

⁴¹Ca(d,p),(pol d,p) 1975Ha14,1978Vo04

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen [#] and Balraj Singh		NDS 135, 1 (2016)	31-May-2016

$J^\pi(^{41}\text{Ca g.s.})=7/2^-$.

1975Ha14 (also **1972E112**): (d,p) E=12 MeV deuteron beam was produced at the tandem accelerator of the Niels Bohr Institute. A 20 $\mu\text{g}/\text{cm}^2$ target with a carbon backing (81.8% in ⁴¹Ca). Protons were momentum analyzed with a broad-range magnetic spectrograph, FWHM=15 keV. Measured $\sigma(E_p, \theta)$. Deduced levels, J^π , L, spectroscopic factors from DWBA analysis.

1978Vo04 (also **1978Vo01**): (pol d,p) E=11 MeV polarized deuteron beam was produced at the McMaster University FN tandem Van de Graaff accelerator. A 25 $\mu\text{g}/\text{cm}^2$ thick target (81.8% in ⁴¹Ca) evaporated onto a carbon backing. Protons were momentum analyzed with a magnetic spectrograph and detected in nuclear emulsions, FWHM=15 keV. Measured $\sigma(E_p, \theta)$, $A_y(\theta)$. Deduced levels, J^π , L, spectroscopic factors from DWBA analysis.

Level energy	Cross section data			
	$\sigma(\text{max})$ $\mu\text{b}/\text{sr}$ (1975Ha14)	$\theta(\text{lab})$	$\sigma(\text{max})$ $\mu\text{b}/\text{sr}$ (1978Vo04)	$\theta(\text{lab})$
0	105	35	98	35
1525	396	15	448	15
1836	22	30	21	35
2423	344	35	346	30
2752	1060	35	1054	35
3187	2050	35	2243	35
3251	266	35	267	40
3295	8	30	12	35
3389	69	10	60	10
3441	11			
3650	399	15		
3888	4	25		
3949	27	5		
3999	23	15		
4052	40	5		
4103	14	30		
4228	14	30		
4356	67	25		
4423	103	5		
4448	3270	15	2525	15
4505	125	15	158	15
4566	13	20		
4666	54	5		
4691	116	5		
4720	72	5		
4760	1650	15	1650	10
4869	1220	15	1277	10
4899	95	5		
4947	36	15		
4977	83	5		
5020	3950	15	4210	15
5084	160	15		
5210	6200	15	6042	10
5325	210	5		
5356	140	15		
5384	58	10		
5412	210	5		
5442	100	5		
5474	2660	15	2804	15
5533	150	5	158	15
5626	100	5		
5669	87	5		
5696	80	10		

5778	14140	15	14530	15
5801	110	15		
5926	160	5		
5956	200	5		
5988	160	5		
6004	170	5		
6021	110	5		
6112	1010	10	1381	15
6138				
6157	160	5		
6184	100	10		
6213	460	5		
6250	94	5		
6276	190	10	181	15
6304	590	10	617	15
6390	130	5		
6426	340	10	360	15
6462	220	5		
6495	450	10	408	10
6557	320	10	282	10
6572	300	5	232	10
6614	510	15	471	20
6653	40	20		
6670	10	30		
6717	160	10		
6760	350	15	794	15
6785	39	10		
6814	2000	15	2853	15
6884	330	10	518	15
6909	960	10	1072	15
6937	160	10		
6961	1920	10	2247	10
6987	200	10		
7025	390	15	572	15
7041	150	10		
7123	650	10	702	15
7160	740	10	823	15
7203	130	5		
7221	160	5		
7270	1940	10	2184	15
7348	1470	10	1579	10
7401	1540	15	1534	15
7422	52	30		
7438	41	25		
7468	110	10		
7520	2110	10	2649	15
7571	400	5		
7600	160	15		
7643	830	10	1272	10
7709	1570	10	1589	15
7760	980	10	1309	15
7793	3100	10	4628	15

$^{41}\text{Ca}(\text{d,p}),(\text{pol d,p})$ 1975Ha14,1978Vo04 (continued) ^{42}Ca Levels

E(level) [†]	L [#]	(2J+1)S [@]	Comments
0	3&a	0.91&	(2J+1)S: 1.0 (1975Ha14).
1525 5	1+3&	0.24,2.7&	Spin of transferred neutron=3/2+7/2 (1978Vo04). (2J+1)S: 0.25, 3.1 (1975Ha14).
1836 5	3&a	0.21&	(2J+1)S: 0.23 (1975Ha14).
2423 5	3&a	3.14&	(2J+1)S: 3.4 (1975Ha14).
2752 5	1+3&	0.32,8.25&	Spin of transferred neutron=3/2+7/2 (1978Vo04). (2J+1)S: 0.35, 9.5 (1975Ha14).
3187 5	3&a	17.1&	(2J+1)S: 20.0 (1975Ha14).
3251 5	3&a	2.36&	L: 3 (1978Vo04). (2J+1)S: 2.4 (L=3), 0.014 (L=(1)) (1975Ha14).
3295 10	3&	0.10&	(2J+1)S: 0.08 (1975Ha14).
3389	1&b	0.04&	L: 1+3 (1975Ha14). (2J+1)S: 0.06 (L=1), 0.05 (L=3) (1975Ha14).
3441 10			
3650 10	1+3&	0.25,0.42&	Spin of transferred neutron=3/2+7/2 (1978Vo04). (2J+1)S: 0.26, 0.72 (1975Ha14).
3888 10			
3949 10	(0+2)	0.006,0.13	
3999 10			
4052 10	(0+2)	0.011,0.10	
4103 10			
4228 10			
4356 10	2(+0)	0.35,0.001	
4423 10	0+2	0.024,0.32	
4448 10	1&b	1.54&	E(level): doublet. (2J+1)S: 1.7 (1975Ha14).
4505 10	1+3&	0.07,0.08&	Spin of transferred neutron=(3/2+7/2) (1978Vo04). (2J+1)S: 0.083, 0.09 (1975Ha14).
4566 10			
4666 10	0+2	0.017,0.021	
4691 10	0+2	0.033,0.20	
4720 10	0+2	0.022,0.05	
4760 10	1&b	1.03&	(2J+1)S: 1.1 (1975Ha14).
4869 10	1&b	0.72&	L: 1(+3) (1975Ha14). (2J+1)S: 0.83 (L=1), 0.51 (L=3) (1975Ha14).
4899 10	0+2	0.023,0.29	
4947 10	(1)	0.025	
4977 10	0	0.026	
5020 10	1&b	2.43&	L: 1(+3) (1975Ha14). (2J+1)S: 2.6 (L=1), 1.4 (L=3) (1975Ha14).
5084 10			
5210 10	1&b	3.78&	(2J+1)S: 4.2 (1975Ha14).
5325 10	0(+2)	0.025,0.016	
5356 10	1	0.083	
5384 10	(0+2)	0.005,0.04	
5412 10	0	0.022	
5442 10	0	0.013	
5474 10	1&b	1.48&	L: 1(+3) (1975Ha14). (2J+1)S: 1.6 (L=1), 1.0 (L=3) (1975Ha14).
5533 10	1&b	0.09&	(2J+1)S: 0.09 (1975Ha14).
5626 10	0(+2)	0.011,0.021	

Continued on next page (footnotes at end of table)

$^{41}\text{Ca}(\text{d,p}),(\text{pol d,p})$ 1975Ha14,1978Vo04 (continued) ^{42}Ca Levels (continued)

E(level) [†]	J ^π [‡]	L [#]	(2J+1)S [@]	Comments
5669 10		0+2	0.010,0.017	
5696 10				
5778 10		1&b	6.88&	(2J+1)S: 9.1 (1975Ha14).
5801 10				
5926 10		0+2	0.021,0.022	
5956 10		0+2	0.023,0.021	
5988 10		0+2	0.019,0.028	
6004 10		0+2	0.015,0.071	
6021 10		0+2	0.011,0.042	
6112 10		1&b	0.70&	L: 1+3 (1975Ha14). (2J+1)S: 0.59 (L=1), 0.57 (L=3) (1975Ha14).
6138 10				
6157 10		0+2	0.019,0.040	
6184 10		(0+2)	0.012,0.036	J ^π : adopted J ^π =(1,2 ⁺).
6213 10		0+2	0.05,0.18	
6250 10		0+2	0.010,0.030	
6276 10		1&b	0.14&	(2J+1)S: 0.11 (1975Ha14).
6304 10	(2 to 5) ⁺	1&	0.33&	Spin of transferred neutron=(3/2) (1978Vo04). (2J+1)S: 0.33 (1975Ha14).
6390 10		0(+2)	0.014,0.006	
6426 10	(2 to 5) ⁺	1&b	0.17&	(2J+1)S: 0.17 (1975Ha14).
6462 10		0+2	0.023,0.071	
6495 10	(2 to 5) ⁺	1&b	0.26&	(2J+1)S: 0.22 (1975Ha14).
6557 15	(2 to 5) ⁺	1&b	0.17&	(2J+1)S: 0.15 (1975Ha14).
6572 15	(2 to 5) ⁺	1&b	0.15&	(2J+1)S: 0.16 (1975Ha14).
6614 15	3 ⁺ ,4 ⁺	1&c	0.34&	L: 1(+3) (1975Ha14). (2J+1)S: 0.30 (L=1), 0.18 (L=3) (1975Ha14).
6653 15				
6670 15				
6717 15		(1+3)	0.070,0.35	
6760 15	3 ⁺ ,4 ⁺	1&	0.32&	Spin of transferred neutron=1/2+3/2 (1978Vo04). L: 1(+3) (1975Ha14). (2J+1)S: 0.18 (L=1), 0.26 (L=3) (1975Ha14).
6785 15				
6814 15	(2 to 5) ⁺	1&b	1.17&	L: 1+3 (1975Ha14). (2J+1)S: 1.0 (L=1), 0.97 (L=3) (1975Ha14).
6884 15	(2 to 5) ⁺	1&b	0.20&	(2J+1)S: 0.15 (1975Ha14).
6909 15	3 ⁺ ,4 ⁺	1&c	0.52&	(2J+1)S: 0.48 (1975Ha14).
6937 15		1+3	0.058,0.14	
6961 15	3 ⁺ ,4 ⁺	1&c	1.06&	(2J+1)S: 0.97 (1975Ha14).
6987 15		(1)	0.075	
7025 15	3 ⁺ ,4 ⁺	1+3&	0.19,0.37&	Spin of transferred neutron=1/2+5/2 (1978Vo04). (2J+1)S: 0.20, 0.33 (1975Ha14).
7041 15		(0+2)	0.015,0.057	
7123 15	3 ⁺ ,4 ⁺	1&	0.36&	Spin of transferred neutron=1/2+3/2 (1978Vo04). (2J+1)S: 0.31 (1975Ha14).
7160 15	3 ⁺ ,4 ⁺	1&c	0.38&	(2J+1)S: 0.35 (1975Ha14).
7203 15		(0+2)	0.016,0.028	
7221 15		(0+2)	0.019,0.026	
7270 15	3 ⁺ ,4 ⁺	1&c	0.91&	(2J+1)S: 0.98 (1975Ha14).
7348 15	3 ⁺ ,4 ⁺	1&c	0.69&	(2J+1)S: 0.74 (1975Ha14).
7401 15	3 ⁺ ,4 ⁺	1&c	0.72&	(2J+1)S: 0.96 (1975Ha14).

Continued on next page (footnotes at end of table)

$^{41}\text{Ca}(\text{d,p}),(\text{pol d,p})$ **1975Ha14,1978Vo04 (continued)** ^{42}Ca Levels (continued)

<u>E(level)[†]</u>	<u>J^π[‡]</u>	<u>L[#]</u>	<u>(2J+1)S[@]</u>	<u>Comments</u>
7422 15				
7438 15				
7468 15		(1+3)	0.056,0.15	
7520 15	3 ⁺ ,4 ⁺	1 ^{&c}	1.06 ^{&}	L: 1+3 (1975Ha14). (2J+1)S: 1.1 (L=1), 0.85 (L=3) (1975Ha14).
7571 15		(1)	0.016	
7600 15		(1+3)	0.072,0.24	
7643 15	3 ⁺ ,4 ⁺	1 ^{&}	0.62 ^{&}	Pure p _{1/2} neutron transfer is indicated by observation of the 7643 group at three most forward angles only (1978Vo04). L: 1+3 (1975Ha14). (2J+1)S: 0.45 (L=1), 0.39 (L=3) (1975Ha14).
7709 15	3 ⁺ ,4 ⁺	1 ^{&c}	0.75 ^{&}	(2J+1)S: 0.74 (1975Ha14).
7760 15	(3,4) ⁺	1 ^{&}	0.54 ^{&}	Spin of transferred neutron=(1/2) (1978Vo04). L: 1+3 (1975Ha14). (2J+1)S: 0.47 (L=1), 0.94 (L=3) (1975Ha14).
7793 15	3 ⁺ ,4 ⁺	1 ^{&c}	1.78 ^{&}	L: 1+3 (1975Ha14). (2J+1)S: 1.6 (L=1), 1.4 (L=3) (1975Ha14).

[†] From 1975Ha14. Almost all the levels are also reported by 1978Vo04. Reported (1978Vo04) energies of 43 groups agree with the values of 1975Ha14 within about 5 keV.

[‡] From 1978Vo04, based on the analyzing power data.

[#] From 1975Ha14 (DWBA analysis), unless otherwise stated.

[@] From 1975Ha14, unless otherwise stated. The values quoted here are from non-zero finite-range potential. 1975Ha14 provide corresponding values for local zero-range potential also. The values from 1978Vo04 correspond to the former choice of potential.

[&] From 1978Vo04. Values from 1975Ha14 are given under comments.

^a Spin of transferred neutron=7/2 from vector analyzing power (1978Vo04).

^b Spin of transferred neutron=3/2 from vector analyzing power (1978Vo04).

^c Spin of transferred neutron=1/2 from vector analyzing power (1978Vo04).