$^{153}_{64}\mathrm{Gd}_{89}$

1 Decay Scheme

Gd-153 disintegrates by 100% electron capture to levels in Eu-153.
Le gadolinium 153 se désintègre à 100% par capture électronique vers des niveaux exités de l'europium 153.

2 Nuclear Data

$T_{1/2}(^{153}\mathrm{Gd}\ )$: 240,4 (10) d
$Q^{+}(^{153}\mathrm{Gd}\ )$: 484,0 (7) keV

2.1 Electron Capture Transitions

	Energy keV	Probability × 100	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,4}$	311 (7)	15,7 (6)	1st Forbidden	7,9	0,8019 (19)	0,1519 (4)	0,0359 (9)
$\epsilon_{0,3}$	381 (7)	42,0 (18)	1st Forbidden	7,7	0,8111 (18)	0,1452 (16)	0,0341 (8)
$\epsilon_{0,2}$	387 (7)	38,0 (11)	Allowed	7,7	0,8116 (18)	0,1448 (16)	0,034 (8)
$\epsilon_{0,1}$	401 (7)	0,05 (7)	1st Forbidden				
$\epsilon_{0,0}$	484 (7)	4 (3)	1st Forbidden	8,9	0,8192 (17)	0,1392 (15)	0,0324 (8)

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 (20)	0,24 (6)	E1		8,54 (12)	1,90 (3)	10,89 (16)
$\gamma_{3,1}$(Eu)	19,81296 (19)	0,45 (6)	E2		2490 (40)	578 (8)	3220 (50)
$\gamma_{4,3}$(Eu)	69,67302 (13)	15,27 (48)	M1+1,8%E2	4,39 (7)	0,719 (12)	0,1572 (25)	5,31 (8)
$\gamma_{4,2}$(Eu)	75,42215 (21)	0,137 (8)	E1+0,3%M2	0,62 (5)	0,112 (13)	0,025 (3)	0,76 (7)
$\gamma_{1,0}$(Eu)	83,36719 (17)	0,938 (36)	M1+65,6%E2	2,33 (4)	1,11 (5)	0,257 (12)	3,76 (7)
$\gamma_{4,1}$(Eu)	89,48598 (21)	0,248 (19)	M1+6,2%E2	2,11 (5)	0,38 (7)	0,085 (16)	2,60 (7)
$\gamma_{2,0}$(Eu)	97,43103 (17)	37,8 (11)	E1	0,256 (4)	0,0382 (6)	0,00823 (12)	0,305 (5)
$\gamma_{3,0}$(Eu)	103,18016 (13)	56,8 (17)	M1+1,4%E2	1,422 (20)	0,213 (3)	0,0462 (7)	1,694 (24)
$\gamma_{4,0}$(Eu)	172,85317 (13)	0,0496 (28)	M1+E2	0,296 (7)	0,0637 (22)	0,0142 (6)	0,377 (6)

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	}	8,1
	$KO_{2,3}$	48,497	}	
X_L				
	$L\ell$	5,1751		
	$L\alpha$	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	32,25 – 34,38	100
KLX	38,59 – 41,27	51
KXY	44,9 – 48,2	6,5
Auger L	3,4 – 7,8	18,9

4 Electron Emissions

		Energy keV	Electrons per 100 disint.
e_{AL}	(Eu)	3,4 - 7,8	98,4 (9)
e_{AK}	(Eu)		9,2 (6)
	KLL	32,25 - 34,38	}
	KLX	38,59 - 41,27	}
	KXY	44,9 - 48,2	}
$ec_{2,1\ L}$	(Eu)	6,0120 - 7,0869	0,171 (43)
$ec_{3,1\ L}$	(Eu)	11,7610 - 12,8361	0,349 (6)
$ec_{4,3\ K}$	(Eu)	21,15402 (13)	10,62 (35)
$ec_{1,0\ K}$	(Eu)	34,84819 (17)	0,459 (18)
$ec_{4,1\ K}$	(Eu)	40,96698 (21)	0,146 (11)
$ec_{2,0\ K}$	(Eu)	48,91203 (17)	7,42 (24)
$ec_{3,0\ K}$	(Eu)	54,66116 (13)	30 (1)
$ec_{4,3\ L}$	(Eu)	61,6210 - 62,6961	1,74 (6)
$ec_{4,3\ M}$	(Eu)	67,9000 - 68,5421	0,380 (13)
$ec_{1,0\ L}$	(Eu)	75,3150 - 76,3903	0,219 (13)
$ec_{2,0\ L}$	(Eu)	89,3790 - 90,4541	1,108 (35)
$ec_{3,0\ L}$	(Eu)	95,1280 - 96,2033	4,49 (14)
$ec_{2,0\ M}$	(Eu)	95,6000 - 96,3001	0,239 (7)
$ec_{3,0\ M}$	(Eu)	101,4000 - 102,0493	0,975 (31)
$ec_{3,0\ N}$	(Eu)	102,820 - 103,047	0,223 (7)

5 Photon Emissions

5.1 X-Ray Emissions

		Energy keV	Photons per 100 disint.	
XL	(Eu)	5,1751 — 7,791	20,1 (5)	
$XK\alpha_2$	(Eu)	40,9024	34,2 (9)	} $K\alpha$
$XK\alpha_1$	(Eu)	41,5427	61,7 (16)	}
$XK\beta_3$	(Eu)	46,904 }		
$XK\beta_1$	(Eu)	47,0384 }	19,4 (6)	$K'\beta_1$
$XK\beta_5''$	(Eu)	47,373 }		
$XK\beta_2$	(Eu)	48,257 }		
$XK\beta_4$	(Eu)	48,386 }	5,01 (17)	$K'\beta_2$
$XKO_{2,3}$	(Eu)	48,497 }		

5.2 Gamma Emissions

	Energy keV	Photons per 100 disint.
$\gamma_{2,1}$(Eu)	14,06383 (20)	0,020 (5)
$\gamma_{3,1}$(Eu)	19,81296 (19)	0,00014
$\gamma_{4,3}$(Eu)	69,67300 (13)	2,42 (7)
$\gamma_{4,2}$(Eu)	75,42213 (23)	0,078 (3)
$\gamma_{1,0}$(Eu)	83,36717 (21)	0,197 (7)
$\gamma_{4,1}$(Eu)	89,48595 (22)	0,069 (5)
$\gamma_{2,0}$(Eu)	97,43100 (21)	29,0 (8)
$\gamma_{3,0}$(Eu)	103,18012 (17)	21,1 (6)
$\gamma_{4,0}$(Eu)	172,85307 (21)	0,036 (2)

6 Main Production Modes

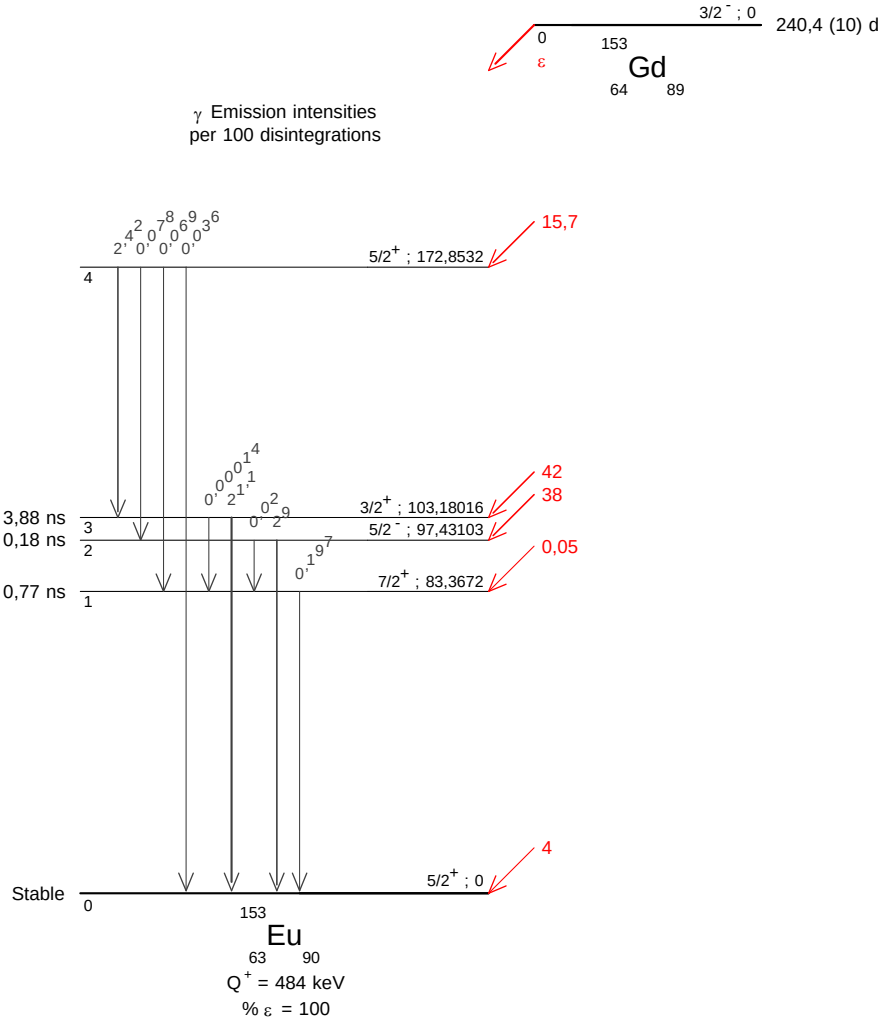
$\left\{ \begin{array}{l} \mathrm{Gd-152(n,\gamma)Gd-153} \qquad \sigma : 735\ (20)\ \mathrm{barns} \\ \mathrm{Possible\ impurities:\ Gd-159,\ Gd-161} \end{array} \right.$

$\left\{ \begin{array}{l} \mathrm{Eu-153(d,2n)Gd-153} \\ \mathrm{Possible\ impurities:\ Gd-151} \end{array} \right.$

7 References

- R.E.Hein, A.F.Voigt. Phys.Rev. 79 (1950) 783
  (Half-life)
- D.C.Hoffman. J. Inorg. Nucl. Chem. 25 (1963) 1196
  (Half-life)
- K.Mühlbauer. Z.Phys. 230 (1970) 18
  (Gamma-ray energies)
- J.F.Emery, S.A.Reynolds, E.I.Wyatt, K.I.Gleason. Nucl.Sci.Eng. 48 (1972) 319
  (Half-life)
- V.A.Sergienko, V.M.Lebedev. Bull. Ac.Sc. URSS Phys.Ser.38 4 (1974) 122
  (Gamma-ray emmission probabilities)
- K.Singh, H.S.Sahota. Indian J. Phys. 59A (1985) 95
  (Gamma-ray emmission probabilities)
- E.Browne, R.B.Firestone. Table of Radioactive Isotopes, Appendix C, Table 7a (John Wiley and Sons, New York) C (1986) 7a
  (P Xrel)
- B.M.Coursey, D.D.Hoppes, F.J.Shima, M.P.Unterweger. Appl. Rad. Isotopes 38 (1987) 31
  (Gamma-ray emmission probabilities)
- S.Subrahmanyeswara Rao, K.Bhaskara Rao, V.Seshagiri Rao, H.C.Padhi. J.Phys.G.Nucl.Phys 14 (1988) 1259
  (Gamma-ray emmission probabilities)
- N.Venkateswara Rao, G.S.Sri Krishna, S.Bhuloka Reddy, C.V.Raghavaiah, G.Satyanarayana, D.L.Sastry. Nuovo Cim. 99A (1988) 303
  (Gamma-ray emmission probabilities)
- Yu.S.Popov, N.Yu.Nezgovorov, G.A.Timofeev. Sov. J. Radiochem. 31 (1989) 1
  (Half-life)
- M.P.Unterweger, D.D.Hoppes, F.J.Shima. Nucl. Instrum. Methods Phys. Res. A 312 (1992) 349
  (Half-life)

- B.Chand, J.Goswamy, D.Metha, N.Singh, P.N.Trehan. Appl. Rad. Isotopes 43 (1992) 997
(Gamma-ray emmission probabilities)
- V.P.Chechev, A.G.Egorov. Nucl. Instrum. Methods Phys. Res. A 312 (1992) 378
(Gamma-ray emmission probabilities)
- A.G.Egorov, V.P.Chechev, G.E.Shchukin. Bull. Acad. Sci. URSS, Phys. 57 5 (1993) 911
(Gamma-ray emmission probabilities)
- V.Kumar, Kawaldeep, K.Singh. J.Radioanal.Nucl.Chem. 189 (1995) 3
(Gamma-ray emmission probabilities)
- E.Schönfeld. Report PTB 6.33-95-2 (1995)
(Elec. capt. probabilities in atomic shells)
- E.Schönfeld, H.Janssen. Nucl. Instrum. Methods Phys. Res. A 369 (1996) 572
(Atomic Data)
- R.G.Helmer. Nuclear Data Sheets 83 (1998) 285
(Multipolarities)
- R.G.Helmer, C.Van der Leun. Nucl. Instrum. Methods Phys. Res. A450 (2000) 35
(Gamma-ray energies)
- I.M.Band, M.B.Trzhaskovskaya, C.W.Nestor, P.O.Tikkanen, S.Raman. Atom. Data and Nucl. Data Tables 91 (2002) 1
(Theoretical internal conversion coefficients)
- T. Kibèdi, T.W. Burrows, M.B. Trzhaskovskaya, P.M. Davidson, C.W. Nestor Jr.. Nucl. Instrum. Methods Phys. Res. A589 (2008) 202
(Theoretical ICCs)
- G.Audi. AMDC web site (2011)
(Q)


3/2 - ; 0
240,4 (10) d
0
ε
153
Gd
64 89
γ Emission intensities
per 100 disintegrations
15,7
5/2+ ; 172,8532
4
42
38
3,88 ns
0,18 ns
3
2
3/2+ ; 103,18016
5/2 - ; 97,43103
0,05
0,77 ns
1
7/2+ ; 83,3672
4
Stable
0
5/2+ ; 0
153
Eu
63 90
Q+ = 484 keV
% ε = 100