^{44}Ca(p,d) 1972Ma23,1968Sm05

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen[#]	NDS 126, 1 (2015)	31-Mar-2015

Target ^{44}Ca $J^{\pi}=0^{+}$.

1972Ma23 (also 1972MaXL): E=40 MeV proton beam was produced from the the Grenoble variable-energy cyclotron. Targets of natural and enriched ^{44}Ca metal foils. Deuterons were detected with ΔE-E counter telescope, FWHM=120 keV. Measured $\sigma(E_d,\theta)$ from 10° to 60° in 4° steps. Overall accuracy on absolute cross sections ≈10%. Deduced levels, J, π, L, spectroscopic factors from DWBA analysis.

1968Sm05: E=26.5 MeV proton beam was produced from the University of Colorado Cyclotron. Target of 98.61% enriched ^{44}Ca. Deuterons were detected with ΔE-E (silicon surface barrier, 211 μm and 1090 μm) counter telescope, FWHM=110 keV. Measured $\sigma(\theta)$ from 21° to 76° in 5° steps. Overall accuracy on absolute cross sections ≈25%. Deduced levels, J, π, L spectroscopic factors from DWBA analysis.

1966Co06: E=17.5 MeV proton beam was produced from the Princeton FM cyclotron. Target of 98.6% enriched ^{44}Ca. Deuterons were detected with ΔE-E (solid-state detector) counter telescope, FWHM=80-100 keV. Measured $\sigma(\theta)$ from 20° to 160° in 10° steps. Overall accuracy on absolute cross sections ≈25%. Deduced levels, J, π, L spectroscopic factors from DWBA analysis. Levels up to 2050 reported.

Cross section data (1968Sm05)

Level energy	dσ/dΩ (mb/sr) (max)
0	6.26
373	0.224
594	0.545
992	3.23
1395	0.141
1680	0.074
1959	2.20
2050	0.531
2252	0.234
2690	0.258
2870	0.266
3050	0.523
3280	0.255
3600	0.045
3920	0.218
4200	0.266
4460	0.308
7970	0.179

^{43}Ca Levels

Spectroscopic factor: $N*C^2S=\sigma(\theta)^{exp}/\sigma(\theta)^{DWBA}$, where N=2.25 (1968Sm05) is the normalization factor.

E(level)[†]	J^{π}[‡]	L[#]	C^2S[@]	Comments
0	$7/2^-$	3	2.8	C^2S: 3.7 (1968Sm05), 2.4 (1966Co06).
374 *25*	$5/2^-$	3	0.05	C^2S: 0.15 (1968Sm05).
594 *25*	$3/2^-$	1	0.04	C^2S: 0.10 (1968Sm05), 0.06 (1966Co06).
993 *25*	$3/2^+$	2	2.4	C^2S: 2.5 (1968Sm05), 0.8 (1966Co06).
1389 *25*	$(3/2)^+$	2	0.34	C^2S: 0.16 for 3/2, 0.12 for 5/2 (1968Sm05).
1680 *25*				
1960 *25*	$1/2^+$	0	1.0	C^2S: 0.62 (1968Sm05).
2050 *25*	$3/2^-$	1	0.05	C^2S: 0.18 (1968Sm05).
2250 *20*	$(5/2)^+$	2	0.26	C^2S: 0.20 for 5/2, 0.28 for 3/2 (1968Sm05).

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^{44}Ca(p,d) 1972Ma23,1968Sm05 (continued)

^{43}Ca Levels (continued)

E(level)[†]	Jπ[‡]	L[#]	C²S[@]	Comments
2660 *20*	(5/2)⁺	2	0.26	C²S: 0.26 for 5/2, 0.36 for 3/2 (1968Sm05). Additional information 1.
2840 *20*	(5/2)⁺	2	0.34	C²S: 0.22 for 5/2, 0.37 for 3/2 (1968Sm05). Additional information 2.
3050 *20*	(5/2)⁺&1/2⁺	2+0	0.47,0.13	L: from 1972Ma23. Other: L=0, S=0.22 (1968Sm05).
3260 *20*		(2,3)		L: from 1972Ma23. Other: L=3, S=0.28 for 7/2⁻ in 1968Sm05. Additional information 3.
3620 *20*	(5/2)⁺	2	0.05	L: from 1972Ma23. Other: L=(1), S=0.02 in 1968Sm05. Additional information 4.
3950 *20*	(5/2)⁺	2	0.26	C²S: 0.28 for 5/2, 0.40 for 3/2 (1968Sm05). Additional information 5.
4210 *20*		(2,3)		L: from 1972Ma23. Other: L=(2), S=0.75 for 3/2, 0.53 for 5/2 (1968Sm05). Additional information 6.
4460? *20*				This group is assigned to ^{39}Ca g.s. in 1972Ma23. 1968Sm05 assign this group as L=2, S=0.53 for 3/2,0.37 for 5/2 in ^{43}Ca.
4720[&] *20*				
5020[&] *20*				
5210[&] *20*		(2,3)		
5430[&] *20*		(2,3)		
5730[&] *20*		(2,3)		
6010[&] *20*	1/2⁺	0	0.05	
6200[&] *20*				
7970 *30*	(3/2)⁺	2	0.31	C²S: 1.1 (1968Sm05). 1978En02 quote S=1.9 (C²=1/6 for T=5/2). IAS of ^{43}K g.s., 3/2⁺ (1972Ma23).
8590 *30*	1/2⁺	0	0.15	L: from 1972Ma23. 1978En02 quote S=0.9 (C²=1/6 for T=5/2). Possible IAS of 561 in ^{43}K (1972Ma23).
8760 *30*	(7/2)⁻	3	0.07	L: from 1972Ma23. Additional information 7. 1978En02 quote S=0.42 (C²=1/6 for T=5/2). Possible IAS of 738 in ^{43}K (1972Ma23).
9000[&] *30*	(3/2)⁻	1	0.006	1978En02 quote S=0.04 (C²=1/6 for T=5/2). Possible IAS of 975 in ^{43}K (1972Ma23).
9150[&] *30*	(5/2)⁺	2	0.05	1978En02 quote S=0.30 (C²=1/6 for T=5/2). Possible IAS of 1110 in ^{43}K (1972Ma23).
10500[&] *30*	1/2⁺	0	0.03	1978En02 quote S=0.18 (C²=1/6 for T=5/2). Possible IAS of 2451 in ^{43}K (1972Ma23).
10730[&] *30*				Possible IAS of 2670 in ^{43}K (1972Ma23).
11390[&] *30*				Possible IAS of 3393 in ^{43}K (1972Ma23).
12060[&] *30*				Possible IAS of 4022 in ^{43}K (1972Ma23).
12280[&] *30*				Possible IAS of 4270 in ^{43}K (1972Ma23).
13260[&] *30*				Possible IAS of 5240 in ^{43}K (1972Ma23).
13700[&] *30*				
13950[&] *30*				

[†] From 1966Co06 for levels up to 2050. From 1972Ma23 above 2050.
[‡] As given by 1972Ma23.

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^{44}Ca(p,d) 1972Ma23,1968Sm05 (continued)

^{43}Ca Levels (continued)

From 1972Ma23.
@ From 1972Ma23 for specified J (typically uncertainty 20%), unless otherwise stated. 1968Sm05 give two sets of values: for zero-range local and for finite-range non-local. The values from the latter set are quoted below under comments. 1978En02 give S-factors (C^2=1 for T=3/2, 1/6 for T=5/2).
& From 1972Ma23 only.