²⁸Si(³⁶Ar,αpnγ) 1999Ru01,1998Ru01,2001Ru02

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

Includes 40 Ca(24 Mg, α pn γ) from 2001Ru02 (also 1999Ru02).

1999Ru01, 1998Ru01 (also 1999Ru02,2000Ru06): E=143 MeV. Measured E γ , I γ , $\gamma\gamma\gamma$, n $\gamma\gamma$, $\gamma\gamma(\theta)$ (DCO), T_{1/2} by residual Doppler-shift method using GAMMASPHERE array of 82 Compton-suppressed Ge detectors, charged-particle array (Microball) of CsI detectors and 15 neutron detectors. A highly-deformed band is reported in the second minimum which is found to decay by γ -emission to spherical states in the first minimum and by prompt proton emission to low-lying levels in ⁵⁷Ni. Self-consistent Hartree-Fock calculations were used to predict large collectivity of the highly-deformed band and general trend of dynamic moment of inertia.

- 2001Ru02, 2001Ru11: 40 Ca(24 Mg, α pn γ) E=96 MeV. Measured γ , $\gamma\gamma$, lifetimes by Doppler-shifted attenuated γ -ray lineshapes using EUROBALL array of 26 CLOVER detectors and 15 CLUSTER detectors. Neutrons were measured in coin with γ rays using an array of 50 liquid scintillators of the EUROBALL neutron wall. In 2001Ru11, γ -proton correlations were measured to deduce lifetime of proton decaying state.
- 2002Ru09: E=148 MeV. Measured E γ , I γ , $\gamma\gamma(\theta)$ (DCO), prompt protons, (proton) γ coin using GAMMASPHERE array of 86 Compton-suppressed Ge detectors, MICROBALL and a wall of four Δ E-E silicon-strip telescopes. Neutrons were detected by 20 liquid scintillators.
- A tentative 6585 level with 1396 γ and 3073 γ proposed earlier is not confirmed by 2002Ru09. DCO values are for 97°-150° geometry.
- 2007JoZW (conference paper): describes experimental arrangement to measure energies and angular distributions of prompt proton from high-spin states in ⁵⁸Cu and ⁵⁸Ni. 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 $E\gamma$ - $E\pi$ coin matrix, earlier results for proton decay from 8915 level were confirmed. However, the plan of this experiment was to study prompt proton decay of high-spin states in ⁵⁸Ni.

⁵⁸Cu Levels

E(level) [†]	$J^{\pi \ddagger}$	$T_{1/2}^{\#}$	Comments
0.0	1^{+}		
443.5 2	$3^{(+)}$		
1548.8 <i>3</i>	(4^{+})		
1646.7 7	(3+)		
2064.4 3	(5+)		
2919.6 5	(5^{+})		
3420.1 5	(7^{+})		
3511.6? 7			
4064.7 6	(7^{+})		
4440.4 6	(8^{+})		
5189 2	(7^{+})		J^{π} : from 2002Ru09.
5346.9 8	(9+)		
5574.0 7	(9 ⁺)		
6386.2 9	(10^{+})		
6793 <i>1</i>	(9)		
7391 <i>1</i>	(11^{+})		
8126 <i>1</i>	(11)		
8227? 1	(9+)		
8486 2	(12^{+})		
8880 2			
8915 [@] 1	(9 ⁺)	0.22 ps <i>18</i>	 %p=96 4 %p: from author's estimation of %γ<3 in 1998Ru01 and conservative lower limit of 93% in 2002Ru09. T_{1/2}: 0.042-0.40 ps (2001Ru11). J^π: from 2001Ru02. Main decay is through prompt proton transition of angular momentum 3 to 5 and E(p)(c.m.

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²⁸Si(³⁶Ar,αpnγ) 1999Ru01,1998Ru01,2001Ru02 (continued)

⁵⁸Cu Levels (continued)

E(level) [†]	$J^{\pi \ddagger}$	$T_{1/2}^{\#}$	Comments
			system)= 2290 20 (2002Ru09) to 3701, 9/2 ⁺ level in 57 Ni. Weak proton transition to 3864, $11/2^{-}$ level in 57 Ni is not confirmed by 2002Ru09. A 2330 γ from this level proposed earlier is not confirmed by 2002Ru09.
			Proton decay is identified from the observation of following γ transitions in ⁵⁷ Ni in coincidence experiments: 769 (from 769 level), 2577 (from 2577 level), 1124 and 2932 (from 3701 level). DCO(1124 γ)=0.47 <i>13</i> (2001Ru02).
9679 <i>3</i>			
9745 [@] 1	(11 ⁺)	0.38 ps 4	$T_{1/2}$: from 2001Ru02. Q(transition)=2.75 +27-24 (2001Ru02). Weak (a^{26}) proton decay from this level, originally proposed is not confirmed by 2002Pu00.
9803 1	(12)		weak ($\approx 8\%$) proton decay from this level, originarry proposed, is not commined by 2002ku09.
10775 3	(12)		
10942 [@] 1	(13 ⁺)	0.104 ps 14	$T_{1/2}$: from 2001Ru02. Q(transition)=2.55 +19-15 (2001Ru02).
11552 <i>3</i> 11841 <i>3</i>			
12519 [@] 1	(15 ⁺)	0.035 ps 7	$T_{1/2}$: from 2001Ru02. Q(transition)=2.21 +26-19 (2001Ru02).
13128 4			
14474 [@] 2 14880 <i>4</i>	(17 ⁺)		
16816 [@] 3	(19^{+})		
19564 [@] 4	(21^+)		
22745 [@] 5	(23+)		

[†] From least-squares fit to $E\gamma's$.

[‡] From 1999Ru01 and 2001Ru02 based on $\gamma\gamma(\theta)$ data, band structures and decay pattern of yrast type states. The parentheses have been added by the evaluators due to lack of strong arguments.

[#] From Doppler-attenuated line shape analysis (2001Ru02).

^(a) Band(A): $v4^{1}\pi4^{1}$ intruder band (1998Ru01,1999Ru01,2001Ru02). Average Q(transition)= 2.0 2 (1998Ru01), β_{2} =0.37. Interpreted (1998Ru01) as well-deformed rotational band in the second minimum. This band is also discussed by 1999Ru02.

$\gamma(^{58}Cu)$

DCO values are from 1999Ru01 ($30^\circ - 83^\circ$ geometry), unless otherwise stated. Angular distribution data are also given by 1999Ru01 in terms of R(asymmetry) for $30^\circ - 83^\circ$ geometry. These values are given under document records. Other DCO values for selected transitions are from 2001Ru02 and 2002Ru09.

E_{γ}^{\dagger}	I_{γ}^{\dagger}	E_i (level)	\mathbf{J}_i^{π}	E_f	\mathbf{J}_f^{π}	Mult. [‡]	Comments
418 1	8 1	2064.4	(5 ⁺)	1646.7	(3^{+})		
443.5 2	100 3	443.5	3(+)	0.0	1+	Q	DCO=1.16 10 (2001Ru02). Additional information 1.
500.5 <i>3</i>	61	3420.1	(7^{+})	2919.6	(5^{+})	Q	DCO= 1.01 20.
515.4 3	26 1	2064.4	(5 ⁺)	1548.8	(4 ⁺)	D	DCO= 0.54 7. Additional information 3.
592.0 5	3 1	3511.6?		2919.6	(5^{+})		
830.2 3	22 1	9745	(11 ⁺)	8915	(9 ⁺)	E2	DCO=0.96 <i>18</i> (2002Ru09). Additional information 15.

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²⁸Si(³⁶Ar,αpnγ) **1999Ru01,1998Ru01,2001Ru02** (continued)

γ (⁵⁸Cu) (continued)

$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	E_{γ}^{\dagger}	I_{γ}^{\dagger}	E _i (level)	\mathbf{J}_i^π	\mathbf{E}_{f}	\mathbf{J}_f^{π}	Mult. [‡]	Comments
$ 1202.44 \ 422 \ 4440.4 \ (8^{+}) \ 3420.1 \ (7^{+}) \ D \\ 202 \ 0.77 \ 12. \\ Additional information 9. \\ Rasymmetry)=0.36 \ 17 \ (1999Ru01). \\ 1050 \ 3 \ 29 \ 1 \ 548.8 \ (4^{+}) \ 443.5 \ 3^{(+)} \ D \\ DCO = 0.55 \ 10. \\ Additional information 2. \\ DCO = 0.95 \ 30. \\ Additional information 7. \\ DCO = 1.07 \ 22 \ (2001Ru02). \\ Additional information 10. \\ $	906 1	8 1	5346.9	(9 ⁺)	4440.4	(8^{+})	D	R(asymmetry)=0.70 17 (1999Ru01).
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1020.4 4	42 2	4440.4	(8+)	3420.1	(7^{+})	D	DCO= 0.77 12.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1020 1	5 1	(29()	(10+)	5246.0	(0+)	D	Additional information 9.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1039 1	5 I 20 I	0380.2	(10^{+})	5346.9	(9^{+}) 2(+)	D	$R(asymmetry) = 0.86 \ 17 \ (1999Ru01).$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1105.0 5	29 1	1340.0	(4)	445.5	3. 7	D	Additional information 2
Additional information 7. 1197.35 30.2 10942 (13^+) 9745 (11^+) $E2$ $DCO=1.07$ 22 $2001Ru02$). 13171 4.1 9803 (12) 8486 (12^+) $DCO=1.07$ 22 $2001Ru02$). 1355.64 752 3420.11 (7^+) 2064.4 (5^+) Q $DCO=1.09$ $10.$ 14461 6.1 6793 (9) 5346.9 (9^+) $Additional information 6.$ 14461 6.1 6793 (9) 5346.9 (9^+) Q $DCO=1.02$ 17 $01999Ru01$); $possibly \Delta I=0$ transition. 1899 5.1 8880 7391 (11^+) Q $DCO=1.02$ 17 $01999Ru01$); $Additional information 11.$ 1509.35 16.1 5774.0 (9^+) 4064.7 (7^+) Q $DCO=1.02$ 17 $0199Ru01$); $Additional information 16.$ 1576.4 28.1 12519 (15^+) 10942 (13^+) $E2$ $DCO=1.23$ 21 $(200Ru02)$; 8 1677.1 8.126 (11) 01^+ $DCO=1.03$ 8.1 $DCO=1.02$ 1.0 $Additional information 18.$ 1647.1 10.1 1646.7 (3^+) 0.0 1^+ $DCO=1.02$ 1.0 $Additional information 14.$ $1880^{\circ\circ}$ $3^{\circ\circ}$ $10^{\circ\circ}$ $11^{\circ\circ}$ 880 $10^{\circ\circ}$ $2000 - 1.23$ 21 $2000 - 1.23$ 127.1 8126 (1^+) 8126	1145.2 5	91	4064.7	(7^{+})	2919.6	(5^{+})		$DCO = 0.95 \ 30.$
$ \begin{array}{llllllllllllllllllllllllllllllllllll$. ,		· · ·		Additional information 7.
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1197.3 5	30 2	10942	(13 ⁺)	9745	(11^{+})	E2	DCO=1.07 22 (2001Ru02).
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1017 1	4.7	0000	(10)	0.407	(10+)		Additional information 19.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	131/1	4 <i>I</i> 75 2	9803 3420 1	(12) (7^+)	8486 2064 4	(12^{+})	0	DCO = 1.00.10
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1555.0 4	15 2	3420.1	(7)	2004.4	(5)	Q	Additional information 6
$ \begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	1446 <i>1</i>	61	6793	(9)	5346.9	(9^{+})		R(asymmetry)=1.7 3 (1999Ru01); possibly $\Delta J=0$ transition.
	1489 <i>1</i>	5 1	8880		7391	(11^{+})		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1509.3 5	16 <i>1</i>	5574.0	(9 ⁺)	4064.7	(7^{+})	Q	DCO=1.02 17 for 1509+1519 (2001Ru02);
Additional information 11. DCD=1.02 17 for 1509+1519 (2001Ru02); \$ R(asymmetry)=1.2 3 (1999Ru01). Additional information 20. Additional information 20.1576.4 428 112519(15 ⁺)10942(13 ⁺)E2DCD=1.23 21 (2002Ru09); R(asymmetry)=1.41 14 (1999Ru01). Additional information 20.1621.2 460 22064.4(5 ⁺)443.5 3(⁺)QAdditional information 4. DCD=1.08 8.1647 110 11646.7(3 ⁺)0.0 1 ⁺ DCO=1.2 3. Additional information 18.1647 110 11646.7(3 ⁺)0.0 1 ⁺ 1671 1819803(12)8126(11)1740 112 18126(11)6386.2 (10 ⁺)(D)1740 112 18126(11)6386.2 (10 ⁺)(D)1887 6611077588801927 133 25346.9(9 ⁺)3420.1(7 ⁺)Q1946 124 26386.2(10 ⁺)440.4(8 ⁺)QDCO= 1.05 15. Additional information 10. Additional information 12.1955 124 114474(17 ⁺)12519(15 ⁺)QDCO=1.2 3 (2001Ru02). Additional information 21.2000 115 14064.7(7 ⁺)2064.4 (5 ⁺)QDCO=1.2 3 (2001Ru02). Additional information 3.2082 26 1118419803 (12) CO=1.23 (2001Ru02). Additional information 13.2018.22084 219 27391(11 ⁺)5346.9(9 ⁺)2084 219 27391(11 ⁺)								$R(asymmetry) = 1.21 \ 12 \ (1999Ru01).$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1510 1	5 1	0745	(11+)	02229	(0^{\pm})	E2	Additional information 11. DCO = 1.02.17 for 1500 + 1510 (2001Bar02) f
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	13191	51	9745	(11)	0227:	(9)	EZ	B(asymmetry) = 1.2.3 (1999 Bu01)
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$								Additional information 16.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1576.4 4	28 1	12519	(15^{+})	10942	(13^{+})	E2	DCO=1.23 21 (2002Ru09); R(asymmetry)=1.41 14
Additional information 20. $1621.2 \ 4 \ 60 \ 2 \ 2064.4 \ (5^+) \ 443.5 \ 3^{(+)} \ Q \ Additional information 4. DC0=1.08 \ 8.1647 \ 1 \ 10 \ 1 \ 1646.7 \ (3^+) \ 0.0 \ 1^+1677 \ 1 \ 8 \ 1 \ 9803 \ (12) \ 8126 \ (11) \ 6386.2 \ (10^+) \ (D) \ DC0=1.2 \ 3. Additional information 18.1740 \ 1 \ 12 \ 1 \ 8126 \ (11) \ 6386.2 \ (10^+) \ (D) \ DC0=1.05 \ 15. \ Additional information 14.1818^{(0)} \ 3^{(0)} \ 1 \ 10775 \ 8880 \ 1927 \ 1 \ 33 \ 2 \ 5346.9 \ (9^+) \ 3420.1 \ (7^+) \ Q \ DC0=1.05 \ 15. \ Additional information 10. \ DC0=1.01 \ 16. \ Additional information 10. \ DC0=1.01 \ 16. \ Additional information 12. \ DC0=1.03 \ 16 \ (2001Ru02). \ Additional information 12. \ DC0=1.03 \ 16 \ (2001Ru02). \ Additional information 8. \ C00=1.23 \ (2001Ru02). \ Additional information 8. \ C00=1.23 \ 17 \ (1999Ru01) \ 17 \ 12519 \ (11^+) \ 5346.9 \ (9^+) \ Q \ DC0=1.23 \ 12001Ru02). \ Additional information 13. \ C00=1.23 \ 2001Ru02). \ Additional information 14. \ C00=1.23 \ 12001Ru02). \ C0=1.23 \ 12001Ru02). \ C0$								(1999Ru01).
$1621.2\ 4$ $60\ 2$ 2064.4 (5^+) $443.5\ 3^{(+)}$ QAdditional information 4. DCO=1.08 8. $1647\ 1$ $10\ 1$ 1646.7 (3^+) $0.0\ 1^+$ $DCO=1.08\ 8.$ $1677\ 1$ $8\ 1$ 9803 (12) 8126 (11) $DCO=1.08\ 8.$ $1740\ 1$ $12\ 1$ 8126 (11) $6386.2\ (10^+)$ (D) $DCO=1.2\ 3.$ Additional information 18. $1740\ 1$ $12\ 1$ 8126 (11) $6386.2\ (10^+)$ (D) $DCO=1.78\ 20.$ Additional information 14. $1818^{(0)}$ $3^{(0)}\ 1$ $7391\ (11^+)$ $5574.0\ (9^+)$ $BCO=1.05\ 15.$ 						(.)		Additional information 20.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1621.2 4	60 2	2064.4	(5^{+})	443.5	3(+)	Q	Additional information 4.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1617 1	10 1	1646 7	(2^{+})	0.0	1+		DCO=1.08 8.
1011 1101 1101 1101 1101 1101 1101 11740 112 18126(11)6386.2(10 ⁺)(D)DCO= 0.78 20. Additional information 14.1818 (a)3 (a)17391(11 ⁺)5574.0(9 ⁺)1895 16 11077588801927 133 25346.9(9 ⁺)3420.1(7 ⁺)Q1946 124 26386.2(10 ⁺)4440.4(8 ⁺)QDCO= 1.05 15. Additional information 10.1946 124 26386.2(10 ⁺)4440.4(8 ⁺)QDCO= 1.08 16(2001Ru02). Additional information 12.1955 124 114474(17 ⁺)12519(15 ⁺)QDCO=1.08 16(2001Ru02). Additional information 21.2000 115 14064.7(7 ⁺)2064.4(5 ⁺)QDCO=1.2 3(2001Ru02). Additional information 8.2038 26 1118419803(12) S346.9R(asymmetry)=1.35 17(1999Ru01) for a doublet.2044 219 27391(11 ⁺)5346.9(9 ⁺)QDCO= 1.3 5, $\hat{R}(asymmetry)=1.25$ 16 (1999Ru01).2087 24 188806793(9) 7391DCO= 1.16 20(2002Ru09). Additional information 13.2087 24 116816(19 ⁺)14474(17 ⁺)QDCO=1.16 20(2002Ru09). Additional information 22.	1677 1	87	9803	(3) (12)	8126	(11)		DCO = 1.2.3
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	10// 1	01	7005	(12)	0120	(11)		Additional information 18.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1740 <i>1</i>	12 <i>I</i>	8126	(11)	6386.2	(10^{+})	(D)	DCO= 0.78 20.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	_	_						Additional information 14.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1818 [@]	3 [@] 1	7391	(11^{+})	5574.0	(9+)		
19277 332 5346.9 (9^+) 3420.1 (7^+) QDCO= 1.0575. Additional information 10. 19461 242 6386.2 (10^+) 4440.4 (8^+) QDCO= 1.1016. Additional information 12. 19551 241 14474 (17^+) 12519 (15^+) QDCO=1.0816 20001 151 4064.7 (7^+) 2064.4 (5^+) QDCO=1.233 20001 151 4064.7 (7^+) 2064.4 (5^+) QDCO=1.233 2002 11841 9803 (12) R(asymmetry)=1.3517 $(1999Ru01)$ for a doublet. 20442 192 7391 (11^+) 5346.9 (9^+) QDCO= 1.2225. Additional information 13. 20872 41 8880 6793 (9) DCO= 1.35, $\hat{R}(asymmetry)=1.2516$ $(1999Ru01)$. 21002 91 8486 (12^+) 6386.2 (10^+) (Q) DCO= 1.35, $\hat{R}(asymmetry)=1.2516$ $(1999Ru01)$. 22882 71 9679 7391 (11^+) Q DCO=1.1620 $2002Ru09$. Additional information 22.	1895 <i>I</i>	61	10775	(0+)	8880		0	
1946 I 24 2 6386.2 (10^+) 4440.4 (8^+) QDCO= 1.01I6. Additional information 10.1955 I 24 I 14474 (17^+) 12519 (15^+) QDCO=1.08 $I6$ (2001Ru02). Additional information 21.2000 I 15 I 4064.7 (7^+) 2064.4 (5^+) QDCO=1.2 3 (2001Ru02). Additional information 8.2038 2 6 I 118419803(12) S346.9R(asymmetry)=1.35 $I7$ (1999Ru01) for a doublet.2044 2 19 2 7391 (11^+) 5346.9 (9^+) QDCO= 1.22 25 . Additional information 13.2087 2 4 I 88806793 (9) T391DCO= 1.3 5 , $\hat{R}(asymmetry)=1.25 16$ (1999Ru01).2082 2 7 I 96797391 (11^+) QDCO= 1.16 20 (2002Ru09). Additional information 22.	1927 1	33 2	5346.9	(9+)	3420.1	(/+)	Q	DCO= 1.05 75.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1946 1	24.2	6386.2	(10^{+})	4440 4	(8^{+})	0	DCO = 1.10.16
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	17101	212	0500.2	(10)	1110.1	(0)	X	Additional information 12.
2000 I 15 I 4064.7 (7^+) 2064.4 (5^+) QAdditional information 21.2038 2 6 I 118419803 (12) Additional information 8.2038 2 6 I 118419803 (12) R(asymmetry)=1.35 $I7$ (1999Ru01) for a doublet.2044 2 19 2 7391 (11^+) 5346.9 (9^+) Q2087 2 4 I 88806793 (9) 2100 2 9 I 8486 (12^+) 6386.2 (10^+) (Q) 2288 2 7 I 96797391 (11^+) 2342 2 16 I 16816 (19^+) 14474 (17^+) QDCO=1.16 20 (2002Ru09). Additional information 22.	1955 <i>1</i>	24 1	14474	(17^{+})	12519	(15^{+})	Q	DCO=1.08 16 (2001Ru02).
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								Additional information 21.
2038 2 $6 I$ 118419803 (12) Additional information 8. R(asymmetry)=1.35 $I7$ (1999Ru01) for a doublet.2044 219 27391 (11^+) 5346.9 (9^+) QDCO= 1.22 25 . Additional information 13.2087 24 I88806793 (9) DCO= 1.3 5 , $\hat{R}(asymmetry)=1.25 16$ (1999Ru01).2100 29 I8486 (12^+) 6386.2 (10^+) (Q) DCO= 1.3 5 , $\hat{R}(asymmetry)=1.25 16$ (1999Ru01).2288 27 I96797391 (11^+) DCO=1.16 20 (2002Ru09).2342 216 I16816 (19^+) 14474 (17^+) QDCO=1.16 20 (2002Ru09). Additional information 22.	2000 1	15 <i>1</i>	4064.7	(7^{+})	2064.4	(5^{+})	Q	DCO=1.2 3 (2001Ru02).
2038 2 $6 I$ 11841 9303 (12) $R(asymmetry)=1.53 I7$ $(1999Ru01)$ for a doublet.2044 2 $19 2$ 7391 (11^+) 5346.9 (9^+) Q $DCO= 1.22 25.$ $2087 2$ $4 I$ 8880 6793 (9) $2100 2$ $9 I$ 8486 (12^+) 6386.2 (10^+) (Q) $2288 2$ $7 I$ 9679 7391 (11^+) $2342 2$ $16 I$ 16816 (19^+) 14474 (17^+) Q $DCO=1.16 20$ $(2002Ru09).$ Additional information 22.	2028.2	6.1	110/1		0803	(12)		Additional information 8. P(asymmetry) = 1.25 I7 (1000Pu01) for a doublet
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2038 2	19.2	7391	(11^{+})	9805 5346 9	(12) (9^+)	0	R(asymmetry) = 1.55 T7 (1999Ru01) for a doublet.DCO= 1.22.25
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	20112	1) 2	1571	(11)	5510.7	())	X	Additional information 13.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2087 2	4 1	8880		6793	(9)		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2100 2	91	8486	(12^{+})	6386.2	(10^{+})	(Q)	DCO= 1.3 5, Â(asymmetry)=1.25 16 (1999Ru01).
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2288 2	71	9679		7391	(11^{+})	-	
Additional information 22.	2342 2	16 <i>I</i>	16816	(19+)	14474	(17^{+})	Q	$DCO=1.16\ 20\ (2002Ru09).$
2353.2 3.1 13128 10775	2353 2	31	13128		10775			Additional information 22.
$247648 141 29196 (5^{+}) 4435 3^{(+)} 0 DCO = 1.17.16$	2355 2	14 1	2919.6	(5^{+})	443 5	3 (+)	0	DCO = 1.17.16
Additional information 5.	2170110	111	2/1/.0		115.5	2	×	Additional information 5.
$2654^{\#}2$ 4 1 8227? (9 ⁺) 5574.0 (9 ⁺)	2654 [#] 2	41	8227?	(9^{+})	5574.0	(9^{+})		
2748 2 8 1 19564 (21^+) 16816 (19^+) Q R(asymmetry)=1.43 23 (1999Ru01).	2748 2	8 1	19564	(21^{+})	16816	(19^{+})	Q	R(asymmetry)=1.43 23 (1999Ru01).
3037 [#] 3 2 1 8227? (9 ⁺) 5189 (7 ⁺)	3037 [#] 3	21	8227?	(9 ⁺)	5189	(7 ⁺)		

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			28	Si(³⁶ Ar, <i>a</i> p	onγ)	1999Ru01	,1998Ru01,2001Ru02 (continued)
						γ (⁵⁸ Cu)	(continued)
E_{γ}^{\dagger}	I_{γ}^{\dagger}	E _i (level)	\mathbf{J}_i^{π}	\mathbf{E}_{f}	\mathbf{J}_f^{π}	Mult. [‡]	Comments
3039 <i>3</i>	3 1	14880		11841			
3066 <i>3</i>	31	11552		8486	(12^{+})		
3125 3	21	5189	(7^{+})	2064.4	(5^{+})		
3181 <i>3</i>	21	22745	(23^{+})	19564	(21^+)		
4171 <i>3</i>	6 1	9745	(11+)	5574.0	(9 ⁺)	E2	DCO=1.1 <i>3</i> (2002Ru09); R(asymmetry)=1.46 <i>25</i> (1999Ru01). Additional information 17.
4399 [@] &	1 [@] 1	9745	(11^{+})	5346.9	(9 ⁺)		

[†] From 1999Ru01 unless otherwise stated.

[‡] From DCO ratios, mult=D corresponds to $\Delta J=1$ and mult=Q to $\Delta J=2$, quadrupole transition. RUL used to restrict mult to E2 when level lifetimes are known.

[#] From 2002Ru09. Uncertainty is assigned as in 1999Ru01 for 2652 2 and 3035 3 transitions.

[@] From 2002Ru09, intensity is quoted in text of 2002Ru09.

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



⁵⁸₂₉Cu₂₉

5

²⁸Si(³⁶Ar,αpnγ) <u>1999Ru01,1998Ru01,2001Ru02</u>



⁵⁸₂₉Cu₂₉