^{28}Si(^{36}Ar,2$\alpha\gamma$) 2008Jo04,1999Ru01,1999Ru02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Huo Junde, Huo Su, Yang Dong	NDS 112, 1513 (2011)	29-Oct-2009

2008Jo04: Three experiments performed using Gammasphere array of HPGe detectors with Compton-suppression, and Microball array for charged particle detection. Measured Eγ, Iγ, $\gamma\gamma$, (particle)$\gamma\gamma(\theta)$, (proton)γ coin. Charged particles were detected using neutron shell of liquid scintillators and ΔE-E Si telescopes. Comparisons with Nilsson-Strutinsky calculations.

Experiment GS54 is also described in 1999Ru01, 1999Ru02.

1999Ru01,1999Ru02: E=143 MeV. Measured Eγ, Iγ, $\gamma\gamma$, particle-γ coin, $\gamma(\theta)$, and $\gamma\gamma(\theta)$(DCO) using Gammasphere array with 82 Ge detectors, 4π CsI Microball and fifteen liquid scintillators for neutrons.

All data are from 2008Jo04, except As noted.

Experiment	GS54	GSFMA42	GSFMA138
Facility	LBNL	Argonne	Argonne
Beam energy	143 MeV	148 MeV	142 MeV
Gammasphere Ge detectors	82	86	77
No. of MICROBALL elements	complete	65	16
Liquid scintillators	15	20	30
Si telescopes	0	4	8
FMA and Ion chamber	--	--	Yes

^{56}Ni Levels

E(level)†	Jπ‡	Comments
0.0#	0^+	
2700.3# *9*	2^+	
3924.3# *12*	4^+	
5316.4# *16*	6^+	
5350.5@ *11*	2^+	
6326.4@ *11*	4^+	
7652.6@ *14*	6^+	
7954.6# *18*	8^+	
8225 *3*	(8^+)	
8890?& *3*	(5)	
9309.5@ *17*	8^+	
9417.8# *20*	10^+	
9735.5& *19*	7	%p≈100 This level decays by protons to $7/2^-$, g.s. in ^{55}Co. E(p)(lab)=2540 *30*, observed in (proton)(summed γ) coin spectrum.
10679 *3*	(10^+)	
10935.5& *18*	9	
11296.4@ *18*	10^+	
12357.8# *22*	12^+	
12508.5& *19*	11	
13578@ *3*	12^+	
13644.4 *24*	(12^+)	Jπ: from earlier paper 2006Jo03 from the same group as 2008Jo04.
14454.5& *21*	13	
14735# *3*	14^+	
16358 *4*	13	
16773& *3*	15	

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^{28}Si(^{36}Ar,2$\alpha\gamma$) 2008Jo04,1999Ru01,1999Ru02 (continued)

^{56}Ni Levels (continued)

E(level)[†]	Jπ[‡]
18632[#] *5*	(16$^+$)
19521[&] *5*	17
22459[&] *7*	

† From least-squares fit to Eγ′s.
‡ From multipolarity of gamma-rays.
# Band(A): yrast (g.s.) band.
@ Band(B): SD-1 band.
& Band(C): SD-2 band.

γ(^{56}Ni)

DCO ratios (E2 gated) and A_2′s are for 30° − 83° arrangement, SEE 1999Ru01.

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	Comments
845 *2*	1 *1*	9735.5	7	8890?	(5)	(E2)	
976 *1*	8 *2*	6326.4	4$^+$	5350.5	2$^+$	E2	A_2=1.49 *18* (1999Ru01). R_{30-83}=1.1 *1* (2008Jo04).
1200 *1*	25 *3*	10935.5	9	9735.5	7	E2	R_{30-83}=1.2 *2* (2008Jo04).
1212 *1*	3 *1*	12508.5	11	11296.4	10$^+$		R_{30-83}=0.7 *4*.
1224 *1*	89 *5*	3924.3	4$^+$	2700.3	2$^+$	E2	DCO=1.01 *17* (1999Ru01). A_2=1.24 *10* (1999Ru01). R_{30-83}=1.2 *1*.
1326 *1*	23 *4*	7652.6	6$^+$	6326.4	4$^+$	E2	A_2=1.27 *15* (1999Ru01). R_{30-83}=1.2 *1* (2008Jo04).
1392 *1*	78 *5*	5316.4	6$^+$	3924.3	4$^+$	E2	DCO=0.89 *16* (1999Ru01). A_2=1.50 *21* (1999Ru01). R_{30-83}=1.2 *1* (2008Jo04).
1463 *1*	28 *3*	9417.8	10$^+$	7954.6	8$^+$	E2	DCO=0.88 *24* (1999Ru01). A_2=1.30 *14* (1999Ru01). R_{30-83}=1.4 *1* (2008Jo04).
1573 *1*	38 *3*	12508.5	11	10935.5	9	E2	A_2=1.31 *18* (1999Ru01). R_{30-83}=1.5 *1* (2008Jo04).
1626 *1*	13 *2*	10935.5	9	9309.5	8$^+$	D	A_2=0.90 *13* (1999Ru01). R_{30-83}=0.8 *1* (2008Jo04).
1657 *1*	25 *3*	9309.5	8$^+$	7652.6	6$^+$	E2	A_2=1.15 *15* (1999Ru01). R_{30-83}=1.1 *1* (2008Jo04).
1946 *1*	35 *5*	14454.5	13	12508.5	11	E2	A_2=1.24 *18* (1999Ru01). R_{30-83}=1.2 *2* (2008Jo04).
1987 *1*	13 *2*	11296.4	10$^+$	9309.5	8$^+$	E2	A_2=1.30 *36* (1999Ru01). R_{30-83}=1.3 *1* (2008Jo04).
2083 *2*	1 *1*	9735.5	7	7652.6	6$^+$		
2282 *2*	11 *2*	13578	12$^+$	11296.4	10$^+$	E2	R_{30-83}=1.2 *2* (2008Jo04).
2318 *2*	28 *2*	16773	15	14454.5	13	E2	R_{30-83}=1.2 *1* (2008Jo04).
2349 *3*	3 *1*	13644.4	(12$^+$)	11296.4	10$^+$		
2377 *2*	9 *3*	14735	14$^+$	12357.8	12$^+$	E2	A_2=1.46 *21* (1999Ru01). R_{30-83}=1.2 *3* (2008Jo04).
2402 *1*	3 *1*	6326.4	4$^+$	3924.3	4$^+$		A_2=1.49 *18* (1999Ru01).
2454[†] *2*	6 *1*	10679	(10$^+$)	8225	(8$^+$)		

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^{28}Si(^{36}Ar,2$\alpha\gamma$) 2008Jo04,1999Ru01,1999Ru02 (continued)

$\gamma(^{56}Ni)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	Comments
2638 *1*	36 *4*	7954.6	8^+	5316.4	6^+	E2	DCO=1.16 *30* (1999Ru01). A_2=1.26 *13* (1999Ru01). R_{30-83}=1.3 *2* (2008Jo04).
2650 *1*	3 *1*	5350.5	2^+	2700.3	2^+	D+Q	Mult.: ΔJ=0 transition. R_{30-83}=1.6 *3* (2008Jo04).
2700 *1*	100 *4*	2700.3	2^+	0.0	0^+	E2	DCO=0.95 *28* (1999Ru01). A_2=1.42 *13* (1999Ru01). R_{30-83}=1.3 *1* (2008Jo04).
2748 *4*	14 *2*	19521	17	16773	15	E2	R_{30-83}=1.5 *1* (2008Jo04).
2779 *3*	3 *1*	16358	13	13578	12^+	D	R_{30-83}=0.7 *2* (2008Jo04).
2908[†] *2*	10 *1*	8225	(8^+)	5316.4	6^+		A_2=1.14 *23* (1999Ru01).
2938 *4*	2 *1*	22459		19521	17		
2940 *1*	12 *1*	12357.8	12^+	9417.8	10^+	E2	DCO=1.02 *40* (1999Ru01). A_2=1.67 *28* (1999Ru01). R_{30-83}=1.2 *3* (2008Jo04).
3626 *1*	12 *1*	6326.4	4^+	2700.3	2^+	E2	A_2=1.51 *32* (1999Ru01). R_{30-83}=1.4 *3* (2008Jo04).
3729 *2*	1 *1*	7652.6	6^+	3924.3	4^+	E2	
3897 *4*	<1	18632	(16^+)	14735	14^+		
4226 *2*	2 *1*	13644.4	(12^+)	9417.8	10^+		
5351 *2*	5 *1*	5350.5	2^+	0.0	0^+	E2	R_{30-83}=1.1 *2* (2008Jo04).

[†] From 1999Ru01.
[‡] From anisotropy ratio $R_{30-83}=I\gamma(30°)/I\gamma(83°)$ with particle-gated $\gamma\gamma$ spectra. Expected ratio ≈1.3 for stretched quadrupoles and ≈0.8 for stretched dipole transitions, see 2008Jo04.

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Level Scheme

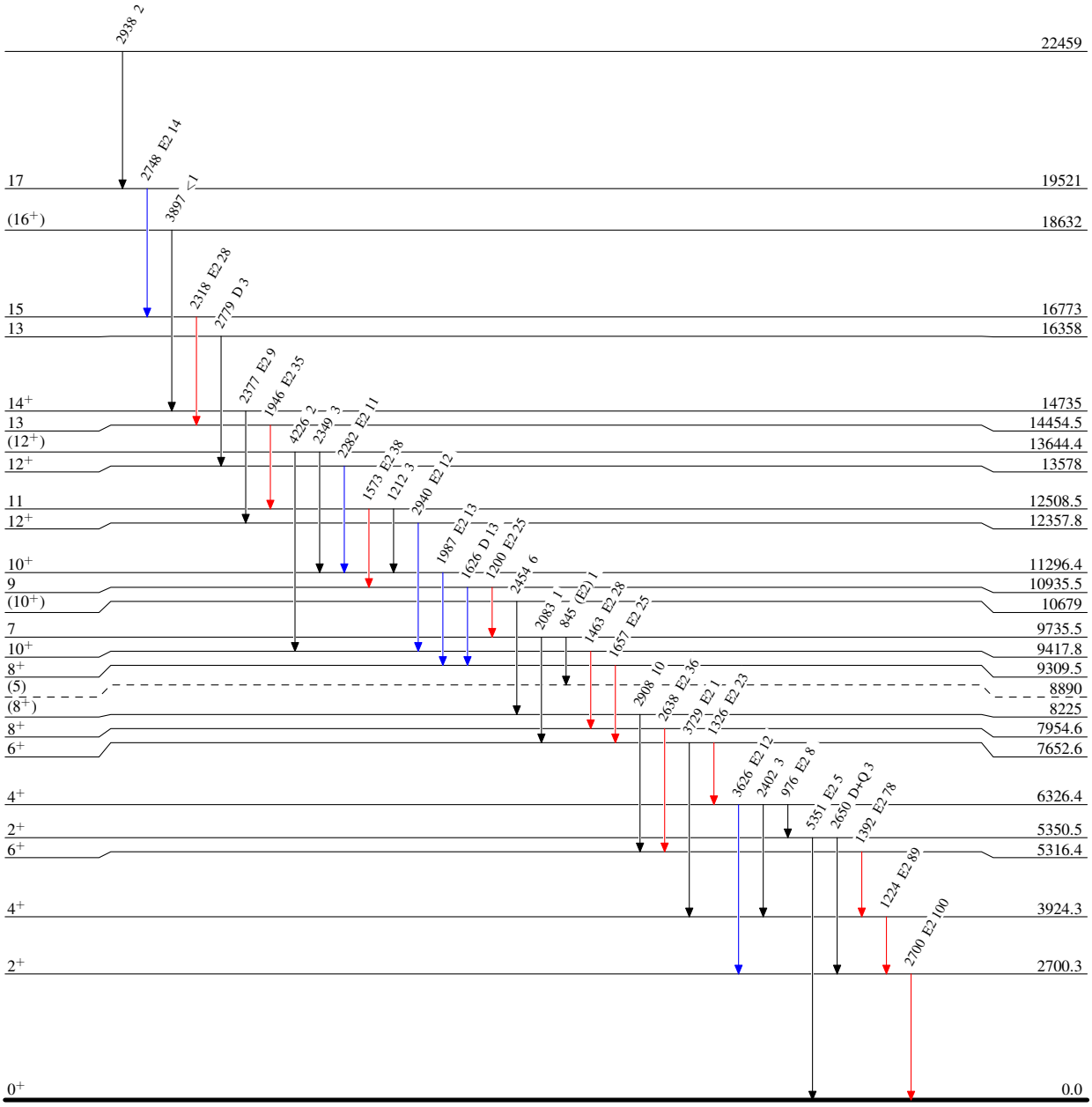
Intensities: Relative I_γ

Legend

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

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

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



$^{56}_{28}Ni_{28}$

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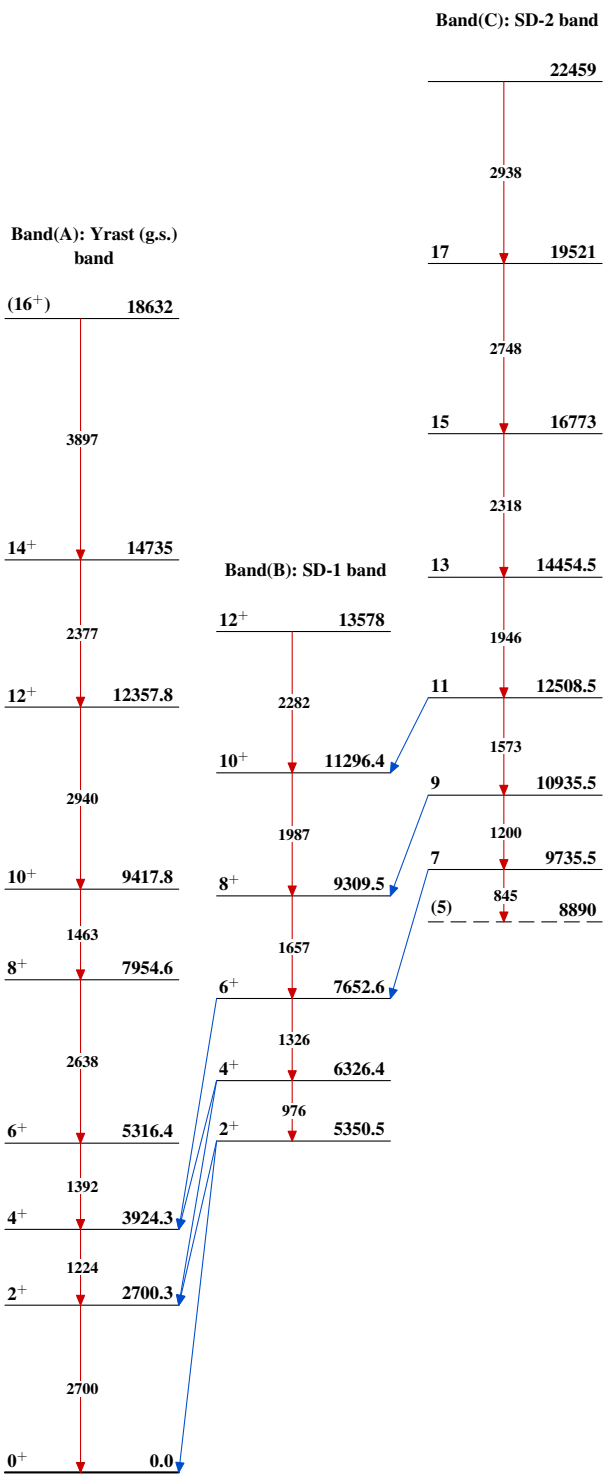

$^{56}_{28}Ni_{28}$