

$^{42}\text{Ca}(\alpha,\alpha')$ 1973Ja17,1967Li13

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

Includes $(\alpha,\alpha'\gamma)$ from 1976Br15.

Inelastic and elastic experiments: measured $\sigma(\theta)$:

1973Ja17 (also 1973JaYN): E=28.5 MeV alpha beam. A target of CaCO_3 (94% in ^{42}Ca , $90 \mu\text{g}/\text{cm}^2$) evaporated on a carbon foil.

Scattered alpha particles were momentum analyzed with an Engel broad-range spectrograph and detected in nuclear emulsions, FWHM=25 keV. Measured $\sigma(\theta)$. Deduced levels, J^π , L from DWBA analysis.

1967Li13: E=31 MeV alpha beam from the MIT cyclotron. A $1.19 \text{ mg}/\text{cm}^2$ thick target of ^{42}Ca enriched to 93.7%. Scattered alpha particles were detected by a $500\text{-}\mu\text{m}$ silicon surface barrier detector, FWHM=70 keV. Measured $\sigma(\theta)$. Deduced levels, J^π , L from DWBA analysis.

1966Pe16: E=42 MeV. Ten levels reported up to 5700 with L values for most of these levels which are in agreement with those from 1973Ja17 and 1967Li13.

1966Gr09: E=30.5 MeV.

1969Mo28: E=18-44 MeV.

1972Oe01: E=24, 29 MeV.

1975Tr01: E=24-29 MeV.

1976Br15: $(\alpha,\alpha'\gamma)$ E=31 MeV. Measured lifetime of 3190, 6^+ state by pulsed-beam electronic timing.

1979Ba14, 1977Al07: E=1.37 GeV.

1989Ai02: E=29.3-50.5 MeV.

Elastic scattering experiments: optical-model parameters deduced from $\sigma(\theta)$ measurements:

1980Gi02: (α,α) E=104 MeV.

1972St28: (α,α) E=40.7-72.3 MeV.

1971FuZT: (α,α) E=72, 24 MeV.

1970Fe02: (α,α) E=42 MeV.

1969Ga22: (α,α) E=18, 22, 24, 29 MeV.

 ^{42}Ca Levels

E(level) [†]	$T_{1/2}$	L [†]	$B_L^{\#}$	Comments
0 [‡]		0 [‡]		
1520 [‡]		2 [‡]	0.19	$\beta_2=0.19$ (1975Tr01), 0.16 (1969Mo28), 0.10 3 (1966Gr09). B(E2)(W.u.)=10.0 15 (1967Li13).
1840 [‡]		0 [‡]		
2420 [‡]		2 [‡]	0.072	$\beta_2=0.092$ (1975Tr01). B(E2)(W.u.)=1.5 2 (1967Li13).
2750 5		4	0.067	$\beta_4=0.107$ (1975Tr01), 0.049 (1969Mo28). B(E4)(W.u.)=1.4 2 (1967Li13).
3188 5	5.27 ns 14	6		$T_{1/2}$: from pulsed-beam electronic timing (1976Br15).
3250 5		4		
3299 5		(0)		
3390 5		2		
3446 5		3	0.30	β_3 from 1975Tr01.
3653 5		2	0.051	B(E2)(W.u.)=0.75 11 (1967Li13).
3891 5		3		
4046 5				
4100 5		5		
4446 5		4	0.077	B(E4)(W.u.)=1.8 4 (1967Li13).
4686 5		3		
4760 5		(2)		
4865 5		2		
4902 5		3		
4972 5		3		

Continued on next page (footnotes at end of table)

$^{42}\text{Ca}(\alpha,\alpha')$ 1973Ja17,1967Li13 (continued) ^{42}Ca Levels (continued)

<u>E(level)[†]</u>	<u>L[†]</u>	<u>B_L[#]</u>	<u>Comments</u>
5017 5	(3,4)		
5156 5	3		
5205 5	2		
5375 5			
5400 [‡]	(4) [‡]	0.036	B(E4)(W.u.)=0.4 1 (1967Li13).
5494 5	3		
5527 5	3		L: from 1967Li13.
5591 5	(3)		
5623 5	(3)		
5667 5	3		
5693 5	(4,5)		
5720 5	(4)		
5794 5	3		
5866 5	2		
5924 5			
6017 5	2		
6050 [‡]	(3) [‡]		
6106 5	(4)		
6154 5	3		
6192 5			
6239 5	3		
6510 [‡]	(4) [‡]	0.053	B(E4)(W.u.)=0.9 2 (1967Li13).
6630 [‡]	(4) [‡]	0.048	B(E4)(W.u.)=0.7 2 (1967Li13).
6950			E(level): from 1967Li13.

[†] From 1973Ja17, unless otherwise stated.

[‡] From 1967Li13.

[#] From 1967Li13.