^{112}In ε decay (14.88 min) 1983Ry03,1962Ru05,1972Ka34

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	S. Lalkovski, F. G. Kondev	NDS 124, 157 (2015)	1-Aug-2014

Parent: ^{112}In: E=0.0; J$^{\pi}$=1^{+}; $T_{1/2}$=14.88 min *17*; Q(ε)=2585 *4*; %ε+%β^{+} decay=62 *4*

1962Ru05: Facility: Osaka University cyclotron; Source: ^{112}In from ^{112}Cd(d,2n) and ^{109}Ag(α,n) reactions at E(d)=11 MeV and E(α)=15-16 MeV, respectively; Targets: 2.7 mg/cm^2 enriched in ^{112}Cd and 5 mg/cm^2 enriched to 99.2% in ^{109}Ag; Detectors: two mushroom β-spectrometers, one NaI(Tl) scintillator; Measured: Iβ^-, Iβ^+, Eβ^+; Deduced: ^{112}Cd level scheme, $I_{\beta+\varepsilon}$(GS).

1972Ka34: Source: ^{112}In produced in ^{113}In(γ,n) reaction. ^{113}In irradiated with γ-rays for 15 min. γ-flux=1.0x10^6 R.min^{-1}; Detectors: one Ge(Li), one NaI(Tl); Measured: Eγ, Iγ, γ-γ, γ-$\gamma(\theta)$ coinc.; Deduced: γ-mult., δ, ^{112}Cd levels, J$^{\pi}$, log *ft*.

1983Ry06: Facility: SAMES at National Physics Laboratory, Teddington, UK; Source: from (n,2n) reaction with E(n)=14.3 MeV on 37 or 187 mg/cm^2 thick natural In targets; Detectors: one HPGe detector, one 4π proportional counter; Measured: γ, Eγ, γ(t), σ(^{112m}In), σ(^{112}In), Isomeric Ratio; Deduced: ^{112}Cd level scheme, I_{β^+}(GS).

1991Gi05: Facility: Van de Graaff accelerator at LNL (Italy); Source: ^{112}In activated in (p,n) reaction. E(p)=6.8 MeV; Target enriched to 94% in ^{112}Cd. Carbon backing; Detectors: one HPGe, one Si(Li), magnetic transport system; Measured: α(K)exp(851γ). Deduced B(E0)/B(E2) and B(E0)/B(M1); Also, from the same collaboration: 1979Gi05.

2009Gr10: Facility: TRIUMF cyclotron; Detectors: ISAC, TRILIS, 8π γ-array comprising 20 Compton-suppressed HPGe detectors; Measured: γ, γ-γ coinc., Eγ, Iγ.

Others: 1986Ho12, 1979OhZV, 1975GaZB, 1972Yo06, 1971It01, 1965Fu07, 1959Gi51, 1953Bl44.

^{112}Cd Levels

E(level)†	J$^{\pi}$‡
0.0	0$^+$
617.519 *3*	2$^+$
1224.345 *5*	0$^+$
1312.394 *8*	2$^+$
1433.282 *17*	0$^+$
1468.811 *15*	2$^+$
1871.17 *10*	0$^+$
2121.48 *6*	2$^+$
2156.22 *6*	2$^+$
2300.66 *7*	0$^+$

† From a least-squares fit to Eγ.
‡ From the Adopted Levels.

ε,β^+ radiations

E(decay)	E(level)	Iβ^+ ‡	Iε‡	Log *ft*	I($\varepsilon+\beta^+$)†‡	Comments
(284 *4*)	2300.66		0.023 *7*	5.80 *14*	0.023 *7*	εK=0.8434 *4*; εL=0.1248 *3*; εM+=0.03180 *8*
(429 *4*)	2156.22		0.013 *6*	6.43 *21*	0.013 *6*	εK=0.8512 *2*; εL=0.1188 *1*; εM+=0.03002 *4*
(464 *4*)	2121.48		0.053 *7*	5.89 *7*	0.053 *7*	εK=0.8523 *2*; εL=0.1179 *1*; εM+=0.02977 *3*
(714 *4*)	1871.17		0.23 *3*	5.65 *7*	0.23 *3*	εK=0.8569; εL=0.11434 *4*; εM+=0.02872 *1*
(1116 *4*)	1468.811		0.173 *25*	6.17 *7*	0.173 *25*	εK=0.8599; εL=0.11204 *2*; εM+=0.028051 *5*
(1152 *4*)	1433.282		0.036 *15*	6.88 *19*	0.036 *15*	εK=0.8600; εL=0.11191 *2*; εM+=0.028014 *5*
(1361 *4*)	1224.345	0.0029 *4*	1.00 *12*	5.58 *6*	1.00 *12*	av Eβ=158.3 *18*; εK=0.8583 *2*; εL=0.11100 *3*; εM+=0.027761 *7*
(1967 *4*)	617.519	0.70 *6*	5.2 *4*	5.19 *5*	5.9 *5*	av Eβ=422.2 *18*; εK=0.7590 *14*; εL=0.09713 *18*; εM+=0.02426 *5* Iβ^+: from Iβ^+(tot)=24% 2 in 1983Ry06, deduced from Iγ(511γ), and Iβ^+(617.37)/Iβ^+(g.s.)=0.029 (1962Ru05), and by assuming that the Iβ^+ feedings to the

Continued on next page (footnotes at end of table)

^{112}In ε decay (14.88 min) 1983Ry03,1962Ru05,1972Ka34 (continued)

ϵ,β^+ radiations (continued)

E(decay)	E(level)	$I\beta^+$ ‡	$I\varepsilon$‡	Log *ft*	$I(\varepsilon+\beta^+)$†‡	Comments
						higher-lying levels are negligible. $I\varepsilon$: from $I\beta^+$ and $I\varepsilon/I\beta^+$=7.36 *13*.
2582 *20*	0.0	23.3 *19*	32 *2*	4.64 *5*	55 *4*	av $E\beta$=696.9 *18*; εK=0.5022 *18*; εL=0.06390 *22*; εM+=0.01595 *6* E(decay): From 1962Ru05. $I\beta^+$: from $I\beta^+$(tot)=24% 2 in 1983Ry06, deduced from $I\gamma(511\gamma)$, and $I\beta^+(617.37)/I\beta^+$(g.s.)=0.029 (1962Ru05), and by assuming that the $I\beta^+$ feedings to the higher-lying levels are negligible. Others: $I\beta^+$(tot)= 21 (1962Ru05) and 24 (1953Bl44). $I\varepsilon$: from $I\beta^+$ and $I\varepsilon/I\beta^+$=1.392 *18*.

† From intensity balances, unless otherwise stated.

‡ Absolute intensity per 100 decays.

$\gamma(^{112}Cd)$

Iγ normalization: from (100 -(Iβ^+(g.s.)+Iε(g.s.)))/Σ Ti(g.s.), where Iβ^+(g.s.)+Iε(g.s.)=89% 4.

E_γ [†]	I_γ [‡&]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [†]	δ [†]	α [@]	$I_{(\gamma+ce)}$ [†&]	Comments
120.68 *10*	<0.5	1433.282	0^+	1312.394	2^+	E2		0.766		α(K)=0.597 *9*; α(L)=0.1367 *20*; α(M)=0.0270 *4* α(N)=0.00453 *7*; α(O)=0.0001141 *17* I_γ: from 1972Yo06.
208.93 *3*		1433.282	0^+	1224.345	0^+	E0			≤0.074	
244.86 [#] *23*	0.031 *10*	1468.811	2^+	1224.345	0^+	(E2)		0.0641		α(K)=0.0538 *8*; α(L)=0.00840 *13*; α(M)=0.001633 *24* α(N)=0.000282 *4*; α(O)=1.143×10^{-5} *17* I_γ: From Iγ(233.86γ)/Iγ(851.285γ)=0.010 *3* and Iγ(851.285γ) from from ^{112}In ε decay (14.88 min).
402.50 *16*	0.53 *7*	1871.17	0^+	1468.811	2^+	E2		0.01271		α(K)=0.01088 *16*; α(L)=0.001485 *21*; α(M)=0.000287 *4* α(N)=5.02×10^{-5} *7*; α(O)=2.43×10^{-6} *4* E_γ: From 2009Gr10. I_γ: from the adopted Iγ branching ratio and Iγ(1253.56γ)=4.7 *3*.
558.7 *5*	0.16 *4*	1871.17	0^+	1312.394	2^+	E2		0.00487		α(K)=0.00420 *6*; α(L)=0.000541 *8*; α(M)=0.0001041 *15* α(N)=1.83×10^{-5} *3*; α(O)=9.61×10^{-7} *14* E_γ: From 2009Gr10; ΔE estimated by the evaluators. I_γ: from the adopted Iγ branching ratio and Iγ(1253.56γ)=4.7 *3*.
606.821 *6*	23.9 *4*	1224.345	0^+	617.519	2^+	E2		0.00388		α(K)=0.00336 *5*; α(L)=0.000427 *6*; α(M)=8.21×10^{-5} *12* α(N)=1.450×10^{-5} *21*; α(O)=7.71×10^{-7} *11*
617.517 *3*	100	617.519	2^+	0.0	0^+	E2		0.00371		α(K)=0.00321 *5*; α(L)=0.000407 *6*; α(M)=7.82×10^{-5} *11* α(N)=1.381×10^{-5} *20*; α(O)=7.37×10^{-7} *11* Mult.: A_2=0.208 *22*; A_4=0.904 *30* (1972Ka34); α(K)exp=0.0038 *7* (1962Ru05).
687.41 *10*	0.015 *7*	2156.22	2^+	1468.811	2^+	M1+E2	−2.3 *19*	0.00285 *24*		α(K)=0.00247 *22*; α(L)=0.000307 *15*; α(M)=5.9×10^{-5} *3* α(N)=1.04×10^{-5} *6*; α(O)=5.7×10^{-7} *7* I_γ: from the adopted Iγ branching ratio and Iγ(1538.68γ)=0.27 *12*.
688.23 *10*	0.142 *16*	2121.48	2^+	1433.282	0^+	E2		0.00279		α(K)=0.00242 *4*; α(L)=0.000302 *5*; α(M)=5.81×10^{-5} *9* α(N)=1.028×10^{-5} *15*; α(O)=5.58×10^{-7} *8* I_γ: from the adopted Iγ branching ratio and Iγ(1504.04γ)=0.95 *9*.

$^{112}_{48}Cd_{64}$-3

γ(^{112}Cd) (continued)

E_γ [†]	I_γ [‡&]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [†]	δ [†]	α [@]	$I_{(\gamma+ce)}$ [†&]	Comments
694.872 *7*	0.24 *15*	1312.394	2^+	617.519	2^+	E2+M1	−4.0 *7*	0.00274		α(K)=0.00238 *4*; α(L)=0.000296 *5*; α(M)=5.68×10^{-5} *8* α(N)=1.007×10^{-5} *15*; α(O)=5.50×10^{-7} *8*
808.82 *19*	0.035 *4*	2121.48	2^+	1312.394	2^+	M1+E2		0.00215		α(K)=0.00187 *3*; α(L)=0.000221 *3*; α(M)=4.23×10^{-5} *6* α(N)=7.56×10^{-6} *11*; α(O)=4.48×10^{-7} *7* I_γ: from the adopted Iγ branching ratio and Iγ(1504.04γ)=0.95 *9*.
815.79 *3*	≤1	1433.282	0^+	617.519	2^+	E2		0.00183		α(K)=0.001589 *23*; α(L)=0.000195 *3*; α(M)=3.74×10^{-5} *6* α(N)=6.63×10^{-6} *10*; α(O)=3.69×10^{-7} *6* E_γ: Transition observed only in 1975GaZB.
831.79 *8*	0.18 *7*	2300.66	0^+	1468.811	2^+	E2		1.75×10^{-3}		α(K)=0.001517 *22*; α(L)=0.000186 *3*; α(M)=3.56×10^{-5} *5* α(N)=6.32×10^{-6} *9*; α(O)=3.52×10^{-7} *5* I_γ: from the adopted Iγ branching ratio and Iγ(1683.22γ)=0.37 *14*.
842.8 *15*	0.007 *4*	2156.22	2^+	1312.394	2^+	[M1]		0.00195		α(K)=0.001706 *25*; α(L)=0.000201 *3*; α(M)=3.85×10^{-5} *6* α(N)=6.88×10^{-6} *10*; α(O)=4.08×10^{-7} *6* I_γ: from the adopted Iγ branching ratio and Iγ(1538.68γ)=0.27 *12*.
851.285 *15*	3.1 *3*	1468.811	2^+	617.519	2^+	M1+E2+E0	+0.050 *18*	0.00195 *4*		α(K)=0.001667 *24*; α(L)=0.000196 *3*; α(M)=3.76×10^{-5} *6* α(N)=6.72×10^{-6} *10*; α(O)=3.98×10^{-7} *6* Mult.: α(K)exp=2.34×10^{-3} *12* (1991Gi05); A_2=0.086 *45*; A_4=−0.081 *100* (1972Ka34). δ: Other: 0.048 *22* from γ(ω) in 1991Gi05, −0.21 +*5*−*6* in γγ(ω) in 1972Ka34. Ice(K)(E0,2^+ to 2^+)/Ice(K)(M1,2^+ to 2^+)=0.41 *7*, B(E0)/B(E2)=2.7 *13*, B(E0)/B(M1)=2555 *472* and ρ^2(E0)=0.031 *20* (1991Gi05). α: From adopted gammas.
897.07 *10*	0.113 *11*	2121.48	2^+	1224.345	0^+	E2		1.46×10^{-3}		α(K)=0.001271 *18*; α(L)=0.0001545 *22*; α(M)=2.96×10^{-5} *5* α(N)=5.26×10^{-6} *8*; α(O)=2.96×10^{-7} *5* I_γ: from the adopted Iγ branching ratio and Iγ(1504.04γ)=0.95 *9*.

γ(^{112}Cd) (continued)

E_γ †	I_γ ‡&	E_i(level)	J^π_i	E_f	J^π_f	Mult. †	δ †	α @	$I_{(\gamma+ce)}$ †&	Comments
1224.341 *7*		1224.345	0^+	0.0	0^+	E0			0.00356 *17*	$I_{(\gamma+ce)}$: From Adopted Levels Ti(1224γ)/Ti(607γ) and Iγ(606γ)=23.9 *4*.
1253.56 *12*	4.7 *3*	1871.17	0^+	617.519	2^+	E2		7.16×10^{-4}		α(K)=0.000612 *9*; α(L)=7.25×10^{-5} *11*; α(M)=1.386×10^{-5} *20* α(N)=2.47×10^{-6} *4*; α(O)=1.430×10^{-7} *20*; α(IPF)=1.517×10^{-5} *22* Mult.: A_2=0.218 *42*; A_4=0.990 *51* (1972Ka34).
1312.36 *4*	0.10 *9*	1312.394	2^+	0.0	0^+	E2		6.64×10^{-4}		α(K)=0.000557 *8*; α(L)=6.58×10^{-5} *10*; α(M)=1.258×10^{-5} *18* α(N)=2.24×10^{-6} *4*; α(O)=1.302×10^{-7} *19*; α(IPF)=2.64×10^{-5} *4*
1433.27 *3*		1433.282	0^+	0.0	0^+	E0			≤0.031	
1468.84 *10*	1.7 *2*	1468.811	2^+	0.0	0^+	E2		5.79×10^{-4}		α(K)=0.000444 *7*; α(L)=5.21×10^{-5} *8*; α(M)=9.96×10^{-6} *14* α(N)=1.777×10^{-6} *25*; α(O)=1.039×10^{-7} *15*; α(IPF)=7.09×10^{-5} *10*
1504.04 *10*	0.95 *9*	2121.48	2^+	617.519	2^+	M1+E2	+1.36 *7*	5.88×10^{-4}		α(K)=0.000444 *7*; α(L)=5.19×10^{-5} *8*; α(M)=9.92×10^{-6} *15* α(N)=1.77×10^{-6} *3*; α(O)=1.045×10^{-7} *15*; α(IPF)=8.01×10^{-5} *12* E_γ: 1507.3 keV *3* in 1972Ka34.
1538.68 *10*	0.27 *12*	2156.22	2^+	617.519	2^+	M1+E2	+0.085 *+25−22*	6.11×10^{-4}		α(K)=0.000459 *7*; α(L)=5.33×10^{-5} *8*; α(M)=1.019×10^{-5} *15* α(N)=1.82×10^{-6} *3*; α(O)=1.089×10^{-7} *16*; α(IPF)=8.67×10^{-5} *13*
1683.22 *10*	0.37 *14*	2300.66	0^+	617.519	2^+	E2		5.45×10^{-4}		α(K)=0.000341 *5*; α(L)=3.98×10^{-5} *6*; α(M)=7.60×10^{-6} *11* α(N)=1.356×10^{-6} *19*; α(O)=7.98×10^{-8} *12*; α(IPF)=0.0001551 *22*
2121.49 *13*	0.027 *3*	2121.48	2^+	0.0	0^+	E2		6.14×10^{-4}		α(K)=0.000222 *4*; α(L)=2.57×10^{-5} *4*; α(M)=4.90×10^{-6} *7* α(N)=8.75×10^{-7} *13*; α(O)=5.19×10^{-8} *8*; α(IPF)=0.000360 *5* I_γ: from the adopted Iγ branching ratio and Iγ(1504.04γ)=0.95 *9*.
2156.20 *10*	0.024 *11*	2156.22	2^+	0.0	0^+	E2		6.23×10^{-4}		α(K)=0.000216 *3*; α(L)=2.49×10^{-5} *4*; α(M)=4.75×10^{-6} *7* α(N)=8.49×10^{-7} *12*; α(O)=5.04×10^{-8} *7*; α(IPF)=0.000377 *6* I_γ: from the adopted Iγ branching ratio and Iγ(1538.68γ)=0.27 *12*.

$\gamma(^{112}$Cd) (continued)

† From the adopted gammas, unless otherwise noted.
‡ From 1972Ka34, unless otherwise noted.
# Only observed by 1975GaZB.
@ Additional information 1.
& For absolute intensity per 100 decays, multiply by 0.067 *25*.

$^{112}_{48}$Cd$_{64}$-6

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Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays