$^{131}_{53}\mathrm{I}_{78}$

1 Decay Scheme

L'iode 131 se désintègre par émission bêta moins vers les niveaux excités de xénon 131, incluant l'isomère xénon 131m de 11,962 (20) jours de période. L'état d'équilibre idéal, c'est à dire l'activité de l'iode 131 étant égale à l'activité de xénon 131m, est obtenue uniquement à tm = 14,04 (9) jours.

I-131 disintegrates through beta minus emissions to excited levels of Xe-131, including the isomeric state Xe-131m. The radioactive equilibrium, i.e. when the activity of I-131 is equal to the activity of Xe-131m, is valid only at tm = 14.04 (9) days.

Pour cette évaluation, l'intensité de la raie gamma de 163,9 keV est donnée, et est valable seulement, au temps t = tm.

For this evaluation, the intensity of the 163.9 keV gamma ray given is only valid at t = tm.

2 Nuclear Data

$T_{1/2}(^{131}\mathrm{I})$	:	8,0233	(19)	d
$Q^-(^{131}\mathrm{I})$	:	970,8	(6)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,8}$	247,9 (6)	2,130 (21)	Allowed	6,98
$\beta^-_{0,7}$	303,9 (6)	0,643 (27)	1st Forbidden	7,79
$\beta^-_{0,6}$	333,8 (6)	7,20 (7)	Allowed	6,86
$\beta^-_{0,4}$	606,3 (6)	89,4 (8)	Allowed	6,64
$\beta^-_{0,3}$	629,7 (6)	0,060 (12)	1st Forbidden	9,8
$\beta^-_{0,2}$	806,9 (6)	0,386 (23)	Unique 1st Forbidden	10,03

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{1,0}$(Xe)	80,1854 (19)	6,63 (15)	M1	1,32 (4)	0,175 (5)	0,036 (1)	1,544 (46)
$\gamma_{8,6}$(Xe)	85,919 (8)	0,0163 (23)	[M1, E2]	1,50 (6)	0,56 (2)		2,2 (1)
$\gamma_{2,0}$(Xe)	163,930 (8)	1,087 (21)	M4	31,6 (5)	14,75 (21)	3,38 (5)	50,5 (7)
$\gamma_{3,2}$(Xe)	177,214 (12)	0,344 (9)	M1+94,9(9)%E2	0,187 (6)	0,0427 (13)	0,00901 (27)	0,241 (7)
$\gamma_{6,5}$(Xe)	232,175 (8)	0,0025 (10)	[E2]	0,0782 (22)	0,0151 (5)	0,0031 (1)	0,097 (2)
$\gamma_{6,4}$(Xe)	272,500 (8)	0,0612 (16)	M1+12,6(6)%E2	0,0453 (7)	0,0061 (3)	0,00125 (6)	0,0530 (9)
$\gamma_{4,1}$(Xe)	284,305 (5)	6,45 (6)	E2	0,0408 (6)	0,00714 (10)	0,001479 (21)	0,0497 (7)
$\gamma_{6,3}$(Xe)	295,846 (13)	0,0012 (6)	[E1]	0,0093 (2)	0,00117 (3)	0,00024 (4)	0,0108 (3)
$\gamma_{7,4}$(Xe)	302,444 (13)	0,0046 (7)	[E1]	0,0088 (2)	0,00111 (1)	0,00022 (1)	0,0102 (2)
$\gamma_{8,5}$(Xe)	318,094 (8)	0,0835 (21)	M1+1,2(9)%E2	0,0301 (5)	0,00388 (6)	0,000786 (12)	0,0350 (5)
$\gamma_{5,1}$(Xe)	324,630 (6)	0,0252 (26)	M1+E2	0,0278 (10)	0,0041 (4)	0,00083 (9)	0,0329 (6)
$\gamma_{7,3}$(Xe)	325,790 (18)	0,283 (8)	M1+39(34)%E2	0,0288 (9)	0,00376 (11)	0,000765 (23)	0,0335 (10)
$\gamma_{8,4}$(Xe)	358,419 (8)	0,017 (8)	[M1,E2]	0,0210 (12)	0,00301 (18)	0,00061 (5)	0,0248 (10)
$\gamma_{4,0}$(Xe)	364,490 (4)	83,1 (5)	M1+95,4(23)%E2	0,0190 (3)	0,00300 (5)	0,000616 (9)	0,0228 (4)
$\gamma_{5,0}$(Xe)	404,815 (4)	0,0562 (17)	M1+50%E2	0,0151 (13)	0,00210 (4)	0,000429 (11)	0,0177 (12)
$\gamma_{7,2}$(Xe)	503,004 (17)	0,3571 (46)	E2	0,00748 (11)	0,001083 (16)	0,000221 (3)	0,00883 (13)
$\gamma_{6,0}$(Xe)	636,990 (4)	7,15 (7)	E2	0,00401 (6)	0,000551 (8)	0,0001123 (16)	0,00470 (7)
$\gamma_{8,1}$(Xe)	642,724 (6)	0,2193 (26)	[E2]	0,0039 (1)	0,00054 (1)	0,00011 (2)	0,0046 (1)
$\gamma_{8,0}$(Xe)	722,909 (4)	1,794 (19)	M1+4,1(1)%E2	0,00390 (6)	0,000488 (7)	0,0000987 (14)	0,00451 (7)

3 Atomic Data

3.1 Xe

ω_K : 0,888 (5)
$\bar{\omega}_L$: 0,097 (5)
n_{KL} : 0,902 (4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	29,459	53,98
	$K\alpha_1$	29,779	100
	$K\beta_3$	33,562	28,99
	$K\beta_1$	33,625	
	$K\beta_5''$	33,881	
	$K\beta_2$	34,415	6,84
	$K\beta_4$	34,496	
	$KO_{2,3}$	34,552	
X_L			
	$L\ell$	3,64	
	$L\alpha$	4,1 - 4,11	
	$L\eta$	3,96	
	$L\beta$	4,42 - 4,78	
	$L\gamma$	4,89 - 5,3	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	23,512 - 24,842	100
KLX	27,897 - 29,770	46,5
KXY	32,27 - 34,54	5,41
Auger L	2,50 - 5,43	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Xe)	2,50 - 5,43	5,87 (4)
e_{AK}	(Xe)		0,67 (4)
	KLL	23,512 - 24,842	
	KLX	27,897 - 29,770	
	KXY	32,27 - 34,54	
$ec_{1,0\ T}$	(Xe)	45,6209 - 80,1732	4,03 (13)
$ec_{1,0\ K}$	(Xe)	45,6209 (19)	3,44 (11)
$ec_{1,0\ L}$	(Xe)	74,7325 - 75,4031	0,456 (14)
$ec_{1,0\ M}$	(Xe)	79,0366 - 79,5086	0,0939 (29)
$ec_{1,0\ N}$	(Xe)	79,9720 - 80,1178	0,01921 (39)
$ec_{2,0\ T}$	(Xe)	129,366 - 163,917	1,066 (47)
$ec_{2,0\ K}$	(Xe)	129,366 (8)	0,662 (29)
$ec_{2,0\ L}$	(Xe)	158,477 - 159,148	0,315 (14)
$ec_{2,0\ M}$	(Xe)	162,781 - 163,253	0,0727 (32)
$ec_{2,0\ N}$	(Xe)	163,717 - 163,862	0,0148 (7)
$ec_{4,1\ K}$	(Xe)	249,741 (5)	0,2505 (44)
$ec_{4,1\ L}$	(Xe)	278,852 - 279,523	0,0438 (7)
$ec_{4,0\ K}$	(Xe)	329,926 (4)	1,543 (26)
$ec_{4,0\ T}$	(Xe)	329,93 - 364,48	1,851 (34)
$ec_{4,0\ L}$	(Xe)	359,04 - 359,71	0,2436 (43)
$ec_{4,0\ M}$	(Xe)	363,34 - 363,81	0,0500 (8)
$ec_{4,0\ N}$	(Xe)	364,28 - 364,42	0,01020 (16)
$ec_{6,0\ K}$	(Xe)	602,426 (4)	0,0286 (5)
$\beta^-_{0,8}$	max:	247,9 (6)	2,130 (21)
	avg:	69,35 (19)	
$\beta^-_{0,7}$	max:	303,9 (6)	0,643 (27)
	avg:	86,94 (19)	
$\beta^-_{0,6}$	max:	333,8 (6)	7,20 (7)
	avg:	96,61 (19)	
$\beta^-_{0,4}$	max:	606,3 (6)	89,4 (8)
	avg:	191,59 (22)	

		Energy (keV)		Electrons (per 100 disint.)
$\beta^-_{0,3}$	max:	629,7 (6)	}	0,060 (12)
	avg:	200,23 (22)	}	
$\beta^-_{0,2}$	max:	806,9 (6)	}	0,386 (23)
	avg:	267,91 (23)	}	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Xe)	3,64 - 5,3	0,631 (13)	
XKα_2	(Xe)	29,459	1,52 (4)	} Kα
XKα_1	(Xe)	29,779	2,81 (6)	}
XKβ_3	(Xe)	33,562	} 0,816 (19)	K$'\beta_1$
XKβ_1	(Xe)	33,625	}	
XKβ''_5	(Xe)	33,881	}	
XKβ_2	(Xe)	34,415	} 0,193 (6)	K$'\beta_2$
XKβ_4	(Xe)	34,496	}	
XKO$_{2,3}$	(Xe)	34,552	}	

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Xe)	80,185 (2)	2,607 (35)
$\gamma_{8,6}$(Xe)	85,9 (2)	0,0051 (7)
$\gamma_{2,0}$(Xe)	163,930 (8)	0,0211 (3)
$\gamma_{3,2}$(Xe)	177,214 (20)	0,277 (7)
$\gamma_{6,5}$(Xe)	232,18 (15)	0,0023 (9)
$\gamma_{6,4}$(Xe)	272,498 (17)	0,0581 (15)
$\gamma_{4,1}$(Xe)	284,305 (5)	6,14 (6)
$\gamma_{6,3}$(Xe)	295,8 (2)	0,0012 (6)
$\gamma_{7,4}$(Xe)	302,4 (2)	0,0046 (7)
$\gamma_{8,5}$(Xe)	318,088 (16)	0,0807 (20)
$\gamma_{5,1}$(Xe)	324,651 (25)	0,0244 (25)
$\gamma_{7,3}$(Xe)	325,789 (4)	0,274 (8)
$\gamma_{8,4}$(Xe)	358,4 (2)	0,017 (8)
$\gamma_{4,0}$(Xe)	364,489 (5)	81,2 (5)
$\gamma_{5,0}$(Xe)	404,814 (4)	0,0552 (17)

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{7,2}$(Xe)	503,004 (4)	0,3540 (46)
$\gamma_{6,0}$(Xe)	636,989 (4)	7,12 (7)
$\gamma_{8,1}$(Xe)	642,719 (5)	0,2183 (26)
$\gamma_{8,0}$(Xe)	722,911 (5)	1,786 (19)

6 Main Production Modes

Fission product

$\left\{ \begin{array}{l} \mathrm{Te-130(n,\gamma)Te-131} \qquad \sigma : 0{,}27\ (6)\ \text{barns} \\ \text{Possible impurities: Te} - 121\text{m, Te} - 121\text{, Te} - 123\text{m, Te} - 125\text{m, Te} - 127\text{, Te} - 129\text{m} \end{array} \right.$

$\mathrm{Te-131}(\beta^-)\mathrm{I-131} \quad T_{1/2}:\ 25\ \text{min}$

$\left\{ \begin{array}{l} \mathrm{Te-130(n,\gamma)Te-131m} \qquad \sigma : 0{,}02\ (1)\ \text{barns} \\ \text{Possible impurities: Te} - 121\text{m, Te} - 121\text{, Te} - 123\text{m, Te} - 125\text{m, Te} - 127\text{, Te} - 129\text{m} \end{array} \right.$

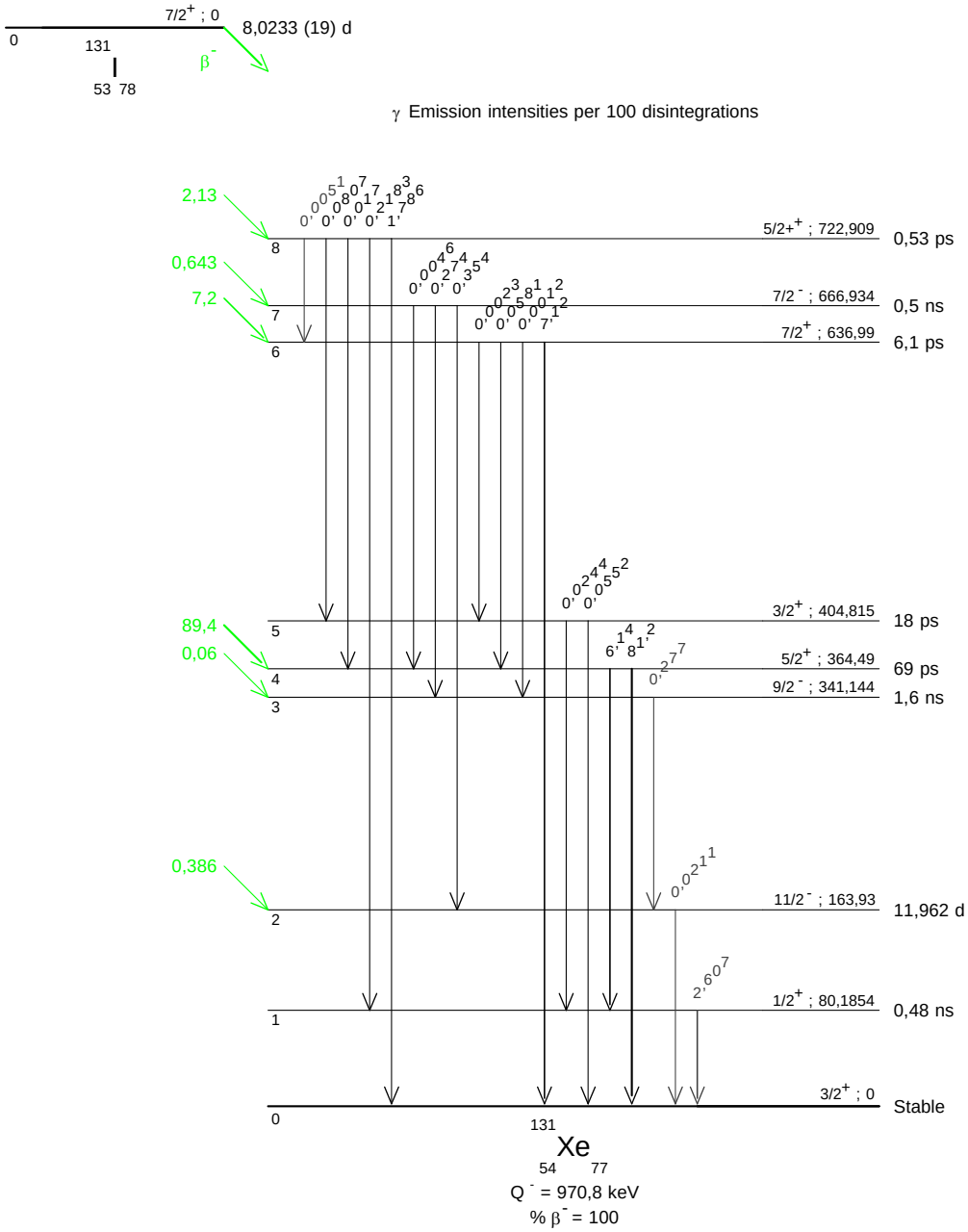
$\mathrm{Te-131m}(\beta^-)\mathrm{I-131} \quad T_{1/2}:\ 30\ \text{h}$

7 References

- J.J.Livingood, G.T.Seaborg. Phys. Rev. 54 (1938) 775
  (Half-life)
- J.H.Sreb. Phys. Rev. 81 (1951) 643
  (Half-life)
- W.K.Sinclair, A.F.Holloway. Nature (London) 167 (1951) 365
  (Half-life)
- R.E.Bell, R.L.Graham. Phys. Rev. 86 (1952) 212
  (Gamma ray intensities, K-internal coefficients)
- J.R.Haskins, J.D.Kurbatov. Phys. Rev. 88 (1952) 884
  (K conversion coefficients)
- I.Bergström. Ark. Fysik 5 (1952) 191
  (ICC)
- E.E.Lockett, R.H.Thomas. Nucleonics 11 (1953) 14
  (Half-life)
- R.M.Bartholomew, F.Brown, R.C.Hawkings, W.F.Merritt, L.Yaffe. Can. J. Chem. 31 (1953) 120
  (Half-life)
- H.H.Seliger, L.Cavallo, S.V.Culpepper. Phys. Rev. 90 (1953) 443
  (Half-life)
- L.Burkinshaw. Phys. in. Med. Biol. 2 (1958) 255
  (Half-life)
- J.P.Keene, L.A.McKenzie, C.W.Gilbert. Philos. Mag. 2 (1958) 360
  (Half-life)
- J.L.Wolfson, J.J.H.Park, L.Yaffe. Nucl. Phys. 39 (1962) 613
  (Internal Conversion)
- H.Jungclaussen, J.S.Schintlmeister, H.Sodan. Nucl. Phys. 43 (1963) 650
  (Gamma ray intensities)
- C.K.Hargrove, K.W.Geiger, A.Chatterjee. Nucl. Phys. 40 (1963) 566
  (Gamma ray intensities, Multipolarity)
- H.Daniel, O.Mehling, P.Schmidlin, D.Schotte, E.Thummernicht. Z. Phys. 179 (1964) 62
  (Gamma ray intensities, L,M-internal coefficients)
- G.A.Moss, D.O.Wells, D.K.McDaniels. Nucl. Phys. 82 (1966) 289
  (Gamma ray energies and intensities)

- C.Ythier, G.Ardisson. Comp. Rend. Acad. Sci. (Paris) 264C (1967) 944
  (Gamma ray intensities)
- G.V.Yakovleva. Program and Theses, Proc. 17th Ann. Conf. Nucl. Spectrosc. Struct. At. Nuclei (1967) 45
  (Half-life)
- G.Graeffe, W.B.Walters. Phys. Rev. 153 (1967) 1321
  (Gamma ray intensities, K, L conversion coefficients)
- P.Kemeny. Rev. Roumaine Phys. 13 (1968) 485
  (Half-life)
- M.Berman, G.B.Beard. Phys. Rev. C2 (1970) 1506
  (Total conversion coefficients)
- A.F.Rupp. Report - ORNL-TM 2876 (1970)
  (Half-life)
- W.H.Zoller, P.K.Hopke, J.L.Fasching, E.S.Macias, W.B.Walters. Phys. Rev. C3 (1971) 1699
  (Half-life)
- N.Singh, S.S.Bhati, R.L.Dhingra, P.N.Trethan. Nucl. Phys. and Solid State Phys. Symp. - Chandigarh (India) (1972) 435
  (Gamma ray intensities)
- K.S.Krane, C.E.Olsen, W.A.Steyert. Phys. Rev. C5 (1972) 1671
  (Mixing Ratios)
- J.F.Emery, S.A.Reynolds, E.I.Wyatt, G.I.Gleason. Nucl. Science and Eng. 48 (1972) 319
  (Half-life)
- R.A.Meyer, F.Momyer, W.B.Walters. Z. Phys. 268 (1974) 387
  (Gamma ray energies and intensities, Total Branching)
- B.K.S.Koene, H.Postma. Nucl. Phys. A219 (1974) 563
  (Mixing ratios)
- J.H.M.Karsten, P.G.Marais, F.J.Haasbroek, C.J.Visser. Agrochemophysica 6 (1974) 25
  (Half-life)
- B.K.S.Koene, H.Postma, H.Ligthart. Nucl. Phys. A250 (1975) 38
  (Mixing ratio)
- Chr.Bargholtz, S.Behai, L.Gidefeldt. Nucl. Phys. A270 (1976) 189
  (Mixing Ratio)
- K.S.Krane. At. Data. Nucl. Data Tables 19 (1977) 363
  (Mixing Ratio)
- F.Lagoutine, J.Legrand, C.Bac. Int. J. Appl. Radiat. Isotop. 29 (1978) 269
  (Half-life)
- A.D.Irving, P.D.Forsyth, I.Hall, D.G.E.Martin. J. Phys. (London) G5 (1979) 1595
  (Mixing Ratio)
- H.Houtermans, O.Milosevic, F.Reichel. Int. J. Appl. Radiat. Isotop. 31 (1980) 153
  (Half-life)
- D.D.Hoppes. Report NBS-SP 626 (1982) 93
  (Half-life)
- K.F.Walz, K.Debertin, H.Schrader. Int. J. Appl. Radiat. Isotop. 34 (1983) 1191
  (Half-life)
- B.Chand, J.Goswamy, D.Mehta, N.Singh, P.N.Trehan. Nucl. Instrum. Methods A284 (1989) 393
  (Gamma ray intensities)
- R.A.Meyer. Fisika (Zagreb) 22 (1990) 153
  (Gamma ray intensities)
- Yu.V.Sergeenkov, Yu.L.Khazov, T.W.Burrows, M.R.Bhat. Nucl. Data Sheets 72 (1994) 487
  (Gamma ray energies, Spin, Parity, Gamma intensities)
- E.Schönfeld, H.Janssen. Nucl. Instrum. Methods A369 (1996) 527
  (Atomic Data)
- I.M.Band, M.B.Trzhaskovskaya, C.W.Nestor Jr., P.O.Tikkanen, S.Raman. At. Data. Nucl. Data Tables 81 (2002) 1
  (Theoretical ICC)
- M.A.L.Da Silva, M.C.M.De Almeida, C.J.Da Silva, J.U.Delgado. Appl. Rad. Isotopes 60 (2004) 301
  (Half-life)
- H.Schrader. Appl. Rad. Isotopes 60 (2004) 317
  (Half-life)

- T.Kibédi, T.W.Burrows, M.B.Trzhaskovskaya, P.M.Davidson, C.W.Nestor Jr. Nucl. Instrum. Methods Phys. Res. A589 (2008) 202
(Theoretical ICCs)
- M.Wang, G.Audi, A.H.Wapstra, F.G.Kondev, M.MacCormick, X.Xu, B.Pfeiffer. Chin. Phys. C36 (2012) 1603
(Q)
- R.Fitzgerald. J. Res. Natl. Inst. Stand. Technol. 117 (2012) 80
(Half-life)
- M.-C.Lépy, L.Brondeau. To be submitted to Applied Radiation Isotopes (2014)
(Gamma-ray emission intensities)
- M.P.Unterweger, R.Fitzgerald. Appl. Rad. Isotopes, doi.org/10.1016/j.apradiso.2013.11.017 (2014)
(Half-life)


7/2+ ; 0
8,0233 (19) d
0
131
53 78
β-
γ Emission intensities per 100 disintegrations
2,13
0,643
7,2
89,4
0,06
0,386
5/2+ ; 722,909
0,53 ps
7/2 - ; 666,934
0,5 ns
7/2+ ; 636,99
6,1 ps
3/2+ ; 404,815
18 ps
5/2+ ; 364,49
69 ps
9/2 - ; 341,144
1,6 ns
11/2 - ; 163,93
11,962 d
1/2+ ; 80,1854
0,48 ns
3/2+ ; 0
Stable
8
7
6
5
4
3
2
1
0
131
Xe
54 77
Q - = 970,8 keV
% β- = 100