^{72}Cu β^- decay 2006Th12

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	D. Abriola(a), A. A. Sonzogni	NDS 111,1 (2010)	1-May-2009

Parent: ^{72}Cu: E=0.0; J^π=(2); $T_{1/2}$=6.63 s *3*; Q(β^-)=8362 *3*; %β^- decay=100.0

^{72}Cu-$T_{1/2}$: from 2006Th12, deduced from fit to the time spectrum collected by the 4$\pi\beta$ detector used in a study of ^{72}Ni β-decay.

^{72}Cu isotope produced by induced fission of a ^{238}U target via a 1-GeV proton beam at the CERN-ISOLDE facility. The fission products were selectively ionized and mass separated.

Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\beta$ coin with four plastic scintillators for β detection with three of them associated with the HPGe γ-ray detectors. Almost the same data were reported in thesis by 2002VaZX.

In table ii, the following γ rays are from impurities as communicated by J.-C. Thomas: 145.1 *3* (from ^{72}Zn decay); 264.6 *1* (from ^{75}Ge decay); 352.4 *4* (from ^{214}Pb background); 386.5 *1*, 487.6 *1* and 619.4 *2* (from ^{71}Zn isomer decay); 834.4 *2* (from ^{72}Ga decay); 1461.1 *4* (from ^{40}K background); and 3355.0 *7* (in coin with 653γ from ^{72}Cu decay, most likely a single-escape peak of 3865γ, its weak coin with 653γ is probably accidental).

Other: 1983Ru06, where ^{72}Zn was produced by W(^{76}Ge,X) at E=9 MeV/nucleon.

^{72}Zn Levels

E(level)[†]	J^π	Comments
0.0	0^+	Beta feeding to this level was not reported by 2006Th12 and it was taken to be negligible on the assumption that the spin of ^{72}Cu is equal to 2. In1983RU06, the g.s. feeding was reported as equal to 21% from the comparison between singles and gamma-gated beta intensities. Simply because the experimental conditions in 2006Th12 were considerable better than in 1983Ru06, we are adopting the results of the former reference. However, it should be pointed out that the g.s. β- intensity remains uncertain.
652.70 *5*	2^+	
1499.52 *8*	(4^+)	
1511.00 *11*	(0^+)	
1612.6 *3*		
1657.30 *10*	2^+	
2057.0 *5*		
2169.0 *3*		
2192.52 *11*		
2441.97 *22*	(3,4)	
2645.63 *11*	(3,4)	
2792.1 *3*		
2804.82 *15*		
2908.66 *11*	(3,4)	
3061.9 *3*		
3110.0 *5*		
3192.7 *20*		
3246.6 *3*	(1,2)	
3395.5 *6*		
3574.6 *3*		
3661.65 *12*		
3697.8 *3*		
3707.27 *13*	(2)	
3752.2 *3*		
3865.6 *4*	(1,2)	
4001.2 *6*		
4130.2 *6*		
4174.8 *4*		
4358.8 *4*		
4427.2 *4*		
4429.1 *3*		
4594.4 *7*		

[†] From least-squares fit to Eγ's.

^{72}Cu β^- decay 2006Th12 (continued)

β^- radiations

E(decay)	E(level)	Iβ^-[†‡]	Log *ft*	Comments
(3768 *3*)	4594.4	1.1 *2*	6.25 *8*	av Eβ=1650.8 *15*
(3933 *3*)	4429.1	1.9 *2*	6.10 *5*	av Eβ=1730.6 *15*
(3935 *3*)	4427.2	0.87 *8*	6.44 *4*	av Eβ=1731.5 *15*
(4003 *3*)	4358.8	2.3 *2*	6.05 *4*	av Eβ=1764.5 *15*
(4187 *3*)	4174.8	0.9 *1*	6.54 *5*	av Eβ=1853.5 *15*
(4232 *3*)	4130.2	2.3 *2*	6.16 *4*	av Eβ=1875.0 *15*
(4361 *3*)	4001.2	2.46 *16*	6.18 *3*	av Eβ=1937.5 *15*
(4496 *3*)	3865.6	9.0 *4*	5.680 *20*	av Eβ=2003.1 *15*
(4610 *3*)	3752.2	3.6 *2*	6.127 *25*	av Eβ=2058.1 *15*
(4655 *3*)	3707.27	7.6 *3*	5.821 *18*	av Eβ=2079.9 *15*
(4664 *3*)	3697.8	1.0 *1*	6.71 *5*	av Eβ=2084.5 *15*
(4700 *3*)	3661.65	10.8 *3*	5.688 *13*	av Eβ=2102.0 *15*
(4787 *3*)	3574.6	2.6 *2*	6.34 *4*	av Eβ=2144.2 *15*
(4967 *3*)	3395.5	0.63 *7*	7.03 *5*	av Eβ=2231.1 *15*
(5115 *3*)	3246.6	1.9 *2*	6.61 *5*	av Eβ=2303.4 *15*
(5169 *4*)	3192.7	0.87 *8*	6.97 *4*	av Eβ=2329.6 *18*
(5252 *3*)	3110.0	0.25 *5*	7.54 *9*	av Eβ=2369.8 *15*
(5300 *3*)	3061.9	4.44 *24*	6.309 *24*	av Eβ=2393.1 *15*
(5453 *3*)	2908.66	9.9 *4*	6.017 *18*	av Eβ=2467.6 *15*
(5557 *3*)	2804.82	1.2 *1*	6.97 *4*	av Eβ=2518.1 *15*
(5570 *3*)	2792.1	0.25 *4*	7.66 *7*	av Eβ=2524.3 *15*
(5716 *3*)	2645.63	3.9 *5*	6.51 *6*	av Eβ=2595.5 *15*
(5920 *3*)	2441.97	0.75 *9*	7.30 *6*	av Eβ=2694.6 *15*
(6169 *3*)	2192.52	0.5 *4*	7.6 *4*	av Eβ=2815.9 *15*
(6193 *3*)	2169.0	1.2 *1*	7.19 *4*	av Eβ=2827.4 *15*
(6305 *3*)	2057.0	0.30 *5*	7.82 *8*	av Eβ=2881.9 *15*
(6705 *3*)	1657.30	6.4 *10*	6.62 *7*	av Eβ=3076.5 *15* Iβ^-: 7 *1* (2006Th12).
(6749 *3*)	1612.6	0.27 *5*	8.00 *8*	av Eβ=3098.2 *15*
(6851 *3*)	1511.00	1.6 *1*	7.26 *3*	av Eβ=3147.7 *15*
(6862 *3*)	1499.52	2.8 *6*	7.02 *10*	av Eβ=3153.3 *15*
(7709 *3*)	652.70	16 *4*	6.50 *11*	av Eβ=3565.6 *15*

[†] From intensity balance.
[‡] Absolute intensity per 100 decays.

$\gamma(^{72}Zn)$

Iγ normalization: from Σ(Iγ to g.s.)=100.

E$_\gamma$	I$_\gamma$[#@]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	E$_\gamma$	I$_\gamma$[#@]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$
535.3 *2*	0.64 *6*	2192.52		1657.30	2^+	942.4 *3*	0.35 *6*	2441.97	(3,4)	1499.52	(4^+)
599.6 *3*	0.32 *5*	2792.1		2192.52		959.9 *3*	0.34 *6*	1612.6		652.70	2^+
612.3 *1*	1.5 *1*	2804.82		2192.52		988.24 *9*	1.9 *1*	2645.63	(3,4)	1657.30	2^+
652.68 *5*	100 *5*	652.70	2^+	0.0	0^+	1004.7 *2*	17.3 *9*	1657.30	2^+	652.70	2^+
716.18 *7*	0.73 *8*	2908.66	(3,4)	2192.52		1016.0 *1*	4.9 *3*	3661.65		2645.63	(3,4)
753.1[†] *2*	0.43 *6*	3661.65		2908.66	(3,4)	1146.4 *2*	1.2 *1*	2645.63	(3,4)	1499.52	(4^+)
798.7 *1*	1.8 *1*	3707.27	(2)	2908.66	(3,4)	1251.5 *1*	7.6 *4*	2908.66	(3,4)	1657.30	2^+
846.75 *7*	11.4 *6*	1499.52	(4^+)	652.70	2^+	1404.3 *5*	0.38 *6*	2057.0		652.70	2^+
858.3 *1*	2.0 *1*	1511.00	(0^+)	652.70	2^+	1408.3 *3*	0.74 *9*	2908.66	(3,4)	1499.52	(4^+)
928.6[†] *7*	0.23 *5*	3574.6		2645.63	(3,4)	1469.0[†] *2*	0.71 *7*	3661.65		2192.52	

Continued on next page (footnotes at end of table)

^{72}Cu β^- decay 2006Th12 (continued)

$\gamma(^{72}Zn)$ (continued)

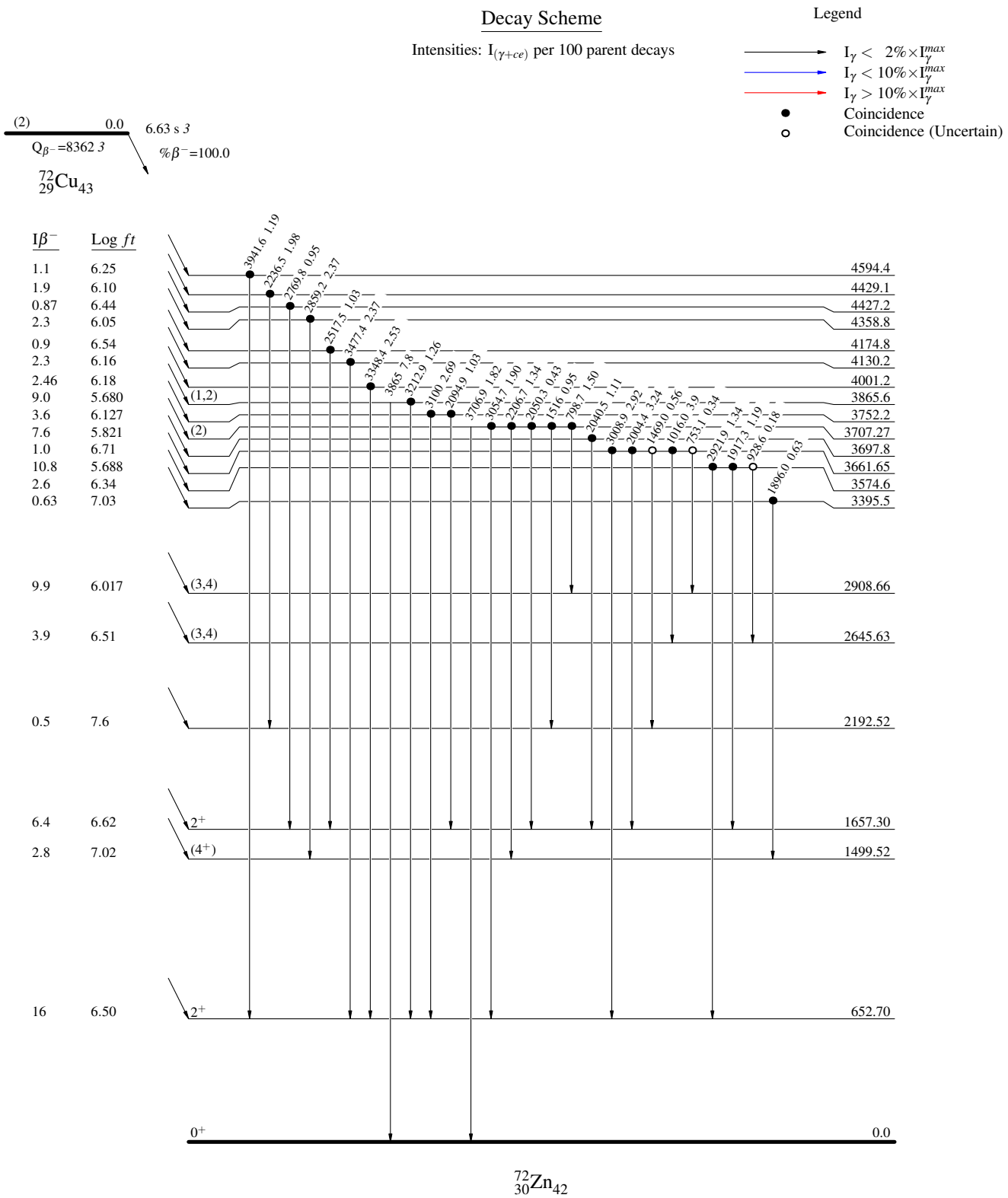
E_γ	I_γ[#@]	E_i(level)	J_i^π	E_f	J_f^π	E_γ	I_γ[#@]	E_i(level)	J_i^π	E_f	J_f^π
1516 *2*	1.1 *1*	3707.27	(2)	2192.52		2517.5 *4*	1.2 *1*	4174.8		1657.30	2^+
1540.0 *2*	6.8 *4*	2192.52		652.70	2^+	2540 *2*	1.1 *1*	3192.7		652.70	2^+
1610.5 *5*	0.31 *6*	3110.0		1499.52	(4^+)	2594.0 *4*	1.7 *2*	3246.6	(1,2)	652.70	2^+
1657.6 *2*	11.7 *6*	1657.30	2^+	0.0	0^+	2769.8 *4*	1.1 *1*	4427.2		1657.30	2^+
1789.3 *3*	0.59 *9*	2441.97	(3,4)	652.70	2^+	2859.2 *4*	2.9 *2*	4358.8		1499.52	(4^+)
1896.0 *6*	0.80 *9*	3395.5		1499.52	(4^+)	2921.9 *5*	1.6 *2*	3574.6		652.70	2^+
1917.3 *3*	1.4 *1*	3574.6		1657.30	2^+	3008.9 *5*	3.6 *2*	3661.65		652.70	2^+
1993.1 *9*	7.0 *4*	2645.63	(3,4)	652.70	2^+	3054.7 *5*	2.3 *2*	3707.27	(2)	652.70	2^+
2004.4 *3*	4.0 *2*	3661.65		1657.30	2^+	3100 *2*	3.3 *2*	3752.2		652.70	2^+
2040.5 *3*	1.3 *1*	3697.8		1657.30	2^+	3212.9 *5*	1.5 *2*	3865.6	(1,2)	652.70	2^+
2050.3 *5*	0.55 *9*	3707.27	(2)	1657.30	2^+	3246.3 *6*	0.7 *2*	3246.6	(1,2)	0.0	0^+
2094.9 *3*	1.2 *1*	3752.2		1657.30	2^+	3348.4 *6*	3.1 *2*	4001.2		652.70	2^+
2169.0 *3*	1.5 *1*	2169.0		0.0	0^+	3477.4 *6*	2.9 *2*	4130.2		652.70	2^+
2206.7[‡] *3*	1.6 *1*	3707.27	(2)	1499.52	(4^+)	3706.9 *7*	2.2 *2*	3707.27	(2)	0.0	0^+
2236.5 *3*	2.4 *2*	4429.1		2192.52		3865[†] *1*	9.9 *5*	3865.6	(1,2)	0.0	0^+
2255.6 *3*	5.6 *3*	2908.66	(3,4)	652.70	2^+	3941.6 *7*	1.4 *2*	4594.4		652.70	2^+
2409.2 *3*	5.6 *3*	3061.9		652.70	2^+						

[†] Placement from energy matching.
[‡] Level-energy difference=2207.7.
[#] Relative intensities deduced from areas of β-gated γ peaks.
[@] For absolute intensity per 100 decays, multiply by 0.79 *4*.

^{72}Cu β^- decay 2006Th12

Decay Scheme

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



^{72}Cu β^- decay 2006Th12

Decay Scheme (continued)

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