^{58}Ni(p,γ) 1985Di05

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 151, 1 (2018)	1-Apr-2018

Others: 1988Iz02 (E(p)=2180-3065), 1984SiZT, 1984SiZP, 1992Ho13.

In following table: "Res Strength" refers to $(2J+1)\Gamma_\gamma\Gamma_{p0}/\Gamma$; "Ex" indicates excit data; authors indicated as having measured "E level" quote E(level) based on unenumerated Eγ data so Eγ values must be deduced from level energy differences.

Summary of ^{58}Ni(p,γ) measurements

Ref.	E(p)	Ex.	E res	Level Sch.	γ Eγ	γ Branch	$\gamma(\theta)$	Res Strength	Other
1957Bu64	700-1900 (17 resonances)	X	X					X	
1959Bo14	1424,1844		X						F
1963Bo07	1424,1844		X						
1960Ca12	1800-4300 (153 resonances)	X	X					X	
1968Tr04	1424,1663,1715								A
1970Fo09	3450-3600							X	
1970Ho34	1376,1424,1844			X					
1972Ma51	3546-3555	X							
1972Sz01	3538								
1974Be72	4700-5200	X				X		X	
1978Be32	4700-5200	X							
1975Co21	3500-3600			X	X	X			
1975Di16	1400-2150		X	X	X				
1975Kl06	3450-3650	X		X	X	X			E
1975Tr05	900-2300 (11 resonances)		X		X	X			
1976Ar01	3473,3545							X	
1977Co03	1833,3547			X	X	X		X	B
1977Ho29	3556,4048		X		X	X			E
1977Kr06	950,1424,1843, 1883,1923		X		X				E
1979Kr20	2500-3900				X	X			E
1980Co02	1100,1377							X	B
1980Ho31	1300-4100 (58 resonances)		X			X		X	
1982Sz01	2839,3488,3550				X	X			
1983Si24	2120-3460					X			
1984Ge02	4400-5320	X				X			
1985Di05	750-5000 (190 resonances)	X	X	X		X		X	
1985Ti04	1180-4200				X				C
1994Ho31	1426-3946 (12 resonances)					X		X	
2014Qu04	1400		X					X	

a. $\gamma\gamma(\theta)$, NaI double sum coin spectrometer.
B. $T_{1/2}$ from DSAM.
C. $(2J+1)\Gamma_{p0}\Gamma_{\gamma 0}/\Gamma$.
D. Relative total Iγ(primary) from resonances (at 55°).
E. Partial Γ_γ for resonance's γ decay.
F. Resonance Γ.

^{59}Cu Levels

Not listed levels from 1985Ti04 whose observed Eγ to g.s. could not be clearly correlated with levels reported in 1985Di05. They are as follows: 7064.5 *13*, 7094.9 *8*, 7160.0 *10*, 7177.2 *10*, 7239.8 *11*, 7290.4 *11*, 7318.7 *11*, 7337.9 *11*, 7369.6 *10*, and 7435.5 *11*. All but two of these (viz., 7065γ and 7160γ) have E consistent with that for a level reported in (p,X) but, given the level density, this may be fortuitous.

The following additional E(level) values proposed by the indicated authors to accommodate observed (typically weak) γ rays have not been confirmed in 1985Di05 and are consequently rejected by the evaluator: 2459 (1975Di16); 3663 and 4053 (1975Tr05); 2392, 3084, 3457, 3785, 3862, 4131, 4689 (1975Kl06); 1296, 2310, 2337 (1980Ho31). The 3022 and 3025 levels proposed in 1975Tr05 have been shown in 1985Di05 to correspond to a single level at 3024 keV.

For additional $(2J+1)\Gamma_{p0}\Gamma_{\gamma}/\Gamma$ data, see 1957Bu64, 1960Ca12, 1980Ho31; for $(2J+1)\Gamma_{p0}\Gamma_{\gamma 0}/\Gamma$ data, see 1985Ti04. In principle, some of those data could be combined with Γ_{p0}/Γ data from (^{3}He,dp) to obtain Γ (or $T_{1/2}$), but the evaluator considers the precision and/or energy resolution of those data inadequate to make that profitable.

E(level)[†]	Jπ[#]	Comments
0.0	$3/2^-$	Jπ: From Adopted Levels.
491	$1/2^-$	Jπ: J=1/2 from γ(θ) (1980Ho31). This result and adopted π=− assumed by 1985Di05.
914.4 *2*	$5/2^-$	E(level): from 1975Co21. Others: 914 (1985Di05), 912 *1* (1975Kl06). Jπ: J=5/2 from γ(θ) (1980Ho31). This result and adopted π=− assumed by 1985Di05.
1398.6 *2*	7/2	E(level): from 1975Co21. Others: 1399 (1985Di05), 1399 *1* (1975Kl06). Jπ: from γ(θ) (1975Tr05); this result and adopted π=− assumed by 1985Di05.
1865.4 *2*	7/2	E(level): from 1975Co21. Others: 1865 (1985Di05), 1865 *1* (1975Kl06). J=7/2 from γ(θ) (1975Tr05); $7/2^-$ assumed by 1985Di05.
1988	5/2	Other E: 1989 *3* (1975Kl06). J=5/2 from γ(θ) (1975Tr05); $5/2^+$ assumed by 1985Di05.
2266	3/2	Jπ: γ(θ) allows J=3/2 but not 1/2 or 5/2 (1975Tr05); fed from J=1/2 resonance. This J and adopted π=+ assumed by 1985Di05.
2318	$1/2,5/2^-$	Other J: γ(θ) allows J=1/2 or 5/2, but not 3/2 (1975Tr05).
2324	$3/2^-$	Jπ: γ(θ) allows J=3/2 but not 1/2 or 5/2 (1975Tr05); this result assumed by 1985Di05.
2586.5 *2*	$11/2^-$	E(level): from 1975Co21. Others: 2587 (1985Di05), 2586 *1* (1975Kl06).
2664	5/2,9/2	Jπ: From 1975Tr05 and J=9/2 preferred (1975Tr05). Other: 5/2 to 11/2 (1985Di05).
2709	$5/2^-$	Jπ: γ(θ) allows J=5/2 but not 3/2 or 7/2 (1975Tr05); this result assumed by 1985Di05.
2716	$7/2^-$	E(level): 2714.4 *2* from 1975Co21. Jπ: 7/2 from γ(θ) (1975Tr05).
2928	$5/2^-$	Other J: 5/2 from γ(θ) (1975Tr05).
2993	$3/2,5/2^-,7/2^-$	
3024[@]	$5/2^-$	Jπ: 5/2,7/2 from γ(θ) (1975Tr05), when 1975Tr05 report two closeby levels at 3022 and 3025, later of spin-parity $3/2^-$. However 1985Di05 report only one level at 3024.
3042.4 *2*	9/2	$g_{9/2}$ antianalogue state. E(level): from 1975Co21. Others: 3042 (1985Di05), 3042 *1* (1975Kl06). Jπ: from γ(θ), 1975Co21 and 1982Sz01. This J and adopted π=+ assumed by 1985Di05.
3115	$5/2^-$	Other J: 5/2 from γ(θ) (1975Tr05).
3130	$1/2^-,3/2,5/2^-$	Other J: ≠ 1/2 from γ(θ) (1975Tr05).
3309	$7/2^-$	
3434	5/2	Other J: (5/2) from γ(θ) (1975Tr05).
3438	(1/2)	Jπ: 1/2,3/2,5/2 from 1985Di05; (1/2) from γ(θ) of 1975Tr05.
3551	5/2	
3574	5/2,7/2	
3578		Jπ: $5/2^+$ assumed by 1985Di05; however, level may differ from adopted 3580 level to which this Jπ is assigned.
3615	$3/2^-,5/2^-$	Other J: 3/2 from γ(θ) (1975Tr05).
3699	7/2	
3729	$3/2^-,5/2$	
3742	$3/2,5/2^+,7/2$	
3758 *1*	$5/2^+,7/2,9/2^-$	E(level): from 1975Kl06; 3756 in 1985Di05.
3887	$3/2,5/2^+$	Probable fragment of $J^\pi=3/2^-$ ^{59}Ni(g.s.) analogue.
3906	$3/2,5/2,7/2^-$	Probable fragment of $J^\pi=3/2^-$ ^{59}Ni(g.s.) analogue.
3930	5/2,7/2	
4072	3/2,5/2,7/2	

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^{58}Ni(p,γ) 1985Di05 (continued)

^{59}Cu Levels (continued)

E(level)[†]	J$^{\pi}$[#]	$T_{1/2}$	E(p)(lab)[a]	Comments
4183	5/2,9/2$^-$			J$^{\pi}$: from $\gamma(\theta)$, J=5/2,7/2,9/2 (1985Di05), not 7/2 (1975Tr05).
4207	5/2,7/2$^-$			
4259? *2*			855 *2*	E(p)(lab): From 1957Bu64; very weak E(level). From Ep and Sp.
4301	5/2,7/2			Other E: 4302 *3* (1975Kl06). Fragment of J$^{\pi}$=5/2$^-$ ^{59}Ni(339 level) analogue.
4307	5/2			Fragment of J$^{\pi}$=5/2$^-$ ^{59}Ni(339 level) analogue.
4349 *2*	(1/2$^-$)		947 *2*	E(level): From Ep and Sp. Analogue of 1/2$^-$ ^{59}Ni(465 level). E(p)(lab): from 1957Bu64; 949 *4* in 1985Di05.
4411.3? *20*			1010 *2*	E(p)(lab): From 1957Bu64; very weak E(level). From Ep and Sp.
4441	7/2			
4465	5/2$^+$,7/2,9/2$^-$			
4494 *4*		7.8 ps *7*	1100 *2*	E(level): From 1985Di05. 4499.8 *20* from E(p) and S(p). $T_{1/2}$: from (2J+1)$\Gamma_{\gamma}\Gamma_{p0}/\Gamma$=0.0252 eV *16* (1980Co02), assuming Γ_{p0}/Γ=0.31 *3* from (^{3}He,d), $\Gamma=\Gamma_{p0}+\Gamma_{\gamma}$ and J=1/2. E(p)(lab): from 1957Bu64; 1098 *4* in 1985Di05.
4530 *1*	5/2$^+$,7/2,9/2$^-$			E(level): from 1975Kl06; 4530 from 1985Di05.
4618 *2*			1227 *2*	E(p)(lab): from 1957Bu64; 1224 *4* in 1985Di05.
4699 *2*	(3/2)		1308 *2*	E(p)(lab): from 1957Bu64; 1307 *4* in 1985Di05.
4710.7 *24*			1316 *2*	E(level),E(p)(lab): from 1957Bu64. E(level)=4706, E(p)=1314 *4* in 1985Di05.
4769 *1*	(3/2,5/2)	3.5 ps *3*	1376 *1*	Fragment of J$^{\pi}$=3/2$^-$ ^{59}Ni(878 level) analogue. E(level): 4771.1 *11* from E(p) and S(p). Other J: 3/2 from $\gamma(\theta)$ (1975Tr05). $T_{1/2}$: from (2J+1)$\Gamma_{\gamma}\Gamma_{p0}$=0.120 eV *8* (1980Co02), assuming Γ_{p0}/Γ=0.65 *4* from (^{3}He,d), $\Gamma=\Gamma_{p0}+\Gamma_{\gamma}$ and J=3/2. E(p)(lab): from 1970Ho34. Others: 1376 *2* (1957Bu64), 1378 *4* (1985Di05).
4817.9 *6*	3/2		1423.6 *4*	E(level): From E(p) and S(p). Fragment of 3/2$^-$ ^{59}Ni(878 level) analogue. Γ=50 eV *50* (1959Bo14). E(p)(lab): from 1963Bo07. 1985Di05 report 1424 *4*. An additional transition (Eγ=3432 *1*, Iγ>2) deexciting this level to an otherwise unknown level is reported in 1970Ho34; it is also reported in 1968Tr04, but absent in 1985Di05 and 1977Kr06. Evaluator omits that γ here.
4914.6 *20*	5/2$^+$,7/2,9/2$^-$		1522 *2*	E(p)(lab): from 1957Bu64; E(level) from Ep and Sp.
4932.3 *20*			1540 *2*	E(level),E(p)(lab): from 1957Bu64 (Ep=1540 *2*); absent in 1985Di05.
4973.6 *20*			1582 *2*	E(level),E(p)(lab): from 1957Bu64 (Ep=1582 *2*); absent in 1985Di05.
5043.3 *20*			1653 *2*	E(level),E(p)(lab): from 1957Bu64 (Ep=1653 *2*); absent in 1985Di05.
5053.2 *20*	(3/2,5/2)		1663 *2*	Analogue of J$^{\pi}$=5/2$^-$ ^{59}Ni(1189 level). E(level): from E(p) and S(p). 5051 *4* from 1985Di05. E(p)(lab): from 1957Bu64. 1664 *4* from 1985Di05.
5105.3 *20*			1716 *2*	E(level): from E(p) and S(p). 5102 *4* from 1985Di05. E(p)(lab): from 1957Bu64. 1985Di05 report 1717 *4*.
5220.3 *20*	9/2	10.5 fs *10*	1833 *2*	E(p)(lab),E(level): E(p)=1833 *2* from 1957Bu64; also observed in 1975Tr05 but absent in 1985Di05. E(level) from E(p) and S(p). J$^{\pi}$: from $\gamma(\theta)$ for 5219 to 1399 and 6905 to 5219 transitions (1977Co03). $T_{1/2}$: weighted average of 9.4 fs *14* and 11.1 fs *14* (from DSAM) and 12.1 fs *28* (based on measured Γ_{γ}/Γ=0.86 *4* and (2J+1)$\Gamma_{\gamma}\Gamma_{p0}/\Gamma$=0.046 eV *5* for 5219 level) (1977Co03).
5230.6 *7*	1/2,3/2,5/2		1843.5 *6*	Analogue of J$^{\pi}$=1/2$^-$ ^{59}Ni(1301 level). E(level): from E(p) and S(p). 5227 *4* from 1985Di05. E(p)(lab): from 1963Bo07 (cf. 1844 from 1985Di05). Γ=100 eV *50* (1959Bo14). Data for this resonance are erroneously attributed to an 1884 resonance in 1994Ho31. Those authors also report a 2923γ feeding an otherwise unknown 3/2$^-$ 2310 level; this γ is omitted here.

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^{58}Ni(p,γ) 1985Di05 (continued)

^{59}Cu Levels (continued)

E(level)[†]	J$^{\pi}$[#]	E(p)(lab)[a]	Comments
5255.0? *10*		1870	E: from 1985Ti04. E(p): from E(level) and S(p). Reported by 1985Ti04; structure visible in yield function of 1985Di05, but not listed in tables.
5264 *4*	3/2	1881 *4*	J$^{\pi}$: from $\gamma(\theta)$, 1975Tr05. Note that data reported for this resonance in 1994Ho31 are actually for the 1844 resonance.
5306 *4*		1924 *4*	
5431 *4*		2051 *4*	
5442[&] *4*		2063[&] *4*	
5473 *4*		2094 *4*	
5482 *4*		2103 *4*	
5521 *4*	3/2^{-},5/2	2143 *4*	Fragment of 5/2^{-} ^{59}Ni(1680 level) analogue. J$^{\pi}$: 5/2 from $\gamma(\theta)$ in 1983Si24.
5542 *4*		2164 *4*	
5550 *4*	(3/2,5/2)	2172 *4*	J$^{\pi}$: Other: 3/2,5/2 from $\gamma(\theta)$ (1983Si24). Fragment of 5/2^{-} ^{59}Ni(1680 level) analogue.
5584 *4*		2207 *4*	
5589 *4*		2212 *4*	
5602 *4*	(3/2)	2225 *4*	Fragment of 3/2^{-} ^{59}Ni(1735 level) analogue.
5608 *4*		2231 *4*	
5620 *4*	7/2	2244 *4*	J$^{\pi}$: from $\gamma(\theta)$ (1975Tr05). E(p)(lab): E(p)=2238 in 1975Tr05. E(p)=2232 in 1983Si24 and 1960Ca12.
5642 *4*	(3/2,5/2)	2266 *4*	E(p)=2256 in 1983Si24; J=1/2,3/2,5/2 from $\gamma(\theta)$ (1983Si24). Fragment of J$^{\pi}$=3/2^{-} ^{59}Ni(1735 level) analogue. 1994Ho31 report a γ branch to an otherwise unknown 2337 level; the evaluator omits that γ and final level here.
5658 *4*	5/2	2282 *4*	J$^{\pi}$: confirmed by $\gamma(\theta)$ from 1975Tr05.
5694 *4*		2319 *4*	
5712 *4*	(5/2)	2337 *4*	Other J: 5/2 from $\gamma(\theta)$ (1983Si24).
5719 *4*	3/2,5/2$^{(+)}$	2344 *4*	
5777.5 *16*		2398	E(level),E(p)(lab): E(p) from 1960Ca12; E(level) from Eγ (1985Ti04). Absent in 1985Di05.
5801 *4*		2428 *4*	
5822 *4*		2449 *4*	
5833 *4*		2460 *4*	
5851 *4*	5/2	2479 *4*	J$^{\pi}$: from $\gamma(\theta)$ (1983Si24).
5881 *4*	3/2,5/2^{-}	2509 *4*	
5897 *4*	7/2^{-}	2525 *4*	Analogue of 7/2^{-} ^{59}Ni(1948 level). 1994Ho31 suggest that this level has J$^{\pi}$=5/2^{-} and that it is the analogue of an otherwise unknown 5/2^{-} ^{59}Ni level at 1969 keV; in the absence of any supporting evidence, the evaluator rejects this suggestion. Their reported photon branching also differs significantly from that shown here (4983γ (19%), 4498γ (73%), 3909γ (8%)).
5914 *4*	5/2	2543 *4*	J$^{\pi}$: from $\gamma(\theta)$ (1983Si24).
5928 *4*	5/2	2557 *4*	J$^{\pi}$: from $\gamma(\theta)$ (1983Si24).
5941 *4*	3/2,5/2	2570 *4*	J$^{\pi}$: from $\gamma(\theta)$ (1983Si24). Other E(p): 2574 (1983Si24).
5957 *4*		2586 *4*	
5968 *4*		2598 *4*	See comments on 5971 level.
5971 *4*		2601 *4*	E(level),E(p)(lab): E(p)=2603 resonance of 1983Si24 could be 2598 and/or 2601 resonances of 1985Di05. J$^{\pi}$: J=5/2 from $\gamma(\theta)$ (1983Si24), but result unreliable if resonance is complex.
6033 *4*		2664 *4*	
6039 *4*	3/2^{+}	2670 *4*	E(p)=2668 resonance of 1983Si24 probably corresponds to E(p)=2670 resonance of 1985Di05, but may include a contribution from the 2664 resonance since δ(g.s. transition) from 1983Si24 is inconsistent with that from 1985Di05 for 2670 resonance. 1983Si24 assign J=3/2 based on $\gamma(\theta)$.
6076 *4*	3/2^{-}	2708 *4*	J$^{\pi}$: from $\gamma(\theta)$ for E(p)=2704 resonance (1983Si24).
6091 *4*	3/2^{-}	2723 *4*	Other E(p): 2721 (1983Si24).
6125 *4*	3/2,5/2	2757 *4*	J$^{\pi}$: from $\gamma(\theta)$ (1983Si24).
6197 *4*	(3/2)	2831 *4*	Possible fragment of J$^{\pi}$=3/2^{-} ^{59}Ni(2415 level) analogue.

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^{58}Ni(p,γ) 1985Di05 (continued)

^{59}Cu Levels (continued)

E(level)[†]	J$^\pi$[#]	E(p)(lab)[a]	Comments
6201 *4*	(3/2,5/2)	2835 *4*	Possible fragment of J$^\pi$=3/2$^-$ ^{59}Ni(2415 level) analogue. Other J: 3/2 from $\gamma(\theta)$ in 1983Si24, assuming authors observed this resonance alone.
6206 *4*	9/2$^+$	2839 *4*	
6238 *4*	(3/2,5/2)	2872 *4*	Possible J$^\pi$=3/2$^-$ ^{59}Ni(2415 level) analogue fragment. Other J: 3/2 from $\gamma(\theta)$ for E(p)=2869 resonance (1983Si24).
6300 *4*	(3/2,5/2)	2935 *4*	Other J: 3/2 from $\gamma(\theta)$ for E(p)=2938 resonance (1983Si24).
6322 *4*	(5/2)	2958 *4*	Other J: 3/2,5/2 from $\gamma(\theta)$ for E(p)=2960 resonance (1983Si24); not adopted because that resonance may be complex.
6326 *4*	(3/2)	2962 *4*	
6336 *4*		2971 *4*	
6341 *4*	(3/2,5/2)	2976 *4*	Other J: 3/2 from $\gamma(\theta)$ for E(p)=2978 resonance (1983Si24), but 1983Si24 may not have resolved the 2971 and 2976 resonances of 1985Di05.
6362 *4*	(3/2)	2999 *4*	Other J: 3/2 from $\gamma(\theta)$ for E(p)=2999 resonance (1983Si24). 1994Ho31 suggest that this level is the analogue of the 3/2$^-$ ^{59}Ni(2415 level). However, others have nominated the 6197, 6201 and 6238 levels, instead, as fragments of that analogue state. Also, 1994Ho31 report a 5.3% photon branch to the 3115 level. The evaluator does not adopt this; 1985Di05 should have seen such a branch too, but did not.
6381 *4*		3018 *4*	
6396 *4*		3032 *4*	
6404 *4*		3041 *4*	
6410 *4*	(5/2,3/2)	3047 *4*	Other J: 5/2,3/2 from $\gamma(\theta)$ for E(p)=3051 resonance (1983Si24); however, it is not clear whether 1983Si24 resolved the 3041 and 3047 resonances.
6419 *4*	3/2	3056 *4*	J$^\pi$: from $\gamma(\theta)$ for E(p)=3062 resonance (1983Si24). 1994Ho31 suggest this is analogue of an otherwise unknown 1/2$^-$,3/2$^-$ ^{59}Ni(2533 level); evaluator rejects this. 1994Ho31 also report a strong γ from this level to an otherwise unknown 5/2$^-$ 2337 level; the evaluator assumes that this is, instead, the transition to the 3/2$^-$ 2324 level, reported in 1983Si24.
6444 *4*		3081 *4*	
6451 *4*		3088 *4*	
6457 *4*	5/2$^-$	3095 *4*	
6461 *4*	3/2$^-$	3099 *4*	
6470 *4*	3/2,5/2	3108 *4*	J$^\pi$: from $\gamma(\theta)$ for E(p)=3106 resonance (1983Si24). Evaluator assumes that resonances 9 keV below and 11 keV above were resolved from this one in 1983Si24.
6481 *4*		3119 *4*	
6487 *4*		3125 *4*	
6493 *4*	7/2	3131 *4*	Analogue of ^{59}Ni(2627 level) (J$^\pi$=7/2$^-$). 1994Ho31 report 6 of the 23 gammas listed here as deexciting this level, but the branch to the 2716 level (expected to be the strongest) is not one of those. If one assumes that 1994Ho31 failed to resolve the 3777γ and 3784γ, the consistency between branching from 1994Ho31 and 1985Di05 is greatly improved. However, it is possible that 1994Ho31 also failed to resolve the E(p)=3131 resonance from the weaker 3125 resonance.
6501[‡] *4*		3140 *4*	
6510[‡] *4*		3149 *4*	
6519[‡] *4*		3157 *4*	
6524[‡] *4*		3163 *4*	
6532 *4*		3171 *4*	
6542[‡] *4*		3181 *4*	
6552[‡] *4*		3191 *4*	
6559 *4*		3199 *4*	
6572[‡] *4*		3212 *4*	
6580[‡] *4*		3220 *4*	
6591[‡] *4*		3231 *4*	
6597[‡] *4*		3237 *4*	
6607[‡] *4*		3247 *4*	

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^{58}Ni(p,γ) 1985Di05 (continued)

^{59}Cu Levels (continued)

E(level)[†]	J$^\pi$[#]	E(p)(lab)[a]	Comments
6615[‡] *4*		3255 *4*	
6621[‡] *4*		3261 *4*	
6627 *4*	3/2	3267 *4*	
6638[‡] *4*		3279 *4*	
6644 *4*		3285 *4*	
6662 *4*		3303 *4*	
6668[‡] *4*		3309 *4*	
6692 *4*		3334 *4*	
6702[‡] *4*		3344 *4*	
6710 *4*	3/2	3352 *4*	Possible fragment of J$^\pi$=3/2$^-$ ^{59}Ni(2894 level) analogue.
6727 *4*	(3/2,5/2)	3369 *4*	Possible fragment of J$^\pi$=3/2$^-$ ^{59}Ni(2894 level) analogue.
6737[‡] *4*		3379 *4*	
6749 *4*	5/2$^+$	3391 *4*	
6760 *4*	(3/2$^-$)	3402 *4*	J$^\pi$: from $\gamma(\theta)$ (1994Ho31). Analogue of 3/2$^-$ ^{59}Ni(2894 level) (1994Ho31).
6768[‡] *4*		3410 *4*	
6782[‡] *4*		3425 *4*	
6797[‡] *4*		3440 *4*	E(level): In Adopted Levels high spin state (19/2$^+$) at 6769.3 – probably a different level.
6811 *4*	3/2	3455 *4*	J$^\pi$: from $\gamma(\theta)$ for E(p)=3453 resonance (1983Si24).
6828[‡] *4*		3472 *4*	
6836 *4*	9/2$^+$	3480 *4*	Possible fragment of J$^\pi$=9/2$^+$ ^{59}Ni(3054 level) analogue.
6843 *4*	3/2$^-$	3487 *4*	
6867 *4*		3511 *4*	
6879 *4*	(5/2)	3524 *4*	
6885 *4*		3530 *4*	
6894 *4*	5/2$^-$	3539 *4*	
6905 *4*	9/2$^+$	3550[b] *4*	Possible fragment of π=9/2$^+$ ^{59}Ni(3054 level) analogue. E(level): 6902.8 *5* (1975Co21). J$^\pi$: confirmed by (p,p$'\gamma$) angular correlation data (1982Sz01). Other E(p): 3568 (1960Ca12), 3546 (1975Co21), 3547 (1975Kl06), 3556 (1980Ho31). (2J+1)$\Gamma_{p0}\Gamma_\gamma/\Gamma$=6.5 eV *5*; weighted average of 6.2 eV *7* (1975Co21), 6.9 eV *8* (1976Ar01). Others: 1980Ho31 (8 eV *4*), 1960Ca12 (7.5 eV), 1975Kl06 (5.4 eV *10*), 1972Sz01 (10.0 eV *9*), 1970Fo09.
6923 *4*	(5/2)	3568 *4*	
6939 *4*	3/2$^-$	3585 *4*	Possible fragment of J=3/2 ^{59}Ni(3182 level) analogue.
6945 *4*	(3/2)	3591 *4*	Possible fragment of J=3/2 ^{59}Ni(3182 level) analogue.
6959 *4*	(3/2)	3605 *4*	J$^\pi$: from 1994Ho31, presumably based on 6959$\gamma(\theta)$. Possible fragment of J=3/2 ^{59}Ni(3182 level) analogue. (1994Ho31). 1994Ho31 report an additional γ branch from this level; the evaluator does not adopt it because it feeds an otherwise unknown 2310 level.
6967 *4*	(3/2,5/2)	3613 *4*	Possible fragment of J=3/2 ^{59}Ni(3182 level) analogue. E(level): Other: 6970.1 *10* (1985Ti04).
6971[‡] *4*		3618 *4*	
6986[‡] *4*		3633 *4*	
6991[‡] *4*		3638 *4*	
7001[‡] *4*		3648 *4*	
7016 *4*		3663 *4*	
7029 *4*		3676 *4*	
7036[‡] *4*		3683 *4*	
7048 *4*		3696 *4*	
7083[‡] *4*		3732 *4*	
7117[‡] *4*		3767 *4*	

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^{58}Ni(p,γ) 1985Di05 (continued)

^{59}Cu Levels (continued)

E(level)[†]	J$^\pi$[#]	E(p)(lab)[a]	Comments
7136.8 *10*		3790 *4*	E(level): From γ energy.
7150[‡] *4*		3800 *4*	
7172[‡] *4*		3822 *4*	
7197 *4*	(3/2)	3848 *4*	J$^\pi$: from $\gamma(\theta)$ 1994Ho31. Authors suggest that this is analogue of the ^{59}Ni(3354 level) (J$^\pi$ unknown).
7251 *4*	(3/2$^-$,5/2)	3903 *4*	J$^\pi$: D γ to 3/2$^-$ from $\gamma(\theta)$ (1994Ho31); γ to 7/2$^-$ 1399. Authors suggest that this is analogue of a 3389-keV ^{59}Ni level, but the evaluator is uncertain which of the Adopted Levels levels corresponds to that state.
7278[‡] *4*		3930 *4*	
7299 *4*	3/2,5/2	3952 *4*	J$^\pi$: possible fragment of 3/2$^-$ ^{59}Ni(3452 level) analogue.
7332 *4*		3985 *4*	Possible fragment of J$^\pi$=3/2$^-$ ^{59}Ni(3452 level) analogue.
7348 *4*	3/2$^-$	4002 *4*	Possible fragment of J$^\pi$=3/2$^-$ ^{59}Ni(3452 level) analogue.
7381[‡] *4*		4035 *4*	
7394 *4*	5/2	4048 *4*	Possible analogue of ^{59}Ni(3540 level) (J$^\pi$=(5/2)$^+$).
7407 *4*		4062 *4*	
7423[‡] *4*		4078 *4*	
7444 *4*	(3/2)	4099 *4*	Possible analogue of ^{59}Ni(3563 level) (1985Di05);≈30 keV below level proposed in (p,X). Not adopted as analogue.
7473 *4*		4129 *4*	
7480[‡] *4*		4136 *4*	
7503 *4*		4159 *4*	
7517 *4*	(5/2)	4173 *4*	Suggested analogue of L(p,d)=3 ^{59}Ni(3730 level), but J=7/2 for that state from (pol p,d) is not consistent with probable J(7517).
7523 *4*		4180 *4*	
7539 *4*	(3/2)	4196 *4*	
7586[‡] *4*		4244 *4*	
7607[‡] *4*		4265 *4*	
7617[‡] *4*		4275 *4*	
7624[‡] *4*		4282 *4*	
7650 *4*	5/2	4309 *4*	
7671[‡] *4*		4330 *4*	
7681[‡] *4*		4340 *4*	
7697 *4*	(5/2)	4357 *4*	
7732[‡] *4*		4392 *4*	
7752[‡] *4*		4413 *4*	
7759[‡] *4*		4420 *4*	
7773[‡] *4*		4434 *4*	
7794[‡] *4*		4455 *4*	
7801[‡] *4*		4462 *4*	
7824[‡] *4*		4486 *4*	
7843[‡] *4*		4505 *4*	
7863[‡] *4*		4525 *4*	
7876[‡] *4*		4539 *4*	
7890[‡] *4*		4553 *4*	
7897[‡] *4*		4560 *4*	
7904[‡] *4*		4567 *4*	
7922[‡] *4*		4585 *4*	
7951[‡] *4*		4614 *4*	
7964[‡] *4*		4628 *4*	

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^{58}Ni(p,γ) 1985Di05 (continued)

^{59}Cu Levels (continued)

E(level)[†]	J$^{\pi}$[#]	E(p)(lab)[a]	Comments
7991[‡] *4*		4656 *4*	
8013 *4*	(3/2)	4678 *4*	Possible analogue of ^{59}Ni(4154 level) (J$^{\pi}$=1/2$^-$,3/2$^-$).
8027[‡] *4*		4692 *4*	
8038[‡] *4*		4703 *4*	
8055[‡] *4*		4721 *4*	
8066[‡] *4*		4732 *4*	
8077 *4*	3/2$^-$,5/2	4743 *4*	
8084[‡] *4*		4750 *4*	
8096[‡] *4*		4762 *4*	
8108[‡] *4*		4775 *4*	
8128[‡] *4*		4797 *4*	
8141[‡] *4*		4808 *4*	
8169[‡] *4*		4837 *4*	
8187[‡] *4*		4855 *4*	
8202[‡] *4*		4870 *4*	
8223 *4*	3/2$^-$,5/2	4892 *4*	
8237[‡] *4*		4906 *4*	
8245[‡] *4*		4914 *4*	
8259 *4*	3/2$^-$,5/2	4928 *4*	
8267[‡] *4*		4936 *4*	
8273[‡] *4*		4943 *4*	
8284[‡] *4*		4954 *4*	
8329[‡] *4*		4999 *4*	

[†] From 1985Di05, except noted otherwise, as deduced by authors from their (unenumerated) Eγ data; ΔE≤4 keV, based on absolute energy calibration of beam energy. For bound levels, these agree within 0-3 keV with values from other sources. Energies deduced from authors′ E(p)(resonance) and S(p), assuming S(p)=3418.6 *4* (2017Wa10), are 2.8 to 4.8 keV higher than those adopted by authors based on their Eγ data, and the latter typically agree within 0-4 keV with Eγ from 1985Ti04 for g.s. transitions from well resolved resonances. The evaluator assigns ΔE=4 keV to these data, consistent with authors′ estimate of uncertainty in absolute E(p).

[‡] From 1985Di05. No depopulation γ listed − probably indicates poorly resolved resonance. Not adopted − if comparable level energy reported by other studies with low spin/parity − data set has been referred.

[#] Without parens: from 1985Di05, based on $\gamma(\theta)$, assuming mult=E2 for Q transitions, mult not E1+M2 for significantly mixed D+Q transitions, and the following J$^{\pi}$ for the levels indicated: 0 [3/2$^-$], 491 [1/2$^-$], 914 [5/2$^-$], 1399 [7/2$^-$], 1865 [7/2], 1988 [5/2], 2266 [3/2$^+$], 2324 [3/2], 2709 [5/2], 2716 [7/2], 3042 [9/2$^+$], 3578 [5/2$^+$]. With parens: from 1984Ca02, based on statistical analysis of spin dependence of decay branching ratios for highly excited resonant p-capture states in fp-shell nuclei (based on data of 1985Di05). Exceptions are noted.

[@] Reported as a doublet (3022, 3025 levels) by 1975Tr05 but found to be a single level at 3024 in 1985Di05.

[&] Evaluator suspects that resonance reported at E(p)=2057 by 1975Tr05 and 1960Ca12 is complex (E(p)=2051 and 2063 resonances of 1985Di05), whereas that at E(p)=2064 in 1975Di16 corresponds to the E(p)=2063 resonance of 1985Di05 alone. Hence, data from 1975Di16 are adopted.

[a] Laboratory proton energy for resonance. From 1985Di05, except as noted. ΔE(absolute)=3-4 keV; resonance separation reproducible to within 1 keV; FWHM≈2 keV. Consistency with other (p,γ) studies is generally very good.

[b] 1975Co21 report a weak resonance ~3 keV above this one and assign the 5992γ to its deexcitation; not confirmed by 1985Di05.

^{58}Ni(p,γ) 1985Di05 (continued)

γ(^{59}Cu)

The evaluator assumes that unstated γ spectrum resolution in 1985Ti04 is <9 keV since E(level) values separated by as little as 9 keV were reported by authors.

E_i(level)	J_i^π	E_γ[†]	I_γ[a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
491	1/2⁻	490.8 *10*	100	0.0	3/2⁻			E_γ: from 1970Ho34.
914.4	5/2⁻	914.0 *10*	100	0.0	3/2⁻	D+Q		E_γ: from 1970Ho34. δ: −0.18 *4* or −1.8 *4* (1970Ho34), −0.19 *3* or −1.90 *15* (1975Tr05), −0.27 *5* or −1.50 *26* (1968Tr04), −0.27 *9* or −1.42 *31* (1968Tr04). Weighted average: −0.21 *2* or −1.75 *12*.
1398.6	7/2	484.2	11.6 *11*	914.4	5/2⁻			I_γ: from 1975Kl06; not reported in 1985Di05.
		1398.6	88.4 *15*	0.0	3/2⁻	Q		I_γ: from 1975Kl06. Mult.,δ: from 1975Tr05; δ(Q,O)=−0.09 *12*. Mult from 1975Tr05, 1968Tr04.
1865.4	7/2	466.8	15 *1*	1398.6	7/2			
		951.0	55 *1*	914.4	5/2⁻	D(+Q)	+0.10 *12*	Mult.,δ: from 1975Tr05.
		1865.4	30 *1*	0.0	3/2⁻	Q(+O)	−0.033 *37*	Mult.,δ: from 1975Co21. δ(Q,O)=+0.003 to −0.07 or −5.1 *9* (1975Co21); −0.1 *2* (1975Tr05).
1988	5/2	1988.0 *10*	100	0.0	3/2⁻	D+Q	−1.23 *9*	E_γ: from 1970Ho34. δ: −0.5 *2* or −1.1 *2* (1970Ho34), −0.32 *4* or −1.43 *15* (1975Tr05), −1.30 *15* (1968Tr04); weighted average is −0.33 *4* or −1.23 *9*.
2266	3/2	1775.0 *10*	48 *1*	491	1/2⁻	D+Q	+1.9 *7*	E_γ: from 1970Ho34. Mult.,δ: from 1975Tr05.
		2266.8 *10*	52 *1*	0.0	3/2⁻	D+Q	+1.0 *6*	E_γ: from 1970Ho34. Mult.,δ: from 1975Tr05.
2318	1/2,5/2⁻	1827	17 *1*	491	1/2⁻			
		2318	83 *1*	0.0	3/2⁻			
2324	3/2⁻	1410	10 *1*	914.4	5/2⁻	D+Q	−1.4 *12*	Mult.,δ: from 1975Tr05; δ=−0.2 to −2.6.
		2324 *1*	90 *1*	0.0	3/2⁻	D		E_γ: from 1970Ho34. Mult.: from 1975Tr05. δ(D,Q)=−0.05 *5* or +4.7 *10* (1975Tr05), +0.14 *14* or −2.9 *8* (1968Tr04). Weighted average=−0.03 *6*.
2586.5	11/2⁻	1187.9	100	1398.6	7/2			
2664	5/2,9/2	799	100	1865.4	7/2	D+Q	+0.35 *10*	Mult.,δ: from 1975Tr05 if J(2664 level)=9/2.
2709	5/2⁻	1310	14 *1*	1398.6	7/2			
		1795	59 *1*	914.4	5/2⁻	D(+Q)	−0.09 *10*	Mult.,δ: from 1975Tr05.
		2218	27 *1*	491	1/2⁻	Q		Mult.,δ: from 1975Tr05. δ(Q,O)=0.0 *5*.
2716	7/2⁻	728	15 *1*	1988	5/2			
		1317	20 *1*	1398.6	7/2	D+Q	+1.3 *4*	Mult.,δ: from 1975Tr05. δ=+1.73 to +0.90.
		1802	28 *1*	914.4	5/2⁻	D+Q	−3.3 *6*	δ: from 1975Tr05.
		2716	37 *1*	0.0	3/2⁻	Q		δ: −0.08 to +0.07 or −3.5 *9* (1975Co21). Other: +0.2 *3* (1975Tr05).
2928	5/2⁻	940	11 *1*	1988	5/2	D+Q	+2.4 *27*	Mult.,δ: from 1975Tr05 (δ=−0.3 to +5.0).
		2014	45 *1*	914.4	5/2⁻	D(+Q)	+0.15 *25*	Mult.,δ: from 1975Tr05.
		2437	10 *1*	491	1/2⁻			

$^{59}_{29}Cu_{30}$-9

^{58}Ni(p,γ) 1985Di05 (continued)

$\gamma(^{59}Cu)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
2928	$5/2^-$	2928	34 *1*	0.0	$3/2^-$			
2993	$3/2,5/2^-,7/2^-$	1005	5 *1*	1988	5/2			
		2079	58 *1*	914.4	$5/2^-$			
		2993	37 *1*	0.0	$3/2^-$			
3024	$5/2^-$	2110	15 *1*	914.4	$5/2^-$			
		2533	40 *1*	491	$1/2^-$			
		3024	45 *1*	0.0	$3/2^-$			
3042.4	9/2	455.9	1.45	2586.5	$11/2^-$			I_γ: from I(455γ):I(1643γ)=1.5:77.3 (1975Co21) and I(1643γ) (1985Di05). Not reported in 1985Di05.
		1177	19.7 *10*	1865.4	7/2	D(+Q)	+0.011 *18*	Mult.,δ: from 1975Co21.
		1643.8	74.9 *10*	1398.6	7/2	D+Q	+0.027 *10*	Mult.,δ: from 1975Co21.
		2128.0	3 *1*	914.4	$5/2^-$			
		3042.3	1 *1*	0.0	$3/2^-$			
3115	$5/2^-$	2624	28 *1*	491	$1/2^-$			
		3115	72 *1*	0.0	$3/2^-$	D+Q		Mult.,δ: from 1975Tr05. δ=+0.52 *10* or +4.2 *10*.
3130	$1/2^-,3/2,5/2^-$	2216	36 *1*	914.4	$5/2^-$			
		2639	35 *1*	491	$1/2^-$			
		3130	29 *1*	0.0	$3/2^-$			
3309	$7/2^-$	1910	30 *1*	1398.6	7/2			
		2395	45 *1*	914.4	$5/2^-$			
		3309	25 *1*	0.0	$3/2^-$			
3434	5/2	2520	70 *1*	914.4	$5/2^-$			
		3434	30 *1*	0.0	$3/2^-$			
3438	(1/2)	3438	100	0.0	$3/2^-$			
3551	5/2	2637	65 *1*	914.4	$5/2^-$			
		3551	35 *1*	0.0	$3/2^-$			
3574	5/2,7/2	2175	30 *1*	1398.6	7/2			
		2660	70 *1*	914.4	$5/2^-$			
3578		1713	33 *1*	1865.4	7/2			
		2664	33 *1*	914.4	$5/2^-$			
		3578	34 *1*	0.0	$3/2^-$			
3615	$3/2^-,5/2^-$	3124	65 *1*	491	$1/2^-$	D+Q		Mult.,δ: from 1975Tr05. δ=−0.16 *10* or −2.6 *5*.
		3615	35 *1*	0.0	$3/2^-$			
3699	7/2	2785	100	914.4	$5/2^-$			
3729	$3/2^-,5/2$	1405	45 *1*	2324	$3/2^-$			
		1741	35 *1*	1988	5/2			
		2330	25 *1*	1398.6	7/2			
3742	$3/2,5/2^+,7/2$	1754	50 *1*	1988	5/2			
		2828	50 *1*	914.4	$5/2^-$			
3758	$5/2^+,7/2,9/2^-$	2359	40 *1*	1398.6	7/2			
		2844	60 *1*	914.4	$5/2^-$			
3887	$3/2,5/2^+$	1899	55 *1*	1988	5/2			
		3887	45 *1*	0.0	$3/2^-$			

$^{59}_{29}Cu_{30}$-10

^{58}Ni(p,γ) 1985Di05 (continued)

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
3906	3/2,5/2,7/2$^-$	2992	50 *1*	914.4	5/2$^-$			
		3906	50 *1*	0.0	3/2$^-$			
3930	5/2,7/2	2531	75 *1*	1398.6	7/2			
		3016	25 *1*	914.4	5/2$^-$			
4072	3/2,5/2,7/2	2084	75 *1*	1988	5/2			
		3158	25 *1*	914.4	5/2$^-$			
4183	5/2,9/2$^-$	1474	60 *1*	2709	5/2$^-$			
		2784	40 *1*	1398.6	7/2			
4207	5/2,7/2$^-$	1883	26 *1*	2324	3/2$^-$			
		2808	22 *1*	1398.6	7/2			
		3293	28 *1*	914.4	5/2$^-$			
		4207	24 *1*	0.0	3/2$^-$			
4301	5/2,7/2	2902	60 *1*	1398.6	7/2			
		3387	40 *1*	914.4	5/2$^-$			
4307	5/2	3393	100	914.4	5/2$^-$			
4349	(1/2$^-$)	1219	17 *1*	3130	1/2$^-$,3/2,5/2$^-$			
		1325	8 *1*	3024	5/2$^-$			
		2025	27 *1*	2324	3/2$^-$			
		2031	9 *1*	2318	1/2,5/2$^-$			
		2083	17 *1*	2266	3/2			
		3858	16 *1*	491	1/2$^-$			
		4349	6 *1*	0.0	3/2$^-$			
4441	7/2	3042	50 *1*	1398.6	7/2			
		3526	50 *1*	914.4	5/2$^-$			
4465	5/2$^+$,7/2,9/2$^-$	3550	100	914.4	5/2$^-$			
4494		4494[&]	64[&]	0.0	3/2$^-$			
4530	5/2$^+$,7/2,9/2$^-$	3615	100	914.4	5/2$^-$			
4618		4618[&]	64[&]	0.0	3/2$^-$			
4699	(3/2)	2375	16 *1*	2324	3/2$^-$			
		4208	21 *1*	491	1/2$^-$			
		4699	63 *1*	0.0	3/2$^-$			E_γ: 1985Ti04 report Eγ=4704.8 *10*, but may not have resolved 1308 and 1316 resonances.
4769	(3/2,5/2)	1027	2 *1*	3742	3/2,5/2$^+$,7/2			
		1331	4 *1*	3438	(1/2)	D(+Q)		Mult.,δ: from 1975Tr05. δ=−0.04 *5* or −1.6 *3* if J(4769)=3/2.
		1639	2 *1*	3130	1/2$^-$,3/2,5/2$^-$			
		1841	2 *1*	2928	5/2$^-$			
		2053	1 *1*	2716	7/2$^-$			
		2060	2 *1*	2709	5/2$^-$			
		2451	7 *1*	2318	1/2,5/2$^-$	D+Q		E_γ: 2452.0 *10* (1970Ho34). Mult.,δ: from 1975Tr05. δ=−0.11 *5* or −1.38 *20* if J(4769)=3/2.
		2503	8 *1*	2266	3/2	D		E_γ: 2504.0 *10* (1970Ho34). Mult.,δ: from 1975Tr05. δ(D,Q)=+0.02 *5*.
		2781	11 *1*	1988	5/2	D+Q	−0.34 *15*	E_γ: 2782.0 *10* (1970Ho34). Mult.,δ: from 1975Tr05.

$^{59}_{29}Cu_{30}$-11

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
4769	(3/2,5/2)	2904	3 *1*	1865.4	7/2			
		3855	19 *1*	914.4	5/2$^-$	D+Q	+0.54 *11*	E_γ: 3855.8 *10* (1970Ho34). Mult.,δ: from 1975Tr05.
		4278	36 *1*	491	1/2$^-$	D+Q		E_γ: 4279.4 *10* (1970Ho34). Mult.,δ: from 1975Tr05. δ=−0.29 *5* or −0.96 *9*.
		4769	3 *1*	0.0	3/2$^-$			
4817.9	3/2	1384	1 *1*	3434	5/2	D(+Q)		Mult.,δ: from 1975Tr05. δ=+0.05 *8* or −6 *2*.
		2494	3 *1*	2324	3/2$^-$	D		E_γ: 2493.6 *10* (1970Ho34). Mult.: from 1968Tr04. δ: δ(D,Q)=+0.11 *11* (1968Tr04); 0.00 *15* or >+2 (1975Tr05) is attributed by evaluator to this transition, based on branching in 1975Tr05 and 1985Di05 (indicated as transition to 3026 level, instead, in table 2 of 1975Tr05).
		2552	2 *1*	2266	3/2	D		E_γ: 2551.6 *10* (1970Ho34). Mult.,δ: from 1975Tr05. δ=−0.04 *6*.
		2830	7 *1*	1988	5/2	D+Q	+0.07 *2*	E_γ: 2829.3 *10* (1970Ho34). δ: weighted average of +0.08 *4* (1968Tr04), +0.06 *2* (1970Ho34), +0.12 *5* (1975Tr05) (evaluator assumes sign of δ misprinted in 1975Tr05).
		3903	5 *1*	914.4	5/2$^-$	D+Q	+0.22 *3*	E_γ: 3903.2 *10* (1970Ho34). δ: weighted average of +0.25 *8* (1975Tr05), +0.27 *8* (1970Ho34), +0.20 *4* (1968Tr04); evaluator assumes sign(δ) misprinted in 1975Tr05.
		4327	55 *1*	491	1/2$^-$	D+Q		E_γ: 4326.6 *10* (1970Ho34). Mult.: A_2=−0.48 *2*, A_4=+0.03 *2* (1985Di05); W(0°)/W(90°)=0.42 *3* (1994Ho31). δ: +0.04 *4* or −1.8 *7* (1985Di05), +0.06 *1* or −2.0 *1* (1970Ho34), −0.05 *5* or −1.96 *30* (1975Tr05), +0.07 *1* or −2.05 *9* (1968Tr04). Weighted average is +0.06 *1* or −2.02 *7*. Other δ: +0.010 *+5−15* (1994Ho31).
		4818	27 *1*	0.0	3/2$^-$	D(+Q)		E_γ: 4819.1 *5* (1985Ti04; recoil corrected), 4816.8 *10* (1970Ho34); weighted average=4818.6 *9*. Mult.: A_2=+0.47 *2*, A_4=+0.04 *3* (1985Di05); W(0°)/W(90°)=1.52 *10* (1994Ho31). δ: +0.05 *5* or +3.3 *7* (1985Di05), +0.06 *2* or +3.2 *5* (1970Ho34), +0.04 *5* or +3.7 *7* (1975Tr05); weighted average is +0.056 *17* or +3.4 *4*. Other δ: −0.07 *3* (1994Ho31).
4914.6	5/2$^+$,7/2,9/2$^-$	4000	100	914.4	5/2$^-$			
5053.2	(3/2,5/2)	1938	9 *1*	3115	5/2$^-$			
		2337	7 *1*	2716	7/2$^-$			
		2344	3 *1*	2709	5/2$^-$			
		3065	36 *1*	1988	5/2			δ,Mult.: 1968Tr04 measured γγ(θ), but assumed J(5052 level)=3/2.
		4137	15 *1*	914.4	5/2$^-$			δ,Mult.: 1968Tr04 measured γγ(θ), but assumed J(5052 level)=3/2.
		5053	30 *1*	0.0	3/2$^-$			E_γ: 5053.7 *10* (1985Ti04).
5105.3		4191		914.4	5/2$^-$			Observed by 1968Tr04 only. δ(D,Q)=+0.12 *7* if J(5104)=3/2.
		4614		491	1/2$^-$			Observed by 1968Tr04 only. δ(D,Q)=−0.08 *4* or −2.16 *20* if J(5104)=3/2.
		5105.7[&] *9*	25[&]	0.0	3/2$^-$			

^{58}Ni(p,γ) 1985Di05 (continued)

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ †	I_γ [a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
5220.3	9/2	1911	≈4.4[b]	3309	7/2⁻			
		2178	3.8[b]	3042.4	9/2			
		2504	1.8[b]	2716	7/2⁻			
		2556	1.9[b]	2664	5/2,9/2			
		3355	10.6[b]	1865.4	7/2			
		3820.0 *5*	63.7[b] *20*	1398.6	7/2	D(+Q)	0.00 *2*	E_γ,Mult.,δ: from 1977Co03. E(level)=5218.6 *5* from adopted E(1399 level) and Eγ. δ: other: −0.01 *3* from 3820γ(θ) (1977Co03).
5230.6	1/2,3/2,5/2	1793	1 *1*	3438	(1/2)			
		2207	1 *1*	3024	5/2⁻			
		2965	6 *1*	2266	3/2			E_γ: 2963.3 *10* in 1970Ho34.
		4739	6 *1*	491	1/2⁻			E_γ: 4739.3 *10* in 1970Ho34.
		5230	86 *1*	0.0	3/2⁻	D		E_γ: 5230.1 *10* (1970Ho34), 5231.4 *5* (1985Ti04); weighted average= 5231.1 *5*. Mult.: A_2=+0.01 *2*, A_4=−0.01 *2* (1985Di05); A_2=−0.007 *25*, A_4=−0.026 *27* (1994Ho31).
5255.0?		5255.0 *10*		0.0	3/2⁻			
5264	3/2	1358	3[c]	3906	3/2,5/2,7/2⁻	D+Q		δ: −0.02 *8* or +4.1 *20* (1975Tr05).
		1649	<1[c]	3615	3/2⁻,5/2⁻			
		1826	1[c]	3438	(1/2)			
		1830	1[c]	3434	5/2			
		2149	12[c] *3*	3115	5/2⁻	D+Q	+0.10 *8*	Mult.,δ: from 1975Tr05.
		2336	7[c] *3*	2928	5/2⁻	D		Mult.,δ: from 1975Tr05. δ(D,Q)=+0.03 *8* (1975Tr05).
		2555	7[c] *3*	2709	5/2⁻	D(+Q)	+0.09 *11*	Mult.,δ: from 1975Tr05.
		2940	7[c] *3*	2324	3/2⁻			
		2946	4[c] *3*	2318	1/2,5/2⁻			
		2998	<1[c]	2266	3/2			
		3276	1[c]	1988	5/2			
		4349	4[c] *3*	914.4	5/2⁻			
		4773	18[c] *3*	491	1/2⁻	D+Q		Mult.,δ: from 1975Tr05; δ=−0.11 *8* or −2.3 *6*.
		5264	35[c] *3*	0.0	3/2⁻	D+Q	+0.18 *9*	E_γ: 1985Ti04 report Eγ=5271.0 *7*; relationship to 5264γ of 1985Di05 is unclear. δ: from 1975Tr05; +2.3 *6* also possible. Other: +0.25 (1983Si24).
5306		1400	2[c]	3906	3/2,5/2,7/2⁻			
		1691	2[c]	3615	3/2⁻,5/2⁻			
		1868	4[c] *3*	3438	(1/2)			
		2176	10[c] *3*	3130	1/2⁻,3/2,5/2⁻			
		2282	7[c] *3*	3024	5/2⁻			
		2982	66[c] *3*	2324	3/2⁻			
		5306	9[c] *3*	0.0	3/2⁻			E_γ: Eγ=5312.2 *8* from 1985Ti04 not adopted; source of discrepancy

$\gamma(^{59}Cu)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[a]	E_f	J_f^π	Mult.[g]	Comments
							not understood, but Iγ from 1985Ti04 is too high, suggesting unresolved impurity.
5442		2418	3[d]	3024	5/2$^-$		
		2514	10[d]	2928	5/2$^-$		
		2726	2[d]	2716	7/2$^-$		Transitions to 2709 and 2716 levels unresolved in 1975Di16. Eγ=2729 in spectrum of fig. 1e.
		2733	2[d]	2709	5/2$^-$		See comment on 2733γ.
		3118	12[d]	2324	3/2$^-$		
		3176	5[d]	2266	3/2		
		3454	23[d]	1988	5/2		
		4527	14[d]	914.4	5/2$^-$		
		4951	18[d]	491	1/2$^-$		
		5442	11[d]	0.0	3/2$^-$		E$_\gamma$: 5443.7 *9* (1985Ti04).
5473		5473.0[&] *9*	[&]	0.0	3/2$^-$		
5482		1904	4[d]	3578			Eγ=1903 in spectrum in fig. 1f of 1975Di16; probably feeds 3578 level, not the 3574 level.
		2367	5[d]	3115	5/2$^-$		
		2440	3[d]	3042.4	9/2		
		2458	5[d]	3024	5/2$^-$		
		3158	15[d]	2324	3/2$^-$		
		3216	16[d]	2266	3/2		
		3494	6[d]	1988	5/2		
		3616	9[d]	1865.4	7/2		
		4083	3[d]	1398.6	7/2		
		4567	4[d]	914.4	5/2$^-$		
		4991	30[d]	491	1/2$^-$		
5521	3/2$^-$,5/2	2805	1 *1*	2716	7/2$^-$		
		4122	4 *1*	1398.6	7/2		
		4606	6 *1*	914.4	5/2$^-$		
		5521	89 *1*	0.0	3/2$^-$	D(+Q)	E$_\gamma$: 5522.3 *4* (1985Ti04). Mult.: A$_2$=−0.51 *2*, A$_4$=+0.04 *2* (1985Di05). δ: −0.04 *2* if J=5/2 (1985Di05).
5550	(3/2,5/2)	1808	3 *1*	3742	3/2,5/2$^+$,7/2		
		1935	5 *1*	3615	3/2$^-$,5/2$^-$		
		2112	3 *1*	3438	(1/2)		
		2116	1 *1*	3434	5/2		
		2435	4 *1*	3115	5/2$^-$		
		2622	7 *1*	2928	5/2$^-$		
		3284	17 *1*	2266	3/2		

$^{59}_{29}Cu_{30}$-14

^{58}Ni(p,γ) 1985Di05 (continued)

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
5550	(3/2,5/2)	3684	23 *1*	1865.4	7/2	D+Q	−0.11 *+7−6*	Mult.,δ: from 1994Ho31. W(0°)/W(90°)=1.02 *14* (1994Ho31).
		5550	37 *1*	0.0	3/2$^-$	D+Q		E_γ: 5550.0 *6* (1985Ti04). Mult.: W(0°)/W(90°)=1.00 *9* (1994Ho31). δ: −0.19 *3* from 1994Ho31 if J(5550 level)=5/2. δ=−0.35 *8* (1983Si24) assumes J(5550 level)=3/2.
5602	(3/2)	2578	13[f] *1*	3024	5/2$^-$			
		3284	10[f] *1*	2318	1/2,5/2$^-$			
		3336	11[f] *1*	2266	3/2			
		4688	3[f] *1*	914.4	5/2$^-$			
		5111	13[f] *1*	491	1/2$^-$			
		5602	50[f] *1*	0.0	3/2$^-$			E_γ: 5600.8 *7* (1985Ti04).
5620	7/2	1437	11[c] *3*	4183	5/2,9/2$^-$			
		2578	3[c]	3042.4	9/2	D		Mult.,δ: from 1975Tr05; δ(D,Q)=+0.05 *20*.
		2692	1[c]	2928	5/2$^-$			
		2904	2[c]	2716	7/2$^-$			
		2911	11[c] *3*	2709	5/2$^-$			
		2956	19[c] *3*	2664	5/2,9/2			
		3632	4[c] *3*	1988	5/2			
		4221	2[c]	1398.6	7/2	D+Q	+0.78 *10*	Misprint in table 1 of 1975Tr05; based on table 2, resonance feeds 1399 level, not 1865 level. δ from 1975Tr05.
		5620	47[c] *3*	0.0	3/2$^-$			
5642	(3/2,5/2)	1943	2 *1*	3699	7/2			
		2527	3 *1*	3115	5/2$^-$			
		2649	7 *1*	2993	3/2,5/2$^-$,7/2$^-$			
		3318	3 *1*	2324	3/2$^-$			
		3324	7 *1*	2318	1/2,5/2$^-$			
		3376	10 *1*	2266	3/2			
		3654	2 *1*	1988	5/2			
		3776	2 *1*	1865.4	7/2			
		4243	4 *1*	1398.6	7/2			
		4728	18 *1*	914.4	5/2$^-$	D+Q		δ: −0.16 *+12−14* from W(0°)/W(90°)=1.12 *20* (1994Ho31) if J(5642)=3/2.
		5151	12 *1*	491	1/2$^-$	D+Q	+0.15 *+7−9*	Mult.,δ: from W(0°)/W(90°)=0.70 *18* (1994Ho31) if J(5642)=3/2.
		5642	30 *1*	0.0	3/2$^-$	D+Q	−0.10 *+5−6*	E_γ: 5645.2 *8* (1985Ti04). Mult.,δ: from W(0°)/W(90°)=1.43 *17* (1994Ho31) if J(5642)=3/2.
5658	5/2	2043	5 *1*	3615	3/2$^-$,5/2$^-$	D		Mult.,δ: from 1975Tr05; δ(D,Q)=−0.05 *12*.
		2080	3 *1*	3578				
		2107	1 *1*	3551	5/2			
		2634	1 *1*	3024	5/2$^-$			
		2730	2 *1*	2928	5/2$^-$			
		2942	12 *1*	2716	7/2$^-$	D+Q	−0.10 *5*	Mult.,δ: from 1975Tr05.
		3340	3 *1*	2318	1/2,5/2$^-$			E_γ: 1975Tr05 assign branch to 2324 level instead of 2318 level so their γ(θ) analysis is incorrect.

$^{59}_{29}Cu_{30}$-15

^{58}Ni(p,γ) 1985Di05 (continued)

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
5658	5/2	3392	8 *1*	2266	3/2	D(+Q)	+0.05 *4*	Mult.,δ: from 1975Tr05.
		3670	5 *1*	1988	5/2	D		Mult.,δ: from 1975Tr05; δ(D,Q)=0.00 *10*.
		3793	3 *1*	1865.4	7/2	D		Mult.,δ: from 1975Tr05; δ(D,Q)=−0.05 *10*.
		4259	43 *1*	1398.6	7/2	D		Mult.: A_2=−0.19 *4*, A_4=+0.01 *4* (1985Di05). δ(D,Q)=+0.03 *5* (1985Di05), −0.02 *3* (1975Tr05); weighted average is −0.01 *3*.
		4743	13 *1*	914.4	5/2⁻	D+Q	+0.27 *13*	Mult.,δ: from 1975Tr05.
5694		5694[&]	[&]	0.0	3/2⁻			Eγ=5692.6 *16* (1985Ti04) for probable doublet (origin of other member unknown).
5712	(5/2)	1970	2 *1*	3742	3/2,5/2⁺,7/2			
		2134	6 *1*	3578				
		2278	4 *1*	3434	5/2			
		2597	4 *1*	3115	5/2⁻			
		2996	4 *1*	2716	7/2⁻			
		3446	7 *1*	2266	3/2			
		4313	10 *1*	1398.6	7/2			
		4797	7 *1*	914.4	5/2⁻			
		5712	56 *1*	0.0	3/2⁻			Eγ: 5713.6 *7* (1985Ti04) for probable doublet (presumably from 2337+2344 resonances of 1985Di05).
5719	3/2,5/2⁽⁺⁾	2695	5 *1*	3024	5/2⁻			
		2791	7 *1*	2928	5/2⁻			
		3395	22 *1*	2324	3/2⁻			
		3401	15 *1*	2318	1/2,5/2⁻			
		3731	35 *1*	1988	5/2			Mult.: A_2=−0.02 *6*, A_4=+0.04 *7* (1985Di05).
		5228	3 *1*	491	1/2⁻			
		5719	13 *1*	0.0	3/2⁻			Mult.: A_2=+0.04 *5*, A_4=+0.01 *7* (1985Di05).
5777.5		5777.5[&] *16*	22[&]	0.0	3/2⁻			
5833		5832.7[&] *10*	67[&]	0.0	3/2⁻			
5851	5/2	5855[&] *2*	12[&]	0.0	3/2⁻			
5881	3/2,5/2⁻	2182	1 *1*	3699	7/2			
		3165	3 *1*	2716	7/2⁻			
		3563	13 *1*	2318	1/2,5/2⁻			
		3893	4 *1*	1988	5/2			
		4967	6 *1*	914.4	5/2⁻			
		5880.7 *7*	70 *1*	0.0	3/2⁻			Eγ: from 1985Ti04. Mult.: A_2=+0.40 *9*, A_4=+0.09 *9* (1985Di05). δ(D,Q)=−0.45 *9* (1983Si24) if J(5881 level)=3/2.
5897	7/2⁻	2782	6 *1*	3115	5/2⁻	D		Mult.: A_2=−0.72 *20*, A_4=+0.23 *19* (1985Di05). δ(D,Q)=−0.1 *11* (1985Di05).
		3909	6 *1*	1988	5/2	D+Q	−2.5 *11*	Mult.: A_2=−0.68 *23*, A_4=+0.34 *4* (1985Di05). δ: too large for anticipated mult.=E1+M2.
		4498	88 *1*	1398.6	7/2	D(+Q)	−0.07 *10*	Mult.: A_2=+0.43 *5*, A_4=−0.08 *7* (1985Di05); W(0°)/W(90°)=2.04 *12*

$^{59}_{29}Cu_{30}$-16

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
								(1994Ho31).
								δ: 1994Ho31 report +0.06 *4*, but assumed a 5/2 to 5/2 transition.
5914	5/2	2890	100	3024	5/2$^-$	D		Observed by 1983Si24 only.
5928	5/2	5931.2[&] *9*	[&]	0.0	3/2$^-$			
5941	3/2,5/2	3623[‡]		2318	1/2,5/2$^-$			
		3675[‡]		2266	3/2			δ(D,Q)=−0.6 *+2−6* if J(5941 level)=3/2 (1983Si24).
		5941[@]		0.0	3/2$^-$	D+Q[@]		δ(D,Q)=−0.77 *12* if J(5941 level)=3/2 (1983Si24).
5957		5958.4[&] *6*	71[&]	0.0	3/2$^-$			
5968		4569[‡h]		1398.6	7/2			
		5053[‡h]		914.4	5/2$^-$			
		5968[‡h]		0.0	3/2$^-$			The E=5969.7 *10* γ of 1985Ti04 is presumably a doublet.
5971		4572[‡h]		1398.6	7/2			
		5056[‡h]		914.4	5/2$^-$			
		5971[‡h]		0.0	3/2$^-$			The E=5969.7 *10* γ of 1985Ti04 is presumably a doublet.
6039	3/2$^+$	2340	1 *1*	3699	7/2			
		2461	4 *1*	3578		D+Q		Mult.: A_2=−0.56 *16*, A_4=−0.16 *16* (1985Di05).
								δ: +0.65 *22* or +4 *2*.
		2488	<1	3551	5/2			
		3111	2 *1*	2928	5/2$^-$			
		3323	2 *1*	2716	7/2$^-$			
		3715	9 *1*	2324	3/2$^-$	D,Q		Mult.: A_2=+0.48 *16*, A_4=−0.13 *18* (1985Di05).
								δ: +0.03 *11* or<−3.
		3773	7 *1*	2266	3/2	D+Q	−1.5 *7*	Mult.: A_2=−0.74 *21*, A_4=+0.10 *19* (1985Di05).
								Other δ: −0.7 *+4−6* (1983Si24); may be for doublet.
		4051	8 *1*	1988	5/2	D+Q	−1.0 *7*	Mult.: A_2=+0.24 *15*, A_4=+0.13 *16* (1985Di05).
								Other δ: −0.1 *+3−8* (1983Si24); may be for doublet.
		5124	9 *1*	914.4	5/2$^-$	D,Q		Mult.: A_2=−0.09 *15*, A_4=−0.14 *16* (1985Di05).
								δ: +0.06 *11* or<−4.
		5548	12 *1*	491	1/2$^-$	D(+Q)		Mult.: A_2=−0.61 *17*, A_4=+0.09 *16* (1985Di05).
								δ: −0.05 *8* or −1.5 *3*. Other: −0.12 *9* (1983Si24); may be for doublet.
		6039	46 *1*	0.0	3/2$^-$	Q(+D)		E_γ: 6041.4 *9* for probable doublet (1985Ti04).
								Mult.: A_2=+0.11 *4*, A_4=+0.02 *4* (1985Di05).
								δ: −0.17 *4* or<−10. Other: −0.63 *6* (1983Si24); may be for doublet.
6076	3/2$^-$	5585[@]		491	1/2$^-$	D+Q[@]	−0.10[@] *8*	
6091	3/2$^-$	2513	1 *1*	3578				
		3067	3 *1*	3024	5/2$^-$			
		3767	11 *1*	2324	3/2$^-$	D+Q		Mult.: A_2=−0.21 *15*, A_4=−0.11 *24* (1985Di05).
								δ: −0.5 *1* or −6 *2*.
		5600	15 *1*	491	1/2$^-$	Q(+D)		Mult.: A_2=+0.24 *23*, A_4=+0.10 *24* (1985Di05).
								δ: −0.4 *2* or<−3 (1985Di05). Other: +0.06 *11* (1983Si24).
		6091	70 *1*	0.0	3/2$^-$	Q(+D)		Mult.: A_2=−0.01 *4*, A_4=−0.07 *4* (1985Di05).

^{58}Ni(p,γ) 1985Di05 (continued)

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ †	I_γ [a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
								δ: −0.29 *4* or<−14. Other: −0.76 *−13+8* (1983Si24). E_γ: 6091.8 *7* (1985Ti04).
6125	3/2,5/2	5634‡		491	1/2⁻	D(+Q)		δ: +0.06 *10* if J(6125 level)=3/2 (1983Si24).
		6125‡		0.0	3/2⁻			δ(D,Q)=−0.23 *9* if J(6125 level)=3/2 (1983Si24). E_γ: 6127.9 *15* (1985Ti04).
6197	(3/2)	2619	22 *1*	3578				
		3481	8 *1*	2716	7/2⁻			
		3873	23 *1*	2324	3/2⁻			
		3931	8 *1*	2266	3/2			
		5706	39 *1*	491	1/2⁻			
6201	(3/2,5/2)	2763	6 *1*	3438	(1/2)			
		3086	13 *1*	3115	5/2⁻			
		3177	5 *1*	3024	5/2⁻			
		3273	4 *1*	2928	5/2⁻			
		3492	4 *1*	2709	5/2⁻			
		3877	18 *1*	2324	3/2⁻			
		3935	5 *1*	2266	3/2			
		4213	21 *1*	1988	5/2	D		Mult.,δ: from 1983Si24; δ(D,Q)=−0.02 *+9−4* for J(6201)=3/2. Were the 2839 resonance not resolved in 1983Si24, it would contribute to this transition.
		5286	6 *1*	914.4	5/2⁻			
		5710	13 *1*	491	1/2⁻	D(+Q)		δ: −0.08 *5* from 1983Si24 for J(6201)=3/2. Were the 2831 resonance not resolved in 1983Si24, it would contribute to this transition.
		6201	5 *1*	0.0	3/2⁻	D(+Q)		δ: −0.11 *8* from γ(θ) (1983Si24) for J(6201)=3/2.
6206	9/2⁺	3091	3 *1*	3115	5/2⁻			
		3164	84 *1*	3042.4	9/2	D(+Q)	+0.3 *4*	Mult.: A_2=+0.59 *12*, A_4=−0.01 *13* (1985Di05). Other δ: ±0.34 (1982Sz01).
		3490	3 *1*	2716	7/2⁻			
		3619	6 *1*	2586.5	11/2⁻	D		Mult.: A_2=+0.03 *17*, A_4=−0.18 *19* (1985Di05). δ(D,Q)=−0.10 *15*.
		4218	4 *1*	1988	5/2	Q		Mult.: A_2=−0.34 *15*, A_4=+0.26 *21* (1985Di05).
6238	(3/2,5/2)	2660	9 *1*	3578				
		3214	4 *1*	3024	5/2⁻			
		3972	7 *1*	2266	3/2			
		4250	4 *1*	1988	5/2			
		4839	14 *1*	1398.6	7/2			
		5747	28 *1*	491	1/2⁻			δ(D,Q)=+0.02 *4* (1983Si24) if J(6238 level)=3/2.
		6238	34 *1*	0.0	3/2⁻	D+Q		E_γ: 6236.6 *9* (1985Ti04). δ: −1.4 *+4−0* from 1983Si24 assuming J(6238 level)=3/2.
6300	(3/2,5/2)	2685	2 *1*	3615	3/2⁻,5/2⁻			
		3185	8 *1*	3115	5/2⁻	Q(+D)		Mult.,δ: δ=+0.33 *20* from 1983Si24 assuming J(res)=3/2. Abs(δ)>8 also possible (1979Kr20).
		3372	20 *1*	2928	5/2⁻	Q(+D)		Mult.,δ: δ=+0.18 *9* from 1983Si24 assuming J(res)=3/2; abs(δ)>8 also possible (1979Kr20).

$^{59}_{29}Cu_{30}$-18

$\gamma(^{59}Cu)$ (continued)

E_i(level)	J_i^π	E_γ †	I_γ [a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
6300	(3/2,5/2)	3584	5 *1*	2716	7/2$^-$			Mult.,δ: A_2=−0.39 *19* (1979Kr20) for probable 3584γ+3591γ doublet.
		3591	2 *1*	2709	5/2$^-$			Mult.,δ: A_2=−0.39 *19* (1979Kr20) for probable 3584γ+3591γ doublet.
		3982	5 *1*	2318	1/2,5/2$^-$			
		4034	4 *1*	2266	3/2	Q(+D)		Mult.,δ: δ=−0.35 *+17−23* from 1983Si24 assuming J(res)=3/2; abs(δ)>4 also possible (1979Kr20).
		4312	18 *1*	1988	5/2	Q(+D)		Mult.,δ: δ=+0.28 *11* from 1983Si24 assuming J(res)=3/2; abs(δ)>10 also possible (1979Kr20).
		4435	5 *1*	1865.4	7/2			A_2=−0.38 *22* (1979Kr20).
		5809	22 *1*	491	1/2$^-$	D(+Q)		Mult.,δ: δ=−0.09 *7* from 1983Si24 assuming J(res)=3/2; δ=−1.43 *10* also possible (1979Kr20).
		6300	9 *1*	0.0	3/2$^-$	D(+Q)		E_γ: 6304.1 *10* (1985Ti04). Mult.,δ: δ=−0.19 *5* from 1983Si24 assuming J(res)=3/2. δ=−16 *−7+54* also possible (1979Kr20).
6322	(5/2)	3606	5 *1*	2716	7/2$^-$			
		4004	11 *1*	2318	1/2,5/2$^-$			
		4056	4 *1*	2266	3/2			
		4457	45 *1*	1865.4	7/2			
		4923	9 *1*	1398.6	7/2			
		5407	5 *1*	914.4	5/2$^-$	D		Mult.,δ: from 1977Ho29. δ(D,Q)=0.002.
		5831	13 *1*	491	1/2$^-$			
		6322	8 *1*	0.0	3/2$^-$			
6326	(3/2)	4008	6 *1*	2318	1/2,5/2$^-$			
		4060	12 *1*	2266	3/2			
		4460	12 *1*	1865.4	7/2			
		5835	5 *1*	491	1/2$^-$			
		6326	65 *1*	0.0	3/2$^-$			E_γ: 6327.4 *6* (1985Ti04); however, may include contribution from 2958 resonance.
6341	(3/2,5/2)	2642	<1	3699	7/2			
		2763	3 *1*	3578				
		2790	8 *1*	3551	5/2			
		3317	1 *1*	3024	5/2$^-$			
		3348	3 *1*	2993	3/2,5/2$^-$,7/2$^-$			
		3625	7 *1*	2716	7/2$^-$			
		4075	18 *1*	2266	3/2	D+Q		δ: −0.4 *+2−3* if J(res)=3/2 (1983Si24).
		5426	46 *1*	914.4	5/2$^-$	D+Q		δ: +0.34 *+14−11* if J(res)=3/2 (1983Si24).
		5850	7 *1*	491	1/2$^-$	D		δ: −0.06 *+14−21* for (D,Q) if J(res)=3/2 (1983Si24).
		6341	7 *1*	0.0	3/2$^-$	D+Q		E_γ: 6344.2 *12* (1985Ti04). δ: −0.8 *+4−5* if J(res)=3/2 (1983Si24).
6362	(3/2)	2784	8 *1*	3578				
		3653	3 *1*	2709	5/2$^-$			
		5447	14 *1*	914.4	5/2$^-$	D+Q	+0.11 *6*	Mult.: from 1983Si24. W(0°)/W(90°)=0.78 *11* (1994Ho31). δ: unweighted average of +0.17 *13* (1983Si24) and +0.05 *7* (1994Ho31).
		5871	40 *1*	491	1/2$^-$	D+Q		Mult.: from 1983Si24. W(0°)/W(90°)=0.38 *4* (1994Ho31). δ: Unweighted average of −0.15 *4* (1983Si24) and +0.015 *+30−4* (1994Ho31) is −0.07 *8*.

$^{59}_{29}Cu_{30}$-19

^{58}Ni(p,γ) 1985Di05 (continued)

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
6362	(3/2)	6362	35 *1*	0.0	3/2$^-$	D+Q	−0.14 *7*	E_γ: 6365.5 *9* (1985Ti04). Mult.: from 1983Si24. W(0°)/W(90°)=1.49 *12* (1994Ho31). δ: unweighted average of-0.21 *5* (1983Si24) and −0.07 *+3−4* (1994Ho31).
6410	(5/2,3/2)	4422[‡]		1988	5/2			δ(D,Q)=+0.20 *14* if J(6410 level)=3/2 (1983Si24) and resonance is not complex.
		6410[‡]		0.0	3/2$^-$			Eγ=6410.4 *10* (1985Ti04); may not be resolved from 3041 resonance. δ: −0.61 *9* if J(6410 level)=3/2 (1983Si24) and resonance is not complex.
6419	3/2	4095	19.3	2324	3/2$^-$	D+Q	−0.45 *+19−27*	I_γ: from 1994Ho31; however, see comment on 6419γ. W(0°)/W(90°)=0.98 *18* (1994Ho31). Mult.,δ: from 1983Si24. 1994Ho31 report +0.07 *11*, but assumed a 3/2 to 5/2 transition to an otherwise unknown 2337 level.
		4153	23.2	2266	3/2	D+Q	−0.54 *+19−45*	I_γ: from 1994Ho31; however, see comment on 6419γ. W(0°)/W(90°)=1.00 *17* (1994Ho31). Mult.,δ: from 1983Si24. 1994Ho31 report +0.09 *11*, but assumed a 3/2 to 5/2 transition.
		5504	19.2	914.4	5/2$^-$	D(+Q)	−0.15 *10*	Mult.: W(0°)/W(90°)=1.11 *17* (1994Ho31). I_γ,Mult.: from 1994Ho31, but see comment on 6419γ. δ is weighted average of −0.12 *+18−21* (1983Si24) and −0.16 *+11−12* (1994Ho31).
		5928	20	491	1/2$^-$	D(+Q)	+0.04 *5*	I_γ: from 1994Ho31; however, see comment on 6419γ. Mult.: W(0°)/W(90°)=0.51 *10* (1994Ho31). δ: weighted average of +0.02 *7* (1983Si24) and +0.06 *+5−6* (1994Ho31).
		6419[h]	18.3	0.0	3/2$^-$			I_γ: from 1994Ho31. Transition shown as tentative because it is not reported in other studies, whereas a g.s. transition is known from the 3047-keV resonance (9 keV below this one).
6451		6451.4[&] *7*	[&]	0.0	3/2$^-$			E_γ: resonances 7 keV above and below may not be resolved. The g.s. branch from the upper resonance is weak.
6457	5/2$^-$	2156	5.5 *10*	4301	5/2,7/2	D+Q	−0.3 *2*	E_γ,I_γ: omitted in error from table iii of 1985Di05; Iγ inferred from (100%- Σ (%Iγ from resonance)). Placement based on table v of 1985Di05. Mult.: A_2=+0.05 *13*, A_4=+0.12 *15* (1985Di05). δ: if J(4301 level)=5/2.
		2758	4.7 *10*	3699	7/2	D+Q	−1.4 *12*	Mult.: A_2=+0.40 *13*, A_4=0.00 *14* (1985Di05).
		2883	6.7 *10*	3574	5/2,7/2	D+Q		Mult.: A_2=+0.07 *13*, A_4=+0.11 *14* (1985Di05). δ: −0.2 *2* if J=5/2, −0.2 *1* or −4 *2* if J=7/2 for 3574 level.
		2906	1.5 *10*	3551	5/2			
		3019	1.2 *10*	3438	(1/2)			
		3023	1.7 *10*	3434	5/2			
		3327	1.4 *10*	3130	1/2$^-$,3/2,5/2$^-$			
		3342	1.7 *10*	3115	5/2$^-$			

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ †	I_γ [a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
6457	5/2⁻	3464	2.7 *10*	2993	3/2,5/2⁻,7/2⁻	D,Q		Mult.: A_2=−0.38 *19*, A_4=+0.06 *21* (1985Di05). δ(D,Q)=+0.2 *2* or <−6 if J(2993 level)=7/2.
		3529	1.1 *10*	2928	5/2⁻			
		3748	11.9 *10*	2709	5/2⁻	D(+Q)		Mult.: A_2=+0.49 *7*, A_4=−0.07 *10* (1985Di05). δ: 0.0 *1* or −1.3 *3*.
		4133	6.2 *10*	2324	3/2⁻	D+Q	−0.2 *1*	Mult.: A_2=−0.83 *14*, A_4=+0.16 *15* (1985Di05).
		4469	3.8 *10*	1988	5/2			
		5058	4.4 *10*	1398.6	7/2	Q(+D)	>+0.27	Mult.: A_2=−0.67 *19*, A_4=−0.10 *19* (1985Di05).
		5542	39.0 *10*	914.4	5/2⁻	D(+Q)	−0.09 *12*	Mult.: A_2=+0.36 *7*, A_4=−0.04 *10* (1985Di05).
		6457	6.5 *10*	0.0	3/2⁻			
6461	3/2⁻	2846	1.9 *10*	3615	3/2⁻,5/2⁻	Q(+D)		Mult.: A_2=−0.3 *3*, A_4=+0.1 *3* (1985Di05). δ: −0.5 *2* or <−2.6 if J(3615 level)=3/2; +0.1 *2* or <−3 if J(3615 level)=5/2.
		2883	4.5 *10*	3578		D+Q		Mult.: A_2=−0.47 *18*, A_4=−0.14 *18* (1985Di05). δ: +0.4 *2* or +11 *8* if J(3578 level)=5/2.
		3331	7.4 *10*	3130	1/2⁻,3/2,5/2⁻	D,Q		Mult.: A_2=+0.48 *14*, A_4=+0.13 *14* (1985Di05). δ(D,Q)=−0.5 *1* or <−10 if J(3130 level)=1/2; 0.0 *1* or <−3 if J(3130 level)=3/2; and −0.9 *4*, <−4.7 if J(3130 level)=5/2.
		3437	3.0 *10*	3024	5/2⁻	Q,D		Mult.: A_2=−0.4 *3*, A_4=0.0 *3* (1985Di05). δ: +0.2 *2* or<−5.
		3752	6.8 *10*	2709	5/2⁻			
		4137	11.6 *10*	2324	3/2⁻	D+Q		Mult.: A_2=+0.64 *19*, A_4=+0.01 *22* (1985Di05). δ: −0.2 *11* or +2.4 *9*.
		4143	12.4 *10*	2318	1/2,5/2⁻	D(+Q)		Mult.: A_2=−0.92 *15*, A_4=+0.03 *16* (1985Di05). δ: −0.3 *1* or −0.9 *1* if J(2318 level)=1/2; +1.3 *4* if J(2318 level)=5/2.
		4195	5.5 *10*	2266	3/2	D+Q	−0.4 *1*	Mult.: A_2=−0.28 *14*, A_4=+0.15 *14* (1985Di05).
		4473	2.5 *10*	1988	5/2			
		5546	25.3 *10*	914.4	5/2⁻	D(+Q)		Mult.: A_2=−0.05 *16*, A_4=+0.02 *19* (1985Di05). δ: −0.05 *14* or −4.7 *25*.
		5970	13.3 *10*	491	1/2⁻	D+Q	−0.6 *2*	Mult.: A_2=+0.89 *21*, A_4=−0.09 *19* (1985Di05).
		6461	4.5 *10*	0.0	3/2⁻			
6470	3/2,5/2	3761‡		2709	5/2⁻			δ(D,Q)=+0.19 *23* if J(6470)=3/2 (1983Si24).
		4152‡		2318	1/2,5/2⁻			
		4204‡		2266	3/2			
		5555‡		914.4	5/2⁻			δ: +0.45 *9* if J(6470)=3/2 (1983Si24).
		5979‡		491	1/2⁻			δ: −0.16 *9* if J(6470)=3/2 (1983Si24).
6493	7/2	2186	1.3 *10*	4307	5/2	D		Mult.: A_2=+0.02 *17*, A_4=−0.33 *18* (1985Di05). δ(D,Q)=+0.1 *1* (1985Di05).
		2192	1.2 *10*	4301	5/2,7/2	D(+Q)		Mult.: A_2=−0.02 *17*, A_4=−0.18 *19* (1985Di05). δ(D,Q)=+0.1 *1* and −0.6 *2* or +3.7 *20* for J(3930 level)=5/2 and 7/2, respectively (1985Di05).
		2286	4.9 *10*	4207	5/2,7/2⁻	D(+Q)		Mult.: A_2=−0.26 *8*, A_4=+0.01 *10* (1985Di05). δ(D,Q)=+0.04 *5* and −0.7 *2* for J(3930 level)=5/2 and 7/2, respectively (1985Di05).

$^{59}_{29}Cu_{30}$-21

^{58}Ni(p,γ) 1985Di05 (continued)

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ †	I_γ [a]	E_f	J_f^π	Mult. [g]	δ [g]	Comments
6493	7/2	2310	3.9 *10*	4183	5/2,9/2$^-$	D(+Q)		Mult.: A_2=−0.05 *10*, A_4=−0.10 *10* (1985Di05). δ(D,Q)=+0.1 *1* and −0.03 *8* for J(3930 level)=5/2 and 9/2, respectively (1985Di05).
		2421	2.2 *10*	4072	3/2,5/2,7/2			Mult.: A_2=+0.52 *24*, A_4=−0.02 *26* (1985Di05).
		2563	1.3 *10*	3930	5/2,7/2			Mult.: A_2=−0.31 *27*, A_4=−0.20 *27* (1985Di05). δ(D,Q)=0.0 *2* and <−0.5 for J(3930 level)=5/2 and 7/2, respectively (1985Di05).
		2587	1.1 *10*	3906	3/2,5/2,7/2$^-$			Mult.: A_2=+0.39 *18*, A_4=−0.18 *19* (1985Di05). Pure Q allowed by γ(θ) (1985Di05).
		2606	1.8 *10*	3887	3/2,5/2$^+$			Mult.: A_2=+0.93 *25*, A_4=−0.23 *26* (1985Di05). Pure Q allowed by γ(θ) (1985Di05).
		2794	3.7 *10*	3699	7/2	D+Q	−0.5 *2*	Mult.: A_2=0.00 *11*, A_4=−0.10 *11* (1985Di05).
		2919	4.4 *10*	3574	5/2,7/2	D+Q		Mult.: A_2=+0.69 *12*, A_4=−0.20 *12* (1985Di05).
		2942	1.9 *10*	3551	5/2			
		3059	6.4 *10*	3434	5/2	D		Mult.: A_2=−0.28 *8*, A_4=−0.12 *9* (1985Di05). δ(D,Q)=0.00 *4* (1985Di05).
		3184	14.5 *10*	3309	7/2$^-$	D+Q	−0.16 *6*	Mult.: A_2=+0.31 *4*, A_4=−0.01 *4* (1985Di05); W(0°)/W(90°)=1.2 *4* (1994Ho31). δ: 1994Ho31 report δ=+0.02 *+11−13*, but this assumes J(3309)=5/2 rather than 7/2.
		3378	1.5 *10*	3115	5/2$^-$	D		Mult.: A_2=−0.24 *22*, A_4=−0.07 *23* (1985Di05). δ(D,Q)=0.0 *2* (1985Di05).
		3451	1.7 *10*	3042.4	9/2	D		Mult.: A_2=−0.15 *20*, A_4=−0.19 *21* (1985Di05). δ(D,Q)=+0.05 *16* (1985Di05).
		3565	7.2 *10*	2928	5/2$^-$	D+Q	−0.9 *2*	Mult.: A_2=−0.42 *6*, A_4=−0.03 *7* (1985Di05); W(0°)/W(90°)=0.35 *13* (1994Ho31). Other δ: −0.10 *+7−9* (1994Ho31).
		3777[#]	16.1[#] *10*	2716	7/2$^-$	D		Mult.: A_2=+0.43 *5*, A_4=−0.03 *7* (1985Di05). δ(D,Q)=−0.05 *11* (1985Di05).
		3784	6.2 *10*	2709	5/2$^-$	D		Mult.: A_2=−0.45 *8*, A_4=+0.09 *8* (1985Di05); W(0°)/W(90°)=1.11 *13* (1994Ho31). δ(D,Q)=−0.03 *5* (1985Di05). δ=+0.20 *4* (1994Ho31) probably results from analysis of 3784γ+3777γ doublet assuming a 7/2 to 5/2 transition.
		3829	2.2 *10*	2664	5/2,9/2	D+Q		Mult.: A_2=+0.52 *15*, A_4=−0.15 *15* (1985Di05). δ: −1.2 *9* if J(2664 level)=9/2.
		4505	0.4 *10*	1988	5/2			
		4627	8.9 *10*	1865.4	7/2	D+Q	−0.15 *8*	Mult.: A_2=+0.32 *6*, A_4=+0.03 *7* (1985Di05); W(0°)/W(90°)=2.0 *4* (1994Ho31). Other δ: +0.05 *+21−16* (1994Ho31).
		5094	4.6 *10*	1398.6	7/2	D		Mult.: A_2=+0.40 *8*, A_4=−0.02 *8* (1985Di05); W(0°)/W(90°)=1.3 *4* (1994Ho31). δ: −0.1 *1* (1985Di05). 1994Ho31 report +0.27 *+9−10* but their analysis assumed J(1399)=5/2 instead of 7/2.
		5578	2.6 *10*	914.4	5/2$^-$			
6532		6531.4[&] *9*	[&]	0.0	3/2$^-$			E_γ: γ may be complex; another resonance lies 8 keV below.
6559		6559.2[&] *6*	[&]	0.0	3/2$^-$			E_γ: γ may be complex; another resonance lies 7 keV below.
6627	3/2	3049	5.0 *10*	3578		D		Mult.: A_2=−0.42 *11*, A_4=−0.02 *12* (1985Di05). δ(D,Q)=+0.2 *1*.

$^{59}_{29}Cu_{30}$-22

^{58}Ni(p,γ) 1985Di05 (continued)

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
6627	3/2	3193	6.4 *10*	3434	5/2			
		3699	2.1 *10*	2928	$5/2^-$			
		4303	4.9 *10*	2324	$3/2^-$			
		4309	5.4 *10*	2318	$1/2,5/2^-$			
		6136	4.1 *10*	491	$1/2^-$			
		6627	77.2 *10*	0.0	$3/2^-$	D(+Q)		E_γ: 6626.3 *7* (1985Ti04). Mult.: A_2=+0.37 *2*, A_4=−0.02 *2* (1985Di05). δ: −0.03 *3* or >−3.6.
6644		6642.8[&] *8*	[&]	0.0	$3/2^-$			E_γ: γ may be complex; another resonance lies 6 keV below.
6662		6660.9[&] *14*	[&]	0.0	$3/2^-$			
6692		6690.3[&] *15*	[&]	0.0	$3/2^-$			
6710	3/2	3272	2.7 *10*	3438	(1/2)			
		3580	2.5 *10*	3130	$1/2^-,3/2,5/2^-$			
		3782	2.7 *10*	2928	$5/2^-$			
		4386	1.7 *10*	2324	$3/2^-$			
		4392	1.0 *10*	2318	$1/2,5/2^-$			
		4444	3.4 *10*	2266	3/2			
		6219	49.0 *10*	491	$1/2^-$	D+Q		Mult.: A_2=−0.78 *2*, A_4=−0.01 *2* (1985Di05). δ: −0.16 *4* or −1.1 *1*.
		6710	37.0 *10*	0.0	$3/2^-$	D+Q		E_γ: 6708.2 *7* (1985Ti04). Mult.: A_2=+0.38 *3*, A_4=−0.02 *3* (1985Di05). δ: −0.02 *3* or −4 *1*.
6727	(3/2,5/2)	2821	1.9 *10*	3906	$3/2,5/2,7/2^-$			
		2840	2.3 *10*	3887	$3/2,5/2^+$			
		3149	4.0 *10*	3578				
		4011	2.7 *10*	2716	$7/2^-$			
		4403	3.2 *10*	2324	$3/2^-$			
		5328	2.4 *10*	1398.6	7/2			
		6236	78.0 *10*	491	$1/2^-$			
		6727.4 *6*		0.0	$3/2^-$			E_γ: from 1985Ti04; γ absent in 1985Di05.
6749	$5/2^+$	2862	2.3 *10*	3887	$3/2,5/2^+$	D		Mult.: A_2=+0.03 *13*, A_4=−0.30 *14* (1985Di05). δ(D,Q)=+0.1 *1* if J(3887 level)=3/2.
		3171	2.3 *10*	3578		D+Q	+2 *1*	Mult.: A_2=+0.71 *12*, A_4=−0.74 *22* (1985Di05).
		4425	2.9 *10*	2324	$3/2^-$	D(+Q)		E_γ: if 6749 level feeds 2324 level as in table iii of 1985Di05; Eγ=3007 if it feeds 3742 level, as in table v of 1985Di05. Mult.: A_2=−0.57 *24*, A_4=+0.22 *26* (1985Di05). δ: −0.04 *13* or −1.8 *4* if J=3/2 level is fed.
		5350	4.2 *10*	1398.6	7/2	D+Q	+0.05 *2*	Mult.: A_2=−0.25 *5*, A_4=+0.15 *5* (1985Di05).
		6749	88.3 *10*	0.0	$3/2^-$	D+Q	+0.21 *3*	E_γ: 6745.7 *6* (1985Ti04). Mult.: A_2=+0.02 *2*, A_4=+0.04 *2* (1985Di05).
6760	$(3/2^-)$	4772	5	1988	5/2			I_γ: from 1994Ho31.
		5361	7	1398.6	7/2			I_γ: from 1994Ho31.
		6760	88	0.0	$3/2^-$	D+Q	−0.19 *+3−4*	I_γ,Mult.,δ: from 1994Ho31. W(0°)/W(90°)=1.15 *9* (1994Ho31).

^{58}Ni(p,γ) 1985Di05 (continued)

$\gamma(^{59}Cu)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
6811	3/2	3883[@]	50 *10*	2928	5/2$^-$	D+Q[@]	+0.55[@] *+9−20*	I_γ: from 1979Kr20.
		4823[@]	16 *3*	1988	5/2	D+Q[@]	+0.61[@] *+44−27*	I_γ: from 1979Kr20.
		6320[@]	28 *6*	491	1/2$^-$	D+Q[@]	−0.30[@] *+12−25*	I_γ: from 1979Kr20.
		6811[@]	6 *1*	0.0	3/2$^-$	D(+Q)[@]	−0.02[@] *+25−14*	I_γ: from 1979Kr20.
6836	9/2$^+$	1921	1.8 *10*	4914.6	5/2$^+$,7/2,9/2$^-$			
		3794	64.9 *10*	3042.4	9/2	D		Mult.: A_2=+0.46 *3*, A_4=+0.01 *3* (1985Di05). δ(D,Q)=−0.02 *7*. Other δ: 1982Sz01.
		4120	1.3 *10*	2716	7/2$^-$			
		4249	12.1 *10*	2586.5	11/2$^-$	D		Mult.: A_2=−0.35 *12*, A_4=+0.22 *13* (1985Di05). δ(D,Q)=0.0 *1*.
		5437	19.9 *10*	1398.6	7/2	D		Mult.: A_2=−0.36 *5*, A_4=+0.01 *5* (1985Di05). δ(D,Q)=0.00 *5*.
6843	3/2$^-$	4519	4.4 *10*	2324	3/2$^-$			
		4577	3.2 *10*	2266	3/2			
		5929	5.0 *10*	914.4	5/2$^-$			
		6352	31.1 *10*	491	1/2$^-$	D+Q		Mult.: A_2=−0.02 *3*, A_4=0.00 *3* (1985Di05). δ: +0.3 *1* or −4 *1*.
		6843	56.3 *10*	0.0	3/2$^-$	D+Q		E_γ: 6842.3 *7* (1985Ti04). Mult.: A_2=−0.20 *2*, A_4=−0.01 *2* (1985Di05). δ: −0.4 *1* or −7 *2*.
6867		4601	6.0 *12*	2266	3/2			I_γ: From 1979Kr20 only.
		5952	7.6 *15*	914.4	5/2$^-$			I_γ: From 1979Kr20 only.
		6376	76 *15*	491	1/2$^-$			I_γ: From 1979Kr20 only.
		6867	10.0 *20*	0.0	3/2$^-$			I_γ: From 1979Kr20 only.
6879	(5/2)	3301	4.4 *10*	3578				
		3764	4.2 *10*	3115	5/2$^-$			
		3886	13.7 *10*	2993	3/2,5/2$^-$,7/2$^-$			
		4170	6.1 *10*	2709	5/2$^-$			
		4555	7.4 *10*	2324	3/2$^-$			
		5480	13.6 *10*	1398.6	7/2			
		5964	31.3 *10*	914.4	5/2$^-$			
		6879	19.3 *10*	0.0	3/2$^-$			
6885		2584	4[e] *1*	4301	5/2,7/2			
		4176	5[e] *1*	2709	5/2$^-$			
		≈4567	6[e] *1*	2318	1/2,5/2$^-$			
		4619	9[e] *2*	2266	3/2			
		4897	10[e] *2*	1988	5/2			
		5019	8[e] *2*	1865.4	7/2			
		5486	18[e] *2*	1398.6	7/2			
		5971	19[e] *2*	914.4	5/2$^-$			
		6885	12[e] *2*	0.0	3/2$^-$			
6894	5/2$^-$	3343	5.5 *10*	3551	5/2	D+Q	−0.5 *3*	Mult.: A_2=−0.26 *19*, A_4=+0.32 *20* (1985Di05).

$^{59}_{29}Cu_{30}$-24

^{58}Ni(p,γ) 1985Di05 (continued)

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
6894	5/2$^-$	3779	3.5 *10*	3115	5/2$^-$			
		4178	6.0 *10*	2716	7/2$^-$			
		4185	5.0 *10*	2709	5/2$^-$			
		4570	10.6 *10*	2324	3/2$^-$	D		Mult.: A_2=−0.42 *17*, A_4=−0.10 *18* (1985Di05). δ(D,Q)=−0.04 *12*.
		4628	13.0 *10*	2266	3/2	D+Q	+0.5 *2*	Mult.: A_2=+0.56 *18*, A_4=+0.08 *19* (1985Di05).
		4906	14.2 *10*	1988	5/2	D(+Q)	−0.2 *2*	Mult.: A_2=+0.17 *14*, A_4=0.00 *15* (1985Di05).
		5495	20.0 *10*	1398.6	7/2	Q+D	−1.4 *11*	Mult.: A_2=+0.43 *5*, A_4=+0.18 *7* (1985Di05).
		5979	11.2 *10*	914.4	5/2$^-$	D+Q		Mult.: A_2=−0.15 *14*, A_4=−0.14 *15* (1985Di05). δ: −0.6 *3* or >+3 (1985Di05).
		6894	11.0 *10*	0.0	3/2$^-$			
6905	9/2$^+$	1685[h]	2.3 *3*	5220.3	9/2	D+Q	−0.12 *4*	E_γ,I_γ,Mult.,δ: from 1977Co03; transition absent in 1985Di05.
		1990	1.8 *10*	4914.6	5/2$^+$,7/2,9/2$^-$			
		2375	1.1 *10*	4530	5/2$^+$,7/2,9/2$^-$			
		2440	0.9 *10*	4465	5/2$^+$,7/2,9/2$^-$			
		2464	2.0 *10*	4441	7/2	D		Mult.: A_2=−0.48 *18*, A_4=+0.09 *20* (1985Di05). δ(D,Q)=−0.04 *8* for J_f=7/2.
		3147	1.5 *10*	3758	5/2$^+$,7/2,9/2$^-$			
		3862	76.1 *10*	3042.4	9/2	D(+Q)	−0.031 *23*	Mult.: A_2=+0.42 *1*, A_4=+0.01 *2* (1985Di05). δ: weighted average of −0.07 *5* (1985Di05), −0.012 *28* (from +0.016 to −0.04 − 1975Co21), and −0.06 *+6−5* (1977Ho29, table ii; sign differs in text). Other: 1982Sz01.
		4189	2.7 *10*	2716	7/2$^-$	D		Mult.: A_2=−0.24 *13*, A_4=+0.08 *13* (1985Di05). δ(D,Q)=−0.06 *8* (1985Di05), +0.018 to −0.026 (1975Co21).
		4318	6.7 *10*	2586.5	11/2$^-$	D		Mult.: A_2=−0.12 *6*, A_4=+0.04 *7* (1985Di05). δ(D,Q)=−0.05 *7* (1985Di05), −0.01 *2* (1975Co21), −0.07 *+10−8* (1977Ho29). Weighted average=−0.02 *2*.
		5039	1.1 *10*	1865.4	7/2			
		5506	3.5 *10*	1398.6	7/2	D+Q	+0.023 *16*	Mult.: A_2=−0.32 *8*, A_4=+0.14 *8* (1985Di05). δ: From +0.039 to +0.008 (1975Co21); Other: +0.04 *6* (1985Di05).
		5990	2.6 *10*	914.4	5/2$^-$			
6923	(5/2)	3345	15.8 *10*	3578				
		4935	46.0 *10*	1988	5/2			
		6008	38.2 *10*	914.4	5/2$^-$			
6939	3/2$^-$	3210	16.3 *10*	3729	3/2$^-$,5/2	Q(+D)		Mult.: A_2=−0.03 *4*, A_4=−0.02 *5* (1985Di05). δ(D,Q)=−0.30 *5* or <−10 (1985Di05) if J_f=3/2.
		3946	4.7 *10*	2993	3/2,5/2$^-$,7/2$^-$			
		4223	8.0 *10*	2716	7/2$^-$			
		4615	9.8 *10*	2324	3/2$^-$			
		4621	3.7 *10*	2318	1/2,5/2$^-$			
		4673	22.2 *10*	2266	3/2	Q(+D)		Mult.: A_2=+0.12 *7*, A_4=+0.11 *8* (1985Di05). δ: −0.2 *1* or>+7 (1985Di05).
		5073	5.7 *10*	1865.4	7/2			

$^{59}_{29}Cu_{30}$-25

^{58}Ni(p,γ) 1985Di05 (continued)

$\gamma(^{59}Cu)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[a]	E_f	J_f^π	Mult.[g]	δ[g]	Comments
6939	3/2$^-$	6024	8.6 *10*	914.4	5/2$^-$	Q(+D)	>+0.3	Mult.: A_2=−0.71 *20*, A_4=+0.03 *20* (1985Di05).
		6448	13.3 *10*	491	1/2$^-$	D+Q		Mult.: A_2=−0.01 *13*, A_4=−0.04 *13* (1985Di05). δ: +0.25 *11* or −4 *2* (1985Di05).
		6939	7.7 *10*	0.0	3/2$^-$			
6945	(3/2)	4621	7.1 *10*	2324	3/2$^-$			
		4627	13.0 *10*	2318	1/2,5/2$^-$			
		4679	23.7 *10*	2266	3/2			
		6454	10.6 *10*	491	1/2$^-$			
		6945	45.6 *10*	0.0	3/2$^-$			E_γ: 6946.2 *9* (1985Ti04).
6959	(3/2)	4693		2266	3/2			
		6959		0.0	3/2$^-$	D+Q	+0.10 *9*	Mult.,δ: from W(0°)/W(90°)=2.1 *3* (1994Ho31).
6967	(3/2,5/2)	3389	3.9 *10*	3578				
		3837	2.0 *10*	3130	1/2$^-$,3/2,5/2$^-$			
		4701	5.9 *10*	2266	3/2			
		4979	6.3 *10*	1988	5/2			
		6052	24.3 *10*	914.4	5/2$^-$			
		6967	57.6 *10*	0.0	3/2$^-$			
7016		7013.7[&] *10*	[&]	0.0	3/2$^-$			
7029		7027.7[&] *10*	[&]	0.0	3/2$^-$			
7048		7044.8[&] *10*	[&]	0.0	3/2$^-$			
7136.8		7136.6[&] *10*	[&]	0.0	3/2$^-$			
7197	(3/2)	6282	24	914.4	5/2$^-$	D+Q	+0.11 *+11−10*	I_γ: from 1994Ho31. Mult.,δ: from W(0°)/W(90°)=0.68 *15* (1994Ho31).
		6706	76	491	1/2$^-$	D+Q	+0.04 *3*	I_γ: from 1994Ho31. Mult.,δ: from W(0°)/W(90°)=0.45 *5* (1994Ho31).
7251	(3/2$^-$,5/2)	4542	11	2709	5/2$^-$			I_γ: from 1994Ho31.
		4587		2664	5/2,9/2			
		4985	9	2266	3/2			I_γ: from 1994Ho31.
		5852	15	1398.6	7/2			I_γ: from 1994Ho31. Mult.,δ: W(0°)/W(90°)=1.6 *4* (1994Ho31). Authors report δ(D,Q)=−0.13 *+17−15* but their analysis assumed a 5/2 to 5/2 transition (not 5/2 to 7/2).
		6336	12	914.4	5/2$^-$			I_γ: from 1994Ho31.
		7251	48	0.0	3/2$^-$	D(+Q)	+0.03 *3*	I_γ: from 1994Ho31. Mult.,δ: from W(0°)/W(90°)=0.55 *7* (1994Ho31).
7299	3/2,5/2	4169	8 *1*	3130	1/2$^-$,3/2,5/2$^-$			Not observed in 1994Ho31.
		4371[h]		2928	5/2$^-$	D+Q		I(4371γ):I(7299γ)=10.3:52.2 in 1994Ho31; γ not observed in 1985Di05 but should have been. Mult.,δ: +0.17 *13* from 1994Ho31, if J(7299)=3/2.
		4590[h]		2709	5/2$^-$	D(+Q)		I(4590γ):I(7299γ)=8.7:52.2 in 1994Ho31; γ not observed in 1985Di05 but should have been. Mult.,δ: −0.16 *+22−26* from 1994Ho31, if J(7299)=3/2.

$^{59}_{29}Cu_{30}$-26

^{58}Ni(p,γ) 1985Di05 (continued)

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ †	I_γ [a]	E_f	J_f^π	Mult. [g]	δ [g]	Comments
7299	3/2,5/2	5033	6 *1*	2266	3/2			I(5033γ):I(7299γ)=4.5:52.2 in 1994Ho31.
		5311	6 *1*	1988	5/2	D(+Q)		I(5311γ):I(7299γ)=12:52.2 in 1994Ho31. Mult.,δ: −0.12 *13* from 1994Ho31, if J(7299)=3/2.
		5900 [h]		1398.6	7/2			I_γ: I(5900γ):I(7299γ)=4:52.2 in 1994Ho31; γ not observed in 1985Di05 but should have been. Mult.,δ: W(0°)/W(90°)=0.66 *27* (1994Ho31). Authors report δ(D,Q)=+0.13 *+24−8* if J(7299)=3/2, but assume J=5/2 (instead of J=7/2) for the final level.
		6384	8 *1*	914.4	5/2$^-$	D+Q		I(6385γ):I(7299γ)=3.3:52.2 in 1994Ho31. Mult.,δ: −0.27 *+19−28* from 1994Ho31, if J(7299)=3/2.
		7299	72 *1*	0.0	3/2$^-$	D+Q		Other Iγ: 52.2 (1994Ho31). Mult.,δ: −0.23 *+3−2* from 1994Ho31, if J(7299)=3/2. A_2=+0.07 *4*, A_4=−0.01 *5*. δ: −0.21 *5* or >+10 for J(7299)=3/2 (1985Di05).
7332		7332	100	0.0	3/2$^-$			
7348	3/2$^-$	3770	20 *1*	3578				
		6433	12 *1*	914.4	5/2$^-$			
		7348	68 *1*	0.0	3/2$^-$	D+Q		δ: A_2=−0.24 *8*, A_4=+0.12 *11*, δ=−0.5 *1* or −6 *3* (1985Di05).
7394	5/2	3816	72 *1*	3578		D+Q	+0.13 *5*	Mult from 1977Ho29. δ is weighted average +0.1 *1* (1985Di05) and 0.14 *6* (1977Ho29). A_2=+0.57 *6*, A_4=0.00 *8* (1985Di05).
		5406	13 *1*	1988	5/2			
		5528	8 *1*	1865.4	7/2			E_γ: misprinted as 5333 (instead of 5533) in fig. 1 of 1977Ho29.
		7394	7 *1*	0.0	3/2$^-$			E_γ: 7391.3 *15* (1985Ti04).
7407		7407	100	0.0	3/2$^-$			
7444	(3/2)	3829	15 *1*	3615	3/2$^-$,5/2$^-$			
		3866	15 *1*	3578				
		7444	70 *1*	0.0	3/2$^-$			
7473		7471.1 [&] *14*	[&]	0.0	3/2$^-$			
7503		7498 [&] *3*	[&]	0.0	3/2$^-$			E_γ: possible doublet (1985Ti04).
7517	(5/2)	6118	70 *1*	1398.6	7/2			
		7517	30 *1*	0.0	3/2$^-$			
7523		7523.9 [&] *1*	5 [&]	0.0	3/2$^-$			E_γ: possible doublet (1985Ti04).
7539	(3/2)	6624	20 *1*	914.4	5/2$^-$			
		7048	55 *1*	491	1/2$^-$			
		7538	25 *1*	0.0	3/2$^-$			
7650	5/2	6251	40 *1*	1398.6	7/2	D(+Q)	+0.1 *1*	Mult.: A_2=−0.75 *7*, A_4=−0.04 *8* (1985Di05).
		7649	60 *1*	0.0	3/2$^-$	D(+Q)	−0.1 *1*	Mult.: A_2=−0.63 *5*, A_4=+0.13 *3* (1985Di05).
7697	(5/2)	5709	10 *1*	1988	5/2			
		5831	17 *1*	1865.4	7/2			
		6298	18 *1*	1398.6	7/2			
		7696	38 *1*	0.0	3/2$^-$			
8013	(3/2)	7521	33 *1*	491	1/2$^-$			
		8012	67 *1*	0.0	3/2$^-$			
8077	3/2$^-$,5/2	8076		0.0	3/2$^-$	D+Q		Mult.: A_2=−0.59 *4*, A_4=+0.03 *3* (1985Di05). δ: −0.09 *2* if J(8077 level)=5/2; −1.0 *2* or −1.7 *3* if J=3/2.

$^{59}_{29}Cu_{30}$-27

^{58}Ni(p,γ) 1985Di05 (continued)

γ(^{59}Cu) (continued)

E_i(level)	J_i^π	E_γ[†]	E_f	J_f^π	Mult.[g]	Comments
8223	3/2$^-$,5/2	8222	0.0	3/2$^-$	D+Q	Mult.: A_2=−0.56 *3*, A_4=+0.01 *3* (1985Di05). δ: −0.07 *3* if J(8223 level)=5/2; −0.9 *2* or −1.8 *3* if J=3/2.
8259	3/2$^-$,5/2	8258	0.0	3/2$^-$	D+Q	Mult.: A_2=−0.43 *15*, A_4=+0.02 *4* (1985Di05). δ: −0.02 *3* if J(8259 level)=5/2; −0.65 *5* or −3.1 *4* if J=3/2.

† From level energy difference and recoil energy subtracted (rounded to nearest keV or one tenth of a keV), except as noted.
‡ Transition reported by 1983Si24; E from level energy difference.
# Erroneously shown as 6461 level to 2716 level transition in table iii of 1985Di05; present placement deduced from presence of 3777γ in spectrum of fig. 4 (for 6493 level deexcitation) and Σ Iγ from 6461, 6493 levels of 114.8%, 83.9%, respectively, in table iii.
@ From 1983Si24. Authors discarded the larger of their two solutions for δ because those implied B(E2) values which they considered to be unjustifiably large.
& E of primary γ to g.s. (from E(level) in 1985Ti04); other possible branches were not investigated in 1985Ti04. Iγ, if shown, has been deduced by the evaluator from the ratio of resonance strengths in (p,γ_0) (1985Ti04) and (p,γ_{total}) (1960Ca12 or 1957Bu64); branching deduced in this way is in excellent agreement with Iγ from 1985Di05 for E(p)=1424, 1844, 2063, 2170, 2225 resonances without any renormalization of (p,γ) strengths (see 1985Ti04 for discussion).
[a] % photon branching; from 1985Di05, except as noted.
[b] From 1977Co03; total Iγ(from 5219 level)=86.2% 20 determined from observed intensity of two ^{59}Cu ε decay γ rays. Authors ascribe remaining 14% to several weak (<2%) unobserved branches.
[c] From 1975Tr05; uncertainty 3%.
[d] From 1975Di16; uncertainty 10-15%.
[e] % branching from 1975Kl06; note, however, that 9% of authors′ assigned Iγ leaving the 6885 level has been omitted by the evaluator because it was assigned by 1975Kl06 to transitions feeding levels for which no other evidence exists (in (p,γ) or in other reactions). Also, Iγ(4564γ) may refer to a doublet since it is unclear whether the 2324, the 2318 or both levels are fed.
[f] 1975Tr05 report somewhat different branching from their E(p)=2221 resonance (3 additional Iγ=1%−7% branches and I(5602γ):I(5111γ)=29 *3*: 44 *3*).
[g] From 1985Di05, except as noted.
[h] Placement of transition in the level scheme is uncertain.

$^{59}_{29}Cu_{30}$-28

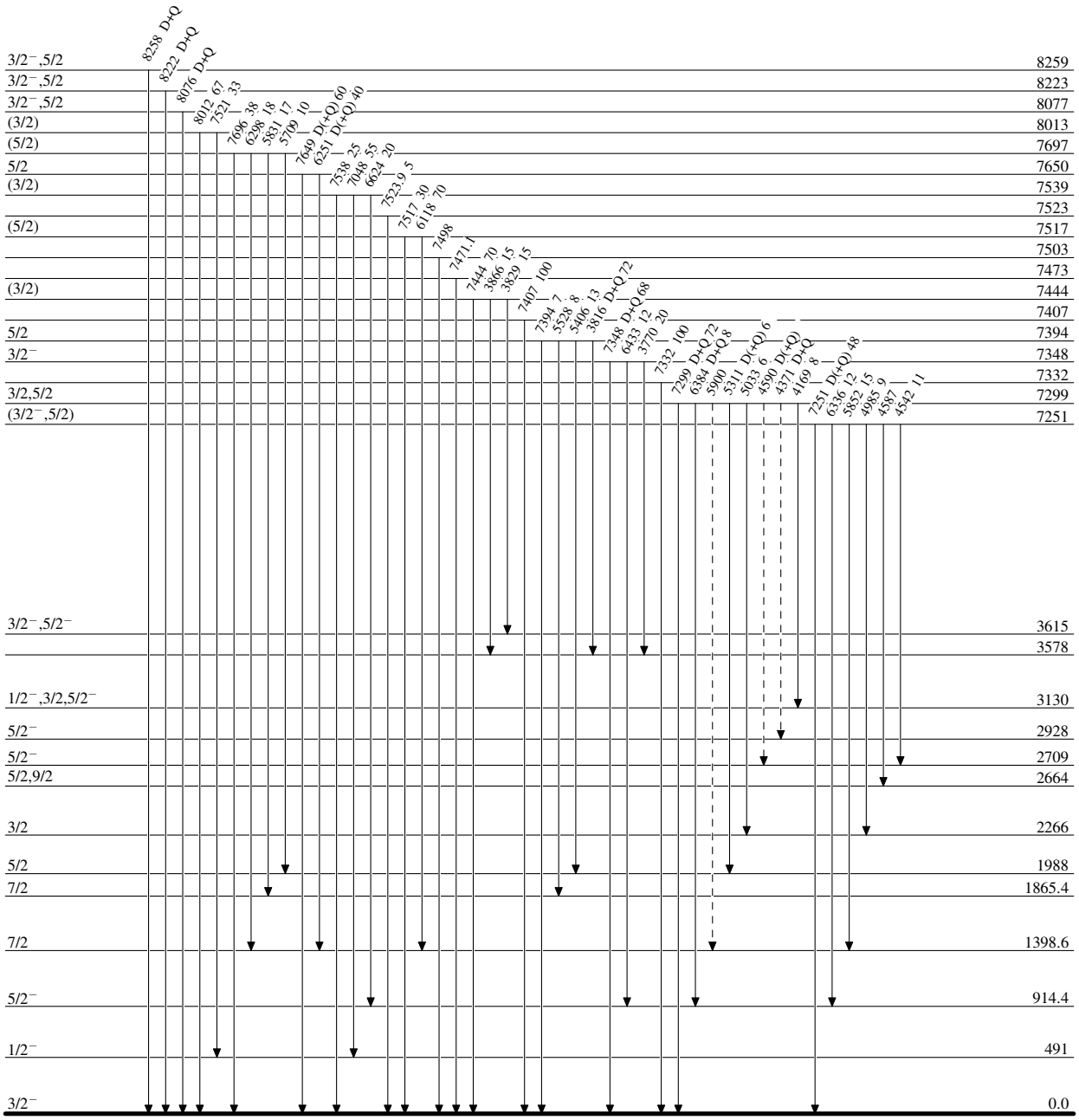
^{58}Ni(p,γ) **1985Di05**

Legend

Level Scheme

Intensities: % photon branching from each level

γ Decay (Uncertain)

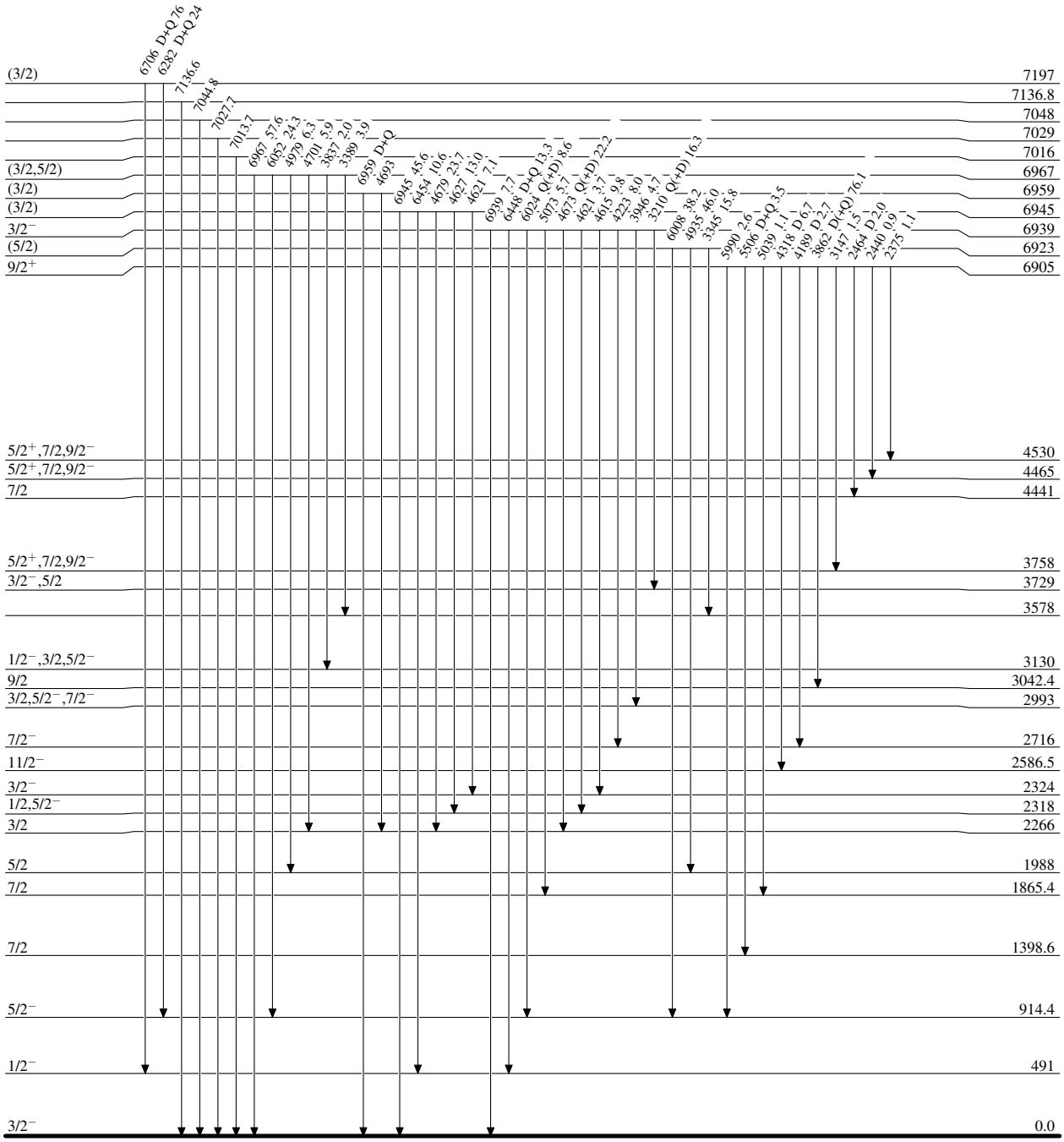


$^{59}_{29}Cu_{30}$

^{58}Ni(p,γ) 1985Di05

Level Scheme (continued)

Intensities: % photon branching from each level



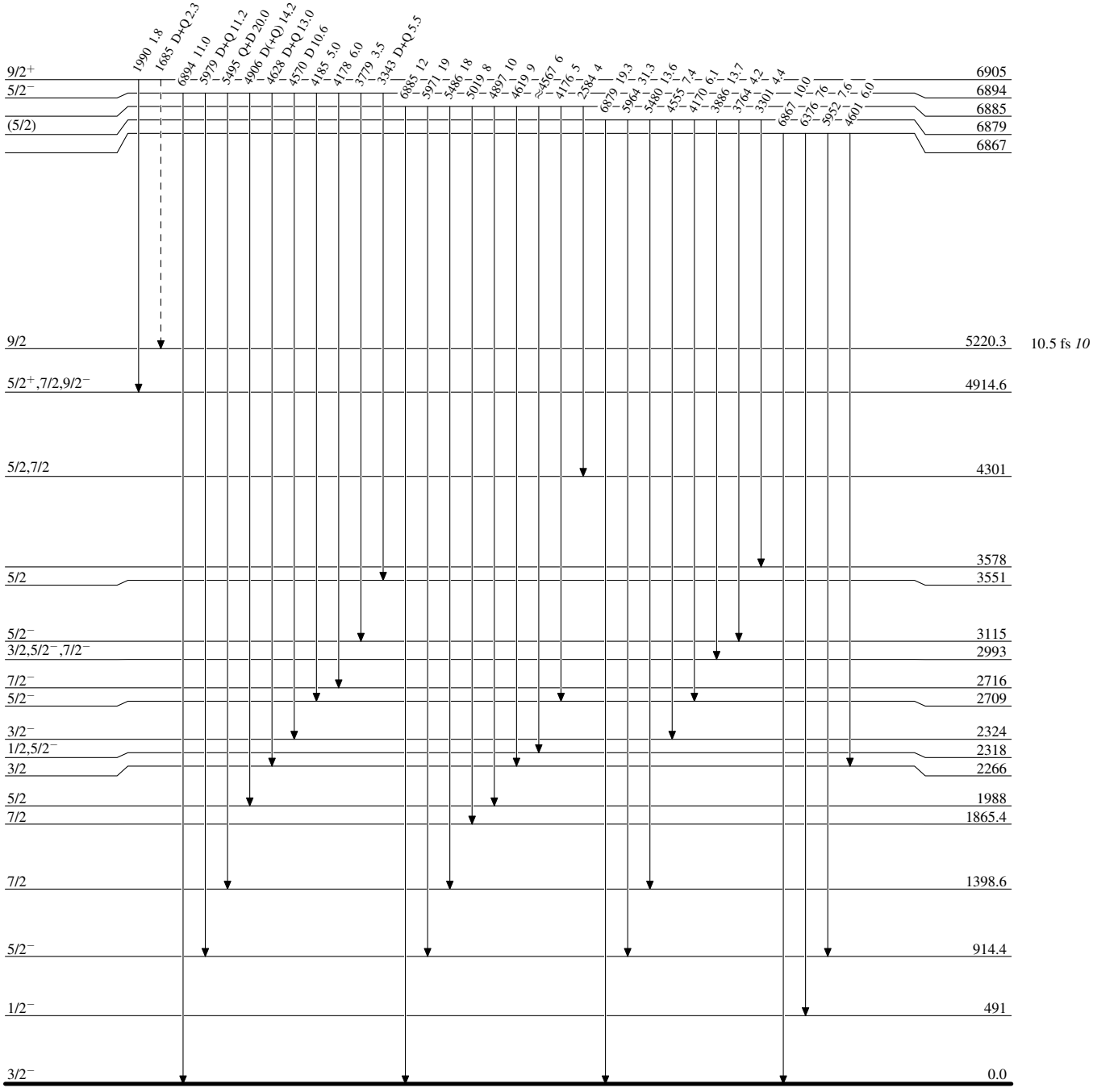
$^{59}_{29}Cu_{30}$

^{58}Ni(p,γ) 1985Di05 Legend

Level Scheme (continued)

Intensities: % photon branching from each level

- - - - - - ► γ Decay (Uncertain)

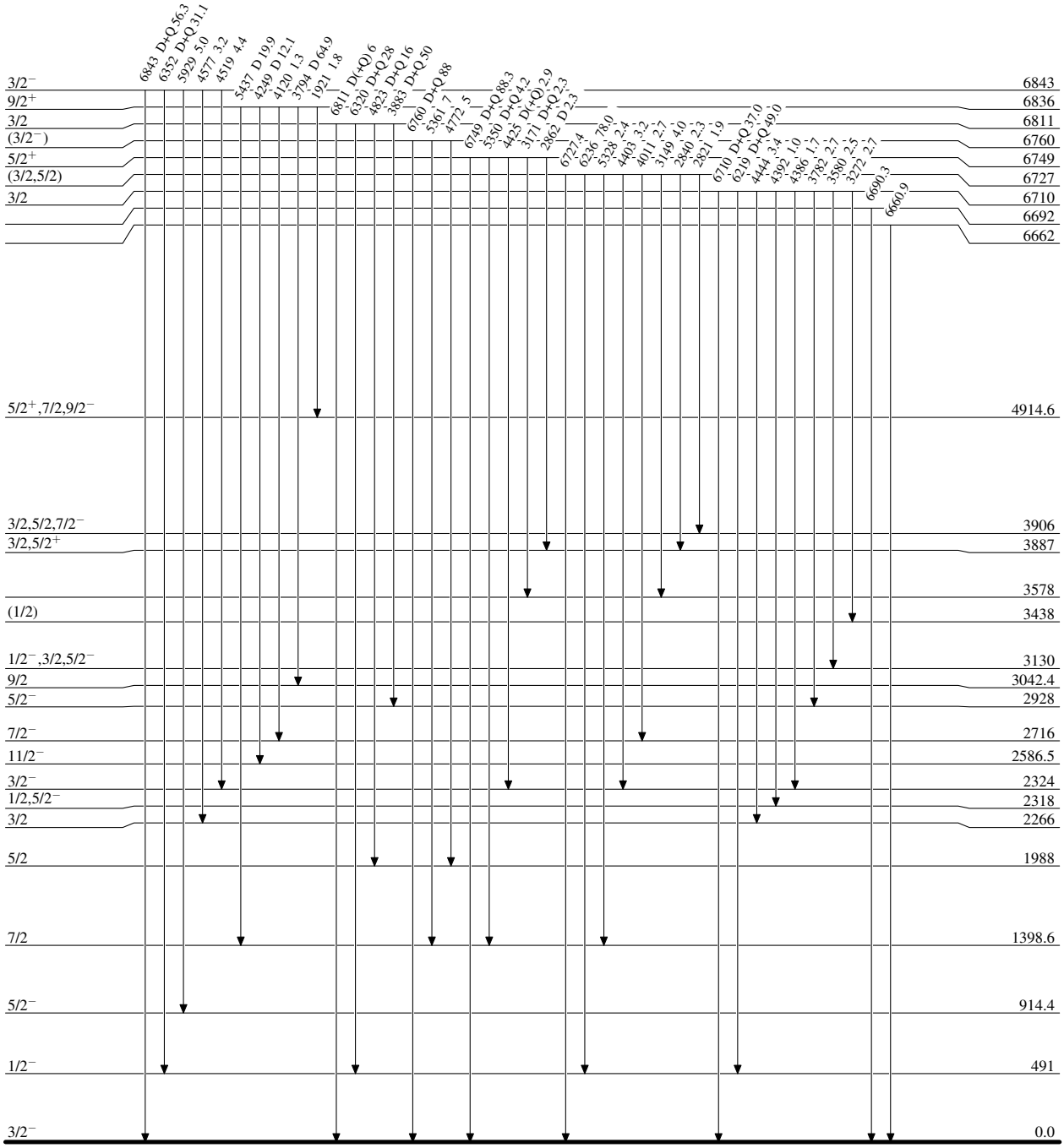


$^{59}_{29}Cu_{30}$

^{58}Ni(p,γ) 1985Di05

Level Scheme (continued)

Intensities: % photon branching from each level

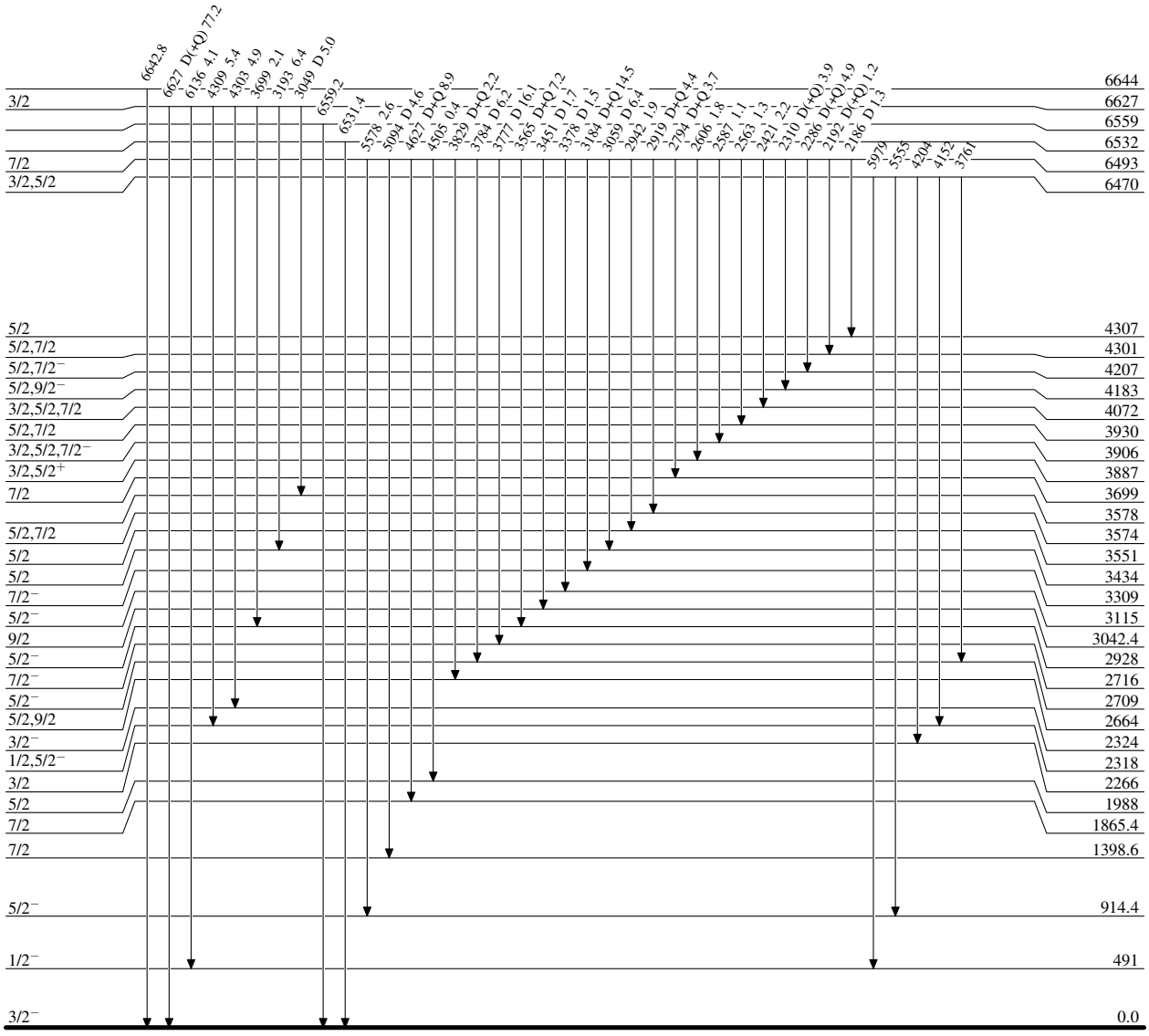


$^{59}_{29}Cu_{30}$

^{58}Ni(p,γ) 1985Di05

Level Scheme (continued)

Intensities: % photon branching from each level



$^{59}_{29}Cu_{30}$

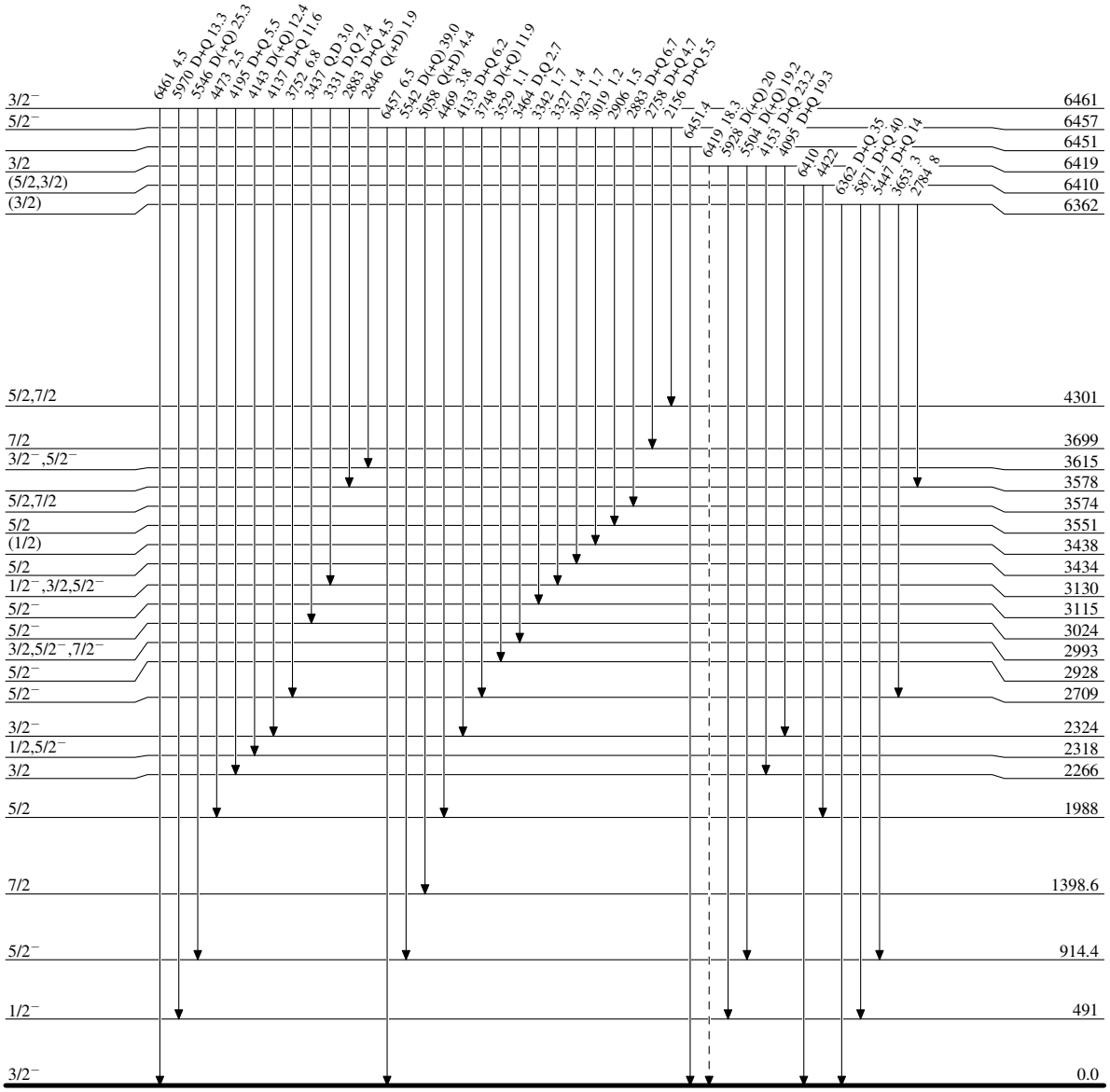
^{58}Ni(p,γ) 1985Di05

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

γ Decay (Uncertain)

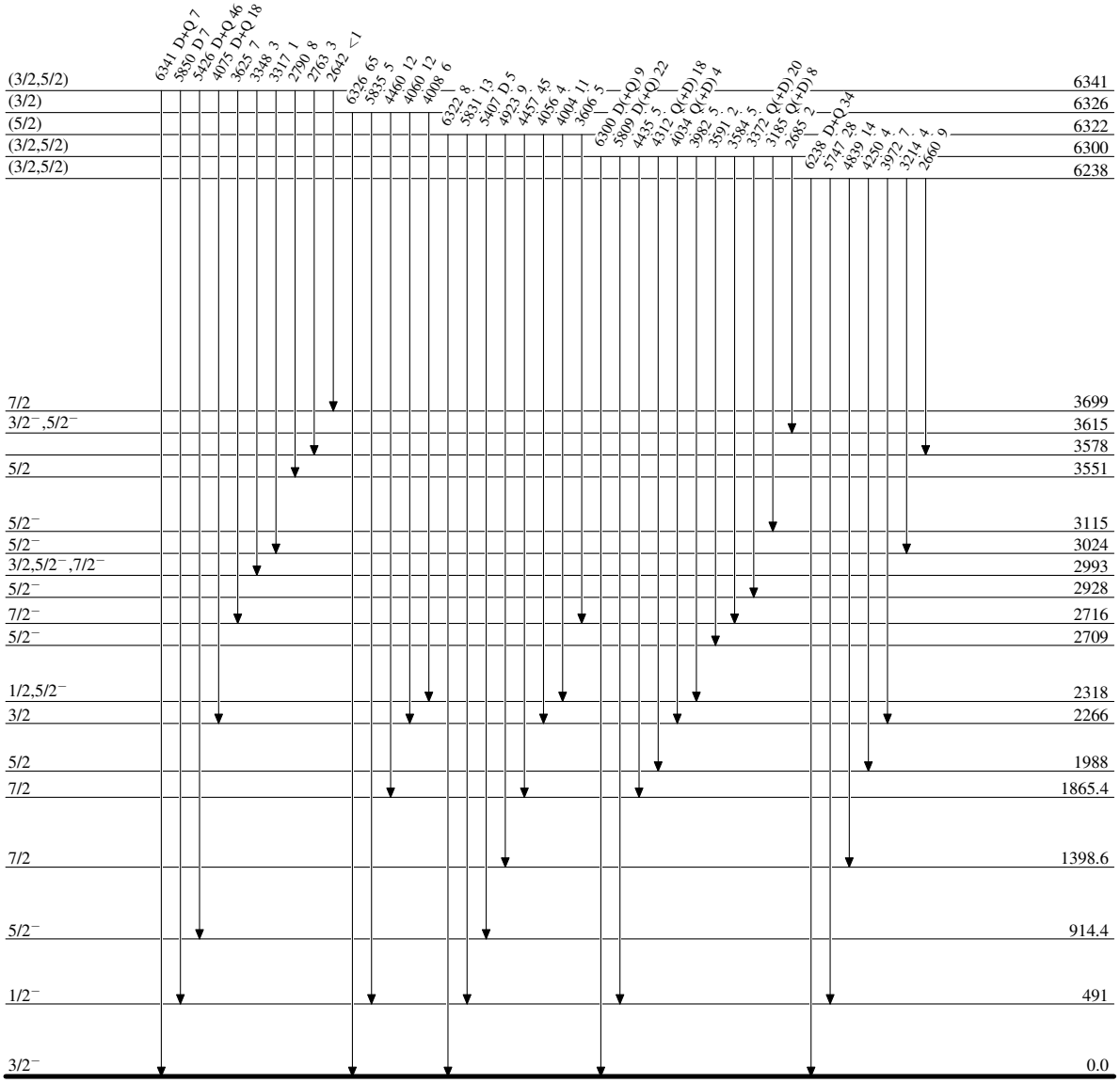


$^{59}_{29}Cu_{30}$

^{58}Ni(p,γ) 1985Di05

Level Scheme (continued)

Intensities: % photon branching from each level



$^{59}_{29}Cu_{30}$

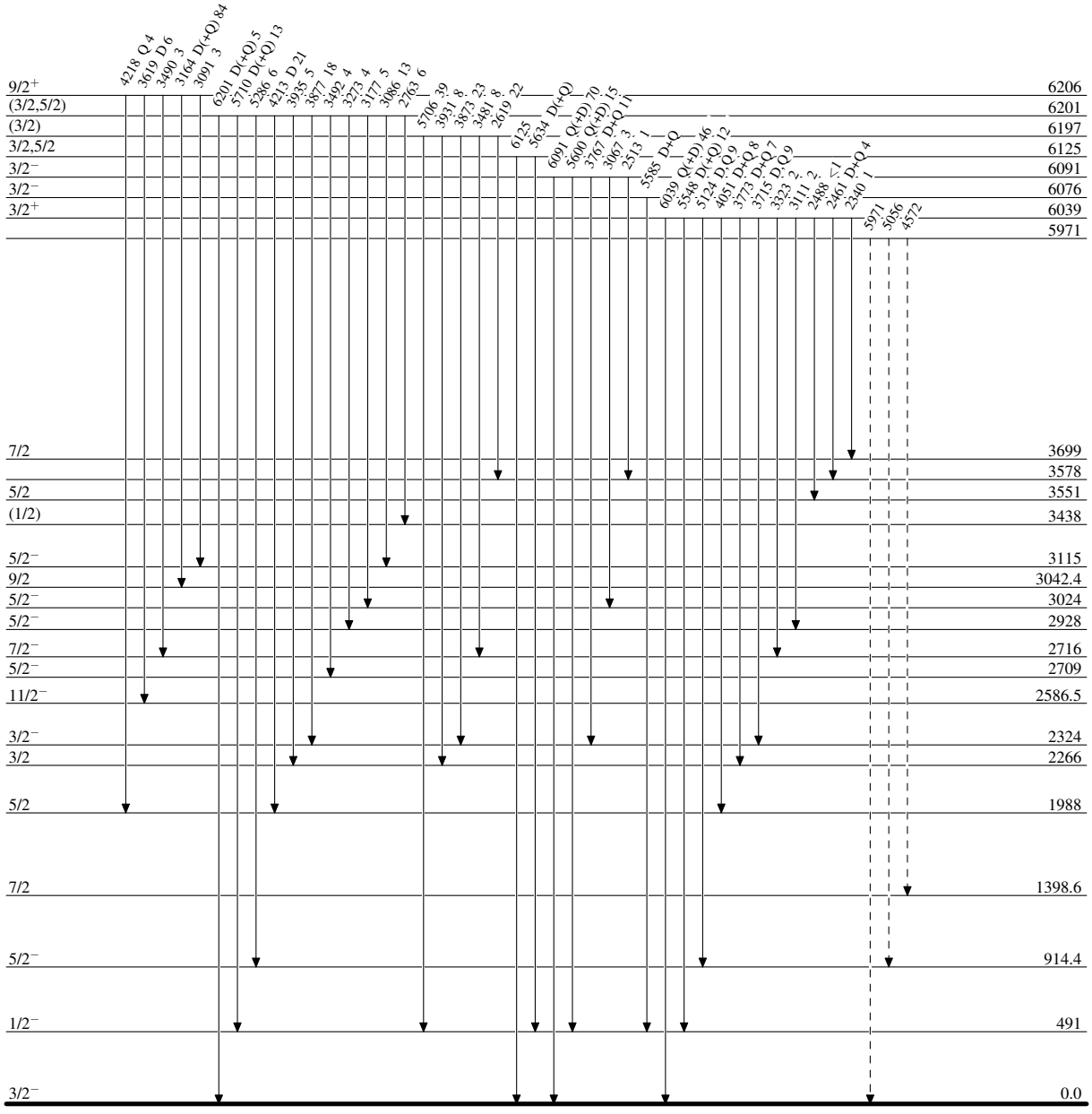
^{58}Ni(p,γ) 1985Di05

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

γ Decay (Uncertain)



$^{59}_{29}Cu_{30}$

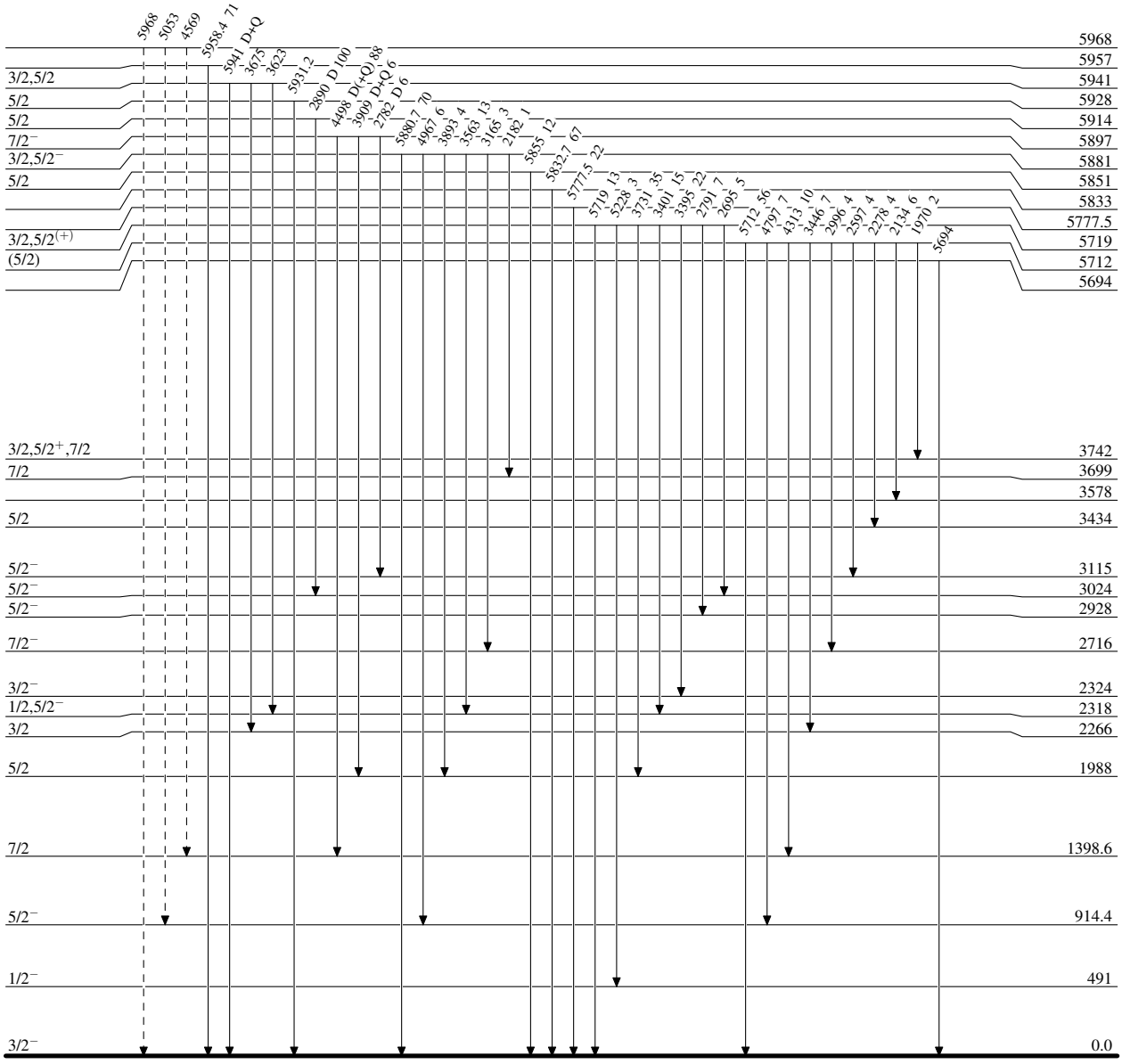
^{58}Ni(p,γ) 1985Di05

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

γ Decay (Uncertain)

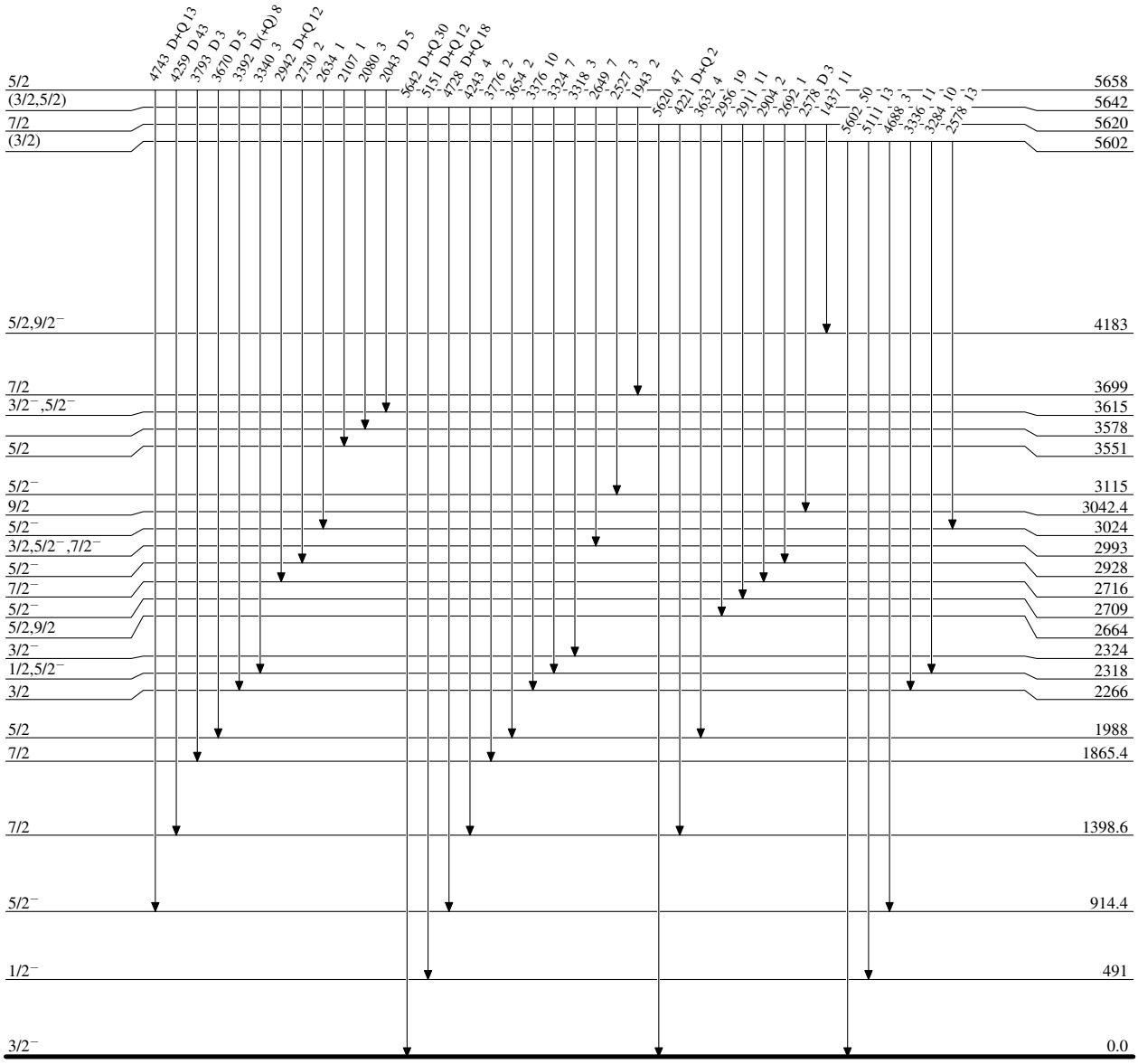


$^{59}_{29}Cu_{30}$

^{58}Ni(p,γ) 1985Di05

Level Scheme (continued)

Intensities: % photon branching from each level

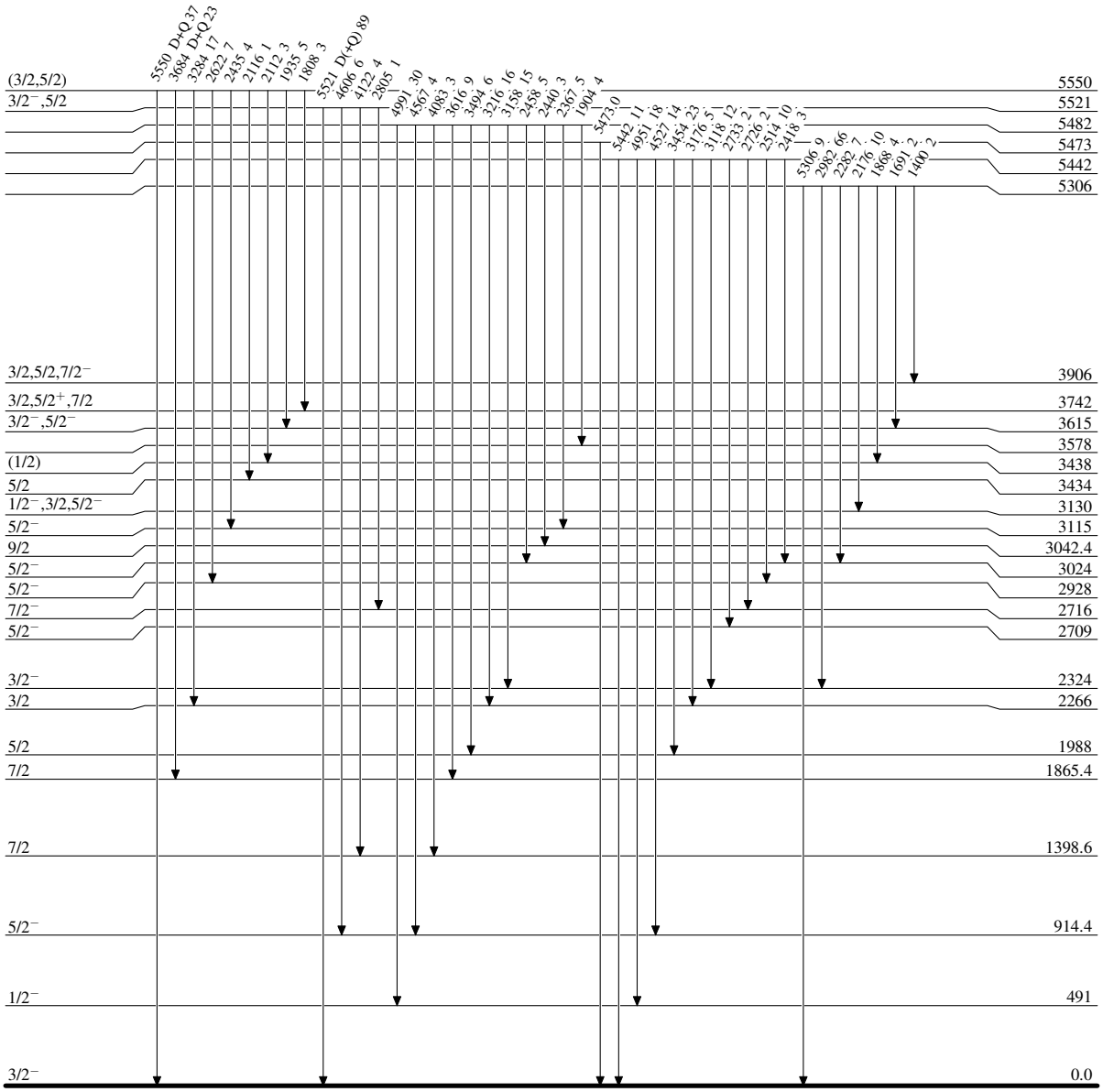


$^{59}_{29}Cu_{30}$

^{58}Ni(p,γ) 1985Di05

Level Scheme (continued)

Intensities: % photon branching from each level



$^{59}_{29}Cu_{30}$

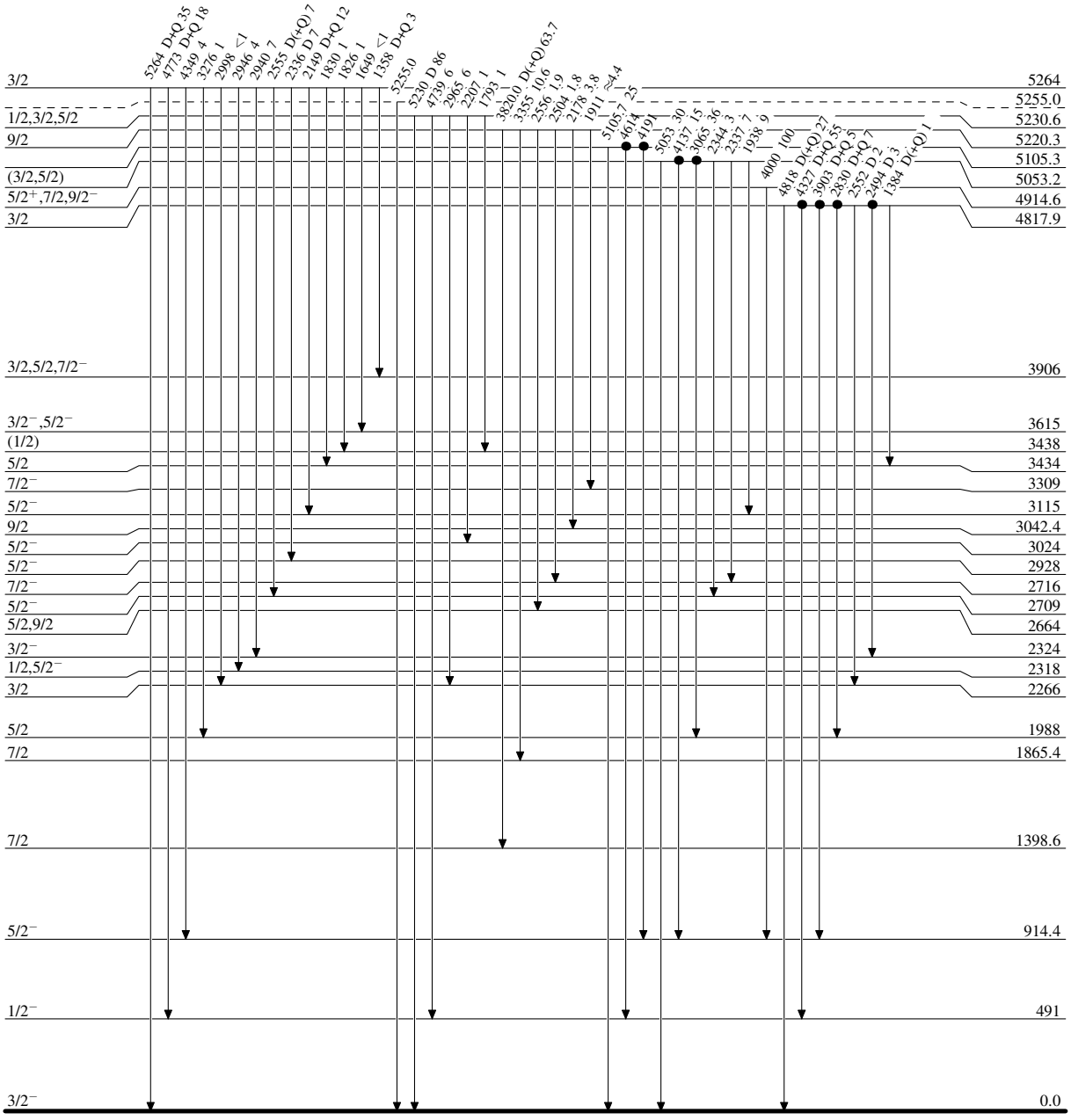
^{58}Ni(p,γ) 1985Di05

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

● Coincidence

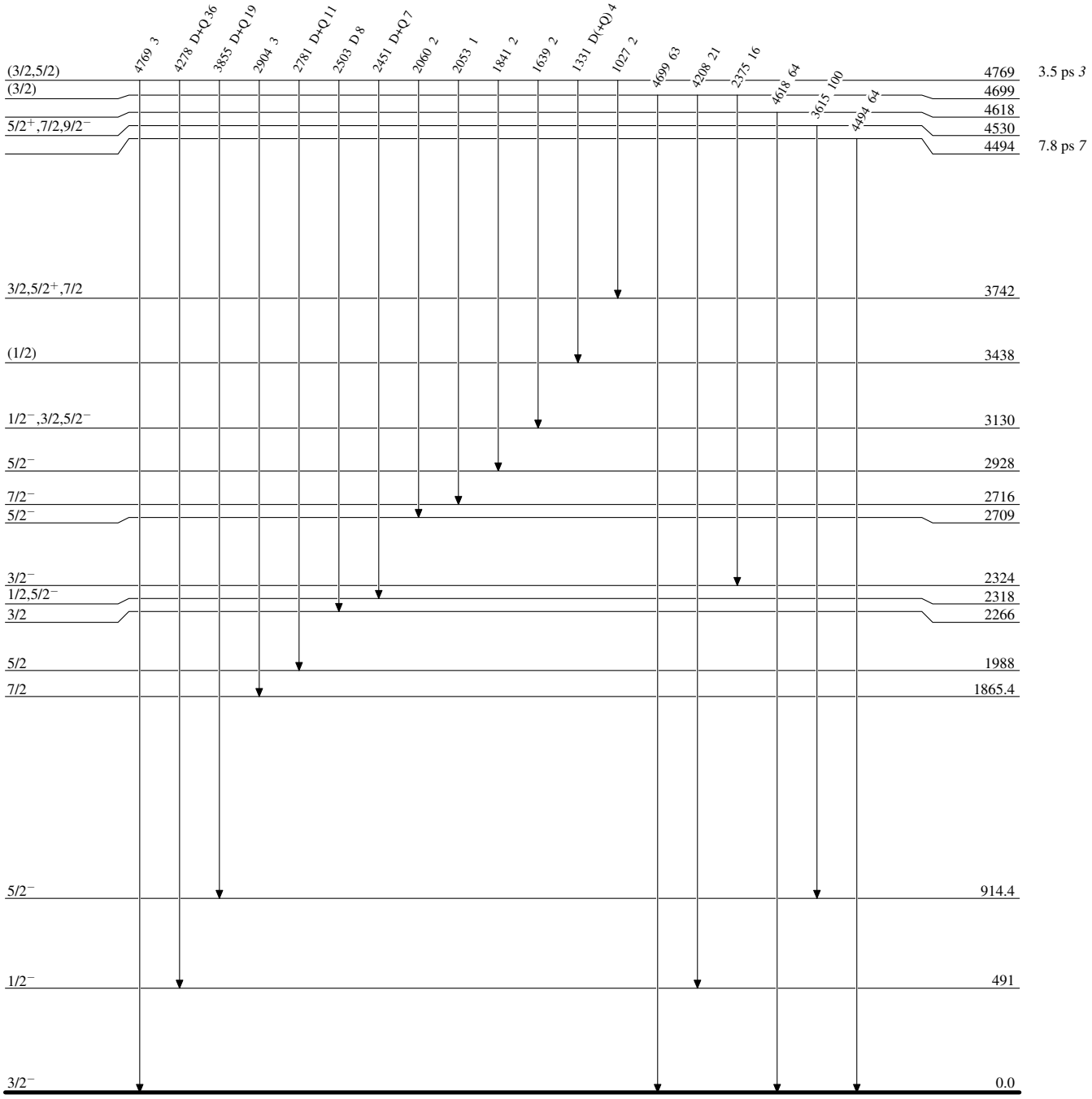


$^{59}_{29}Cu_{30}$

^{58}Ni(p,γ) 1985Di05

Level Scheme (continued)

Intensities: % photon branching from each level

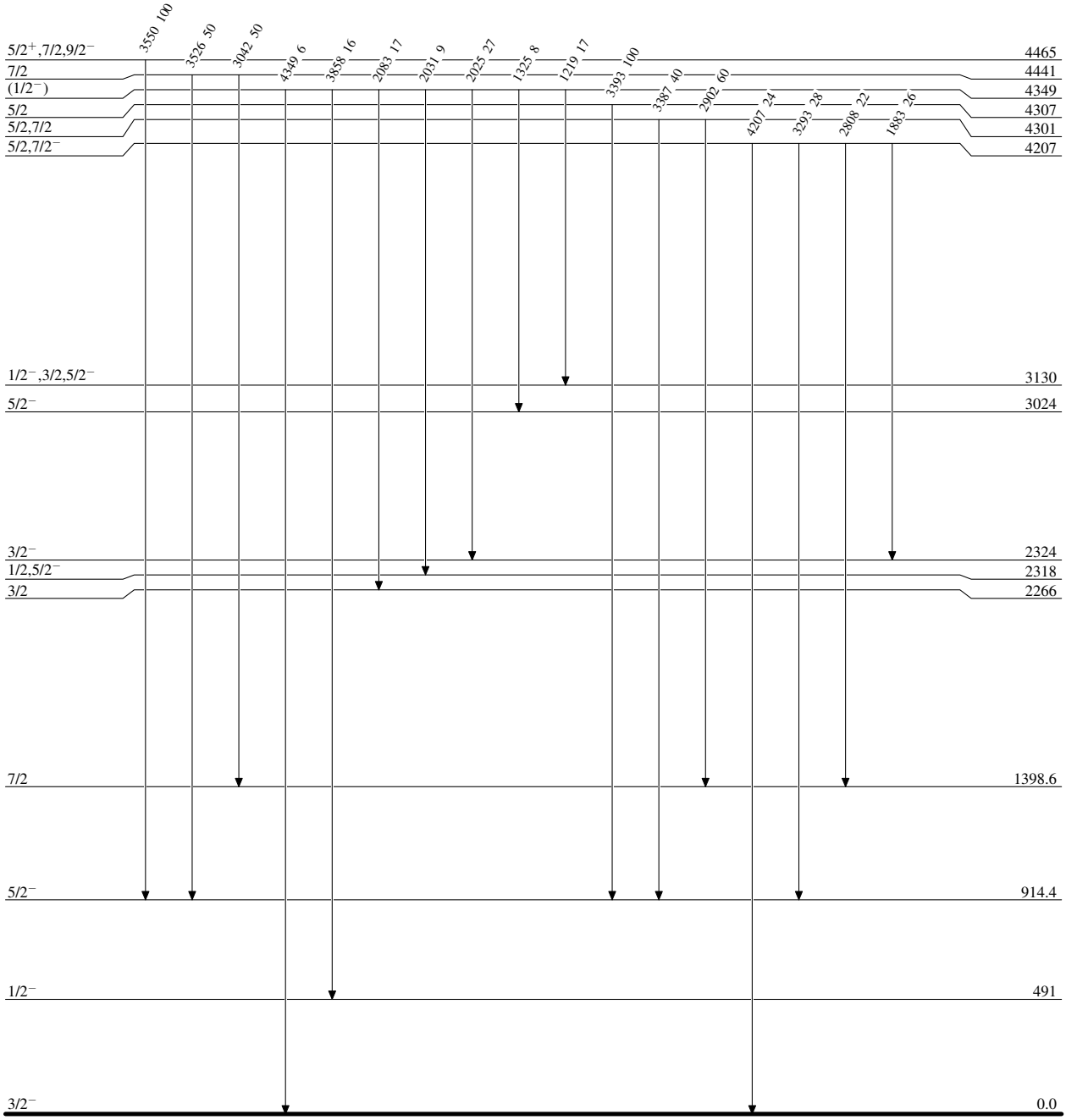


$^{59}_{29}Cu_{30}$

^{58}Ni(p,γ) 1985Di05

Level Scheme (continued)

Intensities: % photon branching from each level

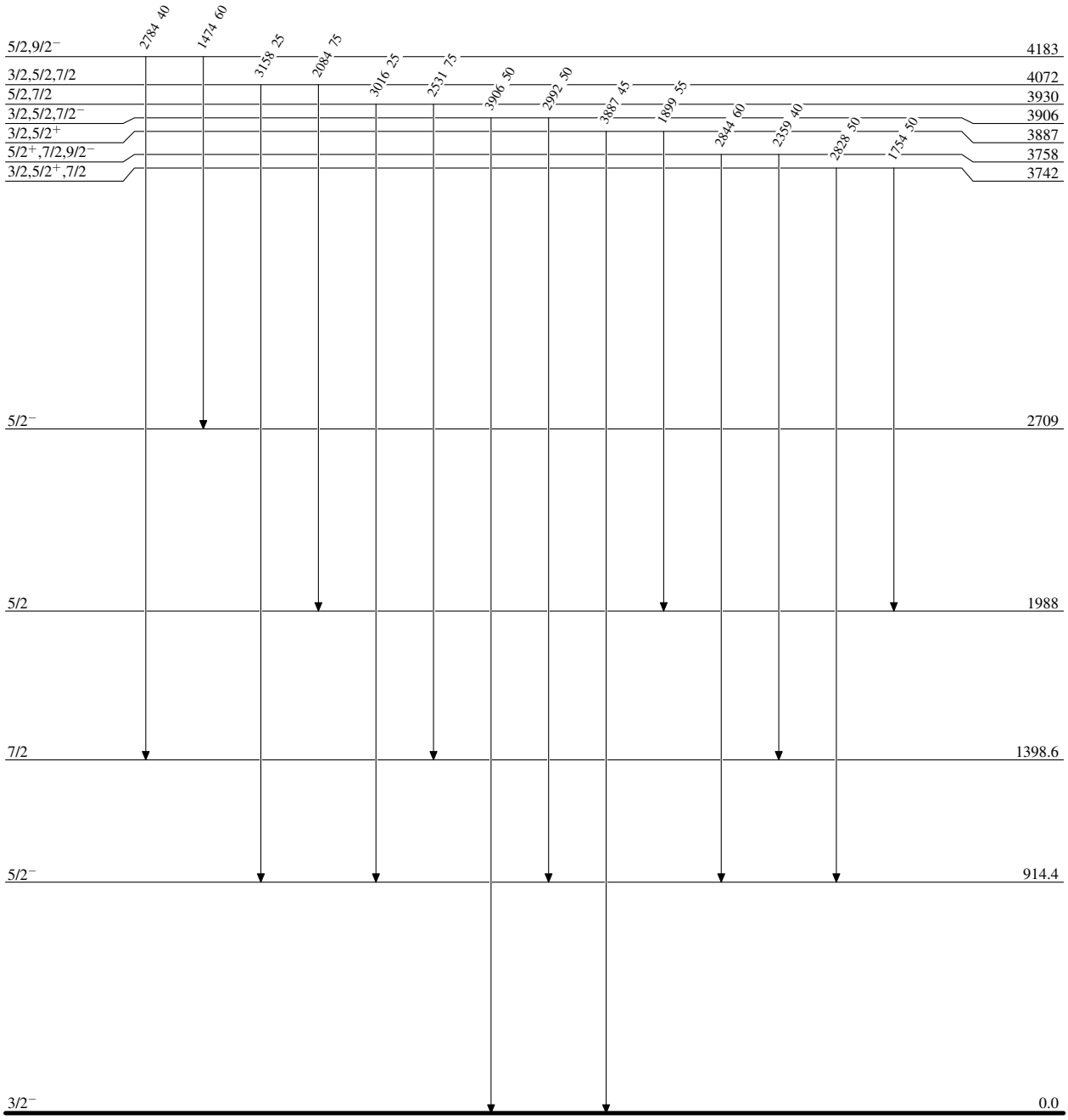


$^{59}_{29}Cu_{30}$

^{58}Ni(p,γ) 1985Di05

Level Scheme (continued)

Intensities: % photon branching from each level

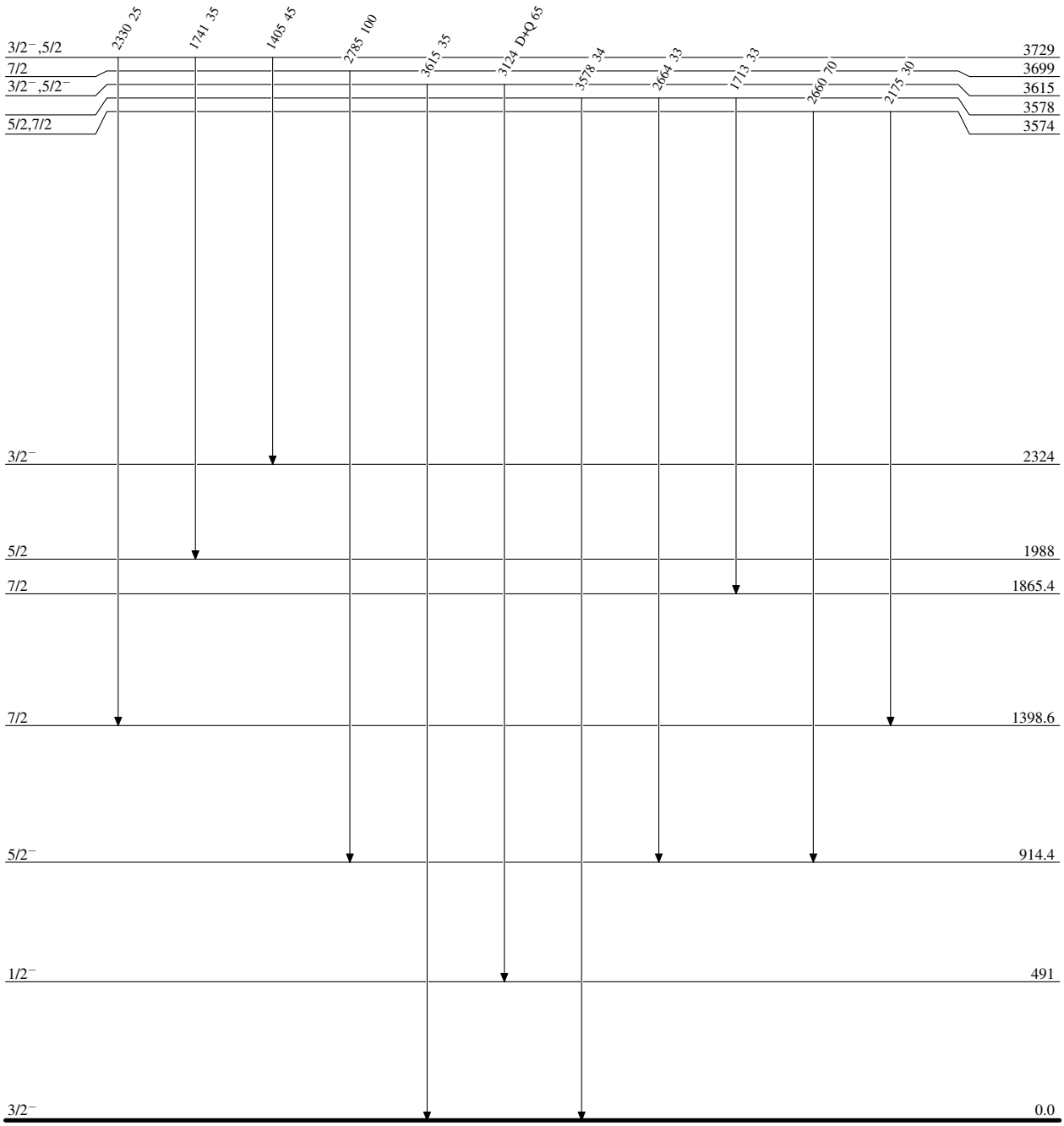


$^{59}_{29}Cu_{30}$

^{58}Ni(p,γ) 1985Di05

Level Scheme (continued)

Intensities: % photon branching from each level



$^{59}_{29}Cu_{30}$

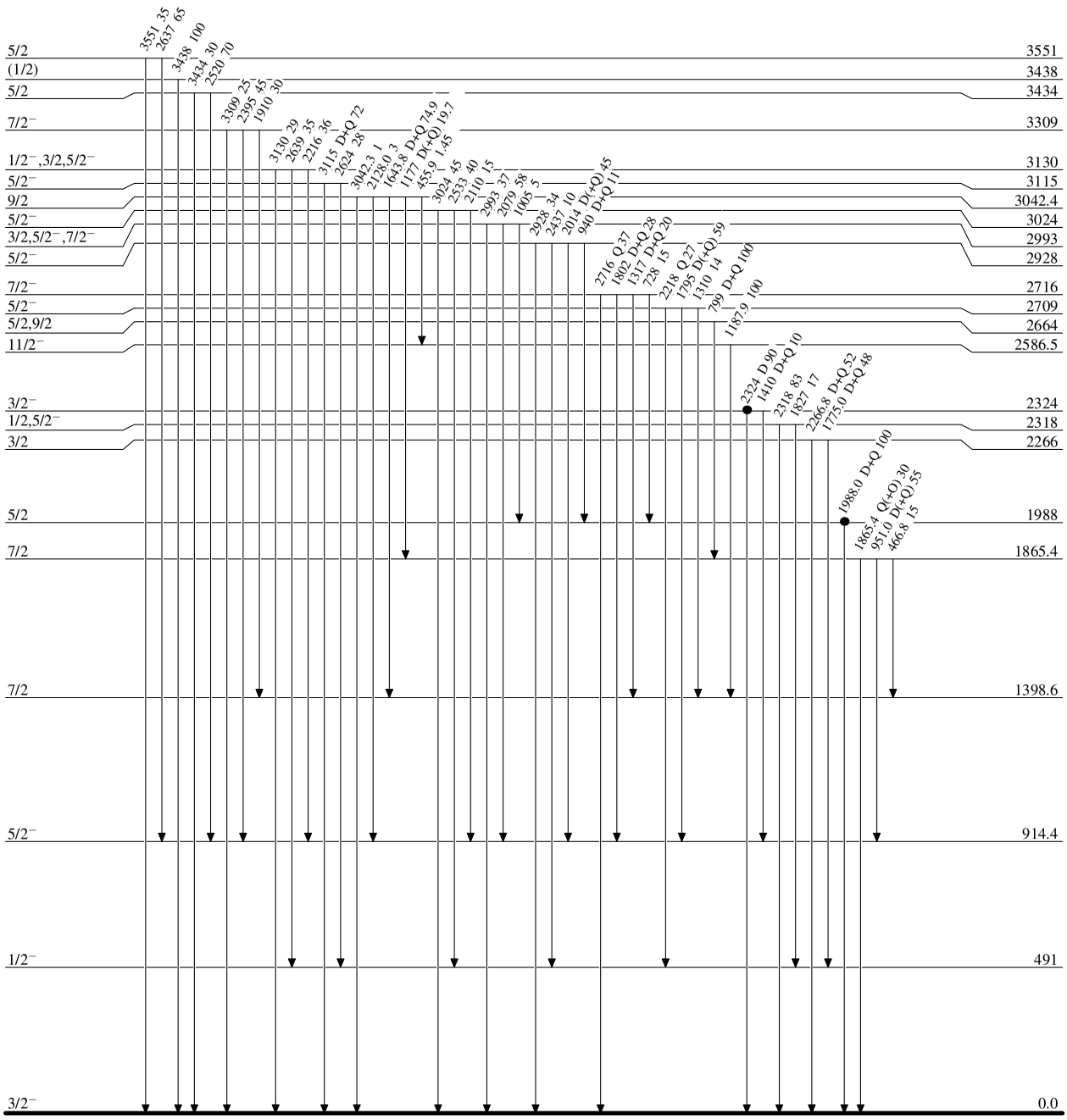
^{58}Ni(p,γ) 1985Di05

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

● Coincidence



$^{59}_{29}Cu_{30}$

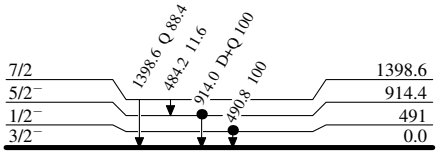
^{58}Ni(p,γ) 1985Di05

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

● Coincidence



$^{59}_{29}Cu_{30}$