^{40}Ca(α,p) 1981Sm03,1970Gi10,1967Sc08

History

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

1981Sm03: E=35.6 MeV α beam was produced from the University of Colorado cyclotron. Target of natural calcium on a 20 μg/cm^2 carbon foil, thickness of 280 μg/cm^2. Protons were momentum analyzed with a magnetic spectrograph and detected in the helical focal plane counter backed by a plastic scintillator, overall FWHM=25-30 keV. Measured σ(E$_p$,θ). Deduced levels, J, π from DWBA analysis.

1970Gi10 (also 1966GiZZ): E=31 MeV α beam was produced from the MIT cyclotron. Target of 1 mg/cm^2 97% enriched self-supporting ^{40}Ca foil. Protons were detected by a ΔE-E solid-state counter telescope, FWHM=90 keV. Measured σ(E$_p$,θ). Deduced levels, J, π, L from DWBA analysis.

1967Sc08: E=12 MeV α beam was produced from the tandem Van de Graaff accelerator at Argonne National Laboratory. Target of 10 μg/cm^2 natural calcium on a 10 μg/cm^2 carbon backing. Protons were momentum analyzed with a 75 cm broad-range magnetic spectrograph and detected in nuclear emulsions. Measured σ(E$_p$,θ). Deduced levels.

1987Fr09: E=12 MeV α beam was produced from the 6 MV Van de Graaff accelerator of the National Accelerator Center (NAC) at Faure. Target of natural CaO on a thin carbon backing. Particles scattered at 90° and 120° to the beam were detected by a ΔE-E detector telescope. Measured relative cross sections compared to those calculated from Hauser-Feshbach analysis for possible J^π assignments. Deduced levels.

1979Th03: E=25 MeV α beam was produced from the Niels Bohr Institute FN tandem Van de Graaff accelerator. Target of a 15 μg/cm^2 81.9% enriched ^{41}Ca (81.9% in ^{41}Ca and 18.1% in ^{40}Ca) on a carbon backing. Protons were analyzed with a single-gap magnetic spectrograph and detected in nuclear emulsions. Measured σ(E$_p$,θ). Deduced levels, J, π from DWBA analysis for 0, 1179, 1811 and 1830 levels. In the spectrum, 13 groups assigned to ^{43}Sc.

1985Ba77: E=25.8 MeV. Measured $\sigma(\theta)$, DWBA analysis. Data for 0, 472, 1179 levels.

1970Ba51: E=11.94 MeV. FWHM=50 keV. Particle spectrum in coin with γ-rays.

1983HaZJ: E=60 MeV. Measured $\sigma(\theta)$. DWBA calculations.

1974Ho39: E-4-10 MeV. Measured cross section.

1972Fi20: E=28.5 MeV. Measured $\sigma(\theta)$. DWBA calculations.

1971Po03: E=9.5, 11 MeV. Measured proton spectrum FWHM≈150 keV. DWBA calculations.

1966Cu01: E=9, 10 MeV. Measured $\sigma(\theta)$. FWHM≈25 keV. DWBA calculations.

1963La04: E=20 MeV or less. Measured $\sigma(\theta)$ for selected groups. A total of 14 groups reported.

1961Ma03: E=21 MeV. Measured Q-value.

Relative total cross sections (1987Fr09)

Level	cross section
1811	3.9 *5*
1829	9.6 *11*
1963	4.5 *5*
2094	3.6 *5*
2106	5.4 *8*
2141	4.9 *6*
2243	5.9 *6*
2289	4.1 *5*
2335	4.0 *5*
2382	3.1 *4*
2459	6.5 *7*
2551	6.7 *7*
2580	4.4 *5*
2669	2.9 *4*
2762	5.6 *7*

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^{43}Sc Levels

E(level)[‡]	J$^\pi$[†]	L[d]	σ(DWBA)/σ(exp)[c]	Comments
0	7/2$^-$	3	0.258	
151[b] 2				
473[a] 2	3/2$^-$	1	0.358	Additional information 1. S-factor=0.267, 0.280 (relative to 1 for g.s.) (1985Ba77).
844[a] 2	5/2$^-$		0.265	Additional information 2.
855[&]				
882[b] 2				
1156[a] 2				Additional information 3.
1178[a] 2	3/2$^-$	1		Additional information 4. S-factor=1.22, 1.28 (relative to 1 for g.s.) (1985Ba77), 1.39 (1981Sm03).
1335[b] 2				
1418[a] 2	7/2$^-$	3	0.024	Additional information 5.
1646[b] 2				
1810[a] 2			0.394	Additional information 6. J$^\pi$: 1981Sm03 assign 1/2$^-$, but adopted J^π=3/2$^-$. Also $\sigma(\theta)$ fitted well to 3/2$^-$ by 1979Th03.
1827[a] 2	11/2$^-$	5	0.168	
1877[b] 2				
1912[#] 6				
1928[a] 2				Additional information 7.
1963[@]				
2094[@]				
2106[@]				Additional information 8.
2141[@]				
2243[@]				
2289	5/2$^-$	3		Additional information 9.
2335[@]				
2382[@]				
2459[@]				
2551[@]				
2580[@]				
2634	(9/2$^-$)		0.110	Additional information 10. J$^\pi$: adopted J^π=(9/2,11/2)$^-$.
2669[@]				
2762[@]				
2810[&]				
2839[&]				
2987	15/2$^-$	7[e]	0.379	J$^\pi$: 1970Gi10 fit a 2980 group to J=1/2.
3123	(19/2$^-$)	9[e]	1.0	Additional information 11.
3141[&]				
3250?				
3289[&]				
3450?				Additional information 12.
3485[&]				
3677[&]				
3807[&]				
3850?				E(level): from 1963La04 only.

Continued on next page (footnotes at end of table)

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^{43}Sc Levels (continued)

E(level)‡	Comments
3955&	
3990&	
4157&	
4370	Additional information 13.
4630	
4940	
5230	Additional information 14.
5340	
5690	Additional information 15.
6080	
6230	Additional information 16.

† From comparison of $\sigma(\theta)$ data with cluster transfer DWBA calculations (1981Sm03, 1970Gi10).
‡ From 1981Sm03 up to 3200 and from 1970Gi10 above 3200, unless otherwise stated.
# From 1966Cu01.
@ From 1987Fr09.
& From 1970Ba51, protons detected in coin with γ-rays.
a From 1967Sc08.
b Weighted average of 1966Cu01 and 1967Sc08.
c From 1981Sm03, normalized to 1.0 for 3123, (19/2$^-$) state.
d From 1970Gi10, unless otherwise indicated.
e From 1983HaZJ.