$^{188}_{75}\mathrm{Re}_{113}$

1 Decay Scheme

Re-188 decays 100 % by beta minus emission to Os-188. A significant fraction (71,1 (22) %) directly populates the ground state.

Le Re-188 se désintègre à 100 % par emission bêta moins vers l'Os-188. Une proportion de 71,1 % peuple directement le niveau fondamental.

2 Nuclear Data

$T_{1/2}(^{188}\mathrm{Re}\ )$: 17,005 (4) h
$Q^{-}(^{188}\mathrm{Re}\ )$: 2120,4 (4) keV

2.1 β^{-} Transitions

	Energy keV	Probability × 100	Nature	lg ft
$\beta^{-}_{0,25}$	98,0 (5)	0,00198 (16)	1st Forbidden	8,2
$\beta^{-}_{0,24}$	100,2 (5)	0,0059 (4)		7,7
$\beta^{-}_{0,23}$	155,4 (4)	0,0021 (3)	1st Forbidden	8,8
$\beta^{-}_{0,22}$	163,3 (4)	0,051 (4)	1st Forbidden	7,4
$\beta^{-}_{0,21}$	171,8 (4)	0,079 (6)		7,3
$\beta^{-}_{0,20}$	179,4 (4)	0,102 (7)	1st Forbidden	7,3
$\beta^{-}_{0,19}$	183,5 (4)	0,000214 (25)		10
$\beta^{-}_{0,18}$	277,5 (4)	0,00299 (22)	1st Forbidden	9,4
$\beta^{-}_{0,17}$	295,5 (4)	0,0236 (17)	1st Forbidden	8,6
$\beta^{-}_{0,16}$	312,8 (4)	0,038 (3)	1st Forbidden	8,5
$\beta^{-}_{0,15}$	355,0 (4)	0,181 (13)	1st Forbidden	8
$\beta^{-}_{0,14}$	390,7 (5)	0,00128 (21)	1st Forbidden	10,3
$\beta^{-}_{0,13}$	416,1 (5)	0,0023 (9)	1st Forbidden	10,1
$\beta^{-}_{0,12}$	434,9 (5)	0,00055 (17)		10,8
$\beta^{-}_{0,11}$	642,3 (4)	0,018 (3)	1st Forbidden	9,8
$\beta^{-}_{0,10}$	657,9 (4)	0,44 (3)		8,5

	Energy keV	Probability × 100	Nature	lg ft
$\beta^-_{0,9}$	662,8 (5)	0,042 (3)	1st Forbidden	9,5
$\beta^-_{0,8}$	676,88 (5)	0,00092 (21)		11,2
$\beta^-_{0,7}$	706,6 (5)	0,0024 (5)	2nd Forbidden	10,8
$\beta^-_{0,6}$	815,5 (4)	0,0241 (17)	1st Forbidden	10
$\beta^-_{0,5}$	1034,0 (4)	0,63 (4)	1st Forbidden	9
$\beta^-_{0,3}$	1487,4 (4)	1,65 (12)	1st Forbidden	9,2
$\beta^-_{0,1}$	1965,3 (4)	25,6 (20)	1st Forbidden	8,4
$\beta^-_{0,0}$	2120,4 (4)	71,1 (22)	1st Forbidden	8,1

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy keV	$P_{\gamma+ce}$ × 100	Multipolarity	α_K	α_L	α_M (10^{-2})	α_T
$\gamma_{3,2}$(Os)	155,0	0,011 (1)	[E2]	0,323 (10)	0,375 (11)	12,2 (4)	0,820 (25)
$\gamma_{1,0}$(Os)	155,041 (4)	27,7 (11)	E2	0,323 (10)	0,375 (11)	12,2 (4)	0,820 (25)
$\gamma_{4,2}$(Os)	312,001 (24)	0,047 (12)	E2	0,0536 (16)	0,0216 (6)	0,070 (21)	0,0822 (25)
$\gamma_{2,1}$(Os)	322,93 (4)	0,0174 (15)	E2	0,0492 (15)	0,0190 (6)	0,61 (2)	0,0743 (22)
$\gamma_{5,3}$(Os)	453,34 (2)	0,075 (8)	(E2)	0,0216 (6)	0,00597 (18)	0,183 (5)	0,0294 (4)
$\gamma_{3,1}$(Os)	477,992 (25)	1,05 (9)	99,6%E2+	0,0193 (6)	0,00508 (15)	0,126 (5)	0,0260 (8)
$\gamma_{3,1}$(Os)			0,1%M1+E0				
$\gamma_{21,10}$(Os)	486,087 (11)	0,079 (6)					
$\gamma_{6,4}$(Os)	514,88 (6)	0,0055 (5)	E2(+¡8%M1)	0,0177 (16)	0,00421 (23)	0,129 (6)	0,0232 (18)
$\gamma_{24,10}$(Os)	557,71 (10)	0,00095 (9)					
$\gamma_{7,4}$(Os)	623,8 (3)	0,0024 (5)					
$\gamma_{3,0}$(Os)	632,982 (21)	1,3 (1)	E2	0,0103 (3)	0,00223 (7)	0,067 (2)	0,0132 (4)
$\gamma_{4,1}$(Os)	634,98 (7)	0,150 (12)	E2+2%M1	0,0106 (3)	0,00226 (7)	0,074 (2)	0,0136 (4)
$\gamma_{10,4}$(Os)	672,536 (16)	0,112 (9)	E1	0,0035 (11)	0,00053 (2)	0,0155 (5)	0,0042 (1)
$\gamma_{8,3}$(Os)	810,49 (4)	0,00092 (22)					
$\gamma_{9,3}$(Os)	825,2 (7)	0,0179 (15)	M1(+E2)	0,013 (5)	0,0021 (7)	0,09 (2)	0,016 (5)
$\gamma_{10,3}$(Os)	829,47 (4)	0,41 (3)	E1(+¡0,25%M2)	0,0025 (7)	0,00038 (11)	0,011 (3)	0,0030 (9)
$\gamma_{11,3}$(Os)	845,07 (4)	0,0065 (5)					
$\gamma_{5,1}$(Os)	931,347 (10)	0,55 (4)	E2	0,00470 (14)	0,00084 (3)	0,025 (1)	0,00579 (18)
$\gamma_{(-1,0)}$(Os)	979,25 (17)	0,00104 (20)					
$\gamma_{10,2}$(Os)	984,1 (5)	0,00034 (21)					
$\gamma_{16,4}$(Os)	1017,7 (1)	0,0147 (11)					
$\gamma_{13,3}$(Os)	1071,4 (3)	0,00067 (13)					
$\gamma_{14,3}$(Os)	1096,8 (4)	0,00064 (17)					
$\gamma_{15,3}$(Os)	1132,31 (2)	0,083 (7)	(E2)	0,00322 (10)	0,00050 (3)	0,015 (5)	0,00387 (12)
$\gamma_{6,1}$(Os)	1149,7 (4)	0,015 (1)					
$\gamma_{20,4}$(Os)	1150,5 (4)	0,015 (1)					
$\gamma_{16,3}$(Os)	1174,57 (3)	0,0180 (15)					
$\gamma_{17,3}$(Os)	1191,84 (12)	0,0134 (11)					
$\gamma_{18,3}$(Os)	1209,790 (24)	0,00302 (24)	M1+¡0,1%E2	0,00620 (19)	0,000820 (25)		0,00729 (21)
$\gamma_{9,1}$(Os)	1302,4 (3)	0,0057 (8)					
$\gamma_{6,0}$(Os)	1304,86 (20)	0,0028 (4)					
$\gamma_{20,3}$(Os)	1308,03 (6)	0,065 (5)					
$\gamma_{11,1}$(Os)	1322,91 (20)	0,011 (3)					
$\gamma_{23,3}$(Os)	1331,96 (7)	0,00174 (24)					
$\gamma_{9,0}$(Os)	1457,55 (13)	0,0186 (15)					
$\gamma_{10,0}$(Os)	1463,0 (6)	0,0008 (3)					

	Energy keV	$P_{\gamma+ce}$ × 100	Multipolarity	α_K	α_L	α_M (10^{-2})	α_T
$\gamma_{12,1}$(Os)	1530,5 (3)	0,00055 (17)					
$\gamma_{13,1}$(Os)	1549,27 (10)	0,0016 (9)					
$\gamma_{14,1}$(Os)	1574,58 (25)	0,00063 (11)					
$\gamma_{15,1}$(Os)	1610,40 (5)	0,098 (8)	[E2]				0,000107
$\gamma_{16,1}$(Os)	1652,50 (14)	0,0035 (4)					
$\gamma_{17,1}$(Os)	1669,98 (7)	0,0104 (8)	[E2]				0,000132
$\gamma_{13,0}$(Os)	1704	0,000065 (7)	E0				
$\gamma_{15,0}$(Os)	1765,1	0,00011 (1)	E0				
$\gamma_{20,1}$(Os)	1785,96 (12)	0,0195 (15)	[E2]				0,00018
$\gamma_{22,1}$(Os)	1802,05 (4)	0,036 (3)	[E2]				0,000185
$\gamma_{16,0}$(Os)	1807,6 (3)	0,00086 (9)					
$\gamma_{23,1}$(Os)	1809,55 (30)	0,00040 (11)					
$\gamma_{17,0}$(Os)	1825	0,000011 (1)	E0				
$\gamma_{24,1}$(Os)	1864,92 (25)	0,0050 (4)	(E2,M1)				0,000213
$\gamma_{25,1}$(Os)	1867,20 (22)	0,00046 (9)					
$\gamma_{19,0}$(Os)	1936,9 (3)	0,00021 (3)					
$\gamma_{20,0}$(Os)	1940,92 (23)	0,00185 (15)	(M1,E2)				0,000248
$\gamma_{22,0}$(Os)	1956,97 (17)	0,0150 (12)	(M1,E2)				0,000255
$\gamma_{25,0}$(Os)	2022,54 (16)	0,00152 (12)	(M1,E2)				0,000285

3 Atomic Data

3.1 Os

ω_K : 0,957 (4)
$\bar{\omega}_L$: 0,308 (12)
n_{KL} : 0,821 (4)

3.1.1 X Radiations

		Energy keV		Relative probability
X_K				
	$K\alpha_2$	61,4873		58,03
	$K\alpha_1$	63,0011		100
	$K\beta_3$	71,078	}	
	$K\beta_1$	71,414	}	
	$K\beta''_5$	71,824	}	33,4
	$K\beta'_5$	71,895	}	
	$K\beta_2$	73,387	}	
	$K\beta_4$	73,615	}	9,4
	$KO_{2,3}$	73,808	}	
X_L				
	$L\alpha$	8,91 –		
	$L\gamma$	– 12,92		

3.1.2 Auger Electrons

	Energy keV	Relative probability
Auger K		
KLL	47,71 – 51,89	100
KLX	57,79 – 60,47	54,2
KXY	67,68 – 69,95	7,3

4 Electron Emissions

		Energy keV	Electrons per 100 disint.
e_{AK}	(Os)		0,210 (14)
	KLL	47,71 - 51,89 }	
	KLX	57,76 - 60,47 }	
	KXY	67,68 - 69,95 }	
$ec_{1,0\ K}$	(Os)	81,170 (4)	4,88 (25)
$ec_{1,0\ L}$	(Os)	142,1 - 144,2	5,7 (3)
$ec_{1,0\ M}$	(Os)	152,0 - 153,1	1,44 (7)
$ec_{5,3\ K}$	(Os)	379,469 (20)	0,00159 (17)
$ec_{3,1\ K}$	(Os)	404,121 (25)	0,0197 (17)
$ec_{5,3\ L}$	(Os)	440,4 - 442,5	0,00044 (5)
$ec_{5,3\ M}$	(Os)	450,3 - 451,4	0,000106 (12)
$ec_{3,1\ L}$	(Os)	465,0 - 467,1	0,0052 (5)
$ec_{3,1\ M}$	(Os)	474,9 - 476,0	0,00125 (11)
$ec_{3,0\ K}$	(Os)	559,110 (21)	0,0131 (11)
$ec_{4,1\ K}$	(Os)	561,11 (7)	0,00156 (13)
$ec_{3,0\ L}$	(Os)	620,0 - 622,1	0,00284 (24)
$ec_{4,1\ L}$	(Os)	622,0 - 624,1	0,00033 (3)
$ec_{3,0\ M}$	(Os)	629,9 - 631,0	0,00067 (6)
$ec_{4,1\ M}$	(Os)	631,9 - 633,0	0,000079 (7)
$ec_{10,3\ K}$	(Os)	755,60 (4)	0,0010 (3)
$ec_{10,3\ L}$	(Os)	816,5 - 818,6	0,00016 (5)
$ec_{10,3\ M}$	(Os)	826,4 - 827,5	0,0000369 (13)
$ec_{5,1\ K}$	(Os)	857,474 (10)	0,00260 (22)
$ec_{5,1\ L}$	(Os)	918,4 - 920,5	0,00046 (4)
$ec_{5,1\ M}$	(Os)	928,3 - 929,4	0,00011 (1)
$ec_{13,0\ K}$	(Os)	1630	0,000065 (7)
$ec_{15,0\ K}$	(Os)	1691,2	0,00011 (1)
$ec_{17,0\ K}$	(Os)	1751	0,000011 (1)
$\beta^-_{0,25}$	max:	98,0 (5)	0,00198 (16)

		Energy keV		Electrons per 100 disint.
$\beta^-_{0,25}$	avg:	25,51	(11)	
$\beta^-_{0,24}$	max:	100,2	(5)	0,0059 (4)
$\beta^-_{0,24}$	avg:	26,12	(11)	
$\beta^-_{0,23}$	max:	155,4	(4)	0,0021 (3)
$\beta^-_{0,23}$	avg:	41,44	(11)	
$\beta^-_{0,22}$	max:	163,3	(4)	0,051 (4)
$\beta^-_{0,22}$	avg:	43,68	(11)	
$\beta^-_{0,21}$	max:	171,8	(4)	0,079 (6)
$\beta^-_{0,21}$	avg:	46,10	(11)	
$\beta^-_{0,20}$	max:	179,4	(4)	0,102 (7)
$\beta^-_{0,20}$	avg:	48,27	(12)	
$\beta^-_{0,19}$	max:	183,5	(4)	0,000214 (25)
$\beta^-_{0,19}$	avg:	49,46	(14)	
$\beta^-_{0,18}$	max:	277,5	(4)	0,00299 (22)
$\beta^-_{0,18}$	avg:	77,41	(12)	
$\beta^-_{0,17}$	max:	295,5	(4)	0,0236 (17)
$\beta^-_{0,17}$	avg:	82,90	(12)	
$\beta^-_{0,16}$	max:	312,8	(4)	0,038 (3)
$\beta^-_{0,16}$	avg:	88,27	(12)	
$\beta^-_{0,15}$	max:	355,0	(4)	0,181 (13)
$\beta^-_{0,15}$	avg:	101,57	(13)	
$\beta^-_{0,14}$	max:	390,7	(5)	0,00128 (21)
$\beta^-_{0,14}$	avg:	113,02	(15)	
$\beta^-_{0,13}$	max:	416,1	(5)	0,0023 (9)
$\beta^-_{0,13}$	avg:	121,28	(13)	
$\beta^-_{0,12}$	max:	434,9	(5)	0,00055 (17)
$\beta^-_{0,12}$	avg:	127,46	(17)	
$\beta^-_{0,11}$	max:	642,3	(4)	0,018 (3)
$\beta^-_{0,11}$	avg:	198,73	(14)	
$\beta^-_{0,10}$	max:	657,9	(4)	0,44 (3)
$\beta^-_{0,10}$	avg:	204,30	(14)	
$\beta^-_{0,9}$	max:	662,8	(5)	0,042 (3)
$\beta^-_{0,9}$	avg:	206,07	(15)	
$\beta^-_{0,8}$	max:	676,88	(5)	0,00092 (21)
$\beta^-_{0,8}$	avg:	211,11	(14)	
$\beta^-_{0,7}$	max:	706,6	(5)	0,0024 (5)
$\beta^-_{0,7}$	avg:	221,84	(18)	
$\beta^-_{0,6}$	max:	815,5	(4)	0,0241 (17)
$\beta^-_{0,6}$	avg:	261,94	(15)	
$\beta^-_{0,5}$	max:	1034,0	(4)	0,63 (4)
$\beta^-_{0,5}$	avg:	345,33	(16)	
$\beta^-_{0,3}$	max:	1487,4	(4)	1,65 (12)

		Energy keV		Electrons per 100 disint.
$\beta^-_{0,3}$	avg:	527,77	(17)	
$\beta^-_{0,1}$	max:	1965,3	(4)	25,6 (20)
$\beta^-_{0,1}$	avg:	728,89	(17)	
$\beta^-_{0,0}$	max:	2120,4	(4)	71,1 (22)
$\beta^-_{0,0}$	avg:	795,40	(17)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy keV		Photons per 100 disint.	
XL	(Os)	8,91 — 12,92		3,00 (15)	
XKα_2	(Os)	61,4873		1,36 (9)	} Kα
XKα_1	(Os)	63,0011		2,35 (16)	}
XKβ_3	(Os)	71,078	}		
XKβ_1	(Os)	71,414	}	0,79 (5)	K$'\beta_1$
XKβ''_5	(Os)	71,824	}		
XKβ'_5	(Os)	71,895	}		
XKβ_2	(Os)	73,387	}		
XKβ_4	(Os)	73,615	}	0,22 (2)	K$'\beta_2$
XKO$_{2,3}$	(Os)	73,808	}		

5.2 Gamma Emissions

	Energy keV	Photons per 100 disint.
$\gamma_{3,2}$(Os)	155,0	0,0059 (6)
$\gamma_{1,0}$(Os)	155,041 (4)	15,2 (6)
$\gamma_{4,2}$(Os)	312,001 (24)	0,043 (12)
$\gamma_{2,1}$(Os)	322,93 (4)	0,0162 (15)
$\gamma_{5,3}$(Os)	453,34 (2)	0,073 (8)
$\gamma_{3,1}$(Os)	477,992 (25)	1,02 (9)
$\gamma_{21,10}$(Os)	486,087 (11)	0,079 (6)
$\gamma_{6,4}$(Os)	514,88 (6)	0,0054 (5)
$\gamma_{24,10}$(Os)	557,71 (10)	0,00095 (9)
$\gamma_{7,4}$(Os)	623,8 (3)	0,0024 (5)
$\gamma_{3,0}$(Os)	632,981 (21)	1,28 (10)
$\gamma_{4,1}$(Os)	634,98 (7)	0,148 (12)

	Energy keV	Photons per 100 disint.
$\gamma_{10,4}$(Os)	672,535 (16)	0,112 (9)
$\gamma_{8,3}$(Os)	810,49 (4)	0,00092 (22)
$\gamma_{9,3}$(Os)	825,2 (7)	0,0176 (15)
$\gamma_{10,3}$(Os)	829,47 (4)	0,41 (3)
$\gamma_{11,3}$(Os)	845,07 (4)	0,0065 (5)
$\gamma_{5,1}$(Os)	931,345 (10)	0,55 (4)
$\gamma_{(-1,0)}$(Os)	979,25 (17)	0,00104 (20)
$\gamma_{10,2}$(Os)	984,1 (5)	0,00034 (21)
$\gamma_{16,4}$(Os)	1017,7 (1)	0,0147 (11)
$\gamma_{13,3}$(Os)	1071,4 (3)	0,00067 (13)
$\gamma_{14,3}$(Os)	1096,8 (4)	0,00064 (17)
$\gamma_{15,3}$(Os)	1132,31 (2)	0,083 (7)
$\gamma_{6,1}$(Os)	1149,7 (4)	0,015 (1)
$\gamma_{20,4}$(Os)	1150,5 (4)	0,015 (1)
$\gamma_{16,3}$(Os)	1174,57 (3)	0,0180 (15)
$\gamma_{17,3}$(Os)	1191,84 (12)	0,0134 (11)
$\gamma_{18,3}$(Os)	1209,790 (24)	0,00300 (24)
$\gamma_{9,1}$(Os)	1302,4 (3)	0,0057 (8)
$\gamma_{6,0}$(Os)	1304,86 (20)	0,0028 (4)
$\gamma_{20,3}$(Os)	1308,03 (6)	0,065 (5)
$\gamma_{11,1}$(Os)	1322,91 (20)	0,011 (3)
$\gamma_{23,3}$(Os)	1331,95 (7)	0,00174 (24)
$\gamma_{9,0}$(Os)	1457,54 (13)	0,0186 (15)
$\gamma_{10,0}$(Os)	1463,0 (6)	0,0008 (3)
$\gamma_{12,1}$(Os)	1530,5 (3)	0,00055 (17)
$\gamma_{13,1}$(Os)	1549,26 (10)	0,0016 (9)
$\gamma_{14,1}$(Os)	1574,57 (25)	0,00063 (11)
$\gamma_{15,1}$(Os)	1610,40 (5)	0,098 (8)
$\gamma_{16,1}$(Os)	1652,49 (14)	0,0035 (4)
$\gamma_{17,1}$(Os)	1669,97 (7)	0,0104 (8)
$\gamma_{20,1}$(Os)	1785,95 (12)	0,0195 (15)
$\gamma_{22,1}$(Os)	1802,04 (4)	0,036 (3)
$\gamma_{16,0}$(Os)	1807,6 (3)	0,00086 (9)
$\gamma_{23,1}$(Os)	1809,54 (30)	0,00040 (11)
$\gamma_{24,1}$(Os)	1864,91 (25)	0,0050 (4)
$\gamma_{25,1}$(Os)	1867,20 (22)	0,00046 (9)
$\gamma_{19,0}$(Os)	1936,9 (3)	0,00021 (3)
$\gamma_{20,0}$(Os)	1940,91 (23)	0,00185 (15)
$\gamma_{22,0}$(Os)	1956,96 (17)	0,0150 (12)
$\gamma_{25,0}$(Os)	2022,53 (16)	0,00152 (12)

6 Main Production Modes

$\mathrm{Re-187(n,\gamma)Re-188}$

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  (Half-life)
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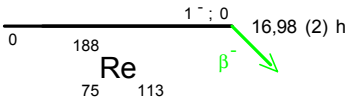
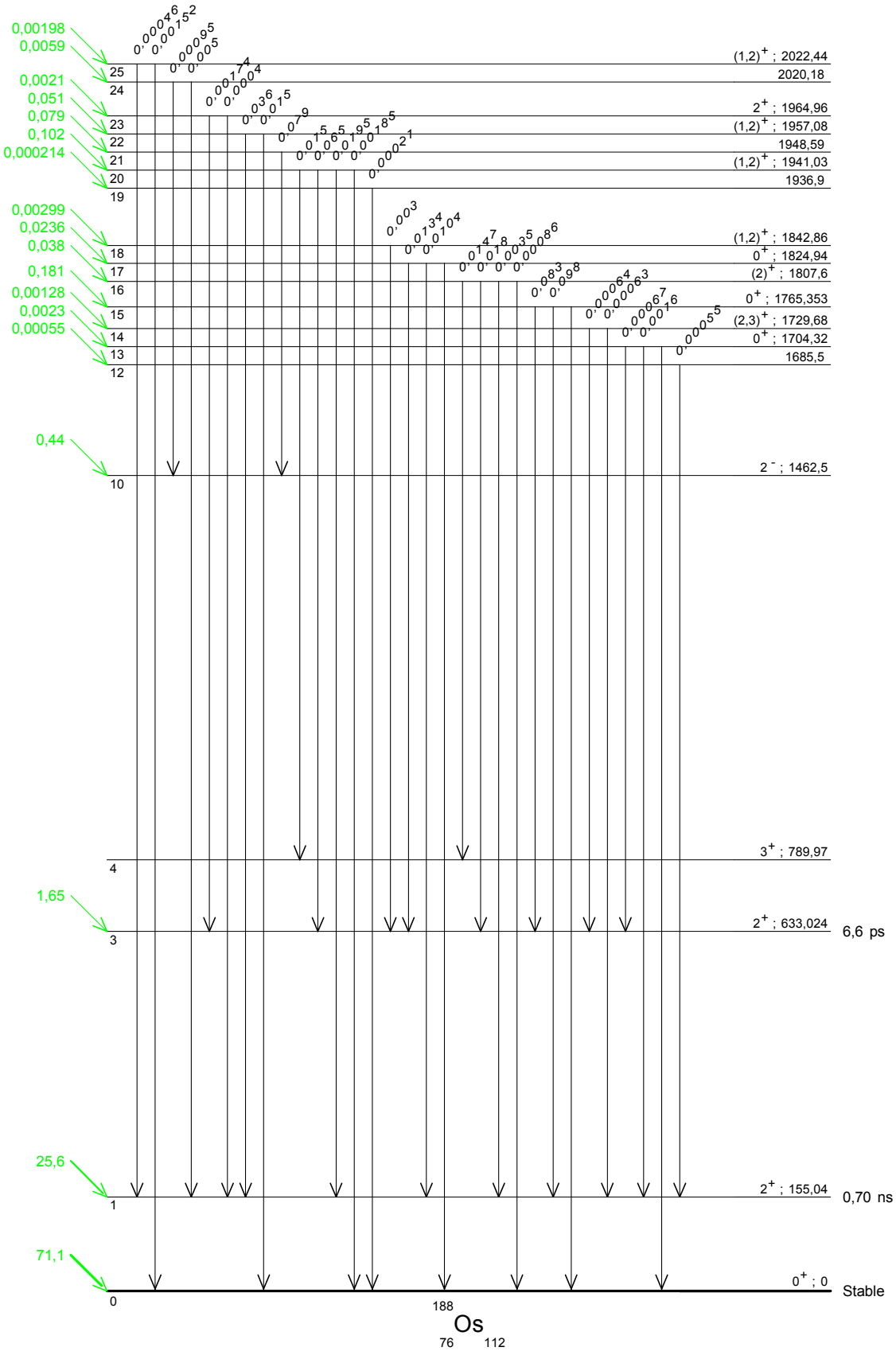
$^{188}_{75}Re_{113}$



γ Emission probabilities per 100 disintegrations

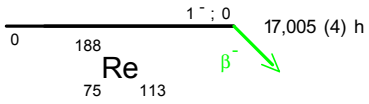


$^{188}_{76}Os_{112}$

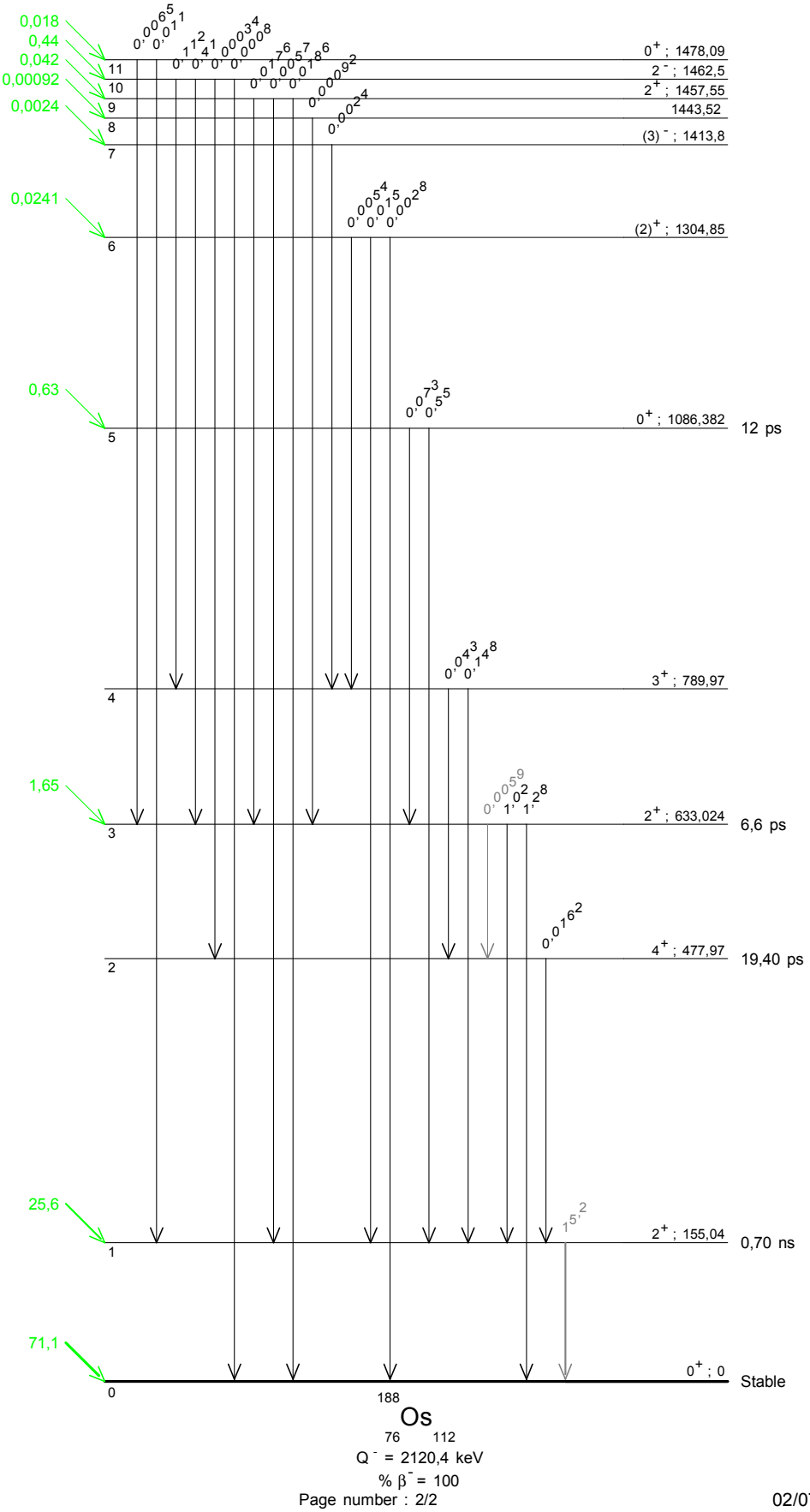
$Q^- = 2120,4$ keV

$\%\ \beta^- = 100$

$^{188}_{75}Re_{113}$



γ Emission probabilities per 100 disintegrations



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