^{50}Ti(p,n),(p,nγ) 1974Ri13,1974To10,1975Gu22

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 157, 1 (2019)	15-Apr-2019

1974Ri02: E=3.5-5 MeV beam from a 5.5-MeV mode CN Van de Graaff. Measured Eγ, Iγ, γγ-coin, Doppler shift attenuation, with Ge(Li) and NaI detectors. Deduced level, $T_{1/2}$, γ-ray branching ratios. See also 1974Ri13 from the same group.

1974Ri13: E=4.5-4.8 MeV beam from the TUNL FN Van de Graaff. Measured Eγ, Iγ, γγ-coin, nγ-coin, γ(θ), γ(lin pol), Doppler shift attenuation, with Ge(Li) detectors. Deduced level, J, π, $T_{1/2}$, γ-ray branching ratios, mixing ratios, multipolarities.

1974To10: E=3.8-5.4 MeV beam from the JAERI 5.5-MV Van de Graaff. Measured σ(θ) for neutrons with three neutron detectors; Eγ, Iγ, γ(θ) with a Ge(Li) detector. Deduced levels, J, π, γ-ray branching ratios, mixing ratios, multipolarities.

1975Gu22: E=5.024 MeV beam from the 5.5-MeV Van de Graaff at Trombay. Measured Eγ, Iγ, γγ-coin with Ge(Li) detectors. Deduced levels, γ-ray branching ratios.

Others:

1969Bl05: E=3.43, 3.51 MeV from the 5.5-MeV Van de Graaff of the University of Padova. Measured γγ-coincidences with a Ge(Li) detector. Levels reported up to 388 keV with four γ rays up to 226.2 keV.

1976Wh01: E=4-4.4 MeV. Measured γ(t) using Mobley beam pulser.

1986Br03: E=11.5-26 MeV. Measured neutron spectrum.

^{50}V Levels

E(level)[†]	Jπ[#]	$T_{1/2}$[@]	Comments
0.0	6^+		
226.15 *24*	5^+	<11 ps	$T_{1/2}$: from γ(t) (1976Wh01).
320.32 *24*	4^+	<320 ps	$T_{1/2}$: from γ(t) (1976Wh01).
355.8 *4*	3^+	<3 ns	$T_{1/2}$: from pulsed-beam measurement (1969Bl05).
388.8 *4*	2^+		
836.4 *5*	5^+	76 fs *28*	Jπ: 3,5 from γ(θ) in 1974Ri13.
909? *1*	$(7)^+$		
909.9 *4*	4^+	76 fs *9*	Jπ: 4^+ from γ(θ,pol) in 1974Ri13. $T_{1/2}$: other: <70 fs (1974Ri02).
1301.7 *5*	2^+	52 fs *11*	Jπ: 2^+ from γ(θ,pol) in 1974Ri13. $T_{1/2}$: other: <70 fs (1974Ri02).
1332.2 *6*	1^+	17 fs *6*	Jπ: 1^+ from γ(θ,pol) in 1974Ri13. $T_{1/2}$: other: <7 fs (1974Ri02).
1402.0 *4*	3^+		Jπ: 3^+ from γ(θ,pol) in 1974Ri13.
1495.6 *5*	1^+	51 fs *7*	Jπ: 1^+ from γ(θ,pol) in 1974Ri13. $T_{1/2}$: other: <14 fs (1974Ri02).
1518.6 *5*	2^+	202 fs *35*	Jπ: 2^+ from γ(θ,pol) in 1974Ri13. $T_{1/2}$: weighted average of 190 fs *25* from DSA of 1130γ and 239 fs *62* from DSA of 1163γ in 1974Ri13. Other: 58 fs *16* from DSA of 1130γ and 69 fs *14* from DSA of 1163γ in 1974Ri02 are in disagreement.
1562.1 *4*	2^+	>380 fs	Jπ: 2^+ from γ(θ,pol) in 1974Ri13. $T_{1/2}$: other: 3.7 ps *33* from DSA of 1172γ and 0.16 ps *12* from DSA of 1206γ (1974Ri02).
1677.4 *4*	3^+	>340 fs	
1702.9 *21*			
1719.3 *15*			
1725.3 *21*			
1753[‡] *4*	$3^+,4^+,5^+$		
1812.8 *15*	$(2,3)^+$		
1936[‡] *5*	$(0\text{ to }5)^+$		
1953[‡] *5*			
2037[‡] *5*			

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^{50}Ti(p,n),(p,nγ) 1974Ri13,1974To10,1975Gu22 (continued)

^{50}V Levels (continued)

† From least-squares fit to Eγ data, unless otherwise noted.
‡ From neutron spectrum in 1974To10.
# From Adopted Levels. Assignments from γ(θ,pol) data in 1974Ri13 are given under comments where available.
@ From DSAM (1974Ri13), except as noted.

γ(^{50}V)

POL are from 1974Ri13, positive values indicate dominant electric multipole character and negative values dominant magnetic character.
Coincidences shown on drawing are from 1974Ri02.

E_i(level)	J_i^π	E_γ †	I_γ @	E_f	J_f^π	Mult.&	δ&	Comments
226.15	5^+	226.3‡ *3*	100	0.0	6^+			
320.32	4^+	94.3‡ *3*	98.5 *2*	226.15	5^+			
		320.2‡ *3*	1.5 *2*	0.0	6^+			
355.8	3^+	35.5‡ *3*	99.3 *2*	320.32	4^+			
		129‡ *1*	0.7 *2*	226.15	5^+			
388.8	2^+	33.1‡ *3*	100	355.8	3^+			
836.4	5^+	516.1 *4*	37 *15*	320.32	4^+	M1(+E2)	−0.08 *40*	E_γ: weighted average of 516.0 *4* (1974Ri13) and 517 *1* (1975Gu22). I_γ: other: 49 (1974Ri13). δ: δ(3+)=+5.7 excluded by comparison to RUL (1974Ri13). POL=−0.49 *6*.
		836 *1*	63 *15*	0.0	6^+			E_γ: weighted average of 836 *1* (1974Ri13) and 835 *1* (1975Gu22). I_γ: other: 51 (1974Ri13).
909?	$(7)^+$	909#a *1*	100	0.0	6^+			
909.9	4^+	683.8 *3*	100	226.15	5^+	M1(+E2)	−0.01 *9*	E_γ: weighted average of 684.0 *3* (1974Ri13), 684.4 *5* (1974Ri02), 683.4 *3* (1975Gu22). δ: others: −0.44 to +0.17 or −11.2 to −1.7 (1974To10). POL=−0.12 *4*.
1301.7	2^+	912.8 *3*	70 *5*	388.8	2^+	M1+E2	−0.12 *5*	E_γ: weighted average of 912.9 *3* (1974Ri13), 912.7 *5* (1974Ri02), 912 *1* (1975Gu22). I_γ: unweighted average of 72 *6* (1974To10) and 69 *5* (1975Gu22). Other: 61 (1974Ri13). POL=+0.34 *4*.
		945 *2*	30 *4*	355.8	3^+	D(+Q)	+0.09 *9*	E_γ: unweighted average of 946 *1* (1974Ri13) and 943 *1* (1975Gu22). Mult.,δ: from γ(θ) (1974To10). I_γ: unweighted average of 28 *4* (1974To10) and 31 *5* (1975Gu22). Other: 39 (1974Ri13).
1332.2	1^+	943.4 *4*	100	388.8	2^+	M1		E_γ: weighted average of 943.1 *4* (1974Ri13), 943.4 *5* (1974Ri02), and 945 *1* (1975Gu22). POL=−0.02 *3*.
1402.0	3^+	493‡ *1*	12 *4*	909.9	4^+			
		1013.4 *3*	58 *3*	388.8	2^+	M1(+E2)	0.00 *20*	POL=−0.47 *6*. E_γ: weighted average of 1013.5 *3* (1974Ri13), 1013.1 *5* (1974Ri02), and 1013 *2* (1975Gu22). I_γ: 88 *5* in 1974To10 seems too high as compared to 58 in 1975Gu22 and 67 in

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^{50}Ti(p,n),(p,nγ) 1974Ri13,1974To10,1975Gu22 (continued)

γ(^{50}V) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[@]	E_f	J_f^π	Mult.[&]	δ[&]	Comments
								1974Ri02. δ: other: +0.08 *3* (1974To10).
1402.0	3+	1045.5 *5*	16 *7*	355.8	3+			E_γ: weighted average of 1046.3 *5* (1974Ri13), 1044.9 *5* (1974Ri02), and 1045 *1* (1975Gu22). I_γ: other: 23 (1974Ri13, 1974Ri02).
		1081.6 *6*	14 *5*	320.32	4+			E_γ: weighted average of 1082.1 *5* (1974Ri13), 1080 *1* (1974Ri02), and 1081 *1* (1975Gu22). I_γ: others: 10 (1974Ri13, 1974Ri02), 12 *3* (1974To10).
1495.6	1+	1106.7 *3*	88 *5*	388.8	2+	M1+E2	−0.58 *3*	E_γ: weighted average of 1106.9 *3* (1974Ri13), 1106.2 *5* (1974Ri02), and 1106 *1* (1975Gu22). δ: from γ(θ) (1974To10). POL=−0.02 *4*.
		1140[#] *1*	12 *5*	355.8	3+			
1518.6	2+	1129.9 *4*	83 *2*	388.8	2+	M1+E2	−0.06 *1*	POL=+0.36 *9*. E_γ: weighted average of 1130.1 *3* (1974Ri13), 1129.6 *5* (1974Ri02), and 1128 *1* (1975Gu22). I_γ: unweighted average of 82 *2* (1974Ri13), 83 *5* (1974To10), and 85 *5* (1975Gu22). Other: 84 (1974Ri02). δ: other: −0.12 to +0.05 or +1.2 *2* (1974To10).
		1162.6 *4*	17 *3*	355.8	3+	D+Q		E_γ: weighted average of 1162.9 *3* (1974Ri13), 1162.2 *5* (1974Ri02), and 1161 *1* (1975Gu22). I_γ: unweighted average of 18 *3* (1974Ri13), 17 *3* (1974To10), and 14 *5* (1975Gu22). δ: −0.017 to +0.36 or ≤−1.7 (1974To10).
1562.1	2+	1173.2 *3*	49 *4*	388.8	2+	M1(+E2)	0.00 *20*	E_γ: weighted average of 1173.1 *3* (1974Ri13), 1173.6 *5* (1974Ri02), and 1173 *1* (1975Gu22). I_γ: average of 49 *2* (1974Ri13), 55 *3* (1974To10), and 43 *6* (1975Gu22). Other: 50 (1974Ri02). δ: other: −0.36 to +2.2 (1974To10). POL=+0.59 *10*.
		1206.4 *3*	51 *4*	355.8	3+	M1+E2		E_γ: weighted average of 1206.5 *3* (1974Ri13), 1206.6 *5* (1974Ri02), and 1205 *1* (1975Gu22). I_γ: average of 51 *2* (1974Ri13), 45 *3* (1974To10), and 57 *6* (1975Gu22). Other: 50 (1974Ri02). δ: +0.01 *16* or −7.1 *+20−40* (1974Ri13); −1.37 to −0.32 (1974To10). POL=−0.36 *9*.
1677.4	3+	275.3 *5*	18 *5*	1402.0	3+			E_γ: weighted average of 277 *1* (1974Ri13), 275 *1* (1974Ri02), and 275.0 *5* (1975Gu22). I_γ: other: 11 (1974Ri02).
		375.5 *4*	44 *7*	1301.7	2+			E_γ: weighted average of 375.7 *4* (1974Ri13), 375.1 *5* (1974Ri02), and 375.7 *5* (1975Gu22). I_γ: other: 54 (1974Ri13, 1974Ri02).
		1288.6 *5*	20 *7*	388.8	2+			E_γ: weighted average of 1289 *1* (1974Ri13), 1288.7 *5* (1974Ri02), and 1288 *1* (1975Gu22). I_γ: other: 15 (1974Ri13, 1974Ri02).
		1321.7 *3*	18 *7*	355.8	3+			E_γ: weighted average of 1321.7 *3* (1974Ri13), 1322.0 *5* (1974Ri02), and 1320 *1* (1975Gu22). I_γ: other: 20 (1974Ri13, 1974Ri02).
1702.9		793[#] *2*	100	909.9	4+			
1719.3		1331[#] *2*	56 *11*	388.8	2+			
		1363[#] *2*	44 *11*	355.8	3+			
1725.3		1405[#] *2*	9 *5*	320.32	4+			

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^{50}Ti(p,n),(p,nγ) 1974Ri13,1974To10,1975Gu22 (continued)

γ(^{50}V) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [@]	E_f	J_f^π	Comments
1725.3		1499[#a] *2*	91 *5*	226.15	5^+	
1812.8	$(2,3)^+$	1424 *2*	21 *11*	388.8	2^+	E_γ: 1422 (1974To10).
		1457[#] *2*	25 *11*	355.8	3^+	
		1493[#a] *2*	55 *13*	320.32	4^+	

[†] From 1974Ri13, unless otherwise noted.
[‡] From 1975Gu22.
[#] γ reported only in 1975Gu22.
[@] Photon branching from each level. Values are from 1975Gu22, unless otherwise noted.
[&] From γ(θ) and γ linear polarization (1974Ri13), except as noted. Sign of mixing ratio in 1974Ri13 seems to be Litherland-Ferguson, thus reversed here for M1+E2 transitions.
[a] Placement of transition in the level scheme is uncertain.

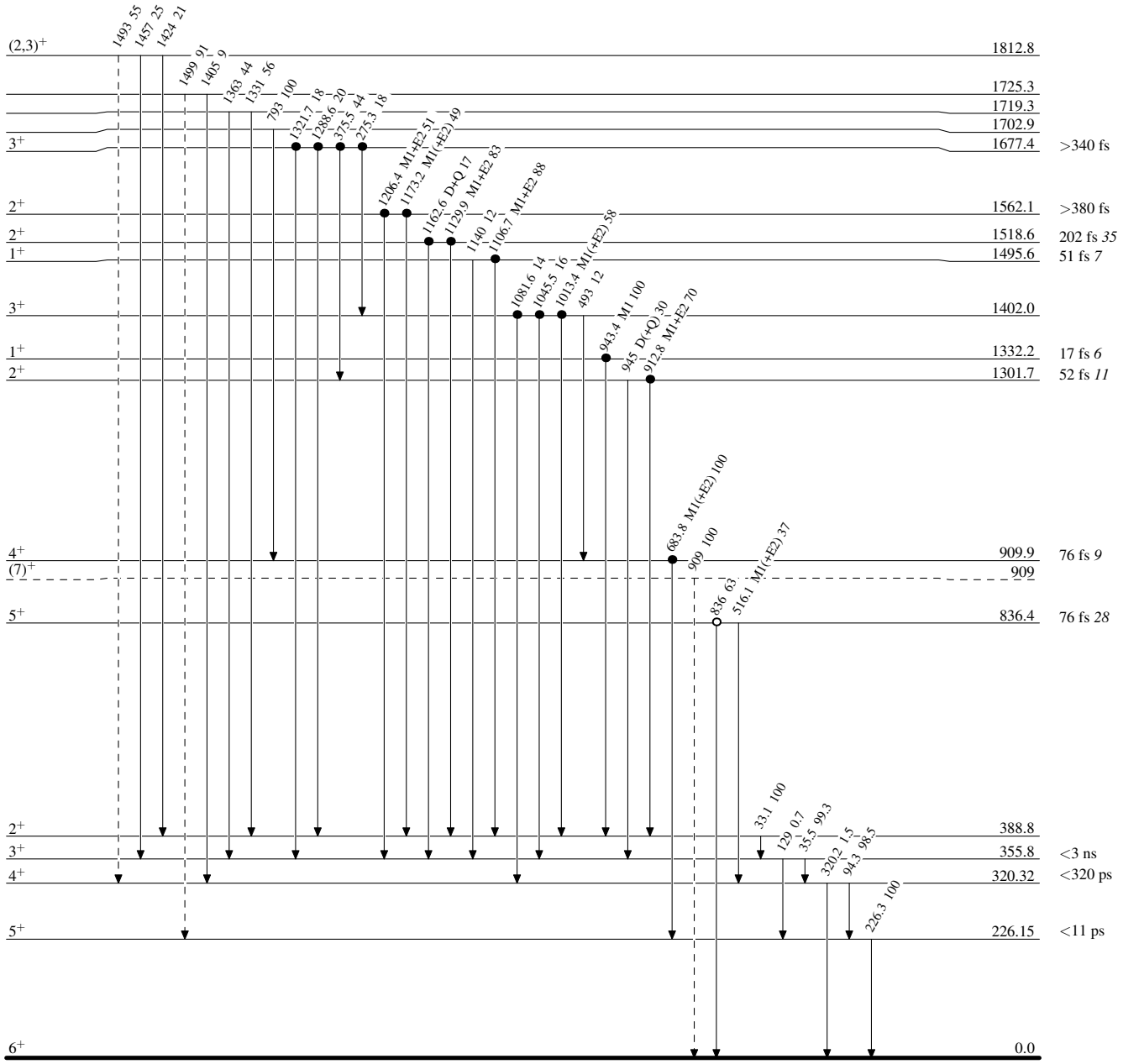
Legend

^{50}Ti(p,n),(p,nγ) 1974Ri13,1974To10,1975Gu22

Level Scheme

Intensities: % photon branching from each level

γ Decay (Uncertain)
Coincidence
Coincidence (Uncertain)



$^{50}_{23}V_{27}$