^{46}Ti(α,pγ) 1975Ha12,1974Ta05,1973Sa12

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	T. W. Burrows[a]	NDS 109, 1879 (2008)	14-Jul-2008

1973Sa12: E=14.2, 12.2, 10.2 MeV, measured γ's, $\gamma(\theta)$, $\gamma\gamma(\theta)$, pγ's, and $\gamma\gamma$'s; annular Si-Au.
1974Ta05: E=10 MeV. Measured Iγ's and pγ's; Si. DSAM.
1975Ha12: E=10.6 MeV. Measured γ's, pγ's and $\gamma\gamma$'s, and p$\gamma(\theta)$ (θ(P)=171°) (Si), and pγ(t) (Si, scin). DSAM. Also measured N-91γ(t) *via* (p,nγ).
All information is from 1975Ha12, except As noted. See 1978Ha15 for a more detailed discussion and comparison of the results from the references cited here and other data. Data from 1975Ha12 and 1974Ta05 are generally In good agreement except As noted by 1978Ha15 or below. Others: see 1995Bu23.

^{49}V Levels

See 1975Ha12 for band parameters of the negative-parity states which appear to show collective behavior.
Other lifetime measurements: 1981Oh08 (E=8 MeV, DSAM), 1975Ha02 (E=10 MeV, RDM), and 1974Br04 (E=11 MeV, RDM).

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]	Comments
0.0	7/2$^-$		
90.71 *8*	5/2$^-$		
152.91 *8*	3/2$^-$		
748.32[@] *15*	3/2$^+$	5.3 ps *6*	J$^\pi$: δ(5/2) from p$\gamma(\theta)$ and comparison to RUL excludes 5/2$^+$. T$_{1/2}$: from RDM (1975Ha02, E=10 MeV).
1021.61 *17*	11/2$^-$	3.4 ps *6*	T$_{1/2}$: weighted av of RDM from 1975Ha02 and 1974Br04.
1140.86[@] *19*	5/2$^+$	1.3 ps *6*	J$^\pi$: 3/2,5/2 from p$\gamma(\theta)$(394γ). ≠ 3/2 from p$\gamma(\theta)$(1050γ). π=+ from M1+E2 γ to 3/2$^+$. T$_{1/2}$: disagrees with 0.17 ps *+35−7* from (p,γ).
1155.41 *20*	9/2$^-$	1.1 ps *3*	J$^\pi$: 9/2 from $\gamma(\theta)$ (1973Sa12). M1+E2 γ to 7/2$^-$.
1514.4 *4*	5/2$^-$	31 fs *20*	J$^\pi$: ≠ 1/2,7/2 from p$\gamma(\theta)$. π=− from M1+E2 γ to 3/2$^-$. 5/2$^-$ from excitation strength In (p,n). T$_{1/2}$: disagrees with <0.01 ps (1974Ta05) but agrees with 31 fs *21* from (p,γ).
1603.0[@] *5*	7/2$^+$	0.47 ps *22*	J$^\pi$: 3/2$^-$,5/2,7/2$^+$ from γ-deexcitation pattern. ≠ 3/2,5/2 from δ(3/2,5/2)=0.53 *31*, 0.7 *+8−3* of γ to 7/2$^-$, δ(5/2)=0.83 *40* of γ to 5/2$^+$, and δ(7/2) of γ to 3/2$^+$ from p$\gamma(\theta)$ and comparison to RUL.
1643.14 *22*	(3/2$^-$,5/2)	35 fs *12*	J$^\pi$: 1/2,3/2$^{(-)}$,5/2 from p$\gamma(\theta)$ and comparison to RUL. π=+ could not Be definitely excluded. T$_{1/2}$: disagrees with <0.02 ps (1974Ta05) but is consistent with 38 fs *21* from (p,γ).
1646.43[&] *24*	(1/2$^+$)	6.6 ps *10*	J$^\pi$: 1/2,3/2$^{(+)}$,5/2$^+$ from p$\gamma(\theta)$ and RUL(898γ). J$^\pi$=1/2$^+$ if state corresponds to L=0, 1652 In (t,α). T$_{1/2}$: from 1981Oh08. Consistent with 5.2 ps<T$_{1/2}$<0.7 ns (1975Ha12) but not with 2.2 ps *+8−5* (1974Ta05).
1661.5 *4*	3/2$^-$	16[a] fs *7*	J$^\pi$: 3/2 or 5/2 from p$\gamma(\theta)$.
1995.1[&] *5*	3/2$^{(+)}$	0.49 ps *21*	J$^\pi$: ≠ 1/2 from p$\gamma(\theta)$. 3/2,5/2 from p$\gamma(\theta)$(855γ,1840γ). ≠ 5/2 from p$\gamma(\theta)$(394γ). π=(+) from suggestion by 1974Ta05 that L(P)=2 In (t,α) is correct. T$_{1/2}$: from 1981Oh08. Others: 0.13 ps *5* (1974Ta05), 0.9 ps *+6−3* (1975Ha12).
2178.7[@] *5*	9/2$^+$	0.56 ps *+49−28*	J$^\pi$: from p$\gamma(\theta)$(577γ, 2179γ) and E2 γ to 5/2$^+$.
2183.1 *8*	7/2$^-$	33[a] fs *12*	J$^\pi$: 3/2,5/2,7/2 from p$\gamma(\theta)$(2092γ). ≠ 3/2 from existence of 1027γ.
2235.3 *9*	5/2	12[a] fs *8*	J$^\pi$: 5/2,7/2,9/2 from p$\gamma(\theta)$. 1975Ha12 suggest π=− from comparison to RUL.
2263.3 *3*	15/2$^-$	0.65 ps *+38−19*	J$^\pi$: 11/2,15/2 from p$\gamma(\theta)$; excit favors 15/2 (1973Sa12). T$_{1/2}$: consistent with <2.4 ps (1974Br04) but not with >2.66 ps (1974Ta05).
2265.3 *4*	5/2$^-$	35[a] fs *9*	J$^\pi$: 1/2$^-$,3/2$^-$,5/2$^-$ from p$\gamma(\theta)$ and M1+E2 γ to 3/2$^-$. 1975Ha12 suggest 3/2$^-$ on the basis of L(P)=1 for 2279 state In (^{3}He,d).

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^{46}Ti(α,pγ) 1975Ha12,1974Ta05,1973Sa12 (continued)

^{49}V Levels (continued)

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]	Comments
2309.7 *11*	3/2$^-$	<18[a] fs	J$^\pi$: 1974Ta05 suggest 3/2$^-$ on basis of Δ and comparison to RUL for γ to 5/2$^-$.
2353.6 *6*	9/2$^-$	33[a] fs *12*	J$^\pi$: 3/2,5/2,9/2 from p$\gamma(\theta)$(2353γ). ≠ 3/2,5/2 from D,E2 γ to 11/2$^-$. π=− from M1+E2 γ to 7/2$^-$.
2388.3[&] *6*	5/2$^+$	57[a] fs *20*	J$^\pi$: from p$\gamma(\theta)$ and M1+E2 γ to 3/2$^+$.
2408.5 *4*	(7/2$^-$)	<8[a] fs	J$^\pi$: 7/2,9/2,11/2$^-$ from p$\gamma(\theta)$, δ's, and comparison to RUL for γ to 7/2$^-$.
2670.9 *4*	(11/2)$^-$	<11[a] fs	J$^\pi$: 9/2$^-$,11/2$^-$,13/2$^-$ from p$\gamma(\theta)$, δ's, and comparison to RUL for γ to 11/2$^-$.
2727.8 *4*	15/2$^-$	0.10[a] ps *4*	J$^\pi$: from p$\gamma(\theta)$ and M1+E2 γ to 15/2$^-$.
2740.9[@] *7*	11/2$^+$	0.39[a] ps *+36−17*	J$^\pi$: 7/2,9/2,11/2$^+$ from D,E2 to 9/2$^+$, 7/2$^+$, and 9/2$^-$. 11/2$^+$ favored by band structure. 1975Ha12 suggest ≠ 7/2$^+$ from γ to 11/2$^-$.
2786.3 *3*	(9/2)$^-$	<11[a] fs	J$^\pi$: 7/2$^-$,9/2,11/2$^-$ from D,E2 γ's to 7/2$^-$ and 11/2$^-$. 9/2,11/2 from p$\gamma(\theta)$. ≠ 9/2$^+$ from δ(9/2 to 7/2 or 9/2) and comparison to RUL.
2806.2 *8*	5/2$^+$	0.32[a] ps *6*	J$^\pi$: ≠ 3/2$^+$ from D,E2 γ to g.s. if L(P)=2, 2812 state In (t,α) (1974Ta05).
2810.8[b] *5*	5/2$^-$,7/2$^-$	<12[a] fs	5/2,7/2,9/2$^-$ from D,E2 γ to 7/2$^-$ and 5/2$^-$.
2860.9 *7*	13/2$^-$	0.10 ps *6*	J$^\pi$: from p$\gamma(\theta)$ and E2 γ to 9/2$^-$.
3017.4 *11*	3/2$^-$,5/2,7/2$^-$	<40 fs	J$^\pi$: from D,E2 γ's to 7/2$^-$ and 3/2$^-$. Not adopted by evaluator.
3133.5[b] *9*	7/2,9/2$^{(+)}$	<40 fs	J$^\pi$: 7/2$^-$,9/2,11/2$^-$ from D,E2 γ's to 7/2$^-$ and 11/2$^-$. 9/2$^+$ from L(P)=4, 3137 state In (^{3}He,d) is not rigorously rejected by δ(9/2 to 7/2) and comparison to RUL.
3133.8 *5*	(9/2,11/2,13/2)	0.22 ps *+8−4*	J$^\pi$: 9/2$^-$,11/2$^-$,13/2$^-$ from pG(THETA) and M1+E2 G to 9/2$^-$,11/2$^-$,13/2$^-$. It is not clear if 1975Ha12 considered and rejected J=7/2 (evaluator).
3259.4 *4*			T$_{1/2}$>2 ps<0.7 ns not likely to Be the L(P)=0, 3248 state observed In (t,α) and (^{3}He,d).
3341.7[@] *6*			T$_{1/2}$>3.5 ps<0.7 ns J$^\pi$: 9/2,11/2,13/2$^+$ from decay modes and T$_{1/2}$. 13/2$^+$ favored if member of K$^\pi$=3/2$^+$ rotational band.

[†] Calculated by the evaluator using least-squares adjustment procedures. Uncertain transitions were excluded.
[‡] From the Adopted Levels. Supporting arguments from (α,pγ) are given In comments As are discrepancies between the adopted J$^\pi$ and those suggested by 1975Ha12.
[#] From DSAM, except As noted. pγ(t) show that all γ's between 0.3 and 3 MeV correspond to T$_{1/2}$<0.7 ns.
[@] Band(A): K$^\pi$=3/2$^+$ rotational band. Assignment of 11/2$^+$ and 13/2$^+$ members is tentative.
[&] Band(B): K$^\pi$=1/2$^+$ rotational band.
[a] From DSAM (1974Ta05).
[b] Proposed As 7/2$^+$ and 9/2$^+$ members of K$^\pi$=1/2$^+$ rotational band by 1975Ha12. This is not supported by the adopted spins and parities.

γ(^{49}V)

Coincidences: transitions In coincidence with the 1022γ are shown on the drawing. See 1973Sa12 for other coincidences.
Note that three transitions with≈700 keV<Eγ<≈900 keV were observed but not placed; these transitions come from states above 3.5 MeV.
B(M1),B(E2): see 1975Ha12 for transitions In the K$^\pi$=3/2$^+$ band and between the negative-parity states. Also see 1974Ta05.

E$_i$(level)	J$_i^\pi$	E$_\gamma$	I$_\gamma$[†]	E$_f$	J$_f^\pi$
90.71	5/2$^-$	90.7 *1*	100	0.0	7/2$^-$
152.91	3/2$^-$	62.2 *1*	42 *2*	90.71	5/2$^-$

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^{46}Ti(α,pγ) 1975Ha12,1974Ta05,1973Sa12 (continued)

$\gamma(^{49}V)$ (continued)

E_i(level)	J_i^π	E_γ	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	Comments
152.91	3/2$^-$	152.9 *1*	58 *3*	0.0	7/2$^-$			
748.32	3/2$^+$	595.3 *2*	48 *2*	152.91	3/2$^-$	D(+Q)	−0.02 *2*	
		657.7 *2*	52 *3*	90.71	5/2$^-$	D(+Q)	−0.01 *2*	
1021.61	11/2$^-$	1021.6 *2*	100	0.0	7/2$^-$	E2(+M3)[#]	−0.03 *3*	
1140.86	5/2$^+$	393.9 *9*	7 *1*	748.32	3/2$^+$	M1+E2		δ: −0.26 *12*; −1.2 *3*.
		987.9 *5*	15 *1*	152.91	3/2$^-$	D(+Q)	−0.02 *9*	
		1050.0 *3*	23 *1*	90.71	5/2$^-$	D+Q		δ<+1.40>+0.05
		1141.0 *3*	55 *3*	0.0	7/2$^-$	D(+Q)	−0.05 *6*	
1155.41	9/2$^-$	133.8 *3*	<5	1021.61	11/2$^-$	D(+Q)	−0.15 *15*	
		1064.8 *5*	23 *1*	90.71	5/2$^-$	E2(+M3)[#]	−0.03 *5*	
		1155.4 *3*	77 *4*	0.0	7/2$^-$	M1+E2[#]	+0.68 *8*	
1514.4	5/2$^-$	1361.5 *4*	60 *3*	152.91	3/2$^-$	M1+E2	−0.57 *5*	
		1423.7 *12*	9 *1*	90.71	5/2$^-$	D+Q		δ<−0.06>−1.23
		1514.4 *10*	31 *2*	0.0	7/2$^-$			
1603.0	7/2$^+$	463.3 *8*	14 *1*	1140.86	5/2$^+$	D(+Q)	−0.05 *21*	
		853.7[&] *22*	13[&] *1*	748.32	3/2$^+$			
		1511.8 *12*	42 *2*	90.71	5/2$^-$			
		1602.8 *10*	31 *2*	0.0	7/2$^-$	D+Q		δ<+1.15>+0.05
1643.14	(3/2$^-$,5/2)	1490.2 *2*	100	152.91	3/2$^-$	D+Q		
1646.43	(1/2$^+$)	898.0 *3*	53 *3*	748.32	3/2$^+$	D+Q		δ: all (J_i=1/2); −0.15 *6* (J_i=3/2); +0.26 *5* (J_i=5/2).
		1493.6 *3*	47 *2*	152.91	3/2$^-$			
1661.5	3/2$^-$	1508.7 *10*	36 *2*	152.91	3/2$^-$			
		1570.7 *4*	64 *3*	90.71	5/2$^-$	D(+Q)	−0.04 *9*	
1995.1	3/2$^{(+)}$	854.5[&] *5*	37[&] *2*	1140.86	5/2$^+$	D+Q	−0.22 *16*	
		1840.3 *14*	39 *2*	152.91	3/2$^-$	D+Q	−0.17 *9*	
		1904.1 *20*	24 *1*	90.71	5/2$^-$			
2178.7	9/2$^+$	576.5 *16*	7 *1*	1603.0	7/2$^+$	D(+Q)	−0.07 *15*	
		1037.0 *7*	21 *1*	1140.86	5/2$^+$	Q		
		1157.9 *10*	10 *1*	1021.61	11/2$^-$			
		2179.0 *15*	62 *3*	0.0	7/2$^-$	D(+Q)	−0.02 *5*	
2183.1	7/2$^-$	1027.2 *12*	21 *1*	1155.41	9/2$^-$			
		2092.0 *10*	79 *4*	90.71	5/2$^-$	D+Q	−0.09 *4*	
		2183.0[a] *20*	<5	0.0	7/2$^-$			
2235.3	5/2	2144.4 *10*	70 *4*	90.71	5/2$^-$	D(+Q)	+0.04 *14*	
		2235.7 *19*	30 *2*	0.0	7/2$^-$	D+Q		δ: +0.17 *12*; <−23; >+6.3.
2263.3	15/2$^-$	1241.7 *2*	100	1021.61	11/2$^-$	E2(+M3)[#]	+0.05 *5*	Mult.,δ: other: D+Q, −0.85 *+6−4* (J_i=11/2); Q+O, +0.01 *2* (J_i=15/2) (1973Sa12). Δ(11/2) not consistent with α(exp) In (p,nγ) (evaluator).
2265.3	5/2$^-$	2112.3 *3*	100	152.91	3/2$^-$	M1+E2		δ: −0.18 *8*; −11 *6*; <−31 (J_i=3/2). Other J_i considered but results not presented by 1975Ha12.
2309.7	3/2$^-$	2156.4 *15*	46 *2*	152.91	3/2$^-$	D+Q		δ: −0.02 *20*; <+11.4; >+2.3; -∞ (J_i=3/2). J_i=5/2 also considered by 1975Ha12 but results not presented.
		2219.3 *14*	54 *3*	90.71	5/2$^-$	D+Q		δ: −0.12 *15*; <−1.5; >−7.1 (J_i=3/2). See comment on preceding G.
2353.6	9/2$^-$	1200.0 *15*	21 *1*	1155.41	9/2$^-$			
		1331.8 *9*	26 *1*	1021.61	11/2$^-$	D+Q	−0.19 *16*	
		2353.2 *7*	53 *3*	0.0	7/2$^-$	M1+E2	−0.54 *23*	
2388.3	5/2$^+$	393.6 *15*	10 *1*	1995.1	3/2$^{(+)}$	D(+Q)	−0.04 *11*	
		1247.8 *12*	7 *1*	1140.86	5/2$^+$			
		1639.6 *7*	59 *3*	748.32	3/2$^+$	M1+E2	−0.36 *15*	

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^{46}Ti(α,pγ) 1975Ha12,1974Ta05,1973Sa12 (continued)

$\gamma(^{49}V)$ (continued)

E_i(level)	J_i^π	E_γ	I_γ †	E_f	J_f^π	Mult.‡	δ‡	Comments
2388.3	$5/2^+$	2235.3[a] *25*	<5	152.91	$3/2^-$			
		2299.2 *22*	17 *1*	90.71	$5/2^-$			
		2388.2 *20*	7 *1*	0.0	$7/2^-$			
2408.5	$(7/2^-)$	229.2[a] *20*	<5	2178.7	$9/2^+$			
		1253.5 *13*	21 *1*	1155.41	$9/2^-$			
		2408.4 *4*	79 *4*	0.0	$7/2^-$	D(+Q)	+0.02 *15*	
2670.9	$(11/2)^-$	1649.2 *3*	100	1021.61	$11/2^-$	M1+E2	−0.41 *6*	
2727.8	$15/2^-$	464.5 *3*	100	2263.3	$15/2^-$	M1+E2		δ<+0.10>−0.04
2740.9	$11/2^+$	562.0 *10*	13 *1*	2178.7	$9/2^+$			
		1139.7 *14*	48 *2*	1603.0	$7/2^+$			
		1585.0 *20*	39 *2*	1155.41	$9/2^-$			
		1719.0 *15*	<5	1021.61	$11/2^-$			
2786.3	$(9/2)^-$	1630.9 *5*	28 *1*	1155.41	$9/2^-$	D+Q		δ: −0.90 *35* (J_i=9/2); +0.02 *9*,<+2.0,>−6.8 (J_i=11/2).
		1764.6 *4*	26 *1*	1021.61	$11/2^-$	D+Q,E2		δ: −0.02 *15*,-∞ (J_i=9/2); −0.78 *20*,−2.1 *5* (J_i=11/2).
		2786.4 *5*	46 *2*	0.0	$7/2^-$	M1+E2,E2		δ: +0.35 *8* (J_i=9/2); +0.02 *6* (J_i=11/2).
2806.2	$5/2^+$	2058	35 *11*	748.32	$3/2^+$			from 1974Ta05 for transitions from this state.
		2806[@]	65[@] *11*	0.0	$7/2^-$			
2810.8	$5/2^-$,$7/2^-$	625.0 *20*	14 *1*	2183.1	$7/2^-$			
		2720.3 *19*	25 *2*	90.71	$5/2^-$			
		2810.9[@] *5*	61[@] *3*	0.0	$7/2^-$			
2860.9	$13/2^-$	597.6 *6*	22 *1*	2263.3	$15/2^-$			
		1705.0 *20*	78 *4*	1155.41	$9/2^-$	E2(+M3)	+0.09 *17*	
3017.4	$3/2^-$,5/2,$7/2^-$	2864.6 *24*	37 *2*	152.91	$3/2^-$			
		2926.1 *16*	45 *2*	90.71	$5/2^-$			
		3017.9 *20*	18 *1*	0.0	$7/2^-$			
3133.5	$7/2,9/2^{(+)}$	1978.0 *15*	27 *1*	1155.41	$9/2^-$			
		2114.0 *25*	9 *1*	1021.61	$11/2^-$			
		3133.0 *11*	64 *3*	0.0	$7/2^-$	D+Q	+0.26 *12*	
3133.8	(9/2,11/2,13/2)	462.9 *3*	100	2670.9	$(11/2)^-$	D(+Q)		δ: −0.10<δ<+1.00 (J_i=J_f=9/2); −0.10<δ<+0.90 (J_i=J_f=11/2); −0.10<δ<+0.80 (J_i=J_f=13/2). It is not clear if 1975Ha12 considered and rejected J_i=7/2 (evaluator).
3259.4		473.1 *2*	100	2786.3	$(9/2)^-$			
3341.7		601.0 *8*	29 *1*	2740.9	$11/2^+$			
		670.5 *8*	31 *2*	2670.9	$(11/2)^-$			
		1163.0 *10*	40 *2*	2178.7	$9/2^+$			

† % photon branching ratio from each state. See 1978Ha15 for a summary of relative intensities.
‡ From p$\gamma(\theta)$ and comparison to RUL. Other values for δ are excluded by adopted J^π.
# 1979AnZP (E=13.8 MeV) measured $\gamma(\theta)$ for these gammas but did not present the data.
@ Multiply placed with undivided intensity.
& Multiply placed with intensity suitably divided.
[a] Placement of transition in the level scheme is uncertain.

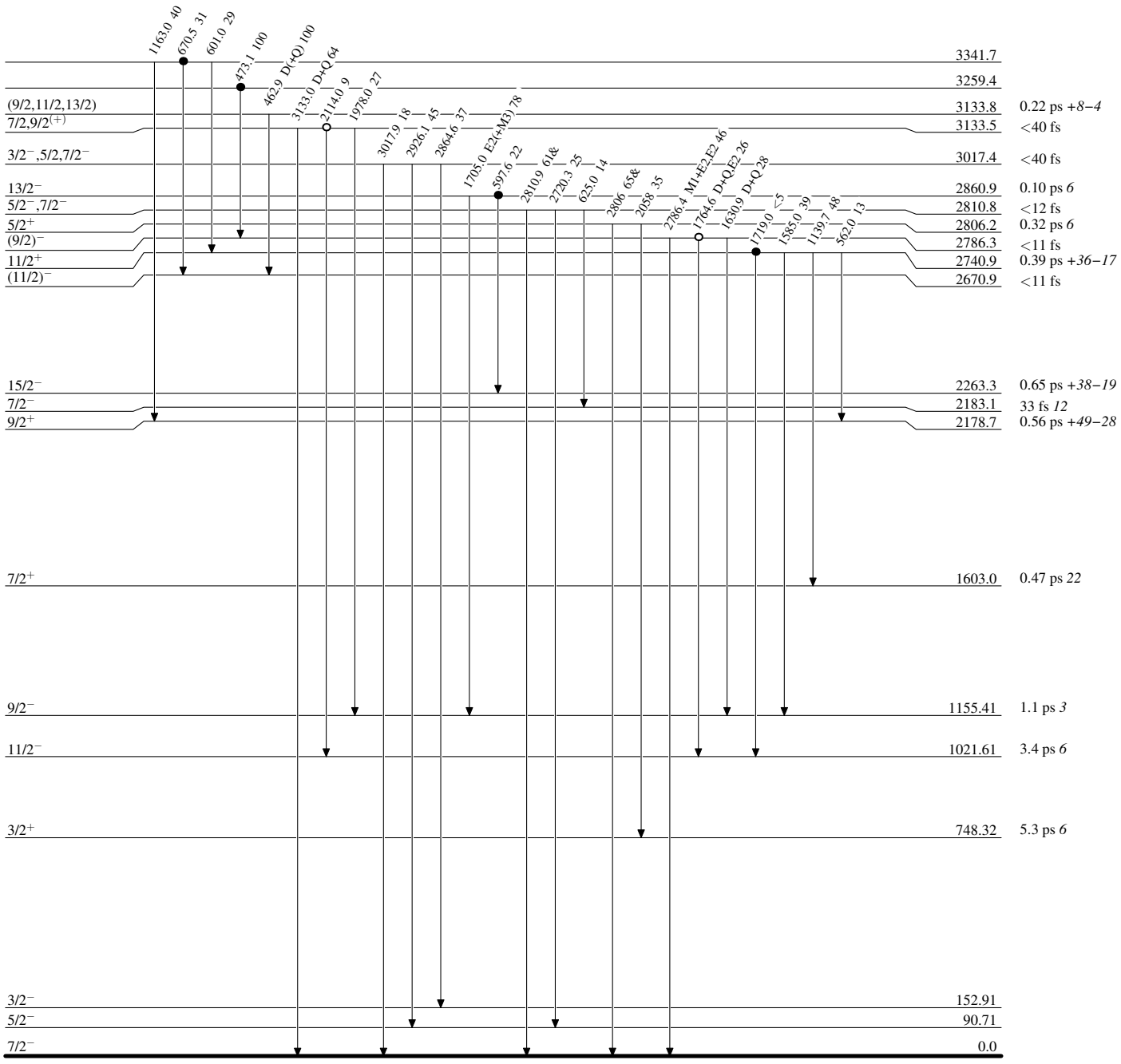
^{46}Ti(α,pγ) 1975Ha12,1974Ta05,1973Sa12

Legend

Level Scheme

Intensities: % photon branching from each level
& Multiply placed: undivided intensity given

● Coincidence
○ Coincidence (Uncertain)



$^{49}_{23}V_{26}$

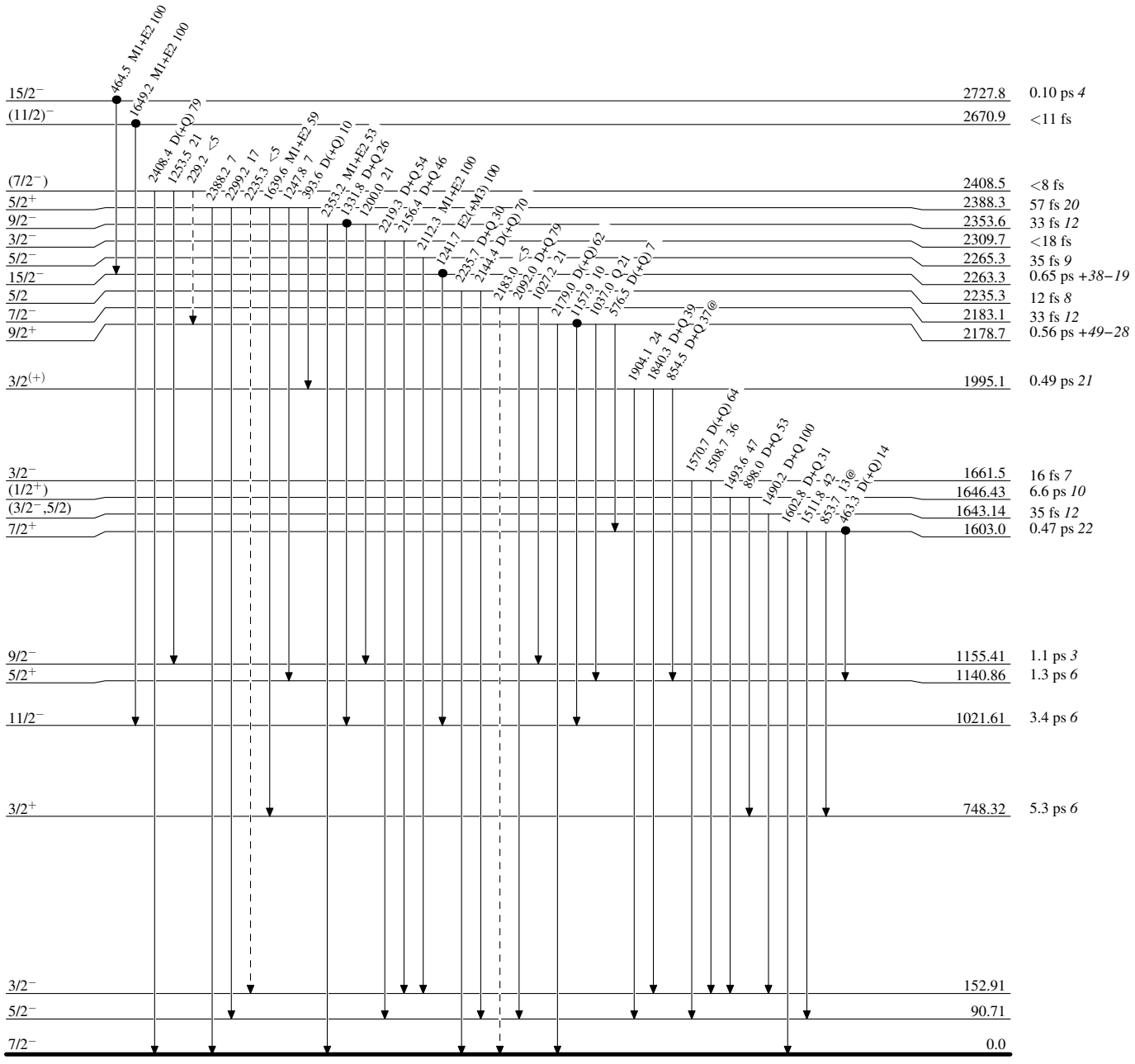
^{46}Ti(α,pγ) 1975Ha12,1974Ta05,1973Sa12

Legend

Level Scheme (continued)

Intensities: % photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

γ Decay (Uncertain)
Coincidence



$^{49}_{23}V_{26}$

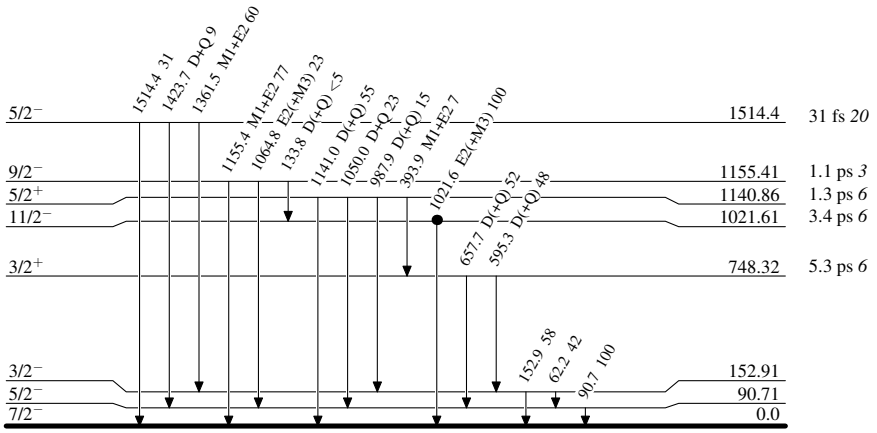
^{46}Ti(α,pγ) 1975Ha12,1974Ta05,1973Sa12

Level Scheme (continued)

Intensities: % photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

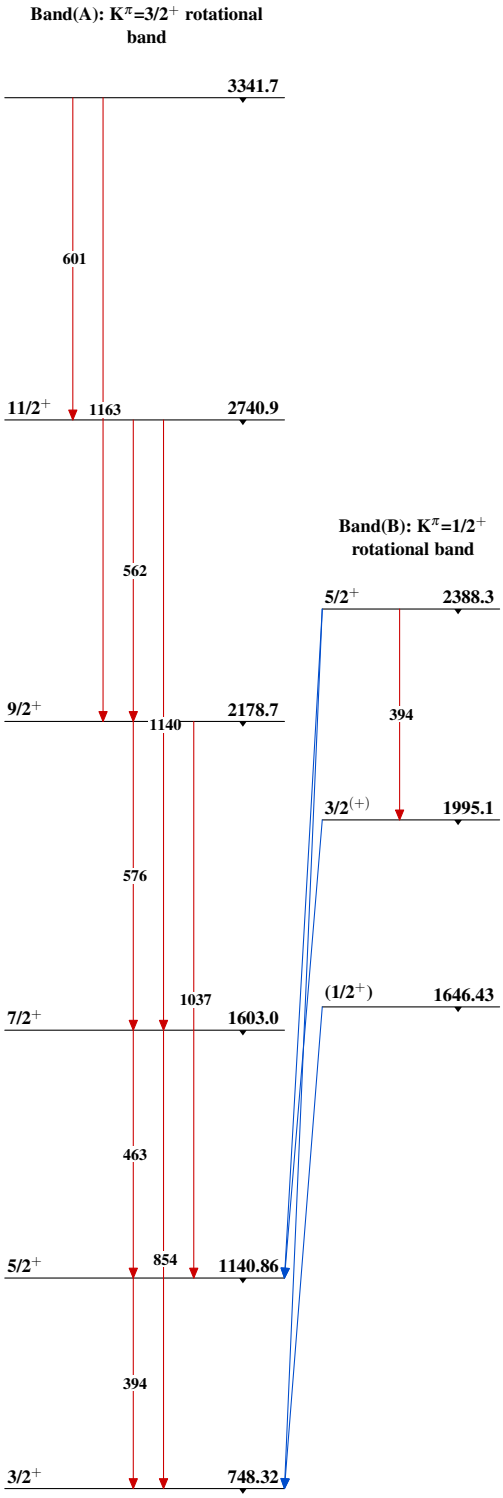
Legend

● Coincidence



$^{49}_{23}V_{26}$

^{46}Ti(α,pγ) 1975Ha12,1974Ta05,1973Sa12



$^{49}_{23}V_{26}$