^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03

History

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

All papers are from the same experimental group. Results given here are mainly from 2009Jo03, with some high-spin excitations taken from earlier papers (2006Ru02,2005Ru06 and 2001Ru03).

Includes reactions: ^{28}Si(^{32}S,2pγ) E=130 MeV; ^{40}Ca(^{28}Ni,2p2αγ) E=122 MeV; ^{40}Ca(^{24}Mg,α2pγ) E=96 MeV.

2009Jo03: three separate experiments were performed. In the first, the ^{36}Ar beam was produced at E=143 MeV at the Lawrence Berkeley National Laboratory. Charged particles were detected and identified using the Microball array. The γ′s were detected by the Gammasphere array. Fifteen liquid scintillator neutron detectors were also used. The second and third experiments were conducted at Argonne National Laboratory with beam energies of 148 MeV and 136 MeV, respectively. Both experiments used the Microball and Gammasphere arrays, as well as the Lund Washington Silicon Array (LuWaSiA), consisting of a box and a wall, each containing four ΔE-E silicon strip telescope detectors. The second experiment used the wall of the LuWaSiA and 20 neutron detectors. The third experiment used 30 neutron detectors, as well as a Fragment Mass Analyzer and an Ionization Chamber to separate and identify reaction products. Measured Eγ, Iγ, γγ-coincidence. Deduced DCO ratios, levels, J, π using γ-ray yields measured by Ge detectors. Deduced multipolarities and mixing ratios.

2006Ru02: ^{28}Si(^{32}S,2pγ) E=130 MeV. Measured Eγ, Iγ, γγ using Gammasphere array with 78 Ge detectors, 4π CsI Microball array for charged particles and neutron wall of 30 liquid scintillators. Deduced three rotational bands at exceptionally high excitations and spins. At the highest spins, the levels are populated only in this study and not in the authors′ most recent publication 2009Jo03.

2004Iz01: ^{40}Ca(^{28}Ni,2p2αγ) E=96 MeV. Measured γγ(θ)(DCO) and lin POL for three γ rays.

2001Ru03: E=143 MeV. Measured Eγ, Iγ, γγ, γγ(θ)(DCO), particle-γ coin using GAMMASPHERE detector array in conjunction with the 4π charged-particle detector array MICROBALL.

2001Ru04: ^{40}Ca(^{28}Ni,2p2αγ) E=122 MeV for excitations below 20 MeV. Higher excitations used reactions: ^{28}Si(^{32}S,2pγ) E=130 MeV; ^{28}Si(^{36}Ar,α2pγ) E=148 MeV and ^{40}Ca(^{24}Mg,α2pγ) E=96 MeV. Detector systems: Gammasphere and Microball arrays with Neutron shell, Euroball and ISIS arrays with Neutron wall. The results of this paper are completely superseded by those in 2009Jo03, as communicated in an email reply of November 14, 2009 from D. Rudolph. Any differences between the results in 2001Ru04 and the authors′ most recent study 2009Jo03 are to be ignored.

2007JoZW (conference paper): describes experimental arrangement to measure energies and angular distributions of prompt proton from high-spin states in ^{58}Cu and ^{58}Ni. The (proton)γ coin were detected using Gammasphere array of 77 HPGe detectors, LuWuSiA array or Microball for charged particles and neutron shell of 30 detectors for neutrons. The residual nuclei were separated using Fragment Mass Analyzer (FMA) at Argonne. Through Eγ-Eπ coin matrix, earlier results for proton decay from 8915 level in ^{58}Cu were confirmed. However, the plan of this experiment was to study prompt proton decay of high-spin states in ^{58}Ni.

^{58}Ni Levels

E(level)	J^{π}†	E(level)	J^{π}†	E(level)	J^{π}†	E(level)	J^{π}†
0.0[c]	0^+	6067.2[d] *7*	7^+	8120.6[e] *7*	9^+	10192.5[e] *9*	11^+
1454.3[c] *1*	2^+	6084.5 *7*	7^-	8717.9 *8*	9^-	10293.5 *12*	9^-
2459.5[c] *6*	4^+	6219.8 *7*	7^+	8896.3? *11*		10394.1 *14*	10^+
3421.7[d] *7*	3^+	6604.4[c] *7*	8^+	9027.1 *9*	9^-	10404.8 *9*	(9^-)
3619.9[d] *7*	4^+	6845.5 *9*	(7^+)	9062.6[e] *8*	10^+	10590.9 *8*	11^-
4105.9 *7*	4^+	6862.9 *9*	6^-	9322.1[d] *10*	11^+	10694.7[b] *9*	10^-
4294.9 *6*	4^+	7273.5 *8*	7^-	9345.6 *8*	10^-	10781.7 *11*	11^+
4383.0[d] *7*	5^+	7314.6[d] *8*	8^+	9585.0[a] *10*	9^-	10882.0 *15*	11^+
4403.9 *7*	4^+	7446.2[d] *8*	9^+	9666.8 *10*	10^+	11005.6 *9*	11^-
4964.5 *7*	$(5)^+$	7724.1[e] *7*	8^+	9790.6 *11*	10^+	11116.8[a] *10*	11^-
5127.2[c] *7*	6^+	7973.4 *9*	8^+	9886.6 *9*	10^+	11255.1[b] *9*	11^-
5384.0[d] *7*	6^+	7982.6 *8*	8^-	10137.2[c] *13*	10^+	11297.6 *9*	12^-
5588.9 *9*	(5^-)	8074.3 *9*	8^+	10144.6 *8*	10^-	11413.1 *11*	11^+
5744.4 *7*	6^+	8114.9 *8*	8^-	10180.8 *8*	11^-	11474.4[e] *9*	12^+

Continued on next page (footnotes at end of table)

^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03 (continued)

^{58}Ni Levels (continued)

E(level)	J$^{\pi}$ [†]	Comments
11579.2 *10*	12^{+}	
11814.2 *10*	12^{-}	
11824.7 *12*	12^{+}	
11996.3[b] *9*	12^{-}	
12155.0 *12*	12^{-}	
12356.7 *11*	12^{-}	
12364.6 *9*	12^{+}	
12570.1 *9*	12^{+}	%p=3.7 *14* (2009Jo03) E(p)(c.m.)=1.83 MeV *5* (2009Jo03). prompt p decay populates 2524, 13/2^{-} level In ^{57}Co which deexcites through 834-466-1224 cascade to ^{57}Co g.s.
12719.2 *9*	12^{+}	
12831.4[a] *10*	13^{-}	
12912.1[b] *10*	13^{-}	
12928 *4*		
13016.3 *12*	13^{-}	
13048.5 *13*	13^{-}	
13094.9 *19*	(12^{+})	
13129.1 *19*	(12^{+})	
13238.1 *9*	13^{+}	
13356.5[e] *11*	13^{+}	
13606.8[i] *15*	12^{+}	
13632 *4*		
13850.0[b] *12*	14^{-}	
13884.0 *18*	(13^{+})	
13943 *4*		
14127.7 *10*	14^{+}	
14217.5 *14*	14^{-}	
14455.9[&] *17*	13^{+}	
14852.2[a] *14*	15^{-}	
14920.8[e] *12*	14^{+}	
14934.6[b] *13*	15^{-}	
15010.5 *10*	14^{+}	
15030.9 *11*	14^{+}	
15105.1 *19*		
15186.8 *24*	(13^{+})	
15241.7 *17*	13^{-}	%p=43 *6* (2009Jo03) E(p)(c.m.)=2.15 MeV *5* (2009Jo03). prompt p decay populates 4814, 17/2^{-} level In ^{57}Co which deexcites through 2290-834-466-1224 cascade to ^{57}Co g.s.
15242.3 *20*		
15266.3 *13*	14^{+}	
15294.2[i] *12*	14^{+}	
15324.2[@] *14*	14^{+}	
≈15400	13^{-}	%p=? E(p)(c.m.)≈2.35 MeV (2009Jo03). prompt p decay populates 4814, 17/2^{-} level In ^{57}Co which deexcites through 2290-834-466-1224 cascade to ^{57}Co g.s.
15412.3 *17*	(13^{-})	J$^{\pi}$: from 2005Ru06.
15433.9 *16*	13^{-}	
15709.3 *11*	15^{+}	
15736.8 *10*	15^{+}	

Continued on next page (footnotes at end of table)

^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03 (continued)

^{58}Ni Levels (continued)

E(level)	J^{π}[†]	$T_{1/2}$	Comments
15858.1 *10*	15^+		
16167.1 *21*			
16171.1[&] *15*	15^+		
16246.5[b] *15*	16^-		
16496.5 *24*	16^-		
16566.9 *11*	16^+		
16674 *3*	(14^-)		%p=? J^{π}: from 2005Ru06, decays by protons to 5918, 19/2$^-$ level in ^{57}Co; the decay mode not shown in 2009Jo03.
16676.3 *10*	16^+		
16708 *3*	14^-		%p=40 *7* (2009Jo03) E(p)(c.m.)=2.56 MeV *5* (2009Jo03). prompt p decay populates 5918, 19/2$^-$ level In ^{57}Co which deexcites through 1104-2290-834-466-1224 cascade to ^{57}Co g.s.
16746 *3*	14^-		%p=? E(p)(c.m.)=2.61 MeV *12* (2009Jo03). prompt p decay populates 5918, 19/2$^-$ level In ^{57}Co which deexcites through 1104-2290-834-466-1224 cascade to ^{57}Co g.s.
16759 *3*	14^-		%p=41 *6* (2009Jo03) E(p)(c.m.)=2.59 MeV *8* (2009Jo03). prompt p decay populates 5918, 19/2$^-$ level In ^{57}Co which deexcites through 1104-2290-834-466-1224 cascade to ^{57}Co g.s.
16797.7[h] *13*	15^-	17 ps *11*	%p=7 *2* (2009Jo03); %α=2.6 *3* (2009Jo03) $T_{1/2}$: from estimated $T_{1/2}$=7-28 ps (2001Ru03) from average Q(transition) in the band=2.4 *3*, assuming that 1364γ and 1385γ are part of the continuation of the band and that Q(transition) does not change at lower spins. E(p)(c.m.)=1.62 MeV *6*, E(α)(c.m.)=6.90 MeV *6* (2009Jo03). prompt p decay populates 6976, 21/2$^-$ level In ^{57}Co which deexcites through 1058-1104-2290-834-466-1224 cascade to ^{57}Co g.s. prompt α decay populates 2949, 6$^+$ level In ^{54}Fe which deexcites through 411(6$^+$ to 4$^+$)−1130(4$^+$ to 2$^+$)−1408(2$^+$ to g.s.) cascade. a 1432γ proposed In 2005Ru06 is not confirmed In 2009Jo03.
17018.8[a] *21*			
17163.1[@] *14*	16^+		
17197 *3*			
17290.2[i] *13*	16^+		Additional information 1.
17483 *4*	15^-		%p=11 *3* (2009Jo03) E(p)(c.m.)=2.35 MeV *6* (2009Jo03). prompt p decay populates 6976, 21/2$^-$ level In ^{57}Co which deexcites through 1058-1104-2290-834-466-1224 cascade to ^{57}Co g.s.
17530.0 *11*	17^+		
17582 *3*	15^-		%p=66 *5* (2009Jo03); %α<10 (2009Jo03) E(p)(c.m.)=2.43 MeV *4*, E(α)(c.m.)=7.71 MeV *8* (2009Jo03). prompt p decay populates 6976, 21/2$^-$ level In ^{57}Co which deexcites through 1058-1104-2290-834-466-1224 cascade to ^{57}Co g.s. prompt α decay populates 2949, 6$^+$ level In ^{54}Fe which deexcites through 411(6$^+$ to 4$^+$)−1130(4$^+$ to 2$^+$)−1408(2$^+$ to g.s.) cascade.
17608 *3*	15^-		%p=43 *4* (2009Jo03) E(p)(c.m.)=2.47 MeV *7* (2009Jo03). prompt p decay populates 6976, 21/2$^-$ level In ^{57}Co which deexcites through 1058-1104-2290-834-466-1224 cascade to ^{57}Co g.s.
17681.3 *11*	17^+		

Continued on next page (footnotes at end of table)

^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03 (continued)

^{58}Ni Levels (continued)

E(level)	J^{π}†	Comments
18261.2& 16	17+	
18342# 3	16−	
18461.0h 14	17−	
18638.8f 11	18+	
19196b 4		
19206‡ 3	17−	
19482.5@ 17	(18+)	
19567.2i 21	18+	
19945.7g 13	19+	
20136# 3	18−	%p<10 (2009Jo03) E(p)(c.m.)=1.94 MeV 7 (2009Jo03). prompt p decay populates 10075, 25/2+ level In ^{57}Co.
20449.8h 20	19−	
20826.2& 24	19+	
21107‡ 3	19−	%p<10 (2009Jo03) E(p)(c.m.)=1.89 MeV 7 (2009Jo03). prompt p decay populates 11069, 27/2+ level In ^{57}Co.
21247.9f 14	20+	
22138i 3	20+	
22212# 3	20−	
22240@ 3	(20+)	
22767.9g 16	21+	
22800h 3	21−	
23332‡ 4	21−	
23741& 4	21+	
24211.8f 18	22+	
24612# 4	22−	
25141i 4	22+	
25550h 4	23−	
25919‡ 4	23−	
26059.6g 21	23+	
27367# 4	24−	
28707h 4	25−	
28933‡ 5	25−	
30490#	(26−)	
32171	(27−)	
32493‡	(27−)	
33970# 3	(28−)	
36041	(29−)	
36533‡	(29−)	
37808#	(30−)	
40329	(31−)	
40930‡	(31−)	
42005#	(32−)	
x		
2868+x		

Continued on next page (footnotes at end of table)

^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03 (continued)

^{58}Ni Levels (continued)

E(level)
6083+x
9667+x

[†] As proposed by 2009Jo03 and 2001Ru03, based on DCO ratios, band associations and decay pattern. IT is also assumed that spins ascend with excitation energy In accordance with yrast population of levels In heavy−ion fusion reactions. All D+Q transitions are treated As M1+E2 for the purpose of J$^{\pi}$ assignments.
[‡] Band(A): Band based on 15^{-}, α=1. Parity from 2009Jo03 and 2006Ru02.
[#] Band(B): Band based on 16^{-}, α=0. Parity from 2009Jo03 and 2006Ru02.
[@] Band(C): Band based on 15323,14^{+}.
[&] Band(D): Band based on 14455,13^{+}.
[a] Band(E): Band based on 9585,9^{-}.
[b] Band(F): ΔJ=1 band based on 10694,10^{-}.
[c] Band(G): Yrast (g.s.) band.
[d] Band(H): ΔJ=1 band based on 3422,3^{+}.
[e] Band(I): ΔJ=1 band based on 7724,8^{+}.
[f] Band(J): Band based on 18638,18^{+}.
[g] Band(j): Band based on 19945,19^{+}.
[h] Band(K): SD-1 band. Based on (15^{-}); from 2009Jo03 and 2001Ru03. This band has been assigned (2001Ru03) In the secondary minimum of the potential well. Population intensity≈2%, relative to the total ^{58}Ni channel. The (13^{-}) states At 15410 and 15431 are possibly continuation of this band towards low-lying states. The (15^{-}) member of this band decays by prompt α emission to ^{54}Fe. Average Q(transition)=2.4 *3* (2001Ru03), from residual Doppler-shift method.
[i] Band(L): SD-2 band. Based on (12^{+}); from 2009Jo03 and 2001Ru03. This band has been assigned (2001Ru03) In the secondary minimum of the potential well. Population intensity≈1%, relative to the total ^{58}Ni channel.

γ(^{58}Ni)

DCO=I(γ_1 at 30°; gated with γ_2 at 83°)/I(γ_1 at 83°; gated with γ_2 at 30 °). Other angle combinations were 30°−53° and 53°−83°. Triple coincidence data for these measurements where two gates are set, one on a set of transitions in the lower energy region or particles and the other on a transition in the high-spin domain. Values are from 2009Jo03 unless otherwise stated. DCO ratios listed here are from 30°−83° combination, which had the most complete data. For other two angle sets, see DCO ratios in 2009Jo03. Expected DCO are as follows: for ΔJ=2, quadrupole gating transition, DCO ≈ 1 for ΔJ=2, quadrupole; ≈0.9 for ΔJ=0 and ≈0.6 for ΔJ=1, dipole transitions. For ΔJ=1, pure dipole gating transition, DCO ≈ 1.6 for ΔJ=2, quadrupole; ≈1.5 for ΔJ=0 and ≈1.0 for ΔJ=1, dipole transitions.

E_{γ}[†]	I_{γ}[†]	E_i(level)	J^{π}_i	E_f	J^{π}_f	Mult.[d]	δ	Comments
277.0 *2*	1.8 *2*	4383.0	5^{+}	4105.9	4^{+}	D+Q[b]		DCO=0.62 *12*
289.9 *2*	0.1 *1*	10694.7	10^{-}	10404.8	(9^{-})			
322.8 *2*	0.5 *1*	6067.2	7^{+}	5744.4	6^{+}	(M1+E2)	−0.18 *10*	DCO=0.71 *7*
384.8 *3*	1.0 *1*	6604.4	8^{+}	6219.8	7^{+}			
396.5 *1*	0.7 *1*	8120.6	9^{+}	7724.1	8^{+}	D+Q		DCO=0.74 *11*
401.0 *10*	0.2 *1*	10694.7	10^{-}	10293.5	9^{-}	D+Q		DCO=1.03 *17*
410.3 *3*	1.1 *1*	10590.9	11^{-}	10180.8	11^{-}	D+Q[b]		DCO=1.07 *10*
410.5 *3*	0.4 *1*	7273.5	7^{-}	6862.9	6^{-}			
446.3 *3*	1.4 *1*	10590.9	11^{-}	10144.6	10^{-}	D+Q		DCO=0.64 *8*
486.0 *3*	0.2 *1*	4105.9	4^{+}	3619.9	4^{+}	[b]		
495.6 *6*	0.2 *1*	6084.5	7^{-}	5588.9	(5^{-})			
518.9 *4*	2.0 *1*	13238.1	13^{+}	12719.2	12^{+}	D+Q		DCO=0.95 *7*
519.5 *4*	0.8 *1*	6604.4	8^{+}	6084.5	7^{-}			

Continued on next page (footnotes at end of table)

^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03 (continued)

γ(^{58}Ni) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[d]	δ	Comments
537.4 4	38.0 10	6604.4	8+	6067.2	7+	(M1+E2)	−0.18 3	DCO=0.76 3
560.6 4	1.9 1	11255.1	11−	10694.7	10−	(M1+E2)	−0.26 5	DCO=0.80 6
603.0 4	0.4 1	8717.9	9−	8114.9	8−	D+Q		DCO=0.72 10
627.9 4	14.1 6	9345.6	10−	8717.9	9−	(M1+E2)	−0.15 3	DCO=0.71 3
668.0 5	5.0 2	13238.1	13+	12570.1	12+	D+Q		DCO=0.94 4
682.9 5	5.0 4	6067.2	7+	5384.0	6+	(M1+E2)	−0.11 8	DCO=0.69 8
683.7 5	0.1 1	4105.9	4+	3421.7	3+			
700.4 5	2.0 2	6084.5	7−	5384.0	6+	E1(+M2)[c]	−0.06 13	DCO=0.67 12 Mult.: from DCO=0.46 4 and POL=+0.039 19 (2004Iz01).
706.0[@] 10	0.09 2	15736.8	15+	15030.9	14+			
707.0[@] 5	3.7 1	11297.6	12−	10590.9	11−	(M1+E2)	−0.15 5	DCO=0.70 6
708.6[&] 10	0.2 1	16566.9	16+	15858.1	15+			
709.2[&] 5	4.6 2	7982.6	8−	7273.5	7−	(M1+E2)	−0.15 3	DCO=0.71 3
709.7[&] 5	1.3 1	7314.6	8+	6604.4	8+	[b]		
723.2 2	0.3 1	5127.2	6+	4403.9	4+			
726.5 5	0.3 1	15736.8	15+	15010.5	14+			Additional information 7.
735.4 5	4.7 2	8717.9	9−	7982.6	8−	(M1+E2)	−0.16 3	DCO=0.71 3
741.4[a] 5	1.7 1	11996.3	12−	11255.1	11−	D+Q		DCO=0.85 8
744.7 5	48.0 10	5127.2	6+	4383.0	5+	(M1+E2)	−0.42 4	DCO=0.92 4
755.0[a] 10	0.1 1	13884.0	(13+)	13129.1	(12+)			
763.1 5	49.0 10	4383.0	5+	3619.9	4+	(M1+E2)	−0.38 5	DCO=1.02 5
789.0 10	0.1 1	13884.0	(13+)	13094.9	(12+)	(D+Q)		DCO=0.58 13
799.1 6	1.4 1	10144.6	10−	9345.6	10−	D+Q[b]		DCO=1.13 23
805.5 5	0.7 1	8120.6	9+	7314.6	8+	D+Q		DCO=0.40 12
818.4 6	0.7 1	16676.3	16+	15858.1	15+	D+Q		DCO=0.35 6
825.1 6	0.5 1	11005.6	11−	10180.8	11−	D+Q[b]		DCO=1.03 20
832.0[f] 7	0.2 1	5127.2	6+	4294.9	4+			
835.5[@] 6	5.7 5	6219.8	7+	5384.0	6+	D+Q	−0.08 4	DCO=0.75 3
835.6[@] 6	19.0 6	10180.8	11−	9345.6	10−	(M1+E2)	−0.09 4	DCO=0.61 3
842.2 6	29.0 10	7446.2	9+	6604.4	8+	(M1+E2)	−0.18 3	DCO=0.78 3
847.0[@] 10	0.2 1	16171.1	15+	15324.2	14+			
847.6[@] 6	0.1 1	15858.1	15+	15010.5	14+			
854.0[a] 6	0.7 1	17530.0	17+	16676.3	16+			
857.6[a] 6	0.5 1	16566.9	16+	15709.3	15+	D+Q		DCO=1.06 13
864.0 10	0.1 1	19206	17−	18342	16−	D+Q		DCO=1.21 18
873.3 6	2.2 2	13238.1	13+	12364.6	12+	D+Q		DCO=0.97 6
878.4 9	0.3 1	7724.1	8+	6845.5	(7+)			
889.6 6	9.7 5	14127.7	14+	13238.1	13+	D+Q		DCO=1.07 5
912.3 6	0.3 1	9027.1	9−	8114.9	8−			
915.7 6	2.0 1	12912.1	13−	11996.3	12−	D+Q		DCO=0.64 17
930.0[a] 10	0.3 1	20136	18−	19206	17−			
938.0[a] 7	1.9 1	13850.0	14−	12912.1	13−	D+Q		DCO=0.61 7
940.1[&] 7	31.0 15	6067.2	7+	5127.2	6+	(M1+E2)	−0.36 4	DCO=0.93 4
940.4[&] 7	0.6 1	16676.3	16+	15736.8	15+			
941.1[&] 7	7.0 3	9062.6	10+	8120.6	9+	(M1+E2)	−0.24 6	DCO=0.70 7
957.2[@] 7	8.5 3	6084.5	7−	5127.2	6+	E1(+M2)[c]	−0.06 5	DCO=0.63 4 Mult.: from DCO=0.59 3 and POL=+0.054 15 (2004Iz01).

Continued on next page (footnotes at end of table)

^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03 (continued)

γ(^{58}Ni) (continued)

Eγ[†]	Iγ[†]	Ei(level)	J^π_i	Ef	J^π_f	Mult.[d]	δ	Comments
957.5[@] 7	0.9 1	18638.8	18+	17681.3	17+			
961[&] 1	0.3 1	3421.7	3+	2459.5	4+			
962[&] 1	0.1 1	4383.0	5+	3421.7	3+			
962.8[&] 7	0.15 5	17530.0	17+	16566.9	16+			
971.0 10	0.1 1	21107	19−	20136	18−	D+Q		DCO=0.95 12
991.0 10	0.1 1	12570.1	12+	11579.2	12+	[b]		
991.1 7	0.5 1	10781.7	11+	9790.6	10+	D+Q		DCO=0.90 10
992.1 10	0.3 1	17163.1	16+	16171.1	15+	D+Q		DCO=0.38 4
1000.2 7	5.0 5	5384.0	6+	4383.0	5+	D+Q		DCO=0.58 16
1004.8[@] 7	0.5 1	17681.3	17+	16676.3	16+			
1005.2[@] 7	105 3	2459.5	4+	1454.3	2+	Q		DCO=0.97 4
1020.3 7	0.7 1	5127.2	6+	4105.9	4+			
1062.0 10	0.1 1	16167.1		15105.1				
1074.1 8	0.8 1	11255.1	11−	10180.8	11−	[b]		
1084.8 8	0.9 1	14934.6	15−	13850.0	14−	D+Q		DCO=1.19 10
1088.9 10	0.2 1	5384.0	6+	4294.9	4+			
1093.4[a] 8	5.0 5	6219.8	7+	5127.2	6+	D+Q		DCO=0.94 8
1095.7 9	2.1 2	7314.6	8+	6219.8	7+			
1097.9 10	0.1 1	18261.2	17+	17163.1	16+	D+Q		DCO=0.84 10
1105.0 10	0.2 1	22212	20−	21107	19−	D+Q		DCO=0.60 6
1109.0[a] 10	0.2 1	18638.8	18+	17530.0	17+			
1113.8[a] 8	0.3 1	17681.3	17+	16566.9	16+			
1116.3 8	9.3 3	11297.6	12−	10180.8	11−	D+Q	−0.22 3	DCO=0.80 4
1117.8 8	0.3 1	10144.6	10−	9027.1	9−	D+Q		DCO=0.76 6
1119.6 4	0.6 1	7724.1	8+	6604.4	8+	D+Q[b]		DCO=0.88 10
1120[‡]		23332	21−	22212	20−			
1120.2 8	0.3 1	7982.6	8−	6862.9	6−			
1129.4 8	6.7 3	10192.5	11+	9062.6	10+	D+Q	−0.45 6	DCO=1.10 7
1153.7 10	0.3 1	10180.8	11−	9027.1	9−			
1157.0[a] 8	0.20 5	12570.1	12+	11413.1	11+			
1161.1 8	40 3	3619.9	4+	2459.5	4+	D+Q[b]		DCO=0.95 5 δ: −1.28 21 or +0.01 20.
1170.5 8	0.3 1	18461.0	17−	17290.2	16+	D+Q[c]	−0.10 6	DCO=0.57 6
1189.9 8	2.7 2	7273.5	7−	6084.5	7−	D+Q[b]		DCO=1.01 17
1221.0[@] 10	0.1 1	15105.1		13884.0	(13+)			
1221.1[@] 10	0.1 1	19482.5	(18+)	18261.2	17+			
1223.8 9	1.3 1	11814.2	12−	10590.9	11−	D+Q	−0.08 2	DCO=1.46 10
1226.1 9	4.1 5	7446.2	9+	6219.8	7+	Q		DCO=1.00 7
1229.9 9	0.8 1	11116.8	11−	9886.6	10+	D+Q[c]	−0.09 7	DCO=0.61 7
1245.2 9	3.6 2	10590.9	11−	9345.6	10−	D+Q		DCO=0.87 15
1245.9 9	2.7 2	7314.6	8+	6067.2	7+	D+Q	−0.15 5	DCO=0.74 5
1256.4 9	2.3 2	6219.8	7+	4964.5	(5)+	(Q)		DCO=0.86 22
1280[‡]		24612	22−	23332	21−			
1281.8 9	3.7 2	11474.4	12+	10192.5	11+	D+Q	−0.55 8	DCO=1.10 8
1301.0[@] 10	0.2 1	11996.3	12−	10694.7	10−	Q		DCO=1.02 17
1301.8[@] 9	0.7 1	21247.9	20+	19945.7	19+			
1306.0[@] 10	0.1 1	12719.2	12+	11413.1	11+			
1307.3[@] 9	0.7 1	19945.7	19+	18638.8	18+			
1312.0 9	0.4 1	16246.5	16−	14934.6	15−	D+Q		DCO=1.18 17
1336.5 28	0.3 1	9062.6	10+	7724.1	8+			

Continued on next page (footnotes at end of table)

^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03 (continued)

γ(^{58}Ni) (continued)

$E_γ$[†]	$I_γ$[†]	E_i(level)	$J^π_i$	E_f	$J^π_f$	Mult.[d]	δ	Comments
1344.7 *2*	0.7 *1*	4964.5	(5)$^+$	3619.9	4$^+$			
1350.0 *10*	0.1 *1*	10694.7	10$^-$	9345.6	10$^-$	[b]		
1351.1 *9*	1.0 *1*	12356.7	12$^-$	11005.6	11$^-$			
1363.1 *10*	3.2 *2*	9345.6	10$^-$	7982.6	8$^-$	Q		DCO=1.06 *8*
1363.8 *10*	0.2 *1*	16797.7	15$^-$	15433.9	13$^-$	Q		DCO=1.01 *10*
1370.0 *10*	2.1 *1*	7973.4	8$^+$	6604.4	8$^+$	[b]		
1378.6 *10*	1.6 *1*	7446.2	9$^+$	6067.2	7$^+$			
1385.4 *10*	0.1 *1*	16797.7	15$^-$	15412.3	(13$^-$)			
1386.7 *10*	1.5 *1*	11579.2	12$^+$	10192.5	11$^+$	D+Q	−0.35 *8*	DCO=0.92 *9*
1403.2 *10*	1.9 *2*	8717.9	9$^-$	7314.6	8$^+$	D+Q[c]	−0.13 *10*	DCO=0.59 *6*
1406.2 *10*	0.2 *1*	11996.3	12$^-$	10590.9	11$^-$			
1424.5 *10*	1.4 *1*	13238.1	13$^+$	11814.2	12$^-$	D[c]		DCO=0.81 *7*
1426.1 *10*	0.3 *1*	10144.6	10$^-$	8717.9	9$^-$			
1444.0[@] *10*	0.2 *1*	24211.8	22$^+$	22767.9	21$^+$			
1444.4[@] *10*	2.1 *1*	8717.9	9$^-$	7273.5	7$^-$			
1454.3 *1*	113 *4*	1454.3	2$^+$	0.0	0$^+$	Q		DCO=1.05 *5*
1463.9 *10*	2.3 *3*	10180.8	11$^-$	8717.9	9$^-$	Q		DCO=1.16 *6*
1470[a] *1*	1.1 *1*	8074.3	8$^+$	6604.4	8$^+$			
1474[#f]		16797.7	15$^-$	15324.2	14$^+$			Additional information 8.
1476.8 *10*	26.5 *10*	6604.4	8$^+$	5127.2	6$^+$	Q		DCO=1.22 *7*
1503.9 *11*	0.5 *1*	16797.7	15$^-$	15294.2	14$^+$	D[c]		DCO=0.46 *7*
1511.5 *11*	0.4 *1*	9585.0	9$^-$	8074.3	8$^+$	D[c]		DCO=0.62 *9*
1516.9 *11*	11.0 *5*	8120.6	9$^+$	6604.4	8$^+$	D+Q	−0.13 *4*	DCO=0.70 *3*
1519.2[a] *11*	0.3 *1*	22767.9	21$^+$	21247.9	20$^+$			
1531.2[@] *11*	0.7 *1*	11116.8	11$^-$	9585.0	9$^-$			
1531.9[@] *11*	0.1 *1*	16797.7	15$^-$	15266.3	14$^+$			
1534.1[a] *11*	2.2 *1*	12831.4	13$^-$	11297.6	12$^-$			
1556.0 *10*	0.2 *1*	16797.7	15$^-$	15241.7	13$^-$			
1559.9 *11*	0.4 *1*	10882.0	11$^+$	9322.1	11$^+$	D+Q[b]		DCO=1.2 *3*
1563.5 *11*	0.2 *1*	10590.9	11$^-$	9027.1	9$^-$			
1564.0 *12*	0.6 *1*	12155.0	12$^-$	10590.9	11$^-$	D+Q	+0.15 *11*	DCO=0.44 *8*
1564.3 *10*	0.1 *1*	14920.8	14$^+$	13356.5	13$^+$			
1581.3[&] *11*	1.4 *1*	15709.3	15$^+$	14127.7	14$^+$	D+Q	−0.22 *4*	DCO=1.46 *12* Additional information 6.
1581.6[&] *11*	0.2 *1*	8896.3?		7314.6	8$^+$			
1582.5[&] *11*	0.3 *1*	12364.6	12$^+$	10781.7	11$^+$			
1583.0 *11*	0.1 *1*	18342	16$^-$	16759	14$^-$			
1592.2 *11*	0.9 *1*	9666.8	10$^+$	8074.3	8$^+$			Additional information 2.
1596.0[@] *11*	0.1 *1*	18342	16$^-$	16746	14$^-$			
1598.0[@] *10*	0.2 *1*	19206	17$^-$	17608	15$^-$			
1609.4 *11*	1.6 *1*	15736.8	15$^+$	14127.7	14$^+$	D+Q		DCO=1.89 *11*
1610.6 *11*	0.6 *1*	9585.0	9$^-$	7973.4	8$^+$	D[c]		DCO=0.56 *16*
1617.0 *11*	1.0 *1*	9062.6	10$^+$	7446.2	9$^+$			
1623.6[a] *11*	0.3 *1*	19206	17$^-$	17582	15$^-$			
1632.0 *10*	0.8 *1*	11824.7	12$^+$	10192.5	11$^+$	D+Q	−0.61 *14*	DCO=1.16 *13*
1632.2 *11*	0.2 *1*	10694.7	10$^-$	9062.6	10$^+$			
1633.8 *11*	2.5 *1*	11814.2	12$^-$	10180.8	11$^-$	D+Q	−0.07 *2*	DCO=1.44 *11*
1634.0 *11*	0.5 *1*	18342	16$^-$	16708	14$^-$	Q		DCO=1.04 *11*
1639.0 *10*	0.3 *1*	7724.1	8$^+$	6084.5	7$^-$			
1644.6 *12*	0.4 *1*	16676.3	16$^+$	15030.9	14$^+$	Q		DCO=1.11 *10*
1645.6 *12*	0.6 *1*	16566.9	16$^+$	14920.8	14$^+$	Q		DCO=1.05 *18*

Continued on next page (footnotes at end of table)

^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03 (continued)

γ(^{58}Ni) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[d]	δ	Comments
1646.4 12	0.3 1	4105.9	4^+	2459.5	4^+	[b]		
1654.0 10	0.2 1	15010.5	14^+	13356.5	13^+			
1657.0 10	0.3 1	7724.1	8^+	6067.2	7^+			
1657.0 12	0.6 1	12912.1	13^-	11255.1	11^-			
1664.0 12	1.8 1	18461.0	17^-	16797.7	15^-	Q		DCO=0.98 5
1665.0 12	0.8 1	16676.3	16^+	15010.5	14^+	Q		DCO=0.89 12
1668.0 12	0.6 1	18342	16^-	16674	(14^-)			
1674.0 12	0.2 1	15030.9	14^+	13356.5	13^+			
1683.5[@] 12	1.4 1	11005.6	11^-	9322.1	11^+			
1684.4[@] 12	13.0 10	6067.2	7^+	4383.0	5^+	Q		DCO=1.11 7
1688.0 12	0.9 1	15294.2	14^+	13606.8	12^+	Q		DCO=0.99 7
1692.7 10	0.4 1	11579.2	12^+	9886.6	10^+			
1694.2 12	1.7 2	9666.8	10^+	7973.4	8^+	Q		DCO=0.92 16
1713.6 12	1.7 1	12831.4	13^-	11116.8	11^-	Q		DCO=1.21 15
1715.0 12	0.3 1	16171.1	15^+	14455.9	13^+	Q		DCO=0.94 9
1718.0 10	0.1 1	6845.5	(7^+)	5127.2	6^+			
1718.3 12	2.0 1	13016.3	13^-	11297.6	12^-	D+Q		DCO=1.32 11
1723.0[a] 13	0.2 1	19206	17^-	17483	15^-			
1731.1 12	2.1 1	15858.1	15^+	14127.7	14^+	D+Q		DCO=1.22 7
1749.8 12	1.4 1	13048.5	13^-	11297.6	12^-	D+Q		DCO=1.01 10
1752.0 11	1.6 2	7973.4	8^+	6219.8	7^+	D+Q	−0.37 8	DCO=0.95 8
1763.0 10	0.3 1	14127.7	14^+	12364.6	12^+			
1764.1[e] 12	5.0[e] 5	5384.0	6^+	3619.9	4^+	Q		DCO=0.98 8
1764.1[e] 12	0.5[e] 1	13238.1	13^+	11474.4	12^+			
1766.0 10	0.4 1	12356.7	12^-	10590.9	11^-			
1773.0 10	0.2 1	15010.5	14^+	13238.1	13^+			
1789.0 13	0.1 1	12570.1	12^+	10781.7	11^+			
1793.3 13	1.0 1	17530.0	17^+	15736.8	15^+	Q		DCO=1.06 14
1794.0 13	0.9 1	20136	18^-	18342	16^-	Q		DCO=1.01 7
1798.2 13	0.2 1	10694.7	10^-	8896.3?				
1807.5 13	1.3 1	11474.4	12^+	9666.8	10^+	Q		DCO=1.21 13
1811.4 13	1.1 1	9886.6	10^+	8074.3	8^+	Q		DCO=1.3 5
1813.8 13	0.3 1	11996.3	12^-	10180.8	11^-			
1819.5 13	0.6 1	17530.0	17^+	15709.3	15^+			
1823.7 13	1.0 1	17681.3	17^+	15858.1	15^+	Q		DCO=1.11 11
1835.3 4	0.2 1	4294.9	4^+	2459.5	4^+	[b]		
1835.6 13	0.2 1	14852.2	15^-	13016.3	13^-			
1839.1 13	0.2 1	17163.1	16^+	15324.2	14^+	Q		DCO=1.12 18
1848.0 13	0.1 1	26059.6	23^+	24211.8	22^+			
1853.8 13	0.9 1	13850.0	14^-	11996.3	12^-	Q		DCO=1.52 17
1854.3 13	2.0 1	8074.3	8^+	6219.8	7^+	D+Q	−0.21 8	DCO=0.72 8
1861.0 13	0.5 1	14217.5	14^-	12356.7	12^-	Q		DCO=0.95 17
1872.5 13	1.5 1	10590.9	11^-	8717.9	9^-	Q		DCO=1.17 12
1876.4 13	6.4 3	9322.1	11^+	7446.2	9^+	Q		DCO=1.02 10
1881.5[a] 13	0.6 1	13356.5	13^+	11474.4	12^+			
1896.6[a] 13	0.2 1	17163.1	16^+	15266.3	14^+			
1899.9[@] 13	10.5 5	9345.6	10^-	7446.2	9^+	D+Q[c]	−0.16 3	DCO=0.75 3
1901.0[@] 14	0.7 1	21107	19^-	19206	17^-	Q		DCO=0.87 5
1913.2 4	1.6 1	9886.6	10^+	7973.4	8^+	Q		DCO=0.92 18 Additional information 3.
1915.6 13	3.0 1	7982.6	8^-	6067.2	7^+	D+Q[c]	−0.17 6	DCO=0.78 9
1923.4 13	15.0 10	4383.0	5^+	2459.5	4^+	D+Q	+0.27 10	DCO=0.39 3
1930.3 14	2.2 2	7314.6	8^+	5384.0	6^+	Q		DCO=0.91 13

Continued on next page (footnotes at end of table)

^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03 (continued)

γ(^{58}Ni) (continued)

Eγ[†]	Iγ[†]	Ei(level)	J_i^π	E_f	J_f^π	Mult.[d]	δ	Comments
1941.7 *14*	1.5 *1*	13238.1	13+	11297.6	12−	D[c]		DCO=0.97 *8*
1944.8 *14*	0.7 *1*	17681.3	17+	15736.8	15+	Q		DCO=1.00 *10*
1962.2 *14*	1.2 *1*	18638.8	18+	16676.3	16+	Q		DCO=1.00 *7*
1965.0 *14*	0.2 *1*	17290.2	16+	15324.2	14+	Q		DCO=1.12 *22*
1972.7 *14*	0.4 *1*	17681.3	17+	15709.3	15+	Q		DCO=0.91 *13*
1974.1 *14*	0.9 *1*	12155.0	12−	10180.8	11−	D+Q	−0.27 *10*	DCO=0.93 *16*
1976.0 *14*	0.1 *1*	15105.1		13129.1	(12+)			
1988.7 *14*	2.1 *1*	20449.8	19−	18461.0	17−	Q		DCO=0.97 *7*
1996.0 *14*	1.3 *1*	17290.2	16+	15294.2	14+	Q		DCO=1.24 *10*
2021.2 *14*	2.6 *3*	14852.2	15−	12831.4	13−	Q		DCO=0.93 *7*
2022.2 *14*	0.7 *1*	14934.6	15−	12912.1	13−	Q		DCO=1.1 *3*
2023.9 *12*	0.2 *1*	17290.2	16+	15266.3	14+			
2029.0[@] *10*	0.3 *1*	10144.6	10−	8114.9	8−			
2031.0[@] *14*	1.1 *1*	8114.9	8−	6084.5	7−			
2044.3 *14*	0.4 *1*	13048.5	13−	11005.6	11−			
2057.0 *20*	0.1 *1*	15186.8	(13+)	13129.1	(12+)			
2062.0 *15*	0.4 *1*	14217.5	14−	12155.0	12−	Q		DCO=1.01 *14*
2072.7 *15*	1.5 *1*	10192.5	11+	8120.6	9+	Q		DCO=1.16 *11*
2073.0 *15*	0.4 *1*	18638.8	18+	16566.9	16+	Q		DCO=1.06 *9*
2076.0 *15*	0.9 *1*	22212	20−	20136	18−	Q		DCO=1.04 *8*
2090.0[&] *15*	0.3 *1*	11116.8	11−	9027.1	9−	Q		DCO=0.91 *16*
2090.0[&] *10*	0.6 *2*	18261.2	17+	16171.1	15+	Q		DCO=0.99 *10*
2092.0[&] *20*	0.1 *1*	17197		15105.1				
2114.0 *15*	9.1 *3*	8717.9	9−	6604.4	8+	D(+Q)[c]	−0.03 *4*	DCO=0.59 *3*
2146.4 *15*	4.7 *3*	7273.5	7−	5127.2	6+	E1+M2[c]	−0.19 *6*	DCO=0.74 *6* Mult.: from DCO=0.48 *15* and POL=+0.048 *30* (2004Iz01).
2152.4 *15*	1.2 *1*	11474.4	12+	9322.1	11+	D+Q	−0.39 *7*	DCO=1.08 *10*
2162.9 *9*	0.2 *1*	10144.6	10−	7982.6	8−			
2166.0[@] *15*	7.0 *10*	3619.9	4+	1454.3	2+	Q		DCO=1.06 *7*
2166.5[@] *15*	0.4 *1*	17018.8		14852.2	15−			
2171.4 *15*	0.2 *1*	12364.6	12+	10192.5	11+			
2174.9 *15*	0.1 *1*	12570.1	12+	10394.1	10+			
2193.7 *15*	0.5 *1*	15242.3		13048.5	13−			
2219.5 *16*	0.8 *1*	9666.8	10+	7446.2	9+	D+Q		DCO=0.93 *14*
2225.0 *16*	0.6 *1*	23332	21−	21107	19−	Q		DCO=1.17 *10*
2229.6 *16*	0.9 *1*	7973.4	8+	5744.4	6+	Q		DCO=0.93 *12*
2249.9 *16*	0.2 *1*	15266.3	14+	13016.3	13−			
2263.4 *16*	1.2 *1*	19945.7	19+	17681.3	17+	Q		DCO=1.05 *8*
2276.9[&] *16*	0.8 *1*	19567.2	18+	17290.2	16+	Q		DCO=0.95 *9* Additional information 10.
2277.9[&] *16*	0.2 *1*	15294.2	14+	13016.3	13−			
2279.0[&] *19*	0.4 *1*	16496.5	16−	14217.5	14−	Q		DCO=1.04 *11*
2283.0[a] *16*	0.1 *1*	16167.1		13884.0	(13+)			
2320.0 *16*	0.2 *1*	19482.5	(18+)	17163.1	16+	(Q)		DCO=0.89 *9*
2343.0 *20*	0.4 *1*	7724.1	8+	5384.0	6+	Q		DCO=1.10 *18*
2344.0 *16*	1.6 *1*	9790.6	10+	7446.2	9+	D+Q		DCO=0.62 *13*
2349.7 *16*	1.7 *1*	22800	21−	20449.8	19−	E2		DCO=1.04 *6*
2377.8 *17*	0.1 *1*	12570.1	12+	10192.5	11+			
2390.1 *17*	0.7 *1*	12570.1	12+	10180.8	11−	D[c]		DCO=0.58 *10*
2396.1 *17*	0.5 *1*	16246.5	16−	13850.0	14−	Q		DCO=1.88 *21*
2400.0 *17*	0.6 *1*	24612	22−	22212	20−	Q		DCO=1.10 *8*

Continued on next page (footnotes at end of table)

^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03 (continued)

γ(^{58}Ni) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[d]	δ	Comments
2410.9 *17*	1.1 *1*	11474.4	12+	9062.6	10+	Q		DCO=1.22 *18*
2415.0 *17*	0.5 *1*	19945.7	19+	17530.0	17+	Q		DCO=1.16 *14*
2431.0 *17*	0.2 *1*	12570.1	12+	10137.2	10+			
2435.6 *17*	0.7 *1*	15266.3	14+	12831.4	13−	D[c]		DCO=0.62 *16* Additional information 5.
2436[#]		17290.2	16+	14852.2	15−			
2459.9 *17*	2.8 *2*	9062.6	10+	6604.4	8+	Q		DCO=0.98 *15*
2462.2 *17*	0.4 *1*	15294.2	14+	12831.4	13−	D+Q[c]	−0.13 *7*	DCO=0.64 *6*
2463.0 *19*	0.2 *1*	6845.5	(7+)	4383.0	5+			
2467.9 *17*	1.4 *1*	11814.2	12−	9345.6	10−	Q		DCO=1.20 *11*
2470.0 *17*	0.4 *1*	15709.3	15+	13238.1	13+			
2478.0 *20*	0.2 *1*	12364.6	12+	9886.6	10+			
2478.9 *18*	1.1 *1*	6862.9	6−	4383.0	5+	D[c]		DCO=0.65 *22*
2501.1 *18*	1.0 *1*	15736.8	15+	13238.1	13+	Q		DCO=1.45 *13*
2502.9 *20*	3.0 *1*	4964.5	(5)+	2459.5	4+	D+Q	−0.52 *11*	DCO=1.05 *9*
2526.5 *18*	0.1 *1*	12719.2	12+	10192.5	11+			
2546.0 *18*	0.4 *1*	16676.3	16+	14127.7	14+	Q		DCO=1.69 *22*
2565.0 *18*	0.5 *1*	20826.2	19+	18261.2	17+	Q		DCO=1.00 *10*
2570.9 *18*	0.3 *1*	22138	20+	19567.2	18+	Q		DCO=1.23 *13*
2586.3 *25*	0.3 *1*	13884.0	(13+)	11297.6	12−	(D)[c]		DCO=0.8 *3*
2587.0 *18*	0.4 *1*	25919	23−	23332	21−	Q		DCO=1.07 *11*
2609.0 *18*	1.4 *2*	21247.9	20+	18638.8	18+	Q		DCO=1.07 *13*
2651.7 *19*	3.5 *1*	4105.9	4+	1454.3	2+	Q		DCO=0.97 *15*
2652.2 *19*	0.9 *1*	12831.4	13−	10180.8	11−	Q		DCO=1.02 *18*
2668.5 *19*	22.0 *10*	5127.2	6+	2459.5	4+	Q		DCO=1.10 *7*
2682.9 *21*	0.3 *1*	12570.1	12+	9886.6	10+			E_γ: 2683γ shown in level scheme figure 3 of 2009Jo03, the energy and intensity are from e-mail reply of Nov 14, 2009 from D. Rudolph.
2688.4 *19*	1.2 *1*	10137.2	10+	7446.2	9+			
2697.0 *20*	0.2 *1*	12364.6	12+	9666.8	10+			
2710.2 *19*	0.4 *1*	10694.7	10−	7982.6	8−	Q		DCO=1.8 *3*
2746.6 *19*	2.6 *2*	10192.5	11+	7446.2	9+	Q		DCO=1.35 *15*
2750.5 *19*	0.6 *1*	25550	23−	22800	21−	Q		DCO=1.11 *6*
2755.0 *20*	0.2 *1*	27367	24−	24612	22−	Q		DCO=0.90 *8*
2757.0 *19*	0.2 *1*	22240	(20+)	19482.5	(18+)	Q		DCO=1.13 *13*
2824.3 *20*	0.8 *1*	22767.9	21+	19945.7	19+	Q		DCO=1.24 *25*
2840.5 *10*	0.3 *1*	4294.9	4+	1454.3	2+			
2868[‡]		2868+x		x				
2914.5 *25*	0.1 *1*	23741	21+	20826.2	19+	Q		DCO=1.32 *16*
2926.9 *20*	3.3 *4*	5384.0	6+	2459.5	4+	Q		DCO=1.13 *21*
2928.0 *20*	0.1 *1*	12719.2	12+	9790.6	10+			
2942.2 *21*	1.8 *1*	9027.1	9−	6084.5	7−	Q		DCO=1.02 *22*
2947.9 *25*	0.7 *1*	4403.9	4+	1454.3	2+	Q		DCO=1.25 *20*
2949.0 *30*	0.1 *1*	19196		16246.5	16−			
2964.0 *19*	0.7 *1*	24211.8	22+	21247.9	20+	Q		DCO=1.07 *11*
3002.8 *21*	0.1 *1*	25141	22+	22138	20+	Q		DCO=0.97 *12*
3014.0 *21*	0.1 *1*	28933	25−	25919	23−	Q		DCO=0.92 *10*
3045.0 *21*	0.1 *1*	13238.1	13+	10192.5	11+			
3062.0 *21*	0.7 *1*	9666.8	10+	6604.4	8+			
3078.0 *22*	0.1 *1*	10394.1	10+	7314.6	8+			
3125[‡]		30490	(26−)	27367	24−			
3129.0 *15*	0.2 *1*	5588.9	(5−)	2459.5	4+			
3157.0 *22*	0.1 *1*	28707	25−	25550	23−	Q		DCO=1.09 *11*

Continued on next page (footnotes at end of table)

^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03 (continued)

γ(^{58}Ni) (continued)

E_γ [†]	I_γ [†]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [d]	δ	Comments
3164.1 *22*	0.5 *1*	13356.5	13⁺	10192.5	11⁺	Q		DCO=1.3 *3*
3185.9 *22*	0.1 *1*	15010.5	14⁺	11824.7	12⁺			
3206.0 *30*	0.1 *1*	15030.9	14⁺	11824.7	12⁺			
3215[‡]		6083+x		2868+x				
3248.0 *23*	0.5 *1*	12570.1	12⁺	9322.1	11⁺	D+Q	−0.44 *11*	DCO=1.21 *14*
3249.7 *23*	1.0 *1*	10694.7	10⁻	7446.2	9⁺	D[c]		DCO=0.67 *17*
3286.0 *18*	2.4 *3*	5744.4	6⁺	2459.5	4⁺	Q		DCO=0.98 *19*
3291.0 *23*	0.2 *1*	26059.6	23⁺	22767.9	21⁺	Q		DCO=1.3 *3*
3302.1 *23*	0.4 *1*	12364.6	12⁺	9062.6	10⁺	Q		DCO=1.44 *17*
3336.0 *23*	1.0 *1*	10781.7	11⁺	7446.2	9⁺	Q		DCO=1.13 *13*
3379[‡]		28933	25⁻	25550	23⁻			
3400.0 *24*	0.2 *1*	12719.2	12⁺	9322.1	11⁺			
3417.0 *24*	0.1 *1*	13606.8	12⁺	10192.5	11⁺			Mult.: E1 in table II of 2009Jo03 seems a misprint. Final level J^π=11⁻ in table II seems a misprint, should be 11⁺.
3431.0 *24*	0.2 *1*	15010.5	14⁺	11579.2	12⁺			
3436.5[f] *24*	0.1 *1*	15433.9	13⁻	11996.3	12⁻			
3445 *2*	0.7 *1*	14920.8	14⁺	11474.4	12⁺	Q		DCO=0.99 *22*
3451.4 *24*	0.1 *1*	15030.9	14⁺	11579.2	12⁺			
3466[‡]		32171	(27⁻)	28707	25⁻			
3480[‡]		33970	(28⁻)	30490	(26⁻)			
3489.4 *24*	0.1 *1*	18342	16⁻	14852.2	15⁻	D(+Q)	−0.02 *14*	DCO=0.54 *12*
3498.4 *25*	0.1 *1*	15324.2	14⁺	11824.7	12⁺			
3498.7 *24*	0.4 *1*	9585.0	9⁻	6084.5	7⁻	Q		DCO=0.99 *22*
3507.0 *25*	0.1 *1*	12570.1	12⁺	9062.6	10⁺			
3533.0 *20*	1.1 *1*	10137.2	10⁺	6604.4	8⁺	Q		DCO=1.08 *13*
3536.4 *30*	0.8 *1*	15010.5	14⁺	11474.4	12⁺	Q		DCO=0.91 *16*
3556.0 *25*	0.5 *1*	15030.9	14⁺	11474.4	12⁺	Q		DCO=1.6 *8*
3564		32493	(27⁻)	28933	25⁻			
3584[‡]		9667+x		6083+x				
3606.0 *30*	0.1 *1*	12928		9322.1	11⁺			
3624.3 *13*	0.9 *1*	6084.5	7⁻	2459.5	4⁺	O		DCO=1.26 *17* Mult.: DCO consistent with pure octupole, E3 required by ΔJ^π.
3655.0 *26*	0.3 *1*	12719.2	12⁺	9062.6	10⁺	Q		DCO=1.8 *3*
3688.3 *28*	0.3 *1*	10293.5	9⁻	6604.4	8⁺			Additional information 4.
3750.0 *26*	0.2 *1*	13943		10192.5	11⁺			
3750		16797.7	15⁻	13048.5	13⁻			Additional information 9.
3772.2 *30*	0.2 *1*	13094.9	(12⁺)	9322.1	11⁺	(D+Q)		DCO=1.2 *3*
3786[‡]		32493	(27⁻)	28707	25⁻			
3788.0 *27*	0.2 *1*	10394.1	10⁺	6604.4	8⁺			
3806.3 *30*	0.2 *1*	13129.1	(12⁺)	9322.1	11⁺	(D+Q)		DCO=1.10 *24*
3838[‡]		37808	(30⁻)	33970	(28⁻)			
3849.0 *27*	0.8 *1*	15324.2	14⁺	11474.4	12⁺	Q		DCO=1.04 *13*
3870[‡]		36041	(29⁻)	32171	(27⁻)			
3965 *3*	0.1 *1*	16797.7	15⁻	12831.4	13⁻	Q		DCO=1.12 *14*
3966.2 *28*	0.8 *1*	11413.1	11⁺	7446.2	9⁺	Q		DCO=1.16 *19*
4040[‡]		36533	(29⁻)	32493	(27⁻)			
4136 *4*	0.1 *1*	15433.9	13⁻	11297.6	12⁻			
4197[‡]		42005	(32⁻)	37808	(30⁻)			
4207.7 *30*	0.1 *1*	10293.5	9⁻	6084.5	7⁻			

Continued on next page (footnotes at end of table)

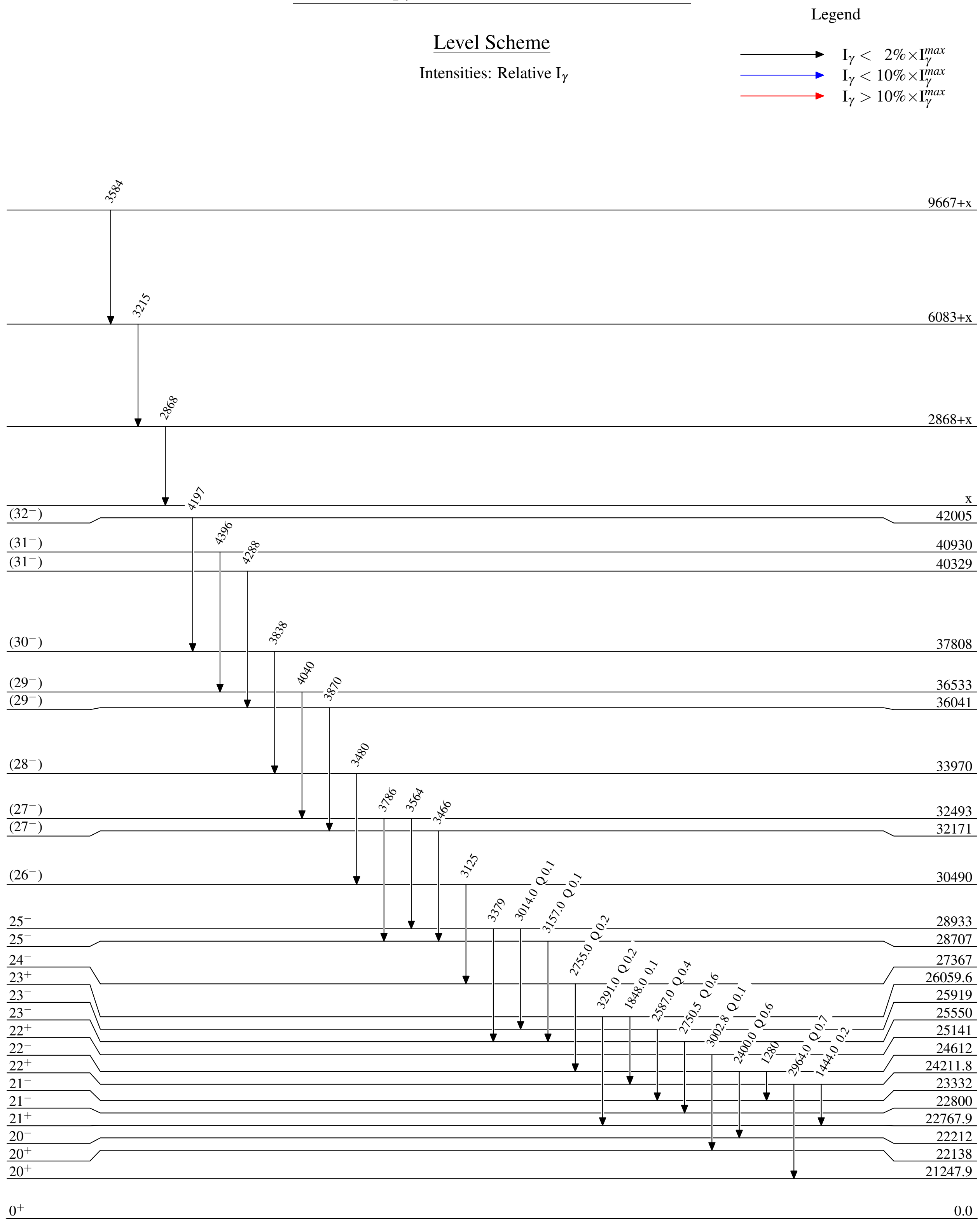
^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03 (continued)

γ(^{58}Ni) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[d]	Comments
4261.7 *30*	0.1 *1*	14455.9	13^+	10192.5	11^+		
4283.9 *31*	0.1 *1*	13606.8	12^+	9322.1	11^+	D+Q	DCO=0.70 *12*
4288[‡]		40329	(31^-)	36041	(29^-)		
4310 *3*	0.1 *1*	13632		9322.1	11^+		
4320.0 *30*	0.1 *1*	10404.8	(9^-)	6084.5	7^-		
4396[‡]		40930	(31^-)	36533	(29^-)		
4997 *4*	0.1 *1*	15186.8	(13^+)	10192.5	11^+		

[†] From 2009Jo03, unless otherwise stated.
[‡] From 2006Ru02 In ^{28}Si(^{32}S,2pγ) reaction.
[#] From 2001Ru03.
[@] Unresolved doublet.
[&] Unresolved triplet.
[a] Unresolved doublet, the other component is an impurity.
[b] ΔJ=0 transition.
[c] ΔJ=1, $\hat{D}$+Q or $\hat{D}$ from $\gamma\gamma(\theta)$(DCO); E1+M2 or E1 from ΔJ^π.
[d] 2009Jo03 assign M1+E2 to most transitions where some mixing is indicated from measured DCO ratios. Since the level lifetimes are not available In most cases, the evaluators assign (M1+E2) only for those transitions of 1 MeV or less, based on RUL. Above this energy, RUL=1 allows small M2 admixtures, although, unlikely from band assignments and other structure features.
[e] Multiply placed with intensity suitably divided.
[f] Placement of transition in the level scheme is uncertain.

$^{28}Si(^{36}Ar,\alpha 2p\gamma)$ 2009Jo03,2006Ru02,2001Ru03



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

$^{28}Si(^{36}Ar,\alpha 2p\gamma)$ 2009Jo03,2006Ru02,2001Ru03

Level Scheme (continued)

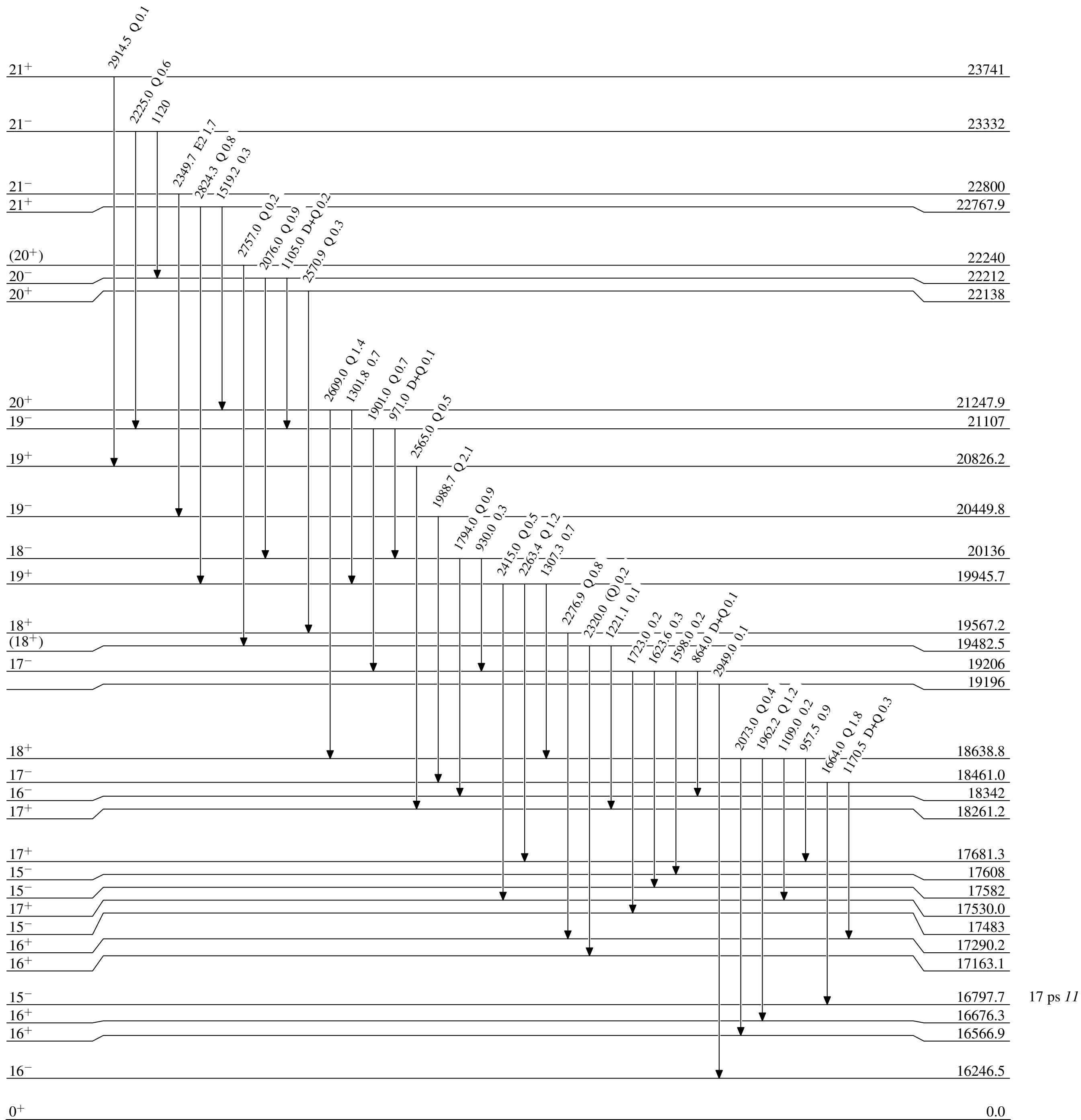
Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$



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

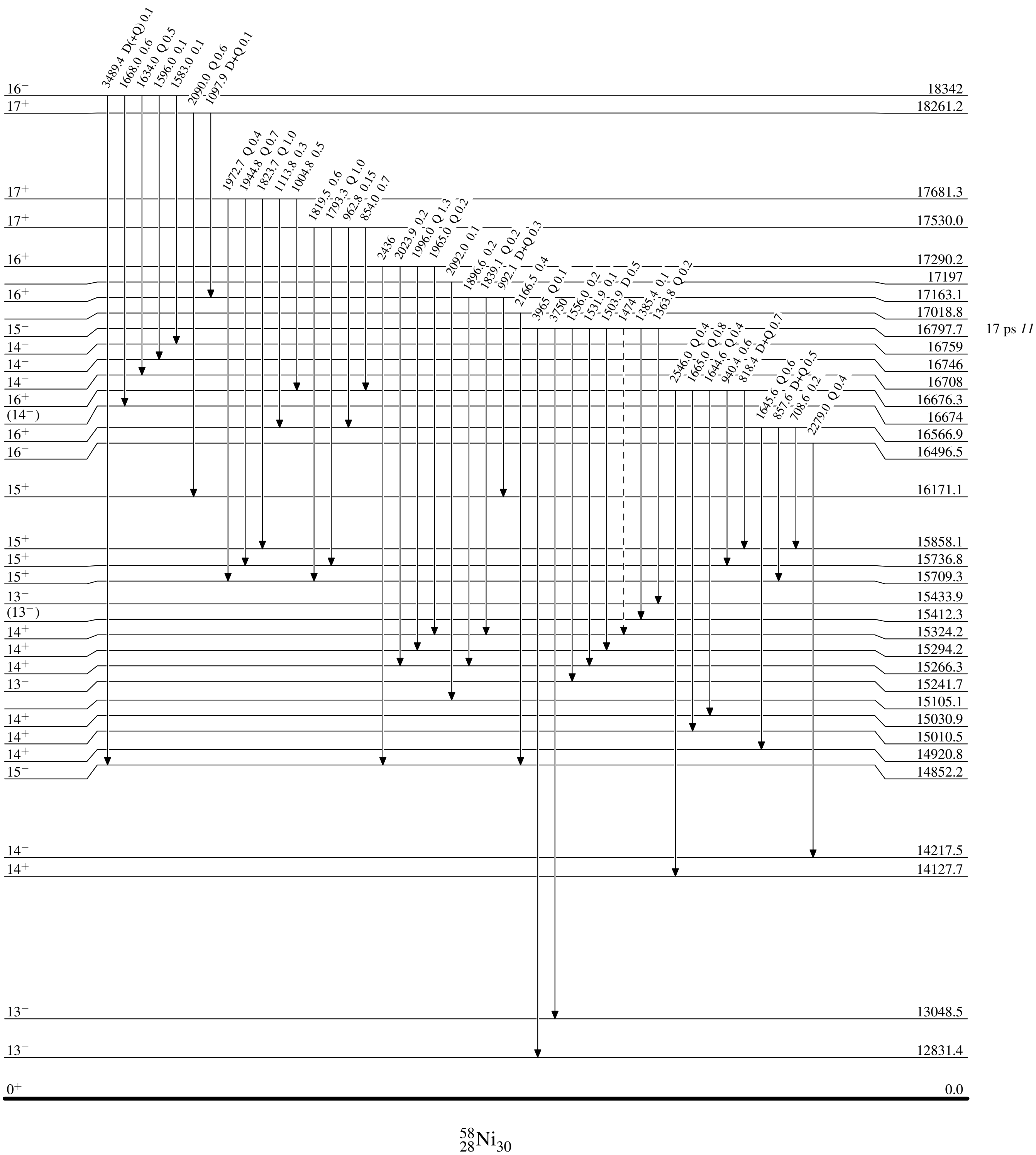
^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)

Level Scheme (continued)

Intensities: Relative I_γ

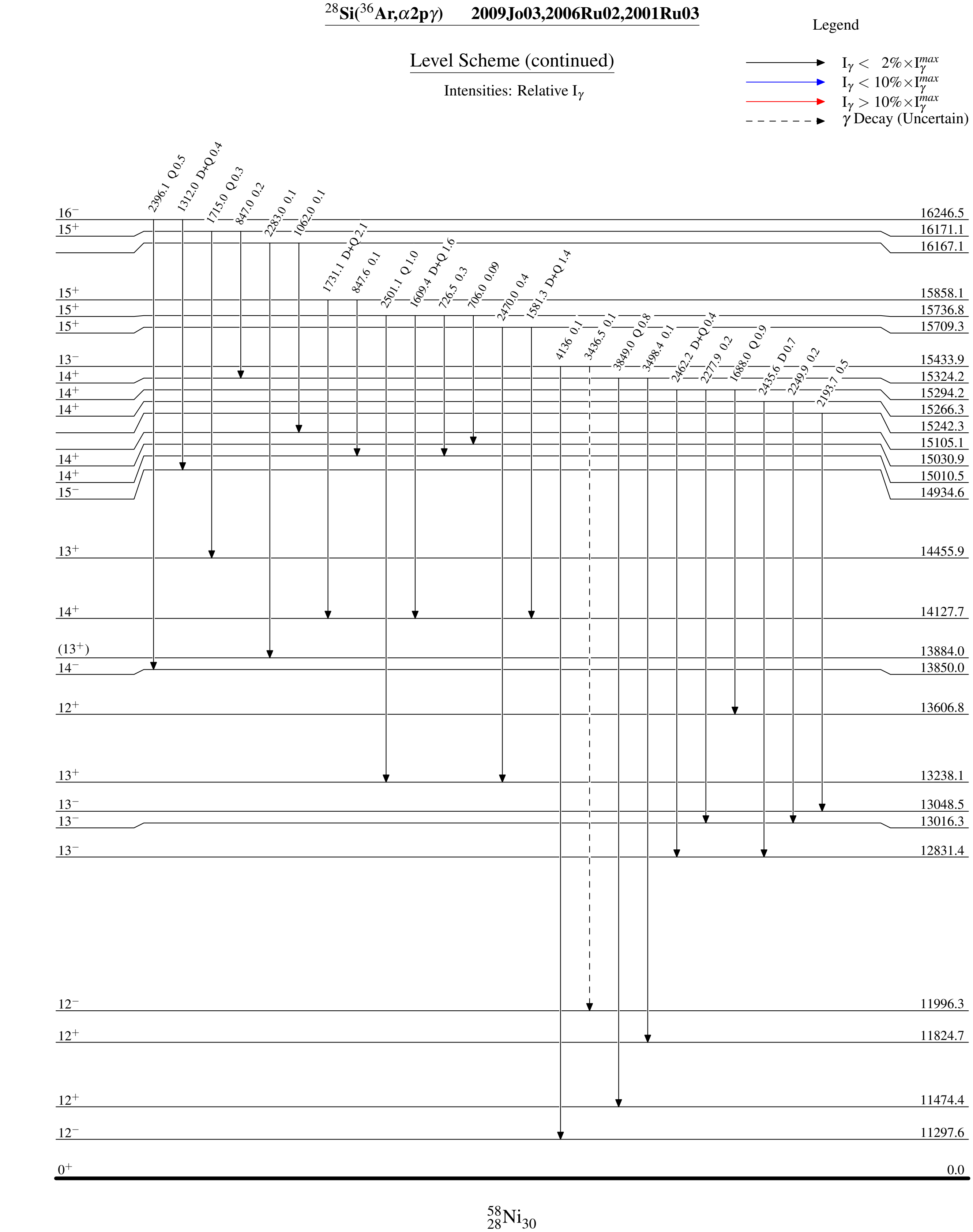


$^{58}_{28}$Ni$_{30}$

$^{28}Si(^{36}Ar,\alpha 2p\gamma)$ 2009Jo03,2006Ru02,2001Ru03

Level Scheme (continued)

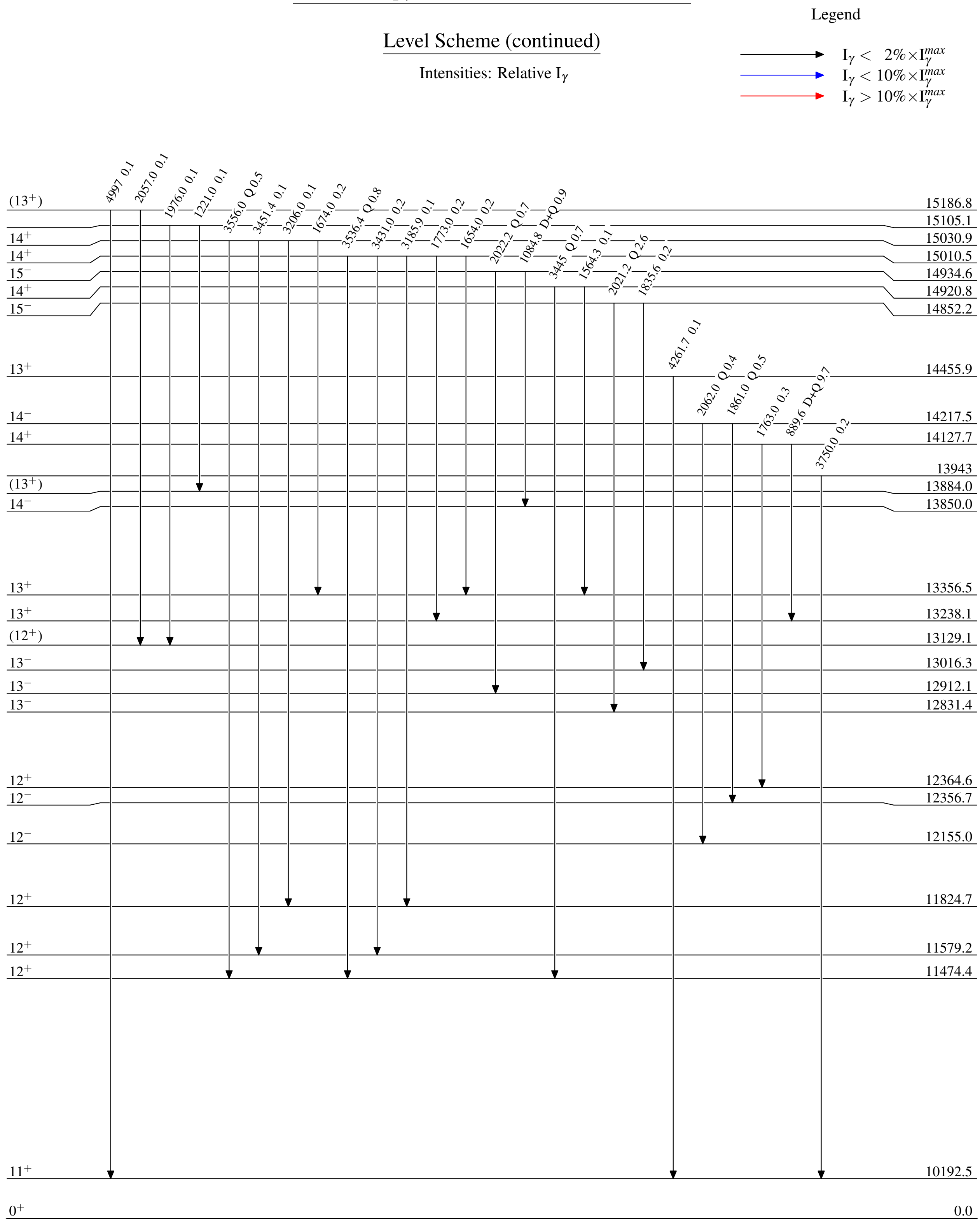
Intensities: Relative I_γ



$^{28}Si(^{36}Ar,\alpha 2p\gamma)$ 2009Jo03,2006Ru02,2001Ru03

Level Scheme (continued)

Intensities: Relative I_γ

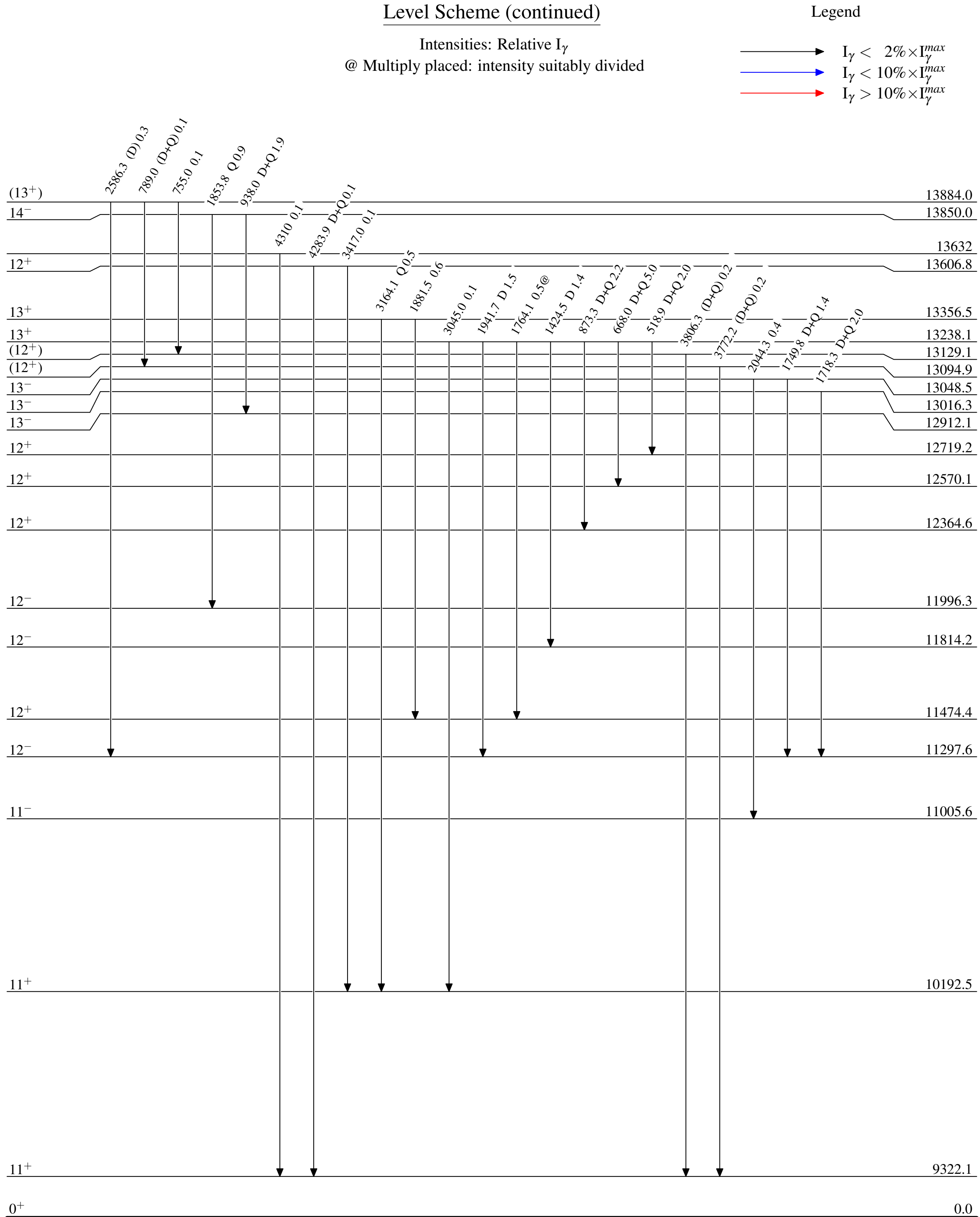


$^{28}Si(^{36}Ar,\alpha 2p\gamma)$ 2009Jo03,2006Ru02,2001Ru03

Level Scheme (continued)

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided



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

^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03

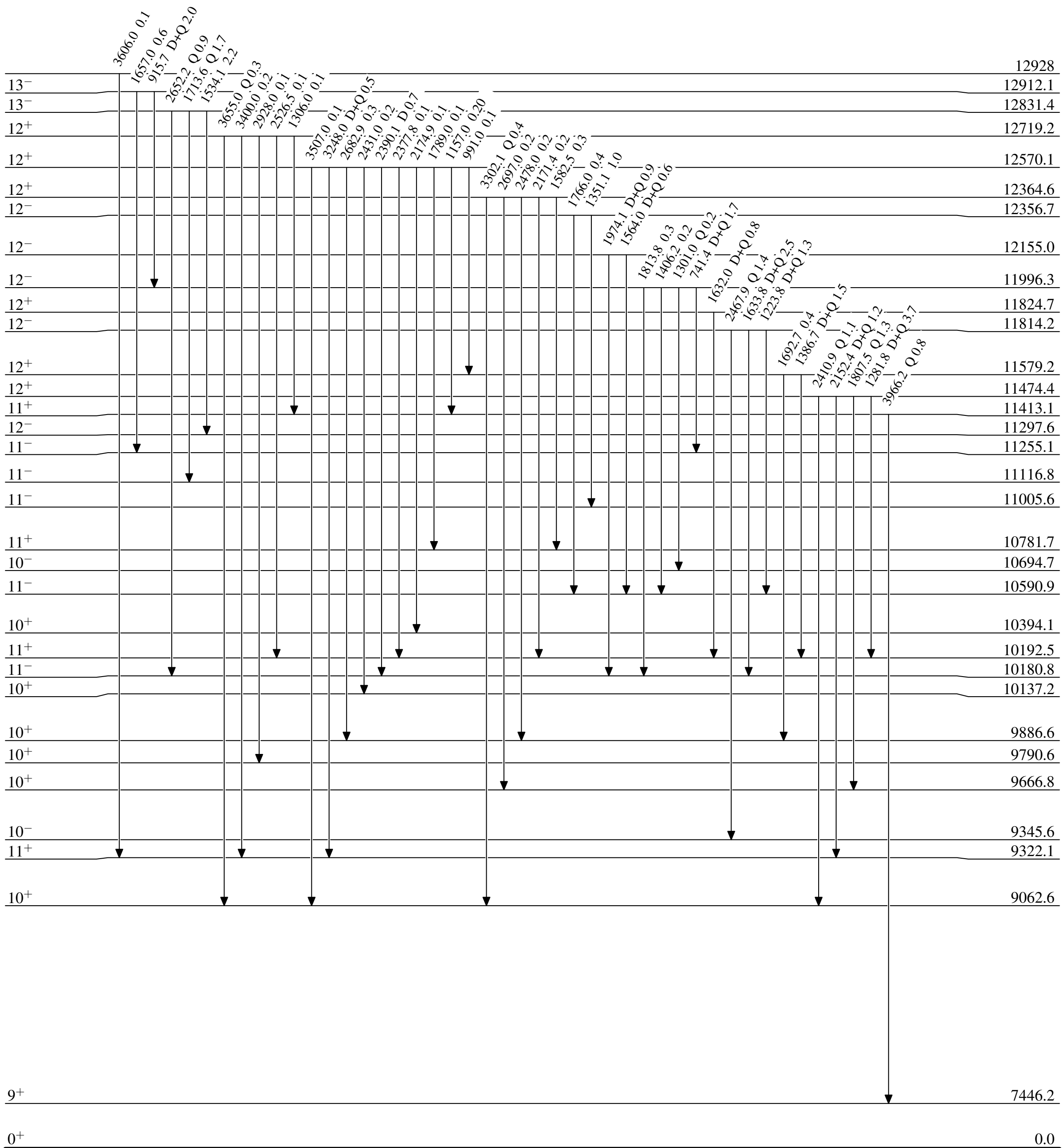
Level Scheme (continued)

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$



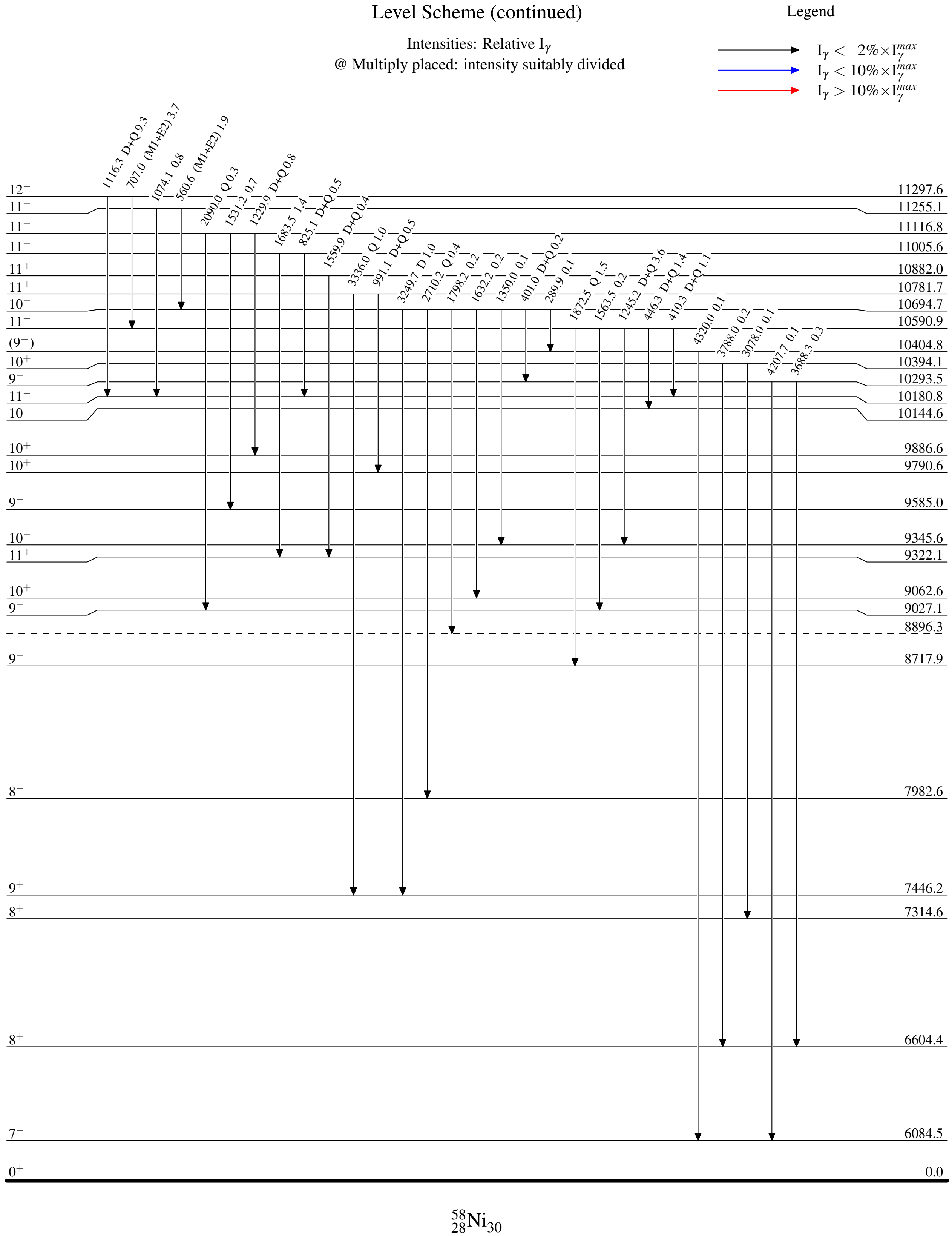
$^{58}_{28}Ni_{30}$

$^{28}Si(^{36}Ar,\alpha 2p\gamma)$ 2009Jo03,2006Ru02,2001Ru03

Level Scheme (continued)

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided

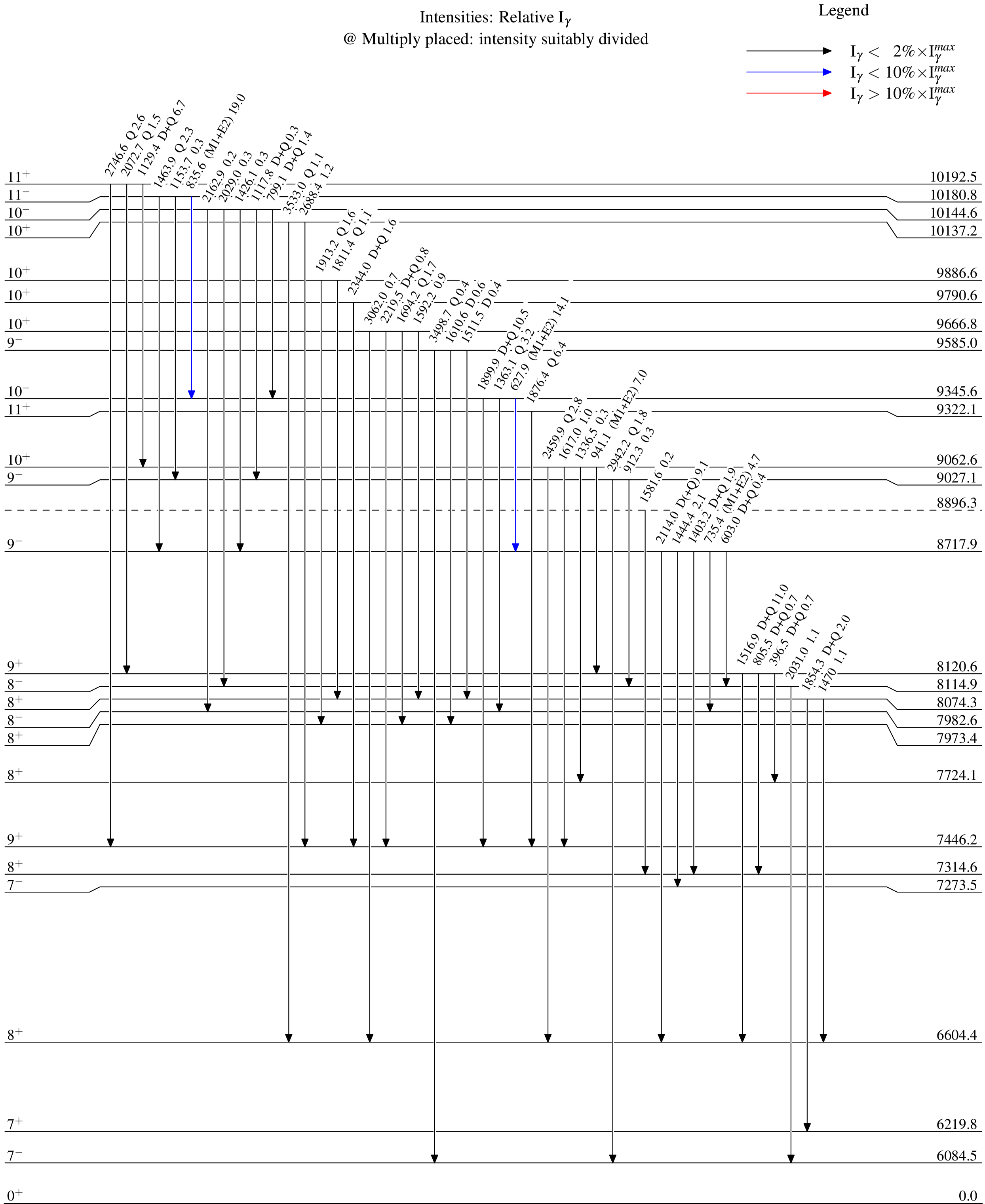


^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03

Level Scheme (continued)

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided



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

^{28}Si(^{36}Ar,α2pγ) 2009Jo03,2006Ru02,2001Ru03

Level Scheme (continued)

Intensities: Relative I_γ

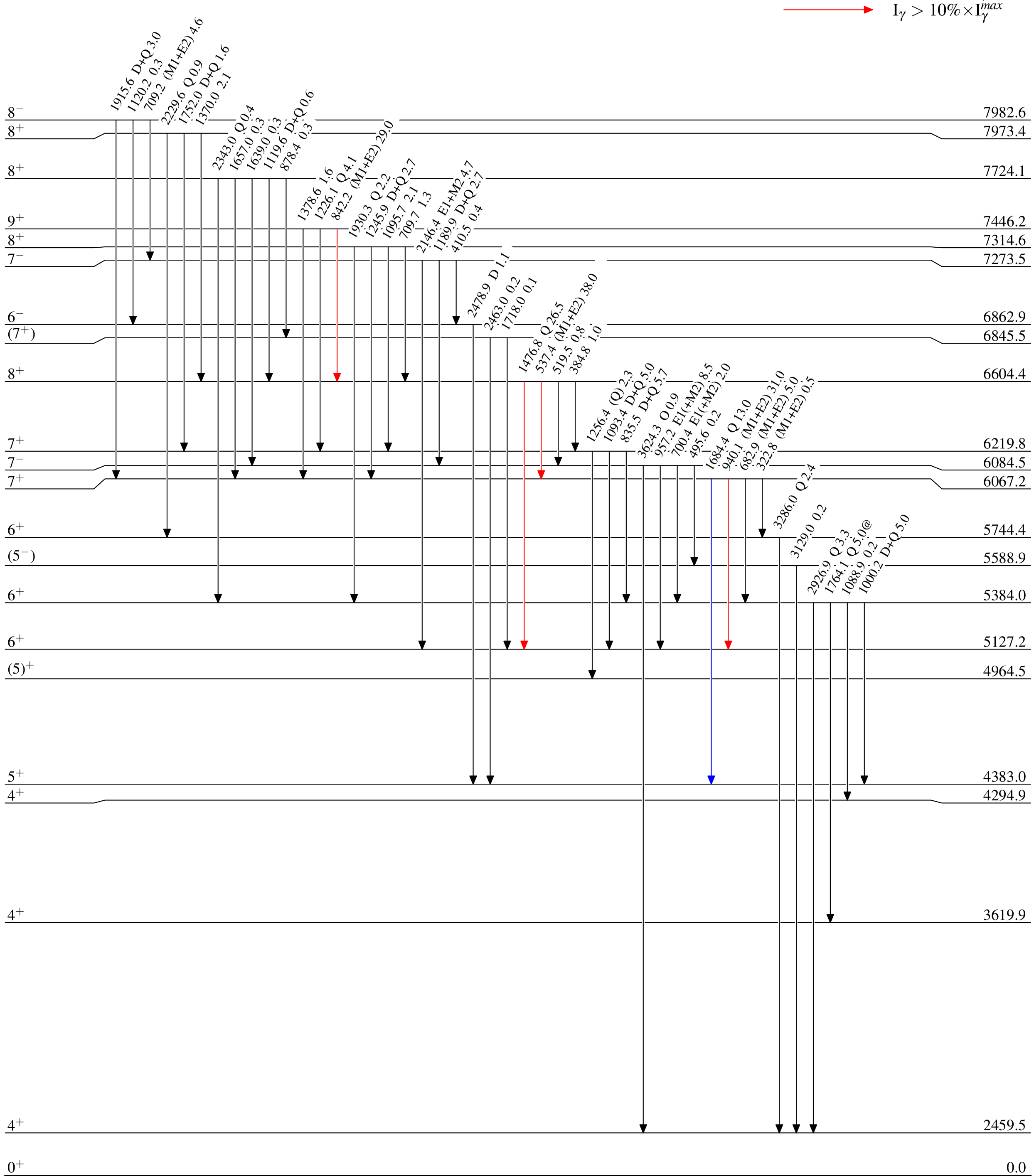
@ Multiply placed: intensity suitably divided

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$



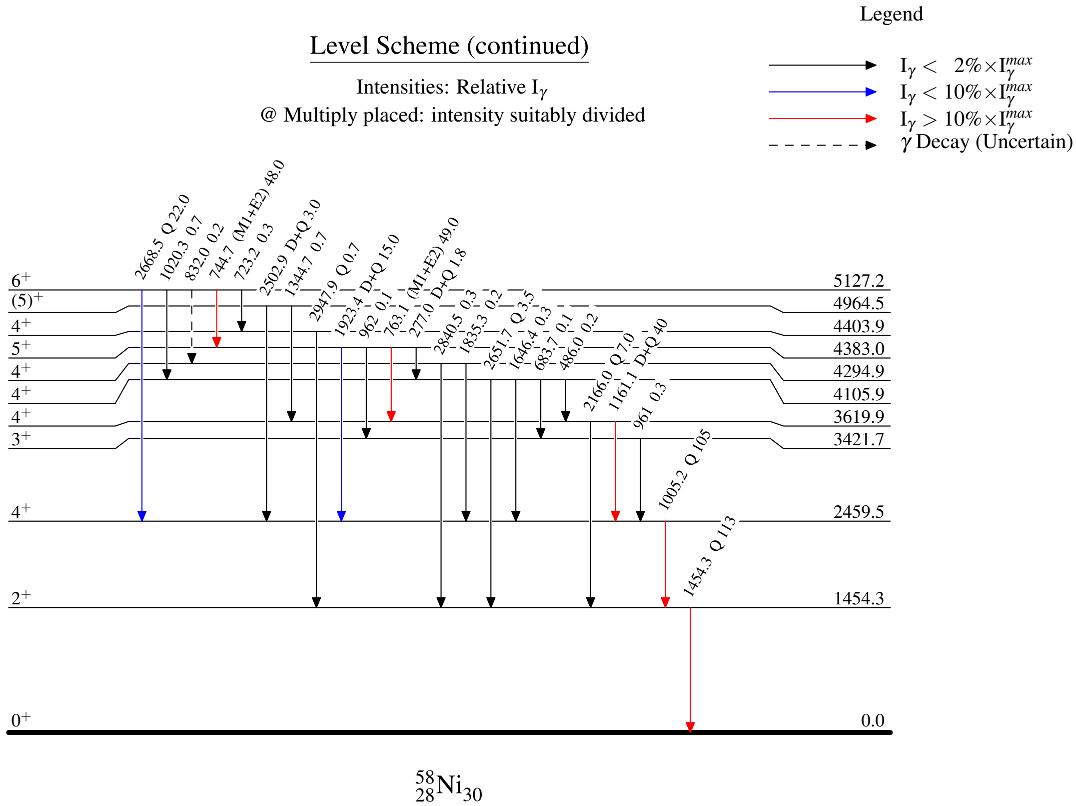
$^{58}_{28}Ni_{30}$

$^{28}Si(^{36}Ar,\alpha2p\gamma)$ 2009Jo03,2006Ru02,2001Ru03

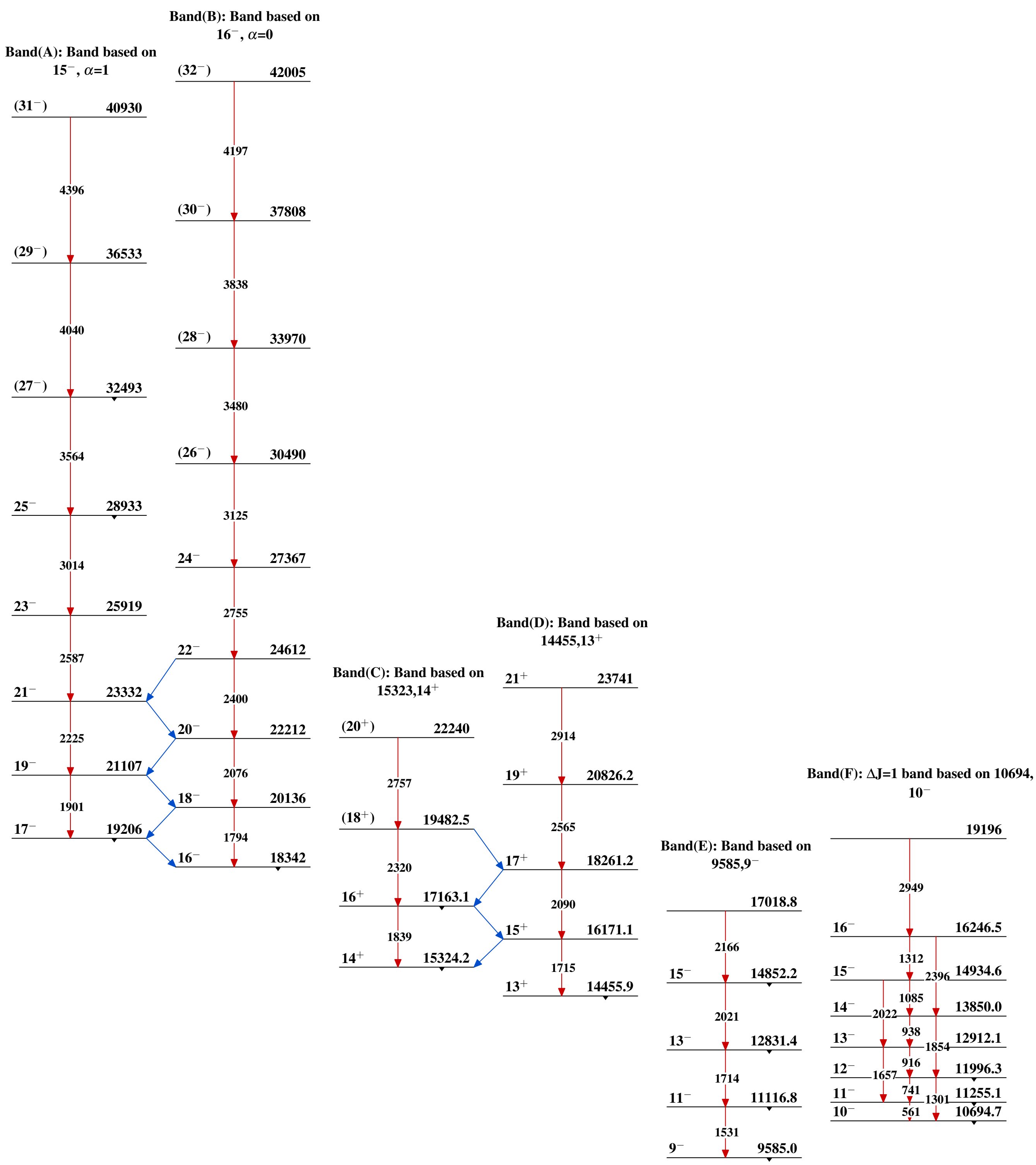
Level Scheme (continued)

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided

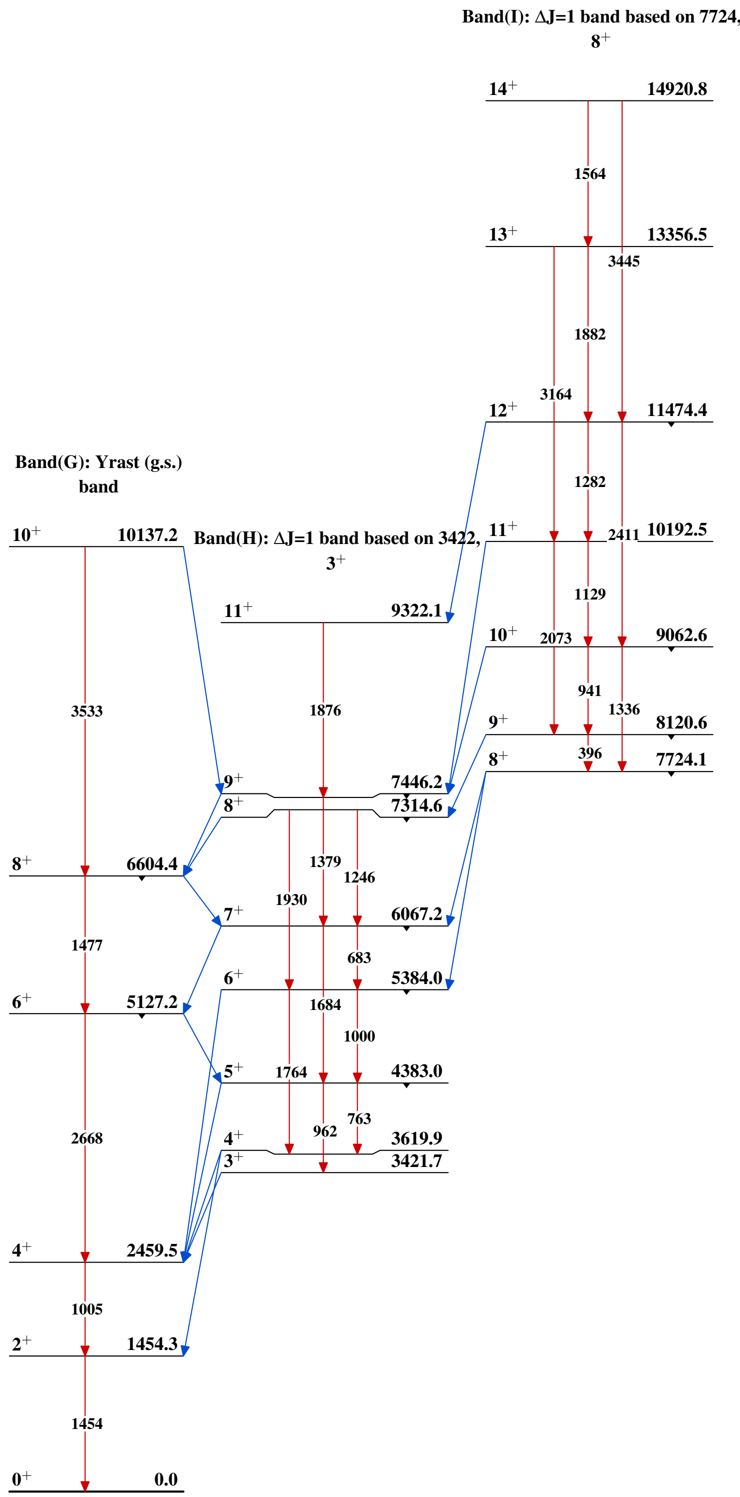


$^{28}Si(^{36}Ar,\alpha 2p\gamma)$ 2009Jo03,2006Ru02,2001Ru03



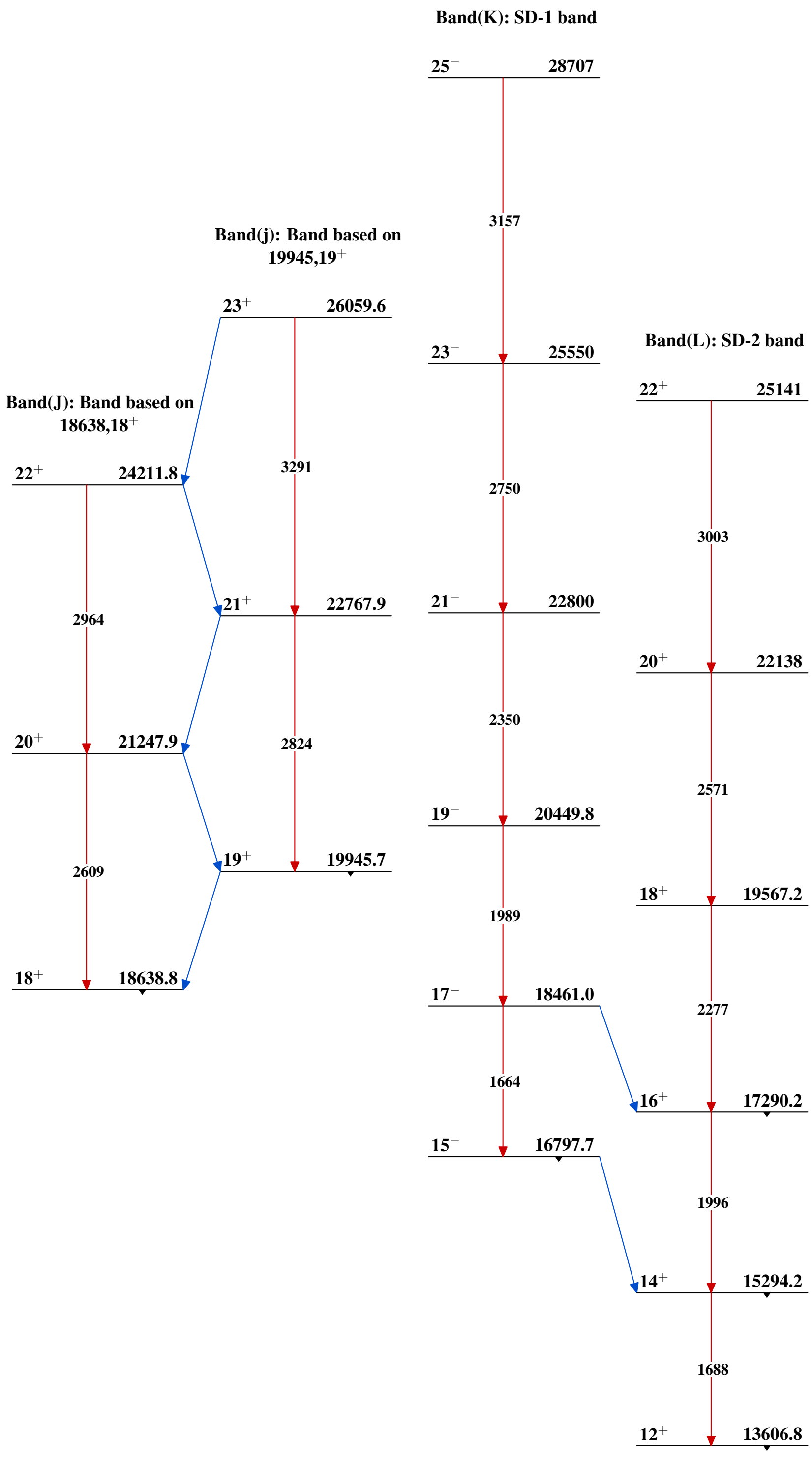
$^{58}_{28}Ni_{30}$

$^{28}Si(^{36}Ar,\alpha 2p\gamma)$ 2009Jo03,2006Ru02,2001Ru03 (continued)



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

$^{28}Si(^{36}Ar,\alpha 2p\gamma)$ 2009Jo03,2006Ru02,2001Ru03 (continued)



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