^{58}Cu $\varepsilon+\beta^+$ decay (3.204 s)   1972Jo01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Caroline D. Nesaraja, Scott D. Geraedts and Balraj Singh	NDS 111,897 (2010)	12-Jan-2010

Parent: ^{58}Cu: E=0.0; J^π=1$^+$; $T_{1/2}$=3.204 s 7; $Q(\varepsilon)$=8565.6 14; %ε+%β^+ decay=100

1972Jo01: measured Eγ, Iγ.
1971Ca03: measured Eγ, Iγ.
1970Ra34: measured Eγ, Iγ, $\gamma\gamma$.
1964Sh11: measured $\gamma\gamma$.
1962Su12, 1962Mi13: measured β^+, $\beta\gamma$, $\gamma\gamma$.
Decay scheme is that of 1972Jo01.
2001Pe23: measured Iγ combined with an on-line mass separation of ^{58}Cu deduced precise $\varepsilon+\beta^+$ feeding to g.s.
2001Ja16: measured total absorption γ-ray spectrum, deduced β feedings.

^{58}Ni Levels

E(level)[†]	J^{π}[‡]	$T_{1/2}$	Comments
0.0	0$^+$		
1454.56 15	2$^+$		
2776.1 3	2$^+$		
2902.86 21	1$^+$		
2943.3 3	0$^+$	1.46 ns 14	$T_{1/2}$: from 1970Ra34.
3038.7 5	2$^+$		
3264.64 16	2$^+$		
3532.2 8	0$^+$		
3594.99 25	1,2$^+$		
3899.5 9	2$^+$		
4450.0 4	1$^+$,2$^+$		
4538.3 7	0$^+$		

[†] From least-squares fit to Eγ's.
[‡] Adopted values.

ε,β^+ radiations

From $\gamma^\pm$/1454.6g=12.5 13 β feeding of ground state=82% 2 was derived (1972Jo01). From similar technique but using a mass separated source, 2001Pe23 deduce feeding of 80.7%. 2001Ja16 deduce 81.2 5 from total absorption gamma-ray spectrum.
From $\beta\gamma$ 1962Su12 give Eβ+=(6000) (%Iβ+<4), 4500 (%Iβ+=15 6); Eβ+(g.s.)=7439 25 (1962Mi13).

E(decay)	E(level)	Iβ^+ [†]	Iε[†]	Log ft	I($\varepsilon+\beta^+$)[†]	Comments
(4027.3 19)	4538.3	0.103 18	0.0020 3	5.92 8	0.105 18	av Eβ=1353.10 75; εK=0.01671 3; εL=0.001808 3; εM+=0.0003053 5 I($\varepsilon+\beta^+$): 0.14 3 (2001Ja16).
(4115.6 18)	4450.0	0.85 8	0.015 1	5.06 4	0.86 8	av Eβ=1395.11 70; εK=0.015345 22; εL=0.0016599 2; εM+=0.0002803 4 I($\varepsilon+\beta^+$): 0.84 3 (2001Ja16).
(4666.1 20)	3899.5	0.123 23	0.00132 25	6.22 8	0.124 23	av Eβ=1658.38 80; εK=0.009460 13; εL=0.0010229 1; εM+=0.00017270 I($\varepsilon+\beta^+$): 0.11 2 (2001Ja16).
(4970.6[‡] 18)	3594.99	<0.14	<0.0012	>6.3	<0.14	av Eβ=1804.90 69; εK=0.007462 8; εL=0.0008067 9; εM+=0.00013621 I($\varepsilon+\beta^+$): 0.01 5 (2001Ja16).
(5033.4 19)	3532.2	0.072 16	0.00059 13	6.64 10	0.073 16	av Eβ=1835.18 78; εK=0.007123 9;

Continued on next page (footnotes at end of table)

^{58}Cu $\varepsilon+\beta^+$ decay (3.204 s)   1972Jo01 (continued)

ϵ,β^+ radiations (continued)

E(decay)	E(level)	Iβ^+ [†]	Iε [†]	Log ft	I($\varepsilon+\beta^+$) [†]	Comments
						εL=0.0007700 *1*; εM+=0.00013000
						I($\varepsilon+\beta^+$): 0.13 *6* (2001Ja16).
(5301.0 *17*)	3264.64	1.15 *7*	0.0077 *5*	5.57 *3*	1.16 *7*	av Eβ=1964.45 *69*; εK=0.005885 *6*; εL=0.0006361 *7*; εM+=0.0001074 *1*
						I($\varepsilon+\beta^+$): 0.91 *3* (2001Ja16).
(5526.9 *18*)	3038.7	0.32 *3*	0.0018 *2*	6.23 *4*	0.32 *3*	av Eβ=2073.89 *73*; εK=0.005055 *5*; εL=0.0005463 *6*; εM+=9.223×10^{-5} *9*
						I($\varepsilon+\beta^+$): 0.31 *6* (2001Ja16).
(5622.3 *18*)	2943.3	10.1 *14*	0.055 *8*	4.77 *6*	10.2 *14*	av Eβ=2120.17 *70*; εK=0.004751 *5*; εL=0.0005135 *5*; εM+=8.669×10^{-5} *8*
						I($\varepsilon+\beta^+$): 10.7 *4* (2001Ja16).
(5662.7 *17*)	2902.86	4.6 *14*	0.024 *7*	5.13 *14*	4.6 *14*	av Eβ=2139.79 *69*; εK=0.004630 *5*; εL=0.0005004 *5*; εM+=8.448×10^{-5} *8*
						I($\varepsilon+\beta^+$): 3.9 *3* (2001Ja16).
(5789.5 *18*)	2776.1	<0.28	<0.0013	>6.4	<0.28	av Eβ=2201.37 *70*; εK=0.004276 *4*; εL=0.0004620 *5*; εM+=7.800×10^{-5} *7*
						I($\varepsilon+\beta^+$): 0.47 *6* (2001Ja16).
(7111.0 *17*)	1454.56	1.4 *4*	0.0033 *9*	6.20 *13*	1.4 *4*	av Eβ=2846.55 *69*; εK=0.002075 *2*; εL=0.0002241 *2*; εM+=3.784×10^{-5} *3*
						I($\varepsilon+\beta^+$): 1.37 *3* (2001Ja16).
(8565.6 *20*)	0.0	81.1 *5*	0.101 *1*	4.870 *3*	81.2 *5*	av Eβ=3561.62 *69*; εK=0.0011017 *6*; εL=0.000119; εM+=2.008×10^{-5} *2*
						Iβ^+: from weighted average of 80.8 *7* (2001Pe23) and 81.2 *5* (2001Ja16). Others: 82 *2* (1972Jo01), 83 *7* (1962Su12).
						Eβ+=7439 *25* (1962Mi13).

[†] Absolute intensity per 100 decays.
[‡] Existence of this branch is questionable.

γ(^{58}Ni)

Iγ normalization: from Σ(I(γ+ce) of γ's to g.s.)=18.8 *5* (100-81.2 *5*) it is consistent with 0.16 *2* from Iγ($\gamma^\pm$)/Iγ(1454.6)=12.5 *13* and theoretical ε/β^+ ratios.

Eγ	Iγ [‡]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult. [†]	δ [†]	α [#]
40.3 *4*	30 *5*	2943.3	0$^+$	2902.86	1$^+$	[M1]		0.581
167.2 *3*	5.7 *6*	2943.3	0$^+$	2776.1	2$^+$	[E2]		0.0809
818.6 *5*	0.7 *4*	3594.99	1,2$^+$	2776.1	2$^+$			
855.0 *4*	4.1 *4*	4450.0	1$^+$,2$^+$	3594.99	1,2$^+$			
1321.4 *5*	7.3 *3*	2776.1	2$^+$	1454.56	2$^+$	E2+M1	−1.1 *1*	
1448.3 *2*	72 *2*	2902.86	1$^+$	1454.56	2$^+$			
1454.6 *2*	100	1454.56	2$^+$	0.0	0$^+$	E2		
1488.6 *7*	6.6 *4*	2943.3	0$^+$	1454.56	2$^+$			
1547.0 *7*	0.45 *11*	4450.0	1$^+$,2$^+$	2902.86	1$^+$			
1584.2 *5*	1.26 *14*	3038.7	2$^+$	1454.56	2$^+$	M1+E2	+0.21 *3*	
1673.8 *6*	0.51 *7*	4450.0	1$^+$,2$^+$	2776.1	2$^+$			
1810.1 *2*	2.50 *14*	3264.64	2$^+$	1454.56	2$^+$	E2+M1	+0.7 *4*	
2077.6 *7*	0.43 *9*	3532.2	0$^+$	1454.56	2$^+$			
2140.2 *10*	0.42 *11*	3594.99	1,2$^+$	1454.56	2$^+$			
2445.6 *11*	0.48 *11*	3899.5	2$^+$	1454.56	2$^+$			

^{58}Cu $\varepsilon+\beta^+$ decay (3.204 s)   **1972Jo01** (continued)

$\gamma(^{58}$Ni) (continued)

E_γ	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[†]	Comments
2776.2 *10*	0.46 *10*	2776.1	2^+	0.0	0^+	E2	I_γ: average of 0.52 *11* (1972Jo01) and 0.41 *10* (2001Pe23).
2902.5 *5*	3.08 *21*	2902.86	1^+	0.0	0^+	D	I_γ: weighted average of 3.22 *21* (1972Jo01) and 2.8 *3* (2001Pe23).
3038.5 *8*	0.65 *8*	3038.7	2^+	0.0	0^+		I_γ: other: 0.65 *11* (2001Pe23).
3083.7 *6*	0.62 *10*	4538.3	0^+	1454.56	2^+		
3264.5 *2*	4.3 *3*	3264.64	2^+	0.0	0^+		I_γ: weighted average of 4.4 *3* (1972Jo01) and 3.9 *5* (2001Pe23).
3595.0 *3*	2.71 *18*	3594.99	$1,2^+$	0.0	0^+		I_γ: other: 2.7 *3* (2001Pe23).
3898.5 *12*	0.25 *7*	3899.5	2^+	0.0	0^+		I_γ: weighted average of 0.33 *12* (1972Jo01) and 0.22 *7* (2001Pe23).

[†] From 'adopted gammas'.

[‡] For absolute intensity per 100 decays, multiply by 0.169 *5*.

[#] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with "Frozen Orbitals" approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

^{58}Cu $\varepsilon+\beta^+$ decay (3.204 s)   1972Jo01

Decay Scheme

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

Legend

| I$_\gamma$ < 2%×I$_\gamma^{max}$ |
| I$_\gamma$ < 10%×I$_\gamma^{max}$ |
| I$_\gamma$ > 10%×I$_\gamma^{max}$ |

1$^+$ 0.0   3.204 s 7

Q_ε=8565.6 14

%ε + %β^+=100

$^{58}_{29}$Cu$_{29}$

	Iβ^+	Iε	Log ft
0$^+$ 4538.3	0.103	0.0020	5.92
1$^+$,2$^+$ 4450.0	0.85	0.015	5.06
2$^+$ 3899.5	0.123	0.00132	6.22
1,2$^+$ 3594.99	<0.14	<0.0012	>6.3
0$^+$ 3532.2	0.072	0.00059	6.64
2$^+$ 3264.64	1.15	0.0077	5.57
2$^+$ 3038.7	0.32	0.0018	6.23
0$^+$ 2943.3 1.46 ns 14	10.1	0.055	4.77
1$^+$ 2902.86	4.6	0.024	5.13
2$^+$ 2776.1	<0.28	<0.0013	>6.4
2$^+$ 1454.56	1.4	0.0033	6.20
0$^+$ 0.0	81.1	0.101	4.870

Transition labels: 3083.7 0.105, 1673.8 0.087, 1547.0 0.076, 855.0 0.069, 3898.5 0.042, 2445.6 0.081, 3595.0 0.458, 2140.2 0.071, 818.6 0.12, 2077.6 0.073, 3264.5 0.73, 1810.1 E2+M1 0.423, 3038.5 0.110, 1584.2 M1+E2 0.213, 1488.6 1.12, 167.2 [E2] 1.05, 40.3 [M1] 8.1, 2902.5 D 0.52, 1448.3 12.2, 2776.2 E2 0.078, 1321.4 E2+M1 1.23, 1454.6 E2 17

$^{58}_{28}$Ni$_{30}$