^{120}In β^- decay (46.2 s) 1988Ra09,1978Ch25

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	K. Kitao, Y. Tendow and A. Hashizume	NDS 96,241 (2002)	1-Dec-2001

Parent: ^{120}In: E=70 *60*; $J^\pi=(5)^+$; $T_{1/2}$=46.2 s *8*; Q(β^-)=5370 *40*; %β^- decay=100

1988Ra09: ^{120}Sn(n,p) E=14 MeV; semi G.

1978Ch25: ^{238}U(p,F) E=100 MeV; on-line mass separation, semi γ, $\gamma\gamma$.

1971Li09: ^{120}Sn(n,p) E=14-15 MeV; semi scin γ, $\gamma\gamma$, (K x ray)γ coin.

Others: 1972JoZP, 1964Ka10.

The decay scheme is that from 1988Ra09.

$\gamma\gamma$ coin from 1978Ch25.

^{120}Sn Levels

E(level)‡	J^π†	$T_{1/2}$	E(level)‡	J^π†	E(level)‡	J^π†
0.0	0^+	stable	2400.9 *3*	3^-	3057.91 *4*	4^+
1171.25 *3*	2^+		2420.83 *3*	2^+	3179.06 *4*	4^+
1875.2 *5*	0^+		2465.61 *4*	4^+	3349.90 *5*	$(4)^+$
2097.17 *4*	2^+		2481.49 *6*	7^-	3438.23 *8*	4^+
2160.0 *7*	0^+		2643.34 *4*	4^+	3777.19 *6*	4^+
2194.25 *4*	4^+		2685.02 *7*	6^+	3857.53 *13*	(4)
2284.11 *5*	5^-		2695.74 *19*	4^-		
2355.31 *4*	2^+		2727.9 *4*	2^+		

† From Adopted Levels.

‡ From a least-squares fit to E(γ's) by the evaluators. The authors show the 0^+ 2588 level as being populated in this decay and being deexcited via a 409γ and a 1417γ. The evaluators reassigned the 490γ to the 2685 level, on the basis of (n,n'γ) data and the energy of the 1417γ deviates by 4σ from the value in (n,n'γ). Also, it is unlikely that a 0^+ state at this energy would be populated in the β^- decay of a 5^- parent. This level has been deleted by the evaluator from this decay, and the 1416γ assigned as unplaced.

β^- radiations

E(decay)	E(level)	Iβ^-†	Log *ft*	Comments
(1.58×10^3 *7*)	3857.53	0.66 *11*	6.06 *11*	av Eβ=597 *32*
(1.66×10^3 *7*)	3777.19	3.68 *22*	5.40 *8*	av Eβ=632 *33*
(2.00×10^3 *7*)	3438.23	1.59 *12*	6.08 *8*	av Eβ=785 *33*
(2.09×10^3 *7*)	3349.90	5.5 *4*	5.62 *7*	av Eβ=825 *33*
(2.26×10^3 *7*)	3179.06	18.1 *8*	5.24 *7*	av Eβ=903 *34*
(2.38×10^3 *7*)	3057.91	48.3 *19*	4.91 *6*	av Eβ=958 *34*
(2.74×10^3 *7*)	2695.74	0.31 *10*	7.36 *15*	av Eβ=1126 *34*
(2.76×10^3 *7*)	2685.02	1.15 *12*	6.79 *7*	av Eβ=1131 *34*
(2.80×10^3 *7*)	2643.34	3.1 *3*	6.39 *7*	av Eβ=1150 *34*
(2.97×10^3 *7*)	2465.61	2.0 *6*	6.69 *14*	av Eβ=1233 *34*
(3.04×10^3 *7*)	2400.9	0.8 *3*	8.53^{1u} *18*	av Eβ=1253 *34*
(3.25×10^3 *7*)	2194.25	14.7 *22*	5.99 *8*	av Eβ=1360 *34*

† Absolute intensity per 100 decays.

^{120}In β^- decay (46.2 s) 1988Ra09,1978Ch25 (continued)

$\gamma(^{120}Sn)$

Iγ normalization: based on assumption of no direct β^- feeding to ^{120}Sn g.s..

E_γ [†]	I_γ [†c]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[b]	δ[b]	α[d]	Comments
89.87[‡] *3*	1.05 *11*	2284.11	5^-	2194.25	4^+	E1		0.246	α(K)=0.213; α(L)=0.0271; α(M)=0.00523; α(N+..)=0.00112 Iγ: from an intensity balance at the 2284 level with assumption of no direct β^- feeding. The 89.87γ is severely attenuated, and the authors do not give an experimental value for it. Mult.: from ^{120}Sb ε decay (5.76 d).
177.79 *9*	0.27 *3*	2643.34	4^+	2465.61	4^+	E2			
(197.37 *3*)	0.105 *8*	2481.49	7^-	2284.11	5^-				Eγ,Iγ: from (n,n′γ). Iγ from intensity balance at the 2482 level.
(203.5 *2*)	0.105 *8*	2685.02	6^+	2481.49	7^-	D+Q			Eγ,Iγ: introduced by the evaluators based on data in (n,n′γ).
295.2 *4*	0.09 *5*	2695.74	4^-	2400.9	3^-	D+Q	+0.01 *4*		
323.5 *3*	0.10 *4*	2420.83	2^+	2097.17	2^+				Eγ: 323.48 *30* (1988Ra09).
400.91[@] *5*	0.86[a] *8*	2685.02	6^+	2284.11	5^-				Eγ=401.0 *3* Iγ=0.9 *6*.
411.54 *20*	0.23 *9*	2695.74	4^-	2284.11	5^-	M1+E2	+0.08 *2*		
414.57[@] *3*	2.65 *14*	3057.91	4^+	2643.34	4^+	(M1+E2)	−0.2 *2*		
449.01 *7*	0.75 *9*	2643.34	4^+	2194.25	4^+	M1+E2	−0.38 *12*	0.0103	α(K)=0.0089; α(L)=0.00111 *1*; α(M)=0.00022
490.80 *24*	0.22 *8*	2685.02	6^+	2194.25	4^+				
546.16[@] *4*	1.74 *10*	2643.34	4^+	2097.17	2^+	E2			
[x]577.0 *6*	[a]								Iγ: 0.10 *5*.
592.34[@] *5*	1.55 *10*	3057.91	4^+	2465.61	4^+				
637.02[@] *4*	1.94 *15*	3057.91	4^+	2420.83	2^+				
702.62[@] *4*	2.68 *11*	3057.91	4^+	2355.31	2^+				Iγ: other: 1.9 *5* (1978Ch25).
704.0 *5*	<0.23	1875.2	0^+	1171.25	2^+				Iγ: other: 11 *2* (1971Li09).
706.43 *8*	1.00 *9*	3349.90	$(4)^+$	2643.34	4^+				
713.37[@] *3*	8.5 *3*	3179.06	4^+	2465.61	4^+	D+Q			
[x]778.80 *17*	[a]								Iγ: 0.43 *11*.
823.60 *17*	0.50 *11*	3179.06	4^+	2355.31	2^+				
863.64[@] *3*	36.1 *11*	3057.91	4^+	2194.25	4^+	M1+E2	−0.04 *4*		Iγ: other: 33.8 *16* (1978Ch25).
[x]915.7 *3*	[a]								Eγ: 915.68 *33* (1988Ra09). Iγ: 0.23 *9*.
925.96[@] *6*	2.02 *19*	2097.17	2^+	1171.25	2^+	M1+E2	−12 *2*	0.00171 *18*	α(K)=0.00148 *16*; α(L)=0.00018 *2* Iγ: other: 1.3 *3* (1978Ch25).
929.08 *11*	1.00 *18*	3349.90	$(4)^+$	2420.83	2^+				
[x]975.7 *5*	[a]								Iγ: 0.13 *6*.
984.91[@] *4*	3.10 *16*	3179.06	4^+	2194.25	4^+	D+Q			
988.7 *7*	0.06 *2*	2160.0	0^+	1171.25	2^+				

$^{120}_{50}Sn_{70}$-2

^{120}In β^- decay (46.2 s) 1988Ra09,1978Ch25 (continued)

$\gamma(^{120}Sn)$ (continued)

E_γ [†]	I_γ [†c]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[b]	δ[b]	α[d]	Comments
1023.02[@] *3*	58.0 *18*	2194.25	4^+	1171.25	2^+	E2		0.00123	α(K)=0.00106; α(L)=0.00013 Mult.: from ^{120}Sb ε decay (5.76 d).
[x]1071.55 *22*	[a]								I_γ: 0.36 *7*.
1081.2 *6*	0.09 *5*	3179.06	4^+	2097.17	2^+				
1112.7[‡] *3*	<0.01	2284.11	5^-	1171.25	2^+				
1133.88 *10*	0.61 *5*	3777.19	4^+	2643.34	4^+				
[x]1146.2 *3*	[a]								E_γ: 1146.23 *30* (1988Ra09). I_γ: 0.20 *8*.
1156.1 *3*	0.57 *11*	3349.90	$(4)^+$	2194.25	4^+				E_γ: 1156.09 *30* (1988Ra09).
1171.22[#] *3*	100 *3*	1171.25	2^+	0.0	0^+				
1184.05[@] *4*	2.70 *11*	2355.31	2^+	1171.25	2^+	M1+E2	+1.2 *2*	0.00100 *10*	α(K)=0.00086 *9*; α(L)=0.00010 *1*
[x]1205.60 *25*	[a]								I_γ: 0.17 *6*.
1229.8[#] *3*	0.9 *3*	2400.9	3^-	1171.25	2^+	E1+M2	+0.04 *2*	0.0013 *10*	α(K)=0.0011 *9*; α(L)=0.00014 *11*
[x]1245.0[&] *6*	0.7 *4*								E_γ: assigned to deexciting γ of the 3439 level in 1978Ch25.
1249.56[@] *2*	1.66 *8*	2420.83	2^+	1171.25	2^+	D+Q			
1253.03[@] *25*	0.26 *6*	3349.90	$(4)^+$	2097.17	2^+				E_γ: assigned to 47.3-s ^{120}In in 1978Ch25.
1294.32[@] *3*	12.7 *5*	2465.61	4^+	1171.25	2^+				
1311.57 *14*	0.34 *6*	3777.19	4^+	2465.61	4^+				
1341.1 *7*	0.08 *3*	3438.23	4^+	2097.17	2^+				
[x]1376.4 *3*	[a]								E_γ: 1376.41 *28* (1988Ra09). I_γ: 0.15 *4*.
[x]1389.8 *3*	[a]								I_γ: 0.14 *5*.
[x]1417.0 *3*	0.17 *5*								E_γ: 1417.04 *32* (1988Ra09).
1421.6 *4*	0.12 *4*	3777.19	4^+	2355.31	2^+				
1472.09[@] *4*	4.72 *17*	2643.34	4^+	1171.25	2^+	E2			
[x]1477.28 *16*	[a]								I_γ: 0.31 *9*.
1494.2 *7*	0.11 *6*	3777.19	4^+	2284.11	5^-				
1556.8 *6*	0.10 *4*	2727.9	2^+	1171.25	2^+	M1+E2	−4.4 *8*		
[x]1567.24 *22*	[a]								I_γ: 0.24 *6*.
1582.76 *17*	0.69 *9*	3777.19	4^+	2194.25	4^+				
[x]1632.96 *22*	[a]								I_γ: 0.24 *7*.
1663.3 *6*	0.11 *6*	3857.53	(4)	2194.25	4^+				
1679.89 *20*	0.30 *7*	3777.19	4^+	2097.17	2^+				
1760.54 *20*	0.32 *9*	3857.53	(4)	2097.17	2^+				
[x]1838.3 *5*	[a]								I_γ: 0.11 *5*.
1886.67[@] *5*	4.90 *18*	3057.91	4^+	1171.25	2^+				
2007.82[@] *4*	6.5 *3*	3179.06	4^+	1171.25	2^+				

$^{120}_{50}Sn_{70}$-3

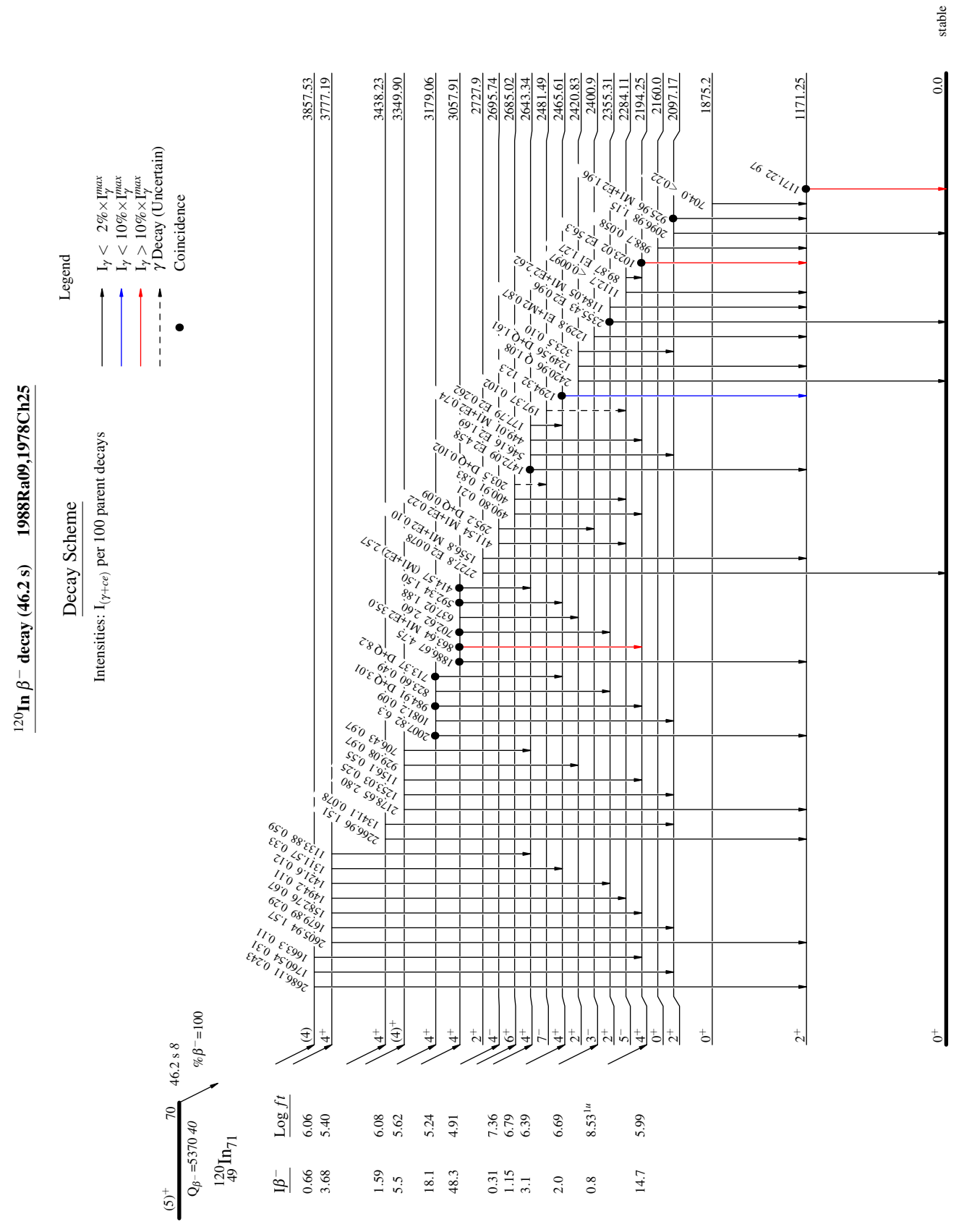
^{120}In β^- decay (46.2 s) 1988Ra09,1978Ch25 (continued)

$\gamma(^{120}Sn)$ (continued)

E_γ [†]	I_γ [†c]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[b]	Comments
2096.98[@] *10*	1.18 *10*	2097.17	2^+	0.0	0^+		
2178.65[@] *5*	2.89 *16*	3349.90	$(4)^+$	1171.25	2^+		
2266.96[@] *7*	1.56 *10*	3438.23	4^+	1171.25	2^+		
2355.43[@] *9*	0.99 *8*	2355.31	2^+	0.0	0^+	E2	
2420.96 *8*	1.11 *8*	2420.83	2^+	0.0	0^+	Q	E_γ: from 1988Ra09.
[x]2460.0 *4*	[a]						I_γ: 0.08 *4*.
[x]2543.82 *16*	[a]						I_γ: 0.24 *3*.
2605.94[@] *8*	1.62 *10*	3777.19	4^+	1171.25	2^+		I_γ: other: 2.3 *4* (1978Ch25).
[x]2613.5[&] *9*							E_γ: isomeric assignment uncertain (1978Ch25). I_γ: 0.64 *21* (1978Ch25).
2686.11[@] *17*	0.25 *3*	3857.53	(4)	1171.25	2^+		I_γ: other: 0.41 *21* (1978Ch25).
2727.8 *5*	0.08 *3*	2727.9	2^+	0.0	0^+	E2	

† From 1988Ra09, unless otherwise noted.
‡ From ^{120}In β^- decay (47.3 s).
# From weighted av from 1988Ra09 and 1978Ch25.
@ Also observed in 1978Ch25.
& Observed in 1978Ch25 only.
[a] Unassigned by 1988Ra09. Iγ for combined 46.2-s and 47.3-s decays are given in comments. If the transition belongs to the former, multiply by 1.14 and if to the later, by 8.3.
[b] From (n,n′γ), unless otherwise noted.
[c] For absolute intensity per 100 decays, multiply by 0.97 *3*.
[d] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[x] γ ray not placed in level scheme.

$^{120}_{50}Sn_{70}$-4


^{120}In β^- decay (46.2 s) 1988Ra09,1978Ch25
Decay Scheme
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)
Coincidence
$^{120}_{49}In_{71}$
$(5)^+$
Q_{β^-}=5370 40
70
46.2 s 8
$\%\beta^-$=100
Iβ− Log ft
0.66 6.06
3.68 5.40
1.59 6.08
5.5 5.62
18.1 5.24
48.3 4.91
0.31 7.36
1.15 6.79
3.1 6.39
2.0 6.69
0.8 8.53u
14.7 5.99
3857.53
3777.19
3438.23
3349.90
3179.06
3057.91
2727.9
2695.74
2685.02
2643.34
2481.49
2465.61
2420.83
2400.9
2355.31
2284.11
2194.25
2160.0
2097.17
1875.2
1171.25
0.0
stable
$^{120}_{50}Sn_{70}$