

$^{40}\text{Ca}(^3\text{He},t)$ **1971Sc02,1971Lo16,2000Ha06**

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 140, 1 (2017)	30-Sep-2015

1971Sc02: E=28 MeV ^3He beam was produced from the MP tandem of the University of Rochester. Target was a $60\text{ }\mu\text{g}/\text{cm}^2$ natural calcium foil. Reaction products were momentum analyzed with an Engel split-pole spectrometer (FWHM=15 keV) and detected in NTB emulsions. Measured $\sigma(\theta)$. Deduced levels.

1971Lo16: E=30.2 MeV ^3He beam was produced from the sector-focused Saclay cyclotron. Target was a $0.25\text{ mg}/\text{cm}^2$ thick natural Ca foil. Reaction products were detected and identified by an E- ΔE silicon solid-state-detector telescope (FWHM=20 keV). Measured $\sigma(\theta)$. Deduced levels, J, π from DWBA analysis.

2000Ha06: E=26.064, 26.076 MeV ^3He beams were produced from the TUNL FN tandem Van de Graaff accelerator. Target was $47\text{ }\mu\text{g}/\text{cm}^2$ natural Ca evaporated onto a $22\text{ }\mu\text{g}/\text{cm}^2$ carbon backing. Reaction were momentum analyzed with an Engel splitpole magnetic spectrograph (FWHM=15 keV) and detected by a position-sensitive avalanche counter. Measured $\sigma(\theta)$. Deduced levels.

Other measurements:

2011St03: E=420 MeV. Measured $\sigma(\theta)$. Deduced relative dipole strength distribution. 105 new excited states in the region of 0.4-16.0 MeV were found but no details are given by authors.

1991Gr03: E=75 MeV. Measured σ at 0° . Deduced isovector giant resonances.

1991Br20 (also **1988Ro17**): E=0.9-2 GeV. Measured $\sigma(\theta)$. Deduced spin multipole Gamow-Teller transition strengths.

1984Va43: E=75, 81 MeV. Measured $\sigma(\theta)$. Deduced transition strengths.

1984Ta11: E=197 MeV. Measured $\sigma(E_t, \theta)$. Deduced levels, giant-dipole resonance, isovector GQR analog.

1982Ta05: E=130, 170 MeV. Measured $\sigma(\theta)$. Deduced GQR and IAS of T=1 GDR.

1966Ma58: measured Q value.

 ^{40}Sc Levels

E(level) [†]	J π [‡]	$\sigma(\text{relative})^b$	Comments
0 ^a	4 ⁻	1.5	
34.3 ^a 15	(3 ⁻)	1.6	E(level): 33.6 15 (1971Sc02), 34 (1971Lo16), 35.1 16 (2000Ha06).
772.1 ^a 16	(2 ⁻)	2.0	E(level): 772 2 (1971Sc02), 772 (1971Lo16), 772.2 16 (2000Ha06).
893.6 ^a 20	(5 ⁻)	5.2	E(level): 892 2 (1971Sc02), 892 (1971Lo16), 895.1 20 (2000Ha06).
1670.8 19	(1 ⁻ &2 ⁻)	1.2	E(level): 1667 4 (1971Sc02), 1680 (1971Lo16), 1671.6 19 (2000Ha06).
			E(level): possibly a triplet (1971Sc02).
1703.2 [@] 22			
1796.9 24	(3 ⁻)	1.0	E(level): 1799 4 (1971Sc02), 1799 (1971Lo16), 1796.1 24 (2000Ha06).
1871 [@] 3			
1933 [@] 3			
2370 ^a 4		6.1	Additional information 1.
			E(level), J π : a peak at 2370 is reported by 1982Ta05 . Possible J π =1 ⁺ from small L-transfer suggested by $\sigma(\theta)$ data of 1984Ta11 who speculate that this state may be the analog of T=1 10310, 1 ⁺ state or T=1 9400, 0 ⁺ state in ^{40}Ca . $\sigma(\theta)$ data of 1971Lo16 suggests 4 ⁻ .
3030 [#] 20	(3 ⁻)		
3140 [#]			
3360 [#]			
3450 ^{#&}		0.5	
3494 ^{&} 8			E(level): from 1971Sc02 only.
12.9 $\times 10^3$ 37			E(level): GDR (1984Ta11 , 1982Ta05).

[†] Weighted average of values from **1971Sc02** and **2000Ha06**.

[‡] From **1971Lo16**, based on comparisons of measured $\sigma(\theta)$ with DWBA calculations.

[#] From **1971Lo16** only.

$^{40}\text{Ca}(^3\text{He,t})$ [1971Sc02](#),[1971Lo16](#),[2000Ha06](#) (continued)

^{40}Sc Levels (continued)

@ From [2000Ha06](#) only.

& 3450 in [1971Lo16](#) and 3494 in [1971Sc02](#) may correspond to the same level.

^a Reported in high-energy experiments of [1984Ta11](#), [1982Ta05](#) also.

^b At 40° ([1971Sc02](#)).