^{58}Ni(^{3}He,d), (^{3}He,dp) 1976Br36,1976Ga19

History

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

Others: 1964Bl21, 1965Bl05, 1966Mo22, 1968Pu03, 1975Ba63, 1976Bi07, 1982Ma04, 1983Dj01, 2013Sc06 (2013Sc06 also studied (α,t) and present data for proton transfer – values are listed in (α,t) dataset).

1976Br36: E(^{3}He)=18.0 MeV. Measured $\sigma(\theta)$ with magnetic spectrograph, θ(c.m.)=5°–90°, FWHM≈20 keV.

1976Ga19: E(^{3}He)=25 MeV; $\sigma(\theta)$ for (^{3}He,d), θ(lab)=9°–50°, FWHM=15-17 keV, magnetic spectrograph. E(^{3}He)=24 MeV; measured d-p angular correlation for (^{3}He,dp), θ=79°–164°, deuterons detected near 0° (Litherland-Ferguson method ii).

For high-energy data, see 1983Dj01 (130 MeV) and 1982Ma04 (90 MeV).

For partial proton widths of unbound levels, see 1976Ga19.

^{59}Cu Levels

E(level)†	Jπ#	L‡	C^{2}S′‡@	Comments
0.0		1	1.95	
491 *5*		1	0.80	
913 *7*		3	2.32	
1399 *7*		3	0.41	
2265		2	0.09	
2323 *7*		1	0.17	
2710 *7*		3	0.12	
3047 *7*		4	3.19	
3137 *7*		1	0.23	E=3124 in 1976Br36.
3309		(4)	0.23	
3437		(4)	0.14	
3548		3	0.22	
3582 *8*		2	0.56	
3619		1	0.10	
3663		1	0.03	
3707 *12*		3	0.17	
3737 *7*		1	0.13	
3891& *9*		1	0.30	^{59}Ni(g.s.) analogue fragment; E from 1976Ga19. Γ_{p0}/Γ<0.01 (1976Ga19).
3903& *7*		1	0.22	E(level): average of 3897 *7* (1976Bi07) and 3912 *9* (1976Ga19). ^{59}Ni(g.s.) analogue fragment. Γ_{p0}/Γ<0.01 (1976Ga19).
4002 *7*	(1/2)	1		Γ_{p0}/Γ<0.02 (1976Ga19).
4046		1		E=4063 *9*, L=(4) in 1976Ga19.
4116 *7*		1		
4154				Reported by 1976Br36 only.
4213 *9*		4	0.09	
4269 *9*		1	0.08	L=(4), C^{2}S′=0.30 from 1976Br36.
4310& *6*		3	1.30	^{59}Ni(339 level) analogue. Γ_{p0}/Γ<0.01 (1976Ga19).
4357& *6*	(1/2)	1	0.32	^{59}Ni(465 level) analogue. Γ_{p0}/Γ=0.27 *2* (1976Ga19).
4454 *9*		4	0.07	
4507 *6*	(1/2)	1	0.03	Γ_{p0}/Γ=0.31 *3* (1976Ga19).
4539 *9*		4	0.20	
4714 *6*	(1/2)	1	0.05	Γ_{p0}/Γ=0.59 *3* (1976Ga19).
4780 *6*	(3/2)	1	0.05	Γ_{p0}/Γ=0.65 *4* (1976Ga19).
4830& *6*	(3/2)	1	0.17	^{59}Ni(878 level) analogue. Γ_{p0}/Γ=0.69 *3* (1976Ga19).
4939 *9*		4	0.05	
4979 *9*		2	0.02	

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^{58}Ni(^{3}He,d), (^{3}He,dp) 1976Br36,1976Ga19 (continued)

^{59}Cu Levels (continued)

E(level)†	Jπ#	L‡	C²S′‡@	Comments
5057& *6*		3	0.14	^{59}Ni(1189 level) analogue.
5106 *9*				
5238& *6*	(1/2)	1	0.21	^{59}Ni(1301 level) analogue. Γ_{p0}/Γ=0.59 *3* (1976Ga19).
5283 *9*		1	0.02	
5316 *9*	(1/2)	1	0.04	Γ_{p0}/Γ=0.97 *3* (1976Ga19).
5453 *9*		2	0.02	
5492 *9*		3	0.03	
5612 *9*	(1/2)	1	0.08	Γ_{p0}/Γ=0.98 *4* (1976Ga19).
5665& *9*	(5/2)	3	0.22	Possible ^{59}Ni(1680 level) analogue (1976Ga19); however, 5521 and 5550 levels are associated with that analogue in (p,γ). Γ_{p0}/Γ=0.98 *4* (1976Ga19).
5722 *9*	(5/2)	3	0.08	Γ_{p0}/Γ=0.96 *6* (1976Ga19).
5855& *9*	(5/2)	3	0.39	Association with ^{59}Ni(1948 level) analogue (1976Ga19) rejected by evaluator; E≈40 keV lower than suggested in (p,γ), and analogue requires J=7/2. Γ_{p0}/Γ=0.98 *2*; Γ_{p1}/Γ=0.010 *5* (1976Ga19).
5923 *9*		1	0.03	
5950 *9*	(9/2)	4	0.27	
6049 *9*	(3/2)	1	0.06	Γ_{p0}/Γ=1.01 *4* (1976Ga19).
6118 *9*	(3/2)	1	0.12	
6201 *9*	(9/2)	4	0.91	Γ_{p0}/Γ=0.98 *5*; Γ_{p1}/Γ=0.02 *1* (1976Ga19).
6243 *9*		1	0.03	
6310 *9*	(9/2)	4	0.39	Γ_{p0}/Γ=0.97 *3*; Γ_{p1}/Γ=0.025 *8* (1976Ga19).
6372 *9*	(3/2)	1	0.05	Γ_{p0}/Γ=0.98 *3*; Γ_{p1}/Γ<0.01 (1976Ga19).
6423 *9*				
6463 *9*		3	0.04	
6519& *6*	(5/2,7/2)	3	0.42	Possible ^{59}Ni(2627 level) analogue. Γ_{p0}/Γ=0.93 *5*; Γ_{p1}/Γ=0.08 *2* (1976Ga19).
6598& *9*	(5/2,7/2)	3	0.12	Possible ^{59}Ni(2681 level) analogue. Γ_{p0}/Γ=0.88 *5*; Γ_{p1}/Γ=0.12 *2* (1976Ga19).
6632 *9*		4	0.10	
6669 *9*		4	0.04	
6744 *9*	(5/2)	3	0.22	Γ_{p0}/Γ=0.93 *5*; Γ_{p1}/Γ=0.075 *15* (1976Ga19).
6769 *9*	(5/2)	3	0.03	
6847& *6*	9/2	4	1.00	Possible ^{59}Ni(3054 level) analogue fragment. Γ_{p0}/Γ=0.92 *4*; Γ_{p1}/Γ=0.060 *15*; Γ_{p2}/Γ=0.012 *5* (1976Ga19).
6916& *6*	9/2,11/2	4	1.70	Possible ^{59}Ni(3054 level) analogue fragment. Γ_{p0}/Γ=0.87 *4*; Γ_{p1}/Γ=0.012 *2*; Γ_{p2}/Γ=0.010 *5* (1976Ga19).
6954&a *8*	3/2	1	0.12	Possible ^{59}Ni(3026 level) analogue (1976Ga19). However, E exceeds that for 3054-level analogue and is more appropriate for 3182-level (J=3/2) analogue.
7042a *9*	(9/2)	4	0.05	
7116 *9*	(5/2)	2	0.21	Γ_{p0}/Γ=0.88 *5*; Γ_{p1}/Γ=0.12 *2* (1976Ga19).
7150 *9*	(3/2)b	2	0.07	Γ_{p0}/Γ=0.90 *7*; Γ_{p1}/Γ=0.10 *3* (1976Ga19).
7198 *9*	(3/2)b	2	0.10	
7274& *8*	(3/2)b	1	0.12	Possible ^{59}Ni(3452 level) analogue fragment (1976Ga19); however, E≈60 keV below that adopted from (p,γ). Γ_{p0}/Γ=0.75 *4*; Γ_{p1}/Γ=0.20 *4* (1976Ga19).
7298& *8*	(3/2)b	1	0.09	Possible ^{59}Ni(3454 level) analogue fragment (1976Ga19); however, E≈50 keV below that adopted from (p,γ).
7358 *9*		2	0.06	
7396 *9*	(5/2)	2	0.23	Γ_{p0}/Γ=0.81 *4*; Γ_{p1}/Γ=0.18 *2* (1976Ga19).
7447 *9*	(3/2)	2	0.09	Γ_{p0}/Γ=0.80 *4*; Γ_{p1}/Γ=0.20 *2* (1976Ga19).
7489 *9*		(4),(1)		
7528 *9*	(5/2)	2	0.12	Γ_{p0}/Γ=0.59 *4*; Γ_{p1}/Γ=0.41 *4* (1976Ga19).

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^{58}Ni(^{3}He,d), (^{3}He,dp) 1976Br36,1976Ga19 (continued)

^{59}Cu Levels (continued)

E(level)[†]	Jπ[#]	L[‡]	C^{2}S′[‡@]	Comments
7643 *9*	(5/2)	2	0.10	Γ_{p0}/Γ=0.73 *6*; Γ_{p1}/Γ=0.26 *4* (1976Ga19).
7692 *9*	7/2,9/2	4	0.22	Γ_{p0}/Γ=0.67 *5*; Γ_{p1}/Γ=0.31 *8* (1976Ga19).
7725 *9*		2	0.04	
7773 *9*	(5/2)[b]	(3)	0.17	Jπ: if L=3. Γ_{p0}/Γ=0.61 *5*; Γ_{p1}/Γ=0.38 *4* (1976Ga19).
7793 *9*	(5/2)[b]	(3)	0.14	Jπ: if L=3.
7904 *9*	(5/2)	2	0.09	Γ_{p0}/Γ=0.77 *6*; Γ_{p1}/Γ=0.24 *3* (1976Ga19).
7948 *9*	(9/2)	4	0.17	
7983 *9*				
8078 *9*				
8123 *9*	(5/2)	2	0.13	Γ_{p0}/Γ=0.44 *4*; Γ_{p1}/Γ=0.56 *6* (1976Ga19).
8193[&] *6*	(5/2)	2	0.22	Possible ^{59}Ni(4506 level) analogue fragment. Γ_{p0}/Γ=0.77 *3*; Γ_{p1}/Γ=0.21 *2* (1976Ga19).
8256[&] *6*	(5/2)	2	0.23	Possible ^{59}Ni(4506 level) analogue fragment. Γ_{p0}/Γ=0.84 *4*; Γ_{p1}/Γ=0.170 *15* (1976Ga19).
8550[&] *8*	(9/2)	4	0.22	Possible ^{59}Ni(4709 level) analogue. Γ_{p0}/Γ=0.59 *7*; Γ_{p1}/Γ=0.41 *11* (1976Ga19).
8985 *9*				
9142 *9*				
9176 *9*				
9252 *20*		4	0.12	E(level): from 1976Bi07.

[†] For E<4200: from 1976Bi07 if ΔE stated; from 1976Br36 otherwise. For E≥4200: from 1976Ga19; ΔE=6-9 keV, but evaluator has allowed ΔE=9 keV unless ΔE explicitly stated by authors.

[‡] L values and C^{2}S′=(2J$_f$+1)C^{2}S values are based on comparisons of $\sigma(\theta)$ with DWBA calculations. Spectroscopic factors from 1976Br36 have been renormalized to N=4.2 (from authors′ preferred value of N=3.2). The spectroscopic factors of 1976Ga19 are almost a factor of two larger than other results and, since no normalization factor is indicated, the C^{2}S′ of 1976Ga19 should be regarded as relative. 1976Ga19 used Gamow functions as form factors for unbound states. Data are from 1976Br36 for E<4200, from 1976Ga19 for E≥4200.

[#] From d-p angular correlations. Without parentheses: firm assignment, independent of assumptions about the population of m=3/2 substates. With parentheses: uncertain assignment independent of substate population, or assignment(s) which correspond(s) to smallest m=3/2 substate population(s) (1976Ga19).

[@] C^{2}S′=(2J$_f$+1)C^{2}S is given.

[&] Probable ^{59}Ni IAS, based on energy, L value, J and comparison of spectroscopic factor with S(d,p) for parent state (1976Ga19).

[a] Γ_{p0}/Γ=0.79 *6* and Γ_{p1}/Γ=0.21 *3* for either the 6954 or the 7042 level but, owing to an error in table 3 of 1976Ga19, it is not clear for which.

[b] d-p(θ) indicates J=(3/2) for 7150 level + 7198 level and for 7274 level + 7298 level and J=(5/2) for 7773 level + 7793 level (1976Ga19).