$^{153}_{62}\mathrm{Sm}_{91}$

1 Decay Scheme

Sm-153 disintegrates via 3 main branches and at least 15 others very weak branches by 100% beta-emission to levels in Eu-153.
Le samarium 153 se désintègre, par émission bêta moins, vers l'europium 153 avec 3 branchements principaux et au moins 15 autres de faible intensité.

2 Nuclear Data

$T_{1/2}(^{153}\mathrm{Sm}\ )$: 1,92855 (5) d
$Q^{-}(^{153}\mathrm{Sm}\ )$: 807,6 (7) keV

2.1 β^{-} Transitions

	Energy keV	Probability × 100	Nature	lg ft
$\beta^{-}_{0,18}$	44,0 (7)	0,000044 (12)		8,9
$\beta^{-}_{0,17}$	47,2 (8)	0,00098 (5)		7,9
$\beta^{-}_{0,16}$	88,9 (8)	0,00143 (10)	Allowed	8,4
$\beta^{-}_{0,15}$	94,5 (8)	0,0141 (5)		7,4
$\beta^{-}_{0,14}$	101,0 (8)	0,0241 (7)	Allowed	7,3
$\beta^{-}_{0,13}$	106,1 (8)	0,0076 (6)		8,8
$\beta^{-}_{0,12}$	113,4 (7)	0,0221 (8)	Allowed	7,4
$\beta^{-}_{0,11}$	125,7 (7)	0,0083 (6)	1st forbidden	7,9
$\beta^{-}_{0,10}$	149,9 (8)	0,00090 (6)		9,3
$\beta^{-}_{0,9}$	171,1 (7)	0,0641 (6)	1st forbidden	7,5
$\beta^{-}_{0,8}$	172,9 (8)	0,0565 (7)	Allowed	7,6
$\beta^{-}_{0,7}$	222,6 (8)	0,00227 (5)		9,4
$\beta^{-}_{0,6}$	537,8 (7)	0,0216 (3)	2nd forbidden	11
$\beta^{-}_{0,5}$	634,7 (7)	30,4 (8)	Allowed	6,7
$\beta^{-}_{0,4}$	656,0 (7)	0,042 (8)	Unique 1st forbidden	10
$\beta^{-}_{0,3}$	704,7 (7)	49,2 (17)	Allowed	6,7

	Energy keV	Probability × 100	Nature	lg ft
$\beta^-_{0,2}$	710,2 (7)	0,62 (8)	1st forbidden	8,6
$\beta^-_{0,0}$	807,6 (7)	19,5 (15)	Allowed	7,3

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy keV	$P_{\gamma+ce}$ × 100	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{2,1}$(Eu)	14,06383 (24)		E1		8,43 (25)	1,90 (6)	10,78 (32)
$\gamma_{3,1}$(Eu)	19,81296 (21)	0,34 (7)	E2		2490 (70)	578 (17)	3220 (100)
$\gamma_{4,2}$(Eu)	54,1947 (5)	0,036 (8)	M1+E2	6,19 (19)	9,30 (28)	2,17 (7)	18,2 (5)
$\gamma_{4,1}$(Eu)	68,2585 (12)	0,0023 (7)	E1	0,648 (19)	0,1040 (31)	0,0225 (7)	0,781 (23)
$\gamma_{5,3}$(Eu)	69,67300 (13)	29,5 (8)	M1+1,82%E2	4,37 (13)	0,719 (22)	0,1571 (47)	5,28 (16)
$\gamma_{5,2}$(Eu)	75,42213 (21)	0,296 (13)	E1+0,3%M2	0,610 (18)	0,1111 (33)	0,0245 (7)	0,752 (23)
$\gamma_{1,0}$(Eu)	83,36717 (17)	0,915 (35)	M1+40%E2	2,30 (7)	1,119 (34)	0,258 (8)	3,74 (11)
$\gamma_{5,1}$(Eu)	89,48595 (21)	0,57 (6)	M1+5,8%E2	2,10 (6)	0,383 (11)	0,0845 (25)	2,59 (8)
$\gamma_{6,5}$(Eu)	96,8838 (7)	0,024 (4)	M1+E2	1,475 (44)	0,68 (2)	0,1570 (47)	2,35 (10)
$\gamma_{2,0}$(Eu)	97,43100 (21)	0,999 (19)	E1	0,254 (8)	0,0382 (11)	0,00823 (25)	0,302 (9)
$\gamma_{3,0}$(Eu)	103,18012 (17)	78,5 (15)	M1+1,4%E2	1,417 (43)	0,213 (6)	0,0462 (14)	1,69 (5)
$\gamma_{6,4}$(Eu)	118,1105 (10)	0,00027 (7)	[E1]	0,1516 (45)	0,0223 (7)	0,00479 (14)	0,180 (5)
$\gamma_{4,0}$(Eu)	151,6257 (5)	0,01128 (30)	E1	0,0775 (23)	0,01112 (33)	0,00239 (7)	0,0916 (27)
$\gamma_{6,3}$(Eu)	166,5568 (15)	0,00085 (8)	[E2]	0,263 (8)	0,1034 (31)	0,0238 (7)	0,396 (12)
$\gamma_{6,2}$(Eu)	172,3060 (7)	0,000426	(E1)	0,0551 (17)	0,00782 (23)	0,00168 (5)	0,065 (2)
$\gamma_{5,0}$(Eu)	172,85320 (13)	0,1012 (30)	M1+40%E2	0,293 (9)	0,0638 (19)	0,01427 (43)	0,375 (11)
$\gamma_{7,5}$(Eu)	412,17 (15)	0,00191 (5)					
$\gamma_{12,6}$(Eu)	424,45 (11)	0,00195 (6)					
$\gamma_{14,6}$(Eu)	436,89 (9)	0,00158 (5)					
$\gamma_{15,6}$(Eu)	443,38 (20)	0,00041 (32)					
$\gamma_{8,5}$(Eu)	461,81 (12)	0,00158 (26)					
$\gamma_{9,5}$(Eu)	463,62 (10)	0,01270 (24)					
$\gamma_{10,5}$(Eu)	484,82 (14)	0,00038 (3)					
$\gamma_{7,2}$(Eu)	487,59 (15)	0,00036					
$\gamma_{11,5}$(Eu)	509,06 (10)	0,00190 (18)					
$\gamma_{12,5}$(Eu)	521,34 (11)	0,0067 (1)					
$\gamma_{8,3}$(Eu)	531,47 (12)	0,0544 (7)					
$\gamma_{9,3}$(Eu)	533,29 (10)	0,0294 (5)					
$\gamma_{9,2}$(Eu)	539,04 (10)	0,02070 (21)					
$\gamma_{12,4}$(Eu)	542,56 (11)	0,00234 (10)					
$\gamma_{16,5}$(Eu)	545,84 (14)	0,0009 (1)					
$\gamma_{14,4}$(Eu)	555,01 (9)	0,0047 (1)					
$\gamma_{10,1}$(Eu)	574,31 (14)	0,00016 (5)					
$\gamma_{11,3}$(Eu)	578,73 (10)	0,0034 (5)					
$\gamma_{11,2}$(Eu)	584,48 (10)	0,00107 (3)					
$\gamma_{17,5}$(Eu)	587,54 (17)	0,00048 (4)					
$\gamma_{12,3}$(Eu)	591,01 (11)	0,00122 (9)					
$\gamma_{12,2}$(Eu)	596,76 (11)	0,0099 (8)					
$\gamma_{13,3}$(Eu)	598,28 (24)	0,0020 (1)					
$\gamma_{11,1}$(Eu)	598,51 (8)	0,0020 (1)					
$\gamma_{14,3}$(Eu)	603,45 (9)	0,0049 (6)					
$\gamma_{13,2}$(Eu)	604,03 (24)	0,0049 (6)					
$\gamma_{14,2}$(Eu)	609,20 (9)	0,0129 (4)					
$\gamma_{15,3}$(Eu)	609,95 (20)	0,0129 (4)					
$\gamma_{16,3}$(Eu)	615,51 (14)	0,00050 (6)					
$\gamma_{15,2}$(Eu)	615,69 (20)	0,00050 (6)					
$\gamma_{13,1}$(Eu)	618,09 (24)	0,00067 (6)					

	Energy keV	$P_{\gamma+ce}$ × 100	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{15,1}$(Eu)	629,75 (20)	0,000099 (15)					
$\gamma_{8,0}$(Eu)	634,66 (12)	0,00050 (3)					
$\gamma_{9,0}$(Eu)	636,47 (10)	0,00195 (7)					
$\gamma_{17,3}$(Eu)	657,21 (7)	0,00037 (2)					
$\gamma_{10,0}$(Eu)	657,67 (25)	0,00037 (2)					
$\gamma_{17,2}$(Eu)	662,96 (17)	0,00007 (7)					
$\gamma_{17,1}$(Eu)	677,02 (17)	0,000044 (15)					
$\gamma_{11,0}$(Eu)	681,88 (8)	0,00015 (12)					
$\gamma_{12,0}$(Eu)	694,19 (11)	0,000020 (6)					
$\gamma_{13,0}$(Eu)	701,46 (24)	0,000029 (6)					
$\gamma_{14,0}$(Eu)	706,63 (9)	0,000023 (12)					
$\gamma_{15,0}$(Eu)	713,12	0,000231 (20)					
$\gamma_{16,0}$(Eu)	718,69 (14)	0,000025 (5)					
$\gamma_{17,0}$(Eu)	760,39 (17)	0,000032 (5)					
$\gamma_{18,0}$(Eu)	763,8 (8)	0,000044 (12)					

3 Atomic Data

3.1 Eu

ω_K : 0,929 (4)
$\bar{\omega}_L$: 0,168 (7)
n_{KL} : 0,853 (4)

3.1.1 X Radiations

		Energy keV		Relative probability
X_K				
	$K\alpha_2$	40,9024		55,42
	$K\alpha_1$	41,5427		100
	$K\beta_3$	46,904	}	
	$K\beta_1$	47,0384	}	
	$K\beta_5''$	47,373	}	31,5
	$K\beta_2$	48,257	}	
	$K\beta_4$	48,386	}	8,13
	$KO_{2,3}$	48,497	}	
X_L				
	$L\ell$	5,175		
	$L\alpha$	5,815 – 5,8461		
	$L\eta$	5,8149		
	$L\beta$	6,4365 – 6,9193		
	$L\gamma$	7,2538 – 7,791		

3.1.2 Auger Electrons

	Energy keV	Relative probability
Auger K		
KLL	32,24 – 34,38	100
KLX	38,59 – 41,52	51
KXY	44,9 – 48,5	6,5
Auger L	3,4 – 7,8	1870

4 Electron Emissions

		Energy keV	Electrons per 100 disint.
e_{AL}	(Eu)	3,4 - 7,8	53,0 (5)
e_{AK}	(Eu)		4,47 (28)
	KLL	32,24 - 34,38 }	
	KLX	38,59 - 41,52 }	
	KXY	44,9 - 48,5 }	
$ec_{3,1\ L}$	(Eu)	11,76 - 12,84	0,26 (6)
$ec_{3,1\ M}$	(Eu)	18,00 - 18,68	0,061 (13)
$ec_{5,3\ T}$	(Eu)	21,154 - 69,650	24,8 (8)
$ec_{5,3\ K}$	(Eu)	21,154 (2)	20,5 (6)
$ec_{5,2\ K}$	(Eu)	26,903 (2)	0,103 (5)
$ec_{1,0\ K}$	(Eu)	34,848 (1)	0,444 (19)
$ec_{5,1\ K}$	(Eu)	40,967 (1)	0,332 (33)
$ec_{2,0\ K}$	(Eu)	48,912 (1)	0,195 (7)
$ec_{3,0\ T}$	(Eu)	54,661 - 103,160	49,3 (15)
$ec_{3,0\ K}$	(Eu)	54,661 (1)	41,4 (13)
$ec_{5,3\ L}$	(Eu)	61,62 - 62,69	3,37 (11)
$ec_{5,3\ M}$	(Eu)	67,90 - 68,54	0,737 (23)
$ec_{5,3\ N}$	(Eu)	69,31 - 69,54	0,168 (5)
$ec_{1,0\ L}$	(Eu)	75,31 - 76,39	0,216 (9)
$ec_{5,1\ L}$	(Eu)	81,43 - 82,51	0,061 (6)
$ec_{3,0\ L}$	(Eu)	95,13 - 96,20	6,22 (18)
$ec_{3,0\ M}$	(Eu)	101,40 - 102,05	1,349 (42)
$ec_{3,0\ N}$	(Eu)	102,82 - 103,05	0,309 (9)
$\beta^-_{0,18}$	max:	44,0 (7)	0,000044 (12)
$\beta^-_{0,18}$	avg:	11,1 (3)	
$\beta^-_{0,17}$	max:	47,2 (8)	0,00098 (5)
$\beta^-_{0,17}$	avg:	12,0 (2)	

		Energy keV		Electrons per 100 disint.
$\beta^-_{0,16}$	max:	88,9	(8)	0,00143 (10)
$\beta^-_{0,16}$	avg:	23,1	(2)	
$\beta^-_{0,15}$	max:	94,5	(8)	0,0141 (5)
$\beta^-_{0,15}$	avg:	24,6	(2)	
$\beta^-_{0,14}$	max:	101,0	(8)	0,0241 (7)
$\beta^-_{0,14}$	avg:	26,4	(3)	
$\beta^-_{0,13}$	max:	106,1	(8)	0,0076 (6)
$\beta^-_{0,13}$	avg:	27,8	(2)	
$\beta^-_{0,12}$	max:	113,4	(7)	0,0221 (8)
$\beta^-_{0,12}$	avg:	29,8	(2)	
$\beta^-_{0,11}$	max:	125,7	(7)	0,0083 (6)
$\beta^-_{0,11}$	avg:	33,2	(2)	
$\beta^-_{0,10}$	max:	149,9	(8)	0,00090 (6)
$\beta^-_{0,10}$	avg:	40,1	(2)	
$\beta^-_{0,9}$	max:	171,1	(7)	0,0641 (6)
$\beta^-_{0,9}$	avg:	46,1	(2)	
$\beta^-_{0,8}$	max:	172,9	(8)	0,0565 (7)
$\beta^-_{0,8}$	avg:	46,7	(2)	
$\beta^-_{0,7}$	max:	222,6	(8)	0,00227 (5)
$\beta^-_{0,7}$	avg:	61,3	(3)	
$\beta^-_{0,6}$	max:	537,8	(7)	0,0216 (3)
$\beta^-_{0,6}$	avg:	164,7	(3)	
$\beta^-_{0,5}$	max:	634,7	(7)	30,4 (8)
$\beta^-_{0,5}$	avg:	199,7	(3)	
$\beta^-_{0,4}$	max:	656,0	(7)	0,042 (8)
$\beta^-_{0,4}$	avg:	221,2	(3)	
$\beta^-_{0,3}$	max:	704,7	(7)	49,2 (17)
$\beta^-_{0,3}$	avg:	225,3	(3)	
$\beta^-_{0,2}$	max:	710,2	(7)	0,62 (8)
$\beta^-_{0,2}$	avg:	227,4	(3)	
$\beta^-_{0,0}$	max:	807,6	(7)	19,5 (15)
$\beta^-_{0,0}$	avg:	264,3	(3)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy keV		Photons per 100 disint.	
XL	(Eu)	5,175 — 7,791		10,88 (21)	
XKα_2	(Eu)	40,9024		16,6 (4)	} Kα
XKα_1	(Eu)	41,5427		30,0 (7)	}
XKβ_3	(Eu)	46,904	}		
XKβ_1	(Eu)	47,0384	}	9,45 (25)	K$'\beta_1$
XKβ''_5	(Eu)	47,373	}		
XKβ_2	(Eu)	48,257	}		
XKβ_4	(Eu)	48,386	}	2,44 (8)	K$'\beta_2$
XKO$_{2,3}$	(Eu)	48,497	}		

5.2 Gamma Emissions

	Energy keV	Photons per 100 disint.
$\gamma_{3,1}$(Eu)	19,81296 (21)	0,000105 (22)
$\gamma_{4,2}$(Eu)	54,1936 (12)	0,0019 (4)
$\gamma_{4,1}$(Eu)	68,2574 (12)	0,0013 (4)
$\gamma_{5,3}$(Eu)	69,67300 (13)	4,691 (41)
$\gamma_{5,2}$(Eu)	75,42213 (23)	0,169 (7)
$\gamma_{1,0}$(Eu)	83,36717 (21)	0,193 (6)
$\gamma_{5,1}$(Eu)	89,48595 (22)	0,158 (15)
$\gamma_{6,5}$(Eu)	96,8824 (7)	0,007 (1)
$\gamma_{2,0}$(Eu)	97,43100 (21)	0,767 (14)
$\gamma_{3,0}$(Eu)	103,18012 (17)	29,19 (16)
$\gamma_{6,4}$(Eu)	118,1105 (10)	0,00023 (6)
$\gamma_{4,0}$(Eu)	151,6244 (12)	0,01033 (27)
$\gamma_{6,3}$(Eu)	166,5546 (15)	0,00061 (6)
$\gamma_{6,2}$(Eu)	172,3032 (13)	0,0004
$\gamma_{5,0}$(Eu)	172,85307 (21)	0,0736 (21)
$\gamma_{7,5}$(Eu)	412,05 (20)	0,00191 (5)
$\gamma_{12,6}$(Eu)	424,4 (3)	0,00195 (6)
$\gamma_{14,6}$(Eu)	436,9 (3)	0,00158 (5)
$\gamma_{15,6}$(Eu)	443,2 (5)	0,00041 (32)
$\gamma_{8,5}$(Eu)	462,0 (3)	0,00158 (26)
$\gamma_{9,5}$(Eu)	463,6 (2)	0,01270 (24)
$\gamma_{10,5}$(Eu)	485,0 (2)	0,00038 (3)
$\gamma_{7,2}$(Eu)	487,75 (23)	0,00036
$\gamma_{11,5}$(Eu)	509,15 (20)	0,00190 (18)
$\gamma_{12,5}$(Eu)	521,30 (25)	0,0067 (1)

	Energy keV	Photons per 100 disint.
$\gamma_{8,3}$(Eu)	531,40 (15)	0,0544 (7)
$\gamma_{9,3}$(Eu)	533,2 (2)	0,0294 (5)
$\gamma_{9,2}$(Eu)	539,1 (2)	0,02070 (21)
$\gamma_{12,4}$(Eu)	542,7 (2)	0,00234 (10)
$\gamma_{16,5}$(Eu)	545,75 (15)	0,0009 (1)
$\gamma_{14,4}$(Eu)	554,94 (10)	0,0047 (1)
$\gamma_{10,1}$(Eu)	574,1 (3)	0,00016 (5)
$\gamma_{11,3}$(Eu)	578,75 (20)	0,0034 (5)
$\gamma_{11,2}$(Eu)	584,55 (20)	0,00107 (3)
$\gamma_{17,5}$(Eu)	587,60 (25)	0,00048 (4)
$\gamma_{12,3}$(Eu)	590,96 (20)	0,00122 (9)
$\gamma_{12,2}$(Eu)	596,7 (2)	0,0099 (8)
$\gamma_{13,3}$(Eu)	598,3 (3)	0,0020 (1)
$\gamma_{11,1}$(Eu)	598,54 (10)	0,0020 (1)
$\gamma_{14,3}$(Eu)	603,6 (4)	0,0049 (6)
$\gamma_{13,2}$(Eu)	604,03 (24)	0,0049 (6)
$\gamma_{14,2}$(Eu)	609,5 (3)	0,0129 (4)
$\gamma_{15,3}$(Eu)	609,95 (20)	0,0129 (4)
$\gamma_{16,3}$(Eu)	615,51 (14)	0,00050 (6)
$\gamma_{15,2}$(Eu)	615,8 (4)	0,00050 (6)
$\gamma_{13,1}$(Eu)	617,9 (3)	0,00067 (6)
$\gamma_{15,1}$(Eu)	630,5 (4)	0,000099 (15)
$\gamma_{8,0}$(Eu)	634,8 (3)	0,00050 (3)
$\gamma_{9,0}$(Eu)	636,5 (2)	0,00195 (7)
$\gamma_{17,3}$(Eu)	657,21 (7)	0,00037 (2)
$\gamma_{10,0}$(Eu)	657,55 (25)	0,00037 (2)
$\gamma_{17,2}$(Eu)	662,4 (6)	0,00007 (7)
$\gamma_{17,1}$(Eu)	677,0 (3)	0,000044 (15)
$\gamma_{11,0}$(Eu)	682,0 (6)	0,00015 (12)
$\gamma_{12,0}$(Eu)	694,1 (3)	0,000020 (6)
$\gamma_{13,0}$(Eu)	701,8 (4)	0,000029 (6)
$\gamma_{14,0}$(Eu)	706,8 (5)	0,000023 (12)
$\gamma_{15,0}$(Eu)	713,9 (3)	0,000231 (20)
$\gamma_{16,0}$(Eu)	719,0 (4)	0,000025 (5)
$\gamma_{17,0}$(Eu)	760,5 (4)	0,000032 (5)
$\gamma_{18,0}$(Eu)	763,8 (6)	0,000044 (12)

6 Main Production Modes

$\mathrm{Sm-152(n,\gamma)Sm-153}$ $\quad \sigma$: 206 barns
$\mathrm{Nd-150(\alpha,n)Sm-153}$

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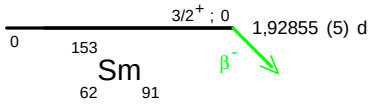
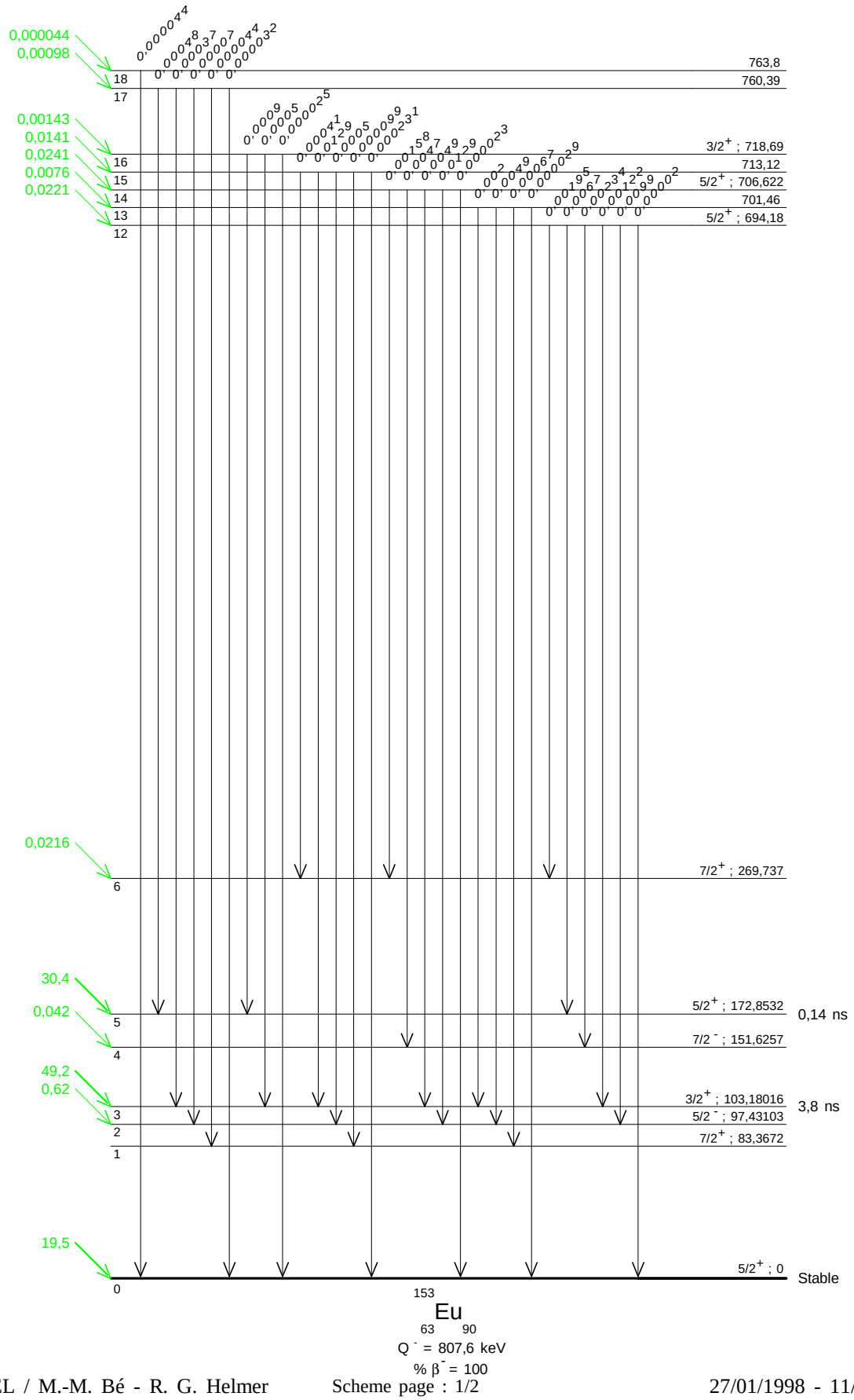
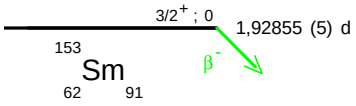
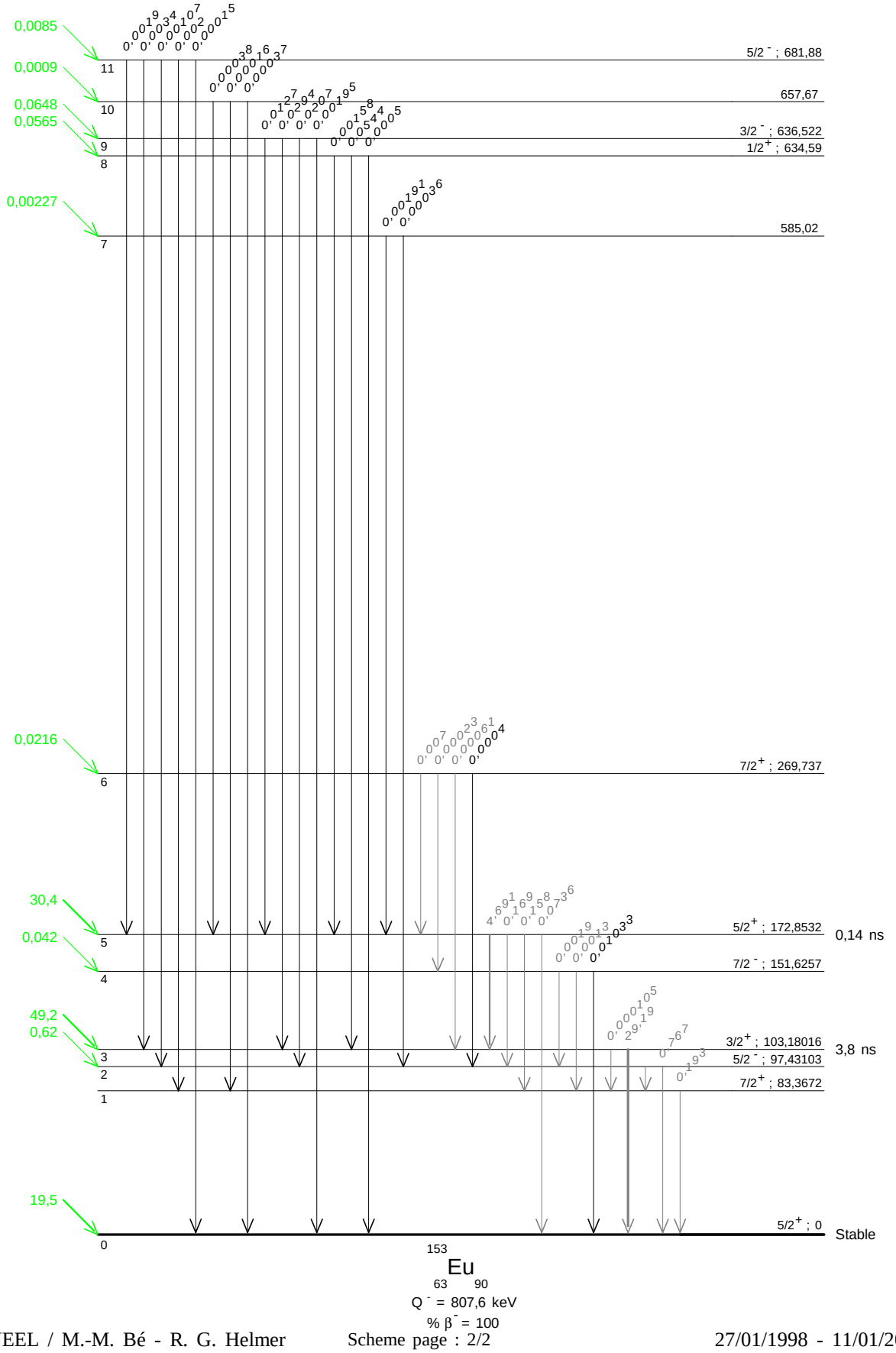


γ Emission intensities per 100 disintegrations





γ Emission intensities per 100 disintegrations



153
Eu
63 90

Q - = 807,6 keV

% β- = 100