^{44}Ca(α,α') 1974De42,2017Bu16

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 190,1 (2023)	20-Jun-2023

1974De42: E=25.5, 28.5, 31.0 MeV alpha beam was produced from the University of Rochester MP tandem Van de Graaff accelerator. Targets were enriched calcium evaporated onto carbon backings. Scattered alpha particles were momentum-analyzed with an Enge split-pole magnetic spectrograph and detected in the focal plane using either a 30 cm long position sensitive proportional detector or 5 cm long position sensitive silicon detectors or photographic emulsions. Measured $\sigma(E_\alpha,\theta)$. Deduced levels, J, π, L-transfers, transition strengths from DWBA analysis.

2017Bu16: E=240 MeV α particles were produced from the Texas A&M K500 superconducting cyclotron. Target was an enriched (>95%) 5.0 mg/cm^2 ^{44}Ca foil. Scattered particles were momentum-analyzed with the multipole-dipole-multipole (MDM) spectrometer. Measured $\sigma(E_\alpha,\theta)$, strength distributions. Deduced centroid energies, widths, and fractions of energy weighted sum rule (EWSR) for isoscalar giant monopole (ISGMR), dipole (ISGDR) and quadrupole (ISGQR) resonances from DWBA analysis and Gaussian fits. Comparisons with theoretical predictions.

2022Ol03: E=196 MeV. Measured Eα, Iα. Deduced isoscalar giant monopole resonance (ISGMR).

2020Ho01: E=386 MeV. Measured Eα, Iα. Deduced ISGMR.

1979Ba14, 1977Al07: E=1.37 GeV. Measured $\sigma(\theta)$. Deduced isoscalar resonances.

1979Ni04: E=13.10 MeV. Measured g factor.

1975Tr01: E=24-29 MeV. Measured $\sigma(\theta)$. Deduced back-angle anomaly.

1969BeYW: measured isoscalar transition strengths.

1966Pe16: E=42 MeV. Measured $\sigma(\theta)$.

Others (elastic scattering for optical-model parameters):

1980Gi02: E=104 MeV.

1979Lo11: E=100 MeV.

1978Lo04: E=36.2, 42.6, 49.5, 61.0 MeV.

1978De25: E=40-58 MeV.

1976Be31: E=166 MeV.

1976Eb03: E=20-26 MeV.

1975Ei04: E=100 MeV.

1973Bi12: E=166 MeV.

1972Br30: E=166 MeV.

1972St28: E=40.7-72.3 MeV.

1972Oe01: E=24, 29 MeV.

1970Fe02: E=42 MeV.

1969Ga22: E=18, 22, 24, 29 MeV.

1966Gr09: E=27-40 MeV.

^{44}Ca Levels

E(level)†	L†	B(EL)↑†	Comments
0			
1161 *5*	2	0.0508	B(E2)↑: other: 0.051 *10* (quoted by 1989It02 from 1969BeYW). g-factor=−0.28 *11* (1979Ni04).
1890? *5*			
2285 *5*	4	0.00033	
2657 *5*	2	0.0069	
3045 *5*	4	0.00017	
3305 *5*	3	0.00826	B(E3)↑: other: 0.0065 *9* (quoted by 1989It02 from 1969BeYW).
3355 *5*			
3661 *5*			
3914 *5*	5	0.00017	B(E5)↑: other: 0.000101 *16* (quoted by 1989It02 from 1969BeYW).
4091 *5*			
4169? *5*	(2)	0.0023	
4358 *5*	3	0.001730	
4398 *5*	3	0.001710	B(E3)↑: other: 0.0029 *3* (quoted by 1989It02 from 1969BeYW) for 4358+4398.

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^{44}Ca(α,α') 1974De42,2017Bu16 (continued)

^{44}Ca Levels (continued)

E(level)[†]	Width	L[†]	B(EL)↑[†]	Comments
4480 *5*		2	0.0018	
4565 *5*		(5)	0.00010	B(E5)↑: other: 0.000048 *7* (quoted by 1989It02 from 1969BeYW).
4585? *5*				
4651 *5*		2	0.0061	
4905 *5*		3	0.001550	
5007 *5*		4	0.00063	
5222 *5*		(3)	0.001640	
5341 *5*		(2)	0.0020	
5407 *5*				
5519 *5*				
5654 *5*				
5730				
5830				
5880				
5940?				
5970				
6020				
16.5×10^3[‡#] *15*	4.9[‡#] MeV *+21−24*			%EWSR=7 for E1 strength (ISGDR) (2017Bu16).
17.13×10^3[‡] *11*	9.40[‡] MeV *14*			%EWSR=68 for E2 strength (ISGQR) (2017Bu16). %EWSR=77 *14* and rms width=5.1 MeV *+13−12* for E=17.2×10^3 *5* from DWBA analysis (2017Bu16).
19.5×10^3[‡@] *4*	5.8[‡@] MeV *+9−7*			E(level): others: 19.5E3 *1* (2020Ho01). %EWSR=75 *11* for E0 strength (ISGMR) from DWBA analysis (2017Bu16), 88 *4* (2020Ho01).
34.9×10^3[‡#] *15*	16.3[‡#] MeV *23*			%EWSR=53 for E1 strength (ISGDR) (2017Bu16).

[†] From 1974De42, unless otherwise noted. L-transfers and transition strengths are from DWBA analysis of measured $\sigma(\theta)$. Statistical errors for B(EL)↑ are ≈15%.

[‡] Giant resonance parameters from Gaussian fits to measured strength distributions with quoted values of widths for FWHM in 2017Bu16, unless otherwise noted. Quoted values of energies are centroid energy. Values from single-folding DWBA analysis of $\sigma(\theta)$ are given under comments.

[#] %EWSR=48 *+19−18* and rms width=8.6 MeV *+10−9* for the sum of two peaks with centroid energy=26.0×10^3 *+17* from the single-folding DWBA analysis (2017Bu16).

[@] From DWBA analysis (2017Bu16).