Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 178, 41 (2021).	12-Nov-2021

Q(β^-)=579.6 *6*; S(n)=7915.868 *24*; S(p)=7200.498 *28*; Q(α)=−6198.9 *4* 2021Wa16
Q(ε)=1674.62 *21*, S(2n)=18779.5 *5*, S(2p)=18578 *19* (2021Wa16).
Mass measurement: 2005Gu36.
See ^{63}Cu(n,γ):resonances dataset for energies and parameters of about 270 neutron resonances from 0.4-152.7 keV.
^{65}Cu(^{3}He,α) E=32 MeV: 1972Ch08 (also 1971ChXT,1968Po03): Measured $\sigma(\theta)$ of recoil nuclei and deduced reaction mechanism. Additional information 1.
^{63}Cu(n,n) E=res: 1966Go38 (28 resonances from 2.63-42.2 keV).
^{63}Cu(α,^{3}He): 1961Sa09: E=43 MeV, one excited state indicated at ≈1 MeV.

^{64}Cu Levels

Cross Reference (XREF) Flags

A	^{61}Ni(α,p)	J	^{63}Cu(n,γ) E=2.642 keV	S	Coulomb excitation
B	^{59}Co(^{7}Li,pnγ)	K	^{63}Cu(n,γ) E=24 keV	T	^{64}Zn(n,pγ)
C	^{61}Ni(α,pγ)	L	^{63}Cu(n,γ),(n,n):resonances	U	^{64}Zn(d,^{2}He)
D	^{62}Ni(^{3}He,p)	M	^{63}Cu(d,p)	V	^{64}Zn(t,^{3}He)
E	^{62}Ni(α,pnγ)	N	^{63}Cu(d,pγ)	W	^{65}Cu(p,pnγ)
F	^{62}Ni(α,d)	O	^{64}Ni(p,n)	X	^{65}Cu(d,t)
G	^{63}Cu(n,γ),(pol n,γ) E=th	P	^{64}Ni(p,nγ)	Y	^{66}Zn(d,α)
H	^{63}Cu(n,γ) E=0.579 keV	Q	^{64}Ni(^{3}He,t)	Z	^{67}Zn(p,α)
I	^{63}Cu(n,γ) E=2.038 keV	R	^{64}Ni(^{6}Li,^{6}He)		

E(level)[†]	J$^\pi$[&]	$T_{1/2}$[‡]	XREF	Comments
0.0	1$^+$	12.7006[#@] h *20*	BCDE GHIJK MNOPQRSTUVWXYZ	%ε+%β$^+$=61.5 *3*; %β$^-$=38.5 *3* μ=−0.2166 *4* (2010Vi07,2019StZV) Q=+0.075 *9* (2010Vi07,2016St14,2021StZZ) J$^\pi$: spin measured by 2010Vi07 by hyperfine structure using collinear laser spectroscopy; parity from L(d,^{2}He)=L(t,^{3}He)=0. Dominant configuration=$\pi p_{3/2}\otimes\nu f_{5/2}$. μ,Q: collinear laser spectroscopy at ISOLDE-CERN, 2010Vi07). Value of μ=−0.2164 in 2010Vi07 is evaluated to −0.2166 in 2019StZV. Value of Q=+0.072 in 2010Vi07 is evaluated to +0.075 in 2016St04 and 2021StZZ. Other: μ=−0.217 *2* (1966Do01,1963Do02, atomic-beam method). δ<r^2>(^{65}Cu,^{64}Cu)=−0.09 fm^2 *1*(stat) *2*(syst) (2020De21, collinear resonance ionization laser spectroscopy at ISOLDE-CERN). δ<r^2>(^{65}Cu,^{64}Cu)=−0.116 fm^2 *3*(stat) *13*(syst) (2016Bi08, collinear resonance ionization laser spectroscopy at ISOLDE-CERN). $T_{1/2}$: weighted average of 12.6975 h *36* (2018Ab02, statistical uncertainty=0.0005 h, systematic uncertainty=0.0036 h, ionization chamber); 12.706 h *5* (2017Pi09, weighted average of four different measurements: 12.707 h *19* using a well counter for gamma radiation, 12.700 h *18* from decay curve for 511-keV radiation using HPGe detector, 12.712 h *14* and 12.706 h *5* using two different ionization

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Adopted Levels, Gammas (continued)

^{64}Cu Levels (continued)

E(level)[†]	J^π[&]	$T_{1/2}$[‡]	XREF	Comments
				chambers); 12.718 h *23* (2012Am05, liquid scintillation counting); 12.696 h *12* (2012Lu14, ionization chamber, value also cited in 2012Be24); 12.702 h *8* (2012Be24, measurement made at NPL, Teddington, using an ionization chamber); 12.704 h *5* (2010Wa46, ionization chamber, value also cited in 2012Be24); 12.694 h *28* (2008Fa12, weighted average of 12.675 h *33* at 293 K and 12.708 h *23* at 12K, 511-radiation counting using HPGe detector); 12.700 h *5* (1989Ab22, γ decay, uncertainty of 0.001 h in 1989Ab22 increased by evaluators); 12.701 h *3* (1982RuZV,1980RuZY, ionization chamber, earlier value of 12.701 h *7* in 1972MeZM from the same lab); 12.704 h *6* (1974Ry01, $4\pi\beta$ counter); 12.699 h *2* (1973De56); 12.72 h *1* (1972Em01, weighted average of 12.71 h *1*, 12.72 h *2*, 12.72 h *4* using NaI(Tl) detector and ionization chamber, also 1972WyZZ and 12.78 h *5* in 1957Wr37); 12.701 h *11* (1968He20, average of three measurements: 12.695 h *20*, 12.702 h *15*, 12.709 h *15*, 511-radiation counting). Weighted average of all the values, including the 19 values, with less precision, listed below is 12.702 h *3* with reduced χ^2=4.7 as compared to critical χ^2=1.5 at 95% confidence level. With small adjustment in uncertainties of a few of the less precise values, NMR weighted average gives 12.702 h *2*, with reduced χ^2=2.5, and RT weighted average gives 12.701 *2* with reduced χ^2=1.7. Additional information 2.
159.282 *3*	2^+	21 ps *4*	ABCDE GHIJK MNOPQRST VWXYZ	XREF: J(?). J^π: $\gamma(\theta)$ in (pol n,γ) on polarized ^{63}Cu; $\gamma(\theta)$ in (p,nγ); L(d,t)=1 from $3/2^-$.
278.256 *8*	2^+	<9 ps	BCDE GHI K MNOPQR T VWXYZ	J^π: $\gamma(\theta)$ in (pol n,γ) on polarized ^{63}Cu; $\gamma(\theta)$, γ(lin pol) in (p,nγ); L(d,t)=1 from $3/2^-$.
343.897 *9*	1^+	<4 ps	B G IJK MNOPQr TUv XY	XREF: r(356)U(400)v(352)Y(?). J^π: $\gamma(\theta)$, γ(lin pol) in (p,nγ); $\gamma(\theta)$ in (pol n,γ) on polarized ^{63}Cu; L(d,p)=1 from $3/2^-$; L(^{3}He,t)=0 and Gamow-Teller transition.
362.230 *6*	3^+	<4 ps	BCDE G IJK MNOPQr T vWXYZ	XREF: r(356)v(352). J^π: $\gamma(\theta)$ in (p,nγ); L(d,p)=1+3 from $3/2^-$; L(^{3}He,p)=2. However, primary γ from 1^- in (n,γ) E=2.038 keV is inconsistent with 3^+.
574.614 *12*	$(4)^+$	<17 ps	BCDE G K MNOP T VWXYZ	J^π: $\gamma(\theta)$ and $\gamma\gamma(\theta)$ in (p,nγ) give J=2,4; L(d,α)=4 and L(^{3}He,p) from 0^+ gives (3^+,4^+,5^+); parity from L(d,p)=3 from $3/2^-$.
608.784 *9*	2^+	<9 ps	B D GHIJK MNOPQR V XY	J^π: spin=2 from $\gamma(\theta)$ in (pol n,γ) on pol ^{63}Cu and $\gamma(\theta)$, γ(lin pol) in (p,nγ); parity from L(d,p)=1 from $3/2^-$ and L(^{3}He,p)=2 from 0^+; L(d,t)=1+3 from $3/2^-$ for 573+606 unresolved group. $T_{1/2}$: >0.12 ps (DSAM in (p,nγ) (1974Ca14)).
662.99 *3*	1^+	<8 ps	B D GH K MNOPQ U XY	XREF: U(730). J^π: spin=1 from $\gamma(\theta)$, $\gamma\gamma(\theta)$ in (p,nγ) and $\gamma(\theta)$ in (pol n,γ) on polarized ^{63}Cu; parity from L(d,p)=1 from $3/2^-$, L(^{3}He,t)=0+2 from 0^+, L(^{3}He,t)=0 from 0^+. Other: L(d,α)=4 from 0^+ for a 661 group inconsistent with J=1. $T_{1/2}$: >0.12 ps (DSAM in (p,nγ) (1974Ca14)).
739.050 *9*	2^+	<11 ps	B d GHIJK mNoPQr V xyZ	XREF: d(745)m(742)o(742). E(level): probably a doublet (739+746) in particle-transfer reactions.

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Adopted Levels, Gammas (continued)

^{64}Cu Levels (continued)

E(level)[†]	Jπ[&]	$T_{1/2}$[‡]	XREF	Comments
				Jπ: spin from γ(θ) in (pol n,γ) on pol ^{63}Cu and γ(θ) in (p,nγ); parity from L(d,p)=1 from 3/2⁻ for 739+746.
746.241 *11*	(3)⁺	<13 ps	BCdE GHIJ mNoP r WxyZ	XREF: d(745)m(742)o(742). Jπ: γ(θ), γγ(θ) in (p,nγ); L(d,t)=1 from 3/2⁻ for the 739+746 doublet; L(^{3}He,p)=2+4 for a 745 *10* group; L(d,α)=2(+4) for a 742 *4* group. A primary γ from 1⁻ in (n,γ) E=2.038 keV is inconsistent with 3⁺.
774.6 *5*	(1)		B	Jπ: ΔJ=2, quadrupole γ to 362, 3⁺ level.
820.7 *5*	(4)		B	Jπ: ΔJ=1, dipole γ to 362, 3⁺ level.
878.274 *18*	(0)⁺	<15 ps	B D GHI K MNOP V XY	XREF: Y(?). Jπ: γγ(θ) in (p,nγ) strongly supports spin 0. Parity from L(d,p)=1 from 3/2⁻. L(^{3}He,p)=2 giving (1⁺,2⁺,3⁺) and primary γ from 2⁻ in (n,γ) E=0.579 keV are inconsistent with J=0 assignment.
895.705 *19*	(3)⁺	<20 ps	BC E G IJK MNOP WXYZ	Jπ: γ(θ) in (p,nγ) and L(d,p)=1+3 from 3/2⁻. However, primary transition from 1⁻ in (n,γ) E=2.038 keV is inconsistent with 3⁺. Cautionary note: 617γ is the only transition from the 895 level seen in all the γ-ray studies where this level is populated, for example, (n,γ) E=Th; (p,nγ); (^{7}Li,pnγ); (α,pnγ); and other reactions. The next common transition is 321 keV, seen in several studies but with different intensities, while not reported in (p,nγ). For the other transitions shown here from this level, there are major differences about their observations and intensities, as noted in comments in the γ-ray Table. It is possible there are two or more levels near 895 keV.
927.080 *10*	1⁺	<11 ps	B D GHI K MNOPQR UV XY	XREF: U(950). Jπ: γ(θ) in (pol n,γ) on pol ^{63}Cu; γ(θ), γγ(θ) in (p,nγ) and L(d,p)=1 from 3/2⁻; L(^{3}He,t)=L(d,^{2}He)=0; L(^{3}He,p)=0+2.
1096.5 *5*	(2⁺)		B	Jπ: ΔJ=(0), D+Q γ to 2⁺.
1241.087 *13*	$1^{(+)},2^{(+)}$		B d Ghijk mNoP v xy	Probably a doublet (1241+1243) in particle transfer reactions and (n,γ) E=res. Jπ: γ(θ) in (pol n,γ) on pol ^{63}Cu; L(d,p)=1 from 3/2⁻ for a 1236 group; L(^{3}He,p)=0 for a 1241 group gives 0⁺,1⁺. Jπ=3⁺ assigned by 2018Sa02 in (^{7}Li,pnγ) without any supporting evidence.
1242.64 *7*	(0,1,2,3⁺)[d]		B d Ghijk mNoP v xy	Jπ: 1242.56γ to 1⁺. See also comment for 1241 level.
1287.15 *5*	(1⁺,2,3⁻)		A GHI K M x	Jπ: primary γs from 2⁻ and 1⁻ in (n,γ) E=0.577, 2.06 keV; γ to 3⁺.
1287.96 *22*	(0⁺,1,2,3⁺)		OP v x	Jπ: 624.7γ to 1⁺, 1010.0γ to 2⁺.
1290.7? *3*	(2⁺)		B N	E(level): may be the same level as 1287.96 or 1287.15. Jπ: ΔJ=1, dipole to 1⁺.
1298.121 *14*	(1)⁺		D GHI M OPQ V XY	Jπ: γ(θ) in (pol n,γ); L(d,α)=0+2 from 0⁺; L(d,t)=L(d,p)=1 from 3/2⁻; L(^{3}He,p)=0; L(^{3}He,t)=0 and Gamow-Teller transition.
1320.335 *20*	(1⁺,2⁺,3⁺)		D G I K OP	Jπ: L(^{3}He,p)=2 from 0⁺.
1354.25 *3*	(3)⁺		B d G K MNOPqR V XY	Jπ: γ to 1⁺ (g.s.); L(d,p)=1+3 from 3/2⁻; L(d,α)=4 from 0⁺; L(^{3}He,p)=2 for 1359 group which overlaps 1354 and 1363 levels suggests 1⁺,2⁺,3⁺ for any of these two levels. Jπ=4⁺ proposed in (^{7}Li,pnγ) inconsistent with γ to 1⁺.
1363.17 *11*	(1,2,3⁺)[c]		d G J Pq XY	XREF: X(?)Y(?). Jπ: 1362γ to 1⁺, 1085γ to 2⁺; primary γ from 2⁻. See also Jπ comment for 1354 level.

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Adopted Levels, Gammas (continued)

^{64}Cu Levels (continued)

E(level)†	Jπ&	T1/2‡	XREF	Comments
1436.2 4	(4+)		B	Jπ: ΔJ=(0), D+Q γ to (4)+.
1438.75 3	(1)+		D GHI K MNOPQ V XY	XREF: H(?)Q(1435). Jπ: L(d,α)=0(+2) from 0+; L(d,p)=1+3 from 3/2−; L(^{3}He,p)=2.
1461.38 13	(2−)		B G M OP XY	XREF: X(?). E(level): possible doublet in (d,p) and (d,α). Jπ: L(d,p)=0+4 from 3/2−; L(d,α)=(3) from 0+. Jπ=4− assigned in (^{7}Li,pnγ) without supporting arguments.
1499 10	1+		Q	Jπ: L(^{3}He,t)=0 and Gamow-Teller transition.
1499.20 3	(2)−		D GHIJK M OP UV XY	XREF: H(?)J(?)U(1520). Jπ: γ to 1+ (g.s.), L(d,p)=0 from 3/2−; L(d,α)=(1+3) from 0+; L(^{3}He,p)=1.
1521.148 19	(2)+		GHIJK M OP XY	Jπ: γ(θ) in (pol n,γ); L(d,p)=1 from 3/2−; L(d,α)=2 from 0+.
1550.49 11	(1+,2+,3+)		D G K M OP V XY	Jπ: γ to 2+; L(^{3}He,p)=2 from 0+. But L(d,p)=4 from 3/2− (for a possible doublet) is inconsistent with positive parity.
1594.19 4	6−	20.4 ns 6	BC EFG N W	μ=+1.06 3 (1972Bl16,2020StZV) XREF: F(1590). μ: DPAD method in (d,pγ) (1972Bl16). Other: +1.02 6 (from (α,pnγ), 1971SuZR). Jπ: γ(θ) in (α,pnγ). L(α,d)=5 for a 1590 group and agreement of σ(θ) with DWBA calculations for configuration=$\pi p_{3/2}\otimes\nu g_{9/2}$. $T_{1/2}$: weighted average of 22 ns 3 (^{198}Pt(^{76}Ge,Xγ), 1997Is13 (also 2001Is02)); 19 ns 2 (γ(t) in (α,pnγ)), 1976Ch36); 20.4 ns 7 (γ(t) in (d,pγ), 1972Bl16) and 20.4 ns 6 (γ(t) in (α,pnγ), 1971SuZR).
1594.39 3	(1+,2)		B G IJK MNOPQ V XY	XREF: B(?)Q(1591). Jπ: primary γs from 1− and 2− in (n,γ) E=2, 2.66 keV; γs to 1+, 3+. L(d,p)=4 from 3/2− for a doublet suggests π=− for one component. L(d,α)=4 from 0+ for a 1589 group is inconsistent with J=1,2.
1607.30 5	(2+,3)		G J M OP XY	XREF: X(?). Jπ: primary γ from 2− in (n,γ) E=2.66 keV; 1032.7γ to 4+, 998.0γ to 2+. L(d,α)=0(+2) from 0+ suggests 1+.
1615.8 5	(5)+		B DE	XREF: D(1602). Jπ: ΔJ=1 γ to 4+; L(^{3}He,p)=4. 5− assigned in (^{7}Li,pnγ) without supporting arguments.
1630? 10	(1 to 5)(+)		M	Jπ: L(d,p)=(3) from 3/2−.
1648 10	(2−)		M U	XREF: M(?)U(1700). Jπ: L(d,p)=(0+2) from 3/2−; 2− from L(d,^{2}He).
1683.126 25	(1+,2+)c		d GH K M OPQ Y	XREF: H(?). Jπ: possible γs to (3+) and (0)+. L(d,p)=0(+2,3) from 3/2− and L(d,α)=(0+2,1) suggest two levels near this energy with Jπ=1−,2− and Jπ=1+; L(^{3}He,p)=2 for a 1689 group which overlaps 1683 and 1700 levels suggests positive parity.
1700.65 5	(1,2+)		d G M OP V Y	Jπ: γ to (0)+, but L(d,p)=2+4 from 3/2− and L(d,α)=(3) from 0+ suggest 2−,3−,4−; L(^{3}He,p)=2 for a 1689 group which overlaps 1683 and 1700 levels suggests positive parity.
1706.1 5	(4+)		B E	Jπ: ΔJ=1, (M1+E2) γ to (3+).

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Adopted Levels, Gammas (continued)

^{64}Cu Levels (continued)

E(level)[†]	Jπ[&]	XREF	Comments
1736.4 *5*	(4^+)	B E	Jπ: ΔJ=(0), (M1+E2) γ to $(4)^+$.
1739.79 *6*	(3^+)	d G M y	Jπ: L(d,α)=4 from 0^+ for a group at 1737 *10* and 1165.2γ to $(4)^+$ limits Jπ to be $(3^+,4^+,5^+)$; 1293.9γ from the 3033.6 level with Jπ limited to $(0,1,2)^-$ from other evidence. See Jπ comment for 3033.6 level.
1742.58 *5*	$(1^+,2,3^+)$	d G OP y	Jπ: γs to 1^+ and $(3)^+$; L(^{3}He,p)=2 for 1741+1775 doublet suggests $1^+,2^+,3^+$ for any of the five levels near this energy.
1749.2 *3*	(≤4)[b]	d G	Jπ: see Jπ comment for 1739 level.
1768.95 *6*	(5^+)	B EG V Y	XREF: Y(1775). Jπ: L(d,α)=4 from 0^+; ΔJ=2 γ to 3^+; γ to $(4)^+$. γ from (1^+) is inconsistent.
1779.55 *4*	$(1^+,2^+)$	D GHI K M OPQ	XREF: D(1775)M(1775)O(1774)Q(1775). Jπ: primary γs from 1^- and 2^- in (n,γ) E=0.577, 2 keV; γs to 1^+ and 3^+; L(d,p)=3(+1) from $3/2^-$. See Jπ comment for 1768 level.
1852.65 *3*	$(1^+,2^+)$	A D GHI K M OPQ V Y	Jπ: primary γs from 1^- and 2^- in (n,γ) E=0.577, 2 keV; γ to 1^+ and L(d,p)=1 from $3/2^-$; L(^{3}He,p)=2. L(d,α)=4 from 0^+ disagrees with J=1,2.
1884 *10*	$(1^+,2,3,4^-)$	M Y	XREF: M(?). Jπ: L(d,α)=(2,3) from 0^+.
1900.28 *5*	(1^+)	D G I K m OP y	Jπ: L(d,α)=(0+2) from 0^+; L(d,p)=1 from $3/2^-$ for a group at 1900 *8*; L(^{3}He,p)=2(+0) for a group at 1907 *10*.
1905.084 *15*	(2^-)	G I m O Q v y	XREF: Q(1911)v(1913). Jπ: γ(θ) in (pol n,γ); γ to $(3)^+$; L(^{3}He,t)=1 from 0^+ for a group at 1911 *10*.
1905.28 *8*	(4^+)	B	Jπ: ΔJ=(0) γ to $(4)^+$.
1917.4 *11*	(≤4⁻)[c]	H v	XREF: v(1913).
1925.0 *7*	$(4,5,6^+)$	B	Jπ: γ to 4^+, and yrast pattern of population in (^{7}Li,pnγ) reaction.
1940.0 *20*	(1^+)	D M OP Y	Jπ: L(d,α)=2(+0) from 0^+; L(d,p)=(1) from $3/2^-$; L(^{3}He,p)=0.
1970.0 *20*	(≤3⁺)[d]	OP	XREF: O(1969).
1976.32 *18*		G m v y	Jπ: γ to 4^+ suggests 2^+ to 6^+. See also comment for 1979 level.
1979.1 *7*	(5^+)	B E m v y	Jπ: L(d,α)=4 from 0^+ for a group at 1980 *8*; ΔJ=2 γ to 3^+. Also L(d,p)=(1,3) from $3/2^-$.
2019.8 *6*	(4^+)	B	Jπ: ΔJ=(0) γ to $(4)^+$.
2020.8 *4*	$(2^+,3^+)$	E H M OPQ Y	XREF: Q(2016). Jπ: L(d,α)=2 from 0^+; 315γ to (4^+), 2021γ to 1^+. Also L(d,p)=(1+3) from $3/2^-$.
2041.8 *5*	(≤3⁺)[d]	d OP r	Jπ: L(^{3}He,p)=2 for 2047 group suggests $1^+,2^+,3^+$ for any of the three levels near this energy.
2050.00 *9*	$(1^+,2,3^-)$	d GHI K m r y	Jπ: primary γs from 1^- and 2^- in (n,γ) E=0.577, 2 keV and γ to (3^+). L(d,α)=4 from 0^+ and L(d,p)=(0,1) for a 2050 group suggest positive parity for one of two levels near 2050 keV. See Jπ comment for 2041 level.
2053.3 *10*	$(\le4^+)$	dE m r y	Jπ: γ to 2^+. See Jπ comment for 2041 level.
2060.0 *20*	(≤3⁺)[d]	OPqr v	
2064.5 *11*	(≤4⁻)[c]	H qr v y	
2072.8 *4*	(5^-)	BC E W	Jπ: ΔJ=1, (M1+E2) γ to 6^-. 1976Ch36 assigned 5^-, assuming the level corresponds to L(d,p)=4 group. But L(d,α)=3 group suggests the level may also correspond to 2075 level populated in (n,γ).
2075.09 *11*	$(2^-,3^-,4^-)$	G M y	XREF: M(2069). Jπ: L(d,α)=3 from 0^+ and L(d,p)=4 from $3/2^-$.
2080.1 *15*	$(1^+,2,3^+)$	OP	Jπ: 1718γ to 3^+, 2080γ to 1^+.
2091.3 *4*	(4^-)	B	Jπ: ΔJ=(0), D+Q γ to $(4)^+$.
2092.24 *16*	$(1^+,2^+,3^+)$	D G M Y	Jπ: L(d,α)=2 from 0^+; L(^{3}He,p)=2. Also L(d,p)=(3) from $3/2^-$.
2115? *10*	(0 to 3)[(+)]	M	Jπ: L(d,p)=(1) from $3/2^-$.

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Adopted Levels, Gammas (continued)

^{64}Cu Levels (continued)

E(level)[†]	J^π[&]	XREF	Comments
2139.7 *7*	$(0^+,1,2,3^+)$[d]	d OP	J^π: 1400.5γ to 2^+, 1477γ to 1^+. See also J^π comment for 2144 level.
2144.54 *6*	(2^+)	d GIKM V Y	J^π: primary γ from 1^- in (n,γ) E=2.038 keV and γs to 1^+, 4^+. L(d,α)=4(+2) from 0^+ suggests 3^+. L(d,p)=1 from $3/2^-$ agrees with 2^+. L(^{3}He,p)=2 for 2146 group suggests $1^+,2^+,3^+$ for any of the two levels near this energy.
2184.2 *5*	(3^+)	M OP Y	J^π: L(d,p)=1 from $3/2^-$ and L(d,α)=(4) from 0^+.
2212 *9*	(1 to 5)$^{(+)}$	M	J^π: L(d,p)=(3) from $3/2^-$.
2221.0 *20*	(3^+)	M OP Y	XREF: M(2230)O(2226). J^π: L(d,α)=4 from 0^+ and γ to 1^+.
2244.0 *20*	$(1^+,2^+,3^+)$	d P	XREF: d(2246). J^π: L(^{3}He,p)=2 from 0^+ for a group at 2246 *10*.
2251.6 *7*	(5^+)	B EF	XREF: F(2250). J^π: ΔJ=1, (M1+E2) γ to 4^+.
2253.86 *11*	$(\leq3^+)$	d G Y	XREF: Y(2249). J^π: γ to 1^+. See comment for 2246.
2267.01 *6*	(2^-)	G m OP UV y	XREF: m(2265)U(2290)V(2260)y(2265). E(level): doublet in (d,α) and (d,p). J^π: L(d,p)=2+4 from $3/2^-$; γ from (1^+) favors 2^-; 2^- from (d,^{3}He).
2274.24 *8*	$(0^+,1,2,3^+)$[d]	G m OP y	XREF: m(2265)O(2275)y(2265). J^π: 1929.5γ to 1^+, 1996γ to 2^+.
2279.76 *5*	1^+[a]	d GIK Qr	J^π: L(^{3}He,t)=0 for composite of 2280+2301 levels and Gamow-Teller transitions. Also L(^{3}He,p)=2 for 2290 level suggests $1^+,2^+,3^+$ for any of the two levels near this energy.
2301.04 *6*	1^+	d GIK OPQr Y	XREF: O(2295)Y(2294). J^π: L(^{3}He,t)=0 for composite of 2280+2301 levels and Gamow-Teller transitions. See also comment for 2279.8 level.
2309.4 *10*	(3^+)	M OP Y	XREF: M(2311)O(2310). J^π: L(d,α)=4 from 0^+ and L(d,p)=1 from $3/2^-$.
2316.50 *7*	$(1^-,2^-)$	G KM OP	XREF: M(2327). J^π: L(d,p)=0(+2) from $3/2^-$.
2322.6 *5*	(5^-)	B E	J^π: ΔJ=(0), (M1+E2) γ to (5^-).
2324.75 *19*	$(1^+,2^+,3^+)$	D G	J^π: L(^{3}He,p)=2.
2354.59 *7*	$(0^+,1,2,3^+)$[d]	G m OPQ y	J^π: 2356γ to 1^+, 1616γ to 2^+.
2360.50 *11*	(≤3)	d G K m y	J^π: primary γ from $1^-,2^-$ in (n,γ) E=th; 1119γ to $1^{(+)},2^{(+)}$ L(^{3}He,p)=2 for 2369 group suggests $1^+,2^+,3^+$ for any of the three levels near this energy.
2376.35 *9*	(1^+)	d G M Y	XREF: M(2375). J^π: L(d,α)=0(+2) from 0^+. See J^π comment for 2360 level.
2378.1 *4*	(7^-)	BC EF W	XREF: F(2370). J^π: ΔJ=1, (M1+E2) γ to 6^-; probable configuration=$\pi f_{5/2}\otimes\nu g_{9/2}$ (1979Ch01).
2381.2 *15*	$(0^+,1,2,3^+)$[d]	d OP	J^π: 2102γ to 2^+, 2382γ to 1^+. See also J^π comment for 2360 level.
2387.1 *4*	(6^-)	B E	J^π: ΔJ=1, D+Q γ to (5^-).
2387.89 *11*	(1^+)	GI M O Q Y	XREF: M(2389)Q(2386). J^π: L(d,α)=0(+2) from 0^+.
2415.2 *7*	$(4,5,6^+)$	B	J^π: γ to 4^+, and yrast pattern of population in (^{7}Li,pnγ) reaction. See also comments for 2417 level.
2417.0 *20*	$(1^+,2^+,3^+)$	D M OP Y	XREF: O(?). E(level): triplet in (d,α). J^π: γ to 1^+; L(^{3}He,p)=2 from 0^+ for a group at 2414 *10*. But L(d,p)=0+4 from $3/2^-$ suggests 2^- for a questionable level at 2415 *10*; L(d,α)=4 from 0^+ suggests $3^+,4^+,5^+$ for a group at 2415 *10*.
2435.9 *7*	$(4,5,6^+)$	B	J^π: γ to 4^+, and yrast pattern of population in (^{7}Li,pnγ) reaction.

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Adopted Levels, Gammas (continued)

^{64}Cu Levels (continued)

E(level)[†]	J^{π}[&]	XREF	Comments
2456.66 *8*	(1$^+$)	D G OP	J^{π}: L(^{3}He,p)=0 from 0$^+$; 1560.9γ to 3$^+$;
2465.47 *10*	(1$^-$,2$^-$)	G I M Q Y	J^{π}: primary γ from 1$^-$ in (n,γ) E=2.038 keV; γ to 1$^+$ and L(d,p)=0+2 from 3/2$^-$. Also L(d,α)=(1) from 0$^+$.
2491.2 *15*	(0$^+$,1,2,3$^+$)[d]	m OP r y	XREF: m(2494)y(2494). J^{π}: 2332γ to 2$^+$, 2491γ to 1$^+$. L(d,p)=2 from 3/2$^-$ and L(d,α)=3 from 0$^+$ for a group at 2494 *9* suggest 2$^-$,3$^-$,4$^-$.
2493.49 *7*	(2$^+$,3$^+$)	G m y	XREF: m(2494)y(2494). J^{π}: 1830.3γ to 1$^+$, 1918.7γ to 4$^+$. But L(d,α)=3 from 0$^+$ and L(d,p)=2 from 3/2$^-$ give (2$^-$,3$^-$,4$^-$) for a 2494 *9*, which could indicate a different level.
2497.58 *3*	(1,2$^+$)	G I m r y	XREF: m(2494)y(2494). J^{π}: primary γ from 1$^-$ in (n,γ) E=2.038 keV and 1618γ to (0)$^+$. See also comment for 2493 level.
2498.4 *6*	(5$^+$)	B	J^{π}: ΔJ=1, D+Q γ to (4$^+$).
2507.26 *11*	($\leq$3)[a]	d G I K OPQr	XREF: Q(2511). J^{π}: L(^{3}He,p)=2 for a 2515 group suggests (1$^+$,2$^+$,3$^+$) for any of the two levels near this energy.
2517.6 *7*	(5$^-$)	B	J^{π}: ΔJ=1, D+Q γ to (4$^-$).
2522 *7*		d M O r Y	XREF: Y(2520). J^{π}: L(d,α)=(0+2) from 0$^+$ suggests (1$^+$) and L(d,p)=(0) from 3/2$^-$ suggests (1$^-$,2$^-$). See comment for 2507 level.
2533.60 *7*	(2$^-$)	G K M OP Y	XREF: M(?)Y(?). J^{π}: L(d,α)=(0+2) supports (1$^+$) for a questionable level at 2534 *10*, whereas, L(d,p)=0(+2) from 3/2$^-$ for a group at 2534 *10* suggests 1$^-$, 2$^-$; 192.5γ from 2726, (3$^+$) level.
2567 *6*	(3$^+$,4$^+$,5$^+$)	O Y	XREF: Y(2550). J^{π}: L(d,α)=4, 4+2 from 0$^+$.
2583.3 *10*	(5$^-$)	B	J^{π}: ΔJ=1, D+Q γ to (4)$^+$.
2586 *6*	(3$^+$)	M O Y	XREF: M(2581). J^{π}: L(d,α)=4(+2) from 0$^+$ and L(d,p)=3 from 3/2$^-$.
2594.4 *4*	(1$^+$)	G I K M Y	J^{π}: L(d,α)=(0+2) from 0$^+$. L(^{3}He,p)=2 for a 2608 group suggests 1$^+$,2$^+$,3$^+$ for any of the three levels near this energy.
2607 *7*		D M O Y	XREF: M(2611)Y(2611). J^{π}: L(d,α)=4 from 0$^+$ and L(d,p)=0 from 3/2$^-$ for doublets suggest J^{π}=3$^+$,4$^+$,5$^+$ and J^{π}=1$^-$, 2$^-$. See J^{π} comment for 2594 level.
2632 *10*	1$^+$	M o Q Y	XREF: M(2622)o(2631)Q(2643)Y(2622). J^{π}: L(d,α)=0+2 from 0$^+$; L(^{3}He,t)=0 and Gamow-Teller transition. See J^{π} comment for 2594 level.
2635.48 *11*	($\leq$3$^+$)	G M o Y	XREF: M(2634)o(2631)Y(2634). J^{π}: primary γ from 1$^-$,2$^-$ in (n,γ) E=th and γ to (1$^+$). L(d,α)=0(+2) from 0$^+$ and L(d,p)=2(+0,1) from 3/2$^-$ suggest (for doublets) J^{π}=1$^+$ and J^{π}=0$^-$ to 4$^-$.
2647.3 *4*	(5)	B	J^{π}: ΔJ=(0), D+Q γ to (5$^-$).
2647.97 *12*	(1$^+$)	G K m O Q u	XREF: u(2660). J^{π}: L(^{3}He,t)=L(d,^{2}He)=0. But L(d,p)=4(+0) from 3/2$^-$ for a doublet suggests π=− for one of the levels; 1$^+$,2$^-$ from (d,^{2}He).
2657.33 *5*	(1$^+$,2)	G I m O u	XREF: u(2660). J^{π}: primary γ from 1$^-$ in (n,γ) E=2.038 keV and γs to 1$^+$, (3)$^+$; 1$^+$,2$^-$ from (d,^{2}He).
2670 *10*	(1,2)	D M U Y	XREF: M(?)U(2660). J^{π}: L(d,p)=0 from 3/2$^-$. L(d,α)=(3+1) from 0$^+$ favors 2$^-$. L(^{3}He,p)=2 for a 2679 group suggests 1$^+$,2$^+$,3$^+$; 1$^+$,2$^-$ from (d,^{2}He). There may be two levels near this energy.
2692.1 *4*	(6$^-$)	B E	J^{π}: ΔJ=1, dipole γ to (7$^-$); γ to 6$^-$.
2695.21 *9*	(1$^-$,2$^-$)	G M O Y	XREF: M(2692)O(2691)Y(2692).

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Adopted Levels, Gammas (continued)

^{64}Cu Levels (continued)

E(level)†	Jπ&	XREF	Comments
			Jπ: L(d,p)=0 from 3/2− for a doublet. γ to (3)+ disfavors 1−.
2716.9 *5*	(7−)	B E	Jπ: ΔJ=1, D+Q γ to 6−.
2717.97 *10*	(1−,2−)	G M O q Y	XREF: M(2720)O(2723)Y(2720). Jπ: L(d,p)=0+2 from 3/2−.
2726.16 *6*	(3+)	D G q	Jπ: L(^{3}He,p)=2 from 0+; 957γ to (5+), 1428γ to (1)+; primary γs from 1−,2− in (n,γ) E=th. But primary γ from 1− in (n,γ) E=2.038 keV is inconsistent with (3)+.
2732.30 *8*	(0+,1,2)	G I q	Jπ: primary γ from 1− in (n,γ) E=2.038 keV and γs to 1+, 2+.
2764.16 *10*	(1−,2−)	D G M O Q U Y	XREF: M(2760)O(2757)Q(2760)U(2780)Y(2760). Jπ: L(d,p)=0+2 from 3/2−; L(^{3}He,p)=1; L(d,α)=(3,2+4) for a doublet; 1+,2− from (d,^{2}He).
2776.55 *7*	(1+,2+)	GHI M u	XREF: M(2774)u(2780). Jπ: primary γs from 2− and 1− in (n,γ) E=0.577, 2.06 keV; γs to 1+ and (3)+; L(d,p)=1 from 3/2−; 1+,2− from (d,^{2}He).
2807 *10*	(1−,2−)	D M Q Y	XREF: M(2800)Q(2821)Y(2814). Jπ: L(d,p)=0 from 3/2−. Others: L(d,α)=(0+2) from 0+ suggesting 1+ and L(^{3}He,p)=0 for 2801+2827 suggesting 0+,1+ for this doublet are inconsistent.
2811.6 *5*	(6−)	B	Jπ: ΔJ=1, dipole γ to (5+).
2830.53 *7*	(1+,2,3+)	D G K M Y	XREF: M(2823)Y(2823). Jπ: 1476γ to (3)+, 2830γ to 1+. Others: L(d,p)=0+2 from 3/2− for a doublet suggests 1−, 2−. L(d,α)=(2,3) from 0+ for a doublet suggests *J*π=1+,2+,3+ or 3−,4−,5−; L(^{3}He,p)=0 for 2801+2827 suggests 0+,1+ for this doublet.
2854 *10*	0+,1+	M Q Y	Jπ: L(^{3}He,t)=0 from 0+; L(d,p)=1 from 3/2− for a doublet. L(d,α)=(3) from 0+ for a doublet suggesting 3−,4−,5− is inconsistent.
2868.5 *11*	(3+)	D H M Y	XREF: M(2876)Y(2876). Jπ: L(d,p)=1+3 from 3/2−; L(d,α)=4 from 0+; L(^{3}He,p)=2.
2892.35 *7*	(1+)	G K M Y	XREF: M(2891)Y(2891). Jπ: L(d,p)=1+3 from 3/2− and L(d,α)=0(+2) from 0+.
2896.79 *7*	(3+)	G I	Jπ: 440.1γ to (1+), 1127.8γ to (5+).
2909 *10*	1+	D M Q Y	XREF: M(?). E(level): weighted average of 2907 *10* from (^{3}He,p), 2913 *11* from (d,p), 2905 *10* from (^{3}He,t), and 2913 *11* from (d,α). Jπ: L(^{3}He,t)=0 from 0+; L(d,p)=1 from 3/2−; L(d,α)=(0+2) from 0+; L(^{3}He,p)=(0+2).
2914.3 *10*	(5−)	B	Jπ: ΔJ=1, dipole γ to (4)+.
2925.8 *4*	(6−)	B	Jπ: ΔJ=(0), M1+E2 γ to (6−).
2932.54 *10*	(2−)	G I M Y	XREF: M(2931)Y(2931). Jπ: L(d,p)=0+2 from 3/2− and L(d,α)=(1+3) from 0+.
2949.5 *7*	(5−)	B	Jπ: ΔJ=1, D+Q γ to (6−).
2965.5 *7*	(5−)	B	Jπ: ΔJ=1, D+Q γ to (6−).
2970 *11*	(3+,4+,5+)	M R Y	XREF: M(2970)R(2982)Y(2970). Jπ: L(d,α)=4 from 0+. Also L(^{6}Li,^{6}He)=(2) from 0+.
2985 *11*	(2−)	D M Q	XREF: Q(2981). Jπ: L(d,p)=0+2 from 3/2−; L(^{3}He,p)=3.
3013.30 *5*	(1−,2−)	G I M q	XREF: M(3009)q(3024). Jπ: L(d,p)=0(+2) from 3/2−.
3033.56 *12*	(2−)	G I M q	XREF: M(3030)q(3024). Jπ: primary γ from 1− in (n,γ) E=2.038 keV and L(d,p)=2 from 3/2− gives *J*π=(0−,1−,2−); 1293.9γ to the 1740 level with *J*π limited to (3+,4+,5+) by L(d,α)=4 from 0+. *J*π(3033.6)=(2−) then further limits *J*π(1740) to be (3+).
3051.1 *7*	(7−)	B E M	XREF: M(3043). Jπ: ΔJ=1, M1+E2 γ to (6−).

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Adopted Levels, Gammas (continued)

^{64}Cu Levels (continued)

E(level)[†]	J^{π}[&]	XREF	Comments
3051.75 *9*	$(\le3^+)$[d]	G M	XREF: M(3055).
3071.5 *11*	(2^-)	D H M Q	XREF: D(3066)M(3077)Q(3064). J^π: L(^{3}He,p)=1(+3); primary γ from 2^- in (n,γ) E=0.579 keV; L(d,p)=4 from $3/2^-$.
3080.85 *9*	$(2^-,3^-)$	G K M	XREF: M(3089). J^π: primary γ from $1^-,2^-$ in (n,γ) E=th; 583.2γ to $(1,2^+)$; L(d,p)=(4) from $3/2^-$.
3111.77 *8*	$(1^+,2)$	G I	J^π: primary γ from 1^- in (n,γ) E=2.038 keV; γs to 1^+ and (3^+).
3125.06 *13*	$(1^+,2^+)$	D G I Q	XREF: D(3130)Q(3122). J^π: L(^{3}He,p)=2 from 0^+; primary γ from 1^- in (n,γ) E=2.038 keV.
3126.0 *3*	(7^-)	B E	J^π: ΔJ=1, (M1+E2) γ to (6^-).
3.15×10^3 *15*	1^+	V	E(level): binned data from 3.0 to 3.25 MeV. Gamow-Teller transition from 0^+ g.s. of ^{64}Zn in (^{3}He,t). J^π: L(^{3}He,t)=0.
3154 *10*	(0 to 4)$^{(-)}$	M	J^π: L(d,p)=(2) from $3/2^-$.
3176.9 *7*		B	J^π: γ to (6^-).
3190.85 *11*	1^+	D GH M QR U	XREF: M(3192)Q(3185)R(3195)U(3190). J^π: L(^{3}He,t)=L(d,^{2}He)=0; L(^{3}He,p)=2. Others: L(d,p)=0 from $3/2^-$ for 3192+3233 suggesting negative parity is inconsistent; L(d,^{2}He)=0, Gamow-Teller transition in (d,^{2}He), (t,^{3}He).
3191.1 *4*	(8^-)	AB E	XREF: A(3200). J^π: ΔJ=1, (M1+E2) γ to (7^-); ΔJ=2, (E2) γ to 6^-.
3207.53 *8*	(0,1,2)	G I Q	J^π: γ to 1^+; primary γ from 1^- in (n,γ) E=2.038 keV.
3231 *10*	$(1^+,2^+,3^+)$	D M	J^π: L(^{3}He,p)=2.
3257.55 *6*	$(1^+,2^+)$	D G I K M Q	XREF: M(3260)Q(3252). J^π: L(^{3}He,p)=2; γ to 1^+; primary γ from 1^- in (n,γ) E=2.038 keV.
3268.4 *7*	$(6,7,8^-)$	B	J^π: γ to (6^-), and yrast pattern of population in (^{7}Li,pnγ) reaction.
3278.6 *7*	$(7,8,9^-)$	B	J^π: γ to (7^-), and yrast pattern of population in (^{7}Li,pnγ) reaction.
3296 *10*	$(3^+,4^+,5^+)$	D M q	XREF: M(3290). J^π: L(^{3}He,p)=4. See comment for 3313 level.
3313.09 *8*	(0,1,2)	G I K M q	XREF: M(3311). J^π: γ to 1^+; primary γ from 1^- in (n,γ) E=2.038 keV; L(d,p)=0 from $3/2^-$ for 3290+3311 suggests $J^\pi=1^-,2^-$.
3343.98 *17*	$(0^-,1,2,3^+)$[c]	fGH Q	XREF: f(3340)Q(3339). J^π: γs to 1^+ and $(2)^-$.
3351.5 *8*	(6^-)	B	J^π: ΔJ=1, D+Q γ to (5^-).
3352.83 *4*	$(1,2,3^-)$[a]	fG I	XREF: f(3340). J^π: 1447.69γ to (2^-), 3074.9γ to 2^+; primary γ from 1^- in (n,γ) E=2.038 keV.
3376.4 *5*	(6^-)	B	J^π: ΔJ=1, D+Q γ to (5^+); 6^- proposed in (^{7}Li,pnγ).
3412.12 *9*	$(1^-,2^-)$	D G I K M	XREF: D(3397)M(3411). J^π: L(^{3}He,p)=1; L(d,p)=(0) from $3/2^-$ for a doublet; γs to 2^+.
3440.18 *7*	$(0^+,1,2,3^-)$[a]	G I M	XREF: M(3448). J^π: γ to $(2^+,3^+)$.
3465.57 *12*	$(0^-,1,2,3^-)$[a]	d G I m	J^π: L(^{3}He,p)=2 for 3472+3513 suggests $1^+,2^+,3^+$ for any of the five levels in the range 3465-3524; γ to (2^-).
3475.20 *16*	$(0^+,1,2)$[a]	d G I K m	XREF: d(3472)m(3475). J^π: γ to 1^+ and 2^+. L(d,p)=2 from $3/2^-$ for a triplet suggests 0 to 4^-. See J^π comment for 3465 level.
3488.6 *5*	(8^-)	B	J^π: ΔJ=1, D+Q γ to (7^-).
3493.35 *19*	$(0^+,1,2,3)$[b]	d G K M	XREF: d(3472)M(3492).

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Adopted Levels, Gammas (continued)

^{64}Cu Levels (continued)

E(level)[†]	Jπ[&]	XREF	Comments
			Jπ: γ to 2⁺. See Jπ comment for 3465 level.
3510.55 *6*	(1,2)	d GHI M	XREF: d(3513)M(3515). Jπ: primary γs from 2⁻ and 1⁻ in (n,γ) E=0.579 and 2.038 keV; γs to 1⁺ and 2⁺. See Jπ comment for 3465 level.
3524.64 *11*	0⁺,1⁺	d G K Q	XREF: d(3513)Q(3522). Jπ: L(^{3}He,t)=0 from 0⁺.
3596.00 *6*	(0,1,2)[a]	d G I m	XREF: d(3607)m(3604). Jπ: γ to 1⁺ and primary γ from 1⁻. See Jπ comment for 3603 level.
3603.09 *15*	(1,2⁺)	d G m	XREF: d(3607)m(3604). Jπ: 2724.8γ to (0)⁺. L(d,p)=2 from 3/2⁻ for 3604+3623 suggests 0 to 4⁻. L(^{3}He,p)=1 for a 3607 group suggests 0⁻,1⁻,2⁻ for any of the two levels near this energy.
3604.9 *4*	(7⁻)	B	Jπ: ΔJ=1, (M1+E2) γ to (6⁻); ΔJ=2, (E2+M3) γ to (5⁻).
3629.40 *9*	(0,1,2,3⁻)[a]	G I M	XREF: M(3623).
3674 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 3674+3705 levels.
3681.6 *10*	(6,7,8⁻)	B	Jπ: γ to 6⁻, and yrast pattern of population in (^{7}Li,pnγ) reaction.
3686.7 *10*	(7⁻)	B	Jπ: ΔJ=1, D+Q γ to 6⁻.
3687 *10*		D M	Jπ: L(^{3}He,p)=2 for 3686+3713 suggests 1⁺,2⁺,3⁺ for any of these two levels.
3711.80 *14*	(0⁺,1⁺)	D G I M Q	XREF: Q(3705). Jπ: L(^{3}He,t)=0 for composite of 3674+3705 levels.
3734.1 *8*	(7,8,9⁻)	B	Jπ: γ to (7⁻), and yrast pattern of population in (^{7}Li,pnγ) reaction.
3763 *10*		D M	Jπ: L(^{3}He,p)=2 for 3763+3802 suggests 1⁺,2⁺,3⁺ for any of these two levels.
3783.16 *8*	(1,2⁺)	G I K M	XREF: M(3791). Jπ: γs to 2⁺ and (0)⁺; primary γ in (n,γ) E=2.038 keV. L(d,p)=(0) from 3/2⁻ for 3763+3791 suggests 1⁻,2⁻ for one level.
3790 *30*	(9⁺)	F	E(level): energy is consistent with 3798 level from (α,pnγ) and (^{7}Li,pnγ), but Jπ assignment from (α,d) is in disagreement with (9⁻) from in-beam γ-ray work. Jπ: L(α,d)=8 for a 3790 group and agreement of σ(θ) with DWBA calculations for configuration=$\pi g_{9/2}\otimes\nu g_{9/2}$.
3800.1 *4*	(9⁻)	B E	E(level): see comment for 3790 level. Jπ: ΔJ=1, M1+E2 γ to (8⁻); ΔJ=2, Q γ to (7⁻).
3802.73 *13*	(0⁺,1⁺)	D G Q	XREF: Q(3804). Jπ: L(^{3}He,t)=0 for composite of 3804+3827 levels; L(^{3}He,p)=2 for a group at 3802 *10* suggests (1⁺,2⁺,3⁺).
3826.92 *10*	(1⁺)	G Q	XREF: Q(3827). Jπ: L(^{3}He,t)=0 for composite of 3804+3827 levels; γ to 3⁺.
3902 *10*	(1⁻,2⁻)	D M	Jπ: L(d,p)=0 from 3/2⁻; L(^{3}He,p)=1.
3970 *10*	(1⁺)	D Q	Jπ: L(^{3}He,t)=0 for composite of 3966+3995+4031+4063+4101+4136 levels, and Gamow-Teller transition for 3966 level. Also L(^{3}He,p)=2.
3987.8 *6*	(9⁻)	B E	Jπ: ΔJ=2, (E2) γ to (7⁻).
3990.85 *21*	(1⁺)	G QR U	XREF: Q(3995)R(3998)U(4010). Jπ: L(^{3}He,t)=0 for composite of 3966+3995+4031+4063+4101+4136 levels, and Gamow-Teller transition for 3966 level; γ to 3⁺.
4034.01 *8*	(1⁺)	D G I M QR	XREF: M(4020)Q(4031)R(4039). Jπ: L(^{3}He,p)=2; γ to 1⁺; L(^{6}Li,^{6}He) from 0⁺ for 4039+3998; L(^{3}He,t)=0 for composite of 3966+3995+4031+4063+4101+4136 levels. But L(d,p)=2 from 3/2⁻ suggests π=−.
4071.59 *10*	(1⁺)	G Q	XREF: Q(4063). Jπ: L(^{3}He,t)=0 for composite of 3966+3995+4031+4063+4101+4136 levels, and Gamow-Teller transition for 4063 level.
4101 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 3966+3995+4031+4063+4101+4136

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Adopted Levels, Gammas (continued)

^{64}Cu Levels (continued)

E(level)[†]	Jπ[&]	XREF	Comments
			levels.
4140.84 *11*	(0⁻,1⁻,2⁻)	D G M Q	XREF: M(4130)Q(4136). Jπ: γ to 1⁺; L(d,p)=2 from 3/2⁻; L(^{3}He,p)=1. L(^{3}He,t)=0 for composite of 3966+3995+4031+4063+4101+4136 levels suggests (0⁺,1⁺).
4162.0 *8*	(6,7,8⁻)	B	Jπ: γ to (6⁻), and yrast pattern of population in (^{7}Li,pnγ) reaction.
4164.7 *8*	(7,8,9⁻)	B	Jπ: γ to (7⁻), and yrast pattern of population in (^{7}Li,pnγ) reaction.
4166.4 *5*	(9⁻)	B	Jπ: ΔJ=2, Q γ to (7⁻).
4205 *10*	1⁺	Q U	XREF: U(4190). Jπ: L(d,^{2}He)=0 and Gamow-Teller transition; L(^{3}He,t)=0 for composite of 4205+4222 level.
4222 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 4205+4222 levels.
4257 *10*	(2⁻,3⁻,4⁻)	D	Jπ: L(^{3}He,p)=3.
4264.07 *17*	(1,2⁺)	G I	Jπ: γ to (0)⁺.
4269.3 *6*	(7,8,9⁻)	B	Jπ: γ to (7⁻), and yrast pattern of population in (^{7}Li,pnγ) reaction.
4293 *10*	(1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 4293+4311 levels, and Gamow-Teller transition for 4293 level.
4311 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 4293+4311 levels.
4316 *10*	(4⁻)	D M	Jπ: L(^{3}He,p)=5; L(d,p)=(2) from 3/2⁻.
4327.41 *11*	(1⁺,2⁺)	G I R	XREF: R(4308). Jπ: primary γ from 1⁻ in (n,γ); γ to (3)⁺; L(^{6}Li,^{6}He)=2.
4360.1 *7*	(9,10,11⁻)	B	Jπ: γ to (9⁻), and yrast pattern of population in (^{7}Li,pnγ) reaction.
4373 *10*	1⁺	Q U	XREF: U(4390). Jπ: L(d,^{2}He)=0 and Gamow-Teller transition. L(^{3}He,t)=0 for composite of 4373+4413+4452 levels.
4413 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 4373+4413+4452 levels.
4430 *10*	(4⁻,5⁻,6⁻)	D	Jπ: L(^{3}He,p)=5.
4432.95 *24*	(1⁻,2⁻)	G M	XREF: M(4420). Jπ: L(d,p)=0 from 3/2⁻.
4444.48 *17*	(0⁺,1⁺)	G Q	XREF: Q(4452). Jπ: L(^{3}He,t)=0 for composite of 4373+4413+4452 levels.
4549.48 *19*	(0,1,2,3⁻)[a]	A G I	XREF: A(4530).
4552.0 *8*	(8,9,10⁻)	B	Jπ: γ to (8⁻), and yrast pattern of population in (^{7}Li,pnγ) reaction.
4556.2 *11*	(7,8,9⁻)	B	Jπ: γ to (7⁻), and yrast pattern of population in (^{7}Li,pnγ) reaction.
4560 *30*	(7⁺)	F	Jπ: possible configuration=$\pi g_{9/2}\otimes\nu d_{5/2}$ or configuration=$\pi d_{5/2}\otimes\nu g_{9/2}$ and systematics of population in (α,d) (1994Fi01).
4568.5 *6*	(10⁻)	B	Jπ: ΔJ=2, (E2) γ to (8⁻).
4571 *10*	(4⁻,5⁻,6⁻)	D	Jπ: L(^{3}He,p)=5.
4599 *10*	(1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 4599+4630 levels, and Gamow-Teller transitions for both the levels.
4630 *10*	(1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 4599+4630 levels, and Gamow-Teller transitions for both the levels.
4670	(1⁺,2⁻)	U	E(level): this level may correspond to 4630 in (^{3}He,t). Jπ: σ(θ) in L(d,^{2}He).
4691.7 *11*	(7,8,9⁻)	B	Jπ: γ to (7⁻), and yrast pattern of population in (^{7}Li,pnγ) reaction.
4763.38 *12*	1⁺	G Q U	XREF: Q(4744)U(4760). Jπ: L(d,^{2}He)=0; L(^{3}He,t)=0.
4877 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 4877+4916+4957+5000+5030+5053+5116 levels.
4898.5 *9*	(10⁻)	B	Jπ: ΔJ=1, (M1+E2) γ to (9⁻).
4916 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 4877+4916+4957+5000+5030+5053+5116 levels.
4957 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 4877+4916+4957+5000+5030+5053+5116 levels.
5000 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of

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Adopted Levels, Gammas (continued)

^{64}Cu Levels (continued)

E(level)†	Jπ&	XREF	Comments
			4877+4916+4957+5000+5030+5053+5116 levels.
5030 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 4877+4916+4957+5000+5030+5053+5116 levels.
5043 *10*	(2⁻)	D M U	XREF: M(5000)U(5060). Jπ: L(d,p)=2 from 3/2⁻; L(^{3}He,p)=3; 2⁻ from (d,^{2}He).
5053 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 4877+4916+4957+5000+5030+5053+5116 levels; and 5053 level interpreted as Gamow-Teller transition.
5085.6 *8*	(9)	B	Jπ: ΔJ=1, D+Q γ to (8⁻).
5095.8 *8*	(9)	B	Jπ: ΔJ=1, D+Q γ to (8⁻).
5116 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 4877+4916+4957+5000+5030+5053+5116 levels.
5198 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5198+5227 levels.
5227 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5198+5227 levels.
5320 *10*	(2⁻,3⁻,4⁻)	D F	XREF: F(5350). Jπ: L(^{3}He,p)=3.
5322 *10*	0⁺,1⁺	Q	Jπ: L(^{3}He,t)=0.
5397 *10*	0⁺,1⁺	Q	Jπ: L(^{3}He,t)=0.
5513 *10*	0⁺,1⁺	Q	Jπ: L(^{3}He,t)=0.
5569 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5569+5617 levels levels.
5617 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5569+5617 levels levels.
5665 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5665+5705 levels.
5686.5 *9*	(11)	B	Jπ: ΔJ=2, Q γ to (9⁻).
5705 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5665+5705 levels.
5809 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5809+5864+5922+5967+6030+6116+6156+6201 levels.
5864 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5809+5864+5922+5967+6030+6116+6156+6201 levels.
5912.6 *11*	(9,10,11⁻)	B	Jπ: γ to (9⁻), and yrast pattern of population in (^{7}Li,pnγ) reaction.
5917.5 *11*	(10)	B	Jπ: ΔJ=1, D+Q γ to (9⁻).
5922 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5809+5864+5922+5967+6030+6116+6156+6201 levels.
5967 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5809+5864+5922+5967+6030+6116+6156+6201 levels.
6003 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5809+5864+5922+5967+6030+6116+6156+6201 levels.
6070.2 *11*	(10)	B	Jπ: ΔJ=1, D+Q γ to (9⁻).
6116 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5809+5864+5922+5967+6030+6116+6156+6201 levels.
6156 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5809+5864+5922+5967+6030+6116+6156+6201 levels.
6201 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 5809+5864+5922+5967+6030+6116+6156+6201 levels.
6321 *10*	0⁺,1⁺	Q	Jπ: L(^{3}He,t)=0.
6413 *10*	0⁺,1⁺	Q	Jπ: L(^{3}He,t)=0.
6464 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 6464+6493+6529+6570 levels.
6493 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 6464+6493+6529+6570 levels.
6529 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 6464+6493+6529+6570 levels.
6570 *10*	(0⁺,1⁺)	Q	Jπ: L(^{3}He,t)=0 for composite of 6464+6493+6529+6570 levels.
≈6630		A	
6740 *10*	0⁺,1⁺	Q	Jπ: L(^{3}He,t)=0.
6810 *6*	0⁺	O Q	E(level): 6810 and 6826 form a doublet in (^{3}He,t) with L=0. Jπ: component of IAS of ^{64}Ni g.s.; L(^{3}He,t)=0.
6826 *6*	0⁺	D Q	E(level): 6810 and 6826 form a doublet in (^{3}He,t) with L=0. Jπ: component of IAS of ^{64}Ni g.s.; L(^{3}He,p)=0; L(^{3}He,t)=0.

Adopted Levels, Gammas (continued)

^{64}Cu Levels (continued)

E(level)†	Jπ&	XREF	Comments
7339 *10*	(1$^+$)	D	Jπ: L(^{3}He,p)=0(+2).

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Adopted Levels, Gammas (continued)

^{64}Cu Levels (continued)

E(level)†	Jπ&	XREF	Comments
(7916.403 *16*)	1⁻,2⁻	G	S(n)=7915.868 *24* (2021Wa16). S(n)=7915.867 *24* (2016Te05, measured from energy of primary ground state transition. Jπ: s-wave capture in ^{63}Cu (g.s. Jπ=3/2⁻). From γ(θ) in (pol n,γ) on oriented ^{63}Cu, J=1 fraction determined as 94% *2* (1983De28). From γ(circ pol), J=1 fraction >92% (1973Ko16).
7916.438 *24*	2⁻	H	E(level): resonance state with S(n)+E(n), where E(n)(lab)=0.579 keV *1* (2018MuZY), S(n)=7915.868 *24* (2021Wa16). Jπ: from 2018MuZY.
7917.874 *24*	1⁻	I	E(level): resonance state with S(n)+E(n), where E(n)(lab)=2.038 keV *3* (2018MuZY), S(n)=7916.868 *24* (2021Wa16). Jπ: from 2018MuZY.
7918.469 *24*	2⁻	J	E(level): resonance state with S(n)+E(n), where E(n)(lab)=2.642 keV *4* (2018MuZY), S(n)=7916.868 *24* (2021Wa16). Jπ: from 2018MuZY.
(7938.49)	(1,2,3⁺)	K	E(level): resonance state with S(n)+E(n), where E(n)(lab)=24 keV, S(n)=7916.868 *24* (2021Wa16). Jπ: s- or p-wave capture in ^{63}Cu g.s., Jπ=3/2⁻; γ to (0)⁺.
8188 *10*	(2⁺)	D O	XREF: O(8170). Jπ: IAS of first 2⁺ state of ^{64}Ni; L(^{3}He,p)=2.
11×10³ *1*	⁻	V	E(level): binned data from 11 to 12 MeV. Jπ: L(t,^{3}He)=1.

† From a least-squares fit to Eγ data for levels populated in γ-ray studies. Reduced χ^2 of 2.8 is somewhat larger than critical χ^2 of 1.2, as some of the primary Eγ values from capture states do not agree well with the fitted values. Above 1 MeV excitation, matching of level energies from different reactions is somewhat ambiguous due to high level density.

‡ From pulsed beam in ^{64}Ni(p,nγ) (1976Wh01), unless noted otherwise.

Other less precise $T_{1/2}$ measurements: 13.02 h *33* (2006Ab30), 12.82 h *4* (1973Ne02, 511-radiation counting); 12.58 h *96* (1973ArZI, scintillation detector); 12.4 h *17*, 13.6 h *7*, 13.8 h *14* (1972Cr02, Ge(Li) detector); 12.65 h *17* (1969Bo11, NaI well-type detector); 12.80 h *4* (1968Ke12); 12.8 h (1967Vi08), 12.86 h *3* (1966Li09); 12.70 h *3* (1966Fu16, coincidence method); 12.86 h *3* (1965Pa18, NaI detector); 13.5 h, 13.9 h (1965He08); 12.85 h *5* (1959Po64); 12.8 h (1957Be46); 12.80 h *3* (1955To07); 12.88 h *3* (1951Si91); 12.9 h (1951Ku42); 12.8 h (1951St89); 12.74 h *7* (1951Sc56); 12.80 h *4* (1950Ra62); 12.8 h (1950Ho26); 12.8 h (1949Pe09); 13 h (1948Mi12); 12.8 h (1947Se33); 11.9 h *10* (1944Hu05,1943Hu03); 12.8 h (1939De01); 12.8 h *3* (1939Sa02); 12.8 h *3* (L.N. Ridenour et al., Phys. Rev. 53, 770 (1938); 12 h (1937He05); 16 h (1937Bo10); 12.8 h *1* (1936Va02); 10 h (1935Am01).

@ Variation of $T_{1/2}$ with chemical environment and temperature studied by 2008Fa12, 1987MaZL, 1979Ko31, 1979Eh01, 1977Do07, 1975MaXN, 1976Ha66, 1975He03, 1974Jo17, 1973De56, 1973Ha60, 1972Em01, 1972-Auric (P. Auric and J.I. Vargas, Chem. Phys. Lett. 15, 366 (1972)), 1968Ke12. A change of 1 to 2% with chemical form of the samples reported by 1968Ke12 is not confirmed by others.

& Due to high level density above 1 MeV, the Jπ values indicated by L-transfers in particle reaction studies are given in parentheses. Correspondence of levels seen in different reactions is not unique. L-transfers from multi-nucleon transfer reactions such as (^{3}He,p) and (d,α) are considered as weak arguments due to reaction mechanism not well known.

[a] Primary transition from 1⁻ (in ^{63}Cu(n,γ) E=2.038 keV) suggests 0,1,2,3⁻ with 3⁻ less likely for strong primary transitions.

[b] Primary transition from 1⁻,2⁻ (in ^{63}Cu(n,γ) E=th) suggests 0,1,2,3,4⁻ with 4⁻ less likely for strong primary transitions.

[c] Primary transition from 2⁻ (in ^{63}Cu(n,γ) E=0.577 and/or ^{63}Cu(n,γ) E=2.66 keV) suggests 0⁻,1,2,3,4⁻ with 0⁻ and 4⁻ less likely for strong primary transitions.

[d] Transition to 1⁺ (g.s.) suggests (0,1,2,3⁺).

$\gamma(^{64}Cu)$

E_i(level)	J_i^π	E_γ†	I_γ†	E_f	J_f^π	Mult.‡	δ‡	α[d]	Comments
159.282	2^+	159.280 *3*	100	0.0	1^+	M1(+E2)	<0.055	0.0160 *4*	B(M1)(W.u.)=0.26 *+6−4*; B(E2)(W.u.)<63 δ: from measured B(E2)(W.u.)<49 in Coulomb excitation and $T_{1/2}$=21 ps *4*. Others: +0.12 *4*, +0.02 *1*, +0.04 *4*, 0.02 *4*, −0.01 *2* in (p,nγ), +0.035 in (α,pnγ). Assuming $T_{1/2}$ is correct, δ=+0.12 *4* gives B(E2)(W.u.)=250 *170* which is larger than B(E2)(W.u.)<49 measured in Coulomb excitation.
278.256	2^+	118.8 *5*		159.282	2^+	[M1+E2]		0.18 *15*	
		278.244 *10*	100	0.0	1^+	M1+E2	+0.10 *2*	0.00398 *7*	B(M1)(W.u.)>0.11; B(E2)(W.u.)>16
343.897	1^+	184.612 *10*	4 *1*	159.282	2^+	(M1(+E2))	+0.10 *10*	0.0113 *15*	B(M1)(W.u.)>0.024 Branching ratios from (p,nγ) (1976Gr13). δ: RUL(E2)=300 does not allow other possible δ=−3.0 to −7.1.
		343.94 *3*	100 *1*	0.0	1^+	[M1+E2]		0.0043 *20*	B(M1)(W.u.)>0.13 Branching ratios from (p,nγ) (1976Gr13). δ: any value possible from $\gamma(\theta)$ in (p,nγ). B(M1)(W.u.) for pure M1. B(E2)(W.u.)>1827 for pure E2 is much larger than RUL=300, suggesting that δ(E2/M1)<0.4.
362.230	3^+	84.0 *5*	0.62 *8*	278.256	2^+	[M1]		0.086	B(M1)(W.u.)>0.047 E_γ,I_γ: from ^{7}Li,pnγ). B(M1)(W.u.) for pure M1. B(E2)(W.u.)>11090 for pure E2 is much larger than RUL=300, suggesting that δ(E2/M1)<0.017.
		202.948 *5*	100.0 *5*	159.282	2^+	M1+E2	+0.06 *3*	0.0086 *2*	B(M1)(W.u.)>0.62; B(E2)(W.u.)>23 I_γ: from ^{7}Li,pnγ).
		362.30 *5*	2.4 *2*	0.0	1^+	[E2]			B(E2)(W.u.)>31 E_γ,I_γ: from (n,γ) E=th.
574.614	$(4)^+$	212.388 *10*	100	362.230	3^+	(M1(+E2))	+0.01 *3*	0.00757 *12*	B(M1)(W.u.)>0.13
		415.26 *10*	3.4 *6*	159.282	2^+	[E2]			B(E2)(W.u.)>4.8 E_γ: from (d,pγ). I_γ: from (^{7}Li,pnγ).
608.784	2^+	264.882 *18*	7 *1*	343.897	1^+	M1+E2	+0.24 *17*	0.0050 *11*	B(M1)(W.u.)>0.0054; B(E2)(W.u.)>0.74 Branching ratios from (p,nγ) (1976Gr13). These values are consistent with those from (p,nγ).
		330.47 *5*	5 *1*	278.256	2^+	[M1+E2]			B(M1)(W.u.)>0.0022; B(E2)(W.u.)>34 B(M1)(W.u.) for pure M1, B(E2)(W.u.) for pure E2.
		449.512 *10*	10 *1*	159.282	2^+	(M1(+E2))	+0.02 *7*		B(M1)(W.u.)>0.0019
		608.75 *3*	100 *2*	0.0	1^+	M1+E2	+0.30 *8*		B(M1)(W.u.)>0.0075; B(E2)(W.u.)>1.8
662.99	1^+	318.9 *7*	19 *3*	343.897	1^+	M1+E2			B(M1)(W.u.)>0.0041; B(E2)(W.u.)>68 Branching ratios from (p,nγ) (1976Gr13). Values are consistent with those from (n,γ). δ: +0.2 to +5.7. B(M1)(W.u.) for pure M1, B(E2)(W.u.) for pure E2.
		384.74 *5*	109 *6*	278.256	2^+	(M1+E2)			B(M1)(W.u.)>0.016; B(E2)(W.u.)>177 δ: +0.07 *5* or −2.9 to −4.7. B(M1)(W.u.) for pure M1, B(E2)(W.u.) for pure E2.

$\gamma(^{64}Cu)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α[d]	Comments
662.99	1^+	503.65 *6*	84 *6*	159.282	2^+	[M1+E2]			B(M1)(W.u.)>0.0052; B(E2)(W.u.)>35 B(M1)(W.u.) for pure M1, B(E2)(W.u.) for pure E2.
		663.06 *5*	100 *6*	0.0	1^+	[M1+E2]			B(M1)(W.u.)>0.0028; B(E2)(W.u.)>11 B(M1)(W.u.) for pure M1, B(E2)(W.u.) for pure E2.
739.050	2^+	376.851 *20*	28 *2*	362.230	3^+	(M1(+E2))	−0.11 *18*		B(M1)(W.u.)>0.0056 Branching ratios from (n,γ).
		395.28 *15*	4.3 *7*	343.897	1^+	[M1+E2]			B(M1)(W.u.)>7.1×10^{-4}; B(E2)(W.u.)>7.7 B(M1)(W.u.) for pure M1, B(E2)(W.u.) for pure E2.
		460.792 *20*	15.2 *7*	278.256	2^+	(M1+E2)	−0.29 *25*		B(M1)(W.u.)>0.0014; B(E2)(W.u.)>0.023
		579.753 *10*	100 *3*	159.282	2^+	M1+E2	−0.18 *11*		B(M1)(W.u.)>0.0058; B(E2)(W.u.)>0.15
		739.12 *3*	10.8 *3*	0.0	1^+	[M1+E2]			B(M1)(W.u.)>3.2×10^{-4}; B(E2)(W.u.)>0.98 B(M1)(W.u.) for pure M1, B(E2)(W.u.) for pure E2.
746.241	$(3)^+$	137.38 *10*	12	608.784	2^+	[M1+E2]		0.10 *8*	B(M1)(W.u.)>0.052 Eγ from (d,pγ), Iγ from (p,nγ). Not reported in (n,γ). B(M1)(W.u.) for pure M1. B(E2)(W.u.)<4660 for pure E2 is much larger than RUL=300, suggesting δ(E2/M1)<0.26.
		383.7 *5*	8.6 *18*	362.230	3^+	(M1)			B(M1)(W.u.)>0.0017 E_γ: from (α,pnγ) and (^{7}Li,pnγ). Not reported in (n,γ). I_γ: from (^{7}Li,pnγ). Other: 30 in (α,pnγ).
		467.992 *10*	100	278.256	2^+	M1+E2	+0.08 *3*		B(M1)(W.u.)>0.013; B(E2)(W.u.)>0.25
		588[@] *1*		159.282	2^+				
774.6	(1)	412.4 *5*	100	362.230	3^+	Q			
820.7	(4)	458.5 *5*		362.230	3^+	D			
878.274	$(0)^+$	534.11 *8*	71 *6*	343.897	1^+	(M1)			B(M1)(W.u.)>0.0036
		600[@e]		278.256	2^+				
		718.7 *5*	6 *2*	159.282	2^+	[E2]			B(E2)(W.u.)>0.28 Eγ from (d,pγ), Iγ from (p,nγ). Not reported in (n,γ) and (^{7}Li,pnγ).
		878.277 *20*	100 *2*	0.0	1^+	[M1]			B(M1)(W.u.)>0.0012
895.705	$(3)^+$	149.3[@e] *5*		746.241	$(3)^+$				
		157.4[@e] *5*		739.050	2^+				
		320.7 *5*	29	574.614	$(4)^+$	(D+Q)			I_γ: from (α,pnγ). Others: 24 *24* in (n,γ), 121 *10* in (^{7}Li,pnγ). This γ has been reported in several γ-ray studies, but with different intensities, while not reported in (p,nγ).
		533.6 *5*	79 *8*	362.230	3^+	[M1+E2]			B(M1)(W.u.)>0.0021; B(E2)(W.u.)>12 E_γ: weighted average from (d,pγ) and (^{7}Li,pnγ). This γ not reported in (p,nγ). I_γ: from (^{7}Li,pnγ) only. B(M1)(W.u.) for pure M1, B(E2)(W.u.) for pure E2.
		617.433 *20*	100 *3*	278.256	2^+	M1+E2			B(M1)(W.u.)>0.0017; B(E2)(W.u.)>7.7 Note that 617γ is the only transition from the 895 level seen in several γ-ray studies, for example (n,γ) E=Th; (p,nγ); (^{7}Li,pnγ); (α,pnγ), and other reactions with γ rays.

γ(^{64}Cu) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	Comments
							δ: +0.07 to +2.5. B(M1)(W.u.) for pure M1, B(E2)(W.u.) for pure E2.
895.705	(3)$^+$	736.52 *9*	10 *1*	159.282	2$^+$	[M1+E2]	B(M1)(W.u.)>9.4×10^{-5}; B(E2)(W.u.)>0.29 δ: +0.40 *13* for a possible doublet (736.5γ+739.1γ). I_γ: from (n,γ) E=thermal. Other: 82 *8* in (p,nγ). This γ not reported in (^{7}Li,pnγ). B(M1)(W.u.) for pure M1, B(E2)(W.u.) for pure E2.
		896.0 *8*	22 *8*	0.0	1$^+$	[E2]	B(E2)(W.u.)>0.18 E_γ: unweighted average from (p,nγ) and (^{7}Li,pnγ). I_γ: from (p,nγ) only.
927.080	1$^+$	565.0[#] *5*	13	362.230	3$^+$	[E2]	B(E2)(W.u.)>4.0 May be the same as 565.43γ from 1461 level.
		648.80 *4*	100 *4*	278.256	2$^+$	[M1+E2]	B(M1)(W.u.)>0.0048; B(E2)(W.u.)>19 δ: +0.04 *11* or −2.5 to −5.7. B(M1)(W.u.) for pure M1, B(E2)(W.u.) for pure E2.
		767.795 *10*	23.7 *5*	159.282	2$^+$	[M1+E2]	B(M1)(W.u.)>6.6×10^{-4}; B(E2)(W.u.)>1.9 B(M1)(W.u.) for pure M1, B(E2)(W.u.) for pure E2.
		927.05 *3*	11.6 *3*	0.0	1$^+$	[M1+E2]	B(M1)(W.u.)>1.8×10^{-4}; B(E2)(W.u.)>0.36 B(M1)(W.u.) for pure M1, B(E2)(W.u.) for pure E2.
1096.5	(2$^+$)	937.2 *5*	100	159.282	2$^+$	D+Q	
1241.087	1$^{(+)}$,2$^{(+)}$	362.9[@e] *5*		878.274	(0)$^+$		Main placement from 362 level.
		494.852 *10*	100 *5*	746.241	(3)$^+$		γ not reported in (^{7}Li,pnγ).
		632.34 *3*	39 *2*	608.784	2$^+$		γ not reported in (^{7}Li,pnγ).
		877.5 *5*		362.230	3$^+$		E_γ: from (^{7}Li,pnγ).
		962.68 *4*	65 *2*	278.256	2$^+$		
		1081.74 *3*	49 *2*	159.282	2$^+$		γ not reported in (^{7}Li,pnγ).
1242.64	(0,1,2,3$^+$)	1242.56 *8*	100	0.0	1$^+$		
1287.15	(1$^+$,2,3$^-$)	924.91 *5*	100	362.230	3$^+$		
1287.96	(0$^+$,1,2,3$^+$)	624.7 *5*	45	662.99	1$^+$		
		1010.0[#] *5*	40	278.256	2$^+$		May be the same as 1009.35γ from 1905 level.
		1128.4 *5*	100	159.282	2$^+$		
1290.7?	(2$^+$)	627.6 *5*		662.99	1$^+$		
		947.2 *5*		343.897	1$^+$	D	
		1131.2 *5*		159.282	2$^+$		
1298.121	(1)$^+$	558.2[#] *5*	6	739.050	2$^+$		
		954.0[#] *5*	19	343.897	1$^+$		May be the same as 953.97γ from 2274 level.
		1019.7[#] *5*	52	278.256	2$^+$		May be the same as 1019.59γ from 1594.2 level.
		1138.821 *20*	100 *2*	159.282	2$^+$		
		1298.134 *20*	50 *2*	0.0	1$^+$		
1320.335	(1$^+$,2$^+$,3$^+$)	711.7[#] *5*	11	608.784	2$^+$		May be the same as 711.94γ from 2075 level.
		958.0[#e] *5*		362.230	3$^+$		
		976.5[#] *5*	13	343.897	1$^+$		

$^{64}_{29}$Cu$_{35}$-17

γ(^{64}Cu) (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	δ‡	Comments
1320.335	(1+,2+,3+)	1041.5# 5	8	278.256	2+			
		1320.315 20	100	0.0	1+			
1354.25	(3)+	608.9@e 5		746.241	(3)+			Main placement from 609 level.
		779.65& 7	34 2	574.614	(4)+			
		992.11 9	29 2	362.230	3+	(M1+E2)		Mult.: from $\gamma(\theta)$ and Pol in (^{7}Li,pnγ).
		1076.3@e 5		278.256	2+			May be the same as 1076.35γ from 1439 level.
		1194.89 3	100 3	159.282	2+			
		1354.68& 19	18 3	0.0	1+			
1363.17	(1,2,3+)	1085.3# 5	<133	278.256	2+			
		1363# 1	100	0.0	1+			May be the same as 1361.76γ from 1521 level.
1436.2	(4+)	861.3 5	100	574.614	(4)+	D+Q		
1438.75	(1)+	700.1@ 5		739.050	2+			
		775.9& 3	6.5 11	662.99	1+			
		831@ 1		608.784	2+			
		1076.35 5	100 4	362.230	3+			
		1161.7 5	<107	278.256	2+			E_γ: from (d,pγ). Eγ=1159.3 5 in (p,nγ). Not reported in (n,γ) E=th. I_γ: from (p,nγ).
		1279.41 4	71 3	159.282	2+			
		1438.75 7	48 3	0.0	1+			
1461.38	(2−)	565.43 17	82 27	895.705	(3)+			E_γ: from (n,γ) E=th.
		1099.6 5	100 52	362.230	3+	D+Q		E_γ: weighted average from (p,nγ) and (^{7}Li,pnγ).
1499.20	(2)−	890.5# 5	77	608.784	2+			May be the same as 890.26γ from 2498 level.
		1220.84 4	91 3	278.256	2+			
		1339.88& 4	100 4	159.282	2+			
		1499.54 13	63 5	0.0	1+			
1521.148	(2)+	858.09 19	23 3	662.99	1+			
		912.37 6	21 1	608.784	2+			
		947.0# 5	283	574.614	(4)+			
		1159.3# 5	<227	362.230	3+			May be the same as 1158.831γ from 1905 level.
		1177.04& 21	7 1	343.897	1+			
		1361.76& 3	100 3	159.282	2+			
		1521.20 3	85 3	0.0	1+			
1550.49	(1+,2+,3+)	812.0# 5	43	739.050	2+			
		1272.6# 5	464	278.256	2+			
		1391.25 12	100	159.282	2+			
1594.19	6−	1019.59 3	100.0 6	574.614	(4)+	(M2+E3)	−0.25	B(M2)(W.u.)=0.078 3; B(E3)(W.u.)=12 +5−4 δ: $\gamma(\theta)$ in (α,pnγ).
		1231.2e 7	1.04 10	362.230	3+	[E3]		B(E3)(W.u.)=0.57 6 E_γ,I_γ: from (^{7}Li,pnγ) only. Evaluators treat the placement from 1594, 6−

$^{64}_{29}Cu_{35}$-18

γ(^{64}Cu) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	Comments
							level as uncertain as it is possible that this γ corresponds to 1232.13γ from 1594, (1$^+$,2) level as seen in (n,γ) E=th.
1594.19	6$^-$	1314.7[e] *7*	3.2 *9*	278.256	2$^+$	[M4]	E_γ,I_γ: from (^{7}Li,pnγ) only. Evaluators treat the placement from 1594, 6$^-$ level as highly questionable as it requires mult=M4, with unrealistic B(M4)(W.u.)=6.6×10^6 *19*. It is possible that this γ corresponds to 1315.3γ from 1594, (1$^+$,2) level as seen in (d,pγ).
1594.39	(1$^+$,2)	1019.59[e] *3*		574.614	(4)$^+$		Main placement from 1594.23 level.
		1232.13 *3*	100 *3*	362.230	3$^+$		1231.2 *7* γ placed from 1594, 6$^-$ level in (^{7}Li,pnγ) may correspond to this γ.
		1250.8[#] *5*	11	343.897	1$^+$		
		1315.3[@] *5*		278.256	2$^+$		1314.7 *7* γ placed from 1594, 6$^-$ level in (^{7}Li,pnγ) may correspond to this γ.
		1594.42 *7*	40 *3*	0.0	1$^+$		
1607.30	(2$^+$,3)	998.0[#] *5*		608.784	2$^+$		May be the same as 998.28γ from 2498 level.
		1032.68 *14*	100	574.614	(4)$^+$		
		1449[#e] *1*		159.282	2$^+$		
1615.8	(5)$^+$	1041.2 *5*	100	574.614	(4)$^+$	D+Q	
1683.126	(1$^+$,2$^+$)	756.3[#] *5*	6	927.080	1$^+$		
		805.0[#] *5*	<4	878.274	(0)$^+$		
		937.0[#] *5*	12	746.241	(3)$^+$		
		1340.0[#] *5*	38	343.897	1$^+$		May be the same as 1339.88γ from 1499 level.
		1683.09 *3*	100	0.0	1$^+$		
1700.65	(1,2$^+$)	805.0[#] *5*	≤48	895.705	(3)$^+$		
		822.33 *5*	100 *5*	878.274	(0)$^+$		
		1541.56[&] *17*	51 *7*	159.282	2$^+$		
1706.1	(4$^+$)	960.0 *7*	100	746.241	(3)$^+$	(M1+E2)	
1736.4	(4$^+$)	1161.6 *7*	100 *7*	574.614	(4)$^+$	(M1+E2)	
		1374.4 *7*	15 *4*	362.230	3$^+$		
1739.79	(3$^+$)	1165.21 *6*	100	574.614	(4)$^+$		E_γ: 1162 *1* in (α,pnγ).
1742.58	(1$^+$,2,3$^+$)	846.87[&] *4*	100 *3*	895.705	(3)$^+$		
		1398.70[&] *18*	67 *7*	343.897	1$^+$		
		1742.83 *20*	72 *10*	0.0	1$^+$		
1768.95	(5$^+$)	1195.4 *4*	100 *4*	574.614	(4)$^+$		I_γ: from (^{7}Li,pnγ).
		1407.08 *13*	96 *4*	362.230	3$^+$	Q	I_γ,Mult.: from (^{7}Li,pnγ).
1779.55	(1$^+$,2$^+$)	1417.27 *4*	100 *4*	362.230	3$^+$		
		1435.3[&] *4*	8 *2*	343.897	1$^+$		
		1780[#] *2*	230	0.0	1$^+$		May be the same as 1782.20γ from 2145 level.
1852.65	(1$^+$,2$^+$)	1508.68 *8*	28 *2*	343.897	1$^+$		
		1852.64 *3*	100 *5*	0.0	1$^+$		
1900.28	(1$^+$)	1557[#] *2*	38	343.897	1$^+$		
		1900.25 *5*	100	0.0	1$^+$		
1905.084	(2$^-$)	1009.35 *5*	25 *1*	895.705	(3)$^+$		

$^{64}_{29}Cu_{35}$-19

Adopted Levels, Gammas (continued)

γ(^{64}Cu) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	Comments
1905.084	(2$^-$)	1158.831 *10*	100 *2*	746.241	(3)$^+$		
1905.28	(4$^+$)	1331.7 *7*	100	574.614	(4)$^+$	D+Q	
1925.0	(4,5,6$^+$)	1350.4 *7*	100	574.614	(4)$^+$		
1940.0	(1$^+$)	1940[#] *2*	100	0.0	1$^+$		
1970.0	(≤3$^+$)	1970 *2*	100	0.0	1$^+$		May be the same as 1972.59γ from 2316 level.
1976.32		1401.66 *19*	100	574.614	(4)$^+$		
1979.1	(5$^+$)	1616.8 *7*	100	362.230	3$^+$	Q	
2019.8	(4$^+$)	313.6 *5*	100	1706.1	(4$^+$)	D	It is possible that 313.6γ in (^{7}Li,pnγ) corresponds to 315γ in (α,pnγ) from 2021 level, although, strong 780.0γ from 2021 level is not reported in (^{7}Li,pnγ).
2020.8	(2$^+$,3$^+$)	315[a] *1*		1706.1	(4$^+$)		
		780.0[#] *5*	100	1241.087	1$^{(+)}$,2$^{(+)}$		May be the same as 779.65γ from 1354 level.
		2021[#] *2*	36	0.0	1$^+$		
2041.8	(≤3$^+$)	2043[#] *2*	100	0.0	1$^+$		
2050.00	(1$^+$,2,3$^-$)	695.41 *16*	89 *14*	1354.25	(3)$^+$		
		1303.90 *11*	100 *9*	746.241	(3)$^+$		
2053.3	(≤4$^+$)	1894 *1*		159.282	2$^+$		E_γ: from (α,pnγ) only.
2060.0	(≤3$^+$)	2060 *2*	100	0.0	1$^+$		
2072.8	(5$^-$)	479.1 *5*	100	1594.19	6$^-$	(M1+E2)	Mult.: γ(θ) in (α,pnγ) and ADO ratio and POL in (^{7}Li,pnγ). For J=5, δ=+022.
2075.09	(2$^-$,3$^-$,4$^-$)	711.94 *9*	100	1363.17	(1,2,3$^+$)		
2080.1	(1$^+$,2,3$^+$)	1718[#] *2*	97	362.230	3$^+$		
		2080[#] *2*	100	0.0	1$^+$		
2091.3	(4$^-$)	629.7 *5*	100 *9*	1461.38	(2$^-$)		In (^{7}Li,pnγ) (2018Sa02), this γ feeds 1460, 4$^-$ level, based on mult(629.7γ)=D+Q. But, evaluators have assigned (2$^-$) to the 1460 level based on L-transfer data. As R_{ADO}=0.98 *6* in (^{7}Li,pnγ) is quite large, it is possible that the 629.7 transition is ΔJ=2, Q rather than ΔJ=0, D+Q.
		1195.6 *7*	48 *6*	895.705	(3)$^+$		
		1517.0 *7*	38 *3*	574.614	(4)$^+$	D+Q	
2092.24	(1$^+$,2$^+$,3$^+$)	1729.70 *22*	100	362.230	3$^+$		
2139.7	(0$^+$,1,2,3$^+$)	1400.5[#] *10*	100	739.050	2$^+$		May be the same as 1401.66γ with 1976 level.
		1477[#] *1*	55	662.99	1$^+$		
		2139[#] *2*	23	0.0	1$^+$		May be the same as 2141.73γ from 2301 level.
2144.54	(2$^+$)	291.71 *12*	28 *4*	1852.65	(1$^+$,2$^+$)		
		1481.75 *20*	30 *4*	662.99	1$^+$		
		1535.70 *17*	27 *3*	608.784	2$^+$		
		1570.22 *21*	23 *3*	574.614	(4)$^+$		
		1782.20 *10*	100 *7*	362.230	3$^+$		
2184.2	(3$^+$)	830.0[#] *5*	12	1354.25	(3)$^+$		
		1575[#] *2*	100	608.784	2$^+$		

$^{64}_{29}Cu_{35}$-21

γ(^{64}Cu) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	Comments
2184.2	(3$^+$)	2184[#] 2	31	0.0	1$^+$		
2221.0	(3$^+$)	2221[#] 2	100	0.0	1$^+$		
2244.0	(1$^+$,2$^+$,3$^+$)	2244[#] 2	100	0.0	1$^+$		
2251.6	(5$^+$)	1677.0 7	100	574.614	(4)$^+$	(M1+E2)	
2253.86	(≤3$^+$)	1910.18 14	100	343.897	1$^+$		
2267.01	(2$^-$)	1904.80[&] 6		362.230	3$^+$		
		1985[#] 2		278.256	2$^+$		
2274.24	(0$^+$,1,2,3$^+$)	953.97[&] 8	100 7	1320.335	(1$^+$,2$^+$,3$^+$)		
		1929.5 6	28 9	343.897	1$^+$		
		1996[#] 2	10	278.256	2$^+$		
		2117[#] 2	8	159.282	2$^+$		
		2275[#] 2	8	0.0	1$^+$		
2279.76	1$^+$	1670.92 6	100	608.784	2$^+$		
2301.04	1$^+$	259.3[#] 5	100	2041.8	(≤3$^+$)		
		1060.0[#] 5	38	1241.087	1$^{(+)}$,2$^{(+)}$		
		1373[#] 1	54	927.080	1$^+$		
		1953[#] 2	38	343.897	1$^+$		
		2141.73[&] 7		159.282	2$^+$		
		2300[#] 2	96	0.0	1$^+$		
2309.4	(3$^+$)	1647[#] 2	77	662.99	1$^+$		
		2029[#] 2	100	278.256	2$^+$		
		2152[#] 2	20	159.282	2$^+$		May be the same as 2153.71γ from 2498 level.
		2309[#] 2	17	0.0	1$^+$		
2316.50	(1$^-$,2$^-$)	1972.59[&] 7		343.897	1$^+$		
		2319[#] 2		0.0	1$^+$		
2322.6	(5$^-$)	249.9 5	100	2072.8	(5$^-$)	(M1+E2)[b]	
2354.59	(0$^+$,1,2,3$^+$)	747.34[&] 6		1607.30	(2$^+$,3)		
		1616[#] 2	100	739.050	2$^+$		
		2356[#] 2	5	0.0	1$^+$		
2360.50	(≤3)	1119.55 19	100	1241.087	1$^{(+)}$,2$^{(+)}$		
2376.35	(1$^+$)	782.29 14	100 14	1594.39	(1$^+$,2)		
		1630.1 3	100 18	746.241	(3)$^+$		
2378.1	(7$^-$)	783.9 5	100	1594.19	6$^-$	(M1+E2)	δ: −1 from (α,pnγ).
2381.2	(0$^+$,1,2,3$^+$)	2102[#] 2	100	278.256	2$^+$		
		2382[#] 2	43	0.0	1$^+$		
2387.1	(6$^-$)	314.0 5	100	2072.8	(5$^-$)	D+Q	
2387.89	(1$^+$)	1641.70 17	100	746.241	(3)$^+$		

From ENSDF

$^{64}_{29}Cu_{35}$-21

γ(^{64}Cu) (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	Comments
2415.2	(4,5,6$^+$)	1840.6 *7*	100	574.614	(4)$^+$		
2417.0	(1$^+$,2$^+$,3$^+$)	1754# *2*	100	662.99	1$^+$		
2435.9	(4,5,6$^+$)	1861.3 *7*	100	574.614	(4)$^+$		
2456.66	(1$^+$)	1560.94& *9*	100	895.705	(3)$^+$		
		2457# *2*		0.0	1$^+$		
2465.47	(1$^-$,2$^-$)	2465.43 *11*	100	0.0	1$^+$		
2491.2	(0$^+$,1,2,3$^+$)	2332# *2*	7	159.282	2$^+$		
		2491# *2*	100	0.0	1$^+$		
2493.49	(2$^+$,3$^+$)	1830.34 *14*	89 *8*	662.99	1$^+$		
		1918.69 *11*	100 *8*	574.614	(4)$^+$		
2497.58	(1,2$^+$)	814.45 *4*	75 *3*	1683.126	(1$^+$,2$^+$)		
		890.26 *4*	53 *3*	1607.30	(2$^+$,3)		
		998.28 *8*	69 *4*	1499.20	(2)$^-$		
		1619.24 *6*	81 *4*	878.274	(0)$^+$		
		1834.22 *15*	28 *3*	662.99	1$^+$		
		2153.71 *6*	100 *7*	343.897	1$^+$		
2498.4	(5$^+$)	478.6 *5*	100	2019.8	(4$^+$)	D+Q	
2507.26	(≤3)	2345# *2*	100	159.282	2$^+$		
2517.6	(5$^-$)	426.3 *5*	100	2091.3	(4$^-$)	D+Q	
2533.60	(2$^-$)	2533.53 *18*	100	0.0	1$^+$		
2583.3	(5$^-$)	2008.7 *10*	100	574.614	(4)$^+$	D+Q	
2635.48	(≤3$^+$)	247.58 *4*	100	2387.89	(1$^+$)		
2647.3	(5)	575.2 *5*	100	2072.8	(5$^-$)	D+Q	
2647.97	(1$^+$)	1327.62 *11*	100	1320.335	(1$^+$,2$^+$,3$^+$)		
2657.33	(1$^+$,2)	974.17 *9*	17 *1*	1683.126	(1$^+$,2$^+$)		
		1761.01 *22*	10 *1*	895.705	(3)$^+$		
		2497.89 *9*	100 *7*	159.282	2$^+$		
		2656.8 *3*	24 *3*	0.0	1$^+$		
2692.1	(6$^-$)	313.4 *5*	<60	2378.1	(7$^-$)	D	I_γ: from (α,pnγ).
		1099.0 *5*	100	1594.19	6$^-$		E_γ,I_γ: from (α,pnγ) only, not reported in (^{7}Li,pnγ).
2695.21	(1$^-$,2$^-$)	1799.48 *8*	100	895.705	(3)$^+$		
2716.9	(7$^-$)	1122.5 *5*	100	1594.19	6$^-$	D+Q	
2717.97	(1$^-$,2$^-$)	1790.30 *24*	100	927.080	1$^+$		
2726.16	(3$^+$)	192.53 *5*	100 *10*	2533.60	(2$^-$)		
		957.27 *7*	83 *5*	1768.95	(5$^+$)		
		1287.40 *20*	20 *3*	1438.75	(1)$^+$		
		1428.17 *14*	33 *3*	1298.121	(1)$^+$		
		1484.85 *25*	25 *4*	1241.087	1$^{(+)}$,2$^{(+)}$		
2732.30	(0$^+$,1,2)	2123.06 *23*	35 *5*	608.784	2$^+$		
		2732.13 *21*	100 *10*	0.0	1$^+$		
2764.16	(1$^-$,2$^-$)	689.08 *5*	100 *5*	2075.09	(2$^-$,3$^-$,4$^-$)		
		2605.2 *4*	71 *18*	159.282	2$^+$		

Adopted Levels, Gammas (continued)

γ(^{64}Cu) (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	Comments
2776.55	(1$^+$,2$^+$)	2037.53 7	100 7	739.050	2$^+$		
		2413.70 24	46 7	362.230	3$^+$		
		2776.8 4	65 14	0.0	1$^+$		
2811.6	(6$^-$)	1040.7 7	100	1768.95	(5$^+$)	D	
2830.53	(1$^+$,2,3$^+$)	1476.10 8	100 6	1354.25	(3)$^+$		
		2830.1 4	64 13	0.0	1$^+$		
2892.35	(1$^+$)	625.35 5	100 5	2267.01	(2$^-$)		
		1649.52 11	56 4	1242.64	(0,1,2,3$^+$)		
2896.79	(3$^+$)	440.13 12	29 4	2456.66	(1$^+$)		
		804.29 21	20 4	2092.24	(1$^+$,2$^+$,3$^+$)		
		1127.84 3	100 3	1768.95	(5$^+$)		
2914.3	(5$^-$)	2339.6 10		574.614	(4)$^+$	D	
2925.8	(6$^-$)	538.6 5	100	2387.1	(6$^-$)	M1+E2	
2932.54	(2$^-$)	2932.06 17	100	0.0	1$^+$		
2949.5	(5$^-$)	562.4 5	100	2387.1	(6$^-$)	D+Q	
2965.5	(5$^-$)	578.4 5	100	2387.1	(6$^-$)	D+Q	
3013.30	(1$^-$,2$^-$)	1574.36 5	100 5	1438.75	(1)$^+$		
		2666.6[ce] 14	18 14	343.897	1$^+$		
3033.56	(2$^-$)	1293.92 11	100	1739.79	(3$^+$)		
3051.1	(7$^-$)	664.0 5	100	2387.1	(6$^-$)	M1+E2	
3051.75	(≤3$^+$)	1808.5 3	17 4	1242.64	(0,1,2,3$^+$)		
		3052.2 3	100 14	0.0	1$^+$		
3080.85	(2$^-$,3$^-$)	583.22 10	100 11	2497.58	(1,2$^+$)		
		587.0 3	29 9	2493.49	(2$^+$,3$^+$)		
3111.77	(1$^+$,2)	214.97 5	100 10	2896.79	(3$^+$)		
		3111.6 6	25 7	0.0	1$^+$		
3126.0	(7$^-$)	200.1 5		2925.8	(6$^-$)		E_γ: from (^{7}Li,pnγ) only.
		313.5 5	78 55	2811.6	(6$^-$)	D+Q	E_γ,I_γ: from (^{7}Li,pnγ) only.
		434.6 5	100 27	2692.1	(6$^-$)	(M1+E2)	
		738.5 5	80 7	2387.1	(6$^-$)	D+Q	E_γ,I_γ: from (^{7}Li,pnγ) only.
		1532.5 5	200	1594.19	6$^-$		E_γ,I_γ: from (α,pnγ) only, not reported in (^{7}Li,pnγ).
3176.9		789.8 5	100	2387.1	(6$^-$)		
3190.85	1$^+$	937.01 5	100	2253.86	(≤3$^+$)		
3191.1	(8$^-$)	813.4 5	36.9 22	2378.1	(7$^-$)	(M1+E2)	
		1596.5 5	100.0 14	1594.19	6$^-$	(E2+M3)	δ(O/Q)=+0.027 in (α,pnγ).
3207.53	(0,1,2)	831.176 20	100 2	2376.35	(1$^+$)		
		2280.36 11	53 5	927.080	1$^+$		
3257.55	(1$^+$,2$^+$)	1556.84 10	41 3	1700.65	(1,2$^+$)		
		3257.26 24	100 10	0.0	1$^+$		
3268.4	(6,7,8$^-$)	881.3 5	100	2387.1	(6$^-$)		
3278.6	(7,8,9$^-$)	561.7 5		2716.9	(7$^-$)		
3313.09	(0,1,2)	261.33 5	100 9	3051.75	(≤3$^+$)		
		3312.4 3	76 11	0.0	1$^+$		

Adopted Levels, Gammas (continued)

γ(^{64}Cu) (continued)

E$_i$(level)	J$^\pi_i$	E$_\gamma$†	I$_\gamma$†	E$_f$	J$^\pi_f$	Mult.‡	Comments
3343.98	(0$^-$,1,2,3$^+$)	1844.67 *21*	86 *14*	1499.20	(2)$^-$		
		3001.4 *7*	100 *32*	343.897	1$^+$		
3351.5	(6$^-$)	402.0 *5*	100	2949.5	(5$^-$)	D+Q	
3352.83	(1,2,3$^-$)	634.78 *9*	46 *4*	2717.97	(1$^-$,2$^-$)		
		1447.69 *4*	100 *4*	1905.084	(2$^-$)		
		3074.9 *8*	37 *13*	278.256	2$^+$		
3376.4	(6$^-$)	878.1 *5*		2498.4	(5$^+$)	D+Q	
3412.12	(1$^-$,2$^-$)	2048.90 *10*	84 *6*	1363.17	(1,2,3$^+$)		
		3133.9 *3*	89 *15*	278.256	2$^+$		
		3253.2 *4*	100 *17*	159.282	2$^+$		
3440.18	(0$^+$,1,2,3$^-$)	946.64 *5*	100	2493.49	(2$^+$,3$^+$)		
3465.57	(0$^-$,1,2,3$^-$)	532.94 *20*	100 *24*	2932.54	(2$^-$)		
		1198.75 *16*	41 *4*	2267.01	(2$^-$)		
3475.20	(0$^+$,1,2)	2811.1 *11*	21 *10*	662.99	1$^+$		
		3316.58 *25*	100 *10*	159.282	2$^+$		
3488.6	(8$^-$)	771.5 *5*	100	2716.9	(7$^-$)	D+Q	
3493.35	(0$^+$,1,2,3)	2885.3 *4*	100	608.784	2$^+$		
3510.55	(1,2)	2772.2 *3*	100 *13*	739.050	2$^+$		
		3232.3 *5*	36 *9*	278.256	2$^+$		
		3510.5 *4*	67 *11*	0.0	1$^+$		
3524.64	0$^+$,1$^+$	1250.45 *8*	100	2274.24	(0$^+$,1,2,3$^+$)		
3596.00	(0,1,2)	1241.50 *9*	100 *11*	2354.59	(0$^+$,1,2,3$^+$)		
		1316.24 *7*	20 *1*	2279.76	1$^+$		
3603.09	(1,2$^+$)	2724.8 *5*	42 *11*	878.274	(0)$^+$		
		2993.91 *20*	100 *10*	608.784	2$^+$		
		3603.9 *5*	26 *8*	0.0	1$^+$		
3604.9	(7$^-$)	228.7 *5*		3376.4	(6$^-$)	D+Q	
		478.6 *5*	100 *15*	3126.0	(7$^-$)		
		679.2 *5*	48 *13*	2925.8	(6$^-$)	D+Q	
		1218.4 *7*	42 *9*	2387.1	(6$^-$)	(M1+E2)	
		1282.4 *7*	49 *7*	2322.6	(5$^-$)	(E2+M3)	
		1531.9 *7*	45.2 *10*	2072.8	(5$^-$)		
3629.40	(0,1,2,3$^-$)	897.06 *5*	100	2732.30	(0$^+$,1,2)		
3681.6	(6,7,8$^-$)	2087.4 *10*	100	1594.19	6$^-$		
3686.7	(7$^-$)	2092.5 *10*	100	1594.19	6$^-$	D+Q	
3711.80	(0$^+$,1$^+$)	3552.9 *7*	100	159.282	2$^+$		
3734.1	(7,8,9$^-$)	1355.9 *7*	100	2378.1	(7$^-$)		
3783.16	(1,2$^+$)	2082.45 *8*	100 *7*	1700.65	(1,2$^+$)		
		2904.6 *16*	18 *14*	878.274	(0)$^+$		
		3623.1 *4*	64 *10*	159.282	2$^+$		
3800.1	(9$^-$)	311.3 *5*		3488.6	(8$^-$)	D	E$_\gamma$,Mult.: γ from (^{7}Li,pnγ) only.
		608.8 *5*	100.0 *16*	3191.1	(8$^-$)	M1+E2	
		1422.4 *7*	12.1 *7*	2378.1	(7$^-$)	Q	E$_\gamma$,I$_\gamma$,Mult.: γ from (^{7}Li,pnγ) only.

$^{64}_{29}Cu_{35}$-24

Adopted Levels, Gammas (continued)

$\gamma(^{64}Cu)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	Comments
3800.1	(9⁻)	2206.4 *10*	6.8 *6*	1594.19	6⁻	[M3]	E_γ,I_γ,Mult.: γ from (^{7}Li,pnγ) only.
3802.73	(0⁺,1⁺)	1826.2 *5*	15 *4*	1976.32			
		3140.0 *3*	100 *12*	662.99	1⁺		
		3802.0 *4*	61 *12*	0.0	1⁺		
3826.92	(1⁺)	1501.94 *20*	33 *4*	2324.75	(1⁺,2⁺,3⁺)		
		2365.32 *17*	60 *6*	1461.38	(2⁻)		
		3464.55 *22*	100 *12*	362.230	3⁺		
		3667.6 *4*	31 *5*	159.282	2⁺		
3987.8	(9⁻)	1609.5 *5*	100	2378.1	(7⁻)	(E2)	
3990.85	(1⁺)	3628.36 *22*	100 *10*	362.230	3⁺		
		3714.0 *7*	33 *10*	278.256	2⁺		
4034.01	(1⁺)	2291.42 *7*	100 *7*	1742.58	(1⁺,2,3⁺)		
		3108.0 *7*	22 *7*	927.080	1⁺		
		3874.7 *5*	28 *9*	159.282	2⁺		
		4033.4 *4*	31 *5*	0.0	1⁺		
4071.59	(1⁺)	1747.3 *3*	26 *5*	2324.75	(1⁺,2⁺,3⁺)		
		2572.03 *19*	100 *10*	1499.20	(2)⁻		
		3175.26 *25*	72 *9*	895.705	(3)⁺		
		3729.6 *9*	16 *6*	343.897	1⁺		
		3911.8 *5*	44 *9*	159.282	2⁺		
4140.84	(0⁻,1⁻,2⁻)	1059.95 *8*	83 *5*	3080.85	(2⁻,3⁻)		
		3478.0 *5*	100 *22*	662.99	1⁺		
4162.0	(6,7,8⁻)	1469.9 *7*	100	2692.1	(6⁻)		
4164.7	(7,8,9⁻)	1786.5 *7*	100	2378.1	(7⁻)		
4166.4	(9⁻)	561.8 *5*	34 *10*	3604.9	(7⁻)		
		1789.5 *7*	100 *11*	2378.1	(7⁻)	Q	
4264.07	(1,2⁺)	3022.8 *4*	58 *10*	1241.087	1⁽⁺⁾,2⁽⁺⁾		
		3385.73 *21*	100 *10*	878.274	(0)⁺		
4269.3	(7,8,9⁻)	664.4 *5*	100	3604.9	(7⁻)		
4327.41	(1⁺,2⁺)	1136.59 *6*	100 *4*	3190.85	1⁺		
		3431.6 *3*	88 *10*	895.705	(3)⁺		
		3718.1 *7*	31 *9*	608.784	2⁺		
4360.1	(9,10,11⁻)	560.0 *5*	100	3800.1	(9⁻)		
4432.95	(1⁻,2⁻)	2838.2 *4*	100 *21*	1594.39	(1⁺,2)		
		3145.4 *4*	84 *13*	1287.15	(1⁺,2,3⁻)		
		3506.7 *7*	50 *14*	927.080	1⁺		
4444.48	(0⁺,1⁺)	3781.8 *5*	27 *7*	662.99	1⁺		
		4166.7 *6*	20 *9*	278.256	2⁺		
		4444.35 *24*	100 *9*	0.0	1⁺		
4549.48	(0,1,2,3⁻)	1074.49 *21*	100	3475.20	(0⁺,1,2)		
4552.0	(8,9,10⁻)	1360.9 *7*	100	3191.1	(8⁻)		
4556.2	(7,8,9⁻)	2178.0 *10*		2378.1	(7⁻)		
4568.5	(10⁻)	580.5 *5*		3987.8	(9⁻)		

$^{64}_{29}Cu_{35}$-25

Adopted Levels, Gammas (continued)

$\gamma(^{64}Cu)$ (continued)

E_i(level)	J^{π}_i	E_{γ}†	I_{γ}†	E_f	J^{π}_f	Mult.‡
4568.5	(10^-)	1377.7 *7*	100 *9*	3191.1	(8^-)	(E2)
4691.7	(7,8,9^-)	2313.5 *10*		2378.1	(7^-)	
4763.38	1^+	960.63 *9*	100 *7*	3802.73	(0^+,1^+)	
		3442.6 *4*	52 *9*	1320.335	(1^+,2^+,3^+)	
		3521.02 *24*	96 *11*	1242.64	(0,1,2,3^+)	
4898.5	(10^-)	1098.4 *7*	100	3800.1	(9^-)	(M1+E2)
5085.6	(9)	1894.4 *7*	100	3191.1	(8^-)	D+Q
5095.8	(9)	1904.6 *7*	100	3191.1	(8^-)	D+Q
5686.5	(11)	1886.4 *7*	100	3800.1	(9^-)	Q
5912.6	(9,10,11^-)	2112.5 *10*		3800.1	(9^-)	
5917.5	(10)	2117.4 *10*	100	3800.1	(9^-)	D+Q
6070.2	(10)	2270.1 *10*	100	3800.1	(9^-)	D+Q
(7916.403)	1^-,2^-	3153.05 *17*	0.84 *6*	4763.38	1^+	
		3366.8 *3*	0.44 *5*	4549.48	(0,1,2,3^-)	
		3472.2 *3*	0.55 *7*	4444.48	(0^+,1^+)	
		3482.9 *5*	0.35 *7*	4432.95	(1^-,2^-)	
		3588.52 *23*	1.03 *12*	4327.41	(1^+,2^+)	
		3651.6 *5*	0.19 *4*	4264.07	(1,2^+)	
		3775.27 *21*	0.61 *6*	4140.84	(0^-,1^-,2^-)	
		3844.44 *15*	1.48 *9*	4071.59	(1^+)	
		3883.0 *4*	0.44 *7*	4034.01	(1^+)	
		4089.11 *14*	0.77 *4*	3826.92	(1^+)	
		4133.08 *13*	1.15 *5*	3783.16	(1,2^+)	
		4204.37 *15*	0.77 *4*	3711.80	(0^+,1^+)	
		4286.62 *13*	1.02 *5*	3629.40	(0,1,2,3^-)	
		4312.8 *3*	0.85 *9*	3603.09	(1,2^+)	
		4320.24 *10*	4.08 *15*	3596.00	(0,1,2)	
		4391.9 *3*	0.40 *5*	3524.64	0^+,1^+	
		4405.00 *12*	0.92 *5*	3510.55	(1,2)	
		4423.12 *22*	0.42 *4*	3493.35	(0^+,1,2,3)	
		4440.9 *3*	0.59 *7*	3475.20	(0^+,1,2)	
		4450.86 *20*	0.52 *4*	3465.57	(0^-,1,2,3^-)	
		4475.66 *11*	1.44 *5*	3440.18	(0^+,1,2,3^-)	
		4504.04 *11*	1.47 *6*	3412.12	(1^-,2^-)	
		4562.95 *12*	0.95 *5*	3352.83	(1,2,3^-)	
		4572.5 *3*	0.30 *4*	3343.98	(0^-,1,2,3^+)	
		4603.07 *9*	1.64 *5*	3313.09	(0,1,2)	
		4658.53 *8*	2.33 *6*	3257.55	(1^+,2^+)	
		4708.9 *4*	0.26 *4*	3207.53	(0,1,2)	
		4790.7 *3*	0.32 *4*	3125.06	(1^+,2^+)	
		4803.8 *3*	0.36 *4*	3111.77	(1^+,2)	
		4835.1 *9*	0.09 *3*	3080.85	(2^-,3^-)	
		4883.0 *6*	0.12 *3*	3033.56	(2^-)	

$^{64}_{29}Cu_{35}$-26

Adopted Levels, Gammas (continued)

$\gamma(^{64}Cu)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f
(7916.403)	$1^-,2^-$	4903.08 20	0.46 3	3013.30	$(1^-,2^-)$
		4983.51 16	0.61 4	2932.54	(2^-)
		5019.5 3	0.57 6	2896.79	(3^+)
		5023.2 3	0.55 6	2892.35	(1^+)
		5085.30 11	0.99 4	2830.53	$(1^+,2,3^+)$
		5139.86 23	0.54 4	2776.55	$(1^+,2^+)$
		5152.11 13	0.81 4	2764.16	$(1^-,2^-)$
		5183.89 12	1.11 5	2732.30	$(0^+,1,2)$
		5190.09 8	2.02 5	2726.16	(3^+)
		5258.67 7	3.11 7	2657.33	$(1^+,2)$
		5269.4 5	0.24 4	2647.97	(1^+)
		5280.67 17	0.76 5	2635.48	$(\le3^+)$
		5321.3 5	0.17 3	2594.4	(1^+)
		5385 3	0.03 3	2533.60	(2^-)
		5408.88 11	1.21 5	2507.26	(≤3)
		5418.49 5	5.59 9	2497.58	$(1,2^+)$
		5450.75 20	0.48 3	2465.47	$(1^-,2^-)$
		5528.2 3	0.37 4	2387.89	(1^+)
		5555.78 13	0.83 4	2360.50	(≤3)
		5600.5 4	0.29 4	2316.50	$(1^-,2^-)$
		5615.01 9	1.49 5	2301.04	1^+
		5636.18 11	1.24 5	2279.76	1^+
		5771.48 13	1.54 7	2144.54	(2^+)
		5824[e] 2	0.9	2092.24	$(1^+,2^+,3^+)$
		5866.16 22	0.44 3	2050.00	$(1^+,2,3^-)$
		6010.83 7	4.80 9	1905.084	(2^-)
		6015.7 3	0.69 6	1900.28	(1^+)
		6063.65 9	1.83 5	1852.65	$(1^+,2^+)$
		6136.05 19	0.60 4	1779.55	$(1^+,2^+)$
		6166.9 3	0.50 5	1749.2	(≤4)
		6233.0 4	0.33 4	1683.126	$(1^+,2^+)$
		6308.61 25	0.50 4	1607.30	$(2^+,3)$
		6321.54 13	1.09 4	1594.39	$(1^+,2)$
		6365.6 3	0.32 3	1550.49	$(1^+,2^+,3^+)$
		6394.86 6	4.21 8	1521.148	$(2)^+$
		6416.9 4	0.29 4	1499.20	$(2)^-$
		6477.15 23	0.52 4	1438.75	$(1)^+$
		6553[e] 3	0.3	1363.17	$(1,2,3^+)$
		6595.63 11	1.91 7	1320.335	$(1^+,2^+,3^+)$
		6618.15 8	3.41 9	1298.121	$(1)^+$
		6628.9 5	0.30 5	1287.15	$(1^+,2,3^-)$
		6674.85 6	6.01 9	1241.087	$1^{(+)},2^{(+)}$
		6988.96 6	10.60 15	927.080	1^+
(7916.403)	$1^-,2^-$	7037.83 16	1.17 6	878.274	$(0)^+$
		7170.10 24	0.92 6	746.241	$(3)^+$
		7177.07 7	7.73 12	739.050	2^+
		7253.05 6	10.54 15	662.99	1^+
		7307.31 6	27.1 4	608.784	2^+
		7555.1 6	0.25 5	362.230	3^+
		7572.32 8	5.26 9	343.897	1^+
		7638.00 9	48.9 12	278.256	2^+
		7756.91 9	4.77 9	159.282	2^+
		7916.26 8	100.0 18	0.0	1^+
7916.438	2^-	4404	11 4	3510.55	(1,2)
		4570	11 4	3343.98	$(0^-,1,2,3^+)$
		4726	17 4	3190.85	1^+
		4844	9 4	3071.5	(2^-)
		5047	11 4	2868.5	(3^+)
		5140	19 4	2776.55	$(1^+,2^+)$
		5851	20 4	2064.5	$(\le4^-)$
		5866	14 4	2050.00	$(1^+,2,3^-)$
		5896	5.9 24	2020.8	$(2^+,3^+)$
		5998	18.4 24	1917.4	$(\le4^-)$
		6062	11.8 24	1852.65	$(1^+,2^+)$
		6136	3.6 24	1779.55	$(1^+,2^+)$
		6233[e]	<4.7	1683.126	$(1^+,2^+)$
		6394	3.6 24	1521.148	$(2)^+$
		6418[e]	<4.7	1499.20	$(2)^-$
		6476[e]	<4.7	1438.75	$(1)^+$
		6617	12 3	1298.121	$(1)^+$
		6628	30 3	1287.15	$(1^+,2,3^-)$
		6674	5.3 24	1241.087	$1^{(+)},2^{(+)}$
		6988	14 3	927.080	1^+
		7036	2.4 18	878.274	$(0)^+$
		7168	14 3	746.241	$(3)^+$
		7176	41 3	739.050	2^+
		7252	7.1 24	662.99	1^+
		7307	8.9 24	608.784	2^+
		7637	37 3	278.256	2^+
		7756	100 4	159.282	2^+
7917.874	1^-	3369.5 5	6.5 19	4549.48	$(0,1,2,3^-)$
		3590.9 2	12.8 16	4327.41	$(1^+,2^+)$
		3654.2 5	7.5 21	4264.07	$(1,2^+)$
		3884.8 6	3.8 14	4034.01	(1^+)
		4134.2 4	7.3 16	3783.16	$(1,2^+)$
		4206.2 3	9.6 14	3711.80	$(0^+,1^+)$

$^{64}_{29}Cu_{35}$-27

$\gamma(^{64}Cu)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f
7917.874	1^-	4290 *2*	1.0 *10*	3629.40	$(0,1,2,3^-)$
		4322.10 *17*	13.5 *13*	3596.00	(0,1,2)
		4407.21 *6*	5.3 *17*	3510.55	(1,2)
		4443.9 *5*	7.5 *21*	3475.20	$(0^+,1,2)$
		4453.1 *15*	2.1 *18*	3465.57	$(0^-,1,2,3^-)$
		4477.62 *12*	28.4 *17*	3440.18	$(0^+,1,2,3^-)$
		4506.2 *3*	7.2 *11*	3412.12	$(1^-,2^-)$
		4564.7 *6*	3.0 *9*	3352.83	$(1,2,3^-)$
		4604.6 *4*	4.5 *10*	3313.09	(0,1,2)
		4660.36 *19*	11.4 *11*	3257.55	$(1^+,2^+)$
		4710.4 *4*	4.6 *11*	3207.53	(0,1,2)
		4792.56 *14*	33.0 *21*	3125.06	$(1^+,2^+)$
		4805.6 *6*	3.8 *13*	3111.77	$(1^+,2)$
		4885.9 *4*	5.6 *11*	3033.56	(2^-)
		4903.46 *10*	35.7 *18*	3013.30	$(1^-,2^-)$
		4984.4 *3*	7.5 *10*	2932.54	(2^-)
		5021.4 *2*	11.0 *12*	2896.79	(3^+)
		5140.9 *3*	6.2 *7*	2776.55	$(1^+,2^+)$
		5185.4 *3*	6.9 *10*	2732.30	$(0^+,1,2)$
		5259.9 *6*	3.0 *7*	2657.33	$(1^+,2)$
		5322.1 *8*	1.9 *7*	2594.4	(1^+)
		5410.4 *3*	7.6 *11*	2507.26	(≤ 3)
		5418.0 *12*	1.3 *9*	2497.58	$(1,2^+)$
		5451.5 *8*	2.9 *13*	2465.47	$(1^-,2^-)$
		5529.9 *3*	8.6 *13*	2387.89	(1^+)
		5617.6 *4*	4.6 *9*	2301.04	1^+
		5637.1 *4*	4.8 *9*	2279.76	1^+
		5772.89 *17*	14.8 *12*	2144.54	(2^+)
		5866.2 *6*	2.9 *9*	2050.00	$(1^+,2,3^-)$
		6012.3 *3*	19.2 *21*	1905.084	(2^-)
		6017.7 *4*	11.7 *18*	1900.28	(1^+)
		6064.62 *17*	14.6 *12*	1852.65	$(1^+,2^+)$
		6135.6 *5*	3.7 *9*	1779.55	$(1^+,2^+)$
		6323.0 *3*	9.7 *11*	1594.39	$(1^+,2)$
		6396.3 *2*	26.3 *20*	1521.148	$(2)^+$
		6417.86 *10*	59.6 *21*	1499.20	$(2)^-$
		6478.8 *4*	11.4 *17*	1438.75	$(1)^+$
		6596.82 *10*	100 *4*	1320.335	$(1^+,2^+,3^+)$
		6619.32 *16*	46 *3*	1298.121	$(1)^+$
		6629.0 *7*	6.0 *18*	1287.15	$(1^+,2,3^-)$
		6675.98 *16*	60 *3*	1241.087	$1^{(+)},2^{(+)}$
		6989.9 *6*	3.5 *9*	927.080	1^+
		7023.4 *12*	1.5 *7*	895.705	$(3)^+$
7917.874	1^-	7039.07 *10*	49.4 *19*	878.274	$(0)^+$
		7171.2 *3*	11.0 *12*	746.241	$(3)^+$
		7178.21 *12*	51.1 *21*	739.050	2^+
		7308.17 *15*	82 *5*	608.784	2^+
		7555.1 *4*	4.9 *7*	362.230	3^+
		7573.6 *3*	7.9 *10*	343.897	1^+
		7638.57 *16*	79 *4*	278.256	2^+
		7756.7 *3*	17.7 *17*	159.282	2^+
		7917.09 *11*	63.8 *21*	0.0	1^+
7918.469	2^-	6309	100 *17*	1607.30	$(2^+,3)$
		6322	100 *17*	1594.39	$(1^+,2)$
		6394	28 *10*	1521.148	$(2)^+$
		6418[e]	<29	1499.20	$(2)^-$
		6553	23 *20*	1363.17	$(1,2,3^+)$
		6674[e]	<75	1241.087	$1^{(+)},2^{(+)}$
		7021	22 *13*	895.705	$(3)^+$
		7168	49 *15*	746.241	$(3)^+$
		7176	49 *15*	739.050	2^+
		7307	28 *13*	608.784	2^+
		7556	75 *13*	362.230	3^+
		7571	35 *10*	343.897	1^+
		7756[e]	<23	159.282	2^+
		7916	77 *15*	0.0	1^+
(7938.49)	$(1,2,3^+)$	4153.3 *6*	7.9 *23*	3783.16	$(1,2^+)$
		4415.6 *5*	8.9 *20*	3524.64	$0^+,1^+$
		4445.2 *7*	5.6 *20*	3493.35	$(0^+,1,2,3)$
		4464.8 *10*	4.0 *20*	3475.20	$(0^+,1,2)$
		4524.7 *14*	4.5 *34*	3412.12	$(1^-,2^-)$
		4625.6 *8*	5.2 *18*	3313.09	(0,1,2)
		4682.6 *7*	9.0 *34*	3257.55	$(1^+,2^+)$
		4855.6 *8*	4.9 *18*	3080.85	$(2^-,3^-)$
		5043.1 *9*	7.9 *34*	2892.35	(1^+)
		5111.0 *13*	4.5 *23*	2830.53	$(1^+,2,3^+)$
		5292.1 *14*	4.5 *23*	2647.97	(1^+)
		5344.8 *5*	11.2 *20*	2594.4	(1^+)
		5409.8 *8*	6.9 *21*		
		5427.8 *15*	3.4 *20*	2507.26	(≤ 3)
		5576.5 *6*	10.1 *23*	2360.50	(≤ 3)
		5620.9 *8*	10.1 *34*	2316.50	$(1^-,2^-)$
		5637.6 *3*	24.7 *23*	2301.04	1^+
		5659.3 *3*	19.1 *23*	2279.76	1^+
		5793.7 *3*	21.0 *21*	2144.54	(2^+)
		5889.1 *7*	7.8 *20*	2050.00	$(1^+,2,3^-)$

$^{64}_{29}Cu_{35}$-28

γ(^{64}Cu) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π
(7938.49)	(1,2,3$^+$)	6036.4 *8*	10.1 *34*	1900.28	(1$^+$)
		6085.9 *4*	20.2 *23*	1852.65	(1$^+$,2$^+$)
		6160.3 *10*	7.9 *23*	1779.55	(1$^+$,2$^+$)
		6254.8 *3*	25.8 *23*	1683.126	(1$^+$,2$^+$)
		6344.5 *2*	33.7 *23*	1594.39	(1$^+$,2)
		6389.6 *5*	31 *5*	1550.49	(1$^+$,2$^+$,3$^+$)
		6416.9 *2*	58 *5*	1521.148	(2)$^+$
		6439.0 *4*	28 *3*	1499.20	(2)$^-$
		6501.6 *6*	25 *5*	1438.75	(1)$^+$
		6584.0 *4*	16.9 *23*	1354.25	(3)$^+$
		6618.3 *8*	10.1 *34*	1320.335	(1$^+$,2$^+$,3$^+$)
		6650.2 *4*	16.9 *23*	1287.15	(1$^+$,2,3$^-$)
		6695.8 *5*	37 *5*	1242.64	(0,1,2,3$^+$)
(7938.49)	(1,2,3$^+$)	7010.85 *15*	57 *3*	927.080	1$^+$
		7042.87 *16*	99 *6*	895.705	(3)$^+$
		7060.8 *12*	7.9 *23*	878.274	(0)$^+$
		7198.6 *6*	48 *9*	739.050	2$^+$
		7275.7 *2*	41.6 *23*	662.99	1$^+$
		7329.7 *3*	38 *3*	608.784	2$^+$
		7360.8 *15*	4.5 *23*	574.614	(4)$^+$
		7575.0 *4*	27 *3*	362.230	3$^+$
		7595.6 *5*	54 *11*	343.897	1$^+$
		7659.27 *16*	56 *3*	278.256	2$^+$
		7778.44 *17*	72 *3*	159.282	2$^+$
		7938.3 *2*	100 *6*	0.0	1$^+$

[†] Primarily from ^{63}Cu(n,γ) E=th and ^{59}Co(^{7}Li,pnγ). Values with uncertainties quoted from (p,nγ) are deduced from branching ratios in 1976Gr13.

[‡] From $\gamma(\theta)$ and $\gamma\gamma(\theta)$ in (p,nγ); $\gamma(\theta)$ in (α,pnγ); and $\gamma\gamma(\theta)$(ADO) and linear polarization in (^{7}Li,pnγ). M1+E2 favored over E1+M2 based on RUL for E2 and M2 transitions.

[#] Reported in (p,nγ) only.

[@] Reported in (d,pγ) only. Iγ not available.

[&] Reported in (n,γ) E=th only.

[a] From $\gamma\gamma$-coin in (α,pnγ) only.

[b] From $\gamma(\theta)$ in (α,pnγ).

[c] Poor fit in level scheme.

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

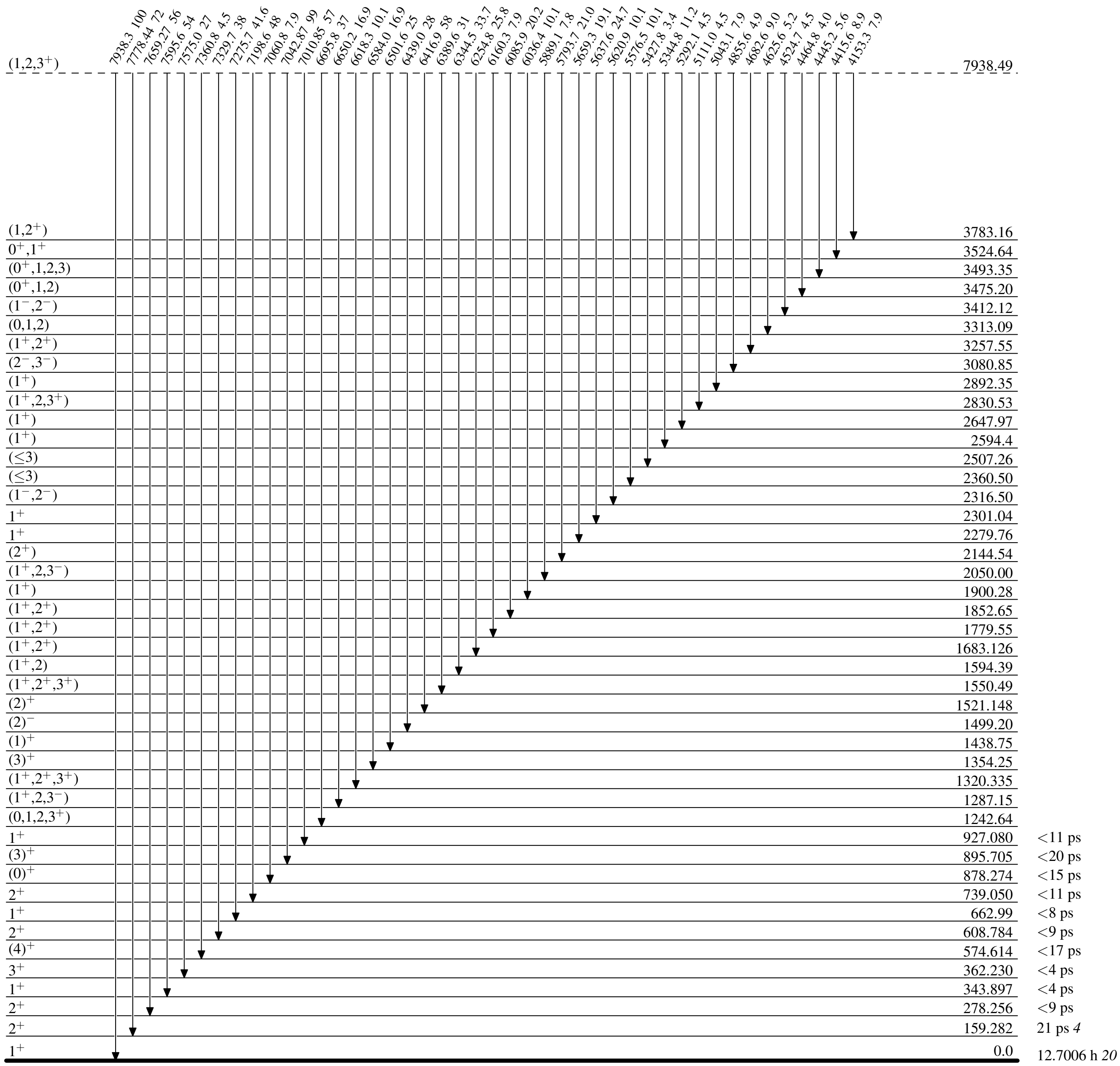
[e] Placement of transition in the level scheme is uncertain.

$^{64}_{29}$Cu$_{35}$-29

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{64}_{29}Cu_{35}$

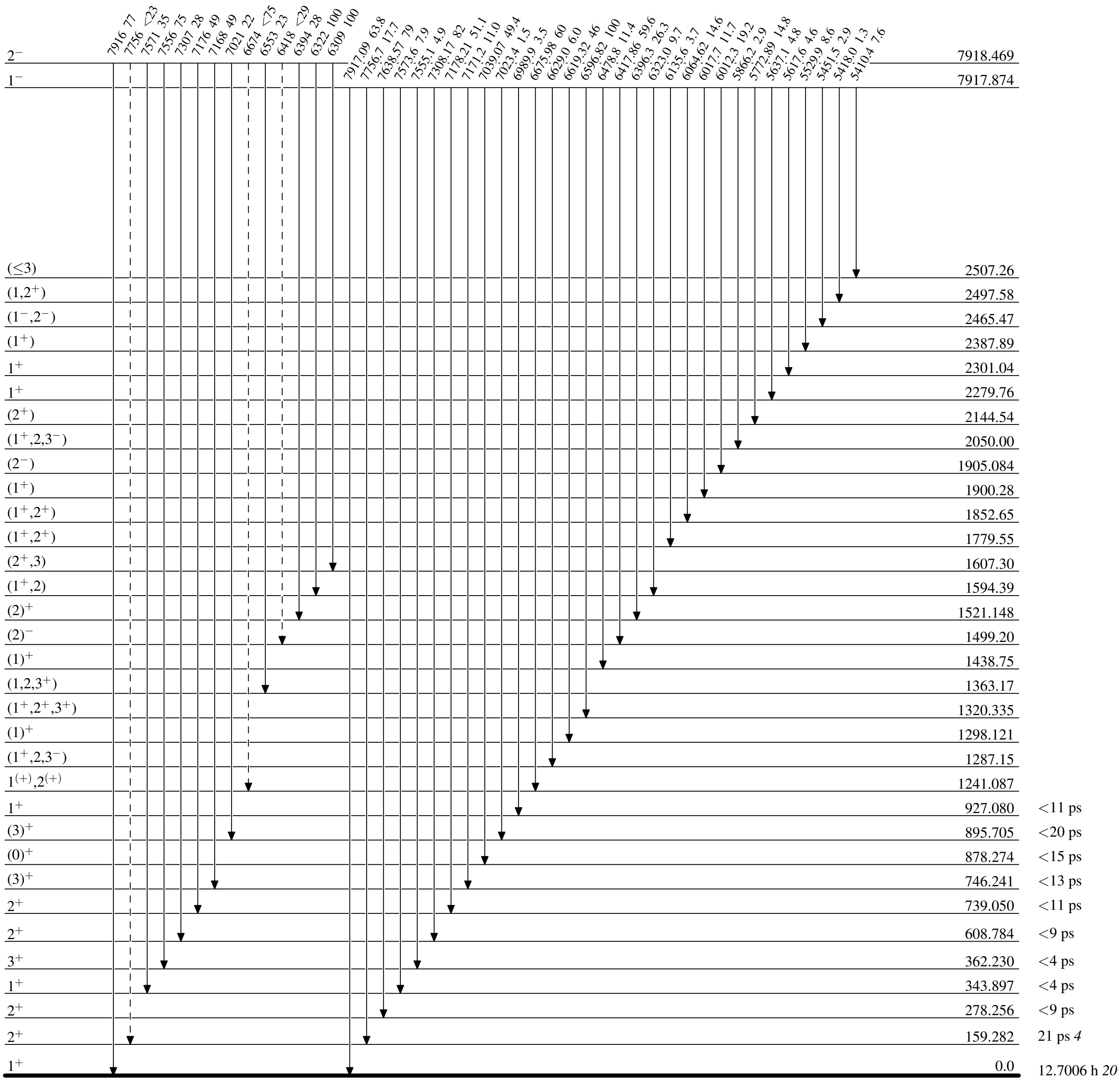
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)

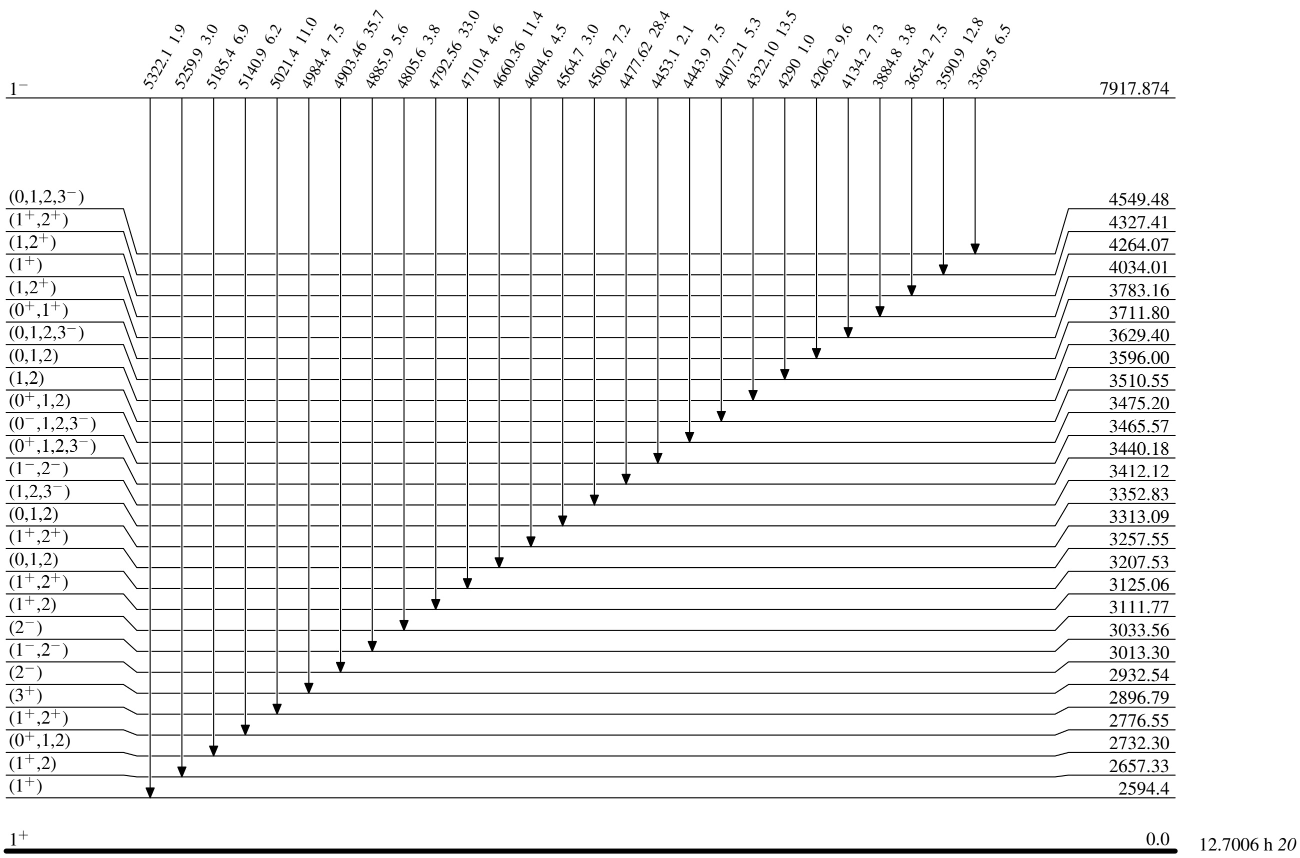


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

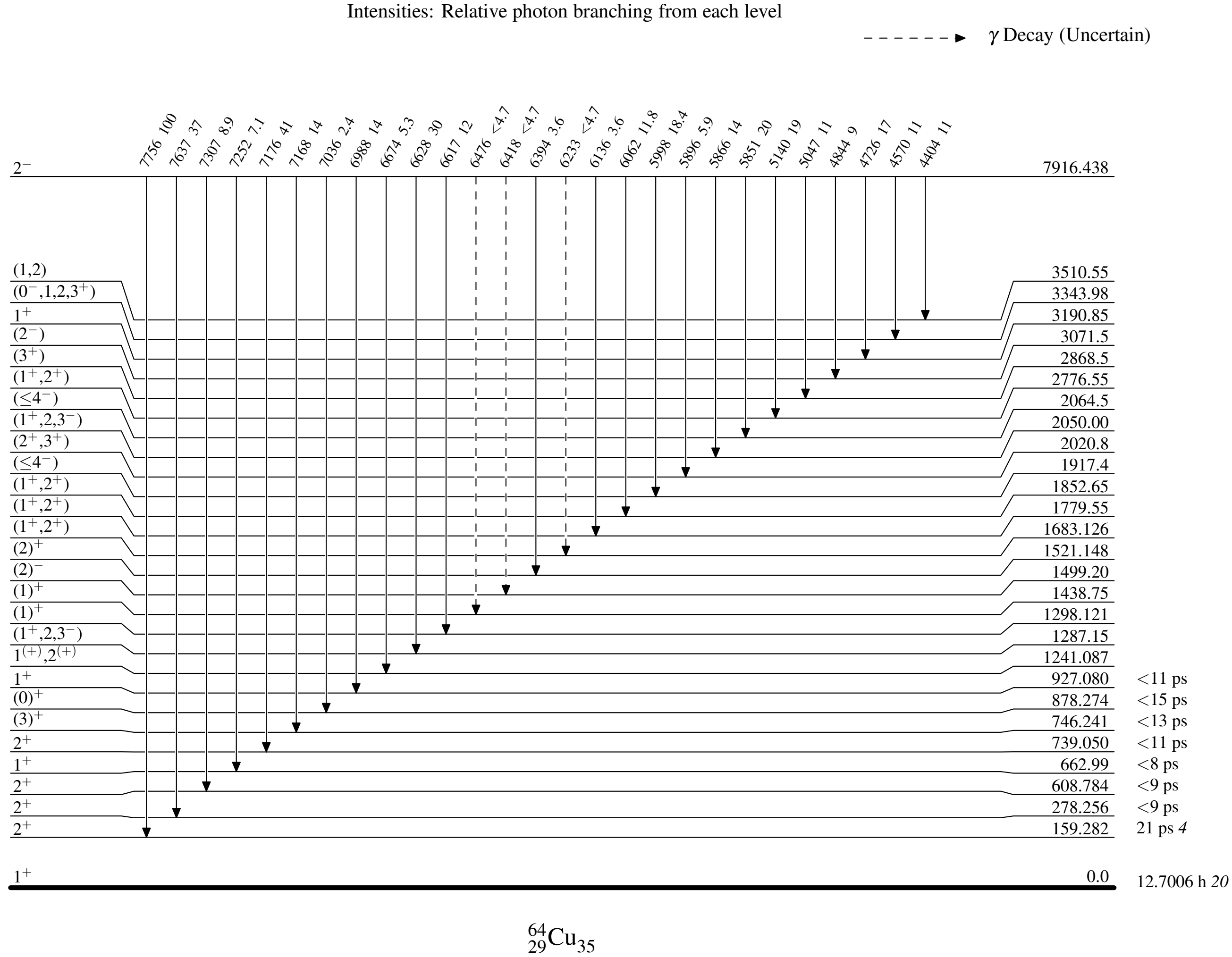


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



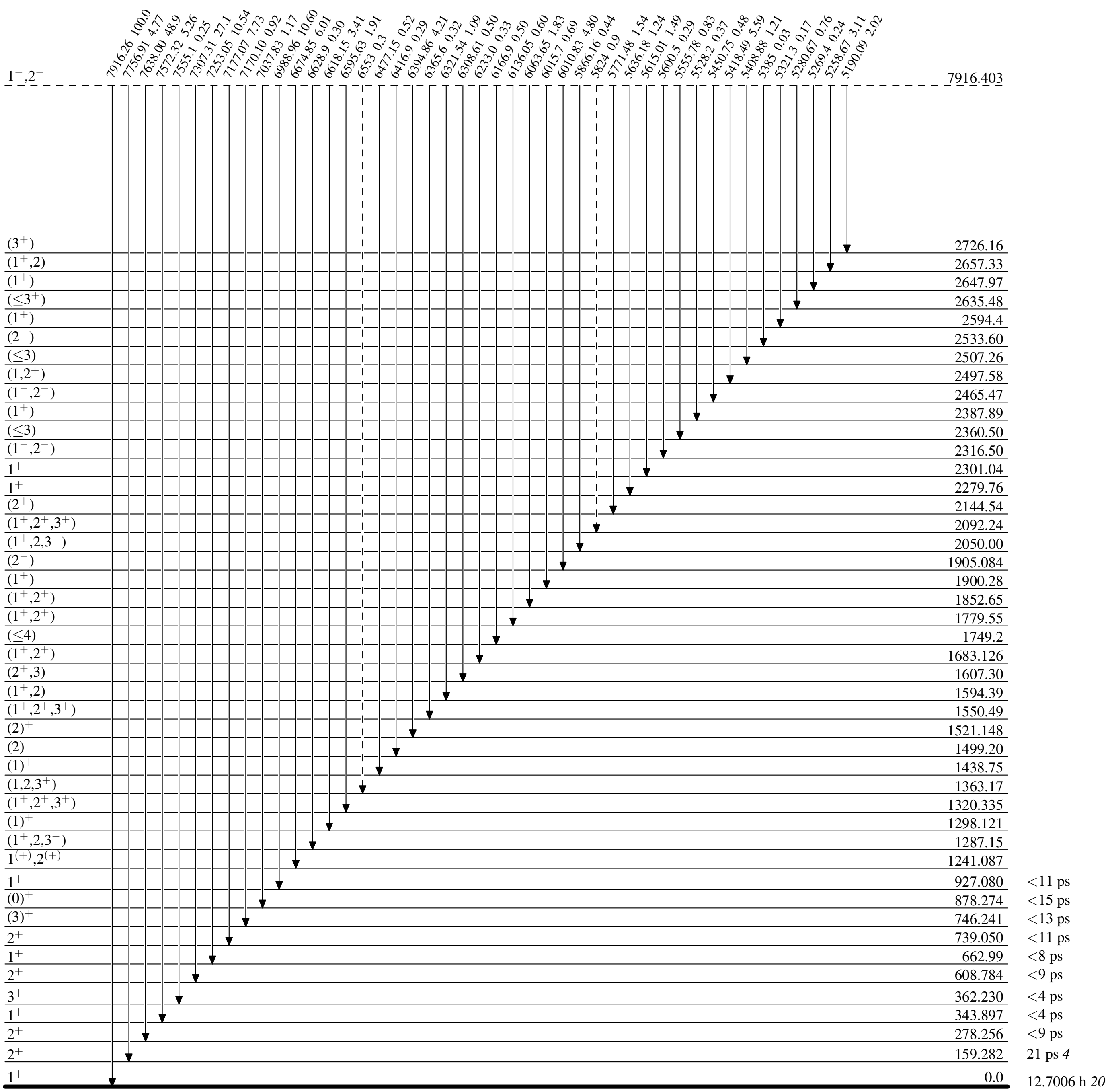
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

- - - - - -► γ Decay (Uncertain)

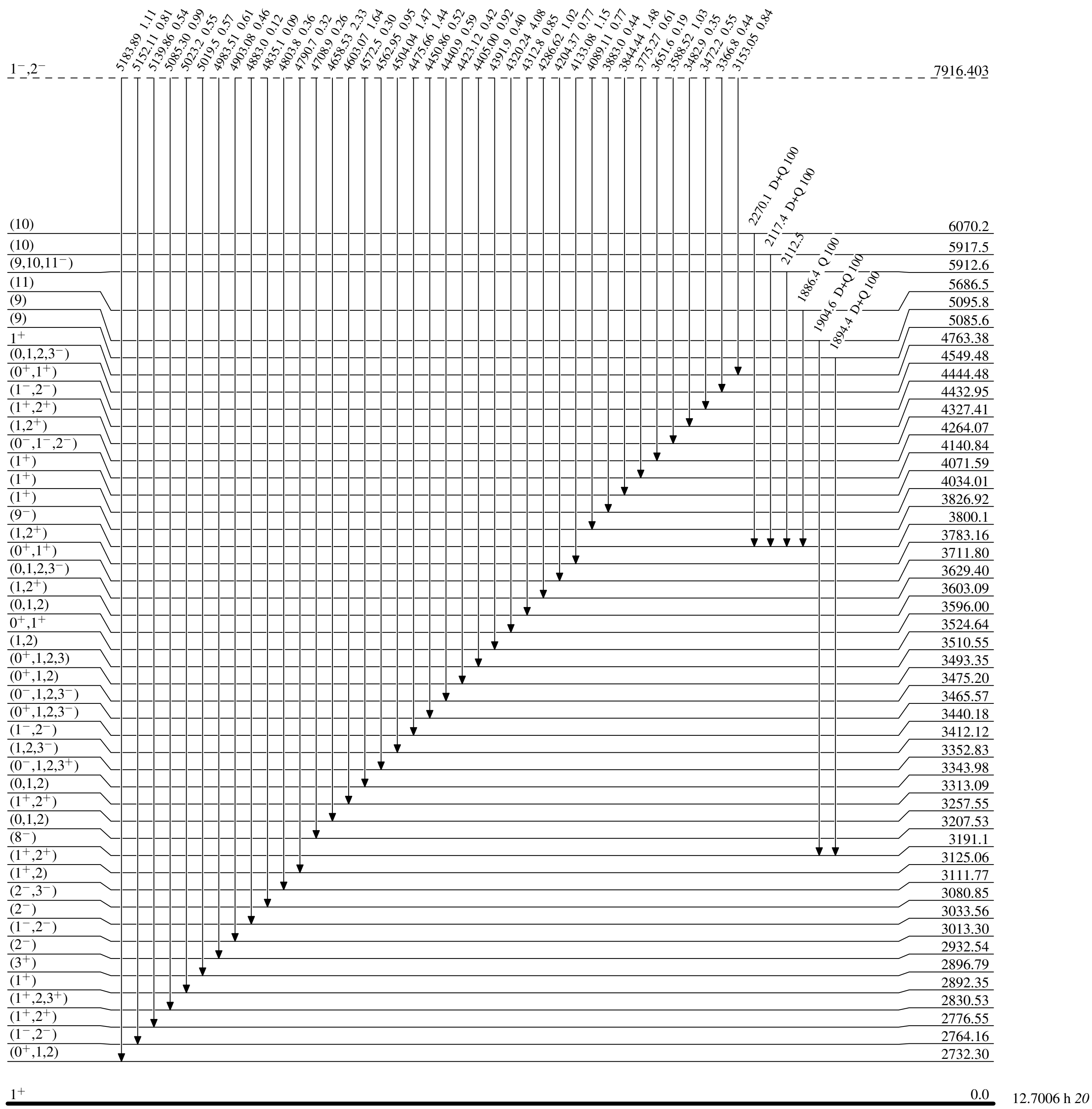


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

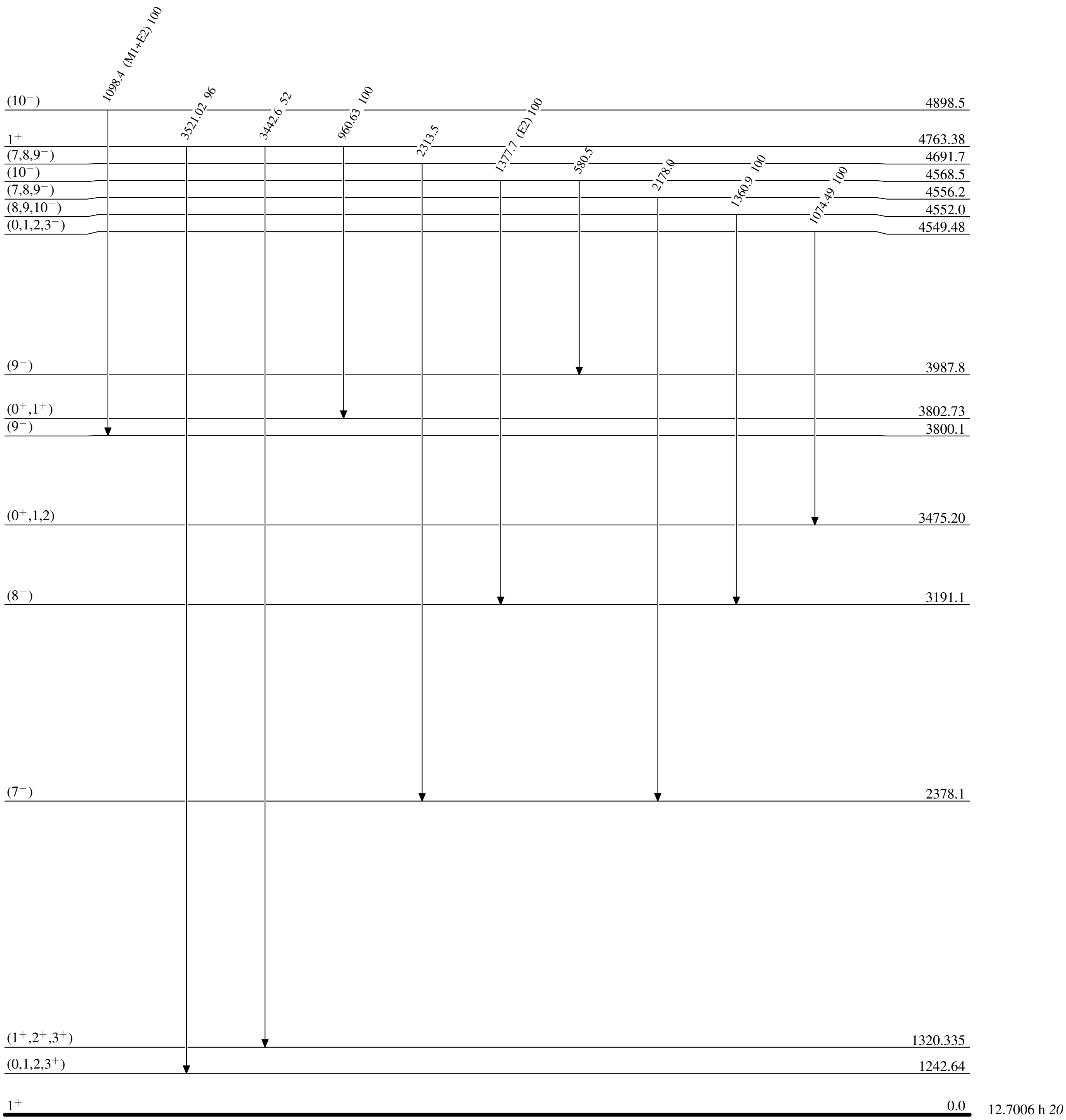


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

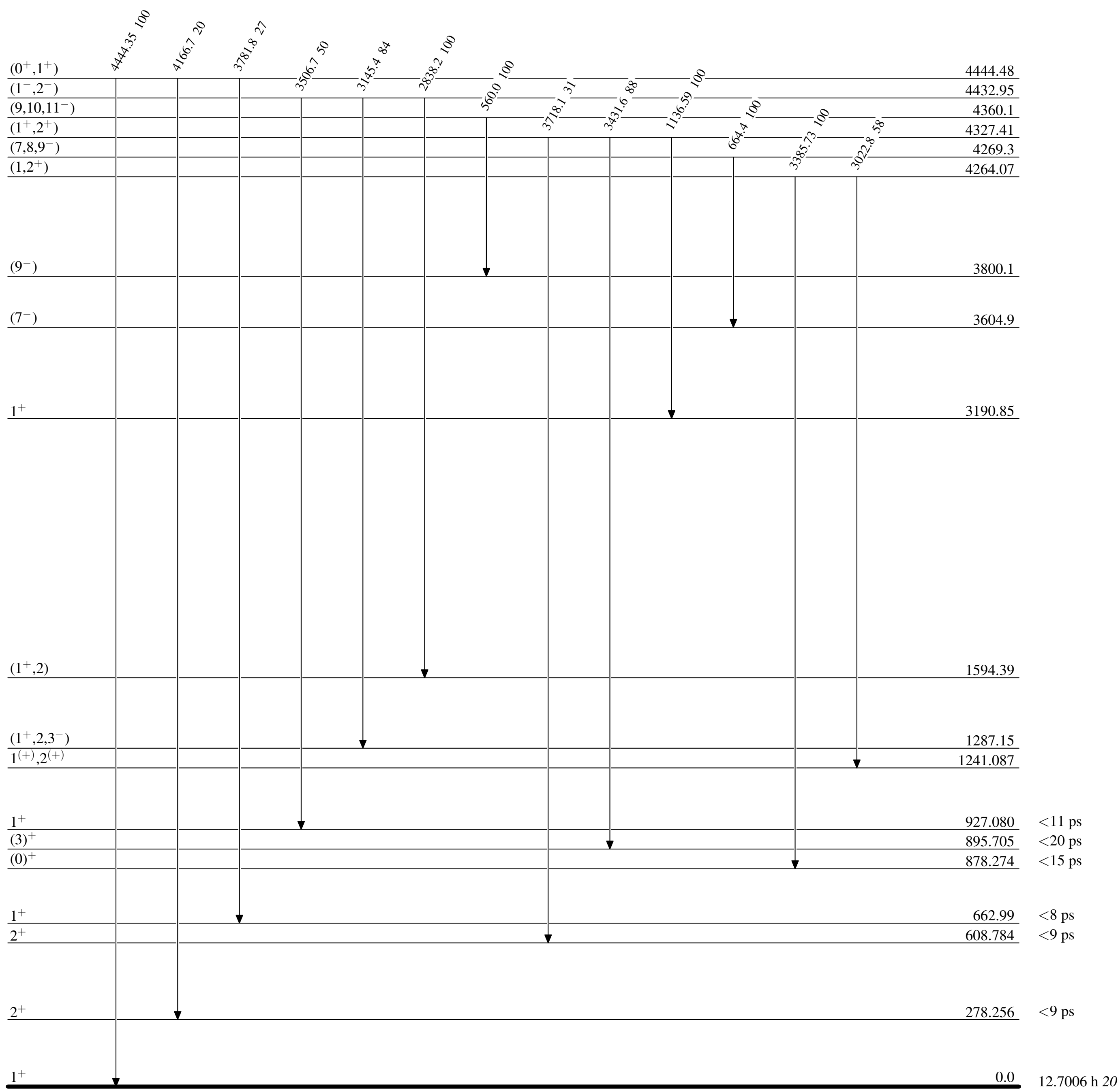


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

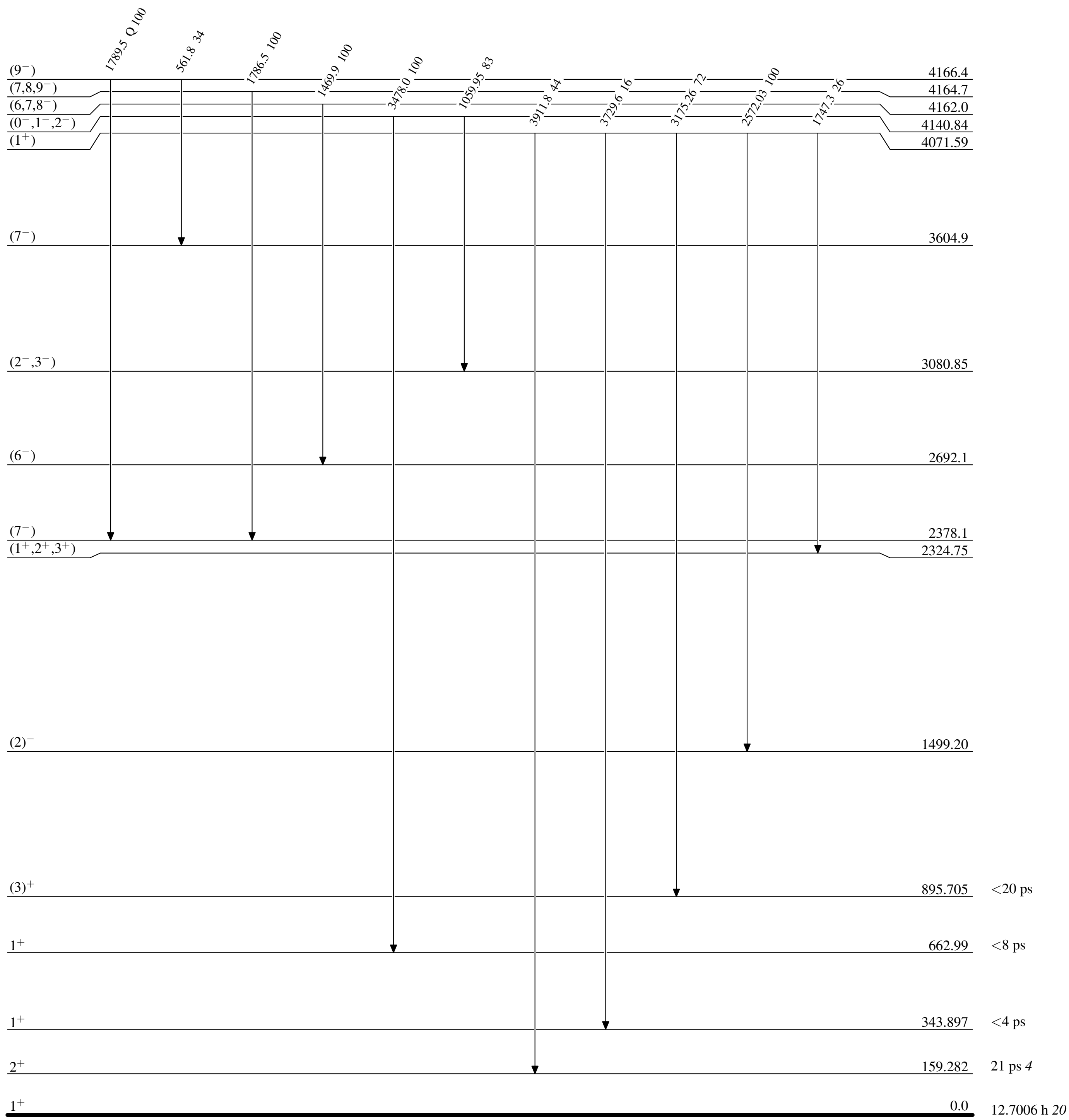


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intentities: Relative photon branching from each level

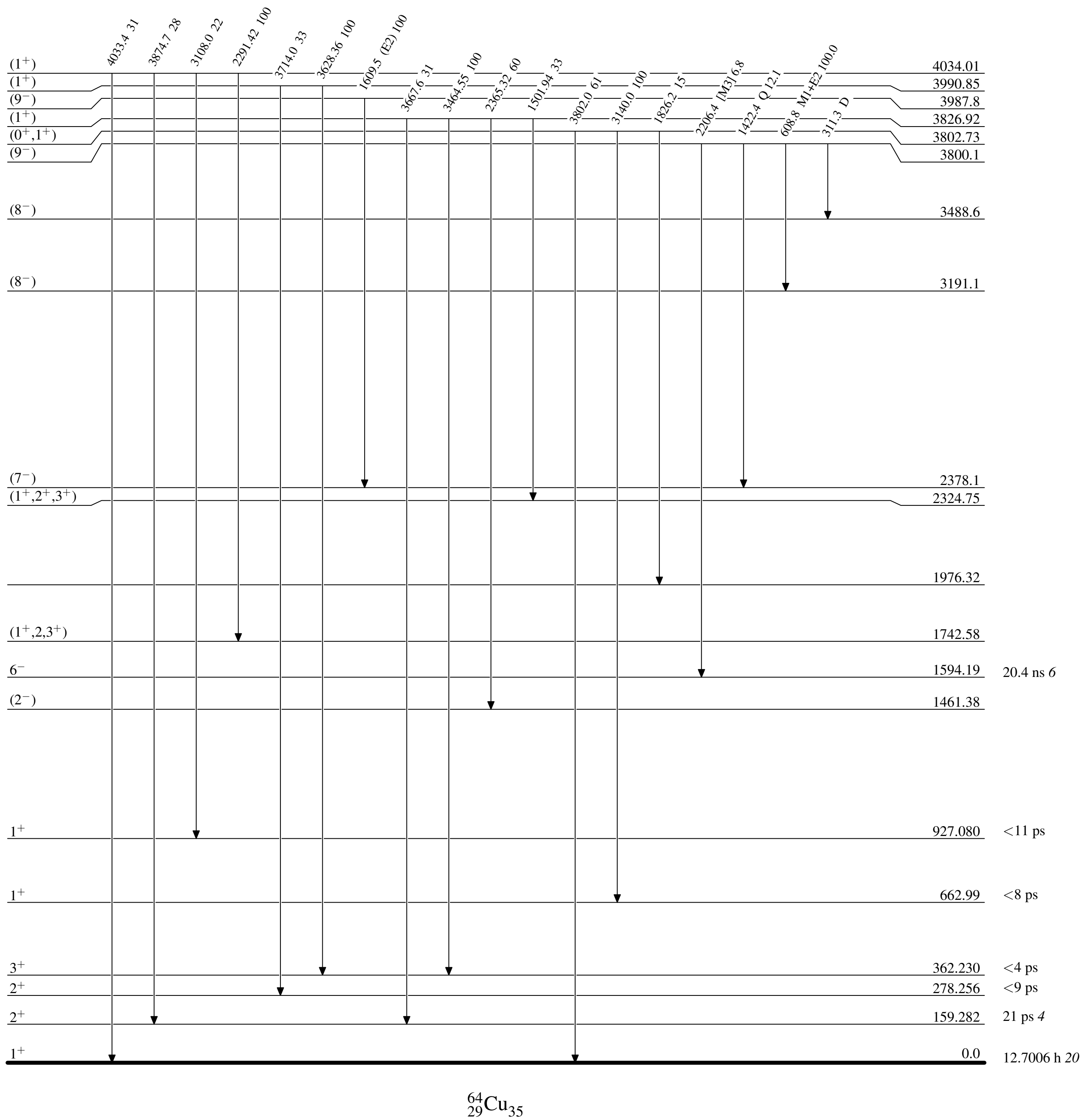


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

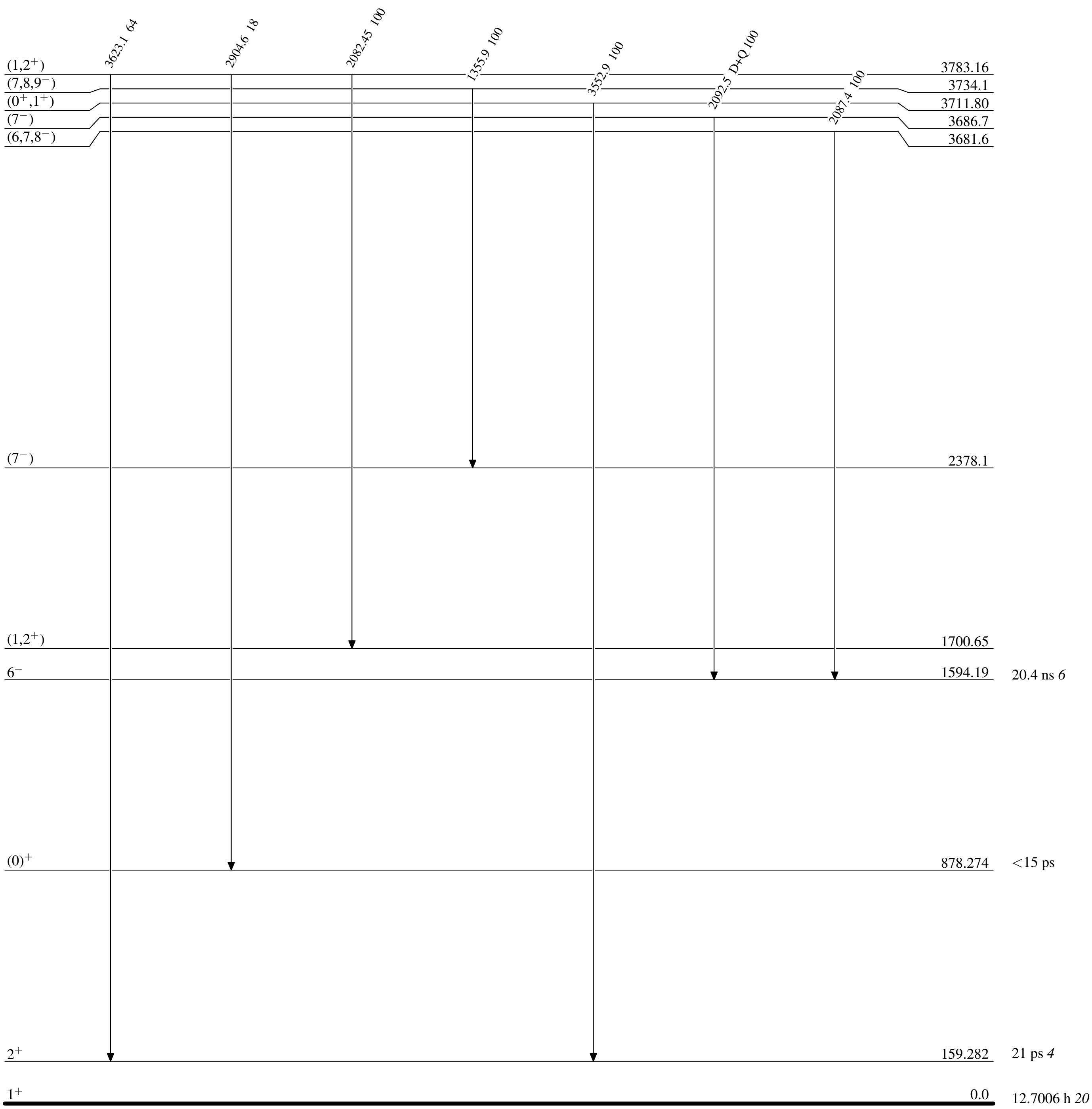
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

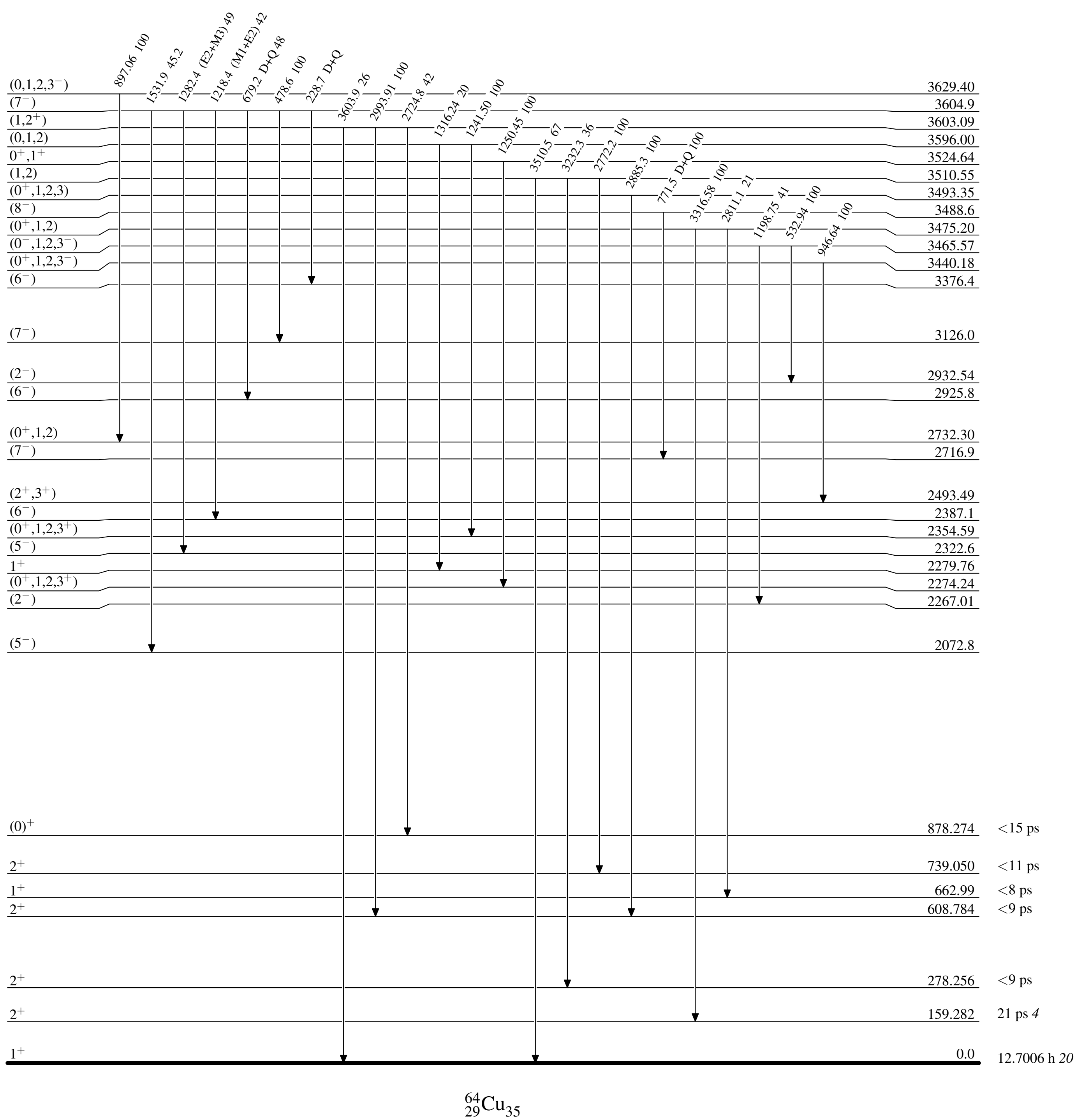


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

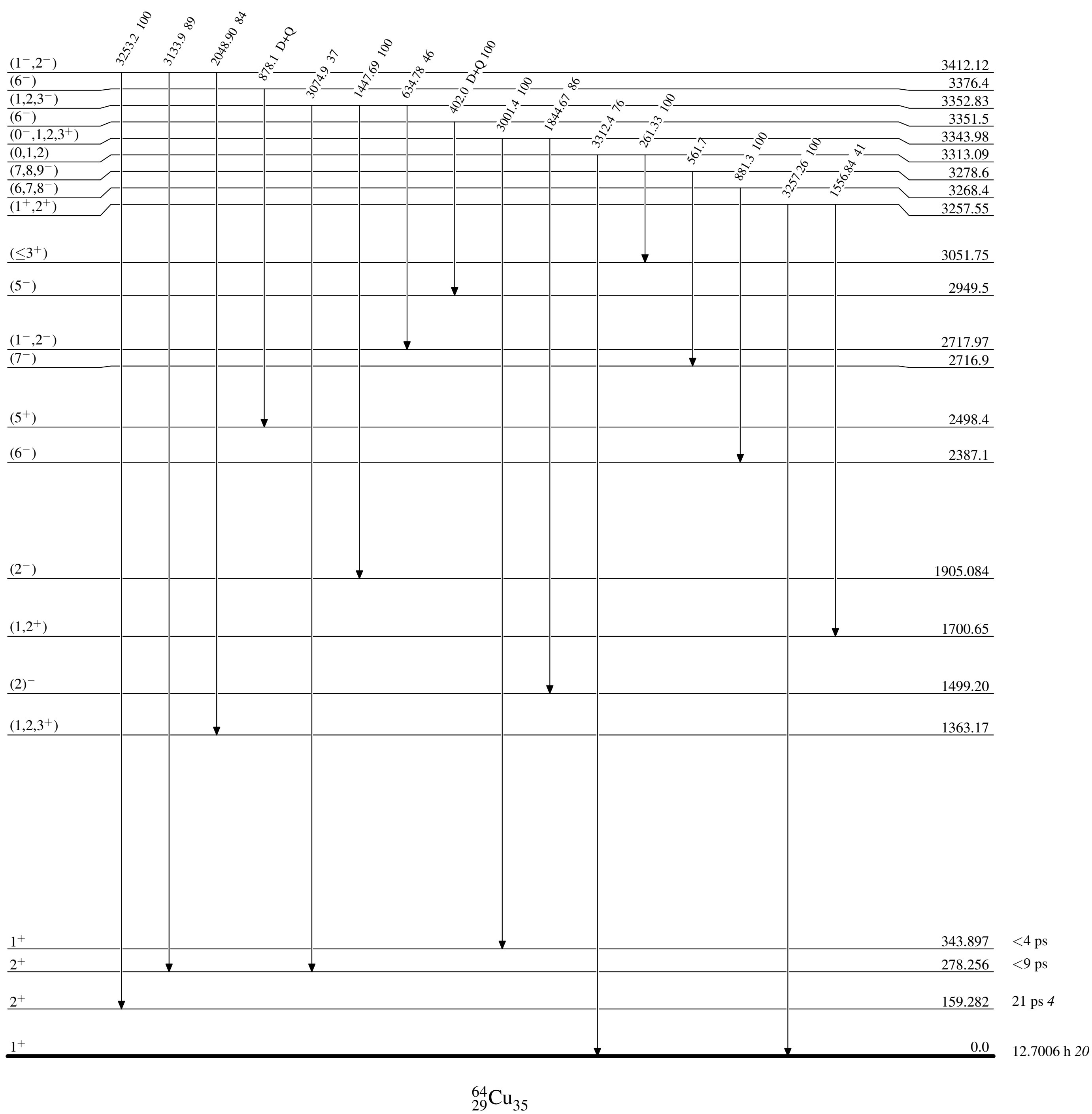
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

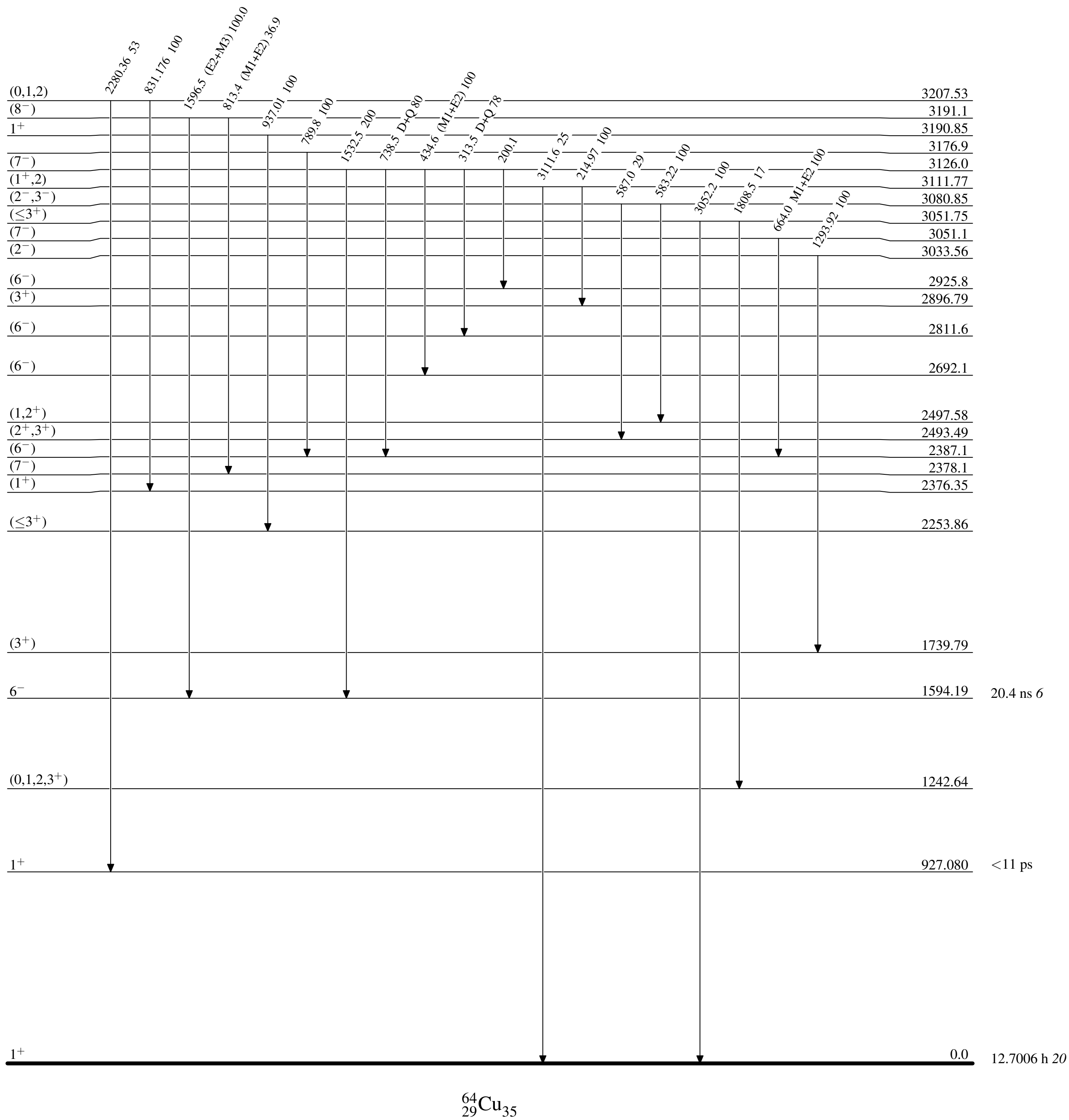
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



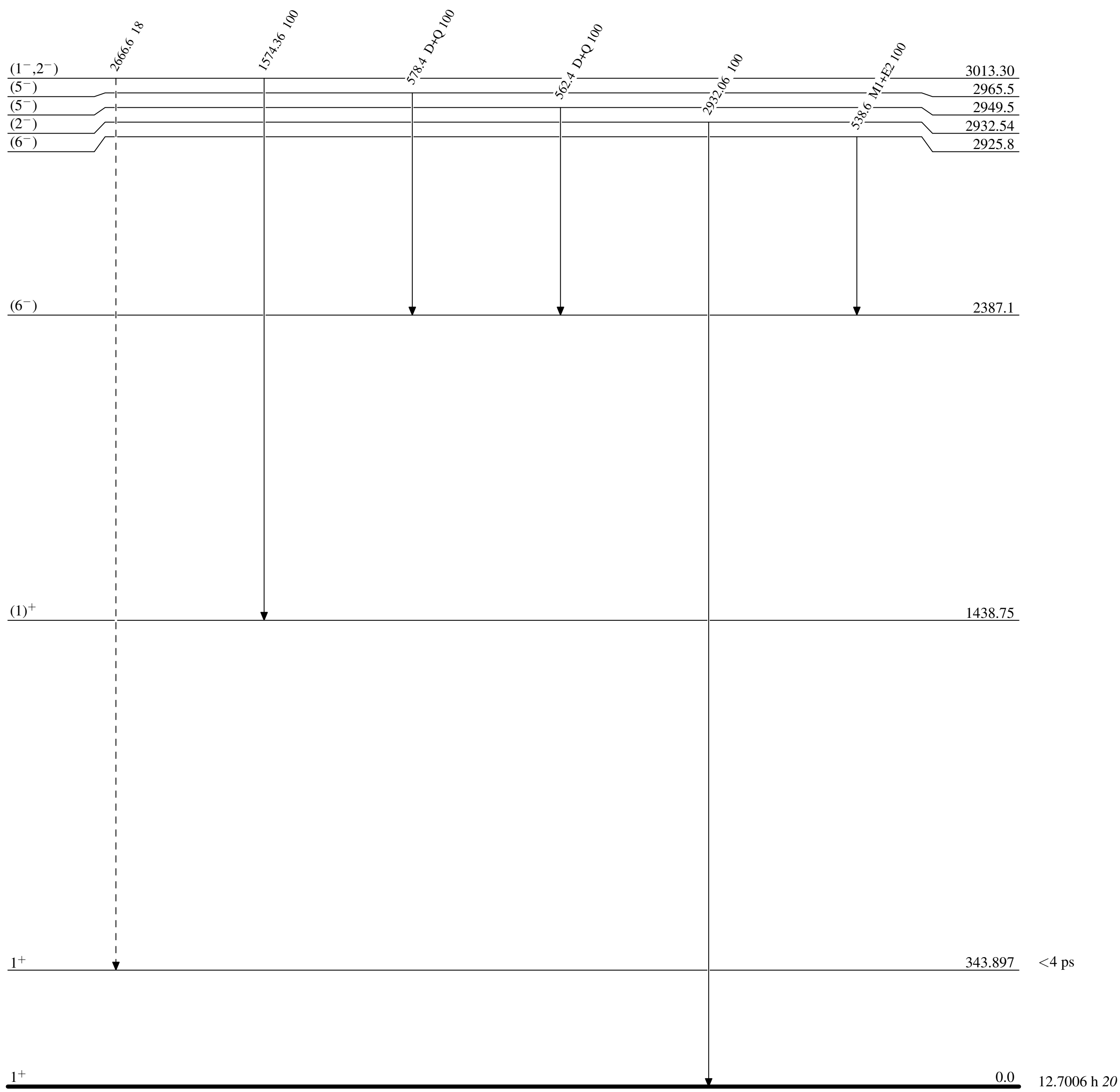
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

- - - - - -► γ Decay (Uncertain)

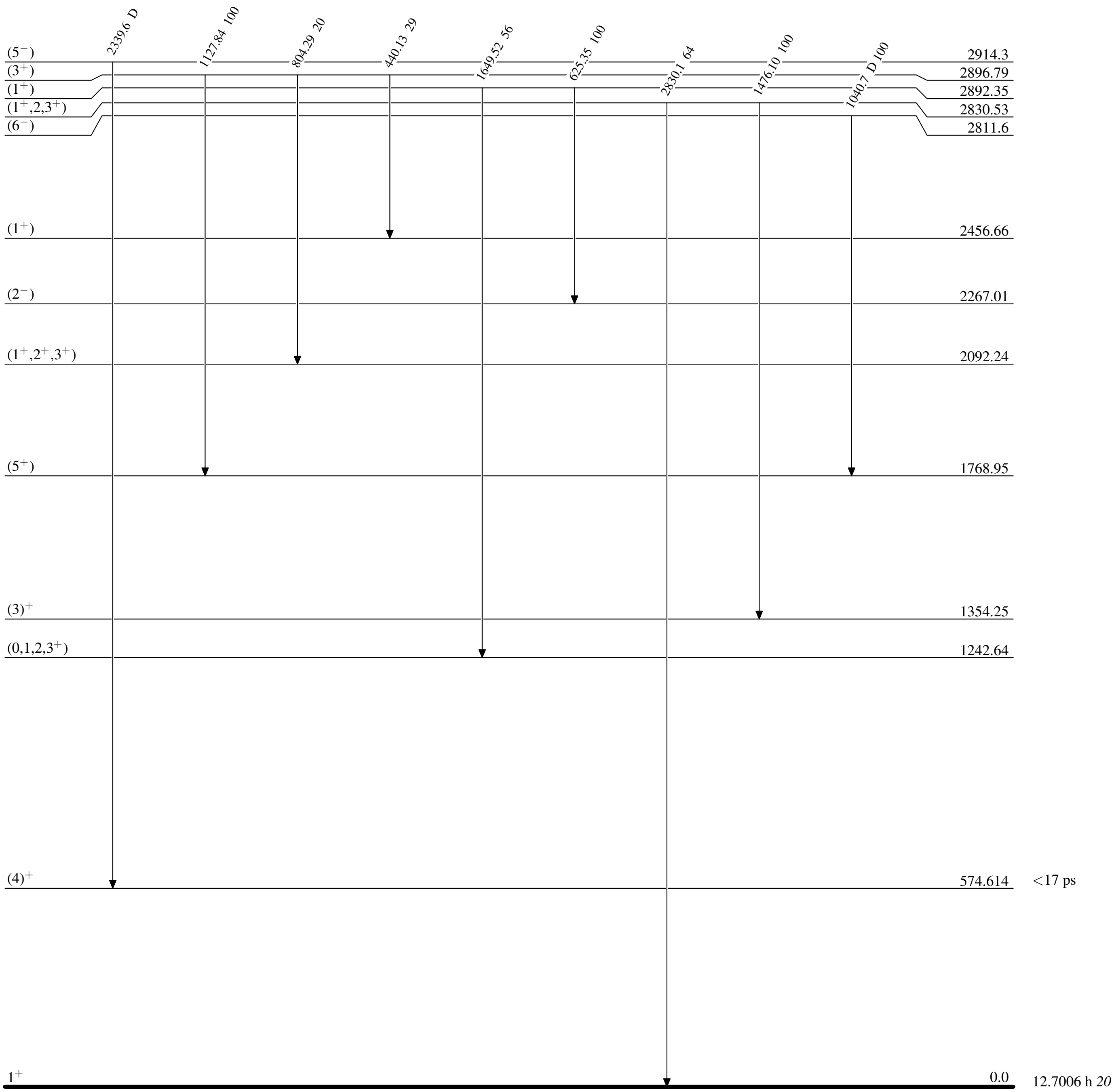


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

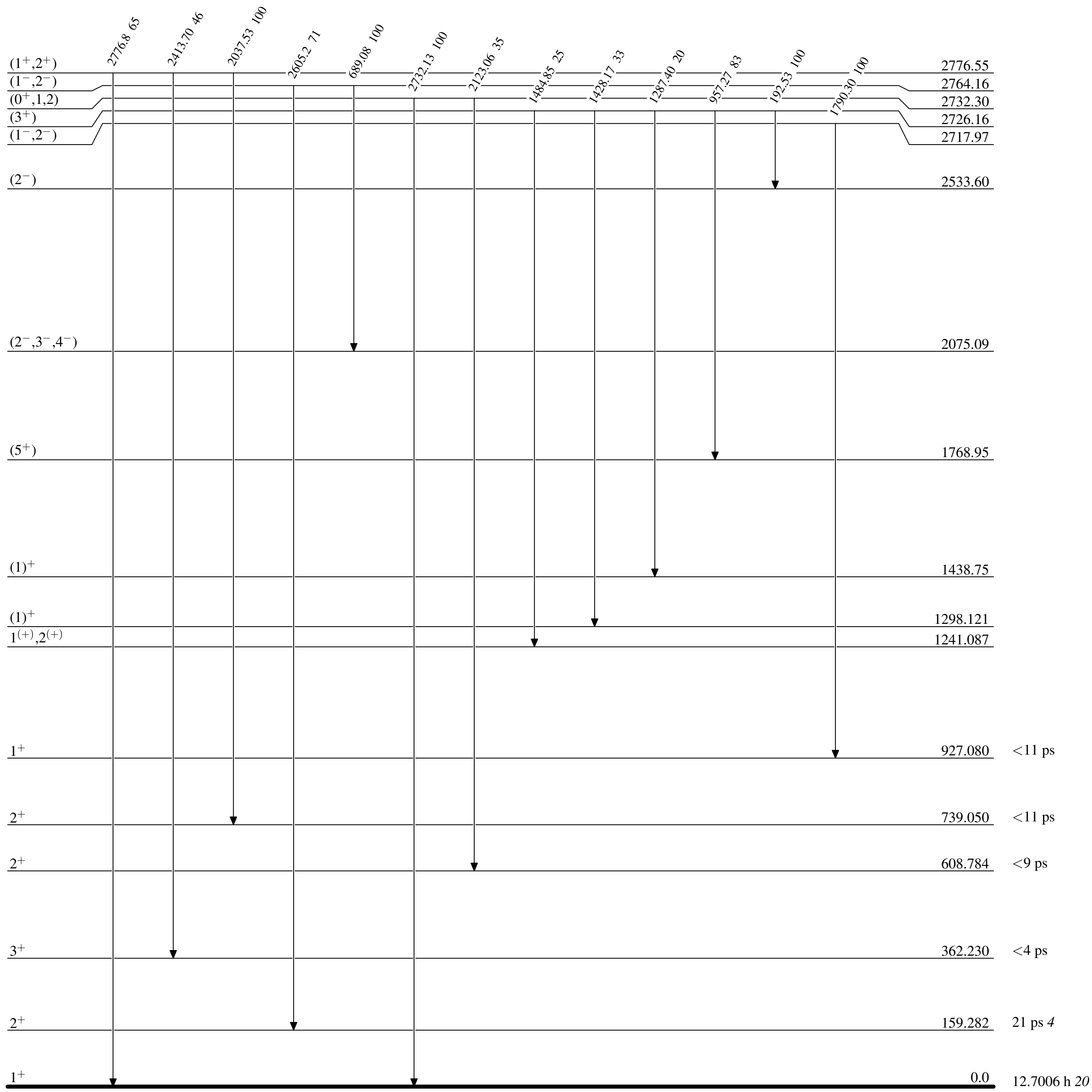


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

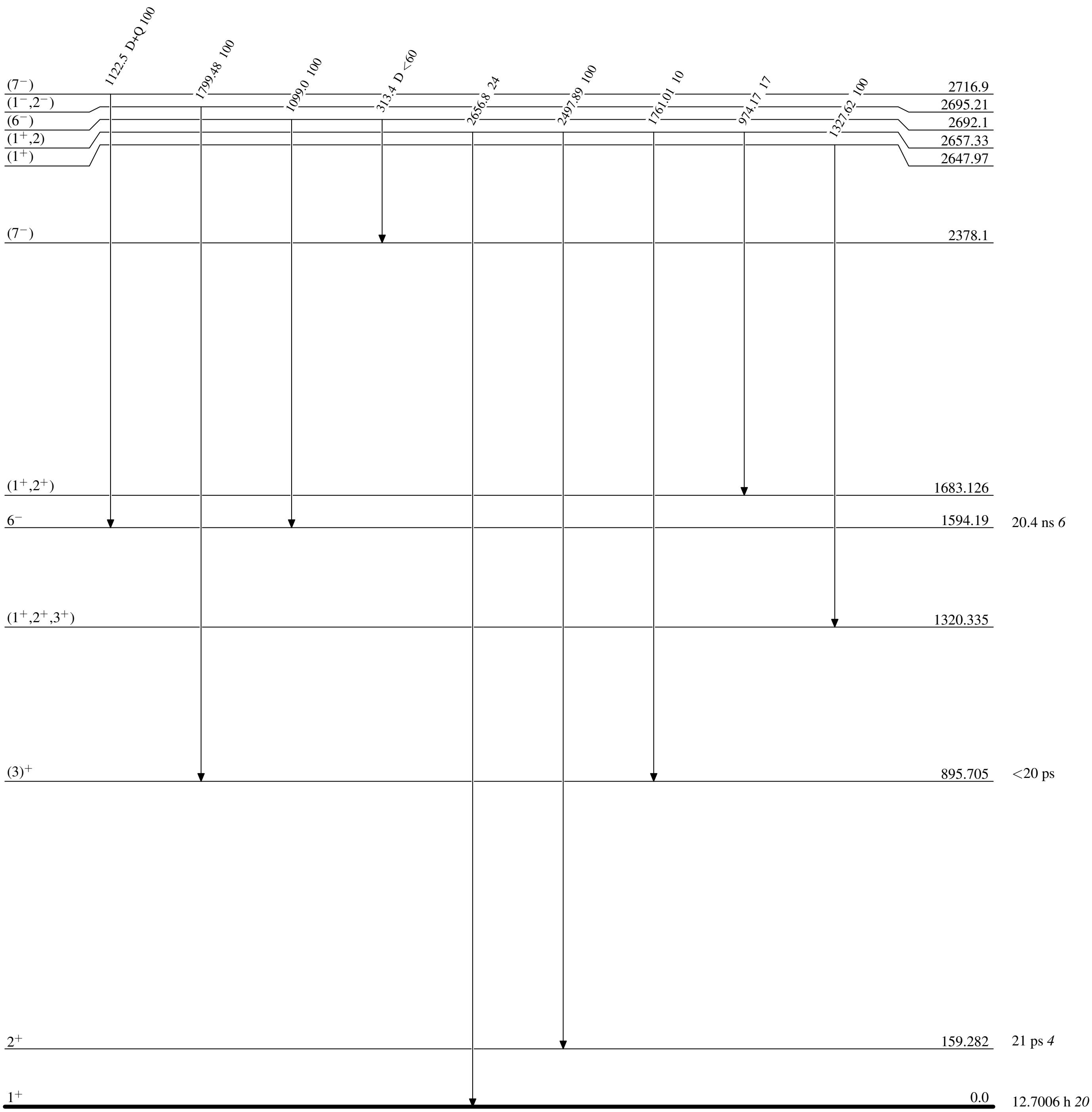


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

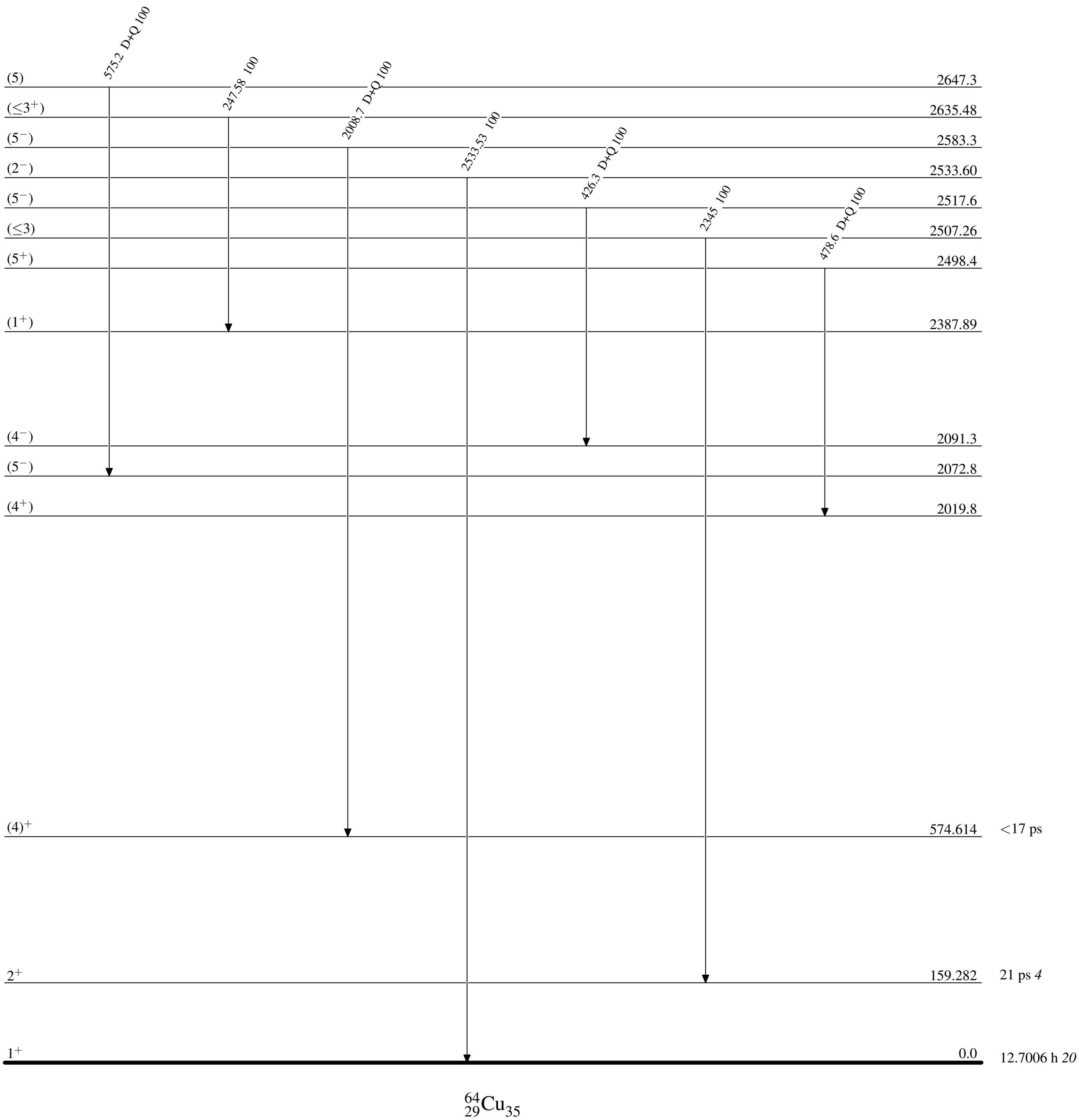


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

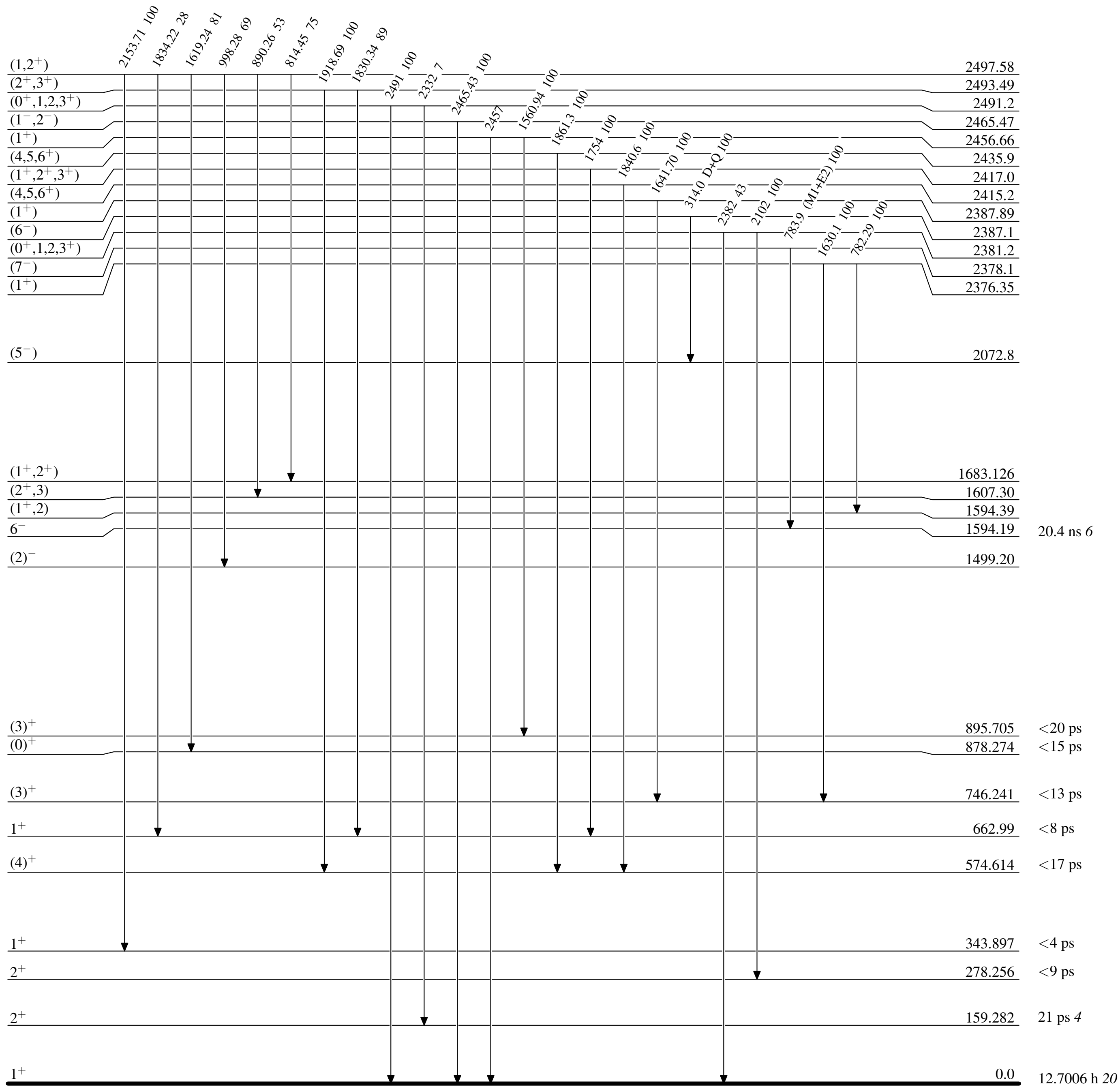
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

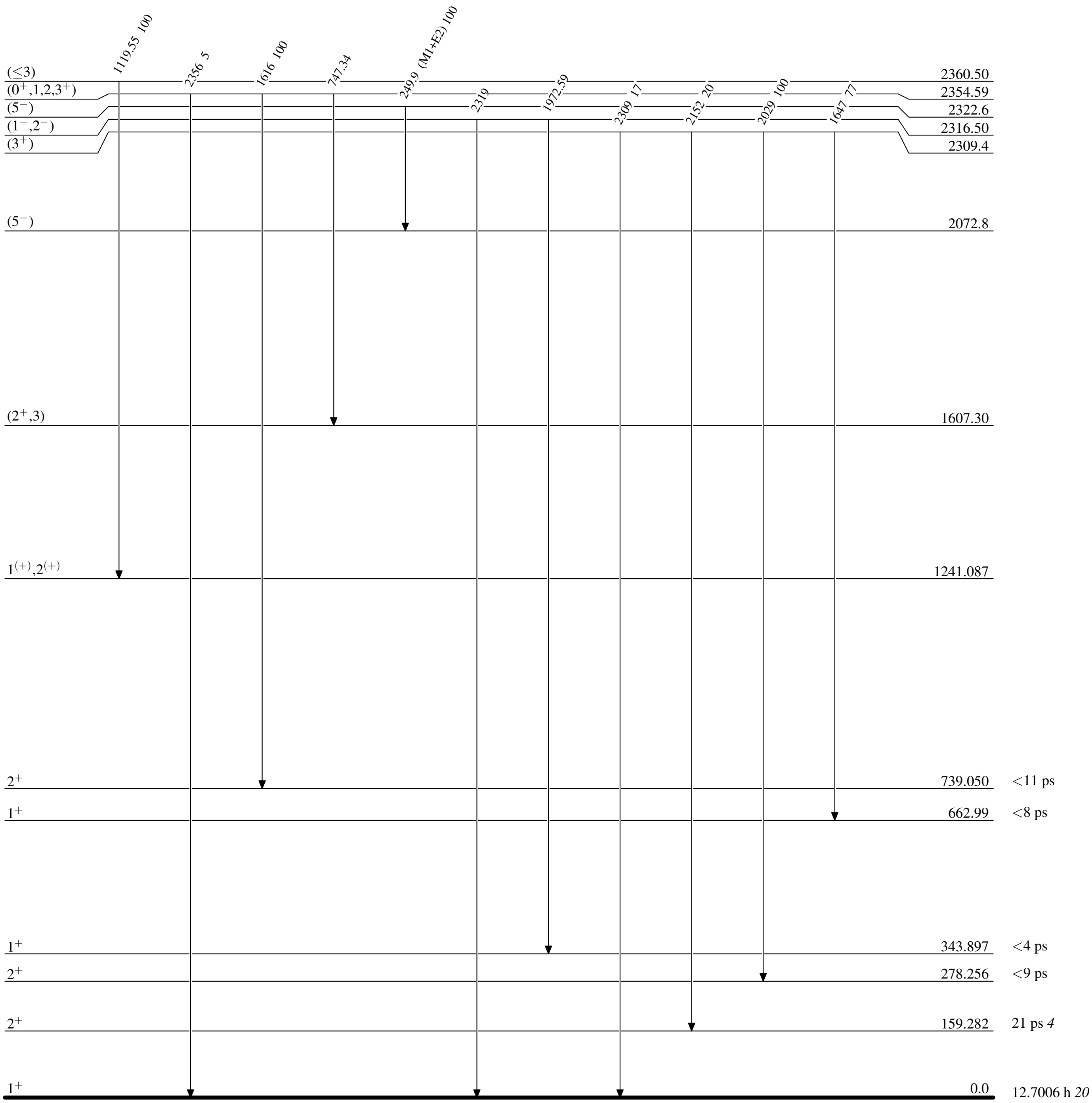


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

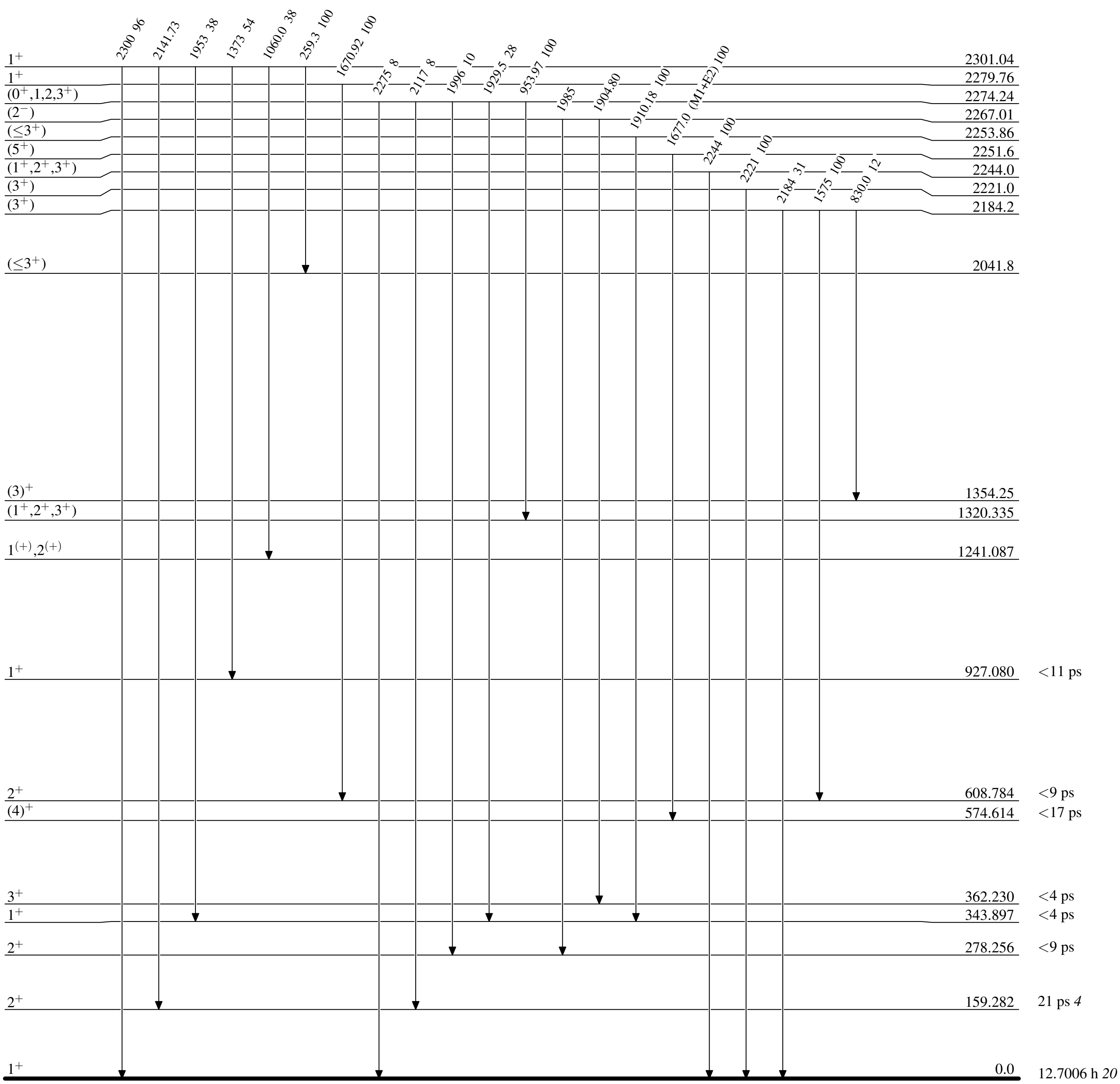


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

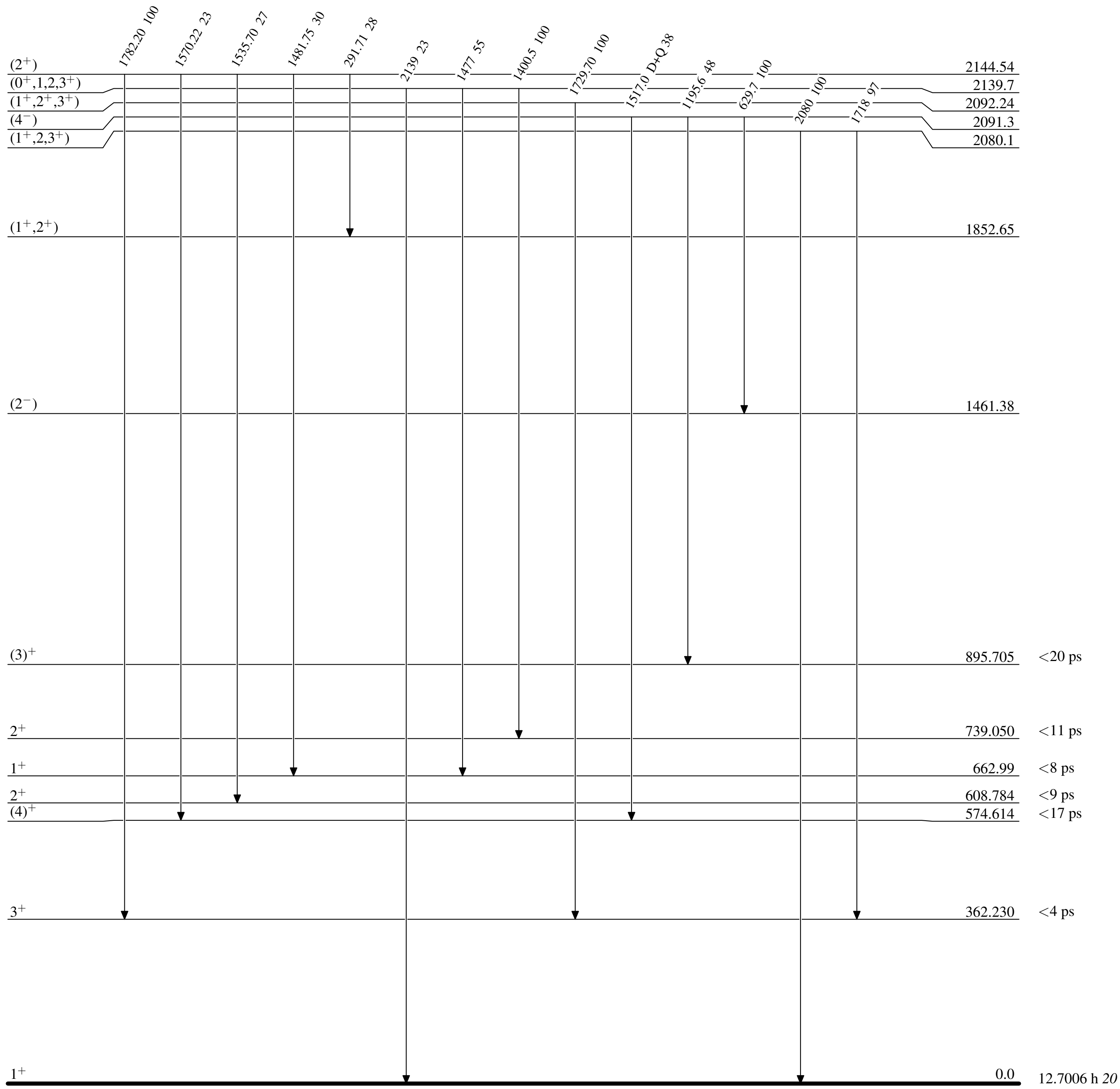


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

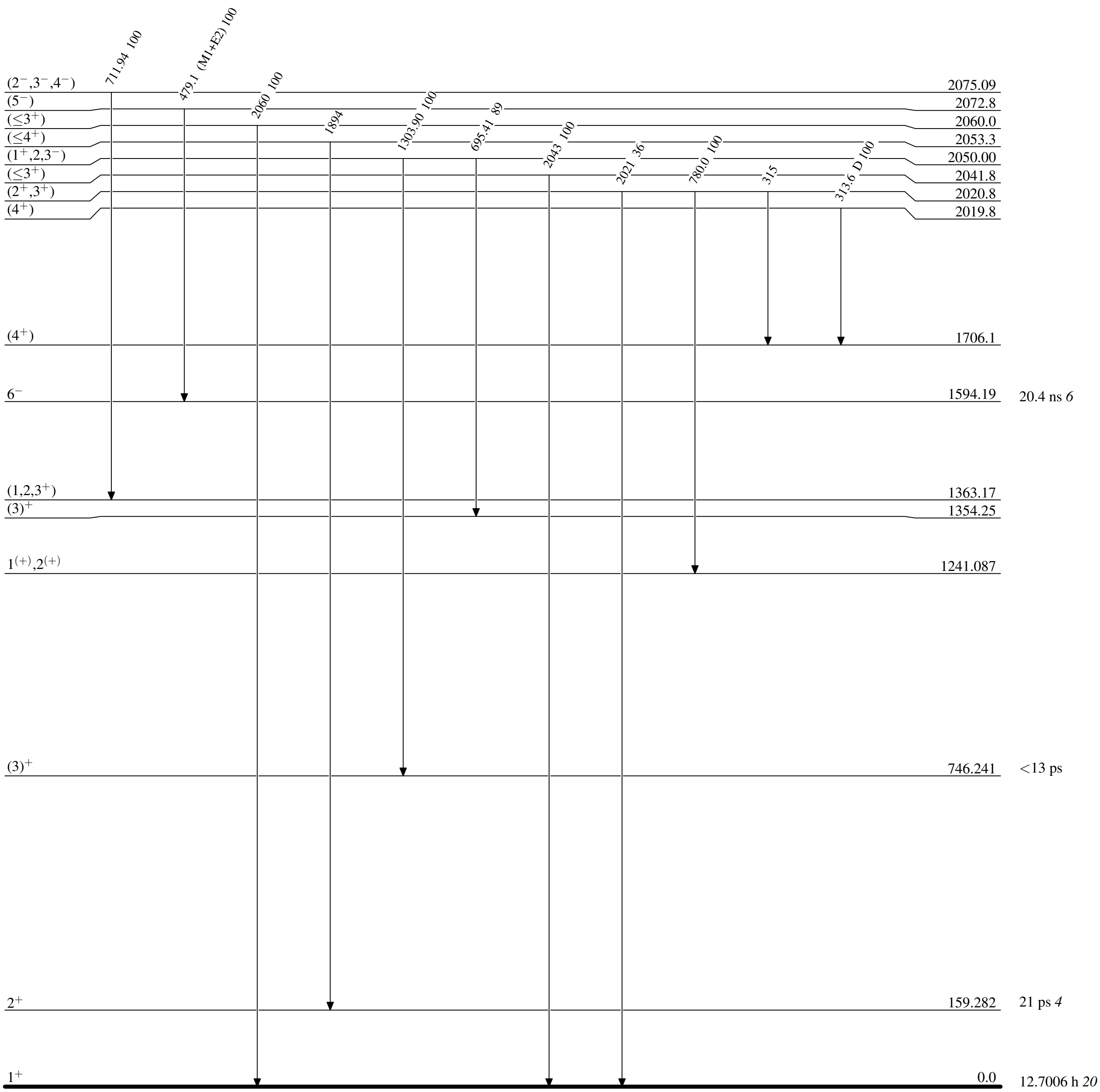


$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{64}_{29}Cu_{35}$

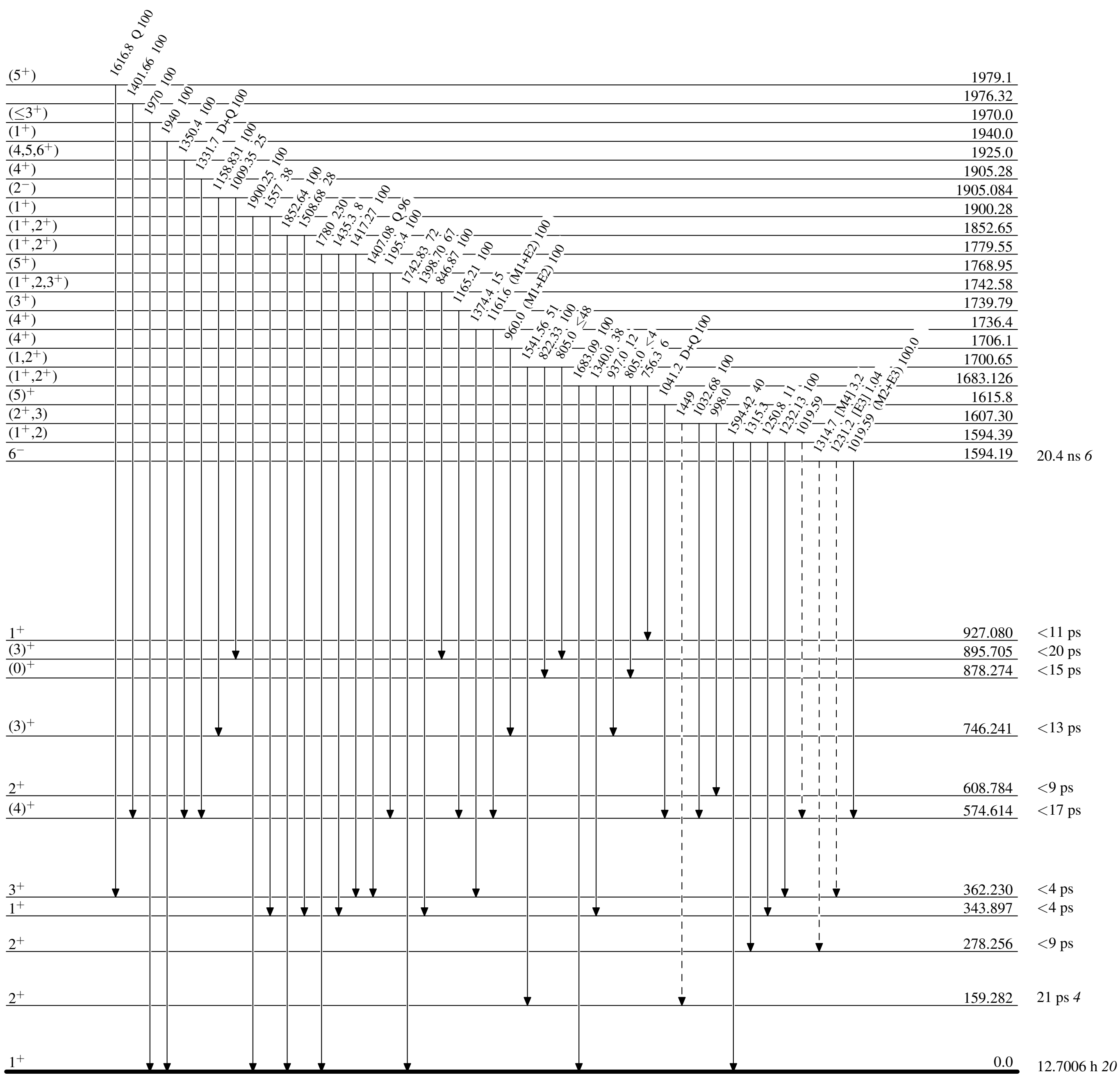
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

Legend

γ Decay (Uncertain)



$^{64}_{29}Cu_{35}$

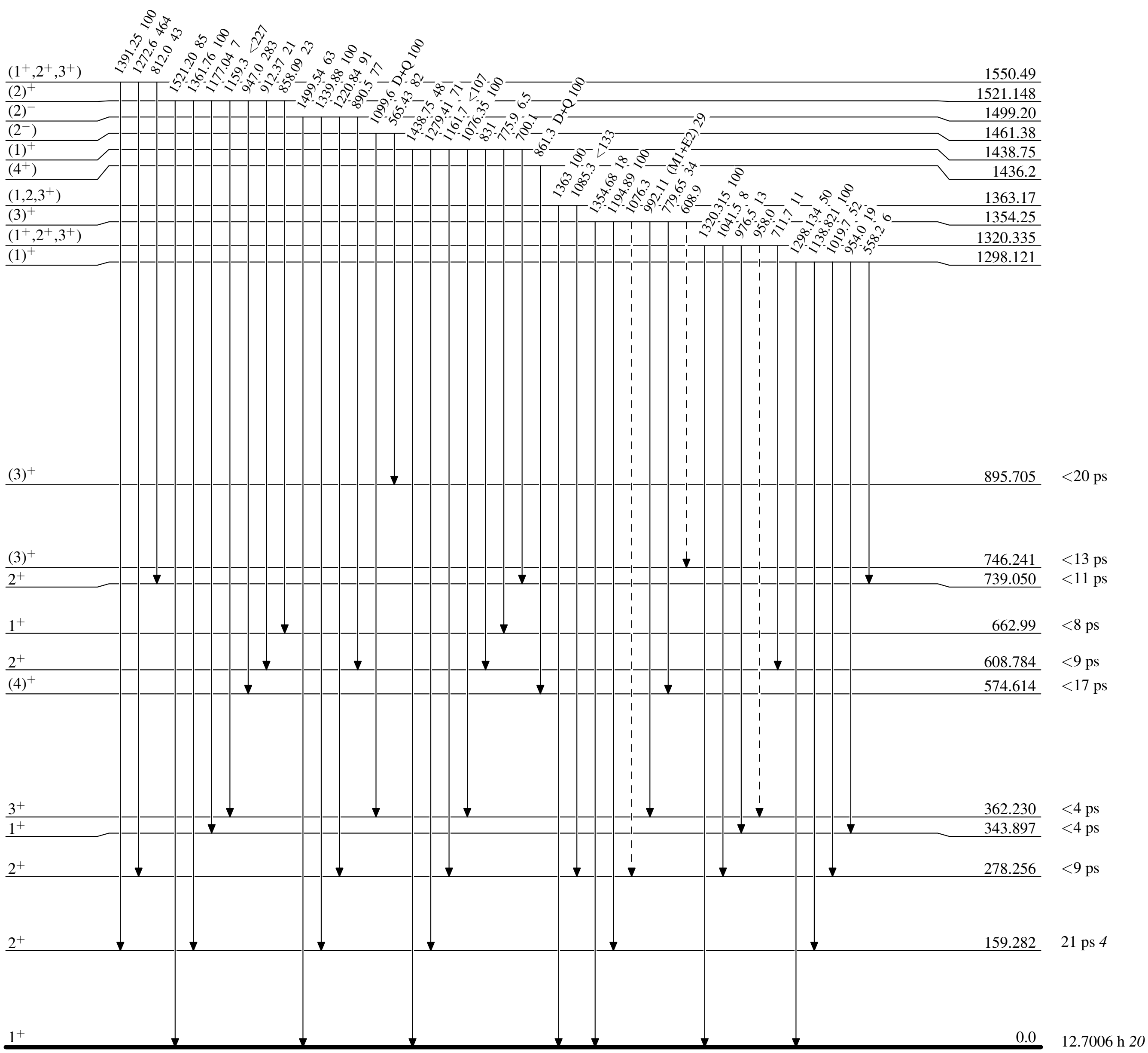
Adopted Levels, Gammas

Legend

Level Scheme (continued)

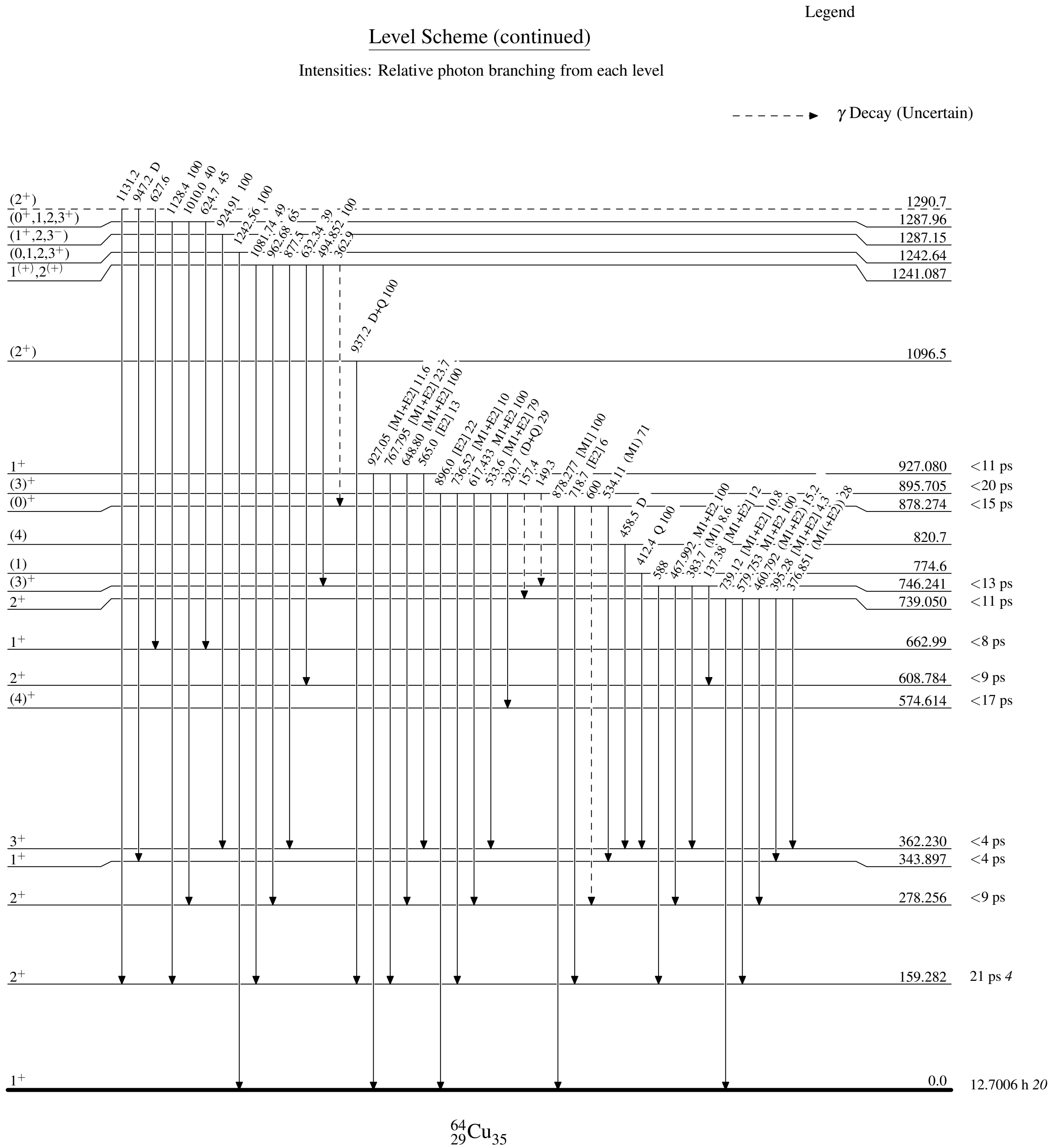
Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)



$^{64}_{29}Cu_{35}$

Adopted Levels, Gammas



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level