

<sup>44</sup>Ca( $\alpha$ ,p),( $\alpha$ ,p $\gamma$ ) 1982Oh08,1974To05,1972Ba95

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	T. W. Burrows	NDS 108, 923 (2007)	20-Feb-2007

1970Gi10: E=31 MeV. Measured  $\sigma(\theta(\text{C.M.})=20^\circ-80^\circ)$ ; Si telescope. FWHM $\approx$ 150 keV.  
 1972Ba95: E=9.5 MeV. Measured  $\gamma$ 's, p $\gamma$ -coincidences, T<sub>1/2</sub>'s; Si, Ge(Li). DSAM.  
 1974To05: E=10.5 and 11 MeV. Measured  $\gamma$ 's,  $\gamma\gamma$ -coincidences, p $\gamma$ -coincidences,  $\gamma(\theta)$  and T<sub>1/2</sub>'s; Si, Ge(Li). DSAM.  
 1974To06: E=11 MeV. Measured linear polarization of 1147 $\gamma$ ; NaI polarimeter.  
 1982Oh08: E=9 MeV. Measured T<sub>1/2</sub>(808- and 1391-keV states); p $\gamma$ -coincidences; Si and high-purity germanium. RDM.

<sup>47</sup>Sc Levels

Other: see 1995Bu05.

E(level) <sup>†</sup>	J $\pi$ <sup>‡</sup>	T <sub>1/2</sub> <sup>#</sup>	L <sup>@</sup>	Comments
0.0	7/2 <sup>-</sup>		3	
767.4 <sup>&amp;</sup> 3	(3/2) <sup>+</sup>	274 ns 10		g=0.24 4 (1968Fo02) E(level): from 1972Ba95. T <sub>1/2</sub> :g: from 1968Fo02. DPAD; NaI.
808.0 2	3/2 <sup>-</sup>	15 ps 4	1	T <sub>1/2</sub> : from RDM (1982Oh08). Others: >2 ps (1974To05), >5 ps (1972Ba95).
1146.6 2	11/2 <sup>-</sup>	3.2 ps 11		J $\pi$ : 7/2 or 11/2 from $\gamma(\theta)$ (1974To05). Linear polarization (1147 $\gamma$ ) (1974To06) selects 11/2.
1297.0 2	5/2 <sup>-</sup>	0.062 ps 21		
1391.2 3	1/2 <sup>+</sup>	9 ps 3		T <sub>1/2</sub> : from RDM (1982Oh08). Others: >1.3 ps (1974To05), >4 ps (1972Ba95).
1404.4 <sup>&amp;</sup> 3	5/2 <sup>+</sup>	0.97 ps 28		J $\pi$ : 5/2 from $\gamma(\theta)$ . $\pi=-$ ruled out by RUL(637 $\gamma$ ) (1974To05).
1797.6 3	3/2,5/2 <sup>-</sup> ,7/2 <sup>-</sup>	0.21 ps 6		J $\pi$ : from $\gamma(\theta)$ and RUL's (1974To05).
1857.1 3	5/2 <sup>-</sup> ,7/2 <sup>(+)</sup>	0.30 ps 6		J $\pi$ : from $\gamma(\theta)$ , RUL's, and $\gamma$ to (3/2) <sup>+</sup> (1974To05).
1878.2 <sup>b</sup> 7	9/2 <sup>-</sup>	0.12 <sup>a</sup> ps 6		J $\pi$ : $\gamma(\theta)$ (1879 $\gamma$ ) excludes 7/2; RUL(732 $\gamma$ ) excludes 5/2 (1974To05).
2002.3 3	3/2 <sup>+</sup>	0.40 ps 9		J $\pi$ : L(p)=2 in (t, $\alpha$ ). $\gamma(\theta)$ and RUL of 1195 $\gamma$ exclude 5/2 <sup>+</sup> .
2148.5 <sup>c</sup> 5	(15/2 <sup>-</sup> )	>2 <sup>a</sup> ps		J $\pi$ : decays completely to 11/2 <sup>-</sup> , 1147-keV state. p $\gamma$ -coin indicates 7/2 $\leq$ J $\leq$ 15/2 (1974To05).
2207.5 3	( $\leq$ 7/2 $\&$ $\geq$ 7/2)	0.08 ps 4		J $\pi$ : evidence for a close doublet with J $\leq$ 7/2 for one member and J $\geq$ 7/2 for the other (1974To05).
2381.3 <sup>c</sup> 8	5/2 <sup>+</sup>	<0.17 <sup>a</sup> ps		
2408.6 <sup>&amp;</sup> 16	7/2 <sup>-</sup> ,9/2	0.21 ps 11		J $\pi$ : from $\gamma(\theta)$ (2407 $\gamma$ ) and RUL's. 9/2 <sup>+</sup> favored by band structure (1974To05). T <sub>1/2</sub> : unweighted av of 0.10 ps 7 (1974To05) and 0.31 ps 12 (1972Ba95).
2410.3 <sup>c</sup> 10	$\leq$ 7/2			J $\pi$ : from $\gamma$ -deexcitation pattern (1974To05).
2499.4 <sup>c</sup> 7	7/2 <sup>-</sup>	<0.15 <sup>a</sup> ps		
2529.4 <sup>c</sup> 9	1/2 <sup>+</sup>	<0.21 <sup>a</sup> ps		
2643.6 <sup>c</sup> 6	(13/2 to 17/2)	0.40 <sup>a</sup> ps 29		J $\pi$ : from $\gamma(\theta)$ and RUL(495 $\gamma$ ) (1974To05).
2910 <sup>@</sup>	3/2 <sup>-</sup> <sup>@</sup>		1	
3320 <sup>@</sup>	3/2 <sup>-</sup> <sup>@</sup>		1	

<sup>†</sup> Weighted average from 1974To05 and 1972Ba95, except as noted.

<sup>‡</sup> From the Adopted Levels. Contributing arguments from these given As comments or footnotes.

<sup>#</sup> From DSAM (1972Ba95), except as noted.

<sup>@</sup> From 1970Gi10. DWBA analysis.

<sup>&</sup> Band(A): K $\pi$ =3/2<sup>+</sup> rotational band (1972Ba95,1974To05).

<sup>44</sup>Ca( $\alpha,p$ ),( $\alpha,p\gamma$ ) **1982Oh08,1974To05,1972Ba95 (continued)**

<sup>47</sup>Sc Levels (continued)

<sup>a</sup> From DSAM (1974To05).

<sup>b</sup> Unweighted averages from 1974To05 and 1972Ba95. 1974To05 observed states At 2407 and 2410 keV. On the basis of the similarity in the  $\gamma$ -ray branching ratios, they identified the state At 2410 keV as the state observed by 1972Ba95 At 2407 keV.

<sup>c</sup> From 1974To05.

$\gamma$ (<sup>47</sup>Sc)

BE $\lambda$ (W.u.),BM $\lambda$ (W.u.): see 1974To05 for values based on their data.

Both 1972Ba95 and 1974To05 searched for other transitions but did not observe them. See figure 3 (1974To05) and table II (1972Ba95).

$E_i$ (level)	$J_i^\pi$	$E_\gamma^\dagger$	$I_\gamma^\ddagger$	$E_f$	$J_f^\pi$	Mult.#	$\delta^\#$	Comments
767.4	(3/2) <sup>+</sup>	767.4	100	0.0	7/2 <sup>-</sup>			I $\gamma$ : from 1972Ba95.
808.0	3/2 <sup>-</sup>	808.0	100	0.0	7/2 <sup>-</sup>			
1146.6	11/2 <sup>-</sup>	1146.6	100	0.0	7/2 <sup>-</sup>	E2		
1297.0	5/2 <sup>-</sup>	489.0	10 <sup>@</sup> 4	808.0	3/2 <sup>-</sup>			$\delta$ : +0.04 5 or <-8.0.
		1297.0	90 <sup>@</sup> 4	0.0	7/2 <sup>-</sup>	D+Q		
1391.2	1/2 <sup>+</sup>	583.2	86 4	808.0	3/2 <sup>-</sup>			
		623.8	14 4	767.4	(3/2) <sup>+</sup>			M1+E2 D(+Q) $\delta$ : -0.72 28 -0.04 8
1404.4	5/2 <sup>+</sup>	596.4	8.4 19	808.0	3/2 <sup>-</sup>			
		637.0	20.4 24	767.4	(3/2) <sup>+</sup>			
		1404.4	71.2 27	0.0	7/2 <sup>-</sup>			D(+Q) D+Q,Q+O $\delta$ : -0.05 20 or +2.34 $\leq\delta\leq$ +57 if J $_i$ =3/2; +0.35 16 if J $_i$ =5/2; +0.11 29 if J $_i$ =7/2.
1797.6	3/2,5/2 <sup>-</sup> ,7/2 <sup>-</sup>	500.6	48 7	1297.0	5/2 <sup>-</sup>			
		989.6	52 7	808.0	3/2 <sup>-</sup>			
		452.7	2.0 <sup>@</sup> 15	1404.4	5/2 <sup>+</sup>			$\delta$ : -1.2 6 if J $_i$ =5/2; +0.01 12 if J $_i$ =7/2.
1857.1	5/2 <sup>-</sup> ,7/2 <sup>(+)</sup>	1089.7	9 <sup>@</sup> 4	767.4	(3/2) <sup>+</sup>			
		1857.1	89 <sup>@</sup> 4	0.0	7/2 <sup>-</sup>	D+Q		
		581.2 <sup>&amp;</sup>		1297.0	5/2 <sup>-</sup>			Observed only in $\gamma\gamma$ -coin. $\delta$ : -0.14 11 -0.14 9
1878.2	9/2 <sup>-</sup>	731.6	31 4	1146.6	11/2 <sup>-</sup>	D+Q		
		1878.2	69 4	0.0	7/2 <sup>-</sup>	D+Q		
		597.9	22 6	1404.4	5/2 <sup>+</sup>			D(+Q) $\delta$ : 0.00 18
2002.3	3/2 <sup>+</sup>	705.3	20 6	1297.0	5/2 <sup>-</sup>			
		1194.3	58 8	808.0	3/2 <sup>-</sup>	D(+Q)		
		1001.9	100 <sup>@</sup>	1146.6	11/2 <sup>-</sup>	Q+O	+0.10 13	$\delta$ : see 1974To05 for other values if J $_i$ <15/2.
2148.5	(15/2 <sup>-</sup> )							
		329.3	7 <sup>@</sup> 4	1878.2	9/2 <sup>-</sup>			
		910.5	9 <sup>@</sup> 6	1297.0	5/2 <sup>-</sup>			7/2 <sup>-</sup> ,9/2
		1399.5	44 <sup>@</sup> 15	808.0	3/2 <sup>-</sup>			
		2207.5	40 <sup>@</sup> 10	0.0	7/2 <sup>-</sup>			
		1573.0	18 <sup>@</sup> 12	808.0	3/2 <sup>-</sup>			D+Q $\delta$ : -0.72 22 if J $_i$ =7/2; +0.02 9 if J $_i$ =9/2.
2381.3	5/2 <sup>+</sup>	1613.9	44 <sup>@</sup> 10	767.4	(3/2) <sup>+</sup>			
		2381.3	38 <sup>@</sup> 10	0.0	7/2 <sup>-</sup>			
		1262	24 4	1146.6	11/2 <sup>-</sup>			D+Q $\delta$ : -0.72 22 if J $_i$ =7/2; +0.02 9 if J $_i$ =9/2.
2408.6	7/2 <sup>-</sup> ,9/2	2409	76 4	0.0	7/2 <sup>-</sup>	D+Q		
		1602	61 <sup>@</sup> 18	808.0	3/2 <sup>-</sup>			$\leq$ 7/2
2410.3	$\leq$ 7/2	1643	39 <sup>@</sup> 18	767.4	(3/2) <sup>+</sup>			

Continued on next page (footnotes at end of table)

$^{44}\text{Ca}(\alpha, \text{p}), (\alpha, \text{p}\gamma)$  [1982Oh08](#), [1974To05](#), [1972Ba95](#) (continued) $\gamma(^{47}\text{Sc})$  (continued)

$E_i(\text{level})$	$J_i^\pi$	$E_\gamma^\dagger$	$I_\gamma^\ddagger$	$E_f$	$J_f^\pi$	Mult. #	$\delta^\#$	Comments
2499.4	$7/2^-$	621.2	21 @ 5	1878.2	$9/2^-$			
		1202.4	52 @ 6	1297.0	$5/2^-$	D+Q	-0.05 8	
		2499.4	27 @ 5	0.0	$7/2^-$	D+Q	+0.54 65	
2529.4	$1/2^+$	1721	69 @ 12	808.0	$3/2^-$			
		1762	31 @ 12	767.4	$(3/2)^+$			
2643.6	$(13/2 \text{ to } 17/2)$	495.1	>60 @	2148.5	$(15/2^-)$	D+Q		$\delta$ : -0.04 8 if $J_i=J_f-1$ ; -0.68 25 if $J_i=J_f$ ; +0.10 8 if $J_i=J_f+1$ .
		765.4	<15 @	1878.2	$9/2^-$			
		1497.0	<40 @	1146.6	$11/2^-$			

$^\dagger$  Calculated by the evaluator from level scheme.

$^\ddagger$  % photon branching ratios from each state. Weighted average from [1974To05](#) and [1972Ba95](#), except as noted.

$^\#$  From  $\gamma(\theta)$  ([1974To05](#)) and comparison to RUL (evaluator), except as noted. See [1974To05](#) for other possible  $\delta$ 's excluded by comparison to RUL or by final  $\Delta J^\pi$ .

@ From [1974To05](#).

& Placement of transition in the level scheme is uncertain.

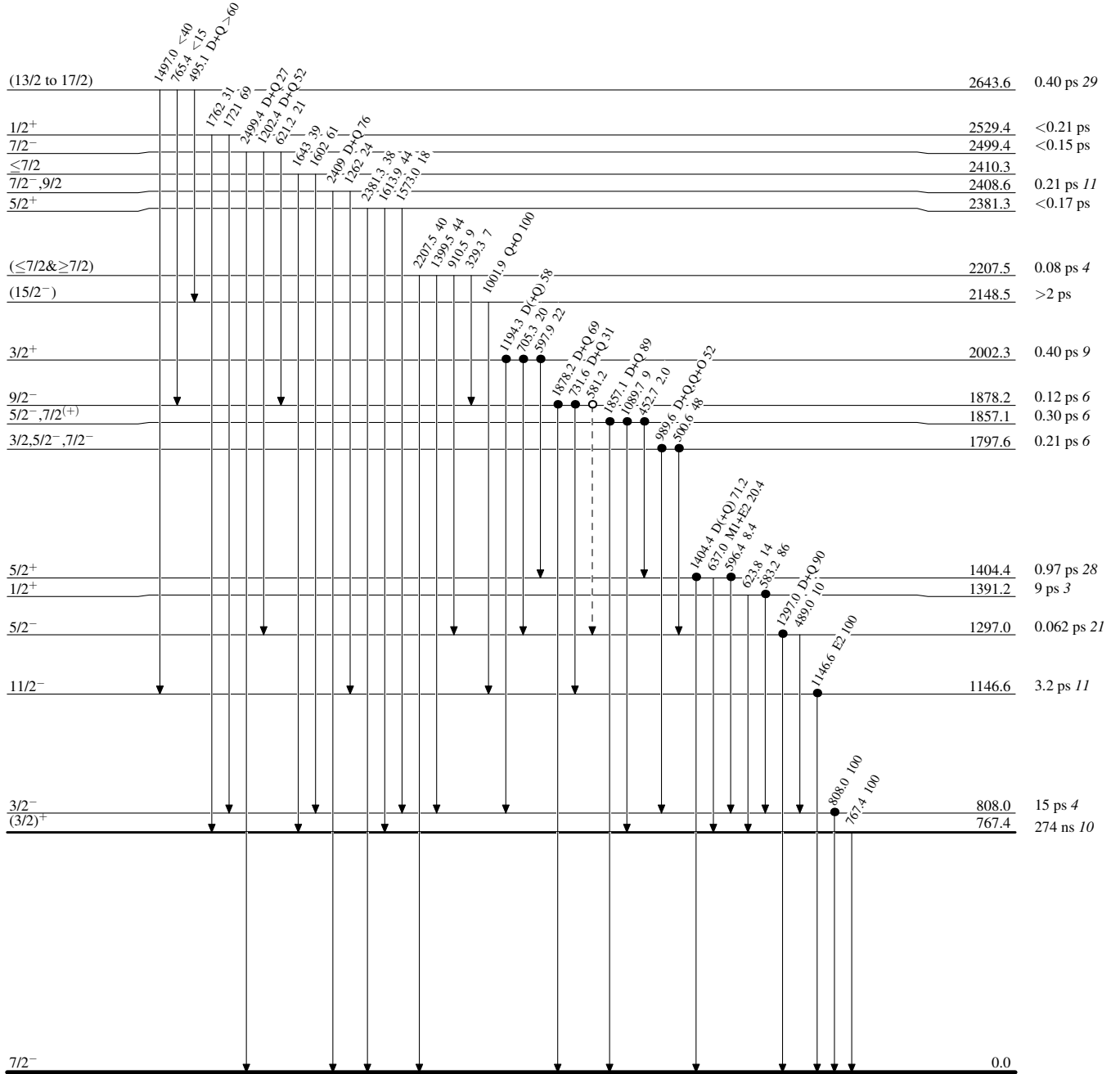
Legend

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

Level Scheme

Intensities: % photon branching from each level

- ▶  $\gamma$  Decay (Uncertain)
- Coincidence
- Coincidence (Uncertain)



$^{47}_{21}\text{Sc}_{26}$

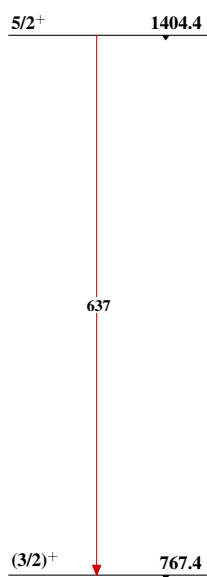
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 ${}^{44}\text{Ca}(\alpha, \text{p}), (\alpha, \text{p}\gamma)$  1982Oh08, 1974To05, 1972Ba95

Band(A):  $K^\pi=3/2^+$   
rotational band  
(1972Ba95, 1974To05)

$7/2^-, 9/2^-$        $2408.6$

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${}^{47}_{21}\text{Sc}_{26}$