^{42}Ca(α,pγ)

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	T. W. Burrows	NDS 109, 171 (2008)	30-Oct-2007

1971Zu03: E=11 MeV. Measured pγ-coincidences, γ's, and p$\gamma(\theta)$; semi, NaI.
1973Sa12,1973Ko21: E=10.2-14.2 MeV. Measured pγ- and $\gamma\gamma$-coincidences, γ's, $\gamma(\theta)$, and linear polarization; semi, Ge(Li).
1976To04,1976Ch07: E=10.5 MeV. Measured p$\gamma(\theta)$ and γ's; semi (FWHM≈170 keV), Ge(Li). DSAM.
The positive-parity states were studied by 1973Ko21 and 1976To04; the negative-parity states, by 1973Sa12 and 1976Ch07.
1971Zu03 primarily studied the negative-parity states. Other: see 1983Bu21.

^{45}Sc Levels

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]	Comments
0.0	7/2$^-$		
12.4[@]	3/2$^+$		
376.8 *3*	3/2$^-$	>4 ps	
543.3[@] *5*	5/2$^+$	6.4 ps *+47−23*	
720.6 *5*	5/2$^-$	0.25 ps *+8−6*	J$^\pi$: ≠ 7/2 from p$\gamma(\theta)$ to 7/2$^-$.
939.5[&] *5*	1/2$^+$	7.3 ps *+6−3*	
974.8[@] *5*	7/2$^+$	2.6 ps *+6−5*	J$^\pi$: 3/2$^-$,5/2,7/2$^+$ from D,E2 γ's to 3/2$^+$ and 7/2$^-$; ≠ 5/2 from p$\gamma(\theta)$ to 3/2$^+$, ≠ 3/2 from p$\gamma(\theta)$ to 5/2$^+$.
1068.6 *10*	3/2$^-$	0.35 ps *+12−8*	J$^\pi$: ≠ 1/2 from D(+Q) γ to 5/2$^-$.
1237.5 *5*	11/2$^-$	2.4 ps *+10−6*	
1303.5[&] *5*	3/2$^+$	2.4 ps *+12−7*	
1409.5 *5*	(7/2)$^-$	0.43 ps *+12−8*	J$^\pi$: 5/2,7/2,9/2 from p$\gamma(\theta)$ to 7/2$^-$.
1433.8[@] *5*	9/2$^+$[a]	5.4 ps *+30−15*	
1557.1 *10*	(3/2)$^-$	0.28 ps *+12−8*	
1662.0 *5*	9/2$^-$	0.14 ps *+5−4*	J$^\pi$: 5/2,9/2 from p$\gamma(\theta)$ to 7/2$^-$. D(+Q) γ to 11/2$^-$; M1+E2 γ to 7/2$^-$.
1800.7[&] *10*	5/2$^+$	0.11 ps *4*	
2031.6[@] *5*	11/2$^+$[a]	1.1 ps *+6−3*	
2092.3 *10*	5/2	<35 fs	J$^\pi$: 3/2,5/2,7/2 from p$\gamma(\theta)$ to 3/2$^-$ and 7/2$^-$. D(+Q) γ's to 3/2$^-$ and 7/2$^-$.
2106.8[b]	15/2$^-$	>6 ps	J$^\pi$: from p$\gamma(\theta)$ and linear polarization.
2563.3[@] *6*	13/2$^+$	1.4 ps *+6−4*	J$^\pi$: 9/2,11/2,13/2$^+$ from D,E2 γ's to 11/2$^+$, 9/2$^+$, and 11/2$^-$; π=+ if J=11/2 from M1+E2 γ to 9/2$^+$. Member of π=+ band.
3159.6[b] *10*			

[†] From 1976To04 and 1976Ch07, except As noted.
[‡] From the Adopted Levels. Contributing arguments from this reaction are given In the comments or footnotes.
[#] From DSAM (1976To04,1976Ch07).
[@] Band(A): K$^\pi$=3/2$^+$ band (1973Ko21).
[&] Band(B): K$^\pi$=1/2$^+$ band? (1976To04).
[a] J$^\pi$(1434)=5/2,7/2,9/2$^+$ from D,E2 γ's to 7/2$^+$, 5/2$^+$, and 7/2$^-$; ≠ 7/2 from p$\gamma(\theta)$'s; π=+ from multipolarities.
J$^\pi$(2032)=7/2$^-$,9/2,11/2$^+$ from D,E2 γ's to 11/2$^-$ and 7/2$^+$; ≠ 9/2 from p$\gamma(\theta)$'s; π=+ from M1+E2 γ to 1434. Therefore, J$^\pi$(1434)=9/2$^+$ and J$^\pi$(2032)=11/2$^+$.
[b] Suggested by 1973Sa12 and 1973Ko21 on the basis of $\gamma\gamma$-coincidences.

^{42}Ca(α,pγ) (continued)

$\gamma(^{45}Sc)$

RI TV % photon branching ratios from each level (1976To04,1976Ch07). I_γ's were deduced from the angular correlation TVanalysis, except for the weak branches which are $I_\gamma(55°)$. Upper limits on other deexciting γ's are:

E_x	I_γ	E_x	I_γ	E_x	I_γ
721	<2	1410	<10	2032	<5
975	<1.4	1434	<3	2092	<10
1069	<10	1557	<8	2107	<15
1238	<10	1662	<5	2563	<7

E_i(level)	J_i^π	E_γ[†]	I_γ	E_f	J_f^π	Mult.[‡]	δ[‡]	Comments
376.8	3/2$^-$	364.4[#]	91.4 *5*	12.4	3/2$^+$	D(+Q)	−0.01 *8*	
		376.8[#]	8.6 *5*	0.0	7/2$^-$	Q(+O)	−0.01 *2*	
543.3	5/2$^+$	166.5[#]	<1.1	376.8	3/2$^-$			
		530.7 *2*	59.4 *8*	12.4	3/2$^+$	M1+E2[&]	−0.55 *+11−18*	
		543.2 *2*	40.6 *8*	0.0	7/2$^-$	E1(+M2)[&]	−0.04[a] *6*	
720.6	5/2$^-$	708.2[#]	3.5 *5*	12.4	3/2$^+$	D,E2[b]		
		720.6 *5*	96.5 *5*	0.0	7/2$^-$	M1+E2[a]	+0.09[a] *6*	
939.5	1/2$^+$	562.7[#]	17.3 *6*	376.8	3/2$^-$	D,E2[b]		
		927.1[#]	82.7 *6*	12.4	3/2$^+$	D,E2[b]		
974.8	7/2$^+$	431.9 *2*	10.5 *7*	543.3	5/2$^+$	M1+E2[a]	−0.24 *+12−16*	
		962.4 *2*	32.5 *10*	12.4	3/2$^+$	E2[&]		
		974.7 *3*	57.0 *10*	0.0	7/2$^-$	E1(+M2)[&]	+0.09 *+17−12*	
1068.6	3/2$^-$	348.0[#]	24 *2*	720.6	5/2$^-$	D(+Q)	+0.04 *13*	
		691.8[#]	76 *2*	376.8	3/2$^-$	M1+E2[a]	−0.11 *5*	
1237.5	11/2$^-$	1237.4 *2*	100	0.0	7/2$^-$	E2[&]		
1303.5	3/2$^+$	760.2[#]	*c*	543.3	5/2$^+$	D+Q		δ: −0.27 *15* or −2.0 *6*.
		1291.1[#]	*c*	12.4	3/2$^+$			
1409.5	(7/2)$^-$	688.9[#]	13 *4*	720.6	5/2$^-$	D,E2[b]		
		1409.5[#]	87 *4*	0.0	7/2$^-$	D+Q		δ: +0.05 *+13−9* if J(1409)=7/2; −0.9 *4* if J(1409)=5/2.
1433.8	9/2$^+$	196.3[#f]	<3	1237.5	11/2$^-$			
		459.0 *2*	18.2 *14*	974.8	7/2$^+$	M1(+E2)[a]	−0.24[d] *6*	
		891.0 *3*	69.9 *17*	543.3	5/2$^+$	E2(+M3)[&]	+0.03 *6*	
		1433.8 *10*	11.9 *13*	0.0	7/2$^-$	D(+Q)	−0.11[a] *+20−24*	
1557.1	(3/2)$^-$	488.5 *10*	≈100	1068.6	3/2$^-$	D[b]		
		1013.8[#]	<20	543.3	5/2$^+$			
1662.0	9/2$^-$	424.5 *5*	21 *3*	1237.5	11/2$^-$	D(+Q)	−0.03 *13*	
		1662.4 *3*	79 *3*	0.0	7/2$^-$	M1+E2[a]	−0.47 *5*	
1800.7	5/2$^+$	1257.4[#]	33.8 *14*	543.3	5/2$^+$	D+Q		δ: 0.0 *2* or +1.4 *9*.
		1788.3[#]	54.2 *16*	12.4	3/2$^+$	D+Q		δ: −0.20 *9* or −1.3 *3*.
		1800.7[#]	12.0 *12*	0.0	7/2$^-$	D,E2[b]		
2031.6	11/2$^+$	597.0 *5*	37.3 *45*	1433.8	9/2$^+$	M1+E2[a]	−0.19 *7*	
		794.1 *10*	5.7 *31*	1237.5	11/2$^-$	D,E2[b]		
		1056.8 *3*	57.0 *50*	974.8	7/2$^+$	E2(+M3)[&e]	+0.03[e] *3*	
2092.3	5/2	788.8[#]	<25	1303.5	3/2$^+$			
		1023.7[#]	10 *2*	1068.6	3/2$^-$	D(+Q)	−0.05[a] *20*	
		1715.5[#]	7 *2*	376.8	3/2$^-$	D,E2[b]		
		2092.3[#]	83 *2*	0.0	7/2$^-$	D(+Q)	−0.05[a] *6*	
2106.8	15/2$^-$	869.7 *2*	≈100	1237.5	11/2$^-$	E2[&e]		

Continued on next page (footnotes at end of table)

^{42}Ca(α,pγ) (continued)

$\gamma(^{45}Sc)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ	E_f	J_f^π	Mult.[‡]	δ[‡]	Comments
2563.3	$13/2^+$	531.7[#]	24.9 *62*	2031.6	$11/2^+$	D,E2[b]		
		1129.8 *3*	56.6 *60*	1433.8	$9/2^+$	E2(+M3)[a]	0.00[a] *4*	Mult.,δ: other possibilities excluded by adopted J^π.
		1325.8	18.5 *65*	1237.5	$11/2^-$	D,E2[b]		
3159.6		1052.8 *5*		2106.8	$15/2^-$			

[†] From 1973Sa12 and 1973Ko21, except As noted.
[‡] From $\gamma(\theta)$ and p$\gamma(\theta)$ (1976To04,1976Ch07), except As noted.
[#] From 1976To04 and 1976Ch07. Energies calculated by evaluator from difference In excitation energies.
[@] Suggested placement with 1433 state (1976To04) not consistent with ΔJ^π.
[&] Experimental linear polarization agreed with that predicted for the given π's, mult′s, and δ's (1973Ko21,1973Sa12).
[a] From $\gamma(\theta)$, p$\gamma(\theta)$, and comparison to RUL (1976To04,1976Ch07).
[b] From comparison to RUL (1976To04,1976Ch07).
[c] 1971Zu03 and 1976To04 experienced difficulties In observing the γ decay of this state. The major difficulties were In assigning the 926γ-377γ coincidence and the low population of the state At some bombarding energies.
[d] From p$\gamma(\theta)$ (1971Zu03).
[e] From $\gamma(\theta)$ and p$\gamma(\theta)$ (1973Sa12,1973Ko21).
[f] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{42}Ca(α,pγ)

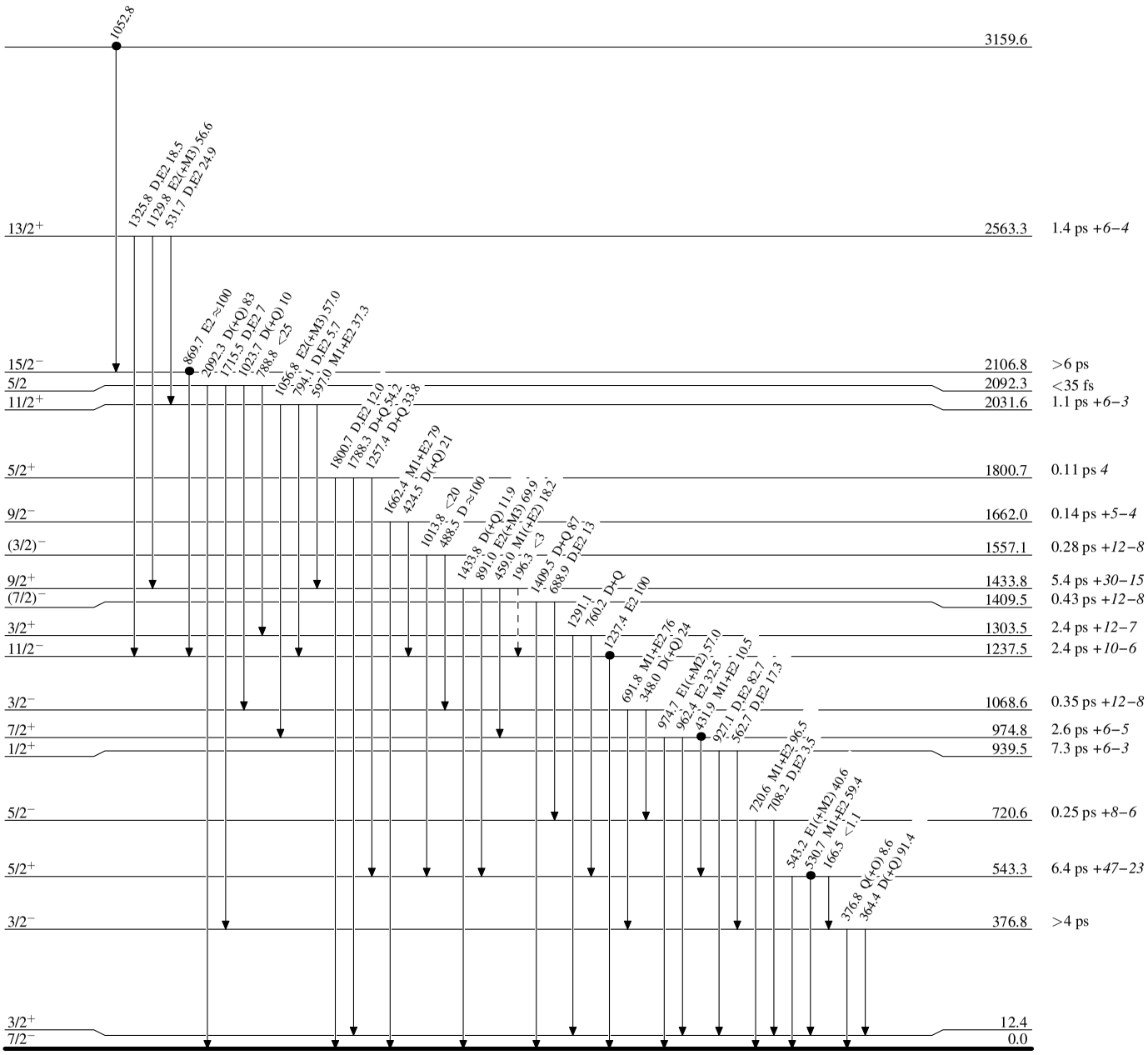
Legend

Level Scheme

Intensities: % photon branching from each level

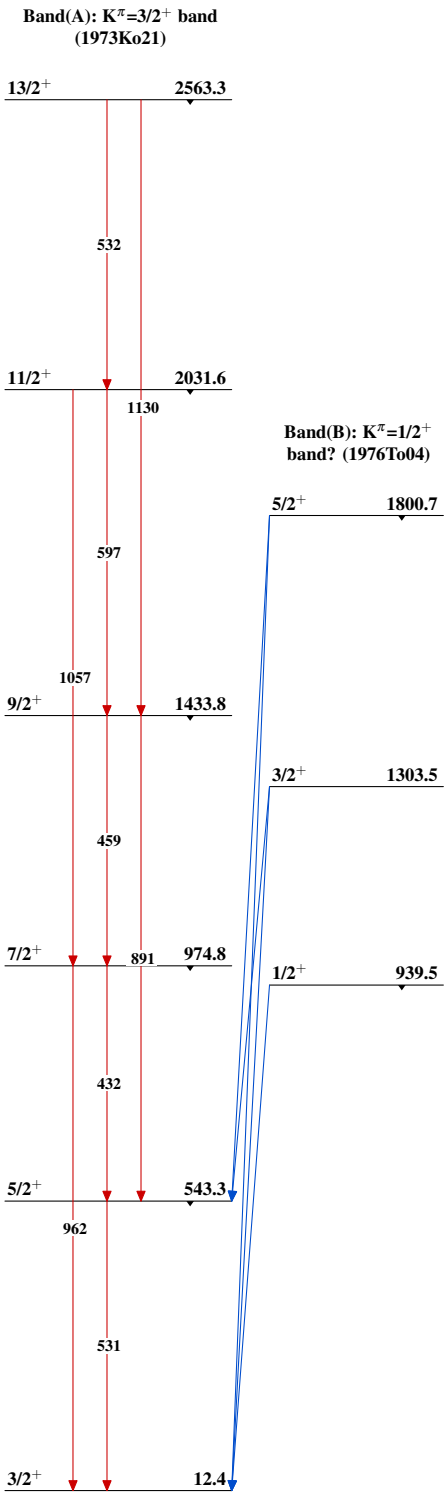
γ Decay (Uncertain)

Coincidence



$^{45}_{21}Sc_{24}$

^{42}Ca(α,pγ)



$^{45}_{21}Sc_{24}$