166 Ho **m**
67 99

1 Decay Scheme

Ho-166m disintegrates by beta minus emission mainly to the 1827 keV and to the 1786 keV levels of Er-166.

L'holmium166 métastable se désintègre par émission bêta moins, principalement vers les deux niveaux de 1827 keV et 1786 keV de l'erbium 166.

2 Nuclear Data

$T_{1/2}(^{166m}\text{Ho})$	:	1133	(8)	a
$Q^-(^{166m}\text{Ho})$	:	1860,5	(9)	keV

2.1 β^- Transitions

	Energy keV	Probability × 100	Nature	lg ft
$\beta^-_{0,17}$	32,9 (9)	17,2 (4)	Allowed	8,4
$\beta^-_{0,16}$	73,5 (9)	74,8 (12)	Allowed	8,8
$\beta^-_{0,11}$	304,6 (9)	0,394 (5)	1st forbidden	12,9
$\beta^-_{0,10}$	484,5 (9)	0,81 (26)	1st forbidden	13
$\beta^-_{0,9}$	644,5 (9)	2,31 (29)	1st forbidden	13,4
$\beta^-_{0,6}$	949,3 (9)	1,12 (6)	1st forbidden	14,2
$\beta^-_{0,3}$	1315,1 (9)	3,4 (6)	1st forbidden	14,3

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy keV	$P_{\gamma+ce}$ × 100	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{5,4}$(Er)	73,62 (7)	0,212 (14)	M1+E2	5,98 (18)	0,902 (27)	0,201 (6)	7,14 (21)
$\gamma_{1,0}$(Er)	80,580 (3)	99,981 (4)	E2	1,65 (3)	4,01 (8)	0,978 (29)	6,90 (14)
$\gamma_{16,15}$(Er)	94,675 (14)	0,650 (23)	M1+E2	2,89 (9)	0,435 (13)	0,0967 (29)	3,45 (10)
$\gamma_{8,7}$(Er)	119,033 (9)	0,452 (11)	E2+M1	0,888 (27)	0,556 (17)	0,1339 (40)	1,614 (48)
$\gamma_{16,14}$(Er)	121,176 (31)	0,593 (20)	E2	0,663 (20)	0,610 (18)	0,1480 (44)	1,460 (44)
$\gamma_{17,15}$(Er)	135,260 (14)	0,194 (4)	E2	0,493 (15)	0,373 (11)	0,0904 (27)	0,981 (29)
$\gamma_{9,8}$(Er)	140,703 (7)	0,0829 (44)	M1+E2	0,604 (18)	0,256 (8)	0,0611 (18)	0,938 (28)
$\gamma_{10,9}$(Er)	160,039 (7)	0,157 (8)	M1+E2	0,417 (13)	0,1530 (46)	0,0363 (11)	0,616 (18)
$\gamma_{17,14}$(Er)	161,76 (3)	0,166 (6)	E2 (+M1)	0,299 (9)	0,171 (5)	0,0412 (12)	0,522 (16)
$\gamma_{2,1}$(Er)	184,4107 (11)	96,7 (7)	E2	0,205 (6)	0,0984 (30)	0,0236 (7)	0,334 (7)
$\gamma_{16,13}$(Er)	190,86 (7)	0,279 (7)	E2	0,186 (6)	0,0853 (26)	0,0204 (6)	0,297 (9)
$\gamma_{16,12}$(Er)	214,75 (6)	0,534 (13)	E2	0,1318 (40)	0,0526 (16)	0,01254 (38)	0,200 (4)
$\gamma_{8,5}$(Er)	215,869 (8)	3,18 (20)	E2	0,1299 (26)	0,0516 (10)	0,01229 (37)	0,197 (4)
$\gamma_{17,13}$(Er)	231,45 (7)	0,253 (7)	E2	0,1062 (21)	0,0391 (8)	0,00928 (28)	0,157 (3)
$\gamma_{9,7}$(Er)	259,736 (9)	1,195 (11)	E2	0,0762 (15)	0,0249 (5)	0,00589 (18)	0,1087 (22)
$\gamma_{3,2}$(Er)	280,4630 (34)	32,07 (28)	E2	0,0613 (12)	0,0187 (4)	0,00439 (13)	0,0855 (17)
$\gamma_{10,8}$(Er)	300,742 (7)	3,99 (4)	E2	0,0503 (10)	0,0144 (3)	0,00338 (10)	0,0691 (14)
$\gamma_{9,6}$(Er)	304,758 (9)	0,0195 (13)	E2	0,0485 (10)	0,0137 (3)	0,00322 (10)	0,0662 (13)
$\gamma_{11,9}$(Er)	339,75 (5)	0,1694 (24)	E2	0,0359 (7)	0,00930 (19)	0,00217 (7)	0,048 (1)
$\gamma_{6,3}$(Er)	365,768 (8)	2,56 (4)	E2	0,0294 (6)	0,00721 (15)	0,00167 (5)	0,0388 (8)
$\gamma_{16,10}$(Er)	410,955 (9)	11,45 (18)	E1(+M2)	0,00743 (22)	0,001055 (32)	0,000233 (7)	0,00878 (26)
$\gamma_{17,10}$(Er)	451,540 (9)	2,936 (14)	E1(+M2)	0,00599 (18)	0,000846 (25)	0,000187 (6)	0,00707 (21)
$\gamma_{10,6}$(Er)	464,797 (9)	1,28 (4)	M1+E2	0,01579 (47)	0,0033 (1)	0,000758 (23)	0,0201 (6)
$\gamma_{15,9}$(Er)	476,319 (13)	0,0365 (13)	E1	0,00531 (16)	0,000748 (22)	0,000165 (5)	0,00627 (19)
$\gamma_{12,8}$(Er)	496,95 (6)	0,126 (3)	E1(+M2)	0,00483 (15)	0,000679 (20)	0,0001497 (45)	0,00571 (17)
$\gamma_{4,2}$(Er)	520,80 (7)	0,155 (6)	E2	0,01192 (36)	0,00234 (7)	0,000535 (16)	0,0149 (3)
$\gamma_{8,3}$(Er)	529,823 (6)	9,5 (4)	M1+E2	0,01145 (26)	0,00223 (5)	0,000508 (15)	0,0144 (3)
$\gamma_{16,9}$(Er)	570,994 (9)	5,45 (20)	E1(+M2)	0,00358 (11)	0,000498 (15)	0,0001097 (33)	0,00421 (13)
$\gamma_{5,2}$(Er)	594,417 (6)	0,59 (6)	E2+M1	0,00881 (26)	0,001613 (48)	0,000366 (11)	0,01089 (33)
$\gamma_{17,9}$(Er)	611,579 (9)	1,31 (21)	E1(+M2)	0,00309 (9)	0,000429 (13)	0,0000944 (28)	0,00364 (11)
$\gamma_{12,7}$(Er)	615,98 (6)	0,100 (31)	E4	0,0444 (13)	0,0185 (6)	0,00449 (13)	0,0687 (21)
$\gamma_{13,7}$(Er)	639,86 (7)	0,0946 (7)	E1	0,00282 (8)	0,000389 (12)	0,0000857 (26)	0,00331 (10)
$\gamma_{11,6}$(Er)	644,51 (5)	0,145 (4)	E2+M1	0,00810 (24)	0,001384 (42)	0,000312 (9)	0,00989 (30)
$\gamma_{9,3}$(Er)	670,526 (6)	5,38 (21)	E2+M1	0,00666 (20)	0,001161 (35)	0,000262 (8)	0,00816 (24)
$\gamma_{7,2}$(Er)	691,253 (8)	1,33 (7)	E2+M1	0,00620 (19)	0,001069 (32)	0,000241 (7)	0,00758 (23)
$\gamma_{4,1}$(Er)	705,21 (7)	0,014 (7)	E2(+M1)	0,00591 (18)	0,001012 (30)	0,000228 (7)	0,00721 (22)
$\gamma_{16,8}$(Er)	711,697 (9)	55,0 (9)	E1(+M2)	0,00227 (7)	0,000311 (9)	0,0000685 (21)	0,00266 (8)
$\gamma_{12,5}$(Er)	712,89 (13)	0,30 (9)	E1				
$\gamma_{15,7}$(Er)	736,055 (14)	0,14 (2)					
$\gamma_{13,5}$(Er)	736,70 (7)	0,374 (6)	E1	0,00211 (6)	0,000290 (9)	0,0000637 (19)	0,00249 (7)
$\gamma_{17,8}$(Er)	752,282 (9)	12,2 (3)	E1(+M2)	0,00203 (6)	0,000278 (8)	0,0000611 (18)	0,00238 (7)
$\gamma_{5,1}$(Er)	778,828 (6)	3,03 (8)	E2+M1	0,00477 (14)	0,000788 (24)	0,000177 (5)	0,00579 (17)
$\gamma_{4,0}$(Er)	785,78 (7)	0,019 (4)	E2	0,00467 (14)	0,000769 (23)	0,000173 (5)	0,00566 (17)
$\gamma_{8,2}$(Er)	810,286 (5)	57,6 (11)	E2+M1	0,00438 (9)	0,00071 (2)	0,0001603 (48)	0,0053 (1)
$\gamma_{10,3}$(Er)	830,565 (6)	9,77 (18)	E2+M1	0,00416 (12)	0,000673 (20)	0,0001509 (45)	0,00503 (15)
$\gamma_{7,1}$(Er)	875,664 (8)	0,724 (9)	E2	0,00371 (11)	0,000592 (18)	0,0001324 (40)	0,00447 (13)
$\gamma_{9,2}$(Er)	950,989 (5)	2,754 (19)	E2	0,00313 (9)	0,000488 (15)	0,0001089 (33)	0,00376 (11)
$\gamma_{11,3}$(Er)	1010,27 (5)	0,0797 (16)	E2	0,00277 (8)	0,000425 (13)	0,0000947 (28)	0,00332 (10)
$\gamma_{14,3}$(Er)	1120,344 (30)	0,199 (4)	E1	0,000956 (29)	0,0001283 (38)	0,0000281 (8)	0,001121 (34)
$\gamma_{15,3}$(Er)	1146,845 (12)	0,2061 (26)	E1	0,000918 (28)	0,0001230 (37)	0,0000270 (8)	0,001075 (32)
$\gamma_{16,3}$(Er)	1241,520 (8)	0,85 (3)	E1(+M2)	0,000796 (24)	0,0001063 (32)	0,0000233 (7)	0,000932 (28)
$\gamma_{17,3}$(Er)	1282,105 (8)	0,183 (7)	E1(+M2)	0,000752 (23)	0,0001004 (30)	0,0000220 (7)	0,000881 (26)
$\gamma_{12,2}$(Er)	1307,24 (6)	0,0055 (11)	E1	0,000727 (22)	0,0000970 (29)	0,0000213 (6)	0,000852 (26)
$\gamma_{13,2}$(Er)	1331,12 (7)	0,0043 (12)	E1	0,000705 (21)	0,0000939 (28)	0,0000206 (6)	0,000825 (25)
$\gamma_{14,2}$(Er)	1400,79 (2)	0,508 (6)	E1	0,000645 (19)	0,0000859 (26)	0,0000188 (6)	0,000755 (23)
$\gamma_{15,2}$(Er)	1427,24 (2)	0,498 (6)	E1	0,000625 (19)	0,0000831 (25)	0,0000182 (5)	0,000732 (22)

3 Atomic Data

3.1 Er

ω_K	:	0,942	(4)
$\bar{\omega}_L$	:	0,216	(9)
n_{KL}	:	0,836	(4)

3.1.1 X Radiations

		Energy keV		Relative probability
X_K				
	$K\alpha_2$	48,2211		56,4
	$K\alpha_1$	49,1277		100
	$K\beta_3$	55,494	}	
	$K\beta_1$	55,681	}	
	$K\beta_5''$	56,04	}	31,9
	$K\beta_2$	57,21	}	
	$K\beta_4$	57,313	}	8,8
	$KO_{2,3}$	57,45	}	
X_L				
	$L\ell$	6,14		
	$L\alpha$	6,9 – 6,95		
	$L\eta$	7,05		
	$L\beta$	7,75 – 8,34		
	$L\gamma$	8,81 – 9,43		

3.1.2 Auger Electrons

	Energy keV	Relative probability
Auger K		
KLL	37,78 – 40,55	100
KLX	45,52 – 49,10	52,2
KXY	53,07 – 56,84	7,84
Auger L	3,9 – 7,6	

4 Electron Emissions

		Energy keV		Electrons per 100 disint.
e_{AL}	(Er)	3,9 - 7,6		72,0 (7)
e_{AK}	(Er)			2,33 (17)
	KLL	37,78 - 40,55	}	
	KLX	45,52 - 49,10	}	
	KXY	53,07 - 56,84	}	
$ec_{5,4\ K}$	(Er)	16,13	(7)	0,15 (10)
$ec_{1,0\ T}$	(Er)	23,095 - 80,550		87,4 (31)
$ec_{1,0\ K}$	(Er)	23,095	(3)	20,9 (7)
$ec_{16,15\ K}$	(Er)	37,189	(14)	0,422 (18)
$ec_{8,7\ K}$	(Er)	61,548	(9)	0,154 (5)
$ec_{16,14\ K}$	(Er)	63,69	(3)	0,160 (7)
$ec_{1,0\ L}$	(Er)	70,828 - 72,222		50,8 (18)
$ec_{1,0\ M}$	(Er)	78,374 - 79,171		12,38 (43)
$ec_{1,0\ N}$	(Er)	80,131 - 80,576		2,89 (10)
$ec_{16,15\ L}$	(Er)	84,924 - 86,317		0,0635 (26)
$ec_{10,9\ K}$	(Er)	102,554	(7)	0,0524 (31)
$ec_{8,7\ L}$	(Er)	109,282 - 110,675		0,0962 (34)
$ec_{16,14\ L}$	(Er)	111,424 - 112,818		0,147 (6)
$ec_{2,1\ T}$	(Er)	126,925 - 184,381		24,1 (7)
$ec_{2,1\ K}$	(Er)	126,925	(1)	14,86 (44)
$ec_{16,12\ K}$	(Er)	157,26	(6)	0,0587 (23)
$ec_{8,5\ K}$	(Er)	158,384	(8)	0,346 (24)
$ec_{2,1\ L}$	(Er)	174,659 - 176,053		7,13 (22)
$ec_{2,1\ M}$	(Er)	182,204 - 183,001		1,71 (5)
$ec_{2,1\ N}$	(Er)	183,962 - 184,406		0,402 (12)
$ec_{9,7\ K}$	(Er)	202,251	(9)	0,0821 (26)
$ec_{8,5\ L}$	(Er)	206,118 - 207,511		0,137 (10)
$ec_{3,2\ T}$	(Er)	222,978 - 280,433		2,5 (16)
$ec_{3,2\ K}$	(Er)	222,978	(4)	1,8 (12)
$ec_{10,8\ K}$	(Er)	243,257	(7)	0,188 (6)
$ec_{3,2\ L}$	(Er)	270,711 - 272,105		0,55 (36)
$ec_{3,2\ M}$	(Er)	278,256 - 279,053		0,13 (8)
$ec_{10,8\ L}$	(Er)	290,991 - 292,384		0,0537 (17)
$ec_{6,3\ K}$	(Er)	308,282	(8)	0,0723 (25)
$ec_{16,10\ K}$	(Er)	353,469	(9)	0,0843 (28)
$ec_{8,3\ K}$	(Er)	472,338	(6)	0,108 (6)
$ec_{16,8\ K}$	(Er)	654,211	(9)	0,1246 (47)
$ec_{8,2\ K}$	(Er)	752,80	(5)	0,251 (9)
$\beta^-_{0,17}$	max:	32,9	(9)	17,2 (4)
$\beta^-_{0,17}$	avg:	8,2	(2)	
$\beta^-_{0,16}$	max:	73,5	(9)	74,8 (12)
$\beta^-_{0,16}$	avg:	18,6	(4)	

		Energy keV		Electrons per 100 disint.
$\beta^-_{0,11}$	max:	304,6	(9)	0,394 (5)
$\beta^-_{0,11}$	avg:			
$\beta^-_{0,10}$	max:	484,5	(9)	0,81 (26)
$\beta^-_{0,10}$	avg:			
$\beta^-_{0,9}$	max:	644,5	(9)	2,31 (29)
$\beta^-_{0,9}$	avg:	201,2	(9)	
$\beta^-_{0,6}$	max:	949,3	(9)	1,12 (6)
$\beta^-_{0,6}$	avg:	294,3	(9)	
$\beta^-_{0,3}$	max:	1315,1	(9)	3,4 (6)
$\beta^-_{0,3}$	avg:	674,6	(9)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy keV		Photons per 100 disint.	
XL	(Er)	6,14 — 9,43		20,8 (4)	
XKα_2	(Er)	48,2211		10,81 (21)	} Kα
XKα_1	(Er)	49,1277		19,2 (4)	}
XKβ_3	(Er)	55,494	}		
XKβ_1	(Er)	55,681	}	6,24 (14)	K$'\beta_1$
XKβ_5''	(Er)	56,04	}		
XKβ_2	(Er)	57,21	}		
XKβ_4	(Er)	57,313	}	1,62 (5)	K$'\beta_2$
XKO$_{2,3}$	(Er)	57,45	}		

5.2 Gamma Emissions

	Energy keV	Photons per 100 disint.
$\gamma_{5,4}$(Er)	73,62 (7)	0,0260 (16)
$\gamma_{1,0}$(Er)	80,5725 (13)	12,66 (23)
$\gamma_{16,15}$(Er)	94,675 (14)	0,146 (4)
$\gamma_{8,7}$(Er)	119,033 (10)	0,173 (3)
$\gamma_{16,14}$(Er)	121,175 (10)	0,241 (7)
$\gamma_{17,15}$(Er)	135,260 (14)	0,0979 (19)
$\gamma_{9,8}$(Er)	140,703 (7)	0,0428 (22)

	Energy keV	Photons per 100 disint.
$\gamma_{10,9}$(Er)	160,039 (7)	0,097 (5)
$\gamma_{17,14}$(Er)	161,76 (3)	0,109 (4)
$\gamma_{2,1}$(Er)	184,4107 (11)	72,5 (3)
$\gamma_{16,13}$(Er)	190,86 (7)	0,215 (5)
$\gamma_{16,12}$(Er)	214,79 (3)	0,445 (11)
$\gamma_{8,5}$(Er)	215,871 (7)	2,66 (17)
$\gamma_{17,13}$(Er)	231,45 (7)	0,219 (6)
$\gamma_{9,7}$(Er)	259,736 (10)	1,078 (10)
$\gamma_{3,2}$(Er)	280,4630 (23)	29,54 (25)
$\gamma_{10,8}$(Er)	300,741 (3)	3,73 (3)
$\gamma_{9,6}$(Er)	304,758 (9)	0,0183 (12)
$\gamma_{11,9}$(Er)	339,75 (5)	0,1616 (23)
$\gamma_{6,3}$(Er)	365,768 (6)	2,46 (4)
$\gamma_{16,10}$(Er)	410,956 (3)	11,35 (17)
$\gamma_{17,10}$(Er)	451,540 (4)	2,915 (14)
$\gamma_{10,6}$(Er)	464,798 (6)	1,25 (4)
$\gamma_{15,9}$(Er)	476,25 (4)	0,0363 (13)
$\gamma_{12,8}$(Er)	496,90 (6)	0,125 (3)
$\gamma_{4,2}$(Er)	520,80 (7)	0,153 (6)
$\gamma_{8,3}$(Er)	529,825 (4)	9,4 (4)
$\gamma_{16,9}$(Er)	570,995 (5)	5,43 (20)
$\gamma_{5,2}$(Er)	594,417 (6)	0,58 (6)
$\gamma_{17,9}$(Er)	611,579 (6)	1,31 (21)
$\gamma_{12,7}$(Er)	615,93 (6)	0,094 (29)
$\gamma_{13,7}$(Er)	639,86 (6)	0,0943 (7)
$\gamma_{11,6}$(Er)	644,51 (7)	0,144 (4)
$\gamma_{9,3}$(Er)	670,526 (4)	5,34 (21)
$\gamma_{7,2}$(Er)	691,253 (7)	1,32 (7)
$\gamma_{4,1}$(Er)	705,21 (7)	0,014 (7)
$\gamma_{16,8}$(Er)	711,697 (3)	54,9 (9)
$\gamma_{12,5}$(Er)	712,89 (13)	0,30 (9)
$\gamma_{15,7}$(Er)	736,02 (8)	0,14 (2)
$\gamma_{13,5}$(Er)	736,70 (7)	0,373 (6)
$\gamma_{17,8}$(Er)	752,280 (4)	12,2 (3)
$\gamma_{5,1}$(Er)	778,827 (6)	3,01 (8)
$\gamma_{4,0}$(Er)	785,78 (7)	0,019 (4)
$\gamma_{8,2}$(Er)	810,286 (4)	57,3 (11)
$\gamma_{10,3}$(Er)	830,565 (4)	9,72 (18)
$\gamma_{7,1}$(Er)	875,663 (7)	0,721 (9)
$\gamma_{9,2}$(Er)	950,988 (4)	2,744 (19)
$\gamma_{11,3}$(Er)	1010,27 (6)	0,0794 (16)
$\gamma_{14,3}$(Er)	1120,32 (3)	0,199 (4)
$\gamma_{15,3}$(Er)	1146,77 (3)	0,2059 (26)
$\gamma_{16,3}$(Er)	1241,519 (4)	0,85 (3)
$\gamma_{17,3}$(Er)	1282,102 (5)	0,183 (7)
$\gamma_{12,2}$(Er)	1307,19 (6)	0,0055 (11)
$\gamma_{13,2}$(Er)	1331,12 (7)	0,0043 (12)

	Energy keV	Photons per 100 disint.
$\gamma_{14,2}$(Er)	1400,79 (2)	0,508 (6)
$\gamma_{15,2}$(Er)	1427,24 (2)	0,498 (6)

6 Main Production Modes

$\begin{cases} \mathrm{Ho-165(n,\gamma)Ho-166m} \quad \sigma : 1 \ \text{barns} \\ \text{Possible impurities : Ho} - 166 \end{cases}$

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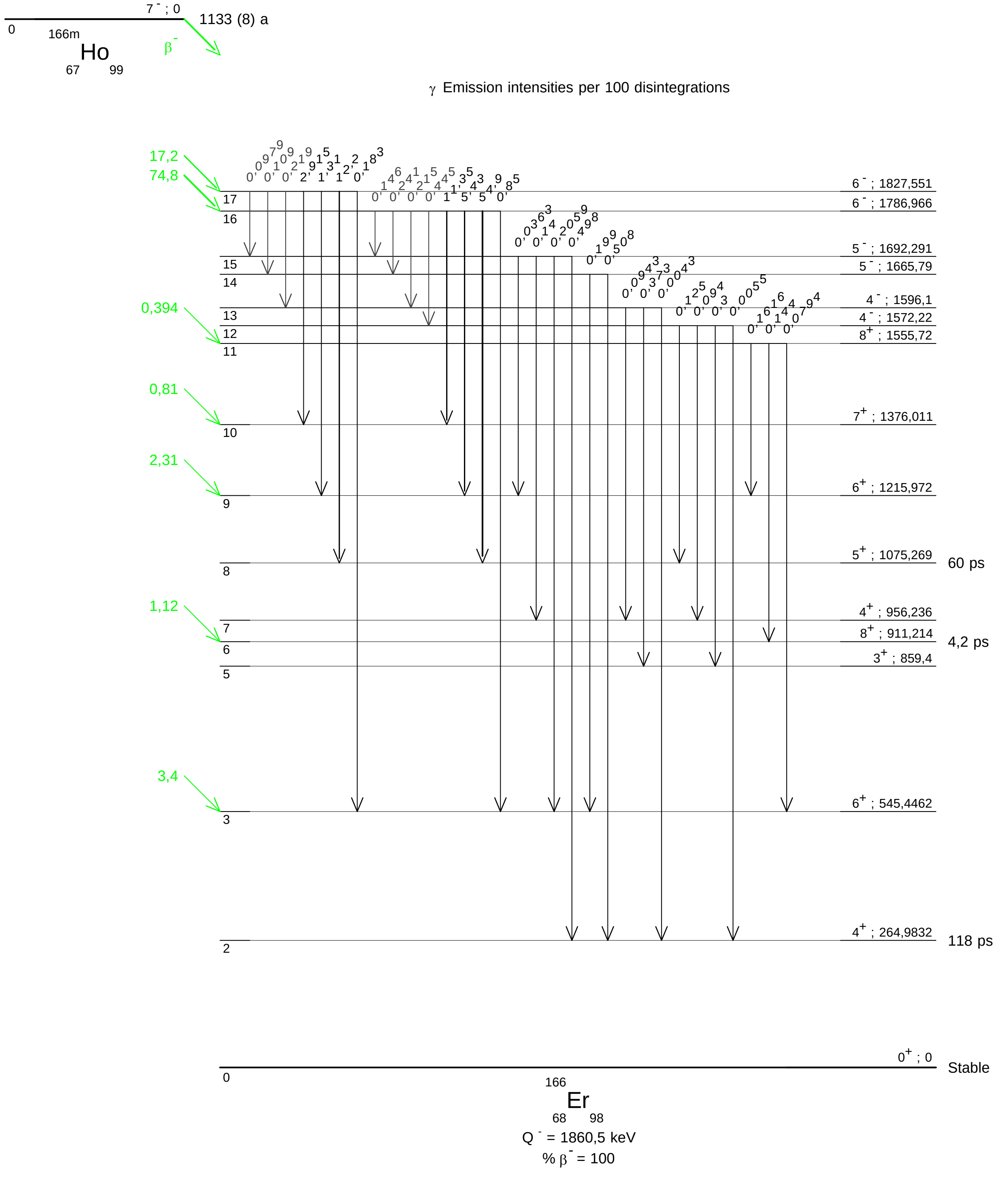
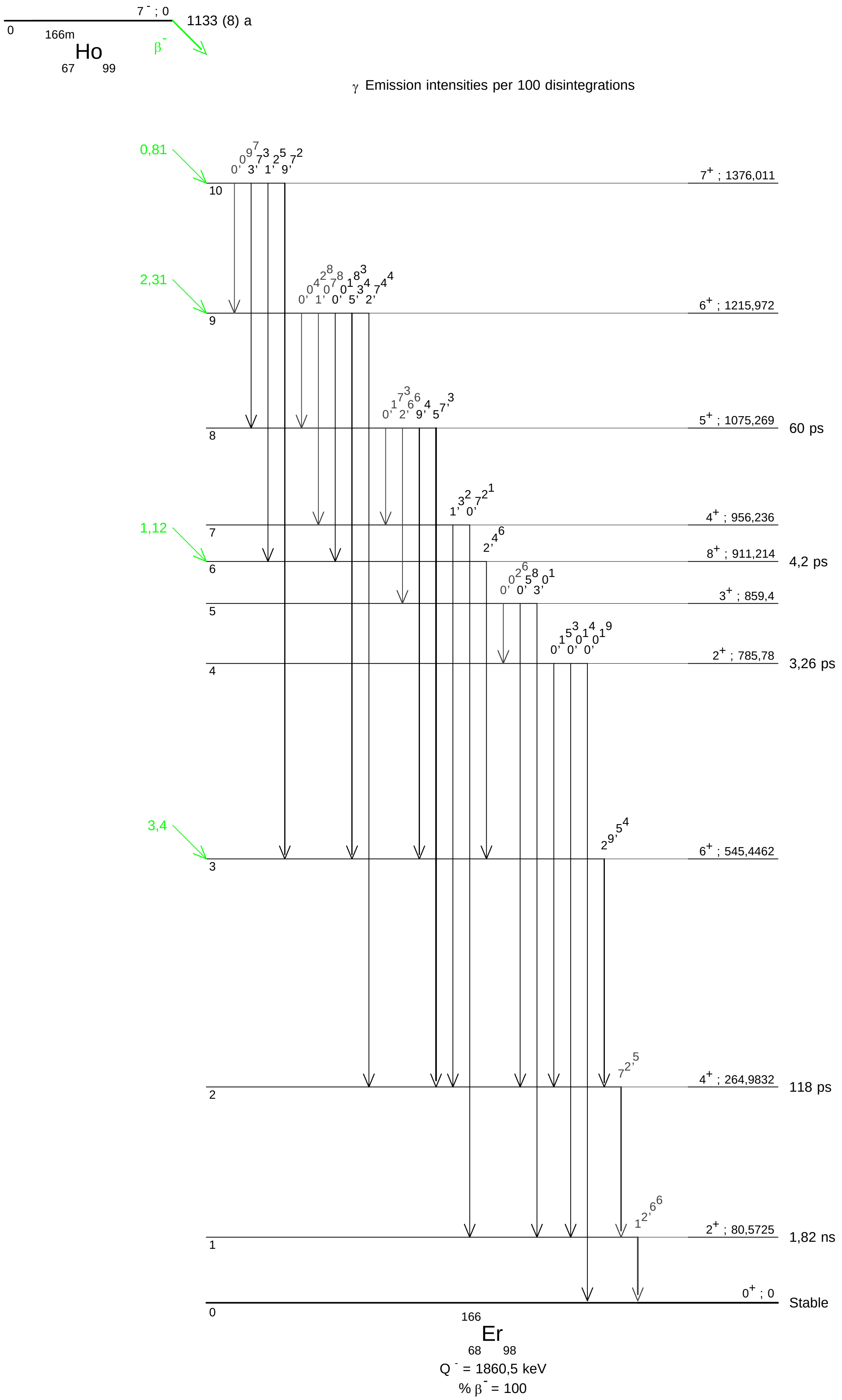

7 - ; 0
1133 (8) a
0
166m
Ho
67 99
β-
γ Emission intensities per 100 disintegrations
17,2
74,8
0,394
0,81
2,31
1,12
3,4
6 - ; 1827,551
6 - ; 1786,966
5 - ; 1692,291
5 - ; 1665,79
4 - ; 1596,1
4 - ; 1572,22
8+ ; 1555,72
7+ ; 1376,011
6+ ; 1215,972
5+ ; 1075,269
60 ps
4+ ; 956,236
8+ ; 911,214
4,2 ps
3+ ; 859,4
6+ ; 545,4462
4+ ; 264,9832
118 ps
0+ ; 0
Stable
166
Er
68 98
Q - = 1860,5 keV
% β- = 100


7⁻ ; 0
1133 (8) a
0
166m Ho 67 99
β⁻
γ Emission intensities per 100 disintegrations
0,81
2,31
1,12
3,4
10
9
8
7
6
5
4
3
2
1
0
7+ ; 1376,011
6+ ; 1215,972
5+ ; 1075,269
60 ps
4+ ; 956,236
8+ ; 911,214
4,2 ps
3+ ; 859,4
2+ ; 785,78
3,26 ps
6+ ; 545,4462
4+ ; 264,9832
118 ps
2+ ; 80,5725
1,82 ns
0+ ; 0
Stable
166 Er 68 98
Q⁻ = 1860,5 keV
% β⁻ = 100