

$^{28}\text{Si}(\text{p},\text{p}'), ^{27}\text{Al}(\text{p},\text{p}): \text{res}$  [1976Mo09](#),[1984Ne03](#),[1984Ne04](#)

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia		NDS 114, 1189 (2013)	1-Apr-2013

Others: [1963Br15](#), [1969Ho24](#), [1972Tv01](#), [1975Me14](#), [1977Ad04](#), [1989Cr02](#), [1991Do01](#), [1992Co17](#), [1996Li07](#), [1997St08](#).

$^{27}\text{Al}(\text{p},\alpha)$ : Res: [1973Na10](#), [1973Sh07](#), [1981Er12](#), [1981Fu07](#).

[1976Mo09](#):  $^{28}\text{Si}(\text{p},\text{p}')$  E=16,20 MeV, 99.9% enriched target of  $^{28}\text{Si}$ . Protons were momentum analyzed in a Q3D spectrograph. Deduced excitation energies in  $^{28}\text{Si}$ .

[1984Ne03](#), [1984Ne04](#):  $^{27}\text{Al}(\text{p},\text{p})$  E=0.92-1.85 MeV and E=1.85-3.05 MeV, respectively. Protons were detected by Si surface barrier detectors at Lab angles  $90^\circ$ ,  $105^\circ$ ,  $135^\circ$ , and  $160^\circ$ . Overall resolution was 350 to 400 eV. Measured proton energies.

 $^{28}\text{Si}$  Levels

E(level) <sup>†</sup>	J <sup>π</sup> @	Comments
0		
4620 <sup>‡</sup>	4	
4980 <sup>‡</sup>	0	
6280 <sup>‡</sup>	3	
9702	3	
9763	3	
9795	3	
9929	3	
10180	3	
10210	3	
10271	3	
10312	3	
10377	3	
10419	3	
10514	3	
10539	3	
10596	3	
10668	3	
10724	3	
10805	3	
10883	3	
10900	3	
10916	3	
10943	3	
10951	3	
10994	3	
11078	3	
11100	3	
11138	3	
11196	3	
11266	3	
11297	3	
11333	3	
11388	3	
11434	3	
11447	3	
11516	3	
11574	6 <sup>-</sup>	T=0 J <sup>π</sup> : From <a href="#">1977Ad04</a> .
11586	3	
11658	3	

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$^{28}\text{Si}(p,p'), ^{27}\text{Al}(p,p)$ : res 1976Mo09,1984Ne03,1984Ne04 (continued) $^{28}\text{Si}$  Levels (continued)

E(level) <sup>†</sup>	J <sup>π</sup> @	Γ <sub>p</sub> &	Comments
11671 3			
11780 3			
11801 3		<0.035 <sup>a</sup>	
11869 3		0.059 <sup>a</sup> 14	
11902 3			
11933 3			
11977 3		<0.04 <sup>a</sup>	
11986 3			E(level): From 1976Mo09.
12015 3			
12024 3			
12073 3		<0.08 <sup>a</sup>	
12152 3			
12173 3		0.0067 5	Γ <sub>p</sub> : Weighted average of data from 1973Na10, 1973Sh07, 1981Er12, 1981Fu07.
12181 3			
12194 3			
12205 3			
12216 3		<0.030	
12240 3			
12294 3		<0.060	
12301 3			
12318 3		<0.040 <sup>a</sup>	
12325 3		<0.050 <sup>a</sup>	
12330 3			
12440 3		0.018 <sup>b</sup> 3	
12474 3			
12487.6 20	3 <sup>-</sup>	0.10 2	E <sub>p</sub> =937 keV 2.
12540.5 20	(3) <sup>+</sup>	0.070 14	E <sub>p</sub> =991.9 keV 20. Other: 991.756 keV 17 (1994Br37).
12551 <sup>#</sup> 3		0.0019 1	T <sub>1/2</sub> : Γ from 1981Er12.
12572.7 20	2 <sup>+</sup>	0.11 22	E <sub>p</sub> =1025.3 keV 20.
12636 <sup>#</sup> 3			
12642 <sup>#</sup> 3			
12663.0 20	4 <sup>-</sup>	0.70 7	E <sub>p</sub> =1118.9 keV 20.
12714 <sup>#</sup> 3	0 <sup>+</sup> ,1 <sup>+</sup>	<0.1	J <sup>π</sup> : From re-interpretation (by evaluator in 1998En04) of γ-decay in 1975Me14. L=0 is reported from the observed (P,P <sub>1</sub> ) yield in 1975Me14.
12725.8 20	2 <sup>+</sup>	0.25 5	E <sub>p</sub> =1184.1 keV 20.
12741.9 20	3 <sup>-</sup>	5.4 5	T <sub>1/2</sub> : Other Γ: 0.66 keV 3 (1972Tv01). E <sub>p</sub> =1200.8 keV 20. T <sub>1/2</sub> : Other Γ: 5.5 keV 3 (1972Tv01).
12754 <sup>#</sup> 3			
12802.6 20	3 <sup>-</sup>	0.10 2	E <sub>p</sub> =1263.7 keV 20.
12816 <sup>#</sup> 3			
12855.2 20	4 <sup>+</sup>	0.030 6	E <sub>p</sub> =1318.3 keV 20.
12866.5 1	(2,3) <sup>+</sup>	0.035 5	E <sub>p</sub> =1330 keV 2.
12900.9 20	2 <sup>+</sup>	0.55 6	E <sub>p</sub> =1365.6 keV 20. Other Γ: <0.1 keV (1972Tv01).
12917.2 20	2 <sup>+</sup>	0.78 8	E <sub>p</sub> =1382.6 keV 20.
12923.7 20	3 <sup>+</sup>	0.60 6	E <sub>p</sub> =1389.3 keV 20.
12923.9 20	2 <sup>+</sup>	0.20 4	E <sub>p</sub> =1389.5 keV 20.
12973.2 20	1 <sup>-</sup>	0.25 5	E <sub>p</sub> =1440.6 keV 20.
12989.5 20	4 <sup>-</sup> ,(3 <sup>-</sup> )	2.3 2	E <sub>p</sub> =1457.5 keV 20.
13014 <sup>#</sup> 3			
13033.6 20	2 <sup>-</sup>	0.55 6	E <sub>p</sub> =1503.3 keV 20.
13049.4 20	4 <sup>+</sup>	3.7 4	E <sub>p</sub> =1519.6 keV 20.
13094.1 20	4 <sup>-</sup>	0.010 2	E <sub>p</sub> =1566 keV 2.

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$^{28}\text{Si}(\text{p,p}'), ^{27}\text{Al}(\text{p,p}): \text{res}$  **1976Mo09,1984Ne03,1984Ne04** (continued) $^{28}\text{Si}$  Levels (continued)

E(level) <sup>†</sup>	J <sup>π</sup> @	Γ <sub>p</sub> &	Comments
13106.1 20	2 <sup>+</sup>	2.4 3	E <sub>p</sub> =1578.4 keV 20.
13106.4 20	3 <sup>-</sup>	0.05 1	E <sub>p</sub> =1578.8 keV 20.
13114 <sup>#</sup> 3			
13172.4 20	2 <sup>+</sup>	0.28 6	E <sub>p</sub> =1647.2 keV 20.
13187.2 20	1 <sup>+</sup>	1.85 19	E <sub>p</sub> =1662.5 keV 20.
13189.1 20	1 <sup>+</sup>	0.45 5	E <sub>p</sub> =1664.5 keV 20.
13203.8 20	2 <sup>+</sup> , (3 <sup>+</sup> )	0.21 4	E <sub>p</sub> =1679.8 keV 20.
13208 <sup>#</sup> 3			
13228.6 20	2 <sup>+</sup>	1.1 1	E <sub>p</sub> =1705.5 keV 20.
13245.9 6	3 <sup>-</sup>	8.0 8	E <sub>p</sub> =1723.4 keV 6.
13246.7 20	5 <sup>-</sup>	0.20 4	E <sub>p</sub> =1724.3 keV 20.
13269.7 20	2 <sup>-</sup>	6.6 7	E <sub>p</sub> =1748.1 keV 20.
13317.2 3	(3,4) <sup>-</sup>	1.2 1	E <sub>p</sub> =1797.4 keV 3.
13319.5 20	1 <sup>+</sup>	0.20 4	E <sub>p</sub> =1799.8 keV 20.
13359.3 20	4 <sup>+</sup>	0.55 6	E <sub>p</sub> =1841 keV 2.
13414 3	4 <sup>+</sup>	0.06 1	E <sub>p</sub> =1898 keV 3.
13422 3	1 <sup>-</sup>	19 2	E <sub>p</sub> =1906 keV 3.
13425 3	5 <sup>+</sup>	0.08 20	E <sub>p</sub> =1909 keV 3.
13478 3	2 <sup>-</sup>	4.0 4	E <sub>p</sub> =1964 keV 3.
13482 3	2 <sup>+</sup>	1.4 1	E <sub>p</sub> =1968 keV 3.
13491 3	3 <sup>-</sup>	31 3	E <sub>p</sub> =1977 keV 3.
13544 3	2 <sup>+</sup>	8.5 9	E <sub>p</sub> =2033 keV 3.
13556 3	5 <sub>1</sub> (4) <sup>+</sup>	0.15 3	E <sub>p</sub> =2045 keV 3.
13559 3	3 <sup>+</sup>	1.8 2	E <sub>p</sub> =2049 keV 3.
13616 3	2 <sup>-</sup>	11 1	E <sub>p</sub> =2107 keV 3.
13634 3	3 <sup>+</sup>	0.57 6	E <sub>p</sub> =2126 keV 3.
13639 3	2 <sup>+</sup>	5 1	E <sub>p</sub> =2131 keV 3.
13639 3	(1,2) <sup>+</sup>	0.12 2	E <sub>p</sub> =2131 keV 3.
			J <sup>π</sup> : (1 <sup>-</sup> , 2 <sup>+</sup> ) in Adopted Levels.
13662 3	(3,4) <sup>-</sup>	0.45 5	E <sub>p</sub> =2155 keV 3.
13666 3	4 <sup>+</sup>	0.17 3	E <sub>p</sub> =2160 keV 3.
13678 3	2 <sup>+</sup>	0.43 4	E <sub>p</sub> =2171 keV 3.
13706 3	2 <sub>1</sub> (3) <sup>+</sup>	0.50 5	E <sub>p</sub> =2200 keV 3.
13706 3	4 <sup>+</sup>	0.04 1	E <sub>p</sub> =2200 keV 3.
13711 3	3 <sup>-</sup>	20 2	E <sub>p</sub> =2206 keV 3.
13734 3	1 <sup>-</sup>	35 4	E <sub>p</sub> =2229 keV 3.
13788 3	3 <sup>-</sup>	2.7 3	E <sub>p</sub> =2286 keV 3.
13805 3	4 <sup>+</sup>	0.15 3	E <sub>p</sub> =2303 keV 3.
13812 3	1 <sup>-</sup>	2.0 2	E <sub>p</sub> =2311 keV 3.
13813 3	3 <sup>+</sup>	0.32 3	E <sub>p</sub> =2312 keV 3.
13831 3	(3,4) <sup>-</sup>	2.2 2	E <sub>p</sub> =2330 keV 3.
13860 3	3 <sup>-</sup>	2.5 3	E <sub>p</sub> =2361 keV 3.
13872 3	3 <sup>-</sup>	4.7 5	E <sub>p</sub> =2373 keV 3.
13889 3	(3 to 6) <sup>-</sup>	0.035 7	E <sub>p</sub> =2390 keV 3.
13901 3	1 <sup>-</sup>	2.5 3	E <sub>p</sub> =2403 keV 3.
13939 3	2 <sup>+</sup>	2.2 2	E <sub>p</sub> =2442 keV 3.
13967 3	4 <sup>+</sup>	0.05 1	E <sub>p</sub> =2472 keV 3.
13971 3	2 <sup>+</sup>	1.5 2	E <sub>p</sub> =2475 keV 3.
13978 3	4 <sub>1</sub> (5) <sup>+</sup>	2.6 3	E <sub>p</sub> =2483 keV 3.
13982 3	5 <sup>-</sup>	0.3 1	E <sub>p</sub> =2487 keV 3.
			J <sup>π</sup> : In Adopted Levels J <sup>π</sup> =6 <sup>-</sup> .
13983 3	2 <sup>+</sup>	0.3 1	E <sub>p</sub> =2488 keV 3.
14011 3	4 <sup>+</sup>	0.08 2	E <sub>p</sub> =2517 keV 3 (1984Ne04).
14024 3	1 <sup>-</sup>	3.0 3	E <sub>p</sub> =2530 keV 3 (1984Ne04).
14037 3	3 <sub>1</sub> (2) <sup>-</sup>	45 5	E <sub>p</sub> =2544 keV 3 (1984Ne04).

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$^{28}\text{Si}(p,p'), ^{27}\text{Al}(p,p)$ : res **1976Mo09,1984Ne03,1984Ne04** (continued) $^{28}\text{Si}$  Levels (continued)

E(level) <sup>†</sup>	J <sup>π</sup> @	Γ <sub>p</sub> &	Comments
14048 3	5,(4) <sup>+</sup>	1.2 1	E <sub>p</sub> =2555 keV 3 (1984Ne04).
14049 3	2 <sup>+</sup>	2.4 2	E <sub>p</sub> =2556 keV 3 (1984Ne04).
14065 3	2 <sup>+</sup>	4.0 4	E <sub>p</sub> =2573 keV 3 (1984Ne04).
14075 3	(2 <sup>-</sup> )	36 4	E <sub>p</sub> =2583 keV 3 (1984Ne04).
14089 3	3 <sup>-</sup>	1.2 1	E <sub>p</sub> =2598 keV 3 (1984Ne04).
14094 3	1 <sup>+</sup>	1.0 1	E <sub>p</sub> =2603 keV 3 (1984Ne04).
14095 3	4 <sup>+</sup>	0.15 3	E <sub>p</sub> =2604 keV 3 (1984Ne04).
14105 3	5 <sup>-</sup>	0.20 4	E <sub>p</sub> =2614 keV 3 (1984Ne04).
14159 3	4,(3) <sup>-</sup>	13.0 13	E <sub>p</sub> =2670 keV 3 (1984Ne04).
14200 3	3 <sup>+</sup>	0.80 8	E <sub>p</sub> =2713 keV 3 (1984Ne04).
14208 3	4 <sup>+</sup>	1.0 1	E <sub>p</sub> =2722 keV 3 (1984Ne04).
14210 3	(2 <sup>-</sup> )	3.0 3	E <sub>p</sub> =2723 keV 3 (1984Ne04).
14213 3	5 <sup>+</sup>	0.60 6	E <sub>p</sub> =2726 keV 3 (1984Ne04).
14227 3	3 <sup>+</sup>	1.4 1	E <sub>p</sub> =2741 keV 3 (1984Ne04).
14245 3	(3 <sup>-</sup> )	35 4	E <sub>p</sub> =2759 keV 3 (1984Ne04).
14247 3	2 <sup>+</sup>	25 3	E <sub>p</sub> =2762 keV 3 (1984Ne04).
14294 3	2 <sup>+</sup>	0.60 6	E <sub>p</sub> =2810 keV 3 (1984Ne04).
14298 3	4 <sup>+</sup>	0.20 4	E <sub>p</sub> =2815 keV 3 (1984Ne04).
14306 3	4 <sup>+</sup>	40 4	E <sub>p</sub> =2823 keV 3 (1984Ne04).
14328 3	(1 <sup>-</sup> )	0.17 3	E <sub>p</sub> =2846 keV 3 (1984Ne04).
14333 3	(4,5) <sup>+</sup>	0.07 1	E <sub>p</sub> =2851 keV 3 (1984Ne04).
14349 3	4 <sup>-</sup>	2.3 2	E <sub>p</sub> =2868 keV 3 (1984Ne04).
14356 3	6 <sup>-</sup>	3.7 4	E <sub>p</sub> =2875 keV 3 (1984Ne04).
14358 3	4 <sup>+</sup>	0.85 9	E <sub>p</sub> =2876.5 keV 3 (1984Ne04).
14358 3	(2 <sup>-</sup> )	17 2	E <sub>p</sub> =2877 keV 3 (1984Ne04).
14375 3	2 <sup>+</sup>	16 2	E <sub>p</sub> =2894 keV 3 (1984Ne04).
14391 3	(0 <sup>+</sup> )	0.36 4	E <sub>p</sub> =2911 keV 3 (1984Ne04).
14391 3	3 <sup>+</sup>	1.0 1	E <sub>p</sub> =2911 keV 3 (1984Ne04).
14400 3	(3 to 5)	0.11 2	E <sub>p</sub> =2921 keV 3 (1984Ne04).
14434 3	3 <sup>+</sup>	19 2	E <sub>p</sub> =2956 keV 3 (1984Ne04).
14474 3	(5,6)	0.18 4	E <sub>p</sub> =2997 keV 3 (1984Ne04).
14493 3	2 <sup>+</sup> ,3 <sup>+</sup>	6.0 6	E <sub>p</sub> =3017 keV 3 (1984Ne04).
14515 3	3 <sup>-</sup>	0.30 6	E <sub>p</sub> =3040 keV 3 (1984Ne04).
14523 3	3 <sup>-</sup>	0.80 8	E <sub>p</sub> =3048 keV 3 (1984Ne04).

<sup>†</sup> Level energies up to 12474 keV are from 1976Mo09 and all above energies are from 1984Ne03 and 1984Ne04, except otherwise noted. Excitation energies are deduced using the E<sub>p</sub> values reported in 1984Ne03 and 1984Ne04 and S<sub>p</sub>=11585.02 keV 10.

<sup>‡</sup> From 1963Br15.

# From 1976Mo09.

@ From 1984Ne03 and 1984Ne04, except otherwise noted. Assignments are based on differential cross section measurements of (P,P<sub>0</sub>) and (P,α<sub>0</sub>) reaction channels.

& From 1984Ne03 and 1984Ne04, except otherwise noted. In units of keV.

<sup>a</sup> Γ quoted in 1990En08 – source ref. missing.

<sup>b</sup> Γ from weighted average of data from 1973Na10, 1973Sh07, 1981Er12, 1981Fu07.