^{31}P(^{3}He,d) 1978Ka18

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 201,1 (2025)	31-Oct-2024

Target $J^{\pi}(^{31}P$ g.s.)=1/2^{+}.

1978Ka18: E=25 MeV ^{3}He beam was produced from the Orsay MP tandem Van de Graaff accelerator. Targets were red phosphorus with thickness of 60-120 μg/cm^{2} on carbon backings. Reaction products were momentum-analyzed with an Enge split pole magnetic spectrograph (FWHM=18 keV) and detected with position sensitive solid state detectors. Measured $\sigma(E_d,\theta)$, θ=5° to 60°. Deduced levels, J, π, L-transfers and spectroscopic factors from DWBA analysis. 1994Ve04 from the same report measured $\sigma(\theta)$ for 0, 2230 and 3778 levels.

1975Ad03: E=8.5 MeV ^{3}He beam from Centre de Recherches Nucleaires University Louis Pasteur, Strasbourg. Target was natural phosphorus. Reaction products were detected with surface barrier detectors. Measured intensity of E0 transition from 3778, 0^{+} level from pair spectrum.

1973Ka26: E=8 MeV ^{3}He from Orsay Van de Graaff accelerator. Measured $\sigma(E_d,\theta)$. Deduced levels, J, L-transfers and spectroscopic factors from DWBA analysis. Comparisons with available data. Report levels up to 6230.

1970Mo01: E=13 MeV ^{3}He from Argonne National lab tandem Van de Graaff accelerator. Target was red phosphorus targets. Deuterons were detected with surface barrier detectors. Measured $\sigma(\theta)$. Deduced levels, J, π, L-transfers, spectroscopic factors from DWBA analysis. Report levels up to 6620.

1968Gr17: E=12 MeV ^{3}He from MIT ONR Van de Graaff. Reaction products were momentum-analyzed with a multigap spectrograph. Measured $\sigma(E_d,\theta)$. Deduced levels, J, π, L-transfers and spectroscopic factors from DWBA analysis. Report levels up to 9485.

1960Hi13: E=10.2 MeV ^{3}He from the Aldermaston Van de Graaff accelerator. Measured $\sigma(E_d)$. Deduced levels. Report levels up to 8496.

1995Ro22: E=25 MeV ^{3}He beam from the Princeton AVF cyclotron. Target was CO_2P with a thickness of 30-50 μg/cm^{2} on a carbon backing. Reaction products were momentum-analyzed with a Q3D spectrometer (FWHM≈20 keV) and detected with surface barrier detectors. Measured particle and γ spectra in coincidence with deuterons. Proton-unbound levels are reported.

Other: 1965He01.

^{32}S Levels

Spectroscopic factor is obtained using $d\sigma/d\Omega_{exp}=4.43(2J_f+1)/(2J_i+1)\times C^2S\times d\sigma/d\Omega_{DWBA}$, where C^2=0.5 for T=0 and T=1 (1978Ka18), J_i the spin of target and J_f=J the spin of the final level.

Values of Isospin are from 1968Gr17 and 1978Ka18.

E(level)[†]	L[‡]	(2J+1)S[‡]	Comments
0	0	2.6	T=0 (2J+1)S: others: 2.48 (1994Ve04), 2.12 (1973Ka26), 2.2 (1970Mo01), 2.4 (1968Gr17).
2229 *5*	2	5.4	T=0 E(level): other: 2237 *10* (1968Gr17). (2J+1)S: others: 5.7 (1994Ve04), 5.64 (1973Ka26), 6.5 (1970Mo01), 6.0 (1968Gr17).
3778 *5*	0	0.68	T=0 E(level): other: 3780 *10* (1968Gr17). (2J+1)S: others: 0.72 (1994Ve04), 0.64 (1973Ka26), 0.66 (1970Mo01), 0.40 (1968Gr17). E0 decay strength to g.s=2.22 fm^{2} 27 (1975Ad03). Γ(E0,pair)/Γ=0.00035 *6* (1975Ad03).
4280 *5*	2	0.06	E(level): other: 4284 *10* (1968Gr17). (2J+1)S: other: <0.24 (1973Ka26).
4463 *5*			E(level): other: 4462 *10* (1968Gr17).
4695 *5*	2	2.4	T=0 E(level): other: 4698 *10* (1968Gr17). (2J+1)S: others: 2.36 (1973Ka26), 2.7 (1970Mo01), 1.5 (1968Gr17).
5006 *5*	3	3.4	E(level): others: 5006 *10* (1968Gr17), 5012 *8* (1960Hi13). (2J+1)S: others: 4.08 (1973Ka26), 3.5 (1970Mo01), 2.24 (1968Gr17).
5415 *5*	2	0.12	(2J+1)S: other: <0.2 (1973Ka26).

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^{31}P(^{3}He,d) 1978Ka18 (continued)

^{32}S Levels (continued)

E(level)†	L‡	(2J+1)S‡	Comments
5550 *5*	2	0.80	T=0 E(level): others: 5548 *10* (1968Gr17), 5553 *8* (1960Hi13). (2J+1)S: others: 0.70 (1973Ka26), 1.0 (1970Mo01), 0.64 (1968Gr17).
5802 *5*	1	0.64	E(level): others: 5790 *10* (1968Gr17), 5799 *8* (1960Hi13). (2J+1)S: others: 0.66 (1973Ka26), 0.78 (1970Mo01), 0.56 (1968Gr17).
6222 *5*	1	0.76	E(level): others: 6221 *10* (1968Gr17), 6226 *8* (1960Hi13). (2J+1)S: others: 0.67 (1973Ka26), 0.95 (1970Mo01), 0.60 (1968Gr17).
6413 *5*			
6580 *5*			
6618 *5*	3	3.2	E(level): others: 6619 *10* (1968Gr17), 6621 *8* (1960Hi13). (2J+1)S: others: 4.2 (1970Mo01), 2.6 (1968Gr17).
6663 *5*	2	0.32	E(level): others: 6666 *10* (1968Gr17), 6671 *8* (1960Hi13). L: L=2 (1978Ka18) disagrees with L=3 (1970Mo01) but in the latter, contributions from impurities are present. L=(3) in 1968Gr17. (2J+1)S: other: (0.72) (1968Gr17).
6759 *5*			
6851 *5*			
7001 *5*	2	2.4	T=1 E(level): others: 6997 *10* (1968Gr17), 7002 *8* (1960Hi13). (2J+1)S: other: 1.76 (1968Gr17).
7116 *5*	2	4.0	T=1 E(level): others: 7108 *15* (1968Gr17), 7114 *8* (1960Hi13). (2J+1)S: other: 3.52 (1968Gr17).
7189 *5*	0	0.20	T=0 E(level): others: 7180 *15* (1968Gr17), 7194 *8* (1960Hi13). (2J+1)S: other: 0.32 (1968Gr17).
7348 *5*	1+3,2	(0.08)	E(level): other: 7371 *20* (1960Hi13), tentative.
7430 *5*	1	0.32	E(level): others: 7421 *15* (1968Gr17), 7429 *10* (1960Hi13). (2J+1)S: other: 0.40 (1968Gr17).
7485 *5*	2,3	(0.16)	E(level): other: 7479 *20* (1960Hi13), tentative.
7538 *5*	0	0.36	T=1 E(level): others: 7522 *15* (1968Gr17), 7532 *2* (1960Hi13). (2J+1)S: other: 0.32 (1968Gr17).
7701 *5*	3	0.24	E(level): other: 7707 *12* (1960Hi13).
7883 *5*	1	0.16	E(level): others: 7872 *15* (1968Gr17), 7881 *12* (1960Hi13). (2J+1)S: other: 0.16 (1968Gr17).
7950 *5*	3	0.40	E(level): others: 7943 *15* (1968Gr17) and 7951 *12* (1960Hi13), doublet. (2J+1)S: other: 0.64 (1968Gr17).
7973 *5*	3	0.36	
8123 *5*	0	0.72	T=1 E(level): others: 8122 *15* (1968Gr17), 8125 *15* (1960Hi13). (2J+1)S: other: 0.56 (1968Gr17).
8194 *5*			
8274 *5*			
8295 *5*	3	0.56	T=1 E(level): others: 8293 *15* (1968Gr17), 8298 *15* (1960Hi13). (2J+1)S: other: 0.56 (1968Gr17).
8345 *5*			
8380 *5*	1+3,2		
8407 *5*			
8499 *5*	1	0.60	T=1 E(level): others: 8497 *15* (1968Gr17), 8496 *15* (1960Hi13). (2J+1)S: other: 0.52 (1968Gr17).
8687 *5*			
8728 *5*	2,3		T=1 E(level): other: 8712 *15* (1968Gr17).
8858 *5*	2,3		

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^{31}P(^{3}He,d) 1978Ka18 (continued)

^{32}S Levels (continued)

E(level)†	L‡	(2J+1)S‡	Comments
9021 *10*	3	0.36	E(level): other: 9020 *15* (1968Gr17), 9023 (1995Ro22). (2J+1)S: other: 0.36 (1968Gr17).
9061 *10*	1	0.32	E(level): other: 9060 *15* (1968Gr17). (2J+1)S: other: 0.28 (1968Gr17).
9169 *10*			T=1 J^{π}: 3^+ proposed as analog to 2178, 3^+ level in ^{32}P (1997Br07).
9209 *10*	(0+2)	0.12,0.32	T=1 E(level): other: 9207 *15* (1968Gr17). L: other: L=(1,2) from 1968Gr17.
9238 *10*	1	0.12	T=1 E(level): other: 9240 *15* (1968Gr17). L: other: L=(1,2) from 1968Gr17.
9255 *10*	2	0.28	T=1
9292 *10*	(0+2)	0.12,0.08	
9395 *10*	1	1.2	E(level): other: 9396 *15* (1968Gr17). (2J+1)S: other: 1.44 (1968Gr17).
9469 *10*			
9493 *10*	1	0.20	E(level): other: 9485 *15* (1968Gr17).
9562 *10*	1		
9652 *10*	1+3,2	0.24	
9732 *10*	3,1	0.68,0.44	E(level): unresolved doublet (1978Ka18).
9823 *10*	3	0.80	
9853 *10*	1	0.16	
9893 *10*	2	0.20	
9955 *10*	1	0.12	
9985 *10*	3	1.0	
10021 *10*	3	0.08	
10072 *10*	1	1.8	
10098 *10*			
10223 *10*	3	2.8	
10257 *10*	3	5.2	
10287 *10*	3		
10330 *10*	1	0.68	
10368 *10*	2	0.24	
10395 *10*	3	1.4	
10428 *10*	2,3		
10533 *10*	3		
10624 *10*	3	0.32	
10698 *10*	1	1.9	
10777 *10*	1	1.0	
10826 *10*	1	0.88	
10977 *10*	(1)		
11008 *10*			
11091 *10*	3	0.24	
11198 *10*	3	0.40	
11233 *10*			
11256 *10*			
11366 *10*			
11438 *10*			
11475 *10*			
11504 *10*			
11551 *10*			
11583 *10*			
11603 *10*			
11623 *10*			
11660 *10*			
11690 *10*			

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^{31}P(^{3}He,d) 1978Ka18 (continued)

^{32}S Levels (continued)

E(level)†	E(level)†	L‡	(2J+1)S‡	E(level)†
11720 *10*	11936 *10*	3	0.24	12340 *10*
11750 *10*	11955 *10*			12362 *10*
11783 *10*	12002 *10*			12393 *10*
11806 *10*	12044 *10*	3	0.56	12426 *10*
11823 *10*	12160 *10*	(2)		12465 *10*
11861 *10*	12196 *10*			12491 *10*
11876 *10*	12235 *10*	(2)		
11900 *10*	12308 *10*			

† From 1978Ka18.
‡ From DWBA analysis of measured $\sigma(\theta)$ in 1978Ka18. The few discrepancies between experiments are noted.