^{30}Si(d,p),(pol d,p) 2000Pi01,1983Wa25,1987Da16

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 184, 29 (2022)	24-Jun-2022

2000Pi01: (d,p) E=12.3 MeV deuterons from cyclotron facility at Academy of Czech Republic. Natural SiO_2 and 95.5% enriched ^{30}Si targets. Reaction products were momentum-analyzed with a high-resolution multi-angle magnetic spectrograph (energy resolution≈0.1%). Measured proton $\sigma(E_p,\theta)$ with θ(lab)=0°−80°. Deduced levels, J, π, L-transfers, spectroscopic factors from DWBA analysis. Comparisons with shell-model calculations. Report 44 levels.

1983Wa25: (d,p) E=10, 17 MeV deuterons from the Nuclear Physics laboratory, Oxford. 98% enriched ^{30}Si target. Reaction products were momentum-analyzed with a multi-gap spectrograph (FWHM≈20 keV). Measured $\sigma(E_p,\theta)$ with θ(lab)=3.75°−175°. Deduced levels, L-transfers from DWBA analysis. Comparisons with CCBA calculations. Report 48 levels.

1974Ho28: (d,p) E=10 MeV deuterons from University of Texas E(n) tandem accelerator. SiO_2 targets with 99% enrichment in ^{30}Si. Measured proton spectra and angular distributions of protons using biased quadrupole spectrometer. Deduced levels, L-transfers, spectroscopic factors from DWBA analysis. Report 40 levels. See also 1974Ho33, 1974Ho16.

1987Da16: (pol d,p) E=12.3 MeV tensor polarized deuterons from University of Birmingham Radial Ridge cyclotron. Enriched SiO_2 targets. Measured σ(Ep,θ) and analyzing powers at θ(lab)=0°−80° using ΔE-E telescopes in a scattering chamber (FWHM=50 keV). Deduced levels, J, π, L-transfers, relative spectroscopic factors from DWBA analysis. Comparisons with shell-model calculations. Report 7 levels.

1966Be26: (d p) E=10 MeV at Max-Planck Institute. Measured σ(Ep,θ) at θ(cm)=5°−120° with a magnetic spectrograph. Deduced levels, L-transfers, spectroscopic factors from DWBA analysis. Report 27 levels.

1985PuZY: (d,p) E=12.3 MeV. Measured $\sigma(E_p,\theta)$ at θ(cm)=0°−90°. Deduced levels. Report 35 levels.

Others: 1979De30, 1974Br33, 1973Za12, 1970Wo03, 1968Wi01, 1966El13, 1964Wi17, 1964Wi02, 1960Br17.

^{31}Si Levels

Cross section data, at angles where values are maximum, are listed under comments from 1983Wa25 at E(d)=17 MeV. The authors also list cross sections for selected levels up to 5.3 MeV at E(d)=10 MeV. See also 1974Ho28 for maximum cross sections for selected levels and E(d)=10 MeV.

E(level)[†]	J^π[&]	L[a]	(2J+1)C^2S[a]	Comments
0.0	$3/2^+$	2	2.81	dσ/dΩ(max)=6.1 mb/sr *3*. (2J+1)C^2S: others: 3.27 (1966Be26), 3.5 (1968Wi01).
752.0 *4*	$1/2^+$	0	0.51	E(level): others: 750 *50* (1987Da16), 752 *10* (1983Wa25), 750 *8* (1966Be26), 752.3 *8* (1985PuZY). (2J+1)C^2S: others: 1.33 (1966Be26), 0.48 (1968Wi01). dσ/dΩ(max)=10.1 mb/sr *5*.
1695 *2*	$5/2^+$	2	≤0.1	E(level): others: 1690 *50* (1987Da16), 1695 *10* (1983Wa25), 1687 *8* (1966Be26). (2J+1)C^2S: others: 0.3 (1966Be26), 0.12 (1968Wi01). dσ/dΩ(max)=0.240 mb/sr *24*.
2316.1 *8*	$3/2^+$	2	0.16	E(level): others: 2316.1 *12* (1985PuZY), 2320 *50* (1987Da16), 2320 *10* (1983Wa25), 2310 *8* (1966Be26), 2322 *6* (1960Br17). (2J+1)C^2S: others: 0.33 (1966Be26), 0.16 (1968Wi01). dσ/dΩ(max)=0.96 mb/sr *10*.
2787.5 *4*	$5/2^+$,$(3/2^+)$	2	0.26	E(level): others: 2788.1 *9* (1985PuZY), 2790 *50* (1987Da16), 2787 *10* (1983Wa25), 2782 *8* (1966Be26), 2788 *6* (1960Br17). (2J+1)C^2S: others: 0.37 (1966Be26), 0.30 (1968Wi01). dσ/dΩ(max)=1.63 mb/sr *8*.
3133.0 *3*	$7/2^-$	3	4.76	E(level): others: 3133.1 *7* (1985PuZY), 3130 *50* (1987Da16), 3134 *10* (1983Wa25), 3130 *8* (1966Be26), 3137 *6* (1960Br17). (2J+1)C^2S: others: 6.67 (1966Be26), 5.1 (1968Wi01). dσ/dΩ(max)=11.8 mb/sr *6*.
3533.0 *3*	$3/2^-$	1	1.61	E(level): others: 3532.9 *7* (1985PuZY), 3530 *50* (1987Da16), 3534 *10* (1983Wa25), 3526 *8* (1966Be26), 3535 *6* (1960Br17).

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^{30}Si(d,p),(pol d,p) 2000Pi01,1983Wa25,1987Da16 (continued)

^{31}Si Levels (continued)

E(level)[†]	L[a]	(2J+1)C^{2}S[a]	Comments
			(2J+1)C^{2}S: others: 2.32 (1966Be26), 1.9 (1968Wi01). dσ/dΩ(max)=44.0 mb/sr *18*.
3873.6 *10*	(4)[b]		E(level): others: 3874 *10* (1983Wa25), 3866 *8* (1966Be26). dσ/dΩ(max)=0.043 mb/sr *6*.
4261.6 *5*	2	0.18	E(level): others: 4261.4 *8* (1985PuZY), 4259 *10* (1983Wa25), 4257*8* (1966Be26). (2J+1)C^{2}S: other: 0.35 (1966Be26). dσ/dΩ(max)=1.25 mb/sr *13*.
4382.4 *3*	1	0.55	E(level): others: 4382.3 *7* (1985PuZY), 4381 *10* (1983Wa25), 4377 *8* (1966Be26), 4386 *6* (1960Br17). (2J+1)C^{2}S: other: 0.60 (1966Be26). dσ/dΩ(max)=15.3 mb/sr *8*.
4690.5 *16*			E(level): others: 4691 *10* (1983Wa25), 4687 *8* (1966Be26).
4719.1 *3*	0	0.22	E(level): others: 4718.9 *7* (1985PuZY), 4719 *10* (1983Wa25), 4715 *8* (1966Be26), 4725 *6* (1960Br17). (2J+1)C^{2}S: other: 0.47 (1966Be26). dσ/dΩ(max)=3.8 mb/sr *2*.
4931 *8*			E(level): weighted average of 4927 *10* (1983Wa25) and 4933 *8* (1966Be26).
4963 *8*			E(level): weighted average of 4968 *10* and 4960 *8* (1966Be26).
4992[#] *10*			
5281.3 *3*	1	0.89	E(level): others: 5281.1 *7* (1985PuZY) 5270 *14* (1974Ho28), 5280 *10* (1983Wa25), 5257 *8* (1966Be26). L: from 2000Pi01. Older data indicated L=0 (1966Be26,1974Ho28,1983Wa25) but recent measurements (2000Pi01) of the angular distribution indicate L=1 fits the data better than L=0. Furthermore, this level with a $J^\pi=1/2^-$ can be better matched to a predicted 5606-keV level in *sd* shell model calculation (2000Pi01). (2J+1)C^{2}S: others: 0.076 (1974Ho28), 0.08 (1966Be26). dσ/dΩ(max)=29.2 mb/sr *12*.
5312 *8*			E(level): weighted average of 5310 *10* (1983Wa25) and 5314 *8* (1966Be26).
5441.9 *4*	3	0.59	E(level): others: 5442.8 *9* (1985PuZY), 5432 *14* (1974Ho28), 5441 *10* (1983Wa25), 5433 *8* (1966Be26), 5447 *6* (1960Br17), L: other: (2) (1974Ho28). (2J+1)C^{2}S: other: 0.27 (1974Ho28). dσ/dΩ(max)=2.80 mb/sr *14*.
5604 *3*			E(level): others: 5603 *10* (1983Wa25), 5592 *8* (1966Be26). dσ/dΩ(max)=0.102 mb/sr *15*.
5647 *8*			E(level): from 1966Be26 only.
5678 *4*			E(level): weighted average of 5680 *4* (2000Pi01), 5677 *10* (1983Wa25), and 5671 *8* (1966Be26). dσ/dΩ(max)=0.072 mb/sr *6*.
5819 *10*	(0)[b]	0.05	E(level): weighted average of 5820 *14* (1974Ho28) and 5819 *10* (1983Wa25). (2J+1)C^{2}S: from 1983Wa25. dσ/dΩ(max)=0.461 mb/sr *23*.
5872.8 *5*	1	0.12	E(level): weighted average of 5872.5 *5* (2000Pi01) and 5873.6 *9* (1985PuZY). Others: 5870 *14* (1974Ho28), 5867 *10* (1983Wa25), 5864 *8* (1966Be26). (2J+1)C^{2}S: other: 0.15 (1974Ho28). dσ/dΩ(max)=3.37 mb/sr *17*.
5957.3 *7*	(1,2)	0.034	E(level): weighted average of 5957.3 *7* (2000Pi01) and 5956.5 *9* (1985PuZY). Others: 5956 *10* (1983Wa25), 5950 *14* (1974Ho28), 5944 *8* (1966Be26). L: other: (2) (1974Ho28). (2J+1)C^{2}S: other: 0.09 (1974Ho28).
5983 *5*	(2)[b]		E(level): weighted average of 5986 *5* (2000Pi01), 5983 *10* (1983Wa25), and 5975 *8* (1966Be26). dσ/dΩ(max)=0.77 mb/sr *8*.
6071.9 *10*	2[c]	0.08[c]	E(level): weighted average of 6071 *2* (2000Pi01) and 6072.1 *10* (1985PuZY). Others: 6070 *14* (1974Ho28), 6068 *10* (1983Wa25), 6063 *8* (1966Be26).

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^{30}Si(d,p),(pol d,p) 2000Pi01,1983Wa25,1987Da16 (continued)

^{31}Si Levels (continued)

E(level)[†]	L[a]	(2J+1)C^{2}S[a]	Comments
			dσ/dΩ(max)=0.108 mb/sr *16*.
6106 *1*	3[c]	0.04	E(level): others: 6100 *14* (1974Ho28), 6108 *10* (1983Wa25), 6097 *8* (1966Be26). L: other: (2,1) (1983Wa25). (2J+1)C^{2}S: from 1983Wa25. Other: 0.29 (1974Ho28). dσ/dΩ(max)=0.51 mb/sr *5*.
6241 *5*	2[c]	0.27[c]	E(level): weighted average of 6239 *5* (2000Pi01), 6240 *14* (1974Ho28), 6251 *10* (1983Wa25), and 6240 *8* (1966Be26).
6284[#] *10*			
6351 *4*			E(level): others: 6340 *14* (1974Ho28), 6348 *10* (1983Wa25), 6351 *8* (1966Be26).
6415 *5*	(3)[b]	0.08	E(level): weighted average of 6417 *4* (2000Pi01), 6390 *14* (1974Ho28), and 6413 *10* (1983Wa25). (2J+1)C^{2}S: from 1983Wa25. dσ/dΩ(max)=0.35 mb/sr *4*.
6461.4 *10*	(2)[b]	0.14	E(level): weighted average of 6461 1 (2000Pi01) and 6461.8 *10* (1985PuZY). Others: 6450 *14* (1974Ho28), 6462 *10* (1983Wa25), (2J+1)C^{2}S: from 1983Wa25. dσ/dΩ(max)=1.20 mb/sr *1*.
6490.9[‡] *13*			
6584.0 *10*	3	0.12	E(level): weighted average of 6583 *1* (2000Pi01) and 6584.9 *9* (1985PuZY). Others: 6580 *14* (1974Ho28), 6587 *10* (1983Wa25). L: other: (2) (1983Wa25). dσ/dΩ(max)=1.80 mb/sr *2*.
6600.6 *10*			E(level): weighted average of 6600 *1* (2000Pi01) and 6601.2 *10* (1985PuZY).
6636.1[‡] *16*			
6661 *10*			E(level): weighted average of 6650 *14* (1974Ho28) and 6667 *10* (1983Wa25).
6771 *2*			E(level): other: 6780 *14* (1974Ho28).
6790.9 *12*			E(level): from 1985PuZY. Others: 6791 *10* (1983Wa25), 6780 *14* (1974Ho28).
6814.1 *5*	2	0.10	E(level): others: 6814.4 *9* (1985PuZY), 6810 *14* (1974Ho28), 6817 *10* (1983Wa25). L: other: (1) (1983Wa25). (2J+1)C^{2}S: other: 0.20 (1974Ho28). dσ/dΩ(max)=1.420 mb/sr *14*.
6876.8 *14*			E(level): from 1985PuZY. Others: 6870 *14* (1974Ho28), 6886 *10* (1983Wa25). dσ/dΩ(max)=0.112 mb/sr *17*.
6915.5 *6*	2	0.15	E(level): weighted average of 6915.2 *5* (2000Pi01) and 6916.6 *9* (1985PuZY). Others: 6900 *14* (1974Ho28), 6915 *10* (1983Wa25). (2J+1)C^{2}S: other: 0.09 (1974Ho28). dσ/dΩ(max)=1.35 mb/sr *14*.
6954.2 *11*	2[c]	0.04[c]	E(level): from 1985PuZY. Others: 6940 *14* (1974Ho28), 6949 *10* (1983Wa25). dσ/dΩ(max)=0.71 mb/sr *7*.
7012.2 *11*	(1)[b]		E(level): from 1985PuZY. Other: 7008 *10* (1983Wa25). dσ/dΩ(max)=0.63 mb/sr *6*.
7164[#] *10*	(2)[b]		dσ/dΩ(max)=0.44 mb/sr *4*.
7207 *2*			E(level): weighted average of 7209 *2* (2000Pi01), 7205 *10* (1983Wa25). E(level): 7214.9 *16* (1985PuZY). dσ/dΩ(max)=0.55 mb/sr *5*.
7268.5 *19*			E(level): weighted average 7266 *3* (2000Pi01), 7269.7 *19* (1985PuZY), and 7265 *10* (1983Wa25).
7310.6 *14*	(2)[b]		E(level): weighted average of 7311 *2* (2000Pi01), 7310.7 *14* (1985PuZY), 7290 *14* (1974Ho28), and 7305 *10* (1983Wa25). dσ/dΩ(max)=0.39 mb/sr *4*.
7365 *2*			E(level): weighted average of 7368 *2* (2000Pi01), 7362 *2* (1985PuZY), and 7356 *10* (1983Wa25). dσ/dΩ(max)=0.037 mb/sr *5*.
7401 *2*			E(level): other: 7397 *10* (1983Wa25).

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^{30}Si(d,p),(pol d,p) 2000Pi01,1983Wa25,1987Da16 (continued)

^{31}Si Levels (continued)

E(level)[†]	L[a]	(2J+1)C^{2}S[a]	Comments
			dσ/dΩ(max)=0.039 mb/sr *6*.
7409.1[‡] *17*			
7438.3 *4*	(2,3)		E(level): others: 7439.2 *12* (1985PuZY), 7420 *14* (1974Ho28), 7432 *10* (1983Wa25). L: 3 from 2000Pi01, while L=2 from 1974Ho28, and (2) from 1983Wa25. In (n,γ),(n,n):resonances, L=2 from R-matrix analysis is reported for a level at E=7438.5 *8*, which is assumed to the same level as the 7438.3 level here. It is likely there is probably a doublet around this energy. (2J+1)C^{2}S: 0.61 for L=3 (2000Pi01), 0.1 for L=2 (1974Ho28). dσ/dΩ(max)=5.00 mb/sr *25*.
7483[#] *10*			dσ/dΩ(max)=0.097 mb/sr *14*.
7564[#] *10*	(2,3)[b]		dσ/dΩ(max)=0.43 mb/sr *4*.
7642 *10*	(2,3)[c]		E(level): weighted average of 7630 *14* (1974Ho28) and 7648 *10* (1983Wa25). dσ/dΩ(max)=0.26 mb/sr *3*.
7718[#] *10*			E(level): 7718 *10* (1983Wa25). dσ/dΩ(max)=0.120 mb/sr *18*.
7765 *2*			E(level): other: 7757 *10* (1983Wa25).
7823[#] *10*			
7904.6 *8*	3	0.30	E(level): others: 7905.8 *17* (1985PuZY), 7880 *14* (1974Ho28), 7899 *10* (1983Wa25). L: other: (1) (1983Wa25). (2J+1)C^{2}S: other: 0.02 (1974Ho28). dσ/dΩ(max)=3.21 mb/sr *16*.
7991 *4*	3[c]		E(level): other: 7990 *14* (1974Ho28).
8016.6 *16*	3	0.16	E(level): weighted average of 8017.5 *12* (2000Pi01), 8010 *14* (1974Ho28), and 8011 *3* (1985PuZY).
8034.9 *12*	3	0.14	E(level): other: 8040 *14* (1974Ho28). (2J+1)C^{2}S: other: 0.08 (1974Ho28).
8071 *3*	3[c]	0.06[c]	E(level): weighted average of 8070 *3* (2000Pi01) and 8090 *14* (1974Ho28).
8115.9 *13*	3	0.38	
8140[@] *14*	3[c]	0.06[c]	
8165.2 *15*	3	0.12	E(level): weighted average of 8164.8 *15* (2000Pi01) and 8167 *3* (1985PuZY).
8220[@] *14*			
8240[@] *14*	(3)[c]	0.01[c]	
8360[@] *14*	3[c]	0.12[c]	
8570[@] *14*	2[c]	0.007[c]	
8605 *3*	2[c]	0.02[c]	E(level): from 1985PuZY. Other: 8620 *14* (1974Ho28).
8648[‡] *3*			
8710[@] *14*	(3)[c]	0.016[c]	
8780[@] *14*	(2)[c]	0.004[c]	
8830[@] *14*	(1)[c]		
8850[@] *14*			
8920[@] *14*	(1)[c]		
8967 *7*	(1)[c]		E(level): weighted average of 8966 *7* (1985PuZY) and 8970 *14* (1974Ho28).
9230[@] *14*	(2)[c]	0.004[c]	
9380[@] *14*			

[†] From 2000Pi01, unless otherwise stated.
[‡] From 1985PuZY only.
[#] From 1983Wa25 only.

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^{30}Si(d,p),(pol d,p) 2000Pi01,1983Wa25,1987Da16 (continued)

^{31}Si Levels (continued)

@ From 1974Ho28 only.
& From L-transfers and Ay(θ) (1987Da16).
a From 2000PI01 extracted from DWBA fit to measured $\sigma(\theta)$, unless otherwise noted. Values from other references are also quoted in comments, and are in general agreement. Discrepancies are pointed out.
b From 1983Wa25.
c From 1974Ho28.