$^{42}\text{Ca}(^3\text{He},\alpha\gamma)$ **1975Fo15,1975Ta05**

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	C. D. Nesaraja, E. A. Mccutchan	NDS 133, 1 (2016)	30-Sep-2015

1975Fo15: E(^{3}He)=18 MeV from the Orsay MP tandem. Measured Eγ, Iγ, $\gamma(\theta)$, α-particle spectrum, $\alpha\gamma$-coin, branching ratios using surface barrier and Ge(Li) detectors (FWHM $\approx$ 4 keV), and lifetimes by Doppler-shift attenuation method.

1975Ta05: E(^{3}He)=18 MeV from University of Pennsylvania tandem. Outgoing particles were detected with a solid-state position-sensitive detector at 0° with respect to the beam and the γ-rays were detected using a Ge(Li) detector. Measured γ, $\alpha\gamma$-coin, $\gamma\theta$. Determined mixing ratio, branching ratio and J^π.

$^{41}\text{Ca Levels}$

E(level)	$J^{\pi\#}$	$T_{1/2}$[@]	Comments
0	$7/2^-$		
1943	$3/2^-$		
2010	$3/2^+$		
2605	$5/2^+$		
2670	$1/2^+$		
2960[†]	$7/2^-$		
3200[†]	$9/2^+$		
3400	$1/2^+$		
3526[†]	$3/2^+$		
3740	$(3/2,5/2)^+$		
3848	$1/2^+$		
4090	$5/2^+$		E(level): Given as 4094 in Fig.2 (1975Fo15).
4185[‡]	$(3/2,5/2)$		
4416			
4728	$(3/2)^+$		
5817.2 9	$3/2^+$	<28 fs	E(level): T=3/2 analog of ^{41}K g.s. This level is populated strongly in (^{3}He,t) (1975Ta05).
6822.3 9	$1/2^+$	<28 fs	E(level): T=3/2 analog of 980 state in ^{41}K.
7146[†]			
8540[†]	$1/2^+$		Level decays principally (98% 1) to ^{40}Ca g.s. through 180-keV s-wave neutron branch. γ transitions from this level were not determined. However authors (1975Ta05) conclude that a weak γ decay branch does exist.

[†] Level not reported by 1975Fo15.
[‡] Level not reported by 1975Ta05.
[#] From Adopted Levels.
[@] From DSAM lifetime measurements in 1975Ta05.

$\gamma(^{41}\text{Ca})$

A_2 and A_4 are from 1975Ta05, except for γ rays from 5817 level which are from 1975Fo15.

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[#]	Comments
1943	$3/2^-$	1943	100	0	$7/2^-$			
2010	$3/2^+$	2010	100	0	$7/2^-$	M2+E3	+0.095 22	A_2=+0.050 17, A_4=−0.019 25.
2605	$5/2^+$	2605	100	0	$7/2^-$			
2670	$1/2^+$	660	29	2010	$3/2^+$			
		727	71	1943	$3/2^-$			
2960	$7/2^-$	2960	100	0	$7/2^-$	M1+E2	−0.31 3	A_2=+0.173 3, A_4=−0.003 44.

Continued on next page (footnotes at end of table)

^{42}Ca(^{3}He,$\alpha\gamma$)   1975Fo15,1975Ta05 (continued)

γ(^{41}Ca) (continued)

E$_i$(level)	J$_i^\pi$	E$_\gamma$[†]	I$_\gamma$[‡]	E$_f$	J$_f^\pi$	Mult.[#]	δ[#]	Comments
3200	9/2$^+$	3200		0	7/2$^-$	E1(+M2)	+0.09 7	δ: or -9 +38$-$19. A$_2$=-0.153 139, A$_4$=+0.136 209.
3400	1/2$^+$	1390	100	2010	3/2$^+$			
3526	3/2$^+$	856		2670	1/2$^+$	M1+E2	+0.22 7	δ: or -3.11+59-90. A$_2$=-0.100 135, A$_4$=+0.168 200.
3740	(3/2,5/2)$^+$	1135[@]	33	2605	5/2$^+$			δ: -0.15 3 given by 1975Ta05 assuming J(3740)=3/2. A$_2$=-0.130 56, A$_4$=-0.028 84.
		1730	67	2010	3/2$^+$			E$_\gamma$: Unresolved with the 1723 γ tansition from 5817.2 (1975Fo15). δ: +0.03 5 given by 1975Ta05 assuming J(3740)=3/2. A$_2$=+0.164 48, A$_4$=-0.002 71.
3848	1/2$^+$	1838	78	2010	3/2$^+$			
		1902	22	1943	3/2$^-$			
4090	5/2$^+$	2080	70	2010	3/2$^+$	M1+E2	+0.06 5	A$_2$=-0.126 47, A$_4$=+0.016 71 for the unresolved doublet 2010-2080. E$_\gamma$: Unresolved with the 2077 γ transition from 5817.2 (1975Fo15).
		4090	30	0	7/2$^-$	E1(+M2)	+0.01 4	δ: or -8.5 +21$-$41. A$_2$=-0.143 55, A$_4$=-0.150 84.
4185	(3/2,5/2)	2175		2010	3/2$^+$			
4416		2406[a]		2010	3/2$^+$			
		2473		1943	3/2$^-$			
4728	(3/2)$^+$	2718	100	2010	3/2$^+$			
5817.2	3/2$^+$	1089[&]	11 2	4728	(3/2)$^+$			A$_2$=-0.70 21. δ: > 0.3 for J$_f$=5/2.
		1723	53 4	4090	5/2$^+$			E$_\gamma$: Unresolved with the 1730 γ tansition from 3740 (1975Fo15).
		2077	8 5	3740	(3/2,5/2)$^+$			E$_\gamma$: Unresolved with the 2080γ tansition from 4090 (1975Fo15).
		2417	16 2	3400	1/2$^+$			A$_2$=-0.51 5. δ: -0.03 14 or -1.7 5.
		3212	12 2	2605	5/2$^+$			I$_\gamma$: 7 3(1975Ta05). δ: -0.25 +30$-$65 or -1.8 +9$-$40. A$_2$=+0.15 12.
		3807	<3	2010	3/2$^+$			I$_\gamma$: 4 (1975Ta05).
6822.3	1/2$^+$	2094	24 2	4728	(3/2)$^+$			I$_\gamma$: 34 6 (1975Ta05).
		2406[a&]	6 4	4416				
		2637[&]	7 2	4185	(3/2,5/2)			
		2974	16 2	3848	1/2$^+$			I$_\gamma$: 10 5 (1975Ta05).
		3082	9 2	3740	(3/2,5/2)$^+$			I$_\gamma$: 20 6 (1975Ta05).
		4152	38 2	2670	1/2$^+$			I$_\gamma$: 31 6 (1975Ta05).
		4812	<2	2010	3/2$^+$			I$_\gamma$: 5 3 (1975Ta05).
7146		4186	35	2960	7/2$^-$			
		7146	65	0	7/2$^-$			

[†] From level-energy differences.
[‡] From 1975Fo15 for 5817 and 6822 levels, others are from 1975Ta05.
[#] From $\gamma(\theta)$ data (1975Ta05).
[@] γ not reported by 1975Fo15.
[&] γ not reported by 1975Ta05.
[a] Multiply placed.

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Level Scheme

Intensities: % photon branching from each level

$^{41}_{20}$Ca$_{21}$