^{49}Ti(n,γ),(pol n,γ) E=thermal 1984Ru06,1971Te01

History

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

J^π(^{49}Ti g.s.)=7/2$^-$.

1984Ru06: beam from the thermal beam facilities at the HFR in Petten. Measured γ spectra using Ge(Li) detector for 0-2.5 MeV range, and a pair spectrometer with a Ge(Li) and two NaI detectors for 1.8-11 MeV range. Measured nuclear orientation (polarized target (average polarization=0.123 *11*) and n beam; θ=0° and θ=90°). Polarization (polarized neutron beam; two Ge(Li) polarimeters on opposite sides of target).

1971Te01: beam from the Israel Research Reactor-2 (IRR-2). Measured γ spectra, $\gamma\gamma(\theta)$ with NaI.

All data are from 1984Ru06, except as noted. Decay scheme constructed with the aid of the Ritz combination principle. All results from the $\gamma\gamma$-coincidence data of 1971Te01 were accepted. Previously observed levels were accepted if populated or depopulated by at least two transitions with at least one of these not having an alternate placement. New levels were added if they were populated by a primary γ and populated or depopulated by at least two unambiguously placed transitions. χ^2=2.29 for the 88 γ rays placed. Others: 1980Is02 and 1969TrZX.

^{50}Ti Levels

E(level)[†]	J^π	Comments
0.0	0$^+$	
1553.796 *6*	2[@]	
2674.929 *7*	4[@]	
3198.691 *13*		
3862.81 *4*		
4147.208 *10*	4[@]	
4171.979 *16*	3[@]	
4309.86 *11*		
4410.01 *3*	3$^-$	
4486.72 *6*		
4789.96 *6*	(2$^+$)	J^π: 2 to 5 from nuclear orientation and circ. pol.; γ to 0$^+$ g.s. suggests 2$^+$.
4880.692 *11*	5[@]	
5186.083 *15*	(3,4)[@]	
5379.917 *16*	4[@]	
5547.79 *4*		
5694.84 *8*		
5806.52 *16*		
5946.450 *19*	3,4[@]	
6123.13 *4*	(3,4,5)[&]	
6156.46 *22*		
6301.77 *3*	2,3,4$^+$[&]	
6379.83 *14*		
6399.78 *15*		
6521.36 *4*	(3,4)[@]	
6710.542 *22*	4[@]	
6729.82 *6*	(2,3,4,5)[&]	
6837.60 *7*		
6849.00 *8*		
7029.38 *25*		
7078.69 *23*		
7232.17 *23*		
7482.92 *7*		
(10939.19[‡] *4*)	3$^-$,4$^-$[#]	

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^{49}Ti(n,γ),(pol n,γ) E=thermal 1984Ru06,1971Te01 (continued)

^{50}Ti Levels (continued)

† Uncertainties are statistical, with 3.2 ppm systematic uncertainty not included.
‡ From 2017Wa10; held fixed in least-squares adjustment.
# Thermal capture on a 7/2$^-$ target.
@ From analysis of nuclear orientation and circular polarization data with the assumption that the primary γ rays are dipole.
& From nuclear orientation and CP.

γ(^{50}Ti)

Iγ normalization: Δ(γ-normalization)=5% systematic uncertainty in Iγ.
A total of 16.8% *6* of the primary strength was found to be missing, assuming that the total strength to the g.s. is 100%.
Coincidences shown on drawing are from 1971Te01.

E_γ †	I_γ ‡b	E_i(level)	J^π_i	E_f	J^π_f
523.759 *10*	2.17 *3*	3198.691		2674.929	4
733.69 *9*	0.214 *17*	4880.692	5	4147.208	4
760.31 *8*	0.340 *25*	5946.450	3,4	5186.083	(3,4)
1121.130 *6*	59.6 *13*	2674.929	4	1553.796	2
1156.65 *16*	0.200 *24*	5946.450	3,4	4789.96	(2$^+$)
1207.930 *11*	2.40 *6*	5379.917	4	4171.979	3
1242.38 *4*	0.71 *3*	6123.13	(3,4,5)	4880.692	5
x1273.22 *19*	0.24 *3*				
1457.6 *3*	0.122 *23*	6837.60		5379.917	4
1472.255 *6*	11.4 *3*	4147.208	4	2674.929	4
1497.054 *25*	9.6 *3*	4171.979	3	2674.929	4
1524.53 *4*	0.70 *3*	6710.542	4	5186.083	(3,4)
1553.785 *6*	99 *3*	1553.796	2	0.0	0$^+$
1636.45 *5*	0.601 *24*	6123.13	(3,4,5)	4486.72	
x1642.40 *12*	0.186 *16*				
1681.69 *15*	0.84 *23*	4880.692	5	3198.691	
1730.8 *3*	0.24 *6*	6521.36	(3,4)	4789.96	(2$^+$)
1735.00 *5*	0.73 *3*	4410.01	3$^-$	2674.929	4
x1755.8 *3*	0.097 *19*				
x1773.77 *20*	0.139 *18*				
1852.9 *4*	0.55 *17*	7232.17		5379.917	4
x2001.5 *6*	0.30 *12*				
2128.4 *5*	0.31 *10*	6301.77	2,3,4$^+$	4171.979	3
x2201.0 *3*	0.71 *14*				
2205.722 *11*	10.1 *3*	4880.692	5	2674.929	4
x2215.0 *5*	0.43 *13*				
2300.43 *5*	0.68 *3*	6710.542	4	4410.01	3$^-$
x2305.07 *11*	0.287 *20*				
2308.98 *4*	0.86 *4*	3862.81		1553.796	2
2348.3c *3*	0.36 *7*	5547.79		3198.691	
2511.110 *20*	4.26 *16*	5186.083	(3,4)	2674.929	4
2538.37 *10*	1.09 *8*	6710.542	4	4171.979	3
2618.33 *7*	19.9 *7*	4171.979	3	1553.796	2
2658.75 *20*	0.50 *6*	6521.36	(3,4)	3862.81	
2700.6 *6*	0.16 *5*	6849.00		4147.208	4
2704.92 *4*	4.38 *17*	5379.917	4	2674.929	4
x2709.2 *4*	0.25 *5*				
2719.1 *3*	0.37 *5*	7029.38		4309.86	
2755.89 *13*	1.32 *11*	4309.86		1553.796	2
x2765.43# *12*	0.73 *6*				

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^{49}Ti(n,γ),(pol n,γ) E=thermal 1984Ru06,1971Te01 (continued)

γ(^{50}Ti) (continued)

E_γ [†]	I_γ [‡b]	E_i(level)	J^π_i	E_f	J^π_f
[x]2810.5 *5*	0.15 *5*				
[x]2846.5 *4*	0.24 *5*				
2856.13 *4*	2.86 *11*	4410.01	3^-	1553.796	2
2867.39 *21*	0.44 *5*	6729.82	(2,3,4,5)	3862.81	
2872.72 *10*	1.31 *8*	5547.79		2674.929	4
2924.9 *5*	0.22 *5*	6123.13	(3,4,5)	3198.691	
2933.27 *12*	0.66 *5*	4486.72		1553.796	2
3019.86 *11*	0.80 *5*	5694.84		2674.929	4
3131.71 *19*	0.39 *4*	5806.52		2674.929	4
3181.9 *6*	0.13 *4*	6379.83		3198.691	
[x]3186.72 *20*	0.37 *4*				
3236.09 *7*	1.20 *5*	4789.96	(2^+)	1553.796	2
3271.41 *3*	3.81 *10*	5946.450	3,4	2674.929	4
3448.4 *5*	0.14 *3*	6123.13	(3,4,5)	2674.929	4
3456.17 *7*	1.03 *4*	(10939.19)	$3^-,4^-$	7482.92	
[x]3534.5 *5*	0.16 *3*				
[x]3545.5 *6*	0.11 *3*				
[x]3565.0 *5*	0.13 *3*				
3632.10 *5*	1.72 *5*	5186.083	(3,4)	1553.796	2
[x]3636.3 *5*	0.13 *3*				
3649.9 *5*	0.11 *3*	6849.00		3198.691	
[x]3688.5 *7*	0.09 *3*				
3707.4 *6*	0.6 *4*	(10939.19)	$3^-,4^-$	7232.17	
3724.1 *5*	0.13 *3*	6399.78		2674.929	4
3826.08 *11*	0.56 *3*	5379.917	4	1553.796	2
[x]3833.22 *24*	0.23 *3*				
3846.18 *11*	1.07 *7*	6521.36	(3,4)	2674.929	4
3860.1 *3*	0.20 *3*	(10939.19)	$3^-,4^-$	7078.69	
3909.0 *4*	0.140 *24*	(10939.19)	$3^-,4^-$	7029.38	
3993.87 *5*	1.07 *4*	5547.79		1553.796	2
4054.75 *11*	0.52 *3*	6729.82	(2,3,4,5)	2674.929	4
4089.93 *8*	0.79 *3*	(10939.19)	$3^-,4^-$	6849.00	
4101.32 *7*	0.84 *3*	(10939.19)	$3^-,4^-$	6837.60	
[x]4150.8 *6*	0.085 *22*				
4209.17 *6*	1.00 *3*	(10939.19)	$3^-,4^-$	6729.82	(2,3,4,5)
[x]4218.19 *8*	0.75 *3*				
4228.43 *3*	4.01 *7*	(10939.19)	$3^-,4^-$	6710.542	4
4309.74 *20*	0.259 *23*	4309.86		0.0	0^+
4402.1 *5*	0.14 *3*	7078.69		2674.929	4
4417.55 *4*	1.84 *4*	(10939.19)	$3^-,4^-$	6521.36	(3,4)
[x]4457.92 *6*	1.15 *3*				
4486.0 *4*	0.110 *20*	4486.72		0.0	0^+
4539.01 *18*	0.297 *22*	(10939.19)	$3^-,4^-$	6399.78	
4559.13 *14*	0.54 *3*	(10939.19)	$3^-,4^-$	6379.83	
4602.50 *25*	0.200 *21*	6156.46		1553.796	2
4637.13 *4*	1.83 *4*	(10939.19)	$3^-,4^-$	6301.77	$2,3,4^+$
4747.73 *4*	2.03 *4*	6301.77	$2,3,4^+$	1553.796	2
4782.6 *4*	0.140 *21*	(10939.19)	$3^-,4^-$	6156.46	
4789.3 *4*	0.136 *21*	4789.96	(2^+)	0.0	0^+
4815.79 *6*	1.07 *3*	(10939.19)	$3^-,4^-$	6123.13	(3,4,5)
4845.6 *3*	0.201 *21*	6399.78		1553.796	2
[x]4869.5 *6*	0.098 *24*				
[x]4897.81 *23*	0.28 *3*				
4992.420 *25*	4.49 *6*	(10939.19)	$3^-,4^-$	5946.450	3,4
[x]5106.5 *5*	0.094 *18*				
5132.72 *25*	0.201 *19*	(10939.19)	$3^-,4^-$	5806.52	

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^{49}Ti(n,γ),(pol n,γ) E=thermal 1984Ru06,1971Te01 (continued)

γ(^{50}Ti) (continued)

E_γ[†]	I_γ[‡b]	E_i(level)	J^π_i	E_f	J^π_f	Mult.
[x]5148.94 *8*	0.732 *24*					
5156.46 *7*	0.852 *25*	6710.542	4	1553.796	2	
[x]5166.39 *13*	0.393 *21*					
5244.04 *10*	0.547 *22*	(10939.19)	$3^-,4^-$	5694.84		
[x]5255.8 *5*	0.095 *18*					
5283.39 *14*	0.366 *21*	6837.60		1553.796	2	
5391.07 *5*	1.96 *4*	(10939.19)	$3^-,4^-$	5547.79		
[x]5396.0 *4*	0.177 *24*					
[x]5412.5 *3*	0.173 *19*					
[x]5419.89 *17*	0.327 *21*					
[x]5498.20[#] *16*	0.352 *21*					
5525.5 *5*	0.126 *24*	7078.69		1553.796	2	
[x]5534.17 *12*	0.34 *3*					
[x]5546.3 *4*	0.190 *24*					
5558.937 *24*	6.14 *8*	(10939.19)	$3^-,4^-$	5379.917	4	
[x]5605.21 *23*	0.246 *20*					
5677.8 *3*	0.165 *20*	7232.17		1553.796	2	
5752.692 *24*	4.72 *6*	(10939.19)	$3^-,4^-$	5186.083	(3,4)	
[x]5906.5 *8*	0.077 *21*					
5929.14 *15*	0.426 *23*	7482.92		1553.796	2	
6058.105 *20*	10.03 *11*	(10939.19)	$3^-,4^-$	4880.692	5	
6148.85 *14*	0.53 *3*	(10939.19)	$3^-,4^-$	4789.96	(2^+)	
6451.6 *5*	0.25 *4*	(10939.19)	$3^-,4^-$	4486.72		
6528.72 *10*	0.92 *3*	(10939.19)	$3^-,4^-$	4410.01	3^-	
6766.73 *5*	17.8 *3*	(10939.19)	$3^-,4^-$	4171.979	3	
6791.41 *7*	7.58 *20*	(10939.19)	$3^-,4^-$	4147.208	4	
8263.51[@] *3*	8.57 *10*	(10939.19)	$3^-,4^-$	2674.929	4	D[a]
9384.41[&] *6*	5.08 *7*	(10939.19)	$3^-,4^-$	1553.796	2	D[a]

[†] Deduced by 1984Al29 (evaluation) from transition energy listed by 1984Ru06 and recoil correction. Uncertainties are statistical and do not include systematic uncertainty of 2.6 ppm for Eγ<1800 keV (^{198}Au standard; 1978Ke02) and 3.2 ppm for Eγ>1800 keV (^{15}N, S(n); 1982Va13).
[‡] Iγ per 100 n-captures. See 1984Ru06 for branching ratios.
[#] The 2765γ may be the same as the γ depopulating the 5440.7 state in ^{50}Sc β^- decay and the 5498γ may populate this state (evaluators).
[@] From $\gamma\gamma(\theta)$ primarily depopulates 3^- capture state (1971Te01).
[&] From $\gamma\gamma(\theta)$ depopulates 3^- capture state only (1971Te01).
[a] From $\gamma\gamma(\theta)$ (1971Te01).
[b] For intensity per 100 neutron captures, multiply by 1.00 *5*.
[c] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

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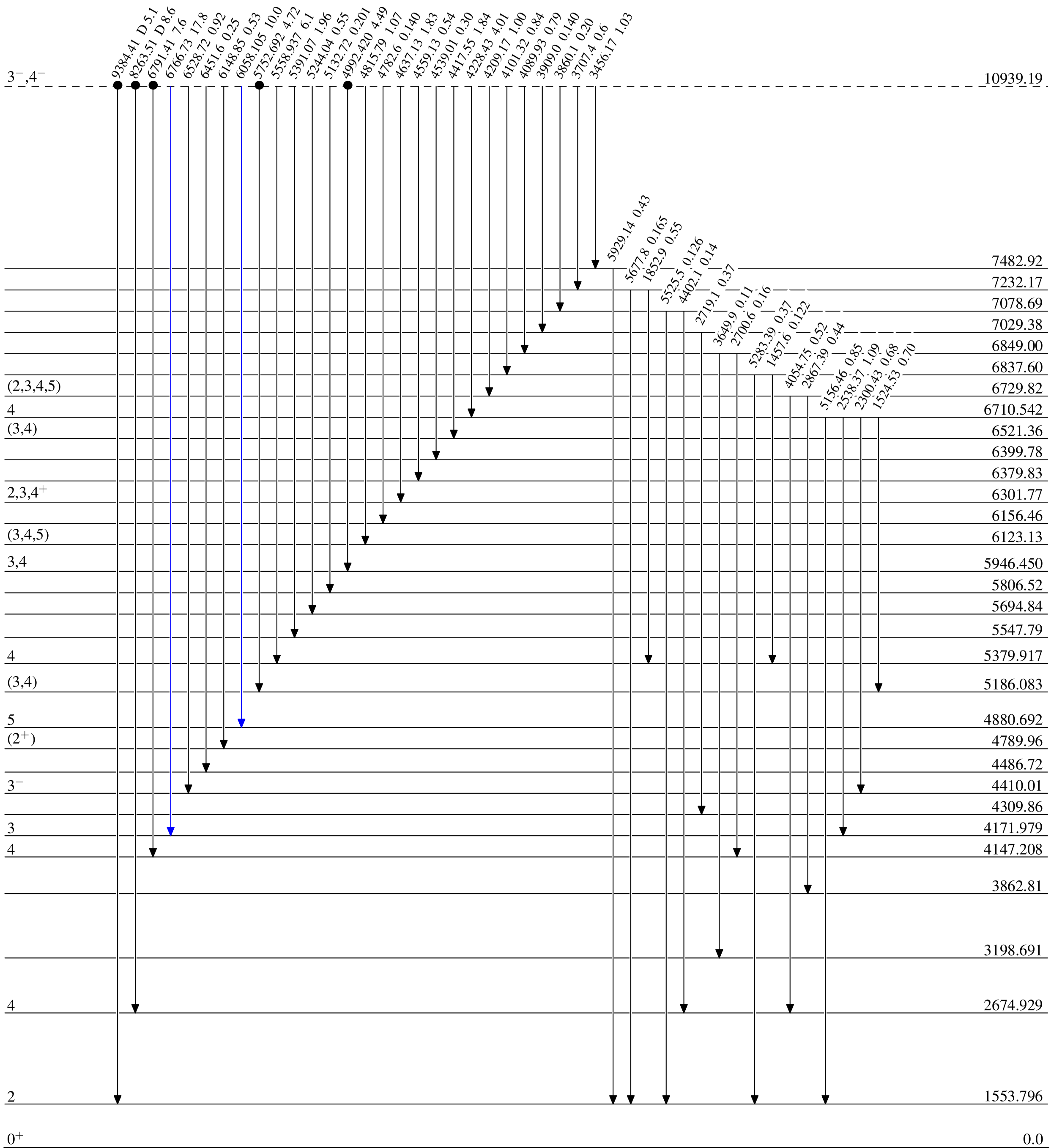
Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- ● Coincidence

Level Scheme

Intensities: Iγ per 100 n-captures

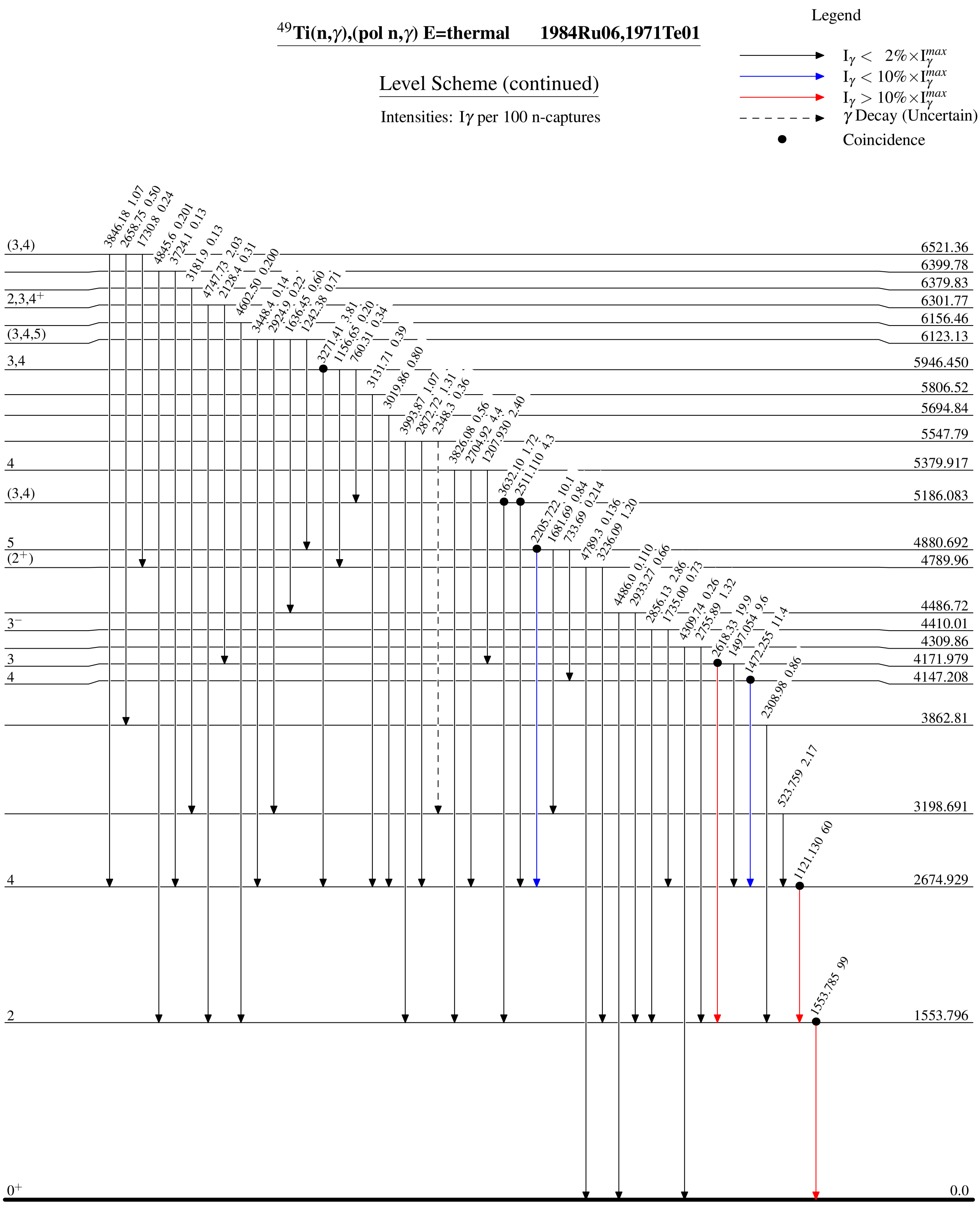


$^{50}_{22}Ti_{28}$

^{49}Ti(n,γ),(pol n,γ) E=thermal 1984Ru06,1971Te01

Level Scheme (continued)

Intensities: Iγ per 100 n-captures



$^{50}_{22}Ti_{28}$