^{40}Ar(d,p),(pol d,p),^{2}H(^{40}Ar,p) 1988EcZY,1975Se13,1961Ka18

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	C. D. Nesaraja, E. A. Mccutchan	NDS 133, 1 (2016)	30-Sep-2015

Other main references: 1966Ho03, 1968Fi05.

2008Ga24: ^{2}H(^{40}Ar,p), inverse kinematics reaction. ^{40}Ar beam was accelerated to an energy of 11 MeV/nucleon at GANIL/SPIRAL on a CD_2 target. The outgoing protons were detected using an array consisting of 8 DSSDs (MUST) located 10 cm upstream from the target. Angular coverage was from 95° to 175° in the lab frame. The background was detected using the GANIL SPEG spectrometer. The detection system consists of two cathode readout drift chambers, an ionization chamber and plastic scintillator. Measured excitation energies of the states, angular distributions, and the differential cross sections. Deduced L-values and spectroscopic factors from DWBA analysis. FWHM=280 keV.

1988EcZY (also 1986EcZZ): (pol d,p). E_d=20 MeV. Proton spectra were measured with a 120 cm single wire detector at the focal plane of the Munich Q3D magnetic spectrograph. Measured $\sigma(\theta)$, vector analyzing powers. FWHM ≈15 keV estimated by evaluators. Excitation energies up to 6.5 MeV compared with DWBA calculations.

1975Se13: (pol d,p). E_d=14.83 MeV. Measured $\sigma(\theta)$, vector analyzing powers. Proton measured with surface barrier and Si(Li) detectors between θ- 15°−130° lab angles. FWHM ≈15 keV estimated by evaluators. Excitation energies up to 6.57 MeV were determined.

1975Ca24 (also 1971Co15): (d,p) E_d=1.5-2.5 MeV at the HVEC Van de Graaff at CSFN in Catania. Outgoing particles detected with surface barrier detectors. Measured $\sigma(\theta)$ at 100°, 12°, 140°, and 160°, and deduced spectroscopic factors for a few states. FWHM ≈15 keV estimated by evaluators. Excitation energies up to 2.5 MeV compared with DWBA calculations.

1968Fi05: (d,p). E_d=11.6 MeV from Heidelberg cyclotron. Outgoing particles detected with surface barrier and Li(Si) detectors. Measured $\sigma(\theta)$, deduced L-values and S factors. Excitation energies up to 3.97 MeV compared with DWBA calculations.

1966Ho03: (d,p) E_d=11 MeV from Tandem Accelerator at University of Pennsylvania. Measured proton energies between 20°, 35°, and 50°. Reaction products were magnetically analyzed and focused onto nuclear emulsion. FWHM≈30 keV estimated by evaluators. Excitation energies up to 8.3 MeV compared with DWBA calculations.

1961Ka18: (d,p). E_d=7.5 MeV from the MIT-ONR electrostatic accelerator. Protons were detected from nuclear emulsions. Measured $\sigma(\theta)$ at 40°−130° with 5° intervals. DWBA calculations. Estimated FWHM≈20 keV by evaluators. Excitation energies up to 6.15 MeV compared with PWBA calculations.

Others:

1967Wi05: (d,p). IAR anomalies in (d,p) excitation function. Excitation energies 2.5-3.1 MeV were measured.

1956Bu94: (d,p). E_d=8.4 MeV. Measured $\sigma(\theta)$ and deduced L values for 10 states up to 3.98 MeV.

1952Gi01: (d,p). E_d=7.8 MeV. Measured $\sigma(\theta)$ and deduced L values for g.s. and 1340 keV.

1949Da15: (d,p). Measured proton groups and cross sections for 10 states up to 3.84 MeV.

1949Sa19: (d,p). E=3.90 MeV from the Yale cyclotron. Measured Q value.

^{41}Ar Levels

Differential cross sections for ^{40}Ar(d,p) reaction

Level	dσ/dΩ (20°) 1988EcZY	dσ/dΩ (max) 1961Ka18	Level	dσ/dΩ (20°) 1988EcZY	dσ/dΩ (max) 1961Ka18
0	4.155	2.6(40°)	4513	0.143	0.08
168	0.141	0.05	4573	0.483	1.0(16°)
516	0.971	4.7(16°)	4613		0.76(0°)
1034	0.514	0.53(34°)	4670	0.583	1.7(20°)
1354	4.481	24.4(17°)	4816		0.09
1636		0.04	4831	0.481	0.52(18°)
1870	0.261	5.0(0°)	4935	0.172	1.9(0°)
1988		0.02	4970	0.577	0.8
2398	0.509	5.3(18°)	5016	0.299	2.5(10°)

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2568   0.044                              5066   0.820           1.0(15°)
2701                  0.67(17°)            5153   0.303
2733   0.829          5.8(16°)             5296   0.055(27.5°)
2891   0.086          0.57(0°)             5321   0.107
2948   0.555          4.1(18°)             5406   0.252(25°)       2.0(8°)
3010   0.223          1.9(18°)             5438   0.401(17.5°)     0.95(10°)
3293                  0.49(15°)            5486   0.264
3326   1.744          11.1(15°)            5618   0.350(22.5°)
3388   0.302          0.14(35°)            5711   0.197(17.5°)
3433   0.181          1.0(15 °)            5753   0.223           0.90(10°)
3565   0.083          0.14                5789   0.515           0.75(10°)
3590   0.102          0.15(30°)            5821   0.449            1.1
3698   0.167          0.10                5920   0.182
3799   0.089(22.5°)    1.14(15°)            5947   0.158(25°)
3847                  0.04                5986   0.080(17.5°)
3900                  0.02                6036   0.788           0.7(20°)
3968   1.470         12.4(15°)             6132   1.257            1.2(15°)
4108                  0.1                 6197   0.836
4123   0.278          0.2                 6280   0.209
4154   0.211          0.18                6310   0.276
4273   0.246          2.4(13°)             6345   0.291
4295   0.232          0.48(0°)             6475   0.769
4395                  1.18(0°)             6512   0.499
4404   0.224          0.10                6564   0.178
4447                  0.50(0°)             6614   0.157
4473   0.061          0.1
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E(level)†	J^{π}†	L†	(2J+1)S&	Comments
0	$7/2^-$	3	2.82	(2J+1)S: Others: 2.96 *48* (2008Ga24), 4.2 *7* (1975Se13), 3.10 (1968Fi05), 3.8 (1975Ca24).
167 *1*	$(5/2)^-$	3	0.31 *5*	J^{π}: $7/2^-$ proposed by 1975Se13 from vector analyzing power data, which was L=2 or 3 but was considered not well reproduced by the DWBA calculations as the state was only weakly populated. Evaluators assign ($5/2^-$) since γ from $1/2^-$ is seen in ^{40}Ar(n,γ). (2J+1)S: From 1975Se13 for 5/2. Other: 0.12 (1988EcZY) for 5/2.
516 *1*	$3/2^-$	1	0.28	(2J+1)S: Others: 0.32 *8* (2008Ga24), 0.35 *6* (1975Se13), 0.29 (1968Fi05), 0.68 (1975Ca24).
1034 *1*	$3/2^+$	2	(0.30)	(2J+1)S: Others: 0.36 *6* (1975Se13), 0.24 (1968Fi05), 0.16 (1975Ca24).
1354 *1*	$3/2^-$	1	1.40	(2J+1)S: Others: 1.92 *36* (2008Ga24), 1.7 *3* (1975Se13), 1.46 (1968Fi05), 1.8 (1975Ca24).
1636# *2*	$3/2^-$		0.092 *32*	(2J+1)S: From 1975Se13 for L=1. J^{π}: Level seen in 1975Se13 was only weakly excited and the angular distribution data was only qualitatively reproduced by the DWBA calculations.
1870 *1*	$1/2^+$	0	0.10	(2J+1)S: Others: 0.120 *26* (1975Se13), 0.08 (1968Fi05), 0.11 (1975Ca24).
1988# *3*				
2321‡ *10*				
2398 *1*	$1/2^-$	1	0.14	(2J+1)S: Others: 0.30 *5* (1975Se13), 0.25 (1968Fi05), 0.44 (1975Ca24).
2568 *1*				
2701# *3*		1@		
2733 *1*	$3/2^-$	1	0.34	(2J+1)S: Others: 0.28 *5* (1975Se13), 0.23 (1968Fi05), 0.31 (1971Co15).
2891 *1*	$9/2^+$	4	(0.07)	L: Other: 0 (1961Ka18).
2948 *1*	$3/2^-$	1	0.25	(2J+1)S: Others: 0.34 *6* (1975Se13), 0.21 for L=1, J=1/2 (1968Fi05), 0.72 (1971Co15). J^{π}: $1/2^-$ proposed by 1971Co15.
3010 *1*	$3/2^-$	1	0.11	
3122‡ *10*				
3293# *5*		1@		
3326 *1*	$1/2^-$	1	0.72	(2J+1)S: Others: 0.58 *12* (2008Ga24), 0.72 *12* (1975Se13), 0.57 (1968Fi05), 0.60 (1971Co15).
3388 *1*	$(1/2)^-$	1	(0.09)	L: Other: 3 (1961Ka18).
3433 *1*	$1/2^-$	1	0.07	

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^{40}Ar(d,p),(pol d,p),^{2}H(^{40}Ar,p) 1988EcZY,1975Se13,1961Ka18 (continued)

^{41}Ar Levels (continued)

E(level)[†]	Jπ[†]	L[†]	(2J+1)S[&]	Comments
3485[‡] *10*				
3565 *1*				
3590 *1*	3/2⁻	1	(0.04)	L: Other: 2 (1961Ka18).
3698 *1*				
3734[‡] *10*				
3775[‡] *10*				
3799 *1*	1/2⁻	1	0.06	Jπ: (3/2⁻) proposed by 1975Se13. (2J+1)S: Other: 0.038 *10* for J=1/2 (1975Se13).
3847[#] *5*				
3900[#] *5*				
3968 *1*	1/2⁻	1	0.57	(2J+1)S: Others: 0.72 *14* (2008Ga24), 0.80 *14* (1975Se13), 0.47 (1968Fi05).
4108[#] *6*				
4123 *1*	3/2⁻	1	0.08	
4154 *1*	3/2⁻	1	0.06	
4251[‡] *10*				
4273 *1*	3/2⁻	1	0.10	(2J+1)S: Other: 0.120 *24* (1975Se13).
4295 *1*		1	0.09	L: Other: (0) (1961Ka18).
4370[‡] *10*				
4395[#] *6*				
4404 *1*	3/2⁻	1	0.06	
4447[#] *6*	1/2⁺	0[@]		
4473 *1*	(1/2⁻,3/2⁺)	(1,2)	(0.02,0.02)	
4513 *1*	(1/2)⁻	1	(0.05)	
4573 *1*	5/2⁺	2	0.12	L,Jπ: Other: L=(3), J=(5/2⁻) (1975Se13). (2J+1)S: Other: 0.21 *6* for L=3, J=5/2 (1975Se13).
4613[#] *7*	1/2⁺	0[@]		
4644[‡] *10*				
4670 *1*	5/2⁺	2	0.16	L,Jπ: Other: L=(3), J=(5/2) (1975Se13). (2J+1)S: Other: 0.33 *8* for L=3, J=5/2 (1975Se13).
4683 *10*	(5/2⁻)	(3)	0.33 *8*	E(level),L,Jπ: From 1975Se13.
4722[‡] *10*				
4754[‡] *10*				
4816[#] *8*				
4831 *1*	(5/2⁻,9/2⁺)	(3,4)	(0.15,0.21)	L: Other: 3 (1961Ka18).
4900[‡] *10*				
4935 *1*	1/2⁻	1	0.05	L: Other: 0 (1961Ka18).
4970 *1*	(5/2⁻,9/2⁺)	(3,4)	(0.18,0.25)	
5016 *1*	1/2⁻,3/2⁻	1	0.10	Jπ: 1/2⁻ (1988EcZY), 3/2⁻ (1975Se13). (2J+1)S: For J=1/2 (1988EcZY). Other: 0.32 *6* for J=3/2, 0.160 *28* for J=1/2 (1975Se13).
5066 *1*	5/2⁻	3	(0.23)	(2J+1)S: Other: 0.48 *14* (1975Se13).
5115[‡] *10*				
5134[‡] *10*				
5153 *1*	(9/2)⁺	4	(0.15)	
5219[‡] *10*				
5244[‡] *10*				
5280[‡] *10*				
5296 *1*				
5321 *1*	(5/2)⁻	3	(0.05)	
5406 *1*	3/2⁻,7/2⁻	1,3	0.12	L: 1 (1961Ka18,1975Se13), 3 (1988EcZY). Jπ: 3/2 (1975Se13), 7/2 (1988EcZY).

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^{40}Ar(d,p),(pol d,p),^{2}H(^{40}Ar,p) 1988EcZY,1975Se13,1961Ka18 (continued)

^{41}Ar Levels (continued)

E(level)[†]	Jπ[†]	L[†]	(2J+1)S[&]	Comments
				(2J+1)S: For L=3, J=7/2 (1988EcZY). Other: 0.32 *6* for J=3/2 (L=1) (1975Se13).
5438 *1*	5/2−	3	0.12	L: Other: 1 (1961Ka18).
5486 *1*	7/2−	3	0.07	
5529[‡] *10*				
5573[‡] *10*				
5618 *1*	(5/2)−	3	(0.12)	(2J+1)S: Other: 0.18 *4* (1975Se13).
5675[‡] *10*				
5711 *1*	(5/2−)	3	(0.06)	
5753 *1*	(7/2−,9/2+)	(3,4)	(0.07,0.12)	L: Other: (2) (1961Ka18).
5789 *1*	5/2−	3	0.15	L: Other: L=(2) (1961Ka18). (2J+1)S: Other: 0.44 *8* (1975Se13).
5821 *1*	5/2−,7/2−	3	0.11	L: Other: (1,2) (1961Ka18). (2J+1)S: For J=7/2. Jπ: 5/2− (1975Se13), 7/2− (1988EcZY).
5870[‡] *10*				
5920 *1*	(7/2)−	3	(0.05)	
5947 *1*				
5986 *1*	(5/2)−	3	(0.03)	
6036 *1*	5/2−	3	0.20	(2J+1)S: Other: 0.38 *7* (1975Se13).
6088[‡] *10*				
6132 *1*	5/2−	3	0.30	(2J+1)S: Other: 0.80 *14* (1975Se13).
6197 *1*	5/2−	3	0.21	
6280 *1*	5/2−	3	0.05	
6310 *1*	5/2−	3	0.08	
6345 *1*	(5/2)−	3	(0.08)	
6375[‡] *10*				
6419[‡] *10*				
6453[‡] *10*				
6475 *1*	5/2−	3	0.18	
6512 *1*	5/2−	3	0.12	(2J+1)S: Other: 0.33 *7* (1975Se13).
6564 *1*	(5/2−,7/2−)	(3)	0.55 *10*	L,Jπ: L=3, J=5/2 (1975Se13); L=(3,4), Jπ=(7/2−,9/2+) (1988EcZY). (2J+1)S: For J=5/2 (1975Se13). Others: 0.73 *14* for J=7/2 (1975Se13), 0.04 for J=7/2 and 0.06 for J=9/2 (1988EcZY).
6614 *1*	(9/2+)	(4)	0.05	
6672[‡] *10*				
6726[‡] *10*				
6762[‡] *10*				
6797[‡] *10*				
6846[‡] *10*				
6903[‡] *10*				
6959[‡] *10*				
7009[‡] *10*				
7049[‡] *10*				
7106[‡] *10*				
7170[‡] *10*				
7220[‡] *10*				
7282[‡] *10*				
7311[‡] *10*				
7351[‡] *10*				
7426[‡] *10*				

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^{40}Ar(d,p),(pol d,p),^{2}H(^{40}Ar,p) 1988EcZY,1975Se13,1961Ka18 (continued)

^{41}Ar Levels (continued)

E(level)[†]	E(level)[†]	E(level)[†]	E(level)[†]
7480[‡] *10*	7725[‡] *10*	7945[‡] *10*	8153[‡] *10*
7524[‡] *10*	7761[‡] *10*	7998[‡] *10*	8234[‡] *10*
7595[‡] *10*	7818[‡] *10*	8030[‡] *10*	8277[‡] *10*
7682[‡] *10*	7872[‡] *10*	8103[‡] *10*	8301[‡] *10*

[†] From 1988EcZY, unless otherwise stated.
[‡] From 1966Ho03.
[#] From 1961Ka18. Value given by 1966Ho03 is in agreement but has larger uncertainty.
[@] From 1961Ka18.
[&] From 1988EcZY, unless otherwise stated. Spectroscopic factors are also given by 1961Ka18 for a large number of states, but these are in a different formalism. For selected levels, values are available from 2008Ga24,1975Se13, 1975Ca24 and 1968Fi05.