^{44}Ca(α,pγ) 1982Oh08,1974To05,1972Ba95

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	S. Ota and E. A. Mccutchan	NDS 203,1 (2025)	1-Apr-2025

1972Ba95: E(α)=9.5 MeV. Measured Eγ, Iγ, pγ-coincidences using an annular Si detector for protons and a 50 cm Ge(Li) detector for γ-rays.

1974To05: E(α)=10.15 and 11 MeV. Measured Eγ, Iγ, $\gamma\gamma$ pγ, $\gamma(\theta)$ using an annular Si detector for protons and an 80 cm^3 Ge(Li) detector for γ-rays. Deduced $T_{1/2}$ using DSAM technique.

1974To06: E(α)=11 MeV. Measured linear polarization of 1147γ; NaI polarimeter.

1982Oh08: E(α)=9 MeV. Measured $T_{1/2}$(808- and 1391-keV states); pγ-coincidences; Si and high-purity germanium. RDM.

Others: 1968Fo02, 1979Lo11.

^{47}Sc Levels

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$[#]	Comments
0.0	7/2$^-$		
767.4[@] *3*	3/2$^+$	274 ns *10*	g=0.24 *4* (1968Fo02) E(level): from 1972Ba95. $T_{1/2}$,g: from 1968Fo02 using DPAD technique.
808.0 *2*	3/2$^-$	15 ps *4*	$T_{1/2}$: from RDM (1982Oh08). Others: >2 ps (1974To05), >5 ps (1972Ba95).
1146.6 *2*	11/2$^-$	3.2 ps *11*	J$^\pi$: 7/2 or 11/2 from $\gamma(\theta)$ (1974To05). Linear polarization (1147γ) (1974To06) selects 11/2.
1297.0 *2*	5/2$^-$	0.062 ps *21*	
1391.2 *3*	1/2$^+$	9 ps *3*	$T_{1/2}$: from RDM (1982Oh08). Others: >1.3 ps (1974To05), >4 ps (1972Ba95).
1404.4[@] *3*	5/2$^+$	0.97 ps *28*	J$^\pi$: 5/2 from $\gamma(\theta)$. π=− ruled out by RUL(637γ) (1974To05).
1797.6 *3*		0.21 ps *6*	J$^\pi$: from $\gamma(\theta)$ and RUL′s given as (1/2$^-$),3/2,5/2$^-$,7/2$^-$.
1857.1 *3*	5/2$^-$,7/2$^+$	0.30 ps *6*	J$^\pi$: from $\gamma(\theta)$, RUL′s, and γ to (3/2)$^+$ (1974To05).
1878.2[a] *7*	9/2$^-$	0.12[&] ps *6*	J$^\pi$: $\gamma(\theta)$(1879γ) excludes 7/2; RUL(732γ) excludes 5/2 (1974To05).
2002.3 *3*	3/2$^+$	0.40 ps *9*	J$^\pi$: L(p)=2 in (t,α). $\gamma(\theta)$ and RUL of 1195γ exclude 5/2$^+$.
2148.5[b] *5*		>2[&] ps	J$^\pi$: decays completely to 11/2-, 1147-keV state. pγ-coin indicates 7/2≤J≤15/2 (1974To05).
2207.5 *3*	(5/2$^-$,7/2$^-$)	0.08 ps *4*	J$^\pi$: evidence for a close doublet with J≤7/2 for one member and J≥7/2 for the other (1974To05).
2381.3[b] *8*	5/2$^+$	<0.17[&] ps	
2408.6 *16*	7/2$^-$,9/2	0.21 ps *11*	J$^\pi$: from $\gamma(\theta)$(2407γ) and RUL′s. 9/2$^+$ favored by band structure (1974To05). $T_{1/2}$: unweighted average of 0.10 ps *7* (1974To05) and 0.31 ps *12* (1972Ba95).
2410.3[b] *10*			J$^\pi$: ≤ 7/2 from γ-deexcitation pattern (1974To05).
2499.4[b] *7*	(5/2$^-$),7/2$^-$	<0.15[&] ps	
2529.4[b] *9*	1/2$^+$	<0.21[&] ps	
2643.6[b] *6*		0.40[&] ps *29*	J$^\pi$: ≥5/2 from $\gamma(\theta)$ and RUL(495γ) (1974To05).

† Weighted average from 1974To05 and 1972Ba95, except as noted.

‡ From 1974To05 who state *J*$^\pi$ assignments are a synthesis of their work and literature. Contributing arguments from this dataset also given as comments or footnotes.

From DSAM (1972Ba95), except as noted.

@ Band(A): K$^\pi$=3/2$^+$ rotational band.

& From DSAM (1974To05).

a Unweighted averages from 1974To05 and 1972Ba95. 1974To05 observed states at 2407 and 2410 keV. On the basis of the similarity in the γ-ray branching ratios, they identified the state at 2410 keV as the state observed by 1972Ba95 at 2407 keV.

b From 1974To05.

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γ(^{47}Sc)

Both 1972Ba95 and 1974To05 searched for additional transitions but did not observe them. See figure 3 (1974To05) and table II (1972Ba95) for a number of limits.

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[#]	Comments
767.4	3/2$^+$	767.4	100	0.0	7/2$^-$			
808.0	3/2$^-$	808.0	100	0.0	7/2$^-$			
1146.6	11/2$^-$	1146.6	100	0.0	7/2$^-$	Q		Mult.: A_2=0.45 *5* (1974To05).
1297.0	5/2$^-$	489.0	10 *4*	808.0	3/2$^-$			
		1297.0	90 *4*	0.0	7/2$^-$	D+Q		δ: +0.04 *5* or <−8.0. Mult.: A_2=−0.18 *5* (1974To05).
1391.2	1/2$^+$	583.2	86 *4*	808.0	3/2$^-$			I_γ: weighted average of 85 *5* (1972Ba95) and 86 *5* (1974To05).
		623.8	14 *4*	767.4	3/2$^+$			I_γ: weighted average of 15 *5* (1972Ba95) and 14 *5* (1974To05).
1404.4	5/2$^+$	596.4	8.4 *19*	808.0	3/2$^-$			I_γ: weighted average of 10 *5* (1972Ba95) and 8 *2* (1974To05).
		637.0	20.4 *24*	767.4	3/2$^+$	D+Q	−0.72 *28*	I_γ: weighted average of 15 *4* (1972Ba95) and 23 *3* (1974To05). Mult.: A_2=−1.17 *15*, A_4=0.24 *11* (1974To05).
		1404.4	71.2 *27*	0.0	7/2$^-$	D(+Q)	−0.04 *8*	I_γ: weighted average of 75 *6* (1972Ba95) and 69 *3* (1974To05). Mult.: A_2=−0.08 *5* (1974To05).
1797.6		500.6	48 *7*	1297.0	5/2$^-$			I_γ: weighted average of 45 *10* (1972Ba95) and 50 *8* (1974To05).
		989.6	52 *7*	808.0	3/2$^-$	D+Q,Q+O		I_γ: weighted average of 55 *10* (1972Ba95) and 50 *8* (1974To05). Mult.: A_2=0.27 *13* (1974To05). δ: −0.05 *20* or +2.34≤δ≤+57 if J_i=3/2; +0.35 *16* if J_i=5/2; +0.11 *29* if J_i=7/2.
1857.1	5/2$^-$,7/2$^+$	452.7	2.0 *15*	1404.4	5/2$^+$			Mult.: A_2=−0.55 *46* (1974To05).
		1089.7	9 *4*	767.4	3/2$^+$			I_γ: other: 8 *8* (1972Ba95).
		1857.1	89 *4*	0.0	7/2$^-$	D+Q		δ: −1.2 *6* if J_i=5/2; +0.01 *12* if J_i=7/2. I_γ: other: 100 (1972Ba95). Mult.: A_2=0.45 *5* (1974To05).
1878.2	9/2$^-$	581.2[@]		1297.0	5/2$^-$			Observed only in $\gamma\gamma$-coin.
		731.6	31 *4*	1146.6	11/2$^-$	D+Q	−0.14 *11*	I_γ: weighted average of 25 *7* (1972Ba95) and 34 *5* (1974To05). Mult.: A_2=0.11 *12*, A_4=−0.16 *11* (1974To05).
		1878.2	69 *4*	0.0	7/2$^-$	D+Q	−0.14 *9*	I_γ: weighted average of 75 *7* (1972Ba95) and 66 *5* (1974To05). Mult.: A_2=−0.66 *13*, A_4=0.18 *10* (1974To05).
2002.3	3/2$^+$	597.9	22 *6*	1404.4	5/2$^+$			I_γ: weighted average of 25 *7* (1972Ba95) and 15 *10* (1974To05).
		705.3	20 *6*	1297.0	5/2$^-$			I_γ: weighted average of 15 *7* (1972Ba95) and 28 *8* (1974To05).
		1194.3	58 *8*	808.0	3/2$^-$	D(+Q)	0.00 *18*	I_γ: weighted average of 60 *10* (1972Ba95) and 57 *13* (1974To05). Mult.: A_2=0.35 *12* (1974To05).
2148.5		1001.9	100	1146.6	11/2$^-$	Q+O	+0.10 *13*	δ: see 1974To05 for other values if J_i<15/2. Mult.: A_2=0.50 *12* (1974To05).
2207.5	(5/2$^-$,7/2$^-$)	329.3	7 *4*	1878.2	9/2$^-$			

Continued on next page (footnotes at end of table)

^{44}Ca(α,pγ) 1982Oh08,1974To05,1972Ba95 (continued)

γ(^{47}Sc) (continued)

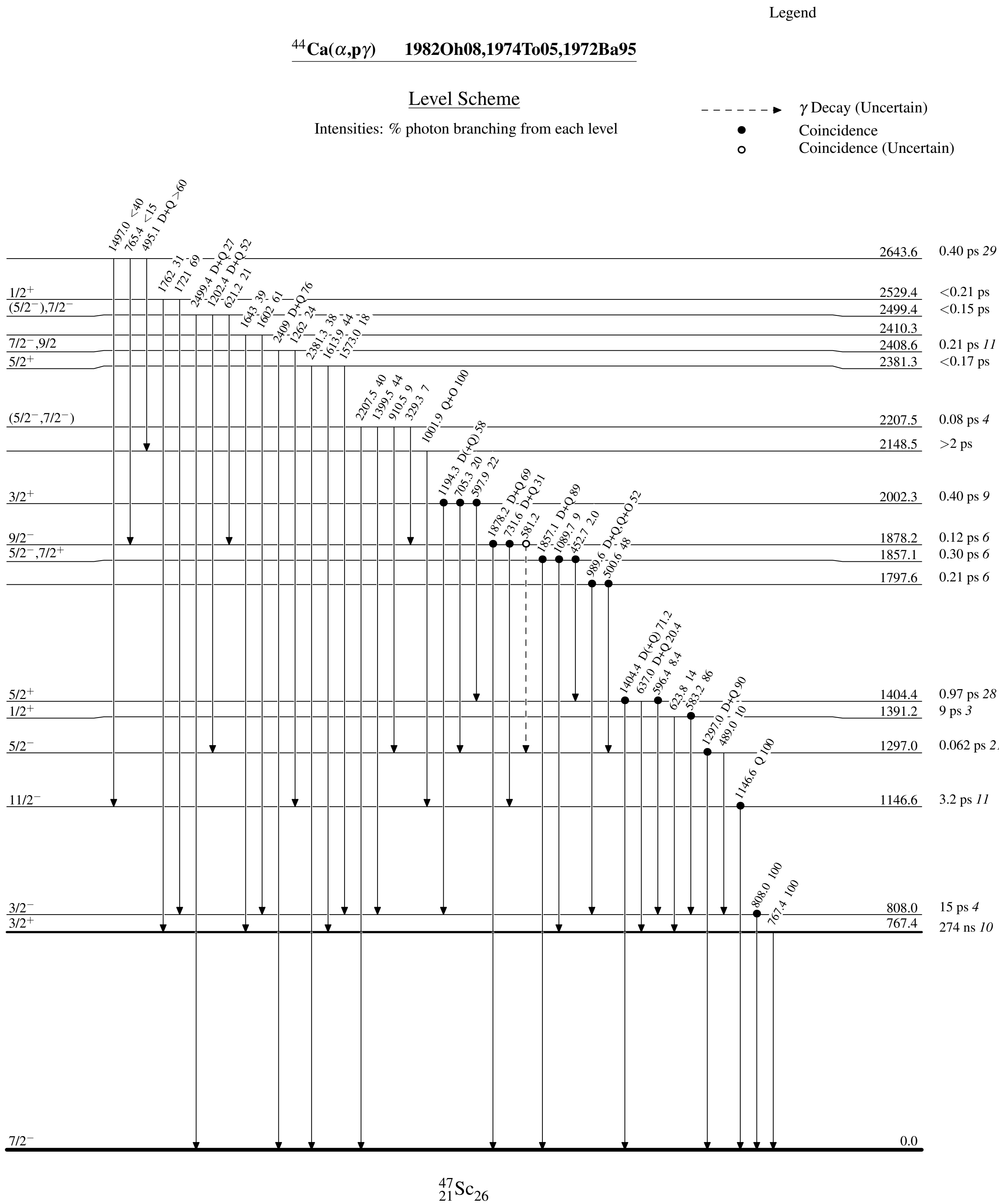
E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[#]	Comments
2207.5	(5/2⁻,7/2⁻)	910.5	9 *6*	1297.0	5/2⁻			I_γ: other: 10 *3* (1972Ba95).
		1399.5	44 *15*	808.0	3/2⁻			I_γ: other: 55 *5* (1972Ba95).
		2207.5	40 *10*	0.0	7/2⁻			I_γ: other: 35 *4* (1972Ba95).
2381.3	5/2⁺	1573.0	18 *12*	808.0	3/2⁻			
		1613.9	44 *10*	767.4	3/2⁺			
		2381.3	38 *10*	0.0	7/2⁻			
2408.6	7/2⁻,9/2	1262	24 *4*	1146.6	11/2⁻			I_γ: weighted average of 25 *5* (1972Ba95) and 21 *7* (1974To05).
		2409	76 *4*	0.0	7/2⁻	D+Q		I_γ: weighted average of 75 *5* (1972Ba95) and 79 *7* (1974To05). δ: −0.72 *22* if J_i=7/2; +0.02 *9* if J_i=9/2. Mult.: A_2=−0.27 *9* (1974To05).
2410.3		1602	61 *18*	808.0	3/2⁻			
		1643	39 *18*	767.4	3/2⁺			
2499.4	(5/2⁻),7/2⁻	621.2	21 *5*	1878.2	9/2⁻			
		1202.4	52 *6*	1297.0	5/2⁻	D+Q	−0.05 *8*	Mult.: A_2=−0.41 *15* (1974To05).
		2499.4	27 *5*	0.0	7/2⁻	D+Q	+0.54 *65*	Mult.: A_2=0.60 *15* (1974To05).
2529.4	1/2⁺	1721	69 *12*	808.0	3/2⁻			
		1762	31 *12*	767.4	3/2⁺			
2643.6		495.1	>60	2148.5		D+Q		δ: −0.04 *8* if J_i=J_f−1; −0.68 *25* if J_i=J_f; +0.10 *8* if J_i=J_f+1. Mult.: A_2=−0.12 *6* (1974To05).
		765.4	<15	1878.2	9/2⁻			
		1497.0	<40	1146.6	11/2⁻			

† Calculated by the evaluators from level scheme.

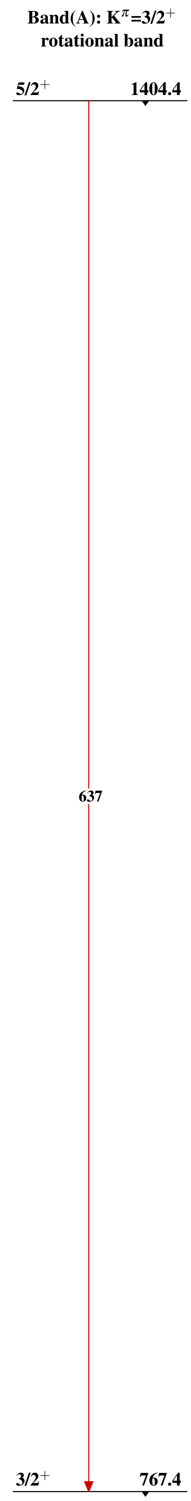
‡ Photon branching ratios from each state from 1974To05, except where noted.

\# From $\gamma(\theta)$ (1974To05), except as noted. See 1974To05 for other possible δ's excluded by comparison to RUL or by final ΔJ^π.

@ Placement of transition in the level scheme is uncertain.


Legend
^{44}Ca(α,pγ) 1982Oh08,1974To05,1972Ba95
Level Scheme
Intensities: % photon branching from each level
γ Decay (Uncertain)
Coincidence
Coincidence (Uncertain)
2643.6 0.40 ps 29
1/2+ 2529.4 <0.21 ps
(5/2−),7/2− 2499.4 <0.15 ps
2410.3
7/2−,9/2 2408.6 0.21 ps 11
5/2+ 2381.3 <0.17 ps
(5/2−,7/2−) 2207.5 0.08 ps 4
2148.5 >2 ps
3/2+ 2002.3 0.40 ps 9
9/2− 1878.2 0.12 ps 6
5/2−,7/2+ 1857.1 0.30 ps 6
1797.6 0.21 ps 6
5/2+ 1404.4 0.97 ps 28
1/2+ 1391.2 9 ps 3
5/2− 1297.0 0.062 ps 21
11/2− 1146.6 3.2 ps 11
3/2− 808.0 15 ps 4
3/2+ 767.4 274 ns 10
7/2− 0.0
1497.0 <40
765.4 <15
495.1 D+Q >60
1762 31
1721 69
2499.4 D+Q 27
1202.4 D+Q 52
621.2 21
1643 39
1602 61
2409 D+Q 76
1262 24
2381.3 38
1613.9 44
1573.0 18
2207.5 40
1399.5 44
910.5 9
329.3 7
1001.9 Q+O 100
1194.3 D(+Q) 58
705.3 20
597.9 22
1878.2 D+Q 69
731.6 D+Q 31
581.2
1857.1 D+Q 89
1089.7 9
452.7 2.0
989.6 D+Q+O 52
500.6 48
1404.4 D(+Q) 71.2
637.0 D+Q 20.4
596.4 8.4
623.8 14
583.2 86
1297.0 D+Q 90
489.0 10
1146.6 Q 100
808.0 100
767.4 100
$^{47}_{21}Sc_{26}$

$^{44}Ca(\alpha,p\gamma)$ 1982Oh08,1974To05,1972Ba95



$^{47}_{21}Sc_{26}$