^{61}Cu ε decay (3.336 h) 1978Me10,1988Sa26

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	20-Jan-2020

Parent: ^{61}Cu: E=0.0; J$^{\pi}$=3/2^{-}; T$_{1/2}$=3.336 h *10*; Q(ε)=2237.8 *10*; %ε+%β^{+} decay=100.0

^{61}Cu-J$^{\pi}$: From ^{61}Cu Adopted Levels.

^{61}Cu-T$_{1/2}$: weighted average (NRM) of 3.321 h *25* (2019Gy04, γ-decay); 3.323 h *10* (2015Cv01, γ-decay, measured 0.06% *4* difference in half-life for the samples in oxide and metallic forms); 3.36 h *6* (2006Ab30, γ-decay); 3.333 h *5* (1982Gr10, γ-decay, uncertainty is statistical only, increased by evaluator to 0.010 h to include possible systematic uncertainty); 3.25 h *16* (1982Ma41, γ decay); 3.39 h *4* (1973Ne02, γ-decay); 3.37 h *2* (1972Cr02, γ-decay, unweighted average of 14 measurements, for different γ-ray energies and different beam energies); 3.26 h *15* (1972Du09, γ-decay); 3.408 h *10* (1969Ri04, γ-decay); 3.27 h *10* (1956Ru45, thesis, β^{+} decay); 3.32 h *3* (1954Be84, 4π scintillation counter); 3.35 h *10* (1950Bo34, ionization chamber); 3.4 h *1* (1937Ri01, electroscope); 3.4 h *1* (1937Th01, electroscope and ionization chamber). In the averaging procedure, uncertainty in 1969Ri04 got adjusted to 0.027 h. Regular weighted averaging gives 3.353 h *10*, but with reduced χ^2 of 4.0 as compared to critical χ^2=1.7, while unweighted average gives 3.340 h *14*. Others: 3.4 h (1950Ku05, Geiger counter and electrometer); 3.33 h (1948Co08, β^{+} detection by a magnetic spectrometer).

^{61}Cu-Q(ε): From 2017Wa10.

1978Me10: chemical separation. Measured Eγ, Iγ, by a Compton-suppressed Ge(Li) detector.

1988Sa26: measured Eγ, Iγ by Ge(Li). Confirmed the presence of 215.6, 625.5, 947.3, 1014.4 and 701.1 γ rays. But presence of 190.8, 276.7, 443.5, 629.9, 820.9 and 1089 γ rays was not confirmed.

Source produced by ^{59}Co(α,2n) (1988Sa26,1967Be12,1967Bo01), ^{60}Ni(d,n) (1967Sc02), and ^{63}Cu(γ,2n) (1969Ri04).

Decay scheme is from $\gamma\gamma$ coin results of 1967Wa04 and energy sums.

Other γ-ray studies using Ge(Li) detectors: 1982Gr10, 1977Wa03, 1971VoZX, 1969Ri04, 1967Be12, 1967Bo01, 1967Sc02, 1967Wa04.

Pre-1960 studies of x ray, β and γ rays from ^{61}Cu decay: 1958Bu07, 1957Ku57, 1956Nu02, 1953En06, 1950Co05, 1950Ow03, 1950Bo34, 1949Bo16, 1949Hu21, 1948Co08, 1945Br02, 1938Al02.

From RADLIST code, deduced total decay energy is 2063 keV *81* as compared to 2238 keV *1* from Q(ε) value. It suggests that the decay scheme is reasonably complete.

^{61}Ni Levels

E(level)[†]	J$^{\pi}$[‡]	T$_{1/2}$	Comments
0.0	3/2^{-}		
67.416 *7*	5/2^{-}	5.34 ns *16*	T$_{1/2}$: from $\beta^{+}\gamma$(t), average of values from 1971AzZZ and 1975Ro25. Other: 4.1 ns *3* (1971VoZX) from (1150β)(67γ)(t).
282.955 *7*	1/2^{-}	22 ps *4*	T$_{1/2}$: from $\beta^{+}\gamma$(t) (1967Be12).
656.017 *7*	1/2^{-}	<21 ps	T$_{1/2}$: from $\beta^{+}\gamma$(t) (1967Be12). J$^{\pi}$: 2015Cv01 suggest 3/2^{-} based on branching ratios, low log *ft* value and systematics of levels in neighboring nuclides. Measured branching ratios (1977Wa03): Iγ(373):Iγ(589):Iγ(656)=15 *1*:9 *1*:76 *1*.
908.620 *11*	5/2^{-}		Measured branching ratios (1977Wa03): Iγ(625):Iγ(841):Iγ(908)=2 *1*:18 *3*:80 *3*.
1014.8 *4*	7/2^{-}		
1099.619 *11*	3/2^{-}		Measured branching ratios (1977Wa03): Iγ(816):Iγ(1032):Iγ(1099)=54 *5*:8 *2*:38 *5*.
1132.333 *18*	5/2^{-}		Measured branching ratios (1977Wa03): Iγ(1064)/Iγ(1132)=34 *8*/66 *8*.
1185.239 *11*	3/2^{-}		Measured branching ratios (1977Wa03): Iγ(529):Iγ(902):Iγ(1118):Iγ(1185)=9 *1*:2 *1*:1 *1*:88 *1*.
1609.642 *22*	5/2^{-}		Measured branching ratios (1977Wa03): Iγ(1542)/Iγ(1609)=64 *10*/36 *10*.
1729.473 *11*	3/2^{-}		Measured branching ratios (1977Wa03): Iγ(1073):Iγ(1446):Iγ(1662):Iγ(1729)=19 *6*:30 *5*:30 5:21 *4*.
1997.8 *7*	5/2^{-}		
2120.0?			
2123.48 *4*	1/2^{-}		

† From least-squares fit to Eγ data. Reduced χ^2=1.8 is below the critical χ^2.

‡ From the Adopted Levels.

^{61}Cu ε decay (3.336 h) 1978Me10,1988Sa26 (continued)

ε,β^+ radiations

E(decay)	E(level)	Iβ^+ ‡	Iε‡	Log *ft*	I($\varepsilon+\beta^+$)†‡	Comments
(114.3 *10*)	2123.48		0.043 *7*	5.01 *8*	0.043 *7*	εK=0.8739 *2*; εL=0.10766 *12*; εM+=0.018459 *23*
(117.8[#] *10*)	2120.0?		<0.009	>5.7	<0.009	εK=0.8743 *2*; εL=0.10728 *11*; εM+=0.018385 *21*
(240.0 *12*)	1997.8		0.0041 *14*	6.7 *2*	0.0041 *14*	εK=0.8817; εL=0.10114 *3*; εM+=0.017198 *6*
(508.3 *10*)	1729.473		0.22 *4*	5.64 *8*	0.22 *4*	εK=0.8851; εL=0.09822; εM+=0.01664
(628.2 *10*)	1609.642		0.068 *12*	6.34 *8*	0.068 *12*	εK=0.8857; εL=0.09774; εM+=0.01654
(1052.6 *10*)	1185.239		4.2 *7*	5.00 *8*	4.2 *7*	εK=0.8867; εL=0.09692; εM+=0.01639
(1105.5 *10*)	1132.333		0.15 *3*	6.49 *9*	0.15 *3*	εK=0.8867; εL=0.09685; εM+=0.01637
(1138.2 *10*)	1099.619		0.68 *11*	5.86 *7*	0.68 *11*	εK=0.8863; εL=0.09678; εM+=0.01636
(1329.2 *10*)	908.620	0.033 *5*	1.27 *20*	5.72 *7*	1.30 *21*	av Eβ=132.90 *42*; εK=0.8642 *3*; εL=0.09419 *3*; εM+=0.015918 *6*
(1581.8 *10*)	656.017	2.5 *4*	10.8 *17*	4.95 *7*	13.3 *21*	av Eβ=238.58 *43*; εK=0.7180 *9*; εL=0.07811 *10*; εM+=0.013198 *16*
(1954.8 *10*)	282.955	5.8 *10*	4.3 *7*	5.53 *8*	10.1 *17*	av Eβ=399.03 *44*; εK=0.3792 *8*; εL=0.04118 *9*; εM+=0.006957 *15*
(2170.4 *10*)	67.416	2.1 *4*	0.80 *14*	6.35 *8*	2.9 *5*	av Eβ=493.97 *45*; εK=0.2438 *5*; εL=0.02645 *6*; εM+=0.004469 *10*
(2237.8 *10*)	0.0	51 *4*	16 *1*	5.07 *4*	67 *5*	av Eβ=523.96 *45*; εK=0.2127 *5*; εL=0.02308 *5*; εM+=0.003898 *8* E(decay): endpoint E(β^+)=1220 *15* (1956Nu02). Iβ^+: from measured β^+ spectrum (1956Nu02).

† From I(γ+ce) imbalance at each level except g.s.

‡ Absolute intensity per 100 decays.

Existence of this branch is questionable.

$\gamma(^{61}$Ni)

Iγ normalization: Summed transition (Iγ+ce) intensity to g.s.=33 *5*, based on measured Iβ^+(g.s.)=51% *5* (1956Nu02) and theoretical ε/β^+ value, which gives Iε(g.s.)=16% *1*. This normalization implies an annihilation radiation intensity of 1180 *200* relative to 100 for 656γ, in agreement with the measured relative intensities of 1350 *43* (1967Sc02) and 1265 *63* (1967Bo01).

Measured intensity of 511-keV annihilation radiation=1350 *43* (1967Sc02) and 1265 *64* (1967Bo01) relative to 100 for 656-keV γ ray.

Following γ rays are reported only by 1969Ri04: tentative 940 *5* and 989 *5* both placed from 2125 level; tentative and unplaced 1153 *2* with Iγ=0.17 *17*; 1216 *2* with Iγ=0.07 *4* placed from 2125 level; tentative and unplaced 1585.5 *20* with Iγ=0.06 *5*; tentative 1715 *1* with Iγ=0.04 *3* placed from 1997 level.

A 1020γ with Iγ=1.6 and a 2023γ with Iγ=0.32, both relative to 100 for 656-keV γ ray, in 1971VoZX are not reported in other studies.

E_γ[†]	I_γ[‡a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[&]	δ[&]	α[b]	Comments
67.412 *10*	38.6 *12*	67.416	5/2⁻	0.0	3/2⁻	(M1+E2)	0.0076 *5*	0.1370	%Iγ=4.0 *6* α(K)=0.1225 *18*; α(L)=0.01262 *18*; α(M)=0.001778 *25* α(N)=7.38×10^{-5} *11* I$_\gamma$: weighted average: Iγ=39.3 *13* (1988Sa26), 36.9 *12* (1978Me10), 59 *15* (1969Ri04), 50 *5* (1967Bo01), 41 *3* (1967Sc02), 38 *4* (1967Be12). Other: 41 (1971VoZX). E$_\gamma$: uncertainty=0.003 in 1978Me10.
117.5[#]	0.10 *5*	1132.333	5/2⁻	1014.8	7/2⁻	[M1+E2]		0.17 *14*	%Iγ=0.010 *5* α(K)=0.15 *13*; α(L)=0.017 *14*; α(M)=0.0023 *20* α(N)=8.4×10^{-5} *68* Iγ=0.10 *5* (1988Sa26).
190.79 *12*	0.047[@] *9*	1099.619	3/2⁻	908.620	5/2⁻	[M1+E2]		0.029 *21*	%Iγ=0.0049 *12* α(K)=0.026 *18*; α(L)=0.0027 *19*; α(M)=3.8×10^{-4} *27* α(N)=1.5×10^{-5} *10* Iγ=0.047 *9* (1978Me10).
215.55 *18*	0.12 *8*	282.955	1/2⁻	67.416	5/2⁻	[E2]		0.0311	%Iγ=0.013 *9* α(K)=0.0278 *4*; α(L)=0.00288 *5*; α(M)=0.000402 *6* α(N)=1.586×10^{-5} *23* I$_\gamma$: unweighted average: Iγ=0.20 *7* (1988Sa26), 0.042 *11* (1978Me10).
276.688 *53*	0.25[@] *12*	1185.239	3/2⁻	908.620	5/2⁻	[M1+E2]		0.0080 *45*	%Iγ=0.026 *13* α(K)=0.0071 *41*; α(L)=7.2×10^{-4} *42*; α(M)=1.01×10^{-4} *58* α(N)=4.1×10^{-6} *23* Iγ=0.25 *12* (1978Me10).
282.956 *10*	122 *5*	282.955	1/2⁻	0.0	3/2⁻	(M1+E2)	0.044 *4*	0.00330	%Iγ=12.7 *20* α(K)=0.00296 *5*; α(L)=0.000295 *5*; α(M)=4.15×10^{-5} *6* α(N)=1.773×10^{-6} *25* E$_\gamma$: uncertainty=0.002 in 1978Me10.

γ(^{61}Ni) (continued)

E_γ[†]	I_γ[‡a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[&]	α[b]	Comments
								I_γ: unweighted average: Iγ=113.2 *27* (1988Sa26), 126 *3* (1982Gr10, uncertainty estimated by evaluator), 117.2 *24* (1978Me10), 113 *6* (1969Ri04), 148 *8* (1967Bo01), 128 *4* (1967Sc02), 109 *11* (1967Be12). Weighted average is 120 *3*, but with reduced χ^2=5.0 as compared to critical χ^2=2.1.
373.050 *10*	20.5 *5*	656.017	1/2$^-$	282.955	1/2$^-$	(M1)	1.71×10^{-3}	%Iγ=2.14 *33* α(K)=0.001531 *22*; α(L)=0.0001513 *22*; α(M)=2.13×10^{-5} *3* α(N)=9.14×10^{-7} *13* E_γ: uncertainty=0.005 in 1978Me10. I_γ: weighted average: Iγ=19.9 *5* (1988Sa26), 21.2 *5* (1982Gr10), 20.2 *6* (1978Me10), 19.8 *16* (1969Ri04), 22.3 *9* (1967Sc02), 20.2 *20* (1967Bo01), 16.5 *17* (1967Be12). Other: 16.0 (1971VoZX).
443.5 *1*	0.035[@] *12*	1099.619	3/2$^-$	656.017	1/2$^-$	[M1+E2]	0.00179 *65*	%Iγ=0.0037 *14* α(K)=0.00161 *58*; α(L)=1.60×10^{-4} *59*; α(M)=2.25×10^{-5} *82* α(N)=9.4×10^{-7} *34* Iγ=0.035 *12* (1978Me10).
529.169 *22*	3.56 *8*	1185.239	3/2$^-$	656.017	1/2$^-$	[M1+E2]	0.00108 *31*	%Iγ=0.37 *6* α(K)=9.7×10^{-4} *28*; α(L)=9.6×10^{-5} *28*; α(M)=1.35×10^{-5} *40* α(N)=5.7×10^{-7} *16* I_γ: weighted average: Iγ=3.49 *8* (1988Sa26), 3.63 *14* (1982Gr10), 3.9 *7* (1978Me10), 4.1 *3* (1969Ri04), 3.4 *3* (1967Sc02), 2.0 *10* (1967Bo01), 4.2 *4* (1967Be12). Other: 2.4 (1971VoZX).
544.8[#c]	0.054 *34*	1729.473	3/2$^-$	1185.239	3/2$^-$	[M1+E2]	9.9×10^{-4} *28*	%Iγ=0.006 *4* α(K)=8.9×10^{-4} *25*; α(L)=8.8×10^{-5} *25*; α(M)=1.24×10^{-5} *35* α(N)=5.3×10^{-7} *15* Iγ=0.054 *34* (1988Sa26). E_γ: a 545 *5* γ also reported by 1969Ri04 in coin with 656γ. γ not reported by 1978Me10.
588.605 *10*	11.18 *12*	656.017	1/2$^-$	67.416	5/2$^-$	[E2]	1.00×10^{-3}	%Iγ=1.17 *18* α(K)=0.000901 *13*; α(L)=8.93×10^{-5} *13*; α(M)=1.256×10^{-5} *18* α(N)=5.30×10^{-7} *8* E_γ: uncertainty=0.009 in 1978Me10. I_γ: weighted average: Iγ=10.83 *19* (1988Sa26), 11.40 *27* (1982Gr10), 11.25 *12* (1978Me10), 10.7 *4* (1969Ri04), 11.9 *4* (1967Sc02), 10.6 *32* (1967Bo01), 11.3 *11* (1967Be12). Other: 10.4 (1971VoZX).
625.605 *24*	0.42 *5*	908.620	5/2$^-$	282.955	1/2$^-$	[E2]	8.38×10^{-4}	%Iγ=0.044 *8* α(K)=0.000753 *11*; α(L)=7.45×10^{-5} *11*; α(M)=1.048×10^{-5} *15* α(N)=4.43×10^{-7} *7* I_γ: weighted average: Iγ=0.37 *4* (1988Sa26), 0.47 *4* (1978Me10).
629.90 *25*	0.059[@] *24*	1729.473	3/2$^-$	1099.619	3/2$^-$	[M1+E2]	0.00067 *15*	%Iγ=0.062 *27*

γ(^{61}Ni) (continued)

E_γ[†]	I_γ[‡a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[&]	δ[&]	α[b]	Comments
									α(K)=0.00060 *14*; α(L)=6.0×10^{-5} *14*; α(M)=8.4×10^{-6} *19* α(N)=3.6×10^{-7} *8* Iγ=0.059 *24* (1978Me10).
656.008 *10*	100.0 *17*	656.017	1/2$^-$	0.0	3/2$^-$	(M1+E2)	1.6 *9*	0.00066 *10*	%Iγ=10.4 *16* α(K)=0.00059 *9*; α(L)=5.9×10^{-5} *9*; α(M)=8.2×10^{-6} *13* α(N)=3.5×10^{-7} *5* E_γ: uncertainty=0.004 in 1978Me10. Iγ=100.0 *17* (1988Sa26), 100.0 *24* (1982Gr10), 100.0 *23* (1978Me10, 2% uncertainty assigned by evaluator), 100 *4* (1969Ri04), 100 *3* (1967Sc02), 100 *5* (1967Bo01), 100 *10* (1967Be12). Other: 100 (1971VoZX).
701.1[c] *3*	0.106[@] *24*	1609.642	5/2$^-$	908.620	5/2$^-$	[M1+E2]		0.00051 *10*	%Iγ=0.0111 *30* α(K)=0.00046 *9*; α(L)=4.5×10^{-5} *9*; α(M)=6.4×10^{-6} *12* α(N)=2.7×10^{-7} *5* Iγ=0.106 *24* (1978Me10).
816.692 *13*	3.37 *8*	1099.619	3/2$^-$	282.955	1/2$^-$	M1+E2	+0.23 *7*	3.06×10^{-4} *6*	%Iγ=0.35 *5* α(K)=0.000276 *5*; α(L)=2.69×10^{-5} *5*; α(M)=3.79×10^{-6} *7* α(N)=1.64×10^{-7} *3* I_γ: weighted average (NRM): Iγ=2.85 *7* (1988Sa26), 3.28 *13* (1982Gr10), 3.39 *7* (1978Me10), 3.84 *16* (1969Ri04), 3.30 *16* (1967Sc02), 2.5 *12* (1967Bo01), 4.0 *4* (1967Be12). Uncertainty got adjusted to 0.21 in 1988Sa26 value in the averaging procedure. Other: 1.6 (1971VoZX).
820.89 *17*	0.211[@] *24*	1729.473	3/2$^-$	908.620	5/2$^-$	[M1+E2]		0.00035 *5*	%Iγ=0.022 *4* α(K)=0.00031 *5*; α(L)=3.1×10^{-5} *5*; α(M)=4.3×10^{-6} *7* α(N)=1.8×10^{-7} *3* Iγ=0.211 *24* (1978Me10).
841.211 *17*	2.28 *9*	908.620	5/2$^-$	67.416	5/2$^-$	M1+E2	+1.83 *20*	3.51×10^{-4} *7*	%Iγ=0.24 *4* α(K)=0.000316 *6*; α(L)=3.10×10^{-5} *6*; α(M)=4.36×10^{-6} *8* α(N)=1.87×10^{-7} *4* I_γ: weighted average (NRM): Iγ=1.99 *6* (1988Sa26), 2.47 *10* (1982Gr 2.32 *9* (1978Me10), 2.21 *9* (1969Ri04), 2.29 *13* (1967Sc02), 1.7 *8* (1967Bo01), 2.45 *25* (1967Be12). Uncertainty was doubled in 1988Sa26 for averaging procedure. Other: 1.6 (1971VoZX).
902.294 *20*	0.831 *24*	1185.239	3/2$^-$	282.955	1/2$^-$	[M1+E2]		0.00028 *4*	%Iγ=0.087 *13*

γ(^{61}Ni) (continued)

E_γ[†]	I_γ[‡a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[&]	δ[&]	α[b]	Comments
									α(K)=0.00025 *3*; α(L)=2.4×10^{-5} *3*; α(M)=3.4×10^{-6} *5* α(N)=1.48×10^{-7} *17* I_γ: weighted average: Iγ=0.77 *5* (1988Sa26), 0.844 *24* (1978Me10), 1.0 *4* (1969Ri04).
908.631 *17*	10.46 *20*	908.620	5/2$^-$	0.0	3/2$^-$	M1+E2	−0.18 *5*	2.44×10^{-4}	%Iγ=1.09 *17* α(K)=0.000219 *4*; α(L)=2.14×10^{-5} *4*; α(M)=3.02×10^{-6} *5* α(N)=1.305×10^{-7} *20* I_γ: weighted average: Iγ=10.22 *19* (1988Sa26), 10.47 *29* (1982Gr10), 11.4 *4* (1978Me10), 10.9 *5* (1969Ri04), 10.3 *5* (1967Sc02), 9.6 *10* (1967Bo01), 10.7 *11* (1967Be12). Other: 8.0 (1971VoZX).
947.4 *4*	0.027 *15*	1014.8	7/2$^-$	67.416	5/2$^-$	M1+E2	+2.46 *15*	2.68×10^{-4}	%Iγ=0.0028 *16* α(K)=0.000241 *4*; α(L)=2.36×10^{-5} *4*; α(M)=3.32×10^{-6} *5* α(N)=1.425×10^{-7} *21* I_γ: weighted average: Iγ=0.09 *5* (1988Sa26), 0.023 *12* (1978Me10).
1014.8	0.009 *5*	1014.8	7/2$^-$	0.0	3/2$^-$	E2		2.33×10^{-4}	%Iγ=0.0009 *5* α(K)=0.000210 *3*; α(L)=2.05×10^{-5} *3*; α(M)=2.89×10^{-6} *4* α(N)=1.241×10^{-7} *18* I_γ: from branching ratios in Adopted dataset. Measured values in this decay are: 0.097 *34* (1988Sa26), <0.012 (1978Me10). Value from 1988Sa26 seems too high.
1032.162 *27*	0.53 *8*	1099.619	3/2$^-$	67.416	5/2$^-$	[M1+E2]		2.06×10^{-4} *19*	%Iγ=0.055 *12* α(K)=0.000185 *17*; α(L)=1.81×10^{-5} *17*; α(M)=2.54×10^{-6} *24* α(N)=1.10×10^{-7} *10* I_γ: unweighted average: Iγ=0.392 *34* (1988Sa26), 0.62 *11* (1978Me10), 0.31 *19* (1969Ri04), 0.57 *10* (1967Sc02), 0.75 *10* (1967Be12).
1064.896 *20*	0.48 *4*	1132.333	5/2$^-$	67.416	5/2$^-$	M1+E2	+0.14 *12*	1.76×10^{-4} *3*	%Iγ=0.050 *9* α(K)=0.000159 *3*; α(L)=1.54×10^{-5} *3*; α(M)=2.18×10^{-6} *4* α(N)=9.43×10^{-8} *16* I_γ: weighted average: Iγ=0.447 *34* (1988Sa26), 0.56 *5* (1978Me10), 0.48 *15* (1969Ri04), 0.40 *7* (1967Sc02), 0.68 *10* (1967Be12).
1073.465 *25*	0.40 *10*	1729.473	3/2$^-$	656.017	1/2$^-$	[M1+E2]		1.89×10^{-4} *16*	%Iγ=0.042 *12* α(K)=0.000170 *15*; α(L)=1.66×10^{-5} *15*; α(M)=2.33×10^{-6} *20* α(N)=1.01×10^{-7} *9* I_γ: unweighted average: Iγ=0.302 *28* (1988Sa26), 0.50 *4* (1978Me10). Others: 0.21 *10* (1969Ri04), 0.08 *6* (1967Sc02), 0.54 *21* (1967Be12).
1089.11[c]	≤0.006[@]	1997.8	5/2$^-$	908.620	5/2$^-$	[M1+E2]		1.83×10^{-4} *15*	%Iγ≤0.0006

γ(^{61}Ni) (continued)

E_γ[†]	I_γ[‡a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[&]	δ[&]	α[b]	Comments
									α(K)=0.000164 *14*; α(L)=1.60×10^{-5} *14*; α(M)=2.26×10^{-6} *19* α(N)=9.8×10^{-8} *8* Iγ≤0.006 (1978Me10),
1099.560 *19*	2.57 *8*	1099.619	3/2$^-$	0.0	3/2$^-$	M1+E2		1.79×10^{-4} *15*	%Iγ=0.27 *4* α(K)=0.000161 *13*; α(L)=1.57×10^{-5} *13*; α(M)=2.21×10^{-6} *19* α(N)=9.6×10^{-8} *8* I_γ: weighted average (NRM): Iγ=2.28 *6* (1988Sa26), 2.51 *9* (1982Gr10), 2.66 *9* (1978Me10), 3.55 *28* (1969Ri04), 2.60 *13* (1967Sc02), 2.3 *8* (1967Bo01), 2.9 *3* (1967Be12). Uncertainties got adjusted to 0.13 in 1988Sa26 and 0.40 in 1969Ri04. Other: 2.4 (1971VoZX).
1117.822 *43*	0.42 *6*	1185.239	3/2$^-$	67.416	5/2$^-$	[M1+E2]		1.74×10^{-4} *14*	%Iγ=0.044 *9* α(K)=0.000155 *12*; α(L)=1.52×10^{-5} *12*; α(M)=2.14×10^{-6} *17* α(N)=9.2×10^{-8} *7*; α(IPF)=1.21×10^{-6} *23* I_γ: unweighted average: Iγ=0.30 *4* (1988Sa26), 0.46 *4* (1978Me10), 0.66 *17* (1969Ri04), 0.27 *5* (1967Sc02), 0.43 *13* (1967Bo01), 0.42 *7* (1967Be12).
1132.351 *32*	0.87 *4*	1132.333	5/2$^-$	0.0	3/2$^-$	M1+E2	−0.47 *9*	1.62×10^{-4} *3*	%Iγ=0.091 *14* α(K)=0.0001441 *24*; α(L)=1.404×10^{-5} *24*; α(M)=1.98×10^{-6} *4* α(N)=8.56×10^{-8} *15*; α(IPF)=1.59×10^{-6} *5* Iγ=0.83 *4* (1988Sa26), 0.93 *4* (1978Me10), 1.09 *17* (1969Ri04), 0.64 *13* (1967Sc02), 0.60 *18* (1967Bo01), 0.80 *11* (1967Be12). Other: 0.6 (1971VoZX).
1185.234 *15*	34.9 *7*	1185.239	3/2$^-$	0.0	3/2$^-$	(M1+E2)	0.17 *3*	1.48×10^{-4}	%Iγ=3.6 *6* α(K)=0.0001286 *19*; α(L)=1.251×10^{-5} *18*; α(M)=1.763×10^{-6} *25* α(N)=7.65×10^{-8} *11*; α(IPF)=4.87×10^{-6} *8* I_γ: weighted average: Iγ=34.8 *7* (1988Sa26), 36.1 *9* (1982Gr10), 34.6 *7* (1978Me10), 34.5 *10* (1967Sc02), 33.0 *17* (1967Bo01), 40 *4* (1967Be12). Others: 28.0 (1971VoZX), 41.7 *17* (1969Ri04, seems a discrepant value).
1446.492 *19*	0.442 *24*	1729.473	3/2$^-$	282.955	1/2$^-$	[M1+E2]		1.62×10^{-4} *14*	%Iγ=0.046 *7* α(K)=9.2×10^{-5} *5*; α(L)=8.9×10^{-6} *5*; α(M)=1.26×10^{-6} *6* α(N)=5.44×10^{-8} *25*; α(IPF)=6.0×10^{-5} *9* I_γ: weighted average: Iγ=0.418 *27* (1988Sa26), 0.469 *24* (1978Me10), 0.66 *12* (1969Ri04), 0.27 *9* (1967Sc02), 0.43 *13* (1967Bo01), 0.35 *11* (1967Be12). Other: 0.36 (1971VoZX).
1542.204 *23*	0.313 *41*	1609.642	5/2$^-$	67.416	5/2$^-$	M1+E2	−0.07 *5*	1.66×10^{-4}	%Iγ=0.033 *7* α(K)=7.78×10^{-5} *11*; α(L)=7.55×10^{-6} *11*; α(M)=1.063×10^{-6} *15* α(N)=4.62×10^{-8} *7*; α(IPF)=7.95×10^{-5} *12* I_γ: unweighted average: Iγ=0.238 *20* (1988Sa26), 0.317 *12* (1978Me10), 0.46 *5* (1969Ri04), 0.18 *7* (1967Sc02), 0.29 *9* (1967Bo01), 0.39 *10* (1967Be12). Other: 0.24 (1971VoZX).

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γ(^{61}Ni) (continued)

E_γ[†]	I_γ[‡a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[&]	δ[&]	α[b]	Comments
1609.625 *48*	0.233 *22*	1609.642	5/2−	0.0	3/2−	M1+E2	−0.33 *14*	1.86×10^{-4} *4*	%Iγ=0.024 *4* α(K)=7.24×10^{-5} *11*; α(L)=7.02×10^{-6} *11*; α(M)=9.90×10^{-7} *16* α(N)=4.30×10^{-8} *7*; α(IPF)=0.000105 *3* I_γ: weighted average: Iγ=0.197 *19* (1988Sa26), 0.258 *24* (1978Me10), 0.37 *5* (1969Ri04), 0.19 *6* (1967Sc02), 0.27 *8* (1967Bo01), 0.28 *8* (1967Be12). Other: 0.24 (1971VoZX).
1662.000 *19*	0.492 *24*	1729.473	3/2−	67.416	5/2−	[M1+E2]		2.16×10^{-4} *20*	%Iγ=0.051 *8* α(K)=7.0×10^{-5} *3*; α(L)=6.8×10^{-6} *3*; α(M)=9.6×10^{-7} *4* α(N)=4.16×10^{-8} *15*; α(IPF)=0.000138 *17* I_γ: weighted average: Iγ=0.490 *27* (1988Sa26), 0.492 *24* (1978Me10), 0.56 *5* (1969Ri04), 0.36 *10* (1967Sc02), 0.45 *13* (1967Bo01), 0.42 *10* (1967Be12). Other: 0.36 (1971VoZX).
1729.473 *18*	0.48 *6*	1729.473	3/2−	0.0	3/2−	[M1+E2]		2.37×10^{-4} *22*	%Iγ=0.050 *10* α(K)=6.51×10^{-5} *23*; α(L)=6.32×10^{-6} *23*; α(M)=8.9×10^{-7} *4* α(N)=3.86×10^{-8} *13*; α(IPF)=0.000165 *20* I_γ: unweighted average: Iγ=0.500 *27* (1988Sa26), 0.75 *5* (1978Me10), 0.50 *6* (1969Ri04), 0.30 *8* (1967Sc02), 0.42 *13* (1967Bo01), 0.42 *6* (1967Be12). Other: 0.36 (1971VoZX).
1840.7 *2*	0.016[@] *5*	2123.48	1/2−	282.955	1/2−	[M1]		2.51×10^{-4}	%Iγ=0.0017 *6* α(K)=5.64×10^{-5} *8*; α(L)=5.46×10^{-6} *8*; α(M)=7.70×10^{-7} *11* α(N)=3.35×10^{-8} *5*; α(IPF)=0.000189 *3* Iγ=0.016 *5* (1978Me10).
1997.73 *85*	0.036 *11*	1997.8	5/2−	0.0	3/2−	M1+E2	−0.27 *6*	3.13×10^{-4}	%Iγ=0.0038 *13* α(K)=4.89×10^{-5} *7*; α(L)=4.74×10^{-6} *7*; α(M)=6.68×10^{-7} *10* α(N)=2.90×10^{-8} *4*; α(IPF)=0.000259 *4* I_γ: weighted average: Iγ=0.036 *11* (1988Sa26), 0.035 *12* (1978Me10), 0.041 *20* (1969Ri04). Other: 0.16 for a 1990γ (1971VoZX).
2120.0[#c]	<0.09	2120.0?		0.0	3/2−				%Iγ<0.0095 Iγ<0.09 (1988Sa26).
2123.432 *35*	0.397 *24*	2123.48	1/2−	0.0	3/2−	[M1+E2]		0.00039 *4*	%Iγ=0.041 *7* α(K)=4.49×10^{-5} *12*; α(L)=4.35×10^{-6} *12*; α(M)=6.12×10^{-7} *17* α(N)=2.66×10^{-8} *7*; α(IPF)=0.00034 *4* E_γ: unweighted averaged value of 2123.78 *18* obtained

$\gamma(^{61}Ni)$ (continued)

E_γ[†]	E_i(level)	Comments
		from 2123.432 *35*, 2124.0 *7* from (α,nγ) and 2123.90 *3* from (n,γ) is listed in Adopted dataset. Eγ=2128.0 *8* in 1967Sc02, 2119.8 *5* in 1967Bo01. Iγ=0.384 *27* (1988Sa26), 0.375 *24* (1978Me10), 0.44 *3* (1969Ri04), 0.36 *11* (1967Sc02), 0.38 *13* (1967Bo01), 0.42 *4* (1967Be12).

[†] From 1978Me10 unless otherwise stated. Uncertainties of five γ-ray energies quoted in 1978Me10 are unrealistically small. Evaluator assigns a minimum energy uncertainty of 0.010 keV, while uncertainty listed in 1978Me10 is given under comments.

[‡] From averages of values from different studies as stated in comments.

[#] γ from 1988Sa26 only.

[@] γ from 1978Me10 only.

[&] From Adopted Gammas.

[a] For absolute intensity per 100 decays, multiply by 0.104 *16*.

[b] 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.

[c] Placement of transition in the level scheme is uncertain.

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^{61}Cu ε decay (3.336 h) 1978Me10,1988Sa26

Decay Scheme

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