamma_{33,1}$ (Gd)	1773 (1)	0,00035 (21)	(M1,E2)				
$\gamma_{30,0}$ (Gd)	1838,0 (5)	0,0008 (2)	(E2)				
$\gamma_{33,0}$ (Gd)	1895 (1)	0,0006 (2)	(E2)				

### 3 Atomic Data

#### 3.1 Sm

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

##### 3.1.1 X Radiations

	Energy keV	Relative probability	
X <sub>K</sub>	K $\alpha_2$	39,5229	
	K $\alpha_1$	40,1186	
	K $\beta_3$	45,289	}
	K $\beta_1$	45,413	
	K $\beta_5''$	45,731	}
	K $\beta_2$	46,575	
	K $\beta_4$	46,705	}
	KO <sub>2,3</sub>	46,813	
	X <sub>L</sub>	L $\ell$	4,99
L $\gamma$		- 7,49	

**3.1.2 Auger Electrons**

	Energy keV	Relative probability
KLL	31,19 – 33,22	100
KLX	37,30 – 40,18	50,7
KXY	45,30 – 46,23	6,42
Auger L	3,2 – 7,6	2277

**3.2 Gd**

$\omega_K$	:	0,932	(4)
$\bar{\omega}_L$	:	0,176	(6)
$n_{KL}$	:	0,850	(4)

**3.2.1 X Radiations**

	Energy keV	Relative probability		
X <sub>K</sub>	K $\alpha_2$	42,3093	55,59	
	K $\alpha_1$	42,9967	100	
	K $\beta_3$	48,556	}	
	K $\beta_1$	48,697	}	
	K $\beta_5''$	49,053	}	31,66
	K $\beta_2$	49,961	}	
	K $\beta_4$	50,099	}	8,32
	KO <sub>2,3</sub>	50,219	}	
	X <sub>L</sub>	L $\ell$	5,36	
		L $\gamma$	– 8,1	

**3.2.2 Auger Electrons**

	Energy keV	Relative probability
KLL	33,32 – 35,58	100
KLX	39,98 – 42,86	51,3
KXY	47,98 – 48,91	6,58
Auger L	3,4 – 8,3	2814

## 4 Electron Emissions

		Energy keV		Electrons per 100 disint.
e <sub>AL</sub>	(Sm)	3,2	- 7,6	0,023 (13)
e <sub>AK</sub>	(Sm)			0,0016 (13)
	KLL	31,19	- 33,22	}
	KLX	37,30	- 40,18	}
	KXY	45,30	- 46,23	}
e <sub>AL</sub>	(Gd)	3,4	- 8,3	33,2 (6)
e <sub>AK</sub>	(Gd)			1,86 (12)
	KLL	33,32	- 35,58	}
	KLX	39,98	- 42,86	}
	KXY	47,98	- 48,91	}
ec <sub>1,0</sub> K	(Gd)	72,832	(1)	26,4 (4)
ec <sub>1,0</sub> L	(Gd)	114,70	- 115,83	16,9 (4)
ec <sub>1,0</sub> M	(Gd)	121,19	- 121,89	3,88 (9)
ec <sub>2,1</sub> K	(Gd)	197,6898	(7)	0,558 (12)
ec <sub>2,1</sub> L	(Gd)	239,56	- 240,69	0,157 (4)
ec <sub>5,1</sub> K	(Gd)	642,180	(2)	0,072 (7)
$\beta_{0,33}^-$	max:	73,7	(11)	0,0035 (6)
$\beta_{0,33}^-$	avg:	19,0	(3)	
$\beta_{0,32}^-$	max:	89,4	(11)	0,0042 (3)
$\beta_{0,32}^-$	avg:	23,3	(3)	
$\beta_{0,31}^-$	max:	107,2	(11)	0,034 (3)
$\beta_{0,31}^-$	avg:	28,1	(3)	
$\beta_{0,30}^-$	max:	130,1	(12)	0,017 (5)
$\beta_{0,30}^-$	avg:	34,5	(3)	
$\beta_{0,29}^-$	max:	171,7	(12)	0,060 (6)
$\beta_{0,29}^-$	avg:	46,3	(3)	
$\beta_{0,28}^-$	max:	178,1	(11)	0,022 (1)
$\beta_{0,28}^-$	avg:	48,1	(3)	
$\beta_{0,27}^-$	max:	197,9	(11)	0,0022 (4)
$\beta_{0,27}^-$	avg:	53,9	(3)	
$\beta_{0,26}^-$	max:	248,8	(11)	28,32 (22)
$\beta_{0,26}^-$	avg:	69,2	(3)	
$\beta_{0,25}^-$	max:	270,2	(11)	0,0100 (4)
$\beta_{0,25}^-$	avg:	75,7	(3)	
$\beta_{0,24}^-$	max:	307,5	(11)	0,849 (9)
$\beta_{0,24}^-$	avg:	87,4	(3)	
$\beta_{0,23}^-$	max:	322,6	(11)	0,148 (4)
$\beta_{0,23}^-$	avg:	92,2	(4)	

		Energy keV		Electrons per 100 disint.
$\beta_{0,22}^-$	max:	351,3	(11)	1,78 (3)
$\beta_{0,22}^-$	avg:	101,4	(4)	
$\beta_{0,21}^-$	max:	408,8	(12)	0,100 (4)
$\beta_{0,21}^-$	avg:	120,3	(4)	
$\beta_{0,20}^-$	max:	437,1	(11)	0,330 (13)
$\beta_{0,20}^-$	avg:	129,8	(4)	
$\beta_{0,19}^-$	max:	458,3	(11)	0,021 (2)
$\beta_{0,19}^-$	avg:	136,9	(4)	
$\beta_{0,18}^-$	max:	550,0	(11)	0,075 (2)
$\beta_{0,18}^-$	avg:	168,8	(4)	
$\beta_{0,16}^-$	max:	570,9	(11)	36,06 (35)
$\beta_{0,16}^-$	avg:	176,2	(4)	
$\beta_{0,13}^-$	max:	704,6	(11)	0,707 (7)
$\beta_{0,13}^-$	avg:	225,0	(4)	
$\beta_{0,12}^-$	max:	716,8	(11)	0,289 (6)
$\beta_{0,12}^-$	avg:	229,5	(4)	
$\beta_{0,8}^-$	max:	840,6	(11)	17,33 (18)
$\beta_{0,8}^-$	avg:	276,6	(4)	
$\beta_{0,7}^-$	max:	920,8	(11)	0,108 (18)
$\beta_{0,7}^-$	avg:	307,8	(4)	
$\beta_{0,6}^-$	max:	972,1	(11)	2,82 (18)
$\beta_{0,6}^-$	avg:	328,1	(4)	
$\beta_{0,5}^-$	max:	1152,9	(11)	0,33 (3)
$\beta_{0,5}^-$	avg:	401,0	(5)	
$\beta_{0,2}^-$	max:	1597,4	(11)	0,31 (7)
$\beta_{0,2}^-$	avg:	588,0	(5)	
$\beta_{0,1}^-$	max:	1845,3	(11)	10,3 (5)
$\beta_{0,1}^-$	avg:	695,6	(5)	



## 5 Photon Emissions

### 5.1 X-Ray Emissions

		Energy keV	Photons per 100 disint.	
XL	(Sm)	4,99 — 7,49	0,0044 (20)	
XK $\alpha_2$	(Sm)	39,5229	0,006 (4)	} K $\alpha$
XK $\alpha_1$	(Sm)	40,1186	0,010 (8)	
XK $\beta_3$	(Sm)	45,289	}	} K' $\beta_1$
XK $\beta_1$	(Sm)	45,413	}	
XK $\beta_5''$	(Sm)	45,731	}	
XK $\beta_2$	(Sm)	46,575	}	} K' $\beta_2$
XK $\beta_4$	(Sm)	46,705	}	
XKO <sub>2,3</sub>	(Sm)	46,813	}	
XL	(Gd)	5,36 — 8,1	7,1 (3)	
XK $\alpha_2$	(Gd)	42,3093	7,2 (2)	} K $\alpha$
XK $\alpha_1$	(Gd)	42,9967	13,0 (3)	
XK $\beta_3$	(Gd)	48,556	}	} K' $\beta_1$
XK $\beta_1$	(Gd)	48,697	}	
XK $\beta_5''$	(Gd)	49,053	}	
XK $\beta_2$	(Gd)	49,961	}	} K' $\beta_2$
XK $\beta_4$	(Gd)	50,099	}	
XKO <sub>2,3</sub>	(Gd)	50,219	}	

### 5.2 Gamma Emissions

	Energy keV	Photons per 100 disint.
$\gamma_{26,24}$ (Gd)	58,4	0,0039 (4)
$\gamma_{8,7}$ (Gd)	80,4	0,0028 (14)
$\gamma_{1,0}$ (Sm)	81,99 (2)	0,0031 (21)
$\gamma_{1,0}$ (Gd)	123,0706 (9)	40,4 (5)
$\gamma_{18,15}$ (Gd)	125,39 (5)	0,007 (2)
$\gamma_{24,20}$ (Gd)	129,5	0,014 (2)
$\gamma_{8,6}$ (Gd)	131,58 (5)	0,0111 (5)
$\gamma_{5,3}$ (Gd)	134,84	0,0072 (4)
$\gamma_{16,12}$ (Gd)	146,05 (5)	0,026 (1)
$\gamma_{16,11}$ (Gd)	156,2	0,0098 (4)
$\gamma_{(-1,1)}$ (Gd)	159,9	0,0010 (5)

	Energy keV	Photons per 100 disint.
$\gamma_{21,16}$ (Gd)	162,09 (5)	0,0011 (4)
$\gamma_{15,8}$ (Gd)	165,90 (21)	0,0025 (5)
$\gamma_{6,5}$ (Gd)	180,7	0,0040 (5)
$\gamma_{2,1}$ (Sm)	184,72	0,0037 (7)
$\gamma_{26,20}$ (Gd)	188,24 (2)	0,239 (6)
$\gamma_{(-1,2)}$ (Gd)	195,5 (5)	0,002 (1)
$\gamma_{(-1,3)}$ (Gd)	197	0,0016 (2)
$\gamma_{22,17}$ (Gd)	202,50 (16)	0,03 (1)
$\gamma_{26,19}$ (Gd)	209,4 (4)	0,0025 (6)
$\gamma_{22,16}$ (Gd)	219,4	0,0023 (5)
$\gamma_{14,7}$ (Gd)	229,01 (13)	0,0024 (8)
$\gamma_{7,5}$ (Gd)	232,01 (5)	0,024 (1)
$\gamma_{20,15}$ (Gd)	237	0,006 (3)
$\gamma_{2,1}$ (Gd)	247,9288 (7)	6,89 (7)
$\gamma_{16,9}$ (Gd)	260,9	0,0022 (7)
$\gamma_{20,13}$ (Gd)	267,44	0,0136 (7)
$\gamma_{16,8}$ (Gd)	269,8	0,0070 (11)
$\gamma_{(-1,4)}$ (Gd)	274,0 (5)	0,0039 (2)
$\gamma_{20,12}$ (Gd)	279,9	0,0030 (2)
$\gamma_{20,11}$ (Gd)	290	0,0033 (2)
$\gamma_{21,13}$ (Gd)	295,7	0,0024 (2)
$\gamma_{(-1,5)}$ (Gd)	296 (1)	0,0014 (9)
$\gamma_{26,18}$ (Gd)	301,25	0,0102 (4)
$\gamma_{26,17}$ (Gd)	305,1	0,0174 (7)
$\gamma_{(-1,6)}$ (Gd)	308,2	0,0024 (6)
$\gamma_{8,5}$ (Gd)	312,3	0,018 (2)
$\gamma_{6,3}$ (Gd)	315,4	0,007 (2)
$\gamma_{(-1,7)}$ (Gd)	320 (1)	0,0010 (7)
$\gamma_{26,16}$ (Gd)	322,02 (5)	0,066 (3)
$\gamma_{7,4}$ (Gd)	329,9 (7)	0,0091 (5)
$\gamma_{4,2}$ (Gd)	346,72 (5)	0,029 (1)
$\gamma_{23,14}$ (Gd)	368,21	0,0030 (2)
$\gamma_{18,7}$ (Gd)	370,71	0,0056 (14)
$\gamma_{22,11}$ (Gd)	375,2 (5)	0,0020 (8)
$\gamma_{23,13}$ (Gd)	382,00 (5)	0,0099 (4)
$\gamma_{24,13}$ (Gd)	397,1	0,029 (1)
$\gamma_{16,6}$ (Gd)	401,259 (14)	0,189 (3)
$\gamma_{20,8}$ (Gd)	403,55 (5)	0,026 (1)
$\gamma_{(-1,8)}$ (Gd)	414,3	0,0049 (6)
$\gamma_{24,11}$ (Gd)	419,4	0,0034 (20)
$\gamma_{(-1,9)}$ (Gd)	422,1	0,0022 (9)
$\gamma_{(-1,10)}$ (Gd)	435,9	0,0038 (10)
$\gamma_{5,2}$ (Gd)	444,4924 (19)	0,560 (8)
$\gamma_{32,17}$ (Gd)	463,9	0,0042 (3)
$\gamma_{26,12}$ (Gd)	467,84 (5)	0,0604 (24)
$\gamma_{26,11}$ (Gd)	478,27 (5)	0,224 (3)
$\gamma_{22,9}$ (Gd)	480,61	0,0048 (3)

	Energy keV	Photons per 100 disint.
$\gamma_{20,7}(\text{Gd})$	483,74	0,0050 (3)
$\gamma_{(-1,11)}(\text{Gd})$	484,64	0,0039 (2)
$\gamma_{22,8}(\text{Gd})$	488,26	0,007 (3)
$\gamma_{27,13}(\text{Gd})$	506,4	0,0063 (14)
$\gamma_{(-1,12)}(\text{Gd})$	510	0,059 (7)
$\gamma^{\pm}$	511	
$\gamma_{(-1,13)}(\text{Gd})$	512	0,032 (7)
$\gamma_{23,8}(\text{Gd})$	518,00 (5)	0,047 (2)
$\gamma_{29,13}(\text{Gd})$	533,1	0,004 (3)
$\gamma_{24,8}(\text{Gd})$	533,1	0,007 (2)
$\gamma_{13,4}(\text{Gd})$	545,6	0,014 (2)
$\gamma_{3,1}(\text{Gd})$	557,58 (5)	0,267 (5)
$\gamma_{21,6}(\text{Gd})$	563,4	0,0028 (7)
$\gamma_{22,7}(\text{Gd})$	569,23	0,0100 (8)
$\gamma_{16,5}(\text{Gd})$	582,01 (5)	0,886 (11)
$\gamma_{26,8}(\text{Gd})$	591,755 (3)	4,95 (5)
$\gamma_{31,13}(\text{Gd})$	597,5	0,0055 (3)
$\gamma_{23,7}(\text{Gd})$	598,3	0,0062 (7)
$\gamma_{17,5}(\text{Gd})$	600	0,006 (4)
$\gamma_{18,5}(\text{Gd})$	602,81 (5)	0,0033 (2)
$\gamma_{24,7}(\text{Gd})$	613,26 (5)	0,093 (4)
$\gamma_{22,6}(\text{Gd})$	620,52	0,091 (5)
$\gamma_{6,2}(\text{Gd})$	625,2556 (24)	0,317 (5)
$\gamma_{27,8}(\text{Gd})$	642,4	0,0044 (17)
$\gamma_{23,6}(\text{Gd})$	649,44 (5)	0,078 (3)
$\gamma_{25,7}(\text{Gd})$	650,6	0,0098 (4)
$\gamma_{24,6}(\text{Gd})$	664,68 (5)	0,029 (1)
$\gamma_{29,8}(\text{Gd})$	668,9	0,013 (2)
$\gamma_{7,2}(\text{Gd})$	676,596 (12)	0,157 (11)
$\gamma_{5,1}(\text{Gd})$	692,4205 (18)	1,79 (3)
$\gamma_{20,5}(\text{Gd})$	715,77 (3)	0,19 (1)
$\gamma_{26,6}(\text{Gd})$	723,3014 (22)	20,05 (21)
$\gamma_{(-1,14)}(\text{Gd})$	737,6	0,0063 (24)
$\gamma_{8,2}(\text{Gd})$	756,8020 (23)	4,53 (5)
$\gamma_{27,6}(\text{Gd})$	774,4	0,008 (4)
$\gamma_{30,7}(\text{Gd})$	790,2	0,010 (3)
$\gamma_{29,6}(\text{Gd})$	800,2	0,032 (5)
$\gamma_{22,5}(\text{Gd})$	801,21 (4)	0,012 (3)
$\gamma_{5,0}(\text{Gd})$	815,53 (5)	0,512 (7)
$\gamma_{(-1,15)}(\text{Gd})$	830,3	0,008 (3)
$\gamma_{24,5}(\text{Gd})$	845,416 (7)	0,586 (9)
$\gamma_{20,3}(\text{Gd})$	850,64 (3)	0,241 (4)
$\gamma_{6,1}(\text{Gd})$	873,1834 (23)	12,17 (12)
$\gamma_{12,2}(\text{Gd})$	880,60 (3)	0,081 (4)
$\gamma_{13,2}(\text{Gd})$	892,775 (6)	0,514 (7)
$\gamma_{33,6}(\text{Gd})$	898,36	0,0020 (5)
$\gamma_{26,5}(\text{Gd})$	904,064 (3)	0,890 (11)

	Energy keV	Photons per 100 disint.
$\gamma_{14,2}$ (Gd)	906,1	0,0118 (6)
$\gamma_{(-1,16)}$ (Gd)	919,24	0,012 (1)
$\gamma_{7,1}$ (Gd)	924,63 (5)	0,062 (2)
$\gamma_{(-1,17)}$ (Gd)	928,4	0,0045 (21)
$\gamma_{29,5}$ (Gd)	981,3 (5)	0,0084 (17)
$\gamma_{(-1,18)}$ (Gd)	984,5	0,0094 (21)
$\gamma_{6,0}$ (Gd)	996,25 (5)	10,5 (1)
$\gamma_{8,1}$ (Gd)	1004,718 (7)	17,86 (18)
$\gamma_{9,1}$ (Gd)	1012,8 (2)	0,003 (1)
$\gamma_{30,5}$ (Gd)	1023 (1)	0,0066 (25)
$\gamma_{(-1,19)}$ (Gd)	1033,4	0,0119 (7)
$\gamma_{18,2}$ (Gd)	1047,4 (1)	0,049 (3)
$\gamma_{(-1,20)}$ (Gd)	1049,4 (1)	0,0172 (8)
$\gamma_{(-1,21)}$ (Gd)	1072,2	0,0035 (14)
$\gamma_{10,1}$ (Gd)	1110	0,003 (2)
$\gamma_{11,1}$ (Gd)	1118,52 (6)	0,108 (14)
$\gamma_{(-1,22)}$ (Gd)	1124,2	0,0069 (10)
$\gamma_{12,1}$ (Gd)	1128,552 (7)	0,317 (5)
$\gamma_{9,0}$ (Gd)	1136,1	0,007 (1)
$\gamma_{13,1}$ (Gd)	1140,702 (6)	0,235 (4)
$\gamma_{(-1,23)}$ (Gd)	1153,1 (5)	0,011 (4)
$\gamma_{20,2}$ (Gd)	1160,36 (8)	0,0436 (21)
$\gamma_{15,1}$ (Gd)	1170,7 (5)	0,0036 (10)
$\gamma_{21,2}$ (Gd)	1188,34 (17)	0,093 (7)
$\gamma_{(-1,25)}$ (Gd)	1216,8	0,0033 (10)
$\gamma_{(-1,24)}$ (Gd)	1232,1 (5)	0,008 (5)
$\gamma_{11,0}$ (Gd)	1241,43 (10)	0,133 (6)
$\gamma_{22,2}$ (Gd)	1246,121 (4)	0,862 (11)
$\gamma_{16,1}$ (Gd)	1274,429 (4)	34,9 (3)
$\gamma_{24,2}$ (Gd)	1290,5 (1)	0,025 (3)
$\gamma_{17,1}$ (Gd)	1292,0 (2)	0,0127 (5)
$\gamma_{18,1}$ (Gd)	1295,5 (2)	0,0091 (10)
$\gamma_{(-1,26)}$ (Gd)	1316,4 (3)	0,017 (4)
$\gamma_{19,1}$ (Gd)	1387,0 (5)	0,019 (2)
$\gamma_{27,2}$ (Gd)	1397,34 (5)	0,0031 (8)
$\gamma_{20,1}$ (Gd)	1408,5 (2)	0,023 (3)
$\gamma_{17,0}$ (Gd)	1415,0 (5)	0,040 (2)
$\gamma_{18,0}$ (Gd)	1418,6 (2)	0,011 (2)
$\gamma_{28,2}$ (Gd)	1419,0 (2)	0,0020 (1)
$\gamma_{29,2}$ (Gd)	1425,9 (5)	0,0012 (7)
$\gamma_{31,2}$ (Gd)	1489,6 (2)	0,0029 (4)
$\gamma_{22,1}$ (Gd)	1494,048 (4)	0,698 (9)
$\gamma_{19,0}$ (Gd)	1510,0 (5)	0,0048 (10)
$\gamma_{33,2}$ (Gd)	1522 (1)	0,0006 (3)
$\gamma_{20,0}$ (Gd)	1531,4 (2)	0,0060 (4)
$\gamma_{24,1}$ (Gd)	1537,81 (4)	0,053 (2)
$\gamma_{(-1,27)}$ (Gd)	1554	0,0011 (5)

	Energy keV	Photons per 100 disint.
$\gamma_{26,1}$ (Gd)	1596,4804 (28)	1,783 (17)
$\gamma_{28,1}$ (Gd)	1667,3 (2)	0,0019 (3)
$\gamma_{29,1}$ (Gd)	1674,0 (5)	0,0017 (4)
$\gamma_{30,1}$ (Gd)	1716,9 (5)	0,0006 (3)
$\gamma_{33,1}$ (Gd)	1773 (1)	0,00035 (21)
$\gamma_{30,0}$ (Gd)	1838,0 (5)	0,0008 (2)
$\gamma_{33,0}$ (Gd)	1895 (1)	0,0006 (2)

## 6 Main Production Modes

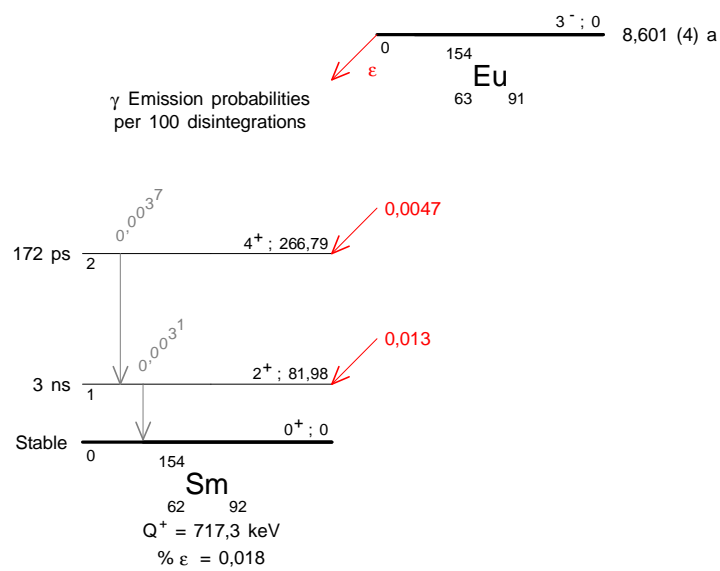
$$\left\{ \begin{array}{l} \text{Eu} - 153(n,\gamma)\text{Eu} - 154 \\ \text{Possible impurities : Eu} - 152, \text{Eu} - 155 \end{array} \right.$$

## 7 References

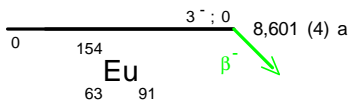
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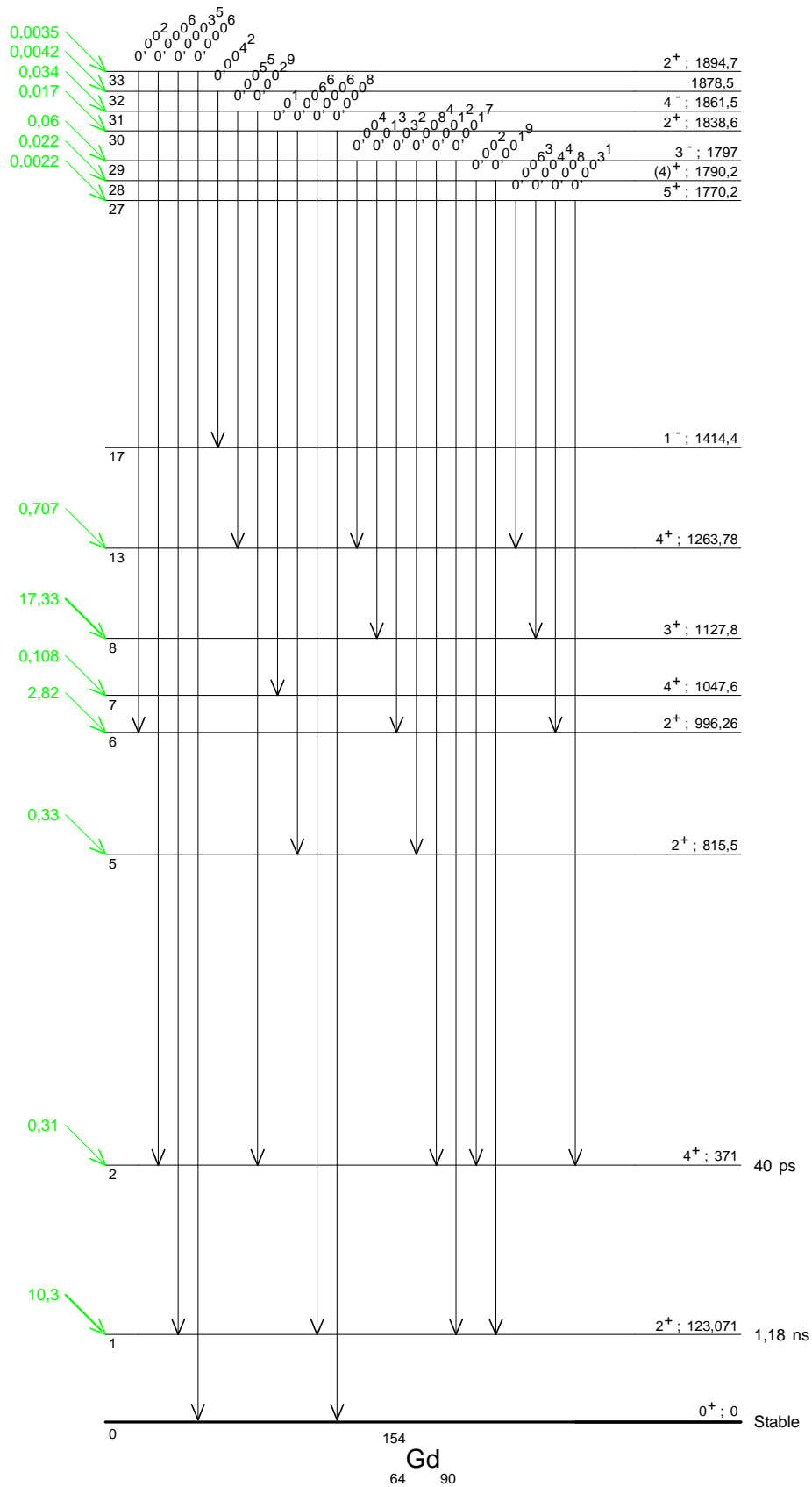
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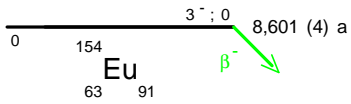




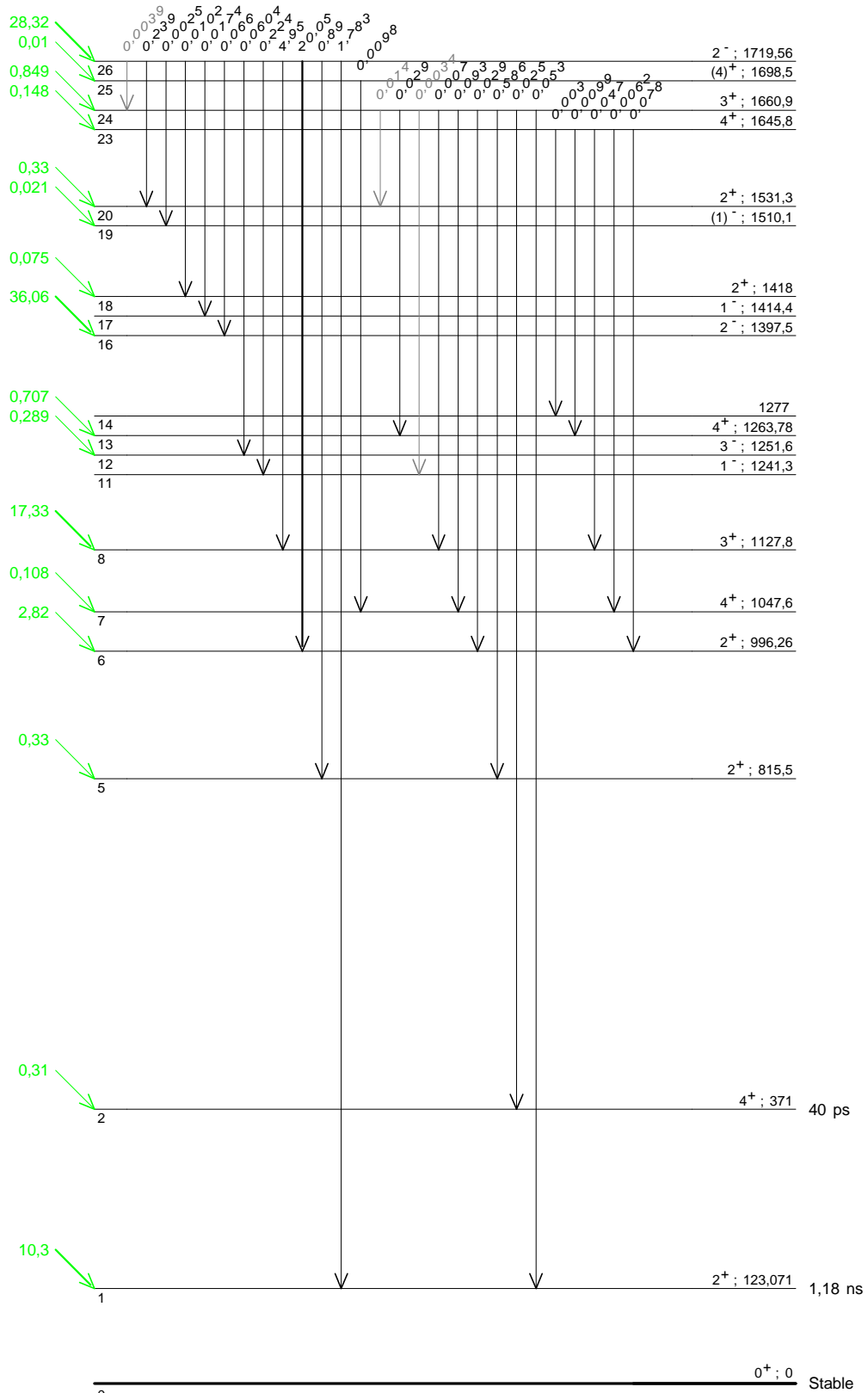


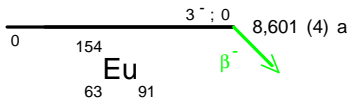
γ Emission probabilities per 100 disintegrations



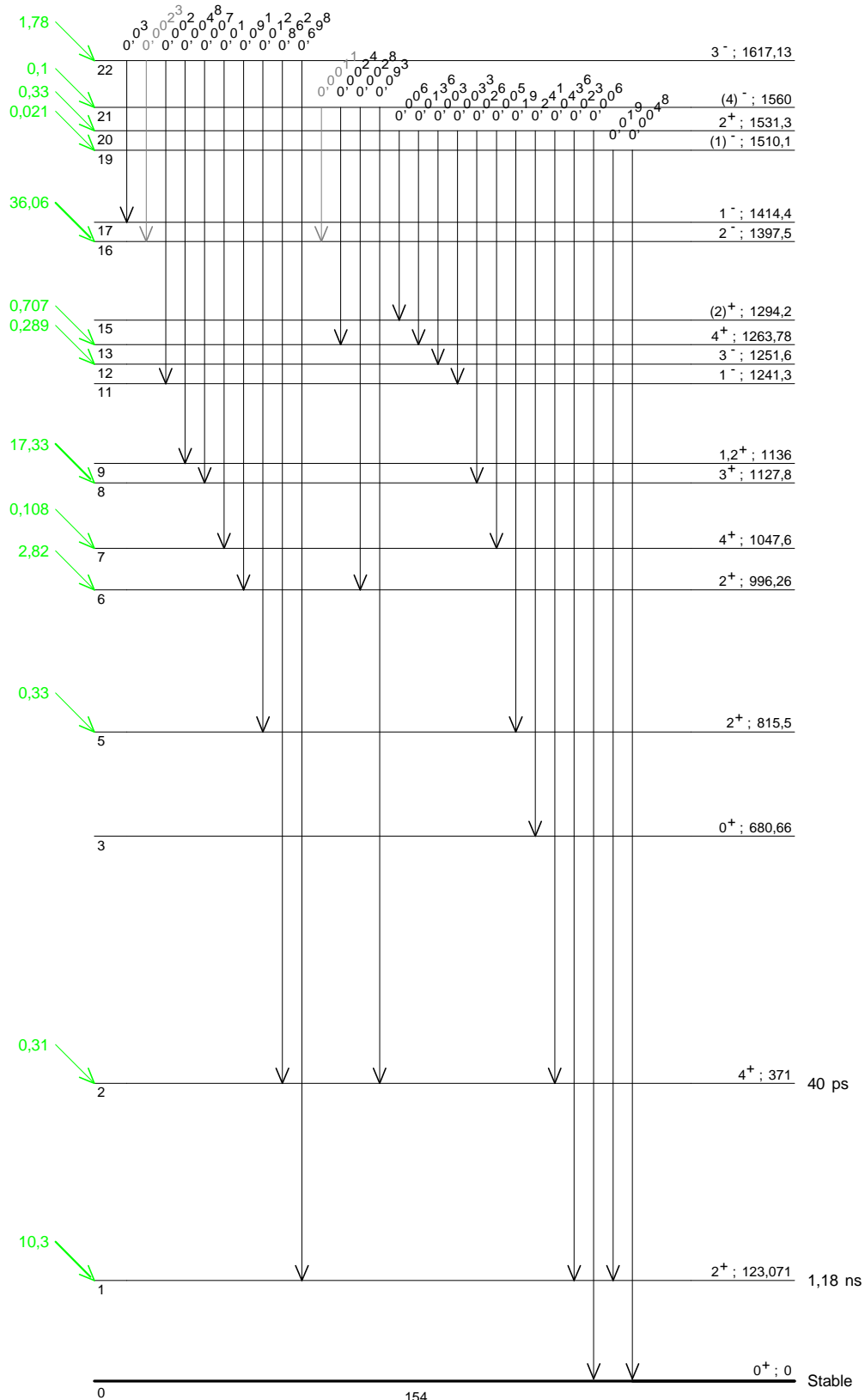


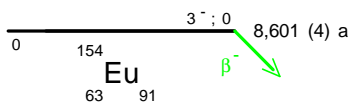
$\gamma$  Emission probabilities per 100 disintegrations



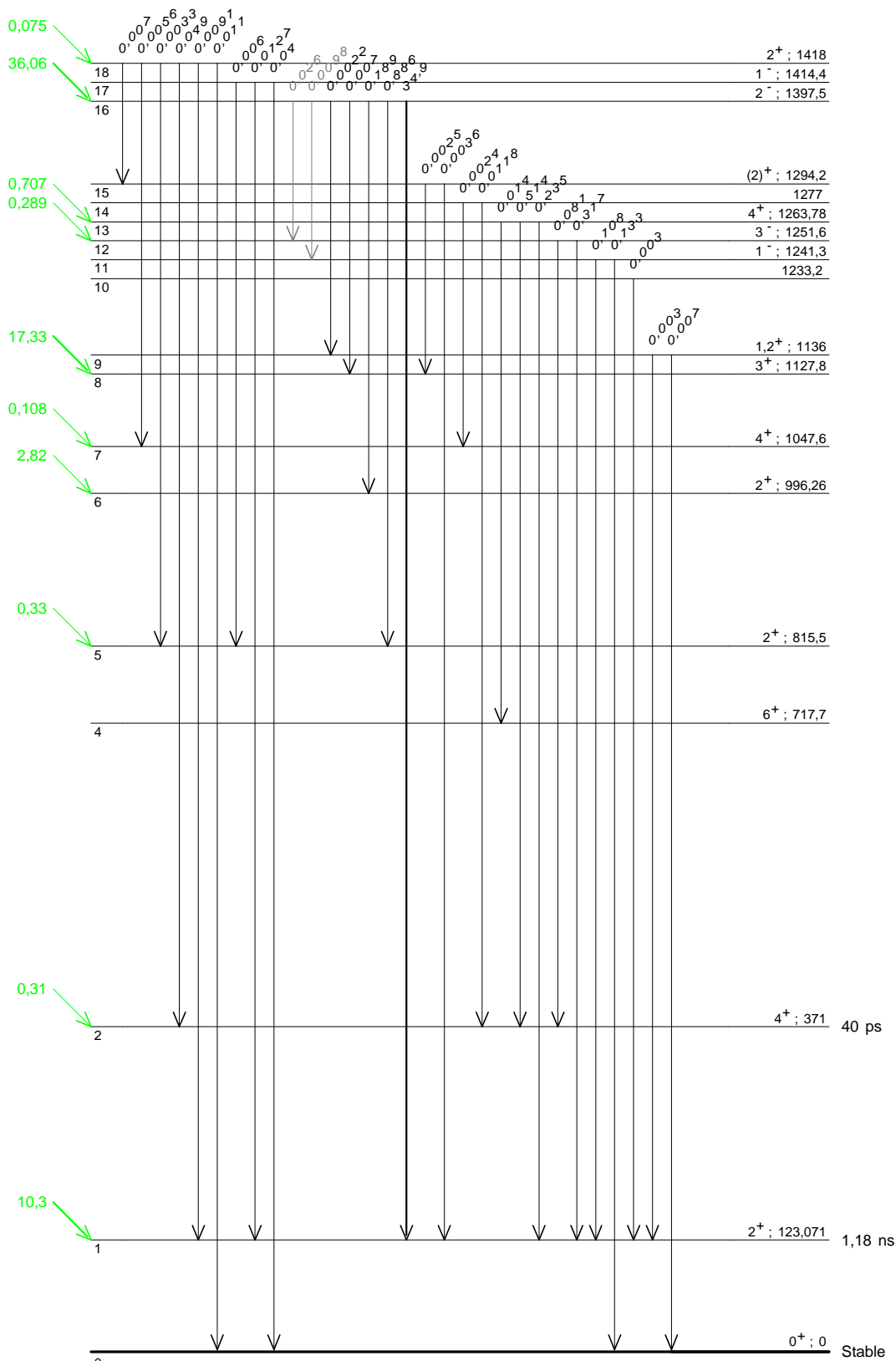


$\gamma$  Emission probabilities per 100 disintegrations

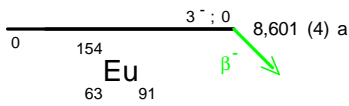




γ Emission probabilities per 100 disintegrations



Q<sup>-</sup> = 1968,4 keV  
% β<sup>-</sup> = 99,982



$\gamma$  Emission probabilities per 100 disintegrations

