Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 202,59 (2025)	25-Feb-2025

Q(β^-)=−1351.7 *4*; S(n)=9910.6 *7*; S(p)=7453.6 *7*; Q(α)=−6790.4 *10* 2021Wa16
S(2n)=17826.4 *7*, S(2p)=19990 *19* (2021Wa16).
Mass Measurements: 2007Gu09, 2005Gu36.
Nuclear Moments: 2009Co14, 2008St12, 2004Gh13, 2004Ho08, 1998Fu01, 1997Br36, 1997Gi09, 1997Is01, 1997Ku06, 1996Do27, 1996Go46, 1996Go55, 1996Ry03, 1995Go42, 1995It05, 1995Sh50, 1994Bb08, 1994Im01, 1994Fe15, 1994Sh42, 1994Go47, 1993Yo10, 1992Be51, 1992Iw01.
Hyperfine structure measurements:
2009Co14,2010Co01: measured nuclear magnetic moment and isotope shifts using in-gas-cell laser spectroscopy at the Leuven Isotope Separator On-Line (LISOL) facility.
2010Vi07: measured hyperfine structure, magnetic dipole moment and electric quadrupole moment of the ground state using Collinear and in-source laser spectroscopic technique at ISOLDE-CERN facility.
1998Da11: measured isotope shift.
Other reactions:
2000To08: ^{65}Cu(n,n). Measured neutron scattering length.
1996Sa19: ^{64}Ni(^{32}S,^{31}P). Measured (particle)γ-coin. Deduced transfer probabilities for ground state, coupling strengths.
1993Ta08: ^{65}Cu(e,p). Measured σ.
Theoretical calculations:
2011Vi03,2010Vi07: calculated levels, J, π, g-factors, quadrupole moments.
2001Ny01: calculated levels, J, π.

^{65}Cu Levels

Cross Reference (XREF) Flags

A	^{65}Ni β^- decay (2.5175 h)	J	^{64}Ni(^{7}Li,α2nγ)	S	^{65}Cu(α,α')
B	^{65}Zn ε+β^+ decay (243.93 d)	K	^{64}Ni(^{12}C,^{11}B),(^{16}O,^{15}N)	T	^{66}Zn(n,d)
C	^{62}Ni(α,p)	L	^{65}Cu(γ,γ')	U	^{66}Zn(pol d,^{3}He)
D	^{63}Cu(t,p)	M	^{65}Cu(e,e′)	V	^{66}Zn(d,^{3}He)
E	^{64}Ni(p,γ) E=res	N	^{65}Cu(n,n′γ)	W	^{66}Zn(t,α)
F	^{64}Ni(p,p),(p,p′),(p,n):res	O	^{65}Cu(n,n′γ) E=fast	X	^{68}Zn(p,α)
G	^{64}Ni(d,n)	P	^{65}Cu(p,p′)	Y	^{238}U(^{64}Ni,Xγ)
H	^{64}Ni(^{3}He,d)	Q	^{65}Cu(p,p′γ)	Z	Coulomb excitation
I	^{64}Ni(α,t)	R	^{65}Cu(d,d′)		

E(level)[†‡]	J$^{\pi}$[#]	$T_{1/2}$[@]	XREF	Comments
0.0	3/2$^-$	stable	ABCDE GHIJKL NOPQRSTUVWXYZ	μ=+2.3844 *4* (1978Lu08,2019StZV) Q=−0.195 *4* (1972St38) J$^{\pi}$: spin=3/2 from hyperfine structure measurement in 2010Vi07; L(t,p)=0 from 3/2$^-$. μ: adjusted value from 2019StZV evaluation, based on original data from Nuclear magnetic resonance in 1978Lu08. Other value: +2.387 *7* Resonance cell laser spectroscopy (2009Co14). Q: from optical spectroscopy (1972St38). 2021StZZ compilation quotes a value of −0.204 *14* from Muonic X ray in 1982Ef01, as recommended by 2018Py01 compilation, however, 1982Ef01 doesn′t report any value for ^{65}Cu. Isotope shift (^{63}Cu-^{65}Cu)=0.977 GHz *21* (2010Co01). Evaluated rms charge radius=3.9022 fm *14* (2013An02).
770.80 *7*	1/2$^-$	101 fs *6*	ABCDE GHI KLMNOPQRSTUVWX Z	B(E2)↑=0.0099 *5*

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Adopted Levels, Gammas (continued)

^{65}Cu Levels (continued)

E(level)[†‡]	J^{π}[#]	$T_{1/2}$[@]	XREF	Comments
				$T_{1/2}$: weighted average of 101 fs *6* from measured width in (γ,γ′), 110 fs *+70−40* from DSAM in (n,n′γ) E=fast, and 95 fs *25* from DSAM in Coulomb excitation. B(E2)↑: from Coulomb excitation. Other: 0.0097 *7* from (e,e′).
1115.549 *2*	5/2⁻	0.285 ps *11*	ABCDE HIJKLMNOPQRSTUVWXYZ	μ=+4.5 *9* (1979Da20,2020StZV) XREF: D(1130) J^{π}: L(^{3}He,d)=L(α,t)=3 from 0⁺; 1115.6γ M1+E2 to 3/2⁻; 5/2⁻ also from βγ(circ pol) in ^{65}Ni β⁻ decay. $T_{1/2}$: from measured Γ in (γ,γ′). Other: 0.42 ps *8* from DSAM in Coulomb excitation. μ: from 1979Da20 using IPAD. See also 2020StZV evaluation.
1481.796 *25*	7/2⁻	0.45 ps *+11−9*	A CDE GHIJKLMNOPQRSTUVWXYZ	XREF: G(1540)H(1503)T(1480?)U(1507) J^{π}: spin=7/2 from γ(θ) in ^{65}Ni β⁻ decay, (n,n′γ) E=fast, (p,p′γ) and Coulomb excitation; L(d,n)=L(^{3}He,d)=L(α,t)=3 from 0⁺. $T_{1/2}$: weighted average of 0.41 ps *+15−9* from Γ in (γ,γ′), 0.42 ps *+42−21* (2000Ko51) and 0.31 ps *+24−13* (1987DoZX) from DSAM in (n,n′γ) E=fast, and 0.53 ps *11* from DSAM in Coulomb excitation. Others: 0.36 ps *+7−5* from B(E2)↑=0.037 *6* in Coulomb excitation; 0.61 ps *2* from B(E2)↑=0.0218 *7* in (e,e′).
1623.42 *5*	5/2⁻	0.86 ps *+31−20*	A CDE HI KLMNOPQRSTUVW YZ	XREF: H(1589)U(1623?) J^{π}: L(^{3}He,d)=L(α,t)=3 from 0⁺; 1623.5γ M1+E2 to 3/2⁻. $T_{1/2}$: from width in (γ,γ′) and adopted branching ratios.
1724.99 *5*	3/2⁻	77 fs *+17−13*	A CDE GH LMNOPQRST	XREF: H(1743)T(1720?) J^{π}: spin=3/2 from γ(θ) in (γ,γ′) and (n,n′γ) E=fast; L(^{3}He,d)=1 from 0⁺. $T_{1/2}$: weighted average of 85 fs *+17−13* from width in (γ,γ′) and branching ratio, 125 fs *+83−42* (2000Ko51) and 67 fs *+23−15* (1987DoZX) 72 fs *+23−16* from DSAM in (n,n′γ) E=fast, and 68 fs *+28−16* from DSAM in (p,p′γ).
2094.28 *7*	7/2⁻	>0.33 ps	dE iJ LmNOPQRstUvwxY	XREF: d(2110)i(2120)L(?)s(2098)t(2100)U(2080) v(2093)w(2093)x(2090) J^{π}: 439.7γ D, ΔJ=1 from 9/2⁺; 978.5γ D+Q to 5/2⁻; L(α,t)=L(d,^{3}He)=L(t,α)=3 from 0⁺ for 2094+2107 doublet. (7/2⁻) also from Hauser-Feshbach (H-F) analysis of γ-ray strength in (p,γ) E=res and (n,n′γ) E=fast; $T_{1/2}$: from width in (γ,γ′) and adopted branching ratios for J=7/2.
2107.42 *8*	(5/2)⁻	0.166 ps *+69−49*	CdE Hi LmNOP Rst vwx	XREF: d(2110)H(2125)i(2120)s(2098)t(2100) v(2093)w(2093)x(2090) J^{π}: 991.8γ M1+E2 to 5/2⁻, 1337.2γ to 1/2⁻; L(α,t)=L(d,^{3}He)=L(t,α)=3 from 0⁺ for 2094+2107 doublet. (5/2⁻) also from Hauser-Feshbach (H-F) analysis of γ-ray strength in (p,γ) E=res and (n,n′γ) E=fast;

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Adopted Levels, Gammas (continued)

^{65}Cu Levels (continued)

E(level)[†‡]	Jπ[#]	$T_{1/2}$[@]	XREF	Comments
2212.64 *10*	(1/2)⁻	0.111 ps *+69−35*	CDE GHI LMNOPQR W	XREF: D(2220)H(2223)L(?) Jπ: (7/2⁻) from Hauser-Feshbach (H-F) analysis of γ-ray strength in (p,γ) E=res and (n,n′γ) E=fast; L(d,n)=L(^{3}He,d)=1 from 0⁺. But L(α,t)=2 from 0⁺, giving 3/2⁺,5/2⁺, is inconsistent. $T_{1/2}$: other: >0.13 ps from width in (γ,γ′) and adopted branching ratios for J=1/2.
2279.12 *12*	7/2⁻	>5.9 fs	DE LMNOP R UVWXY	XREF: D(2290)L(?)X(2270) Jπ: L(pol d,^{3}He)=3 from 0⁺ and L+1/2 from analyzing power; (7/2⁻) also from Hauser-Feshbach (H-F) analysis of γ-ray strength in (p,γ) E=res and (n,n′γ) E=fast. $T_{1/2}$: from width in (γ,γ′) and adopted branching ratios.
2328.91 *17*	3/2⁻	32 fs *8*	CDE HI LMNOP RS	XREF: D(2340)S(2344) Jπ: L(t,p)=0 from 0⁺. $T_{1/2}$: other: 9 fs *+6−4* from width in (γ,γ′) and adopted branching ratio.
2406.09 *7*	(5/2⁻,7/2⁻)[a]		D MNOP R W Y	
2525.71 *10*	9/2⁺		d i K PQrs w	XREF: d(2540)i(2540)K(2510)r(2531)s(2530) w(2535) Jπ: spin=9/2 from γ(θ) in (p,p′γ); L(p,p′)=3 from 3/2⁻.
2533.08 *15*	(1/2,3/2,5/2⁻)		dE k mNO rs	XREF: d(2540)k(2510)r(2531)s(2530) Jπ: 1762.4γ to 1/2⁻.
2533.68 *7*	9/2⁺	25.6 ps *21*	CdE HiJk mNO rs w Y	XREF: d(2540)H(2550)i(2540)k(2510) r(2531)s(2530)w(2535) Jπ: L(^{3}He,d)=4 from 0⁺ for a group at 2550; 1052.1γ D, ΔJ=1 to 7/2⁻. $T_{1/2}$: from γγ(t) in (^{7}Li,α2nγ).
2593.71 *17*	(5/2⁻)		E MNOPQR W	Jπ: 1822.7γ to 1/2⁻, 499.8γ to 7/2⁻; (1/2⁻,5/2⁻) from H-F analysis in (p,γ) E=res and (n,n′γ) E=fast.
2620 *20*	5/2⁻,7/2⁻		hi p r u wX	XREF: h(2650)i(2650)p(2644)r(2648)u(2645) w(2654) Jπ: L(p,α)=3 from 0⁺.
2643.28 *27*	(5/2⁻)		d hi mNOpQr uvw	XREF: d(2660)h(2650)i(2650)p(2644)r(2648) u(2645)v(2651)w(2654) Jπ: 1872.0γ to 1/2⁻, 1163.4γ to 7/2⁻; (7/2⁻,5/2⁻) from HFM analysis in (n,n′γ) E=fast. L(^{3}He,d)=L(d,^{3}He)=L(t,α)=3 from 0⁺ for a composite peak around E=2650 give 5/2⁻,7/2⁻.
2649.78 *12*	(5/2⁻)	8.3 fs *+42−35*	dE hi mNOp r uvw	XREF: d(2660)h(2650)i(2650)p(2654)r(2648) u(2645)v(2651)w(2654) Jπ: 1879.1γ to 1/2⁻; (5/2⁻,7/2⁻) from HFM analysis in (n,n′γ) E=fast. L(^{3}He,d)=L(d,^{3}He)=L(t,α)=3 from 0⁺ for a composite peak around E=2650 give 5/2⁻,7/2⁻.
2654.88 *14*	5/2⁻	58 fs *+18−13*	dE hi pQr uvw	XREF: d(2660)h(2650)i(2650)p(2654)r(2648) u(2645)v(2651)w(2654) Jπ: spin=5/2 from 2655.5γ(θ) in (p,p′γ);

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Adopted Levels, Gammas (continued)

^{65}Cu Levels (continued)

E(level)[†‡]	J^{π}[#]	$T_{1/2}$[@]	XREF	Comments
				2655.5γ M1+E2 to 3/2$^-$. L(^{3}He,d)=L(d,^{3}He)=L(t,α)=3 from 0$^+$ for a composite peak around E=2650 give 5/2$^-$,7/2$^-$. $T_{1/2}$: from DSAM in (p,p′γ).
2668.80 *21*	(1/2$^-$)[a]	4.2 fs *35*	d hi MNOp r vw	XREF: d(2660)h(2650)i(2650)p(2654)r(2648) v(2651)w(2654)
2753.38 *21*	(5/2$^-$,7/2$^-$)	35 fs *14*	DE I MNOP R W	XREF: I(2780) J^{π}: L(α,t)=(3,4) from 0$^+$ for a group at 2780; 2753γ to 3/2$^-$. Other: (7/2$^+$,9/2$^+$) from Hauser-Feshbach-Moldauer analysis in (n,n′γ) E=fast is consistent, and is ruled out since it would require for 2753γ an unrealistically large B(M2)(W.u.) if J^{π}=7/2$^+$ or B(E3)(W.u.) if J^{π}=9/2$^+$, which are ruled out by RUL.
2839.32 *20*	(7/2$^+$)	21 fs *+8−6*	dE MNOP R W	XREF: d(2850) J^{π}: (7/2$^+$,9/2$^+$) from Hauser-Feshbach-Moldauer analysis in (n,n′γ) E=fast; 732γ to (5/2)$^-$.
2862.4 *2*	(1/2$^-$)[a]	19.3 fs *+22−18*	dE g i LmNOP rs w	XREF: d(2850)E(?)g(2910)i(2874)r(2861) s(2858)w(2870) $T_{1/2}$: from width in (γ,γ′) if J(2863)=1/2.
2866.94 *27*	(5/2$^-$,7/2$^-$)[a]	12.5 fs *+42−35*	dE g i mNOp rs w	XREF: d(2880)g(2910)i(2874)p(2868)r(2861) s(2858)w(2870)
2873.9 *7*	(3/2$^-$)[a]	13 fs *+5−4*	dE g i LmNOp rs w	XREF: d(2880)g(2910)i(2874)p(2868)r(2861) s(2858)w(2870) $T_{1/2}$: from width in (γ,γ′) and adopted branching ratio if J=3/2.
2893.44 *16*	(3/2$^-$)[a]		dE ghi lmNOP r w	XREF: d(2880)g(2910)h(2898)i(2900)l(2898) r(2894)w(2897) $T_{1/2}$: 46 fs *+44−21* from width in (γ,γ′) and adopted branching, if 2898 level corresponds to this level and J(2894)=3/2.
2902.10 *18*	(5/2$^-$)[a]		CdE ghi lmNOP r w	XREF: d(2880)g(2910)h(2898)i(2900)l(2898) r(2894)w(2897) $T_{1/2}$: 0.10 ps *+8−4* from width in (γ,γ′) and adopted branching, if 2898 level corresponds to this level and J(2902)=5/2.
2944.95 *20*			g MNO x	XREF: g(2910)x(2970)
2974.28 *20*	(3/2$^-$)[a]		dE MNOP rs wx	XREF: d(3000)r(2979)s(2980)w(2982)x(2970)
2990 *2*			dE m p rs wx	XREF: d(3000)p(2993)r(2979)s(2980)w(2982) x(2970) E(level): from (p,γ) E=res.
2997.90 *9*	(11/2$^-$)	9.0 fs *42*	C E J mNOp r wxY	XREF: C(3003)p(2993)r(2979)w(2982)x(2970) J^{π}: from DWBA analysis and j-dependence of measured σ(θ) in (α,p).
3032.5 *2*	(1/2$^-$)[a]		d i MNOP R W	XREF: d(3000)i(3060)
3079.64 *29*	(3/2)$^+$	83 fs *+56−42*	cdE NOP rS	XREF: c(3082)d(3090)r(3078)S(3082) J^{π}: (3/2$^+$,5/2$^+$) from Hauser-Feshbach-Moldauer analysis in (n,n′γ) E=fast; 2308.2γ to 1/2$^-$; L(α,α′)=3 from 3/2$^-$.
3086 *2*	(3/2$^-$)	0.14 ps *+6−3*	cd ghI L P r U W	XREF: c(3082)d(3090)g(3110)h(3119)I(3060) r(3078)U(3096)W(3079) J^{π}: from analyzing power in (pol d,^{3}He). $T_{1/2}$: from width in (γ,γ′) if J(3086)=3/2.
3113.1 *3*	(1/2$^-$,3/2$^-$)[a]		gh mNO	XREF: g(3110)h(3119)m(3140)

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Adopted Levels, Gammas (continued)

^{65}Cu Levels (continued)

E(level)[†‡]	J^{π}[#]	$T_{1/2}$[@]	XREF	Comments
3119.41 *20*	(5/2$^-$,7/2$^-$)[a]	0.21 ps +*28*−*7*	gh mNO	XREF: g(3110)h(3119)m(3140)
3126.9 *18*			gh mN p r	XREF: g(3110)h(3119)m(3140)p(3137) r(3160)
3132.1 *22*			gh mN p r	XREF: g(3110)h(3119)m(3140)p(3137) r(3160)
3143.1 *22*			gh mN p r u	XREF: g(3110)h(3157)m(3140)p(3137) r(3160)u(3096)
3159.9 *11*			dE ghi mNOp r	XREF: d(3170)E(3154)g(3110)h(3157) i(3170)m(3150)p(3159)r(3160)
3166.0 *13*			d hi LmN p r	XREF: d(3170)h(3157)i(3170)m(3150) p(3159)r(3160) $T_{1/2}$: $T_{1/2}$/(2J+1)=5.5 fs *6* from width in ^{65}Cu(γ,γ').
3173.1 *22*			d hi N r	XREF: d(3170)h(3157)i(3170)r(3160)
3240.78 *30*	(3/2,5/2$^+$)		E NOP u W	XREF: u(3252) J^{π}: (1/2$^+$,3/2,5/2$^+$) from HFM analysis in (p,γ) E=res; 2125.2γ to 5/2$^-$.
3260.85 *17*	(1/2$^-$,5/2$^-$,7/2$^-$)[a]		E L NOP r u x	XREF: r(3270)u(3252)x(3300) $T_{1/2}$: $T_{1/2}$/(2J+1)=27 fs +*16*−*8* from width in (γ,γ').
3274.1 *23*	3/2$^+$,5/2$^+$		d hI N p r Wx	XREF: d(3290)h(3284)I(3290)p(3273)r(3270) x(3300) J^{π}: L(t,α)=2 from 0$^+$ for a group at 3267 *16*; L(α,t)=2 for a group at 3290.
3278 *3*	(11/2$^-$)		Cd h p r x	XREF: d(3290)h(3284)p(3273)r(3270)x(3300) XREF: d(3290)h(3284)p(3273)r(3270)x(3300) E(level): from (p,p′) J^{π}: from DWBA analysis and j-dependence of measured $\sigma(\theta)$.
3325.8 *10*	(3/2,5/2)		dE i L N P rs x	XREF: d(3350)i(3290)r(3350)s(3310)x(3300) J^{π}: from $\gamma(\theta)$ in (γ,γ'). $T_{1/2}$: $T_{1/2}$/(2J+1)=5.5 fs *6* from ^{65}Cu(γ,γ').
3337.8 *16*			d mN P r wx	XREF: d(3350)m(3380)r(3350)w(3358) x(3300)
3349 *10*	+		d m P r wx	XREF: d(3350)m(3380)r(3350)w(3358) x(3300) E(level): from (p,p′). J^{π}: L(p,p′)=3 from 3/2$^-$.
3355.29 *20*	5/2$^+$	1.4 fs +*51*−*12*	Cd LmNOP r wx	XREF: C(3359)d(3350)m(3380)r(3350) w(3358)x(3300) J^{π}: 5/2$^+$ from DWBA analysis and j-dependence of measured $\sigma(\theta)$ in (α,p); L(t,α)=2 for a group at 3358 *15*. But (7/2$^-$) from HFM analysis in (n,n′γ) E=fast is inconsistent. $T_{1/2}$: from width in (γ,γ') and adopted branching ratio.
3399.1 *23*	3/2$^+$,5/2$^+$		D H mN P u	XREF: D(3370)H(3391)m(3380)u(3408) E(level): other: 3392 *10* from (p,p′). J^{π}: L(^{3}He,d)=2 from 0$^+$ for a group at E=3391; L(t,p)=3 for a group at E=3370 *20*.
3402 *5*	(7/2$^-$)		C I m P u w	XREF: m(3380)P(3407)u(3408)w(3432) E(level): from (α,p). Other: 3407 *10* from (p,p′).

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Adopted Levels, Gammas (continued)

^{65}Cu Levels (continued)

E(level)[†‡]	Jπ[#]	$T_{1/2}$[@]	XREF	Comments
				Jπ: (7/2,9/2) from DWBA analysis and j-dependence of measured σ(θ) in (α,p); $7/2^-$ from analyzing power for a group at E=3408; L(α,t)=(3,4) from 0^+ for a group at 3400.
3428.27 *21*	($5/2^-$)	49 fs *14*	OP W	XREF: W(3432) Jπ: L(t,α)=3 from 0^+ for a group at 3432 *15*; 2657.4γ to $1/2^-$.
3449 *3*			dE gh p	XREF: d(3450)g(3490)h(3452)p(3451) E(level): from (p,γ) E=res. L(t,p)=(0) from 0^+ for 3450 *20* gives ($3/2^-$); L(^{3}He,d)=(2) from 0^+ for 3452 *20* gives $3/2^+$,$5/2^+$.
3457.1 *24*			d gh N P	XREF: d(3450)g(3490)h(3452)P(3470) E(level): other: 3470 *10* from (p,p′). L(t,p)=(0) from 0^+ for 3450 *20* gives ($3/2^-$); L(^{3}He,d)=(2) from 0^+ for 3452 *20* gives $3/2^+$,$5/2^+$.
3484 *5*	(7/2,9/2)		Cd i P s	XREF: d(3500)i(3500)s(3494) E(level): weighted average of 3485 *5* from (α,p) and 3482 *10* from (p,p′). Jπ: from DWBA analysis and j-dependence of measured σ(θ) in (α,p).
3504 *2*	$(3/2,5/2)^+$		dE ghi L P Rs W	XREF: d(3500)E(3506)g(3490)h(3519)i(3500)R(3510) s(3494)W(3510) $T_{1/2}$: $T_{1/2}$/(2J+1)=17 fs *+5−3* from width in (γ,γ′). Jπ: L(t,α)=2 from 0^+ for a group at 3510 *15*; L(α,α′)=3 from $3/2^-$ for a group at 3494 *25*; L(p,p′)=3 for a group at 3500 *10*. But L(d,n)=1 from 0^+ gives $1/2^-$,$3/2^-$ for a group at E=3490 *50*; L(^{3}He,d)=1+3 from 0^+ gives π=− for a group at E=3519; L(α,t)=(3,4) from 0^+ gives ($5/2^-$,7/2,$9/2^+$) for a group at E=3500.
3518 *5*	($9/2^+$)		Cde ghi P s	XREF: C(3519)d(3500)e(3506)g(3490)h(3519)i(3500) s(3494) E(level): weighted average of 3519 *5* from (α,p) and 3513 *10* from (p,p′). Jπ: from DWBA analysis and j-dependence of measured σ(θ) in (α,p). But L(d,n)=1 from 0^+ gives $1/2^-$,$3/2^-$ for a group at E=3490 *50*; L(^{3}He,d)=1+3 from 0^+ gives π=− for a group at E=3519.
3541 *10*			D P	XREF: D(3530) E(level): from (p,p′).
3547.63 *18*	($11/2^+$)		J Y	Jπ: 527.4γ (Q), ΔJ=(2) from ($15/2^+$); 1014.1γ to $9/2^+$.
3563.1 *24*			c N P	XREF: c(3566)P(3557) Jπ: (5/2,7/2) for a group at 3566 *5*, based on DWBA analysis, which double be a doublet.
3576 *10*			c P	XREF: c(3566) E(level): from (p,p′). Jπ: see comments at 3563 level.
3604 *5*	(7/2,9/2)		C H P	XREF: H(3601) E(level): weighted average of 3595 *10* from (p,p′) and 3606 *5* from (α,p). Other: 3601 from (^{3}He,d). Jπ: from DWBA analysis in (α,p). Other: L(^{3}He,d)=2 from 0^+ gives $3/2^+$,$5/2^+$, which may indicate a different level.
3631.7 *14*	($1/2^+$,$3/2^+$)		dE L N P r u w	XREF: d(3650)r(3640)u(3623)w(3629)

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Adopted Levels, Gammas (continued)

^{65}Cu Levels (continued)

E(level)[†‡]	Jπ[#]	$T_{1/2}$[@]	XREF	Comments
				Jπ: from Hauser-Feshbach-Moldauer analysis in (n,γ) E=res. But L(t,α)=1 from 0^+ gives $1/2^-$,$3/2^-$ for a group at E=3629 *15*, which could be a doublet; ($3/2^-$,$5/2^-$) from analyzing power in (pol d,^{3}He) for a group at E=3623. $T_{1/2}$: $T_{1/2}$/(2J+1)=16 fs *3* from width in (γ,γ′), assuming %branching ratio=100 for 3631.4γ.
3641 *5*			Cd i P r u w	XREF: d(3650)i(3650)r(3640)u(3623)w(3629) E(level): weighted average of 3646 *10* from (p,p′) and 3640 *5* from (α,p). Jπ: L(α,t)=(3,4) from 0^+ gives ($5/2^-$,7/2,$9/2^+$) for a group at 3650; L(t,α)=1 from 0^+ gives $1/2^-$,$3/2^-$ for a group at E=3629 *15*; ($3/2^-$,$5/2^-$) from analyzing power in (pol d,^{3}He) for a group at E=3623.
3659.66 *10*	($13/2^+$)		J Y	Jπ: 1126.1γ Q, ΔJ=2 to $9/2^+$, 661.5γ D, ΔJ=1 to ($11/2^-$).
3664 *5*	(9/2,7/2)		Cd i P r	XREF: d(3650)i(3650)r(3640) Jπ: from DWBA and j-dependence analysis in (α,p). E(level): weighted average of 3656 *10* from (p,p′) and 3666 *5* from (α,p).
3685 *10*			d m P s W	XREF: d(3700)m(3730)s(3709)W(3691) E(level): from (p,p′). Other: 3691 *15* from (t,α).
3713.9 *21*			d mN P rs	XREF: d(3700)m(3730)P(3718)r(3730)s(3709) Jπ: L(α,α′)=3 from $3/2^-$ gives π=+ for a group at E=3709 *25*.
3728 *10*			de m P rs u w	XREF: d(3700)e(3740)m(3730)r(3730)s(3709)u(3748) w(3736) E(level): from (p,p′). Jπ: see comments at 3714 level.
3739 *3*			C E i m p r u w	XREF: i(3770)m(3730)p(3746)r(3730)u(3748)w(3736) XREF: E(3770)m(3730)p(3746)r(3730)u(3748)w(3736) E(level): weighted average of 3737.8 from (α,p) and 3740 *3* from (p,γ) E=res. Jπ: $7/2^-$ from analyzing power in (pol d,^{3}He) for a group at E=3748, which could be a doublet.
3752.7 *20*	($7/2^-$)	2.3 fs +*13*−*6*	Cd i LmN p r u w	XREF: C(3757)d(3770)i(3770)m(3730)p(3746)r(3730) u(3748)w(3736) Jπ: (7/2,9/2) from DWBA and j-dependence analysis in (α,p); $T_{1/2}$/(2J+1)=18 fs +*10*−*5* from width in (γ,γ′) rules out Mult=M2 or Q for 3752.6γ to $3/2^-$ based on RUL. See comments at 3739 level. Other: L(t,p)=(0) from $3/2^-$ gives ($3/2^-$) for a group at E=3770 *20*; L(α,t)=(3,4) gives ($5/2^-$,7/2,$9/2^+$) for a group at E=3770. $T_{1/2}$: $T_{1/2}$/(2J+1)=18 fs +*10*−*5* from width in (γ,γ′) for J=7/2.
3777 *10*	$3/2^+$,$5/2^+$		Hi m P W	XREF: H(3768)i(3770)m(3730)W(3772) E(level): from (p,p′). Other: 3772 *15* from (t,α), 3768 from (^{3}He,d). Jπ: L(^{3}He,d)=L(t,α)=2 from 0^+. Other: L(t,p)=(0) from $3/2^-$ gives ($3/2^-$) for a group at E=3770 *20*; L(α,t)=(3,4) gives ($5/2^-$,7/2,$9/2^+$) for a group at E=3770.
3796 *10*			d P r	XREF: d(3770)r(3800) E(level): from (p,p′).

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Adopted Levels, Gammas (continued)

^{65}Cu Levels (continued)

E(level)†‡	Jπ#	$T_{1/2}$@	XREF	Comments
3808 *10*			h m P r	XREF: h(3800)m(3850)r(3800) E(level): from (p,p′). Jπ: L(^{3}He,d)=4 from 0+ gives 7/2+,9/2+ for a group at E=3800 *50*.
3825 *2*			C h Lm P r	XREF: C(3825)h(3800)L(3825)m(3850)P(3816) r(3800) $T_{1/2}$: $T_{1/2}$/(2J+1)=18 fs +*6*−*4* from width in (γ,γ′).
3851 *10*			H m P	XREF: H(3858)m(3850) E(level): from (p,p′).
3881 *10*	1/2−,3/2−		I m P u	XREF: I(3890)m(3850)u(3901) E(level): from (p,p′). Jπ: L(α,t)=1 from 0+ for a group at E=3890.
3893.2 *25*	1/2+	17.3 fs +*31*−*23*	E LmN P r u W	XREF: m(3850)P(3894)r(3930)u(3901)W(3897) Jπ: L(t,α)=0 from 0+ for a group at E=3897 *15*. Others: (5/2,7/2)− from analyzing power in (pol d,^{3}He) for a group at E=3901, which may be a different level from all others levels nearby. $T_{1/2}$: from width in (γ,γ′) for J(3895)=1/2.
3909 *5*	(9/2)		C P rs u	XREF: r(3930)s(3930)u(3901) Jπ: from DWBA and j-dependence analysis in (α,p). E(level): weighted average of 3910 *5* from (α,p) and 3904 *10* from (p,p′).
3925.0 *20*			E L N P rs	XREF: r(3930)s(3930) $T_{1/2}$: $T_{1/2}$/(2J+1)=5.9 fs *6* from width in (γ,γ′).
3957.0 *20*			c L N P rs	XREF: c(3965)P(3955)r(3930)s(3930) $T_{1/2}$: $T_{1/2}$/(2J+1)=3.8 fs *4* from width in (γ,γ′).
3964 *3*	1/2−,3/2−		E H p	XREF: H(3966)p(3961) Jπ: L(^{3}He,d)=1 from 0+.
3965 *5*	(9/2,11/2)		C p	XREF: p(3961) E(level): from (α,p). This level is considered as different from 3964 level due to very different spin-parity. Jπ: from DWBA and j-dependence analysis in (α,p).
3986.9 *22*			N P r	XREF: P(3979)r(4010)
4006 *2*	5/2−,7/2−		g L P r W	XREF: g(4050)P(3999)r(4010) Jπ: L(t,α)=3 from 0+ gives 5/2−,7/2− for a group at E=4007 *15*. $T_{1/2}$: $T_{1/2}$/(2J+1)=11 fs +*8*−*3* from width in (γ,γ′).
4006.42 *12*	(13/2+)		J Y	Jπ: 350γ Q, ΔJ=2 from (17/2+); 1472.8γ to 9/2+.
4011 *3*	(11/2−)		C g P r	XREF: g(4050)r(4010) E(level): weighted average of 4011 *3* from (α,p) and 4014 *10* from (p,p′). Jπ: from DWBA and j-dependence analysis in (α,p).
4031 *10*			g P rs	XREF: g(4050)r(4010)s(4047) E(level): from (p,p′).
4049.1 *26*			g N P rs	XREF: g(4050)P(4047)r(4070)s(4047) Jπ: L(α,α′)=3 from 3/2− gives (3/2 to 9/2)+ for a group at E=4047 *25*, which could be a multiplet.

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Adopted Levels, Gammas (continued)

^{65}Cu Levels (continued)

E(level)[†‡]	Jπ[#]	$T_{1/2}$[@]	XREF	Comments
4055 *2*	(1/2+,3/2,5/2+)		E g L P rs	XREF: g(4050)P(4057)r(4070)s(4047) Jπ: from Hauser-Feshbach-Moldauer analysis in (p,γ) E=res. $T_{1/2}$: $T_{1/2}$/(2J+1)=2.38 fs *+28−23* from width in (γ,γ′).
4074.60 *13*	(15/2+)		J Y	Jπ: 414.8γ D+Q, ΔJ=1 to (13/2+), 281.1γ D+Q, ΔJ=1 from (15/2+), with both transitions likely M1+E2.
4086.3 *27*	(1/2+,3/2,5/2+)		E ghi N P r	XREF: g(4050)h(4080)i(4090)P(4079)r(4070) Jπ: from Hauser-Feshbach-Moldauer analysis in (p,γ) E=res. Other: L(^{3}He,d)=1 from 0+ gives 1/2−,3/2− for a group at E=4080; L(α,t)=(3,4) from 0+ gives (5/2−,7/2,9/2+) for a group at E=4090.
4090 *3*	(9/2)		C g i p r	XREF: g(4050)i(4090)p(4092)r(4070) E(level): from (α,p). This level is considered as different from 4087 in (p,γ) E=res and 4098 level in (γ,γ′) and (n,n′γ) because of very different Jπ. Jπ: from DWBA and j-dependence analysis in (α,p). See also comments at 4087 level.
4096.9 *15*	(1/2,3/2,5/2−)		ghi L N p r u	XREF: g(4050)h(4080)i(4090)p(4092)r(4070) u(4125) Jπ: 3325γ to 1/2−. See also comments at 4087 level. $T_{1/2}$: $T_{1/2}$/(2J+1)=2.9 fs *+44−17* from width in (γ,γ′).
4119.1 *27*			E N P r	XREF: P(4116)r(4140)
4126 *2*	3/2+	12.0 fs *+14−12*	Lm P r U	XREF: m(4170)P(4125)r(4140)U(4125) Jπ: from analyzing power in (pol d,^{3}He). $T_{1/2}$: from width in (γ,γ′) for J(4126)=3/2.
4141 *2*			h Lm P r	XREF: h(4190)m(4170)P(4142)r(4140) $T_{1/2}$: $T_{1/2}$/(2J+1)=2.7 fs *+4−3* from width in (γ,γ′).
4176.1 *27*			h mN P s	XREF: h(4190)m(4170)P(4157)s(4180)
4184.1 *27*			E hi mN P s	XREF: h(4190)i(4200)m(4170)P(4182)s(4180)
4201.2 *27*	(9/2+)		C hi mN P s	XREF: C(4195)h(4190)i(4200)m(4170) P(4195)s(4180) Jπ: from DWBA and j-dependence analysis in (α,p). Others: L(α,t)=4 from 0+ for a group at E=4200 and L(^{3}He,d)=4 from 0+ for a group at E=4190 *50* gives 7/2+,9/2+ for possible multiplet.
4217.2 *27*			mN	XREF: m(4170)
4227.2 *27*			N p	XREF: p(4232)
4237.2 *27*			c N p rs w	XREF: c(4238)p(4232)r(4260)s(4260)w(4251) Jπ: (13/2+) for a tentative level at 4238 in (α,p), based on DWBA and j-dependence analysis.
4244.2 *27*			c E N P rs w	XREF: c(4238)P(4245)r(4260)s(4260)w(4251) Jπ: L(t,α)=1 from 0+ gives 1/2−,3/2− for a group at E=4251 *15*, which is likely a multiplet.
4266.2 *28*			N p rs w	XREF: p(4264)r(4260)s(4260)w(4251)
4272.6 *20*			L N p rs	XREF: p(4264)r(4260)s(4260)

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Adopted Levels, Gammas (continued)

^{65}Cu Levels (continued)

E(level)[†‡]	J^{π}[#]	$T_{1/2}$[@]	XREF	Comments
				$T_{1/2}$: $T_{1/2}/(2J+1)$=3.8 fs +*8*−*6* from width in (γ,γ').
4290 *10*			i P	XREF: i(4300)
4304 *10*			i P	XREF: i(4300) J^{π}: L(α,t)=(3,4) from 0^+ gives ($5/2^-$,7/2,$9/2^+$) for a group at E=4300 which could be a multiplet.
4320 *10*			i P	XREF: i(4300)
4331.2 *28*			i N P	XREF: i(4300)P(4335)
4355.79 *15*	($17/2^+$)		J Y	J^{π}: 696.6γ Q, ΔJ=2 to ($13/2^+$).
4356.5 *20*			L N P	XREF: P(4358) $T_{1/2}$: $T_{1/2}/(2J+1)$=5.4 fs +*13*−*9* from width in (γ,γ').
4366 *10*			P	
4376 *2*			L p	XREF: p(4383) $T_{1/2}$: $T_{1/2}/(2J+1)$=7.6 fs +*28*−*16* from width in (γ,γ').
4393 *4*			LmN p	XREF: m(4430)p(4383) $T_{1/2}$: $T_{1/2}/(2J+1)$=1.68 fs +*23*−*18* from width in (γ,γ').
4408 *10*			m P	XREF: m(4430)
4418.2 *28*	$5/2^-$,$7/2^-$		mN P W	XREF: m(4430)P(4417) J^{π}: L(t,α)=3 from 0^+ for a group at E=4415 *15*.
4436.2 *28*			mN P	XREF: m(4430)P(4430)
4460.2 *29*			mN P	XREF: m(4430)P(4446)
4483.2 *29*			N P u	XREF: P(4476)u(4487) J^{π}: see comments at 4490 level.
4490 *10*			P u	XREF: u(4487) J^{π}: $7/2^-$,$1/2^+$ from analyzing power in (pol d,^{3}He) for a group at E=4487, which could be a doublet.
4513 *10*			P	
4524.9 *20*	$1/2^+$	2.7 fs +*7*−*4*	L N P w	XREF: P(4523)w(4528) J^{π}: L(t,α)=0 from 0^+ for a group at E=4528 *15*. $T_{1/2}$: from width in (γ,γ') for J(4524)=1/2.
4536.7 *35*			L N P	XREF: P(4535) $T_{1/2}$: $T_{1/2}/(2J+1)$=2.7 fs +*7*−*5* from width in (γ,γ').
4557 *10*			P w	XREF: w(4562) J^{π}: L(t,α)=3 from 0^+ gives $5/2^-$,$7/2^-$ for a group at E=4562 *15*, likely a doublet.
4566.2 *29*			N P w	XREF: P(4571)w(4562) J^{π}: see comments at 4557 level.
4598 *10*			P w	XREF: w(4611) J^{π}: see comments at 4616 level.
4616 *10*			P w	XREF: w(4611) J^{π}: L(t,α)=3 from 0^+ gives $5/2^-$,$7/2^-$ for a group at E=4611 *15*, likely a doublet.
4647 *10*			P	
4668 *10*			P w	XREF: w(4678)
4682 *10*			P w	XREF: w(4678)
4706 *10*			P	
4724.2 *30*			mN P	XREF: m(4770)P(4720)
4736 *10*			m P w	XREF: m(4770)w(4761)
4759.2 *30*			mN P w	XREF: m(4770)P(4759)w(4761)
4776.2 *30*			mN P w	XREF: m(4770)P(4778)w(4761)
4795 *10*			m P	XREF: m(4770)
4808 *10*			m P	XREF: m(4770)
4822 *10*			m P	XREF: m(4770)
4863.2 *31*			N P	XREF: P(4848)
4892.2 *31*			N	
4923.2 *31*			N u	XREF: u(4928) J^{π}: see comments at 4932 level.

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Adopted Levels, Gammas (continued)

^{65}Cu Levels (continued)

E(level)[†‡]	J^{π}[#]	$T_{1/2}$[@]	XREF	Comments
4932.2 *31*			N u	XREF: u(4928) J^{π}: $3/2^+,7/2^-$ from analyzing power in (pol d,^{3}He) for a group at E=4928, likely a doublet.
4936.40 *16*	(13/2,15/2,17/2)		Y	J^{π}: 861.8γ D+Q to $(15/2^+)$.
5017.2 *32*			N	
5063.2 *32*			N	
5077.2 *32*			N	
5083.2 *32*			N	
5100.2 *32*			N	
5217.2 *33*			N	
5230.2 *33*			N	
5236.2 *33*			N	
5244.2 *33*			N	
5262.2 *33*			N	
5296.2 *33*			N u	XREF: u(5292) J^{π}: $(1/2^+,5/2^-,7/2^-)$ from analyzing power in (pol d, ^{3}He) for a group at E=5292, likely a multiplet.
5305.2 *33*			N u	XREF: u(5292)
5310.2 *33*			N u	XREF: u(5292)
5320.2 *33*			N	
5335.2 *33*			N	
5384.2 *34*			N	
5392.2 *34*			N	
5424.2 *34*			N	
5430.2 *34*			N	
5447.3 *34*			N	
5485.90 *17*			Y	
5526.3 *35*			N	
5603.3 *35*			N	
5618.5 *22*			N	
5632.3 *35*			N	
5732	$7/2^-$		U	E(level),J^{π}: from (pol d,^{3}He).
5779 *4*			N	
6070	(3/2)	0.7 fs *+5−2*	L	E(level),J^{π}: from (γ,γ), with spin from $\gamma(\theta)$. $T_{1/2}$: from width in (γ,γ').
6233.11 *26*			Y	
6486	$(3/2^+,5/2^+,7/2^-)$		U	J^{π}: from analyzing power in (pol d,^{3}He).
6556	(1/2)	6.5 fs *+26−30*	L	E(level),J^{π}: from (γ,γ'), with spin from $\gamma(\theta)$. $T_{1/2}$: from width in (γ,γ').
7505	$(3/2,5/2)^+$		U	J^{π}: from analyzing power in (pol d,^{3}He).
7939.3 *14*	(5/2)		L	J^{π}: from $\gamma(\theta)$ in (γ,γ').
8484.3 *15*	$(1/2,5/2^-)$	1.38 fs *13*	L	J^{π}: (1/2,5/2) from $\gamma(\theta)$ in (γ,γ'); 7714γ to $1/2^-$. $T_{1/2}$: from width in (γ,γ').
8535	$5/2^+$		U	J^{π}: from analyzing power in (pol d,^{3}He).
9483	$5/2^+$		U	J^{π}: from analyzing power in (pol d,^{3}He).
10513	$5/2^+$		U	J^{π}: from analyzing power in (pol d,^{3}He).
10520 *2*	$1/2^+$	0.64 keV	F	
10523 *2*	$1/2^+$	0.06 keV	F	
10528 *2*	$(1/2^-,3/2^-)$	0.16 keV	F	

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Adopted Levels, Gammas (continued)

^{65}Cu Levels (continued)

E(level)[†‡]	J$^{\pi}$[#]	$T_{1/2}$[@]	XREF	Comments
10529 *2*	1/2$^+$	0.135 keV	F	
10532 *2*	(1/2$^-$,3/2$^-$)	0.07 keV	F	
10539 *2*	1/2$^+$	0.17 keV	F	
10547 *2*	1/2$^+$	0.035 keV	F	
10551 *2*	1/2$^+$	0.05 keV	F	
10552 *2*	(3/2$^+$,5/2$^+$)	0.025 keV	F	
10559 *2*	(1/2$^-$)	0.525 keV	F	
10561 *2*	1/2$^+$	0.585 keV	F	
10563 *2*	1/2$^+$	0.375 keV	F	
10568 *2*	1/2$^+$	0.21 keV	F	
10569 *2*	1/2$^+$	0.025 keV	F	
10577		10 keV	F	E(level): resonance at E(lab)=3172 *10*; IAS of ^{65}Ni(g.s.). In ^{64}Ni(^{3}He,d) reaction, 5 levels from 10750 *40* to 13090 *40* have been seen and assigned as IAS of various levels in ^{65}Ni. However, because of the poor resolution, it is not possible to establish a one-to-one correspondence between these levels and those seen in the ^{64}Ni(p,p), (p,p′), (p,n), IAR reaction.
10577 *2*	1/2$^+$	0.21 keV	F	
10579 *2*	(1/2$^-$)	0.17 keV	F	
10580 *2*	(1/2$^-$)	0.1 keV	F	
10583 *2*	1/2$^+$	0.42 keV	F	
10584 *2*	1/2$^+$	0.56 keV	F	
10596 *2*	(1/2$^-$)	0.07 keV	F	
10603 *2*	1/2$^-$	0.045 keV *7*	F	
10606 *2*	(1/2$^-$)	0.53 keV *10*	F	
10607 *2*	(1/2$^-$)	0.46 keV *15*	F	
10608 *2*	(1/2$^-$,3/2$^-$)	0.22 keV *8*	F	
10610 *2*	1/2$^+$	0.06 keV	F	
10612 *2*	1/2$^+$	0.03 keV	F	
10613 *2*	1/2$^-$	0.80 keV *13*	F	
10616 *2*	1/2$^+$	0.375 keV	F	
10621 *2*	1/2$^-$	0.125 keV *29*	F	
10622 *2*	1/2$^-$	0.18 keV *4*	F	
10623.2 *20*	1/2$^-$	0.26 keV *6*	F	
10623.5 *20*		0.23 keV *6*	F	
10625 *2*	(1/2$^-$)	0.19 keV *5*	F	
10626 *2*	(1/2$^-$)	0.080 keV *18*	F	
10627 *2*	1/2$^-$	0.52 keV *11*	F	
10628 *2*	1/2$^-$	0.23 keV *6*	F	
10629 *2*	1/2$^-$	0.20 keV *4*	F	
10633 *2*	1/2$^-$	0.045 keV *11*	F	
10635 *2*	1/2$^+$	0.06 keV	F	
10638 *2*	1/2$^+$	0.2 keV	F	
10641 *2*	(1/2$^-$)	0.17 keV	F	
10643 *2*	(1/2$^-$,3/2$^-$)	0.135 keV	F	
10644 *2*	1/2$^+$	0.43 keV	F	
10647 *2*	1/2$^+$	0.62 keV	F	
10652 *2*	1/2$^+$	0.22 keV	F	
10658 *2*	(1/2$^-$,3/2$^-$)	0.275 keV	F	
10659 *2*	1/2$^+$	0.675 keV	F	
10664 *2*	1/2$^+$	0.21 keV	F	
10669 *2*	1/2$^+$	0.4 keV	F	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{65}Cu Levels (continued)

E(level)†‡	Jπ#	$T_{1/2}$@	XREF	Comments
10681 *2*	(1/2⁻,3/2⁻)	0.33 keV	F h	XREF: h(10750)
10684 *2*	(1/2⁻,3/2⁻)	0.3 keV	F h	XREF: h(10750)
10686 *2*	(1/2⁺)	0.28 keV	F	
10902	3/2⁻&	8 keV	F	E(level): IAS of 310, 3/2⁻ level in ^{65}Ni.
11290	3/2⁻&	19 keV	F	E(level): IAS of 692, 3/2⁻ level in ^{65}Ni.
11502	5/2⁺		U	Jπ: from analyzing power in (pol d,^{3}He).
11589		40 keV	F	E(level): possible IAS of 1017, 9/2⁺ level in ^{65}Ni.
11760 *40*			H	E(level): assigned as IAS of ^{65}Ni E(level)=1017, Jπ=9/2⁺ in (^{3}He,d).
11930	1/2⁺	13 keV	F	Jπ: L(p,p)=0 from 0⁺.
12018	1/2⁻&	52 keV	F	E(level): IAS of 1418, 1/2⁻ level in ^{65}Ni.
≈12360?			F	XREF: F(?) E(level): not given explicitly; E(lab)=4983 deduced assuming this resonance is IAS of 1779 level in ^{65}Ni.
12411 *10*	1/2⁺	39 keV	F	
12480 *10*	5/2⁺&	19.0 keV *23*	F U	XREF: U(12503) E(level): IAS of 1920, 5/2⁺ level in ^{65}Ni. Jπ: also from analyzing power in (pol d,^{3}He).
12591? *10*	1/2⁻	38 keV	F	XREF: F(?)
12670 *40*			H	Associated with IAS of ^{65}Ni E(level)=1920, Jπ=5/2⁺ in (^{3}He,d).
12697	3/2⁻	22 keV	F	E(level): IAS of 2147, 3/2⁻ level in ^{65}Ni.
12894		30 keV	F	E(level): possible IAS of 2302 level in ^{65}Ni.
12938? *10*		20 keV *3*	F	XREF: F(?)
13090 *40*			H	
13275 *10*	5/2⁺	29 keV	F	
13347 *10*	5/2⁺&	30 keV *4*	F	E(level): IAS of 2793, 5/2⁺ level in ^{65}Ni.
13403 *10*	1/2⁺	51 keV *6*	F	E(level): IAS of 2829, 1/2⁺ level in ^{65}Ni. Jπ: L(p,p)=0 from 0⁺; J=1/2 confirmed by pγ(θ).
13450?			F	XREF: F(?) E(level): possible IAS of 2902, (3/2)⁺ level in ^{65}Ni.
13509 *10*	5/2⁺&	39 keV *5*	F U	XREF: U(13501) E(level): possible IAS of 3044, (5/2⁺) level in ^{65}Ni. Jπ: also from analyzing power in (pol d,^{3}He).
13593?	(3/2⁺)		F	XREF: F(?) E(level): possible IAS of 3014, 3/2⁺ level in ^{65}Ni.
13695		15 keV	F	
13836		20 keV	F	E(level): possible IAS of 3279, (3/2)⁺ level in ^{65}Ni.
13894	(5/2⁺)	38 keV	F	E(level): possible IAS of 3354, 5/2⁺ level in ^{65}Ni.
13918		50 keV	F	
13957		35 keV	F	E(level): possible IAS of 3411 level in ^{65}Ni.
14059		12 keV	F	E(level): possible IAS of 3509 level in ^{65}Ni.
14114	5/2⁺&	36 keV	F	E(level): possible IAS of 3569 level in ^{65}Ni.
14305	5/2⁺&	33 keV	F	E(level): possible IAS of 3743 level in ^{65}Ni.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{65}Cu Levels (continued)

E(level)[†‡]	J^{π}[#]	$T_{1/2}$[@]	XREF	Comments
14444		37 keV	F	E(level): possible IAS of 3907 level in ^{65}Ni.
14501	5/2$^+$		U	J^{π}: from analyzing power in (pol d,^{3}He).
14540			F	E(level): possible IAS of 4012 level in ^{65}Ni.
14662			F	E(level): possible IAS of 4108 level in ^{65}Ni.
15178			F	E(level): possible IAS of 4655 level in ^{65}Ni.
15498	5/2$^+$		U	J^{π}: from analyzing power in (pol d,^{3}He).

† Additional information 1.

‡ From a least-square fit to γ-ray energies with uncertainties for levels connected with γ transitions and from (p,p),(p,p′),(p,n):res for proton resonance levels, unless otherwise noted.

For high-spin yrast levels (J≥11/2) populated in (^{64}Ni,Xγ) and (^{7}Li,α2nγ), it is assumed spin ascends as excitation energy increases. For resonance level (E≥10520) in (p,p),(p,p′),(p,n):res, spin-parities are from analysis of measured $\sigma(E_p)$, unless otherwise noted.

@ Half-life is from DSAM in (n,n′γ) E=fast up to 3428 level and from measured width in (γ,γ') with adopted branching for levels above 3428, and width is from (p,p),(p,p′),(p,n):res, unless otherwise noted.

& From analyzing power and assigned L-value in (p,p),(p,p′),(p,n):res.

a From Hauser-Feshbach-Moldauer analysis in (n,n′γ) E=fast.

$\gamma(^{65}Cu)$

Additional information 2.

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	δ	α†	Comments
770.80	1/2⁻	770.7 *1*	100	0.0	3/2⁻	M1+E2	0.099 *6*	0.000384 *5*	B(M1)(W.u.)=0.472 *+29−26*; B(E2)(W.u.)=12.9 *+18−16* α(K)=0.000345 *5*; α(L)=3.41×10^{-5} *5*; α(M)=4.80×10^{-6} *7* α(N)=1.470×10^{-7} *21* E_γ: from (n,n′γ) E=fast. Others: 770.6 *2* from ^{65}Ni β^- decay, 770.6 *2* from (p,γ) E=res, 770.6 *2* from (n,n′γ), 770.7 *3* from (p,p′γ), and 770.8 *5* from Coulomb excitation. Mult.: D+Q from $\gamma(\theta)$ in Coulomb excitation; E1+M2 ruled out by RUL. δ: from adopted B(E2)↑=0.0099 *5* taken from Coulomb excitation and adopted $T_{1/2}$=101 fs *6*.
1115.549	5/2⁻	345.1 *3*	0.0054 *5*	770.80	1/2⁻	[E2]		0.00620 *9*	B(E2)(W.u.)=1.42 *14* α(K)=0.00555 *8*; α(L)=0.000568 *8*; α(M)=7.96×10^{-5} *11* α(N)=2.302×10^{-6} *33* E_γ: from (p,p′γ). Other: 344.95 from level-energy difference. I_γ: weighted average of 0.0061 *6* from ^{65}Ni β^- decay and 0.0051 *4* from ^{65}Zn ε decay.
		1115.539 *2*	100.00 *14*	0.0	3/2⁻	M1+E2	−0.34 *5*	0.0001833 *27*	B(M1)(W.u.)=0.0499 *25*; B(E2)(W.u.)=7.7 *+21−19* α(K)=0.0001639 *24*; α(L)=1.615×10^{-5} *24*; α(M)=2.271×10^{-6} *33* α(N)=6.97×10^{-8} *10*; α(IPF)=9.62×10^{-7} *18* E_γ: from 2000He14 recommendation, based on measured energy difference (1971He20) between 1115.5γ from ^{65}Zn ε decay and Eγ=1087.6842 *7* in ^{198}Au β^- decay. Others: 1115.53 *4* from ^{65}Ni β^- decay, 1115.5 *2* from (p,γ) E=res, 1115.5 *1* from (n,n′γ), 1115.6 *1* from (n,n′γ) E=fast, 1115.83 *5* from (p,p′γ), and 1115.5 *1* from (^{64}Ni,Xγ). I_γ: from ^{65}Zn ε decay. Other: 100.00 *31* from ^{65}Ni β^- decay. Mult.: D+Q from $\gamma(\theta)$ in (γ,γ′), (p,γ) E=res, (^{64}Ni,Xγ) and Coulomb excitation, and from $\gamma\gamma(\theta)$ in (n,n′γ) E=fast; E1+M2 ruled out by RUL. δ: weighted average of −0.437 *15* (1968Me09) and −0.52 *7*

$^{65}_{29}Cu_{36}$-15

γ(^{65}Cu) (continued)

E$_i$(level)	J$^\pi_i$	E$_\gamma$ ‡	I$_\gamma$ ‡	E$_f$	J$^\pi_f$	Mult.	δ	α †	Comments
									(1964Be21) from (γ,γ'), −0.50 *15* from (n,n′γ) E=fast, −0.24 *13* (1964El03), −0.22 *6* (1964Ro10), −0.19 *6* (1966Gu10) and −0.28 *5* (1972Ro21) from Coulomb excitation. Others: −0.1 from (^{64}Ni,Xγ), −0.09 *8* from (p,γ) E=res; 0.46 *3* from B(E2)↑=0.0305 *21* in Coulomb excitation and 0.39 *2* from B(E2)↑=0.0228 *7* in (e,e′).
1481.796	7/2$^-$	366.26 *3*	20.13 *20*	1115.549	5/2$^-$	M1+E2	−0.03 *1*	2.02×10^{-3} *3*	B(M1)(W.u.)=0.167 *+41−33*; B(E2)(W.u.)=1.9 *+16−11* α(K)=0.001810 *25*; α(L)=0.0001812 *25*; α(M)=2.55×10^{-5} *4* α(N)=7.74×10^{-7} *11* E$_\gamma$: weighted average of 366.27 *3* from ^{65}Ni β^- decay, 366.3 *3* from (p,γ) E=res, 366.3 *1* from (n,n′γ), 366.2 *1* from (n,n′γ) E=fast, 365.6 *3* from (p,p′γ), 366.3 *5* from (^{64}Ni,Xγ), and 366.7 *7* from Coulomb excitation. I$_\gamma$: weighted average of 20.37 *22* (1987Ju05), 20.15 *14* (1990Lo03), 20.2 *6* (1973Ra10), 18.6 *8* (1972Pa30), 18 *1* (1963Cl06), 21 *2* (1960Ri06), 12 *5* with Ge(Li), 17 *5* with NaI(Tl) (1965Sp07), 19 *3* (1972Co31) in ^{65}Ni β^- decay, 23.1 *8* from (n,n′γ), 16.0 *34* from (p,p′γ), 18.2 *6* from (^{64}Ni,xγ), and 17.7 *24* from Coulomb excitation. Other: 30.0 *17* from (n,n′γ) E=fast (outlier), Mult.: D+Q from $\gamma\gamma(\theta)$ in β^- decay, $\gamma(\theta)$ in (n,n′γ) E=fast, (p,p′γ), (^{64}Ni,Xγ) and Coulomb excitation; E1+M2 ruled out by RUL. δ: from (n,n′γ) E=fast. Others: −0.030 *30* from ^{65}Ni β^- decay, −0.07 *+7−14* from (p,p′γ); −0.16 *6* from Coulomb excitation is discrepant; .
		1481.75 *5*	100.0 *19*	0.0	3/2$^-$	E2		0.0001922 *27*	B(E2)(W.u.)=9.4 *+23−19* α(K)=0.0001008 *14*; α(L)=9.93×10^{-6} *14*; α(M)=1.395×10^{-6} *20* α(N)=4.27×10^{-8} *6*; α(IPF)=8.00×10^{-5} *11* E$_\gamma$: weighted average of 1481.84 *5* from ^{65}Ni β^- decay, 1481.8 *2* from (p,γ) E=res, 1481.8 *1* from (n,n′γ), 1481.7 *1* from (n,n′γ) E=fast, 1481.63 *5* from (p,p′γ), and 1481.8 *1* from (^{64}Ni,Xγ). Others: 1481.7 *5* from (γ,γ') and 1481.4 *5* from Coulomb excitation. I$_\gamma$: from ^{65}Ni β^- decay. Others: 100.0 *33* from (n,n′γ)

$\gamma(^{65}Cu)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	δ	α†	Comments
									E=fast, 100.0 *34* from (p,p′γ), 100 *13* from (^{64}Ni,Xγ), and 100.0 *24* from Coulomb excitation. Mult.: Q from γ(θ) in (n,n′γ) E=fast and (p,p′γ); M2 ruled out by RUL.
1623.42	5/2⁻	507.8 *1*	58.6 *9*	1115.549	5/2⁻	M1+E2	+0.20 *3*	0.000990 *17*	B(M1)(W.u.)=0.060 *+19−16*; B(E2)(W.u.)=20.3 *+83−72* α(K)=0.000888 *15*; α(L)=8.85×10^{-5} *16*; α(M)=1.244×10^{-5} *22* α(N)=3.79×10^{-7} *6* E_γ: weighted average of 507.9 *1* from ^{65}Ni β^- decay, 507.8 *3* from (p,γ) E=res, 507.9 *1* from (n,n′γ), and 507.7 *1* from (p,p′γ). Others: 507 *1* from (n,n′γ) E=fast and 507.9 *10* from (^{64}Ni,Xγ). I_γ: weighted average of 58.7 *5* from ^{65}Ni β^- decay, 72 *16* from (n,n′γ), 43 *5* from (n,n′γ) E=fast, 67 *5* from (p,p′γ), and 58 *33* from (^{64}Ni,Xγ). Mult.,δ: D+Q and δ(Q/D) from γγ(θ) in β^- decay; E1+M2 ruled out by RUL.
		852.6 *1*	23 *4*	770.80	1/2⁻	[E2]		0.000396 *6*	α(K)=0.000355 *5*; α(L)=3.54×10^{-5} *5*; α(M)=4.97×10^{-6} *7* α(N)=1.503×10^{-7} *21* B(E2)(W.u.)=11.9 *+41−37* E_γ: weighted average of 852.7 *2* from ^{65}Ni β^- decay, 852.7 *3* from (p,γ) E=res, 852.5 *1* from (n,n′γ) E=fast, and 853.1 *2* from (p,p′γ). Other: 853.0 *12* from (n,n′γ). I_γ: unweighted average of 16.0 *10* from ^{65}Ni β^- decay, 21.6 *23* from (n,n′γ), and 30.5 *10* from (n,n′γ) E=fast.
		1623.49 *7*	100.0 *15*	0.0	3/2⁻	M1+E2	−0.75 *+30−45*	0.000208 *9*	α(K)=8.07×10^{-5} *16*; α(L)=7.92×10^{-6} *16*; α(M)=1.114×10^{-6} *23* α(N)=3.43×10^{-8} *7*; α(IPF)=0.000118 *7* B(M1)(W.u.)=0.00211 *90*; B(E2)(W.u.)=0.75 *+54−43* E_γ: weighted average of 1623.42 *6* from ^{65}Ni β^- decay, 1623.3 *2* from (p,γ) E=res, 1624 *1* from (γ,γ′), 1623.4 *1* from (n,n′γ), 1623.2 *3* from (n,n′γ) E=fast, 1623.8 *1* from (p,p′γ), and 1623.8 *3* from (^{64}Ni,Xγ). I_γ: from ^{65}Ni β^- decay. Others: 100 *4* from (n,n′γ), 100.0 *29* from (n,n′γ) E=fast, 100 *5* from (p,p′γ), and 1.0E2 *8* from (^{64}Ni,Xγ). Mult.,δ: D+Q and δ(Q/D) from γ(θ) in ^{65}Ni β^- decay;

From ENSDF

Adopted Levels, Gammas (continued)

$\gamma(^{65}Cu)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	δ	α†	Comments
									E1+M2 ruled out by RUL. Others: δ(Q/D)=−0.03 9 or +3.7 +26−8 from $\gamma(\theta)$ in (p,p′γ); 1.75 50 from $\gamma\gamma(\theta)$ in (n,n′γ) E=fast.
1724.99	3/2⁻	609.6 1	35 4	1115.549	5/2⁻	[M1+E2]	<0.5	0.00067 4	B(M1)(W.u.)=0.31 12 α(K)=0.000601 33; α(L)=5.97×10^{-5} 34; α(M)=8.4×10^{-6} 5 α(N)=2.56×10^{-7} 14 E_γ: weighted average of 609.5 1 from ^{65}Ni β^- decay, 609.5 3 from (p,γ) E=res, 609.4 1 from (n,n′γ), 609.7 1 from (n,n′γ) E=fast, and 610.4 3 from (p,p′γ). I_γ: unweighted average of 41.4 13 from ^{65}Ni β^- decay, 29.6 27 from (n,n′γ), and 33 8 from (p,p′γ). Other: 65.3 32 from (n,n′γ) E=fast is greatly discrepant. δ: deduced by the evaluator from RUL=300 for B(E2)(W.u.).
		953.9 7	<0.9	770.80	1/2⁻	[M1,E2]		0.000272 27	α(K)=0.000245 24; α(L)=2.42×10^{-5} 25; α(M)=3.41×10^{-6} 34 α(N)=1.04×10^{-7} 10 E_γ: unweighted average of 954.5 3 from ^{65}Ni β^- decay, 952.0 13 from (n,n′γ), 954.0 1 from (n,n′γ) E=fast, and 954.9 3 from (p,p′γ). I_γ: from ^{65}Ni β^- decay. Others: <7.5 in (p,p′γ); 9.2 20 from (n,n′γ) and 11.6 11 from (n,n′γ) E=fast are not confirmed in ^{65}Ni β^- decay and (p,p′γ) and may be questionable. B(M1)(W.u.)<0.0027 if M1, B(E2)(W.u.)<5.0 if E2.
		1724.85 6	100.0 6	0.0	3/2⁻	M1+E2	0.32 5	0.0002268 34	α(K)=7.093×10^{-5} 99; α(L)=6.96×10^{-6} 10; α(M)=9.79×10^{-7} 14 α(N)=3.01×10^{-8} 4; α(IPF)=0.0001479 23 B(M1)(W.u.)=0.0373 +79−69; B(E2)(W.u.)=2.13 +82−68 E_γ: weighted average of 1724.92 6 from ^{65}Ni β^- decay, 1725.0 2 from (p,γ) E=res, 1724.9 1 from (n,n′γ), 1724.7 1 from (n,n′γ) E=fast, and 1724.7 1 from (p,p′γ). Other: 1724.9 5 from (γ,γ′). I_γ: from ^{65}Ni β^- decay. Others: 100 4 from (n,n′γ), 100.0 11 from (n,n′γ) E=fast, and 100 8 from (p,p′γ). Mult.,δ: D+Q and δ from $\gamma\gamma(\theta)$ in (n,n′γ) E=fast; E1+M2 ruled out by RUL. Other: δ(Q/D)=−0.15 +31−35 or <−4.6 or >+2.3 from $\gamma(\theta)$ in ^{65}Ni β^- decay, 0.15 5 or 1.8 8 from $\gamma(\theta)$ in (γ,γ′).
2094.28	7/2⁻	471.0 2	11 4	1623.42	5/2⁻	[M1,E2]		0.0017 5	α(K)=0.0015 5; α(L)=1.5×10^{-4} 5; α(M)=2.1×10^{-5} 7 α(N)=6.3×10^{-7} 20

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γ(^{65}Cu) (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	δ	α†	Comments
									Eγ,Iγ: from (n,n′γ) E=fast. Others: 471.0 *3* with Iγ=12 from (p,γ) E=res and 470.5 *5* with Iγ=13 *8* from (^{64}Ni,Xγ). B(M1)(W.u.)<0.049 if M1.
2094.28	7/2⁻	612.5 *2*	28.2 *29*	1481.796	7/2⁻	(M1+E2)		0.00080 *18*	α(K)=0.00072 *16*; α(L)=7.2×10^{-5} *16*; α(M)=1.01×10^{-5} *23* α(N)=3.1×10^{-7} *7* Eγ: unweighted average of 612.7 *5* from (n,n′γ), 612.7 *1* from (n,n′γ) E=fast, and 612.1 *2* from (^{64}Ni,Xγ). Iγ: unweighted average of 24.7 *20* from (n,n′γ), 26 *4* from (n,n′γ) E=fast, and 33.9 *9* from (^{64}Ni,Xγ). Mult.: D+Q from γ(θ) in (^{64}Ni,Xγ); Δπ=no from level scheme. B(M1)(W.u.)<0.047 if M1, B(E2)(W.u.)<208 if E2.
		978.7 *1*	100.0 *27*	1115.549	5/2⁻	(M1+E2)	+0.4	0.0002399 *34*	α(K)=0.0002156 *30*; α(L)=2.128×10^{-5} *30*; α(M)=2.99×10^{-6} *4* α(N)=9.17×10^{-8} *13* B(M1)(W.u.)<0.035; B(E2)(W.u.)<12 Eγ: weighted average of 978.8 *3* from (p,γ) E=res, 978.8 *1* from (n,n′γ) E=fast, and 978.5 *1* from (^{64}Ni,Xγ). Other: 978.8 *7* from (n,n′γ). Iγ: others: 100.0 *29* from (n,n′γ) E=fast and 100.0 *30* from (^{64}Ni,Xγ). Mult.,δ: D+Q and δ(Q/D) from γ(θ) in (^{64}Ni,Xγ); Δπ=no from level scheme.
		2094.6 *6*	57.8 *15*	0.0	3/2⁻	[E2]		0.000416 *6*	α(K)=5.20×10^{-5} *7*; α(L)=5.10×10^{-6} *7*; α(M)=7.17×10^{-7} *10* α(N)=2.204×10^{-8} *31*; α(IPF)=0.000358 *5* B(E2)(W.u.)<0.86 Eγ: unweighted average of 2094.3 *2* from (p,γ) E=res, 2094.0 *17* from (n,n′γ), 2093.5 *1* from (n,n′γ) E=fast, 2096.8 *4* from (p,p′γ), and 2094.2 *1* from (^{64}Ni,Xγ). Iγ: weighted average of 54.2 *24* from (n,n′γ), 55.7 *29* from (n,n′γ) E=fast, and 59.2 *13* from (^{64}Ni,Xγ).
2107.42	(5/2)⁻	382.5 *2*	16 *4*	1724.99	3/2⁻	[M1+E2]	<0.4	0.00200 *18*	α(K)=0.00179 *16*; α(L)=0.000180 *16*; α(M)=2.52×10^{-5} *23* α(N)=7.6×10^{-7} *6* B(M1)(W.u.)=0.14 *+14−8* Eγ: weighted average of 382.4 *3* from (p,γ) E=res, 383.1 *5* from (n,n′γ), and 382.4 *2* from (n,n′γ) E=fast. Iγ: other: 17 *7* from (n,n′γ) E=fast. δ: deduced by the evaluator from RUL=300 for B(E2)↑.
		625.4 *3*	89.5 *33*	1481.796	7/2⁻	[M1+E2]	<0.6	0.00064 *4*	α(K)=0.00058 *4*; α(L)=5.7×10^{-5} *4*; α(M)=8.1×10^{-6} *6*

$^{65}_{29}Cu_{36}$-19

Adopted Levels, Gammas (continued)

$\gamma(^{65}Cu)$ (continued)

E_i(level)	J^π_i	E_γ[‡]	I_γ[‡]	E_f	J^π_f	Mult.	δ	α[†]	Comments
									α(N)=2.45×10^{-7} *16* B(M1)(W.u.)=0.17 +*13*−*9* E_γ: unweighted average of 625.6 *3* from (p,γ) E=res, 625.8 *5* from (n,n′γ), and 624.9 *1* from (n,n′γ) E=fast. I_γ: weighted average of 88 *6* from (n,n′γ) and 90.0 *33* from (n,n′γ) E=fast. δ: deduced by the evaluator from RUL=300 for B(E2)↑.
2107.42	(5/2)$^-$	991.8 *1*	100.0 *33*	1115.549	5/2$^-$	M1+E2		0.000250 *23*	α(K)=0.000224 *20*; α(L)=2.22×10^{-5} *21*; α(M)=3.12×10^{-6} *29* α(N)=9.5×10^{-8} *8* E_γ: from (n,n′γ) E=fast. Others: 991.9 *3* from (p,γ) E=res and 991.5 *7* from (n,n′γ). I_γ: from (n,n′γ) E=fast. Other: 100 *7* from (n,n′γ). Mult.,δ: D+Q and δ(Q/D)=0.32 *10* or 0.8 *15* from $\gamma(\theta)$ in (n,n′γ) E=fast; E1+M2 ruled out by RUL. B(M1)(W.u.)=0.051 +*22*−*15* if M1, B(E2)(W.u.)=86 +*36*−*26* if E2.
		1337.2 *4*	25 *7*	770.80	1/2$^-$	[E2]		0.0001760 *25*	α(K)=0.0001247 *17*; α(L)=1.230×10^{-5} *17*; α(M)=1.729×10^{-6} *24* α(N)=5.29×10^{-8} *7*; α(IPF)=3.72×10^{-5} *5* B(E2)(W.u.)=4.8 +*24*−*19* E_γ: unweighted average of 1336.8 *3* from (p,γ) E=res, 1337.0 *14* from (n,n′γ), and 1337.9 *1* from (n,n′γ) E=fast. I_γ: weighted average of 27 *7* from (n,n′γ) and 23 *7* from (n,n′γ) E=fast.
		2107.3 *2*	35 *12*	0.0	3/2$^-$	[M1,E2]		0.000390 *32*	α(K)=5.04×10^{-5} *12*; α(L)=4.94×10^{-6} *12*; α(M)=6.95×10^{-7} *17* α(N)=2.14×10^{-8} *5*; α(IPF)=0.000334 *31* E_γ: weighted average of 2107.4 *2* from (p,γ) E=res, 2108.0 *17* from (n,n′γ), and 2106.5 *5* from (n,n′γ) E=fast. I_γ: unweighted average of 46 *7* from (n,n′γ) and 23 *7* from (n,n′γ) E=fast. B(M1)(W.u.)=0.00187 +*97*−*78* if M1, B(E2)(W.u.)=0.70 +*36*−*29* if E2.
2212.64	(1/2)$^-$	487.7 *3*	17 *7*	1724.99	3/2$^-$	[M1+E2]	<0.4	0.00110 *7*	α(K)=0.00099 *6*; α(L)=9.9×10^{-5} *6*; α(M)=1.39×10^{-5} *8* α(N)=4.23×10^{-7} *24* B(M1)(W.u.)=0.15 +*21*−*11* E_γ: weighted average of 487.8 *3* from (p,γ) E=res, 487.0 *11* from (n,n′γ), and 487 *1* from (n,n′γ) E=fast. I_γ: weighted average of 27 *14* from (n,n′γ) and 14 *7* from (n,n′γ) E=fast. δ: deduced by the evaluator from RUL=300 for B(E2)↑.
		1441.2 *9*	100 *17*	770.80	1/2$^-$	[M1]		0.0001596 *22*	α(K)=9.84×10^{-5} *14*; α(L)=9.66×10^{-6} *14*; α(M)=1.359×10^{-6} *19*

$^{65}_{29}Cu_{36}$-20

Adopted Levels, Gammas (continued)

$\gamma(^{65}Cu)$ (continued)

E_i(level)	J^π_i	E_γ[‡]	I_γ[‡]	E_f	J^π_f	Mult.	α[†]	Comments
								α(N)=4.18×10^{-8} *6*; α(IPF)=5.01×10^{-5} *7* B(M1)(W.u.)=0.036 *+17−14* E_γ: unweighted average of 1442.2 *3* from (p,γ) E=res, 1442.0 *14* from (n,n′γ), 1441.9 *1* from (n,n′γ) E=fast, and 1438.6 *4* from (p,p′γ). I_γ: other: 100 *22* from (n,n′γ) E=fast.
2212.64	(1/2)$^-$	2212.6 *1*	65 *7*	0.0	3/2$^-$	[M1,E2]	0.000434 *35*	α(K)=4.63×10^{-5} *11*; α(L)=4.53×10^{-6} *11*; α(M)=6.37×10^{-7} *15* α(N)=1.96×10^{-8} *4*; α(IPF)=0.000382 *34* E_γ: weighted average of 2212.8 *2* from (p,γ) E=res and 2212.5 *1* from (n,n′γ) E=fast. Other: 2213.0 *17* from (n,n′γ). I_γ: weighted average of 69 *22* from (n,n′γ) and 64 *7* from (n,n′γ) E=fast. B(M1)(W.u.)=0.0065 *+32−25* if M1, B(E2)(W.u.)=2.2 *+11−8* if E2.
2279.12	7/2$^-$	1162.9 *3*	100 *4*	1115.549	5/2$^-$	[M1,E2]	0.000180 *12*	α(K)=0.000159 *10*; α(L)=1.57×10^{-5} *11*; α(M)=2.20×10^{-6} *15* α(N)=6.7×10^{-8} *4*; α(IPF)=3.7×10^{-6} *6* E_γ: unweighted average of 1162.6 *8* from (n,n′γ), 1162.6 *1* from (n,n′γ) E=fast, and 1163.5 *1* from (^{64}Ni,Xγ). I_γ: from (n,n′γ) E=fast. Other: 100 *13* from (^{64}Ni,Xγ). B(M1)(W.u.)<2.3 if M1.
		2280.2 *12*	4.1 *17*	0.0	3/2$^-$	[E2]	0.000498 *7*	α(K)=4.47×10^{-5} *6*; α(L)=4.38×10^{-6} *6*; α(M)=6.16×10^{-7} *9* α(N)=1.895×10^{-8} *27*; α(IPF)=0.000448 *6* B(E2)(W.u.)<5.7 E_γ: unweighted average of 2282.6 *4* from (p,γ) E=res, 2279.0 *18* from (n,n′γ), and 2279 *1* from (n,n′γ) E=fast. I_γ: weighted average of 4.6 *17* from (n,n′γ) and 3.5 *18* from (n,n′γ) E=fast.
2328.91	3/2$^-$	1213.1 *4*	68 *19*	1115.549	5/2$^-$	[M1,E2]	0.000171 *11*	α(K)=0.000145 *9*; α(L)=1.43×10^{-5} *9*; α(M)=2.02×10^{-6} *12* α(N)=6.2×10^{-8} *4*; α(IPF)=9.3×10^{-6} *15* E_γ: weighted average of 1213.5 *3* from (p,γ) E=res, 1211.0 *13* from (n,n′γ), and 1212.7 *4* from (n,n′γ) E=fast. I_γ: unweighted average of 49 *14* from (n,n′γ) and 86 *7* from (n,n′γ) E=fast. Other: 48 from (p,γ) E=res. B(M1)(W.u.)=0.095 *+39−27* if M1, B(E2)(W.u.)=106 *+44−31* if E2.
		1557.2 *7*	109 *11*	770.80	1/2$^-$	[M1,E2]	0.000195 *16*	α(K)=8.82×10^{-5} *33*; α(L)=8.66×10^{-6} *33*; α(M)=1.22×10^{-6} *5* α(N)=3.74×10^{-8} *13*; α(IPF)=9.7×10^{-5} *12* E_γ: unweighted average of 1558.4 *3* from (p,γ) E=res, 1556.0 *14* from (n,n′γ), and 1557.2 *4* from (n,n′γ) E=fast.

$\gamma(^{65}Cu)$ (continued)

E_i(level)	J_i^π	E_γ[‡]	I_γ[‡]	E_f	J_f^π	Mult.	δ	α[†]	Comments
									I_γ: weighted average of 116 *9* from (n,n′γ) and 93 *14* from (n,n′γ) E=fast. Other: 61 from (p,γ) E=res. B(M1)(W.u.)=0.072 *+26−16* if M1, B(E2)(W.u.)=49 *+18−11* if E2.
2328.91	3/2⁻	2329.0 *2*	100 *14*	0.0	3/2⁻	M1+E2	−1.25 *30*	0.000491 *12*	α(K)=4.25×10^{-5} *6*; α(L)=4.16×10^{-6} *6*; α(M)=5.85×10^{-7} *9* α(N)=1.802×10^{-8} *27*; α(IPF)=0.000444 *12* B(M1)(W.u.)=0.0077 *+44−24*; B(E2)(W.u.)=3.7 *+14−12* E_γ: from (p,γ) E=res. Others: 2330.0 *18* from (n,n′γ) and 2328.7 *4* from (n,n′γ) E=fast. I_γ: from (n,n′γ) E=fast. Other: 100 *15* from (n,n′γ). Mult.,δ: D+Q and δ(Q/D) from γ(θ) in (n,n′γ) E=fast; E1+M2 ruled out by RUL. Other: δ(Q/D)=0.15 *5* or 1.9 *9* from γ(θ) in (γ,γ′).
2406.09	(5/2⁻,7/2⁻)	312.1 *4*	44.0 *25*	2094.28	7/2⁻				E_γ: weighted average of 312.4 *4* from (n,n′γ), 311.5 *5* from (n,n′γ) E=fast, and 312.1 *5* from (^{64}Ni,Xγ). I_γ: weighted average of 62 *8* from (n,n′γ), 50 *10* from (n,n′γ) E=fast, and 43.2 *15* from (^{64}Ni,Xγ).
		924.3 *1*	100.0 *18*	1481.796	7/2⁻				E_γ: from (n,n′γ) E=fast. Others: 924.5 *7* from (n,n′γ) and 924.3 *1* from (^{64}Ni,Xγ). I_γ: from (^{64}Ni,Xγ). Other: 100 *10* from (n,n′γ) E=fast.
		1290.6 *1*	73 *13*	1115.549	5/2⁻				E_γ: from (^{64}Ni,Xγ). Others: 1290.0 *14* from (n,n′γ) and 1290.2 *3* from (n,n′γ) E=fast. I_γ: weighted average of 97 *13* from (n,n′γ), 60 *10* from (n,n′γ) E=fast, and 66 *33* from (^{64}Ni,Xγ).
2525.71	9/2⁺	1043.9 *1*	100	1481.796	7/2⁻	(E1+M2)	+0.18 *13*	0.000118 *20*	α(K)=0.000106 *18*; α(L)=1.04×10^{-5} *18*; α(M)=1.46×10^{-6} *25* α(N)=4.5×10^{-8} *8* E_γ: from (p,p′γ). Mult.,δ: D+Q and δ(Q/D) from γ(θ) in (p,p′γ); Δπ=yes from level scheme.
2533.08	(1/2,3/2,5/2⁻)	808.0 *3*	19	1724.99	3/2⁻				E_γ,I_γ: from (p,γ) E=res only.
		1762.4 *3*	100 *15*	770.80	1/2⁻				E_γ: from (p,γ) E=res. Others: 1763.0 *15* from (n,n′γ) and 1762.2 *5* from (n,n′γ) E=fast. I_γ: other: 100 *29* from (n,n′γ) E=fast.
		2533.0 *2*	42 *13*	0.0	3/2⁻				E_γ: from (p,γ) E=res. Others: 2533.0 *19* from (n,n′γ) and 2533.2 *4* from (n,n′γ) E=fast. I_γ: from (n,n′γ). Others: 100 *29* from (n,n′γ) E=fast, 84 from (p,γ) E=res.

$^{65}_{29}Cu_{36}$-22

γ(^{65}Cu) (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	α†	Comments
2533.68	9/2$^+$	254.5 *1*	32.2 *34*	2279.12	7/2$^-$	(E1)	0.00336 *5*	α(K)=0.00302 *4*; α(L)=0.000299 *4*; α(M)=4.19×10^{-5} *6* α(N)=1.251×10^{-6} *18* B(E1)(W.u.)=1.37×10^{-4} *+19−16* E_γ: from (^{64}Ni,Xγ). Others: 255.0 *11* from (n,n′γ) and 255 *1* from (n,n′γ) E=fast. I_γ: unweighted average of 36 *6* from (n,n′γ), 35 *4* from (n,n′γ) E=fast, and 25.5 *6* from (^{64}Ni,Xγ). Mult.: ΔJ=1 from $\gamma(\theta)$ in (^{64}Ni,Xγ); Δπ=yes from level scheme.
		439.5 *1*	100 *3*	2094.28	7/2$^-$	(E1)	0.000744 *10*	α(K)=0.000669 *9*; α(L)=6.61×10^{-5} *9*; α(M)=9.28×10^{-6} *13* α(N)=2.81×10^{-7} *4* B(E1)(W.u.)=8.25×10^{-5} *+77−65* E_γ,I_γ: from (^{64}Ni,Xγ). Other: 439.7 *5* with Iγ=100 *13* from (n,n′γ). Mult.: ΔJ=1 from $\gamma(\theta)$ in (^{64}Ni,Xγ); Δπ=yes from level scheme.
		1052.1 *1*	94 *3*	1481.796	7/2$^-$	(E1)	0.0001050 *15*	α(K)=9.44×10^{-5} *13*; α(L)=9.27×10^{-6} *13*; α(M)=1.303×10^{-6} *18* α(N)=3.99×10^{-8} *6* B(E1)(W.u.)=5.65×10^{-6} *+54−45* E_γ: from (n,n′γ) E=fast. Others: 1052.0 *4* from (p,γ) E=res, 1052.0 *7* from (n,n′γ), and 1052.1 *1* from (^{64}Ni,Xγ). I_γ: weighted average of 100 *5* from (n,n′γ), 100 *4* from (n,n′γ) E=fast, and 91 *2* from (^{64}Ni,Xγ). Mult.: ΔJ=1 from $\gamma(\theta)$ in (^{64}Ni,Xγ); Δπ=yes from level scheme.
		2534.1 *10*	7.0 *13*	0.0	3/2$^-$	[E3]	0.000429 *6*	α(K)=5.69×10^{-5} *8*; α(L)=5.59×10^{-6} *8*; α(M)=7.86×10^{-7} *11* α(N)=2.417×10^{-8} *34*; α(IPF)=0.000366 *5* B(E3)(W.u.)=8.5 *17* E_γ,I_γ: from (^{64}Ni,Xγ).
2593.71	(5/2$^-$)	499.8 *3*	100 *18*	2094.28	7/2$^-$			E_γ,I_γ: from (n,n′γ) E=fast. Others: Eγ=499.7 *21* from (p,γ) E=res and 500.0 *11* from (n,n′γ).
		1822.7 *2*	9 *5*	770.80	1/2$^-$			E_γ: from (p,p′γ). Others: 1821.0 *16* from (n,n′γ) and 1821 *2* from (n,n′γ) E=fast. I_γ: from (n,n′γ) E=fast.
		2593.7 *5*	23 *5*	0.0	3/2$^-$			E_γ,I_γ: from (n,n′γ) E=fast. Other: Eγ=2594.0 *19* from (n,n′γ). I_γ: from (n,n′γ) E=fast.
2643.28	(5/2$^-$)	550.0 *12*	8.3 *33*	2094.28	7/2$^-$			
		1163.4 *8*	100 *18*	1481.796	7/2$^-$			E_γ: weighted average of 1163.7 *8* from (n,n′γ) and 1163 *1* from (n,n′γ) E=fast. I_γ: from (n,n′γ) E=fast.
		1529 *1*	6.6 *29*	1115.549	5/2$^-$			E_γ: from (n,n′γ) E=fast. Other: 1529.0 *14* from (n,n′γ). I_γ: from (n,n′γ). Other: 4.4 from (n,n′γ) E=fast.

$\gamma(^{65}Cu)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	δ	α†	Comments
2643.28	(5/2⁻)	1872.0 *3*	22 *5*	770.80	1/2⁻				E_γ: from (p,p′γ). Other: 1872 *1* from (n,n′γ) E=fast. I_γ: from (n,n′γ) E=fast.
2649.78	(5/2⁻)	924.7 *3*	73 *9*	1724.99	3/2⁻	[M1+E2]	<0.3	0.000264 *4*	α(K)=0.000238 *4*; α(L)=2.35×10^{-5} *4*; α(M)=3.30×10^{-6} *6* α(N)=1.012×10^{-7} *17* B(M1)(W.u.)=1.0 *+12−5* E_γ: weighted average of 924.6 *3* from (p,γ) E=res, 924.5 *7* from (n,n′γ), and 924.8 *3* from (n,n′γ) E=fast. I_γ: from (n,n′γ) E=fast. Others: 73 from (n,n′γ), 20 from (p,γ) E=res. δ: deduced by the evaluator from RUL=300 for B(E2)(W.u.).
		1025.4 *5*	20 *4*	1623.42	5/2⁻	[M1+E2]	<1.0	0.000222 *10*	α(K)=0.000200 *9*; α(L)=1.97×10^{-5} *9*; α(M)=2.77×10^{-6} *13* α(N)=8.5×10^{-8} *4* B(M1)(W.u.)=0.17 *+34−12* E_γ: unweighted average of 1026.3 *3* from (p,γ) E=res, 1025.0 *13* from (n,n′γ), and 1024.9 *1* from (n,n′γ) E=fast. I_γ: weighted average of 12 *7* from (n,n′γ) and 22 *4* from (n,n′γ) E=fast. Other: 9.2 from (p,γ) E=res. δ: deduced by the evaluator from RUL=300 for B(E2)(W.u.).
		1534.1 *3*	12 *6*	1115.549	5/2⁻	[M1,E2]		0.000189 *15*	α(K)=9.07×10^{-5} *35*; α(L)=8.92×10^{-6} *35*; α(M)=1.25×10^{-6} *5* α(N)=3.85×10^{-8} *14*; α(IPF)=8.8×10^{-5} *11* E_γ: from (p,γ) E=res. Others: 1534.0 *14* from (n,n′γ) and 1534 *1* from (n,n′γ) E=fast. I_γ: from (n,n′γ). Others: 9.1 from (n,n′γ) E=fast, 20 from (p,γ) E=res. B(M1)(W.u.)=0.038 *+36−20* if M1, B(E2)(W.u.)=27 *+26−14* if E2.
		1879.1 *2*	100 *13*	770.80	1/2⁻	[E2]		0.000324 *5*	α(K)=6.34×10^{-5} *9*; α(L)=6.23×10^{-6} *9*; α(M)=8.76×10^{-7} *12* α(N)=2.69×10^{-8} *4*; α(IPF)=0.0002533 *35* B(E2)(W.u.)=81 *+60−29* E_γ: from (n,n′γ) E=fast. Others: 1879.0 *3* from (p,γ) E=res and 1878.0 *16* from (n,n′γ). I_γ: from (n,n′γ). Other: 100 *18* from (n,n′γ) E=fast, 100 from (p,γ) E=res.
		2649.8 *2*	27 *7*	0.0	3/2⁻	[M1,E2]		0.00062 *4*	α(K)=3.40×10^{-5} *7*; α(L)=3.33×10^{-6} *7*; α(M)=4.68×10^{-7} *10* α(N)=1.442×10^{-8} *30*; α(IPF)=0.00058 *4* E_γ: weighted average of 2649.6 *2* from (p,γ) E=res and 2650.1 *3* from (n,n′γ) E=fast. Other: 2649.0 *19* from (n,n′γ).

$^{65}_{29}Cu_{36}$-24

Adopted Levels, Gammas (continued)

$\gamma(^{65}Cu)$ (continued)

E_i(level)	J_i^π	E_γ‡	I_γ‡	E_f	J_f^π	Mult.	δ	α†	Comments
									I_γ: weighted average of 18 *7* from (n,n′γ) and 32 *5* from (n,n′γ) E=fast. Other: 28 from (p,γ) E=res. B(M1)(W.u.)=0.017 *+13−7* if M1, B(E2)(W.u.)=3.9 *+30−16* if E2.
2654.88	5/2$^-$	929.2 *2*	100 *5*	1724.99	3/2$^-$	[M1+E2]	<0.7	0.000269 *11*	α(K)=0.000242 *9*; α(L)=2.39×10^{-5} *10*; α(M)=3.36×10^{-6} *13* α(N)=1.03×10^{-7} *4* B(M1)(W.u.)=0.29 *+15−13*; B(E2)(W.u.)<281 E_γ,I_γ: from (p,p′γ). δ: deduced by the evaluator from RUL=300 for B(E2)(W.u.).
		2655.5 *2*	44 *5*	0.0	3/2$^-$	M1+E2		0.00062 *4*	α(K)=3.39×10^{-5} *7*; α(L)=3.31×10^{-6} *7*; α(M)=4.66×10^{-7} *10* α(N)=1.437×10^{-8} *30*; α(IPF)=0.00059 *4* E_γ,I_γ: from (p,p′γ). Mult.,δ: D+Q and δ(Q/D)=+0.22 *11* or +1.9 *+7−5* from $\gamma(\theta)$ in (p,p′γ); E1+M2 ruled out by RUL. B(M1)(W.u.)=0.0062 *+19−16* if M1, B(E2)(W.u.)=1.45 *+44−37* if E2.
2668.80	(1/2$^-$)	943.8 *2*	100	1724.99	3/2$^-$	[M1+E2]	<0.12	0.0002516 *35*	α(K)=0.0002261 *32*; α(L)=2.230×10^{-5} *31*; α(M)=3.14×10^{-6} *4* α(N)=9.63×10^{-8} *14* E_γ: from (n,n′γ) E=fast. Other: 944.0 *13* from (n,n′γ). δ: deduced by the evaluator from RUL=300 for B(E2)(W.u.). B(M1)(W.u.)=6 *+31−3* exceeds RUL=3, it could be that the $T_{1/2}$ is too small and underestimated.
2753.38	(5/2$^-$,7/2$^-$)	659 *1*	33 *8*	2094.28	7/2$^-$	[M1+E2]	<0.6	0.000569 *35*	α(K)=0.000511 *32*; α(L)=5.07×10^{-5} *32*; α(M)=7.1×10^{-6} *5* α(N)=2.17×10^{-7} *13* B(M1)(W.u.)=0.31 *+42−18* E_γ,I_γ: from (n,n′γ) E=fast only. δ: deduced by the evaluator from RUL=300 for B(E2)(W.u.).
		1271.9 *3*	100 *8*	1481.796	7/2$^-$	[M1,E2]		0.000166 *11*	α(K)=0.000132 *7*; α(L)=1.30×10^{-5} *7*; α(M)=1.83×10^{-6} *10* α(N)=5.60×10^{-8} *30*; α(IPF)=1.91×10^{-5} *30* E_γ,I_γ: from (n,n′γ) E=fast. Others: 1271 *3* with Iγ=100 from (p,γ) E=res and 1271.0 *14* with Iγ=100 from (n,n′γ). B(M1)(W.u.)=0.142 *+93−42* if M1, B(E2)(W.u.)=145 *+95−43* if E2.
		2753.0 *3*	83 *8*	0.0	3/2$^-$	[M1,E2]		0.00066 *4*	α(K)=3.19×10^{-5} *7*; α(L)=3.12×10^{-6} *7*; α(M)=4.39×10^{-7} *9* α(N)=1.354×10^{-8} *28*; α(IPF)=0.00063 *4* E_γ,I_γ: from (n,n′γ) E=fast. Other: 2753.0 *20* with Iγ=29 *24* from (n,n′γ). B(M1)(W.u.)=0.0116 *+77−34* if M1, B(E2)(W.u.)=2.5 *+17−8* if E2.
2839.32	(7/2$^+$)	732 *1*	31 *6*	2107.42	(5/2)$^-$	[E1]		0.0002195 *31*	α(K)=0.0001972 *28*; α(L)=1.943×10^{-5} *28*; α(M)=2.73×10^{-6} *4*

Adopted Levels, Gammas (continued)

$\gamma(^{65}Cu)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	δ	α†	Comments
									α(N)=8.32×10^{-8} *12* E_γ,I_γ: from (n,n′γ) E=fast. B(E1)(W.u.)=0.0120 *+53−38* exceeds RUL=0.01, making this transition more likely to be M1 and π(2839)=−.
2839.32	(7/2$^+$)	1357.5 *2*	100 *7*	1481.796	7/2$^-$	[E1]		0.0002215 *31*	α(K)=5.98×10^{-5} *8*; α(L)=5.86×10^{-6} *8*; α(M)=8.23×10^{-7} *12* α(N)=2.526×10^{-8} *35*; α(IPF)=0.0001550 *22* B(E1)(W.u.)=0.0061 *+25−17* E_γ: from (n,n′γ) E=fast. Other: 1356.0 *14* from (n,n′γ). I_γ: from (n,n′γ) E=fast.
2862.4	(1/2$^-$)	2862.3 *2*	100	0.0	3/2$^-$	[M1,E2]		0.00071 *5*	α(K)=2.99×10^{-5} *6*; α(L)=2.93×10^{-6} *6*; α(M)=4.12×10^{-7} *9* α(N)=1.269×10^{-8} *26*; α(IPF)=0.00068 *5* E_γ: weighted average of 2862.7 *2* from (p,γ) E=res, 2862.1 *10* from (γ,γ′), 2862.0 *21* from (n,n′γ), and 2862.0 *2* from (n,n′γ) E=fast. B(M1)(W.u.)=0.0486 *50* if M1, B(E2)(W.u.)=9.8 *10* if E2.
2866.94	(5/2$^-$,7/2$^-$)	1243.6 *3*	51 *8*	1623.42	5/2$^-$	[M1+E2]	<2	0.000165 *9*	α(K)=0.000137 *6*; α(L)=1.35×10^{-5} *7*; α(M)=1.89×10^{-6} *9* α(N)=5.80×10^{-8} *26*; α(IPF)=1.35×10^{-5} *18* B(M1)(W.u.)=0.13 *+31−10* E_γ: weighted average of 1243.5 *3* from (p,γ) E=res, 1244.0 *13* from (n,n′γ), and 1245 *1* from (n,n′γ) E=fast. I_γ: weighted average of 33 *11* from (n,n′γ) and 55 *5* from (n,n′γ) E=fast. δ: deduced by the evaluator from RUL=300 for B(E2)(W.u.).
		1384.3 *10*	24 *5*	1481.796	7/2$^-$	[M1,E2]		0.000167 *12*	α(K)=0.000111 *5*; α(L)=1.09×10^{-5} *5*; α(M)=1.54×10^{-6} *7* α(N)=4.72×10^{-8} *21*; α(IPF)=4.3×10^{-5} *6* E_γ: weighted average of 1385.0 *14* from (n,n′γ) and 1384 *1* from (n,n′γ) E=fast. I_γ: weighted average of 18 *7* from (n,n′γ) and 27 *5* from (n,n′γ) E=fast. B(M1)(W.u.)=0.091 *+41−27* if M1, B(E2)(W.u.)=79 *+35−24* if E2.
		2866.8 *7*	100 *7*	0.0	3/2$^-$	[M1,E2]		0.00071 *5*	α(K)=2.99×10^{-5} *6*; α(L)=2.92×10^{-6} *6*; α(M)=4.11×10^{-7} *9* α(N)=1.266×10^{-8} *26*; α(IPF)=0.00068 *5* E_γ: unweighted average of 2866.8 *2* from (p,γ) E=res, 2868.0 *21* from (n,n′γ), and 2865.7 *3* from (n,n′γ) E=fast. I_γ: other: 100 *9* from (n,n′γ) E=fast. B(M1)(W.u.)=0.043 *+17−11* if M1, B(E2)(W.u.)=8.6 *+34−22* if E2.
2873.9	(3/2$^-$)	2103.2 *17*	64 *11*	770.80	1/2$^-$	[M1,E2]		0.000388 *32*	α(K)=5.06×10^{-5} *12*; α(L)=4.96×10^{-6} *12*; α(M)=6.97×10^{-7} *17*

Adopted Levels, Gammas (continued)

$\gamma(^{65}Cu)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	α†	Comments
								α(N)=2.15×10^{-8} *5*; α(IPF)=0.000332 *31* E_γ: weighted average of 2104.0 *17* from (n,n′γ) and 2102 *2* from (n,n′γ) E=fast. I_γ: weighted average of 53 *20* from (n,n′γ) and 67 *11* from (n,n′γ) E=fast. B(M1)(W.u.)=0.071 +*34*−*21* if M1, B(E2)(W.u.)=27 +*13*−*8* if E2.
2873.9	(3/2⁻)	2873.8 *8*	100 *9*	0.0	3/2⁻	[M1,E2]	0.00071 *5*	α(K)=2.97×10^{-5} *6*; α(L)=2.91×10^{-6} *6*; α(M)=4.09×10^{-7} *8* α(N)=1.261×10^{-8} *25*; α(IPF)=0.00068 *5* E_γ: unweighted average of 2874.4 *2* from (p,γ) E=res, 2875.1 *10* from (γ,γ′), 2874.0 *21* from (n,n′γ), and 2871.6 *3* from (n,n′γ) E=fast. I_γ: from (n,n′γ). Other: 100 *11* from (n,n′γ) E=fast. B(M1)(W.u.)=0.044 +*20*−*12* if M1, B(E2)(W.u.)=8.7 +*41*−*24* if E2.
2893.44	(3/2⁻)	785.6 *4*	63 *13*	2107.42	(5/2)⁻			
		1271.1& *3*		1623.42	5/2⁻			E_γ: from (p,γ) E=res. Other: 1271.0 *14* from (n,n′γ). I_γ: 169 from (n,n′γ) for a doublet; not seen in (n,n′γ) E=fast.
		2122.2 *2*	19 *6*	770.80	1/2⁻			E_γ,I_γ: other: 2123.0 *17* with Iγ=154 for a doublet in (n,n′γ).
		2894.1 *15*	100 *13*	0.0	3/2⁻			E_γ: unweighted average of 2894.4 *2* from (p,γ) E=res, 2898 *2* from (γ,γ′), 2891.0 *21* from (n,n′γ), and 2892.8 *2* from (n,n′γ) E=fast. I_γ: other: 100 *31* from (n,n′γ).
2902.10	(5/2⁻)	794.6 *2*	50 *8*	2107.42	(5/2)⁻			
		2902.2 *3*	100 *17*	0.0	3/2⁻			E_γ: weighted average of 2902.4 *2* from (p,γ) E=res, 2898 *2* from (γ,γ′), 2901.0 *21* from (n,n′γ), and 2902.0 *3* from (n,n′γ) E=fast.
2944.95		1219.9 *2*	100 *11*	1724.99	3/2⁻			
		1830.6 *10*	47 *11*	1115.549	5/2⁻			E_γ: weighted average of 1832.0 *16* from (n,n′γ) and 1830 *1* from (n,n′γ) E=fast. I_γ: from (n,n′γ) E=fast.
2974.28	(3/2⁻)	879.9 *2*	100 *11*	2094.28	7/2⁻			E_γ: unweighted average of 877.0 *12* from (n,n′γ) and 879.9 *2* from (n,n′γ) E=fast. I_γ: from (n,n′γ) E=fast. Other: 100 *32* from (n,n′γ).
		1493.1 *5*	35 *11*	1481.796	7/2⁻			E_γ: weighted average of 1492.0 *14* from (n,n′γ) and 1493.2 *5* from (n,n′γ) E=fast. I_γ: weighted average of 48 *28* from (n,n′γ) and 33 *11* from (n,n′γ) E=fast.
2997.90	(11/2⁻)	591.9& *1*		2406.09	(5/2⁻,7/2⁻)			E_γ: from (^{64}Ni,Xγ) only; not seen in (n,n′γ) E=fast. I_γ: Iγ(591.9γ)/Iγ(1516.2γ)=100 *28*/25.6 *10* in (^{64}Ni,Xγ).
		902.0 *4*	100 *25*	2094.28	7/2⁻	[E2]	0.000343 *5*	α(K)=0.000308 *4*; α(L)=3.06×10^{-5} *4*; α(M)=4.31×10^{-6} *6* α(N)=1.304×10^{-7} *18*

$^{65}_{29}Cu_{36}$-27

$\gamma(^{65}$Cu) (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	α†	Comments
								B(E2)(W.u.)=3.6×10^3 *+28−13* greatly exceeds RUL=300, making Mult=E2 unlikely. It is probable that $T_{1/2}$ is too small and greatly underestimated or there should be a dominant M1 component, making J(2998)<11/2.
2997.90	(11/2⁻)	1515.1 *2*	88 *13*	1481.796	7/2⁻	[E2]	0.0001996 *28*	α(K)=9.63×10^{-5} *13*; α(L)=9.48×10^{-6} *13*; α(M)=1.333×10^{-6} *19* α(N)=4.08×10^{-8} *6*; α(IPF)=9.24×10^{-5} *13* B(E2)(W.u.)=2.4×10^2 *+20−8* E_γ: other: 1515.0 *14* from (n,n′γ). B(E2)(W.u.)=2.4×10^2 *+20−8* upper bound exceeds RUL=300.
3032.5	(1/2⁻)	3032.4 *2*	100	0.0	3/2⁻			E_γ: from (n,n′γ) E=fast. Other: 3032.0 *21* from (n,n′γ).
3079.64	(3/2)⁺	1964.1 *3*	33 *11*	1115.549	5/2⁻	[E1]	0.000646 *9*	α(K)=3.32×10^{-5} *5*; α(L)=3.24×10^{-6} *5*; α(M)=4.56×10^{-7} *6* α(N)=1.402×10^{-8} *20*; α(IPF)=0.000609 *9* B(E1)(W.u.)=1.7×10^{-4} *+18−8* E_γ: from (p,γ) E=res. Others: 1964.0 *16* from (n,n′γ) and 1964 *1* from (n,n′γ) E=fast. I_γ: other: 109 *32* for a possible multiplet in (n,n′γ), 22 from (p,γ) E=res. Iγ(1964γ)/Iγ(2309γ)=22/100 from ^{64}Ni(p,γ).
		2308.2 *12*	100 *22*	770.80	1/2⁻	[E1]	0.000871 *12*	α(K)=2.62×10^{-5} *4*; α(L)=2.56×10^{-6} *4*; α(M)=3.60×10^{-7} *5* α(N)=1.108×10^{-8} *16*; α(IPF)=0.000842 *12* B(E1)(W.u.)=3.1×10^{-4} *+31−13* E_γ: unweighted average of 2309.0 *3* from (p,γ) E=res, 2306.0 *18* from (n,n′γ), and 2309.7 *1* from (n,n′γ) E=fast. I_γ: other: 100 *26* from (n,n′γ).
3086	(3/2⁻)	3086# *2*	100	0.0	3/2⁻			
3113.1	(1/2⁻,3/2⁻)	3113.0 *3*	100	0.0	3/2⁻	[M1,E2]	0.00081 *5*	α(K)=2.61×10^{-5} *5*; α(L)=2.55×10^{-6} *5*; α(M)=3.59×10^{-7} *7* α(N)=1.108×10^{-8} *22*; α(IPF)=0.00078 *5* E_γ: weighted average of 3116.0 *22* from (n,n′γ) and 3113.0 *2* from (n,n′γ) E=fast.
3119.41	(5/2⁻,7/2⁻)	1495.7 *10*	13 *4*	1623.42	5/2⁻	[M1,E2]	0.000181 *14*	α(K)=9.5×10^{-5} *4*; α(L)=9.4×10^{-6} *4*; α(M)=1.32×10^{-6} *5* α(N)=4.05×10^{-8} *16*; α(IPF)=7.5×10^{-5} *10* E_γ: weighted average of 1497.0 *14* from (n,n′γ) and 1495 *1* from (n,n′γ) E=fast. I_γ: weighted average of 14 *7* from (n,n′γ) and 12 *4* from (n,n′γ) E=fast. B(M1)(W.u.)=0.0036 *+22−19* if M1, B(E2)(W.u.)=2.7 *+16−14* if E2.

Adopted Levels, Gammas (continued)

$\gamma(^{65}Cu)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	α†	Comments
3119.41	(5/2⁻,7/2⁻)	1637.6 *2*	100 *7*	1481.796	7/2⁻	[M1,E2]	0.000217 *19*	α(K)=8.01×10⁻⁵ *27*; α(L)=7.86×10⁻⁶ *28*; α(M)=1.11×10⁻⁶ *4* α(N)=3.40×10⁻⁸ *11*; α(IPF)=0.000128 *16* E_γ,I_γ: other: 1638.0 *15* with Iγ=100 *11* from (n,n′γ). B(M1)(W.u.)=0.021 *+11−9* if M1, B(E2)(W.u.)=13.0 *+68−57* if E2.
3126.9		2356.0 *18*	100	770.80	1/2⁻			E_γ: from (n,n′γ).
3132.1		3132.0 *22*	100	0.0	3/2⁻			E_γ: from (n,n′γ).
3143.1		3143.0 *22*	100	0.0	3/2⁻			E_γ: from (n,n′γ).
3159.9		2042.9 *19*	100 *14*	1115.549	5/2⁻			E_γ: unweighted average of 2041.0 *17* from (n,n′γ) and 2044.7 *2* from (n,n′γ) E=fast. I_γ: from (n,n′γ) E=fast. Other: 100 *33* from (n,n′γ).
		2389.7 *13*	33 *8*	770.80	1/2⁻			E_γ: weighted average of 2392.0 *18* from (n,n′γ) and 2389 *1* from (n,n′γ) E=fast. I_γ: weighted average of 48 *38* from (n,n′γ) and 32 *8* from (n,n′γ) E=fast.
3166.0		3165.9 *13*	100	0.0	3/2⁻			E_γ: weighted average of 3166.5 *10* from (γ,γ′) and 3163.0 *22* from (n,n′γ).
3173.1		3173.0 *22*	100	0.0	3/2⁻			E_γ: from (n,n′γ).
3240.78	(3/2,5/2⁺)	2125.2 *3*	100 *20*	1115.549	5/2⁻			E_γ: weighted average of 2123.0 *17* from (n,n′γ) and 2125.2 *2* from (n,n′γ) E=fast.
		3240.4 *20*	50 *10*	0.0	3/2⁻			E_γ: weighted average of 3242.0 *22* from (n,n′γ) and 3239 *2* from (n,n′γ) E=fast.
3260.85	(1/2⁻,5/2⁻,7/2⁻)	2145.2 *2*	9.1 *18*	1115.549	5/2⁻	[E2]	0.000438 *6*	α(K)=4.98×10⁻⁵ *7*; α(L)=4.88×10⁻⁶ *7*; α(M)=6.86×10⁻⁷ *10* α(N)=2.111×10⁻⁸ *30*; α(IPF)=0.000383 *5*
		3260.9 *3*	100 *18*	0.0	3/2⁻	[M1,E2]	0.00087 *5*	α(K)=2.43×10⁻⁵ *5*; α(L)=2.37×10⁻⁶ *5*; α(M)=3.33×10⁻⁷ *7* α(N)=1.029×10⁻⁸ *20*; α(IPF)=0.00084 *5* E_γ: weighted average of 3261 *2* from (p,γ) E=res, 3265 *2* from (γ,γ′), 3263.0 *23* from (n,n′γ), and 3260.8 *2* from (n,n′γ) E=fast.
3274.1	3/2⁺,5/2⁺	3274.0 *23*	100	0.0	3/2⁻			E_γ: from (n,n′γ).
3325.8	(3/2,5/2)	3325.7 *10*	100	0.0	3/2⁻	(D+Q)		E_γ: weighted average of 3325.4 *15* from (p,γ) E=res, 3326.0 *10* from (γ,γ′), and 3325.0 *23* from (n,n′γ). Mult.,δ: from γ(θ) in (γ,γ′), with δ(Q/D)=0.9 *5* if J(3326)=3/2.
3337.8		1856.0 *16*	100	1481.796	7/2⁻			
3355.29	5/2⁺	1261.0 *2*	100 *10*	2094.28	7/2⁻	[E1]	0.0001663 *23*	α(K)=6.79×10⁻⁵ *10*; α(L)=6.66×10⁻⁶ *9*; α(M)=9.36×10⁻⁷ *13* α(N)=2.87×10⁻⁸ *4*; α(IPF)=9.08×10⁻⁵ *13* E_γ,I_γ: other: 1261.0 *14* with Iγ=100 *18* from (n,n′γ).

$^{65}_{29}Cu_{36}$-29

γ(^{65}Cu) (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	α†	Comments
								B(E1)(W.u.)=0.10 +25−7 exceeds RUL=0.01, which may indicate that $T_{1/2}$ is too small and underestimated.
3355.29	5/2$^+$	1630.0 15	19 11	1724.99	3/2$^-$	[E1]	0.000409 6	α(K)=4.42×10^{-5} 6; α(L)=4.33×10^{-6} 6; α(M)=6.08×10^{-7} 9 α(N)=1.869×10^{-8} 26; α(IPF)=0.000360 5 B(E1)(W.u.)=0.009 +23−7 B(E1)(W.u.)=0.009 +23−7 upper bound exceeds RUL=0.01.
		1732 1	18 5	1623.42	5/2$^-$	[E1]	0.000483 7	α(K)=4.02×10^{-5} 6; α(L)=3.93×10^{-6} 6; α(M)=5.53×10^{-7} 8 α(N)=1.699×10^{-8} 24; α(IPF)=0.000438 6 B(E1)(W.u.)=0.007 +17−5 E_γ: from (n,n′γ) E=fast. Other: 1732.0 15 from (n,n′γ). I_γ: weighted average of 34 20 from (n,n′γ) and 17 5 from (n,n′γ) E=fast. B(E1)(W.u.)=0.007 +17−5 upper bound exceeds RUL=0.01.
		3355.2 10	10 5	0.0	3/2$^-$	[E1]	1.43×10^{-3} 2	α(K)=1.580×10^{-5} 22; α(L)=1.540×10^{-6} 22; α(M)=2.165×10^{-7} 30 α(N)=6.68×10^{-9} 9; α(IPF)=0.001410 20 B(E1)(W.u.)=5×10^{-4} +14−4 E_γ: weighted average of 3356 2 from (γ,γ'), 3355.0 23 from (n,n′γ), and 3355 1 from (n,n′γ) E=fast. I_γ: other: 86 13 for a possible multiplet in (n,n′γ).
3399.1	3/2$^+$,5/2$^+$	3399.0 23	100	0.0	3/2$^-$			E_γ: from (n,n′γ).
3428.27	(5/2$^-$)	1805 1	100 25	1623.42	5/2$^-$	[M1,E2]	0.000271 24	α(K)=6.67×10^{-5} 20; α(L)=6.55×10^{-6} 20; α(M)=9.21×10^{-7} 28 α(N)=2.83×10^{-8} 8; α(IPF)=0.000197 22 B(M1)(W.u.)=0.044 +21−12 if M1, B(E2)(W.u.)=22 +11−6 if E2.
		2657.4 2	75 25	770.80	1/2$^-$	[E2]	0.000666 9	α(K)=3.44×10^{-5} 5; α(L)=3.36×10^{-6} 5; α(M)=4.73×10^{-7} 7 α(N)=1.457×10^{-8} 20; α(IPF)=0.000628 9 B(E2)(W.u.)=2.4 +12−8
3457.1		3457.0 24	100	0.0	3/2$^-$			
3504	(3/2,5/2)$^+$	3504# 2	100	0.0	3/2$^-$			
3547.63	(11/2$^+$)	1014.1 2	100	2533.68	9/2$^+$			E_γ: from (^{64}Ni,Xγ). Other: 1014 from (^{7}Li,α2nγ).
3563.1		3563.0 24	100	0.0	3/2$^-$			
3631.7	(1/2$^+$,3/2$^+$)	2861& 2	347	770.80	1/2$^-$	[E1]	1.18×10^{-3} 2	α(K)=1.949×10^{-5} 27; α(L)=1.901×10^{-6} 27; α(M)=2.67×10^{-7} 4 α(N)=8.24×10^{-9} 12; α(IPF)=0.001162 16 E_γ,I_γ: from (p,γ) E=res, tentatively placed; not seen in (γ,γ') and (n,n′γ).
		3631.4 20	100	0.0	3/2$^-$	[E1]	1.54×10^{-3} 2	α(K)=1.428×10^{-5} 20; α(L)=1.391×10^{-6} 20; α(M)=1.956×10^{-7} 27 α(N)=6.03×10^{-9} 8; α(IPF)=0.001523 21

$^{65}_{29}$Cu$_{36}$-30

Adopted Levels, Gammas (continued)

$\gamma(^{65}Cu)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	δ	α†	Comments
									E_γ: weighted average of 3632 *2* from (p,γ) E=res, 3631 *2* from (γ,γ'), and 3631.0 *25* from (n,n'γ). I_γ: from (p,γ) E=res.
3659.66	(13/2$^+$)	661.5 *1*	41.3 *16*	2997.90	(11/2$^-$)	D			E_γ,I_γ,Mult.: from (^{64}Ni,Xγ), with Mult from $\gamma(\theta)$.
		1126.1 *1*	100 *4*	2533.68	9/2$^+$	Q			E_γ,I_γ,Mult.: from (^{64}Ni,Xγ), with Mult from $\gamma(\theta)$.
3713.9		2943.0 *21*	100	770.80	1/2$^-$				
3752.7	(7/2$^-$)	3752.6 *20*	100	0.0	3/2$^-$	[E2]			B(E2)(W.u.)=21 *+8−7* E_γ: weighted average of 3753 *2* from (γ,γ') and 3752.0 *25* from (n,n'γ).
3825		3825 *2*	100	0.0	3/2$^-$				
3893.2	1/2$^+$	3893.1 *25*	100	0.0	3/2$^-$	[E1]		1.65×10^{-3} *2*	α(K)=1.308×10^{-5} *18*; α(L)=1.274×10^{-6} *18*; α(M)=1.791×10^{-7} *25* α(N)=5.53×10^{-9} *8*; α(IPF)=0.001639 *23* B(E1)(W.u.)=4.09×10^{-4} *+63−61* E_γ: weighted average of 3895 *2* from (γ,γ') and 3890.0 *25* from (n,n'γ).
3925.0		3924.9 *20*	100	0.0	3/2$^-$				E_γ: weighted average of 3926 *2* from (γ,γ') and 3923.0 *26* from (n,n'γ).
3957.0		3956.9 *20*	100	0.0	3/2$^-$				E_γ: weighted average of 3958 *2* from (γ,γ') and 3955.0 *26* from (n,n'γ).
3964	1/2$^-$,3/2$^-$	3964 *3*	100	0.0	3/2$^-$				
3986.9		3216.0 *22*	100	770.80	1/2$^-$				
4006	5/2$^-$,7/2$^-$	4006# *2*	100	0.0	3/2$^-$				
4006.42	(13/2$^+$)	458.4 *7*	31 *13*	3547.63	(11/2$^+$)				E_γ,I_γ: from (^{64}Ni,Xγ).
		1472.8 *1*	100 *19*	2533.68	9/2$^+$				E_γ,I_γ: from (^{64}Ni,Xγ).
4049.1		4049.0 *26*	100	0.0	3/2$^-$				
4055	(1/2$^+$,3/2,5/2$^+$)	4055 *2*	100	0.0	3/2$^-$				E_γ: weighted average of 4054 *3* from (p,γ) E=res and 4056 *2* from (γ,γ').
4074.60	(15/2$^+$)	414.8 *1*	100.0 *16*	3659.66	(13/2$^+$)	D+Q	≈+0.3		E_γ,I_γ,Mult.,δ: from (^{64}Ni,Xγ), with Mult and δ(Q/D) from $\gamma(\theta)$.
		527.4 *3*	6.60 *29*	3547.63	(11/2$^+$)	(Q)			E_γ,I_γ,Mult.: from (^{64}Ni,Xγ), with Mult from $\gamma(\theta)$.
4086.3	(1/2$^+$,3/2,5/2$^+$)	4086.2 *27*	100	0.0	3/2$^-$				E_γ: weighted average of 4089 *3* from (p,γ) E=res and 4084.0 *27* from (n,n'γ).
4096.9	(1/2,3/2,5/2$^-$)	3325.0@ *23*	<95@	770.80	1/2$^-$				
		4097.6 *20*	100 *18*	0.0	3/2$^-$				E_γ: weighted average of 4099 *2* from (γ,γ') and 4095.0 *27* from (n,n'γ).
4119.1		4119.0 *27*	100	0.0	3/2$^-$				
4126	3/2$^+$	4126# *2*	100	0.0	3/2$^-$	[E1]		1.74×10^{-3} *2*	α(K)=1.216×10^{-5} *17*; α(L)=1.185×10^{-6} *17*; α(M)=1.665×10^{-7} *23*

$\gamma(^{65}Cu)$ (continued)

E_i(level)	J_i^π	E_γ‡	I_γ‡	E_f	J_f^π	Mult.	δ	α†	Comments
									α(N)=5.14×10^{-9} *7*; α(IPF)=0.001724 *24* B(E1)(W.u.)=4.96×10^{-4} *+55−53*
4141		4141 *2*	100	0.0	$3/2^-$				
4176.1		4176.0 *27*	100	0.0	$3/2^-$				
4184.1		4184.0 *27*	100	0.0	$3/2^-$				
4201.2	$(9/2^+)$	4201.0 *27*	100	0.0	$3/2^-$				
4217.2		4217.0 *27*	100	0.0	$3/2^-$				
4227.2		4227.0 *27*	100	0.0	$3/2^-$				
4237.2		4237.0 *27*	100	0.0	$3/2^-$				
4244.2		4244.0 *27*	100	0.0	$3/2^-$				
4266.2		4266.0 *28*	100	0.0	$3/2^-$				
4272.6		4272.4 *20*	100	0.0	$3/2^-$				E_γ: weighted average of 4271 *2* from (γ,γ') and 4275.0 *28* from (n,n′γ).
4331.2		4331.0 *28*	100	0.0	$3/2^-$				
4355.79	$(17/2^+)$	281.1 *1*	94.5 *15*	4074.60	$(15/2^+)$	D+Q	≈+0.4		E_γ,I_γ,Mult.,δ: from (^{64}Ni,Xγ), with Mult and δ from $\gamma(\theta)$.
		350.0 *3*	21 *9*	4006.42	$(13/2^+)$	Q			E_γ,I_γ,Mult.: from (^{64}Ni,Xγ), with Mult from $\gamma(\theta)$.
		696.6 *5*	100.0 *12*	3659.66	$(13/2^+)$	Q			E_γ,I_γ,Mult.: from (^{64}Ni,Xγ), with Mult from $\gamma(\theta)$.
4356.5		4356.3 *20*	100	0.0	$3/2^-$				E_γ: weighted average of 4356 *2* from (γ,γ') and 4357.0 *28* from (n,n′γ).
4376		4376# *2*		0.0	$3/2^-$				
4393		4393 *4*	100	0.0	$3/2^-$				E_γ: unweighted average of 4397 *2* from (γ,γ') and 4389.0 *28* from (n,n′γ).
4418.2	$5/2^-,7/2^-$	4418.0 *28*	100	0.0	$3/2^-$				
4436.2		4436.0 *28*	100	0.0	$3/2^-$				
4460.2		4460.0 *29*	100	0.0	$3/2^-$				
4483.2		4483.0 *29*	100	0.0	$3/2^-$				
4524.9	$1/2^+$	4524.7 *20*	100	0.0	$3/2^-$	[E1]		1.88×10^{-3} *3*	α(K)=1.086×10^{-5} *15*; α(L)=1.058×10^{-6} *15*; α(M)=1.486×10^{-7} *21* α(N)=4.59×10^{-9} *6*; α(IPF)=0.001866 *26* B(E1)(W.u.)=0.00167 *+30−32* E_γ: weighted average of 4525 *2* from (γ,γ') and 4524.0 *29* from (n,n′γ).
4536.7		4536.5 *35*	100	0.0	$3/2^-$				E_γ: unweighted average of 4533 *2* from (γ,γ') and 4540.0 *29* from (n,n′γ).
4566.2		4566.0 *29*	100	0.0	$3/2^-$				
4724.2		4724.0 *30*	100	0.0	$3/2^-$				
4759.2		4759.0 *30*	100	0.0	$3/2^-$				
4776.2		4776.0 *30*	100	0.0	$3/2^-$				
4863.2		4863.0 *31*	100	0.0	$3/2^-$				
4892.2		4892.0 *31*	100	0.0	$3/2^-$				
4923.2		4923.0 *31*	100	0.0	$3/2^-$				
4932.2		4932.0 *31*	100	0.0	$3/2^-$				

γ(^{65}Cu) (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	δ	Comments
4936.40	(13/2,15/2,17/2)	861.8 *1*	100	4074.60	(15/2$^+$)	D+Q	≈−1.0	E_γ,Mult.,δ: from (^{64}Ni,Xγ), with Mult and δ(Q/D) from $\gamma(\theta)$.
5017.2		5017.0 *32*	100	0.0	3/2$^-$			
5063.2		5063.0 *32*	100	0.0	3/2$^-$			
5077.2		5077.0 *32*	100	0.0	3/2$^-$			
5083.2		5083.0 *32*	100	0.0	3/2$^-$			
5100.2		5100.0 *32*	100	0.0	3/2$^-$			
5217.2		5217.0 *33*	100	0.0	3/2$^-$			
5230.2		5230.0 *33*	100	0.0	3/2$^-$			
5236.2		5236.0 *33*	100	0.0	3/2$^-$			
5244.2		5244.0 *33*	100	0.0	3/2$^-$			
5262.2		5262.0 *33*	100	0.0	3/2$^-$			
5296.2		5296.0 *33*	100	0.0	3/2$^-$			
5305.2		5305.0 *33*	100	0.0	3/2$^-$			
5310.2		5310.0 *33*	100	0.0	3/2$^-$			
5320.2		5320.0 *33*	100	0.0	3/2$^-$			
5335.2		5335.0 *33*	100	0.0	3/2$^-$			
5384.2		5384.0 *34*	100	0.0	3/2$^-$			
5392.2		5392.0 *34*	100	0.0	3/2$^-$			
5424.2		5424.0 *34*	100	0.0	3/2$^-$			
5430.2		5430.0 *34*	100	0.0	3/2$^-$			
5447.3		5447.0 *34*	100	0.0	3/2$^-$			
5485.90		549.5 *2*	73 *25*	4936.40	(13/2,15/2,17/2)	D+Q		E_γ,I_γ,Mult.,δ: from (^{64}Ni,Xγ), with Mult from $\gamma(\theta)$.
		1130.1 *1*	100 *6*	4355.79	(17/2$^+$)			E_γ,I_γ: from (^{64}Ni,Xγ).
5526.3		5526.0 *35*	100	0.0	3/2$^-$			
5603.3		5603.0 *35*	100	0.0	3/2$^-$			
5618.5		4503.0& *29*		1115.549	5/2$^-$			
		5618.0 *35*		0.0	3/2$^-$			
5632.3		5632.0 *35*	100	0.0	3/2$^-$			
5779		5779 *4*	100	0.0	3/2$^-$			
6070	(3/2)	6070		0.0	3/2$^-$			
6233.11		747.2 *2*	100	5485.90				E_γ: from (^{64}Ni,Xγ).
6556	(1/2)	6556		0.0	3/2$^-$			
7939.3	(5/2)	5832# *3*	10#	2107.42	(5/2)$^-$			
		6214# *3*	5.8#	1724.99	3/2$^-$			
		6315# *3*	25#	1623.42	5/2$^-$			
		6457# *3*	17#	1481.796	7/2$^-$			
		7939# *3*	100#	0.0	3/2$^-$			
8484.3	(1/2,5/2$^-$)	6269# *3*	1.5#	2212.64	(1/2)$^-$			
		6760# *3*	1.5#	1724.99	3/2$^-$			

From ENSDF

$^{65}_{29}$Cu$_{36}$-33

γ(^{65}Cu) (continued)

E_i(level)	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	Comments
8484.3	7714# *3*	4#	770.80	1/2⁻		
	8484# *3*	100#	0.0	3/2⁻	D+Q	Mult.: from $\gamma(\theta)$ in (γ,γ').

† Additional information 3.

‡ From (n,n′γ) E=fast up 3428 level and from (n,n′γ) for levels above 3428, unless otherwise noted.

From (γ,γ').

@ Multiply placed with undivided intensity.

& Placement of transition in the level scheme is uncertain.

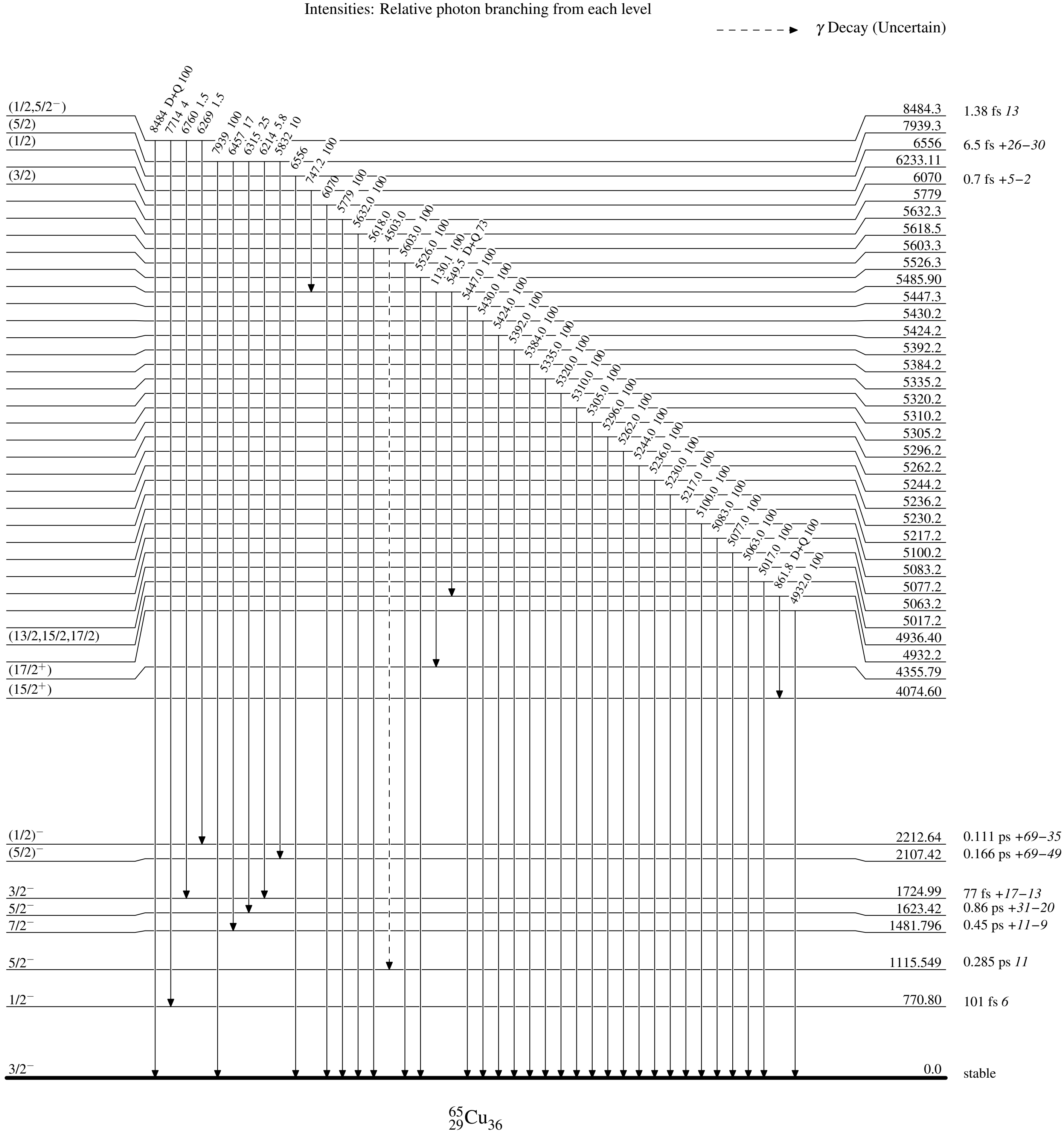
$^{65}_{29}Cu_{36}$-34

Adopted Levels, Gammas

Legend

Level Scheme

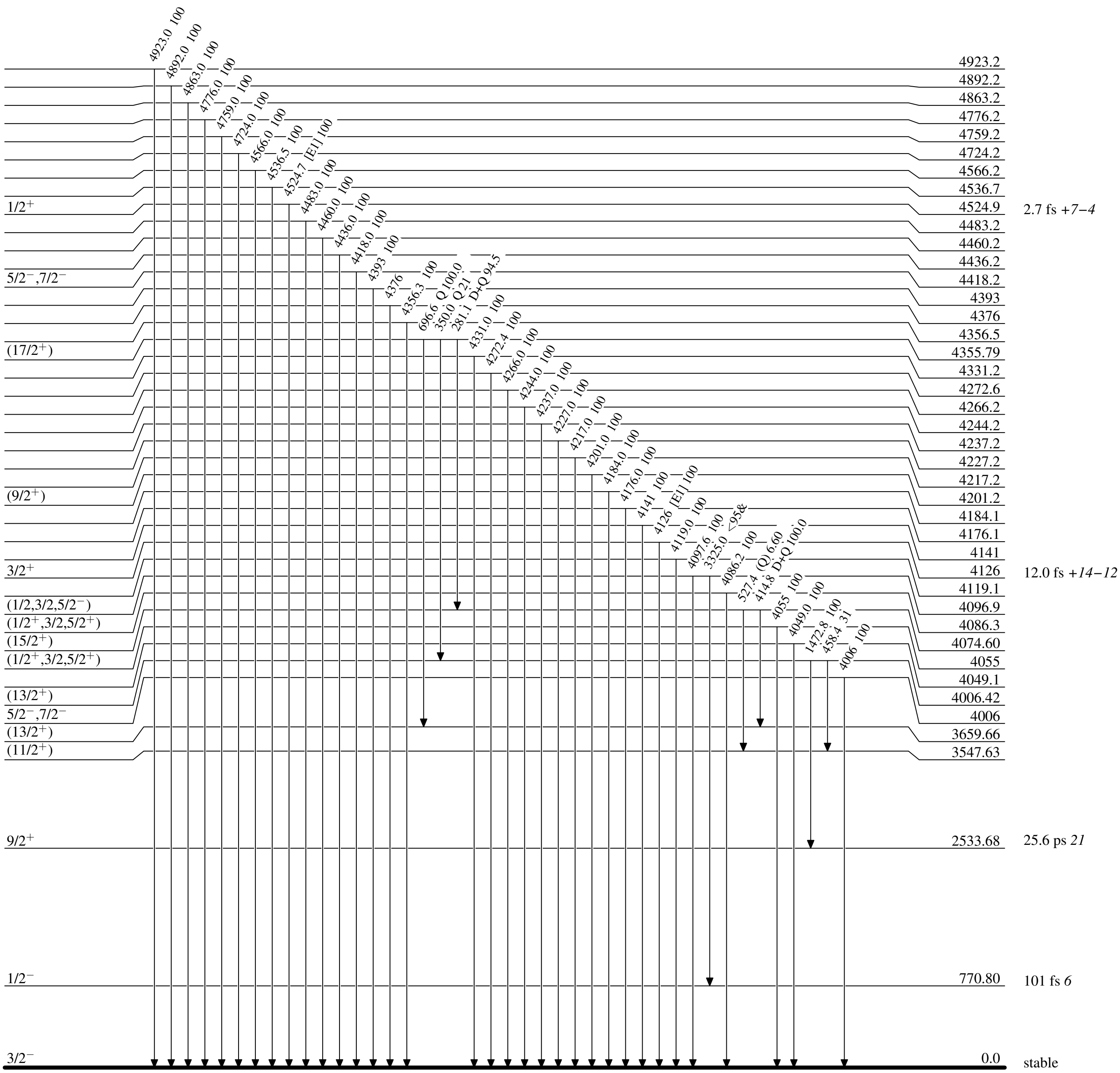
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



$^{65}_{29}Cu_{36}$

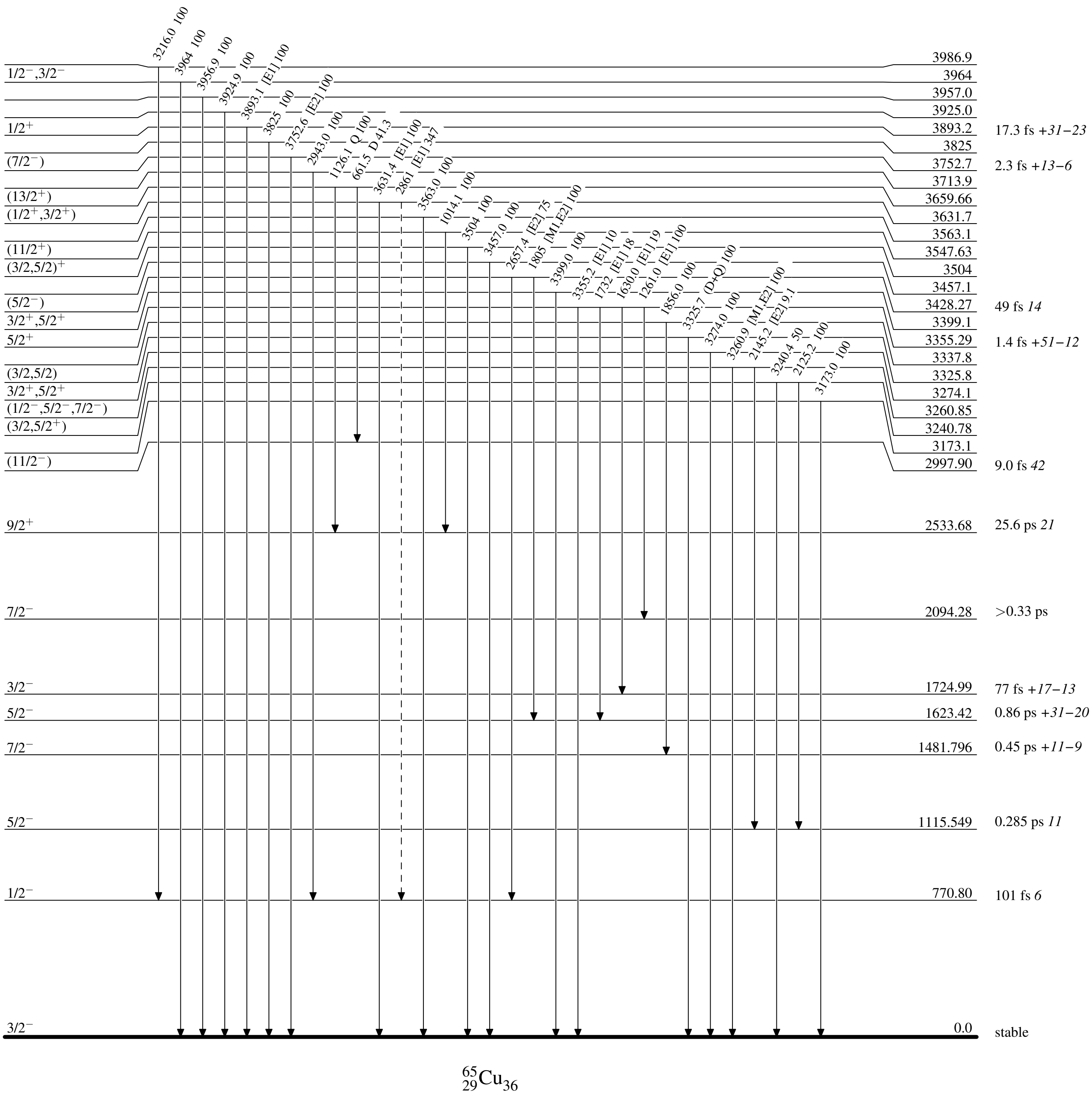
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

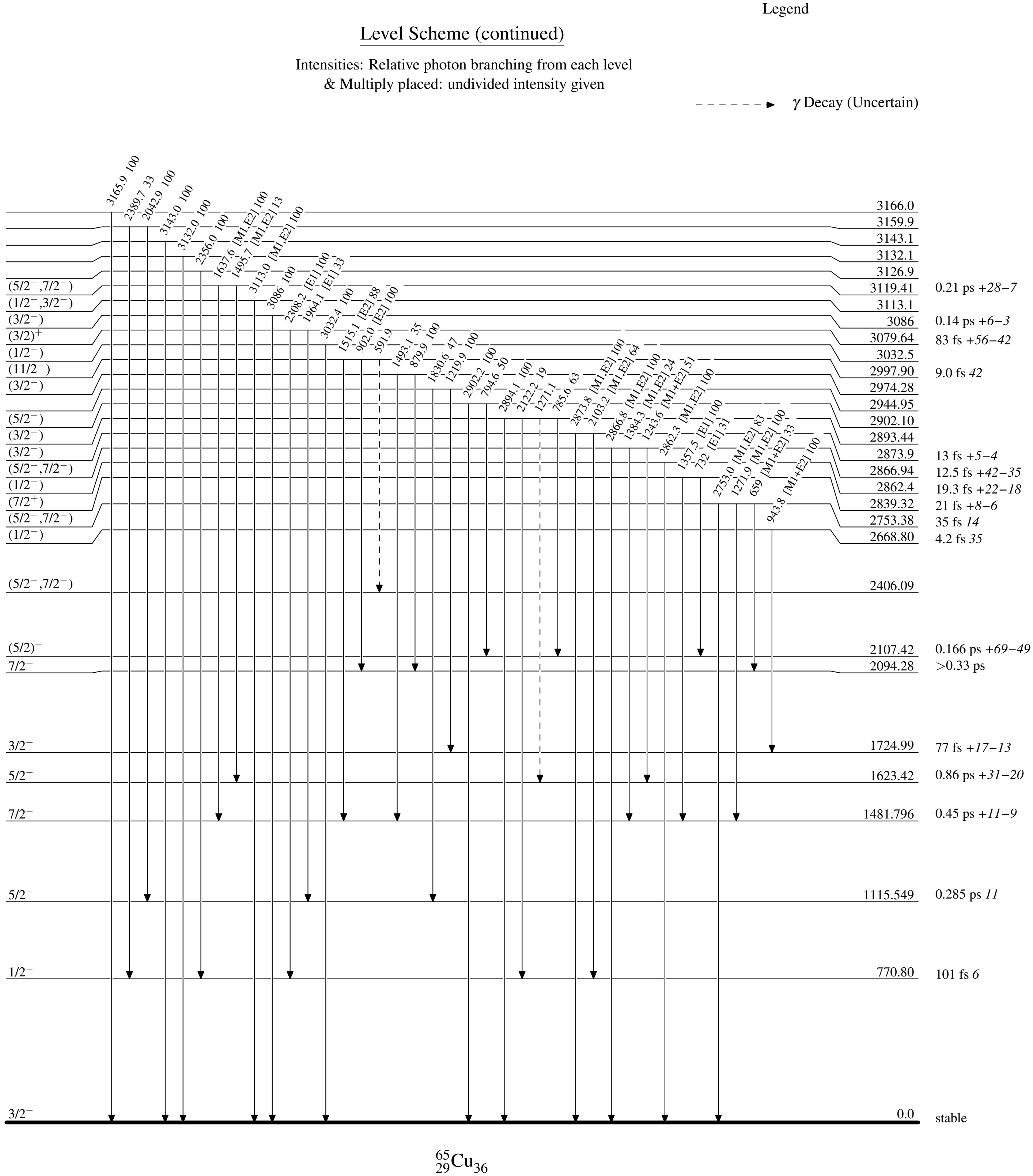
γ Decay (Uncertain)



Adopted Levels, Gammas

Level Scheme (continued)

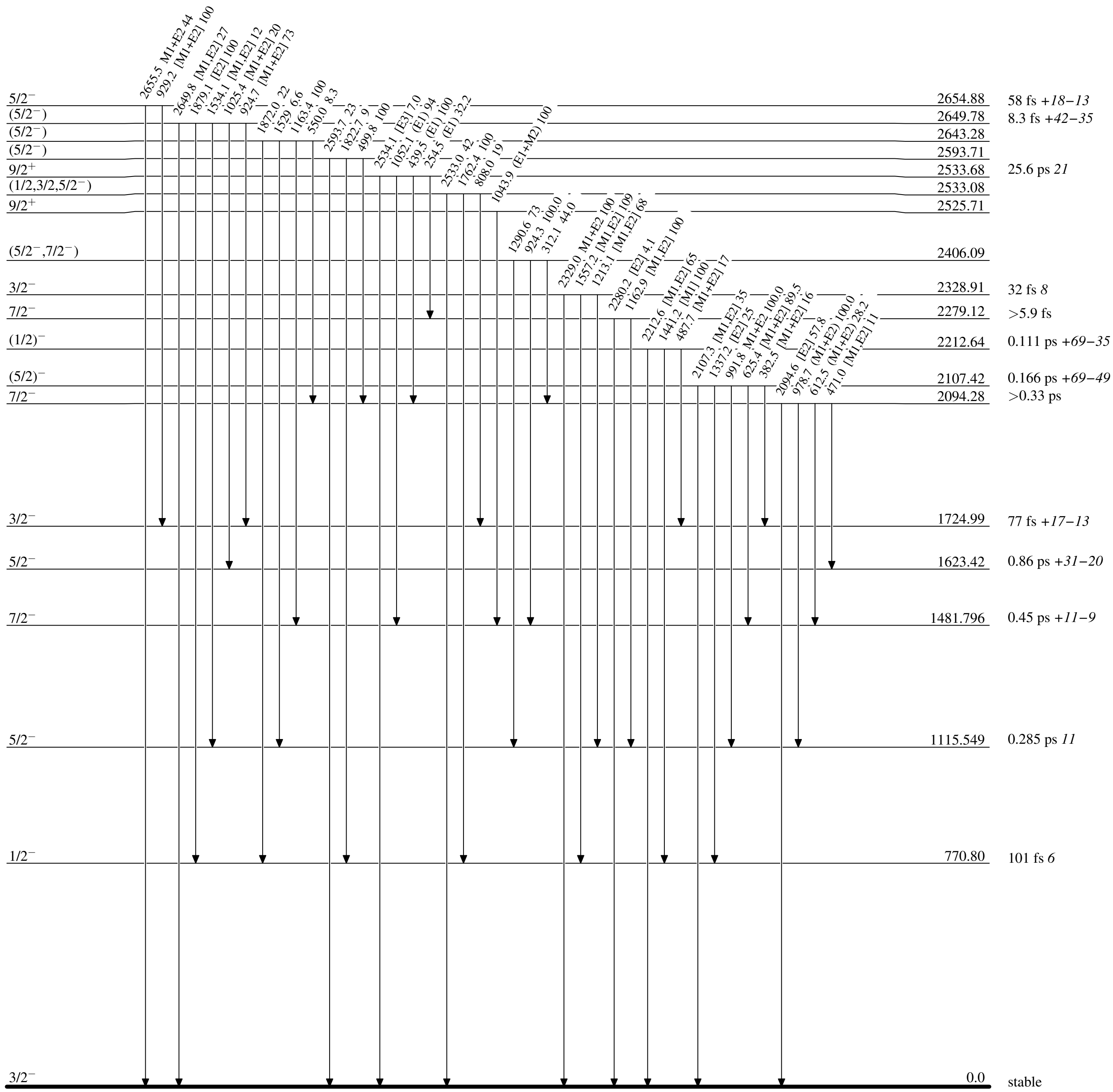
Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

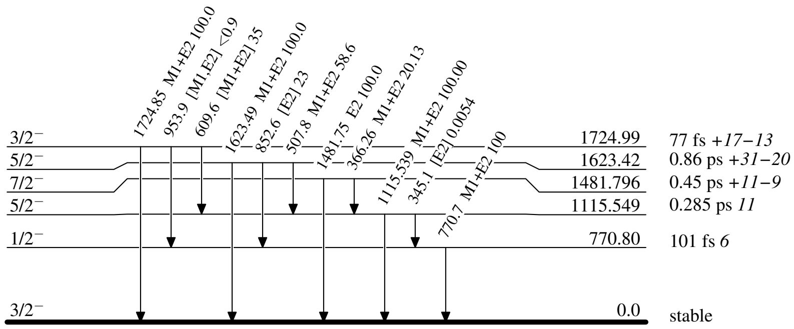


$^{65}_{29}Cu_{36}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



$^{65}_{29}Cu_{36}$