^{165}Ho(^{3}He,5nγ),(α,6nγ) 1977Fo08

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	C. W. Reich, Balraj Singh	NDS 111, 1211 (2010)	12-Apr-2010

Additional information 1.

1977Fo08: ^{165}Ho(^{3}He,5nγ) E=40-57 MeV. Measured Eγ,Iγ, excitation functions for isotopic assignments. ^{165}Ho(α,6nγ) E=73 MeV. Measured Eγ, Iγ, $\gamma(\theta)$, $\gamma\gamma$-coin.

1977RoYU: ^{165}Ho(α,6nγ) E=64-79 MeV. Measured Eγ, Iγ, $\gamma\gamma$, γ(t), $\gamma(\theta)$.

Although there is general agreement between the data and conclusions of 1977Fo08 and 1977RoYU, there are differences both in Eγ (values in 1977RoYU are generally ≈0.5 keV smaller) and in the placement of the transitions, particularly for the high-spin states, the J+1/2=even members of the 1/2[541] band, and the 7/2[404] and 7/2[523] bands, where 1977RoYU were unable to observe the low-energy interband connecting transitions. The work of 1977Fo08 seems more complete since many levels (below 3200) and transitions are in agreement with a more recent (^{19}F,4nγ) work (1991Je04,1992JeZW). So the data given here are adopted from 1977Fo08.

^{163}Tm Levels

Bands: see Adopted Levels for parameter values.

E(level)	J$^\pi$†	T$_{1/2}$‡	Comments
0.0@	1/2$^+$		
13.514@ 23	3/2$^+$		
23.25& 6	(7/2)$^+$		
86.85a 12	(7/2)$^-$		
136.716 23	5/2$^+$		E(level): from Adopted Levels.
144.40@ 4	(5/2)$^+$		
164.65& 11	(9/2$^+$)	≈43 ns	
174.47a 15	(9/2)$^-$		
175.11@ 11	(7/2)$^+$	#	
217.40b 10	(1/2)$^-$	#	
248.2? 5	(5/2$^-$)		Level added (evaluators) based on (^{19}F,4nγ).
253.5?b 10	(≤7/2)		248 level proposed in (^{19}F,4nγ) replaces this band member. No 253 level reported in (^{19}F,4nγ) or ε decay.
289.96a 18	(11/2$^-$)	≈43 ns	
331.05& 14	(11/2$^+$)		T$_{1/2}$: ≈8.5 ns from γ(t) (1977RoYU) assuming 165.5γ or 166.2γ of 1977RoYU corresponds to 166.4γ of 1977Fo08.
369.22b 14	(9/2$^-$)		Additional information 2.
436.89a 19	(13/2$^-$)	≈8.5 ns	
451.31@ 14	(11/2$^+$)	#	
521.06& 15	(13/2$^+$)		
586.62b 17	(13/2$^-$)	#	
603.23a 19	(15/2$^-$)		T$_{1/2}$: ≈8.5 ns from γ(t) (1977RoYU) assuming 165.5γ or 166.2γ of 1977RoYU corresponds to 166.4γ of 1977Fo08.
732.56& 22	(15/2$^+$)		
804.89a 20	(17/2$^-$)	≈8.5 ns	
829.7@ 3	(15/2$^+$)	#	
900.63b 19	(17/2$^-$)		
962.82& 23	(17/2$^+$)		
1011.16a 21	(19/2$^-$)		
1121.1?b 6	(15/2$^-$)	#	J$^\pi$: 1977Fo08 propose this as the 15/2$^-$ member of the π1/2[541] band.

Continued on next page (footnotes at end of table)

^{165}Ho(^{3}He,5nγ),(α,6nγ) 1977Fo08 (continued)

^{163}Tm Levels (continued)

E(level)	J$^{\pi}$ [†]	Comments
1211.1[&] 4	(19/2^{+})	
1261.16[a] 22	(21/2^{-})	
1294.4[@] 4	(19/2^{+})	
1308.52[b] 22	(21/2^{-})	
1473.6[&] 4	(21/2^{+})	
1498.1[a] 3	(23/2^{-})	
1552.3?[b] 6	(19/2^{-})	J$^{\pi}$: 1977Fo08 propose this as the 19/2^{-} member of the π1/2[541] band.
1749.8[&] 4	(23/2^{+})	
1785.8[a] 4	(25/2^{-})	
1804.0[b] 4	(25/2^{-})	
1826.6[@] 6	(23/2^{+})	
2034.2[&] 6	(25/2^{+})	
2046.2[a] 4	(27/2^{-})	
2323.0[&] 6	(27/2^{+})	
2356.3[a] 5	(29/2^{-})	
2377.3[b] 7	(29/2^{-})	
2397.5[@] 7	(27/2^{+})	
2607.7[&] 7	(29/2^{+})	
2626.2[a] 5	(31/2^{-})	
2878.5[&] 7	(31/2^{+})	
2921.0[a] 5	(33/2^{-})	
3015.0[b] 8	(33/2^{-})	
3171.0[a] 5	(35/2^{-})	

† From Adopted Levels.

‡ From γ(t) (1977RoYU). 1977Fo08 note that, in their delayed $\gamma\gamma$-coin spectra, all γ's above 100 keV had lifetimes less than the natural beam burst cycle time of the cyclotron.

<14 ns from the resolving time of $\gamma\gamma$ coin system (1977RoYU).

@ Band(A): π1/2[411] band. 1977Fo08 note that, in contrast to other odd-A Tm nuclides, the α=−1/2 members are poorly fed while the α=+1/2 members were not observed.

& Band(B): π7/2[404] band. Identification based on strong cross-over transitions.

a Band(C): π7/2[523] band. Shows strong variations in the inertial parameter due to strong Coriolis mixing in the $h_{11/2}$ subshell, similar to ^{165}Tm.

b Band(D): π1/2[541] band (?). Due to lack of conclusive data on multipolarities of transitions the identification of this band is considered as tentative.

γ(^{163}Tm)

Eγ[†]	Iγ[†]	Ei(level)	J^π_i	Ef	J^π_f	Mult.[‡]	δ[‡]	α[#]	Comments
7.68[@] *3*	0.17 *11*	144.40	(5/2)$^+$	136.716	5/2$^+$	[M1]		219 *4*	α(M)=173 *4*; α(N+..)=46.5 *9* α(N)=40.4 *8*; α(O)=5.78 *11*; α(P)=0.311 *6* Iγ: from branching ratio in adopted gammas and Iγ(144γ).
9.74[@] *5*		23.25	(7/2)$^+$	13.514	3/2$^+$	E2		1.32×10^5	$I_{(\gamma+ce)}$: ≥720 from total intensity feeding 23.2 level.
13.53[@] *3*	≥3.5[&]	13.514	3/2$^+$	0.0	1/2$^+$	M1+E2	≈0.04	≈240	α(L)≈186; α(M)≈42.5; α(N+..)≈11.24 α(N)≈9.84; α(O)≈1.337; α(P)≈0.0575
^{x}62.7[a] *5*	37 *19*								
63.6 *1*	165 *17*	86.85	(7/2)$^-$	23.25	(7/2)$^+$	E1(+M2)	<0.028	1.14 *7*	α(K)=0.92 *5*; α(L)=0.174 *17*; α(M)=0.039 *4*; α(N+..)=0.0102 *11* α(N)=0.0090 *10*; α(O)=0.00115 *13*; α(P)=4.3×10^{-5} *6* A_2=+0.02 *8*. $I_{(\gamma+ce)}$: Iγ(1+α)=380 *40* not consistent with I(γ+ce)≥630 *70* from ΣIγ(1+α) feeding state.
^{x}72.7[a] *5*	3 *2*								
87.6 *1*	105 *11*	174.47	(9/2)$^-$	86.85	(7/2)$^-$	M1(+E2)	0.4 *+5−4*	4.62 *20*	α(K)=3.5 *8*; α(L)=0.9 *7*; α(M)=0.21 *18*; α(N+..)=0.05 *5* α(N)=0.05 *4*; α(O)=0.006 *5*; α(P)=0.00021 *6* Mult.,δ: from 'Adopted Gammas'. A_2=+0.05 *2*, A_4=+0.13 *4*.
^{x}90.1[a] *5*	7 *4*								
^{x}93.3 *5*	32 *16*								
^{x}94.6 *5*	71 *32*								
^{x}98.6[a] *5*	3 *2*								
^{x}100.0[a] *5*	16 *8*								A_2=+0.02 *8*.
^{x}102.2[a] *5*									Iγ(α,6nγ)=39 *20*. A_2=−0.02 *8*.
108.9[a,j] *5*	2 *1*	253.5?	(≤7/2)	144.40	(5/2)$^+$				
^{x}113.7[a] *5*	22 *11*								
115.5 *1*	157 *16*	289.96	(11/2$^-$)	174.47	(9/2)$^-$	[e]			A_2=+0.05 *1*, A_4=+0.05 *1*.
121.7[a,j] *5*	13 *7*	369.22	(9/2$^-$)	248.2?	(5/2$^-$)				Placement (by evaluators) based on (^{19}F,4nγ).
^{x}123.1[a] *5*	34 *17*								
123.21[@] *2*	≥4.87[&]	136.716	5/2$^+$	13.514	3/2$^+$	M1+E2	0.28 *4*	1.686 *25*	α(K)=1.37 *3*; α(L)=0.244 *9*; α(M)=0.0552 *22*; α(N+..)=0.0147 *6* α(N)=0.0129 *5*; α(O)=0.00178 *6*; α(P)=8.33×10^{-5} *17*
130.8 *3*	35[b] *19*	144.40	(5/2)$^+$	13.514	3/2$^+$	M1(+E2)	0.5 *5*	1.38 *10*	α(K)=1.07 *21*; α(L)=0.24 *9*; α(M)=0.055 *22*; α(N+..)=0.014 *6* α(N)=0.013 *5*; α(O)=0.0017 *5*; α(P)=6.4×10^{-5} *16*

γ(^{163}Tm) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α[#]	Comments
								I_γ: from branching ratios in adopted gammas and Iγ(144γ). Iγ<42 for a composite line in (^{3}He,5nγ). A_2=−0.05 *3*.
135.2 *3*	44 *14*	586.62	(13/2$^-$)	451.31	(11/2$^+$)	D+Q[e]		A_2=−0.31 *5*, A_4=+0.07 *4*.
136.70[@] *3*	≥0.6[&]	136.716	5/2$^+$	0.0	1/2$^+$	E2	0.968	α(K)=0.478 *7*; α(L)=0.376 *6*; α(M)=0.0914 *13*; α(N+..)=0.0233 *4* α(N)=0.0208 *3*; α(O)=0.00246 *4*; α(P)=2.06×10^{-5} *3*
[x]140.1[a] *5*	20 *10*							
141.4 *1*	<190[b]	164.65	(9/2$^+$)	23.25	(7/2)$^+$	(M1,E2)	1.01 *15*	α(K)=0.7 *3*; α(L)=0.23 *9*; α(M)=0.056 *23*; α(N+..)=0.014 *6* α(N)=0.013 *6*; α(O)=0.0016 *6*; α(P)=3.9×10^{-5} *21* $I_{(\gamma+ce)}$: ≥285 from total intensity feeding 23.2 level. Mult.: not E1 from α(exp) deduced from I(γ+ce) and Iγ.
[x]142.5[a] *5*	8 *4*							
144.4 *5*	13 *7*	144.40	(5/2)$^+$	0.0	1/2$^+$	E2	0.797 *15*	α(K)=0.411 *7*; α(L)=0.295 *7*; α(M)=0.0717 *15*; α(N+..)=0.0183 *4* α(N)=0.0163 *4*; α(O)=0.00194 *4*; α(P)=1.79×10^{-5} *3*
146.9 *1*	180 *18*	436.89	(13/2$^-$)	289.96	(11/2$^-$)	[e]		A_2=+0.09 *1*, A_4=+0.05 *1*.
[x]152.5 *5*	30 *15*					[e]		A_2=−0.12 *3*.
[x]154.4[a] *5*	8 *4*							
[x]155.7[a] *5*	11 *6*							
[x]156.9[a] *5*								Iγ(α,6nγ)=35 *18*.
161.6 *1*	176 *18*	175.11	(7/2)$^+$	13.514	3/2$^+$	(E2)[d]	0.537	α(K)=0.301 *5*; α(L)=0.181 *3*; α(M)=0.0439 *7*; α(N+..)=0.01122 *16* α(N)=0.01001 *15*; α(O)=0.001198 *17*; α(P)=1.340×10^{-5} *19* A_2=+0.19 *4*, A_4=−0.05 *5*.
[x]164.2[a] *5*	22 *11*							A_2=−0.11 *10*.
166.4[h] *1*	207[h] *21*	331.05	(11/2$^+$)	164.65	(9/2$^+$)			A_2=+0.04 *2*.
166.4[h] *1*	207[h] *21*	603.23	(15/2$^-$)	436.89	(13/2$^-$)			
[x]171.2[a] *5*	14 *7*							
[x]178.5[a] *5*	9 *5*							
190.1 *3*	<52[b]	521.06	(13/2$^+$)	331.05	(11/2$^+$)			A_2=+0.23 *11*.
194.1 *1*	112 *11*	369.22	(9/2$^-$)	175.11	(7/2)$^+$	D[e]		A_2=−0.09 *7*, A_4=−0.06 *10*.
[x]197.3[a] *5*	26 *13*							
201.8 *1*	105 *11*	804.89	(17/2$^-$)	603.23	(15/2$^-$)			A_2=+0.21 *7*; A_4=−0.07 *12*.
203.4 *5*	32 *16*	289.96	(11/2$^-$)	86.85	(7/2)$^-$			
205.0[j] *5*	40 *20*	217.40	(1/2)$^-$	13.514	3/2$^+$			
206.5 *5*	96 *49*	1011.16	(19/2$^-$)	804.89	(17/2$^-$)			A_2=+0.13 *5*, A_4=+0.02 *8*.
211.3 *5*	18 *9*	732.56	(15/2$^+$)	521.06	(13/2$^+$)			
[x]212.9 *5*	<21[b]							A_2=+0.65 *5*; A_4=+0.37 *6*.
217.4[i] *1*	32[i] *16*	217.40	(1/2)$^-$	0.0	1/2$^+$			
217.4[i] *1*	104[i] *22*	586.62	(13/2$^-$)	369.22	(9/2$^-$)	[d]		I_γ: total Iγ=136 *14* divided, based on branching in adopted gammas. A_2=+0.29 *4*, A_4=−0.03 *8*.
[x]227.8[a] *5*	24 *12*							Iγ(α,6nγ)=24 *12*.

$^{163}_{69}$Tm$_{94}$-4

γ(^{163}Tm) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	Comments
230.2 *5*	11 *6*	962.82	(17/2+)	732.56	(15/2+)		
234.7[j] *5*	25 *12*	248.2?	(5/2−)	13.514	3/2+		Placement (by evaluators) based on (^{19}F,4nγ).
237.1 *3*	33 *10*	1498.1	(23/2−)	1261.16	(21/2−)	[e]	A_2=−0.09 *5*, A_4=−0.09 *8*.
240.0[aj] *3*	31 *10*	253.5?	(≤7/2)	13.514	3/2+		
[x]241.3 *5*	<54[b]						A_2=−0.22 *16*.
242.9 *5*	18 *9*	829.7	(15/2+)	586.62	(13/2−)		
248[c]		1211.1	(19/2+)	962.82	(17/2+)		
249.9[h] *3*	71[h] *22*	1261.16	(21/2−)	1011.16	(19/2−)		A_2=+0.10 *2*, A_4=+0.03 *2*.
249.9[h] *3*	71[h] *22*	3171.0	(35/2−)	2921.0	(33/2−)		
260.8 *5*		2046.2	(27/2−)	1785.8	(25/2−)		Iγ(α,6nγ)=45 *23*. Weak in (^{3}He,5nγ). A_2=−0.06 *4*.
262.3[h] *3*	56[h] *17*	436.89	(13/2−)	174.47	(9/2)−		A_2=+0.14 *2*.
262.3[h] *3*	56[h] *17*	1473.6	(21/2+)	1211.1	(19/2+)		
[x]267.8[a] *5*	13 *7*						A_2=−0.27 *58*.
270.7[g] *5*		2626.2	(31/2−)	2356.3	(29/2−)		Iγ(α,6nγ)=24 *12*. A_2=−0.05 *30*.
270.7[ga] *5*		2878.5	(31/2+)	2607.7	(29/2+)		Iγ(α,6nγ)=24 *12*. A_2=−0.05 *30*.
[x]275.2 *5*	11 *6*						
276.2[h] *1*	200[h] *10*	451.31	(11/2+)	175.11	(7/2)+	[d]	A_2=+0.15 *3*, A_4=−0.04 *5*.
276.2[h] *1*	200[h] *10*	1749.8	(23/2+)	1473.6	(21/2+)		
284[c]		2034.2	(25/2+)	1749.8	(23/2+)		
287.9 *3*	25 *8*	1785.8	(25/2−)	1498.1	(23/2−)		A_2=+0.01 *7*.
295.1 *5*		2921.0	(33/2−)	2626.2	(31/2−)		Iγ(α,6nγ)=44 *22*. A_2=+0.03 *3*.
[x]296.5 *5*	29 *15*						
[x]298.0[a] *5*							Iγ(α,6nγ)=61 *31*.
[x]298.9 *5*	28 *14*						
[x]306.3 *5*	45 *23*					[d]	A_2=+0.36 *5*.
307.8 *3*	81 *25*	331.05	(11/2+)	23.25	(7/2)+	[d]	A_2=+0.35 *9*.
310.2 *5*		2356.3	(29/2−)	2046.2	(27/2−)		$I_{(\gamma+ce)}$: ≥14 from total intensity feeding 23.2 level. Iγ(α,6nγ)=62 *31*.
313.3 *1*	<115[b]	603.23	(15/2−)	289.96	(11/2−)		A_2=+0.36 *4*, A_4=−0.07 *4*.
314.0 *1*	<584[b]	900.63	(17/2−)	586.62	(13/2−)		
[x]316.5[a] *5*	17 *9*						
[x]320.1[a] *5*							Iγ(α,6nγ)=13 *7*, weak in (^{3}He,5nγ). A_2=−0.10 *34*.
[x]334.6[a] *5*	14 *7*						A_2=+0.18 *28*.
[x]346.5[a] *5*	18 *9*						

$^{163}_{69}$Tm$_{94}$-5

γ(^{163}Tm) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	Comments
[x]350.7[a] 5							Iγ(α,6nγ)=13 7. A_2=−0.5 5.
356.4 1	109 11	521.06	(13/2$^+$)	164.65	(9/2$^+$)		A_2=+0.15 17; A_4=+0.29 26.
[x]358.7[a] 5	25 13						A_2=−0.5 3.
[x]361.5[a] 5	32 16						
367.9 1	116 12	804.89	(17/2$^-$)	436.89	(13/2$^-$)	Q[f]	A_2=+0.28 2, A_4=−0.03 1.
[x]370.2[a] 5	9 5						
[x]375.1[a] 5	12 6						
378.5 3	84 25	829.7	(15/2$^+$)	451.31	(11/2$^+$)	Q[f]	A_2=+0.31 3, A_4=−0.10 4.
[x]383.9[a] 5	36 18						A_2=+0.45 8.
[x]386.3[a] 5	17 9						
393.4 5	29 15	1294.4	(19/2$^+$)	900.63	(17/2$^-$)		A_2=−0.06 11.
401.5 2	106 21	732.56	(15/2$^+$)	331.05	(11/2$^+$)	d	A_2=+0.31 4, A_4=−0.03 6.
407.9[h] 1	231[h] 23	1011.16	(19/2$^-$)	603.23	(15/2$^-$)		E_γ: γ(t) (1977RoYU) indicate a doublet consisting of a prompt component and an ≈8.5 ns component. A_2=+0.31 3.
407.9[h] 1	231[h] 23	1308.52	(21/2$^-$)	900.63	(17/2$^-$)		γ(t) (1977RoYU) indicate a doublet consisting of a prompt component and an ≈8.5−ns component.
[x]412.7[a] 5	25 13						
[x]416.6[a] 5							Iγ(α,6nγ)=14 7. A_2=−0.34 29. Additional information 3.
[x]422.4[a] 5	17 9						A_2=+0.03 27.
[x]431.0 5	<52[b]						A_2=+0.07 21.
[x]435.7[a] 5	20 10						
[x]438.5[a] 5							Iγ(α,6nγ)=96 49.
441.8 2	50 10	962.82	(17/2$^+$)	521.06	(13/2$^+$)	Q[f]	A_2=+0.21 3, A_4=−0.12 4.
[x]454.8[a] 5	24 12						
456.3 1	95 10	1261.16	(21/2$^-$)	804.89	(17/2$^-$)	Q[f]	A_2=+0.30 2, A_4=−0.06 2.
464.8 3	52 16	1294.4	(19/2$^+$)	829.7	(15/2$^+$)	d	A_2=+0.33 3.
[x]471.4[a] 5							Iγ(α,6nγ)=54 27. A_2=−0.40 21.
478.5 3	62 19	1211.1	(19/2$^+$)	732.56	(15/2$^+$)	d	A_2=+0.18 5, A_4=−0.01 7.
[x]483.6 5	17 9						A_2=+1.05 10.
486.9 2	56 12	1498.1	(23/2$^-$)	1011.16	(19/2$^-$)		
495.5 3	43 14	1804.0	(25/2$^-$)	1308.52	(21/2$^-$)	Q[f]	A_2=+0.31 3, A_4=−0.06 3.
[x]501.8[a] 5	19 10						A_2=+0.19 5.
[x]506.3[a] 5							Iγ(α,6nγ)=61 31. A_2=+0.14 21.

γ(^{163}Tm) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	Comments
511.1 *5*		1473.6	(21/2$^+$)	962.82	(17/2$^+$)		E_γ: from fig. 3 of 1977Fo08. Table 1 gives 511.0. γ obscured by $\gamma^\pm$.
^{x}513.7 *5*	78 *39*						
^{x}514.7[a] *5*							Iγ(α,6nγ)=58 *29*. A_2=+0.55 *11*.
518.5[aj] *5*		1826.6	(23/2$^+$)	1308.52	(21/2$^-$)		Iγ(α,6nγ)=59 *30*. A_2=+0.41 *5*.
524.6 *5*	46 *23*	1785.8	(25/2$^-$)	1261.16	(21/2$^-$)	Q[f]	A_2=+0.32 *5*, A_4=−0.12 *9*.
^{x}529.5[a] *5*	8 *4*						A_2=+0.51 *16*.
532.1 *5*	26 *13*	1826.6	(23/2$^+$)	1294.4	(19/2$^+$)	[d]	Additional information 4. A_2=+0.57 *11*.
534.5[aj] *5*		1121.1?	(15/2$^-$)	586.62	(13/2$^-$)		Iγ(α,6nγ)=43 *22*. A_2=+0.76 *10*.
538.8 *5*	27 *14*	1749.8	(23/2$^+$)	1211.1	(19/2$^+$)	[d]	A_2=+0.34 *7*.
545.1 *5*	15 *8*	3171.0	(35/2$^-$)	2626.2	(31/2$^-$)	[d]	A_2=+0.34 *6*.
547.9 *3*	58 *18*	2046.2	(27/2$^-$)	1498.1	(23/2$^-$)	[d]	Additional information 5. A_2=+0.22 *4*, A_4=+0.08 *7*.
^{x}550.0[a] *5*	15 *8*						
555.7 *5*		2878.5	(31/2$^+$)	2323.0	(27/2$^+$)	[d]	Iγ(α,6nγ)=25 *13*. A_2=+0.24 *5*.
560.6 *5*	17 *9*	2034.2	(25/2$^+$)	1473.6	(21/2$^+$)	[d]	A_2=+0.28 *7*.
564.5 *3*	$<$56[b]	2921.0	(33/2$^-$)	2356.3	(29/2$^-$)		
570.7[h] *5*	28[h] *14*	2356.3	(29/2$^-$)	1785.8	(25/2$^-$)		Iγ(α,6nγ)=138 *41*. A_2=+0.32 *6*, A_4=−0.07 *11*.
570.7[h] *5*	28[h] *14*	2397.5	(27/2$^+$)	1826.6	(23/2$^+$)		
573.3[h] *5*	30[h] *15*	2323.0	(27/2$^+$)	1749.8	(23/2$^+$)		A_2=+0.32 *8*, A_4=+0.02 *15*.
573.3[h] *5*	30[h] *15*	2377.3	(29/2$^-$)	1804.0	(25/2$^-$)		
573.3[h] *5*	30[h] *15*	2607.7	(29/2$^+$)	2034.2	(25/2$^+$)		
579.9 *3*	26 *9*	2626.2	(31/2$^-$)	2046.2	(27/2$^-$)	[d]	Iγ(α,6nγ)=79 *24*. A_2=+0.35 *3*.
^{x}583.7[a] *5*	27 *14*						
594[c]		2397.5	(27/2$^+$)	1804.0	(25/2$^-$)		
^{x}603.6[a] *5*							Iγ(α,6nγ)=58 *29*.
^{x}606.7[a] *5*							Iγ(α,6nγ)=47 *24*.
^{x}630.6[a] *5*							Iγ(α,6nγ)=15 *8*.
637.7 *5*		3015.0	(33/2$^-$)	2377.3	(29/2$^-$)		Iγ(α,6nγ)=28 *14*.
651.7[aj] *5*		1552.3?	(19/2$^-$)	900.63	(17/2$^-$)		Iγ(α,6nγ)=31 *16*.

γ(^{163}Tm) (continued)

† E(^{3}He)=44 MeV, θ=125°, except as noted. Uncertainties estimated by the evaluators based on authors′ general statement that ΔE(γ)=0.1, ΔIγ=10% for strong and well-resolved peaks ranging up to ΔE(γ)=0.5, ΔIγ=50% for weak and poorly resolved peaks. Intensities are also available from 1977Fo08 for (α,6nγ) at E=73 MeV, θ=125°.

‡ From adopted gammas, unless otherwise stated.

From adopted gammas, except as noted.

@ From adopted gammas.

& Lower limit from branching ratios in ε decay, and total transition intensity of transitions feeding the state.

[a] Isotopic assignment is uncertain.

[b] Contaminated by lines from other reaction products.

[c] From $\gamma\gamma$ coin.

[d] Positive A_2 in $\gamma(\theta)$ is consistent with ΔJ=2, quadrupole.

[e] Negative A_2 in $\gamma(\theta)$ is consistent with ΔJ=1, dipole or D+Q.

[f] Positive A_2 and negative A_4 in $\gamma(\theta)$ indicate ΔJ=2, stretched quadrupole (E2).

[g] Multiply placed.

[h] Multiply placed with undivided intensity.

[i] Multiply placed with intensity suitably divided.

[j] Placement of transition in the level scheme is uncertain.

[x] γ ray not placed in level scheme.

^{165}Ho(^{3}He,5nγ),(α,6nγ) 1977Fo08

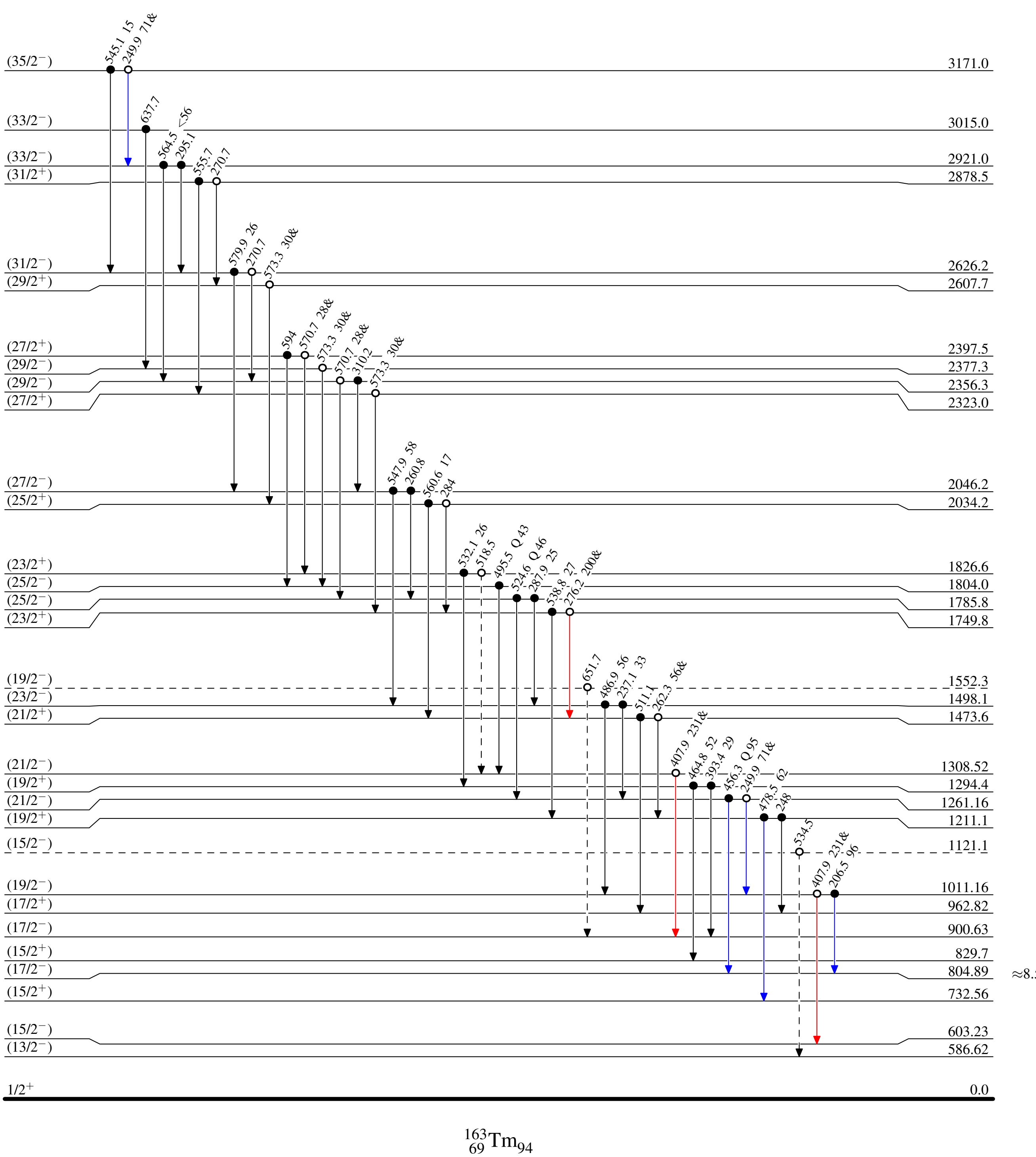
Level Scheme

Intensities: Relative I_γ

& Multiply placed: undivided intensity given

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)
- Coincidence
- Coincidence (Uncertain)



^{165}Ho(^{3}He,5nγ),(α,6nγ) 1977Fo08

Level Scheme (continued)

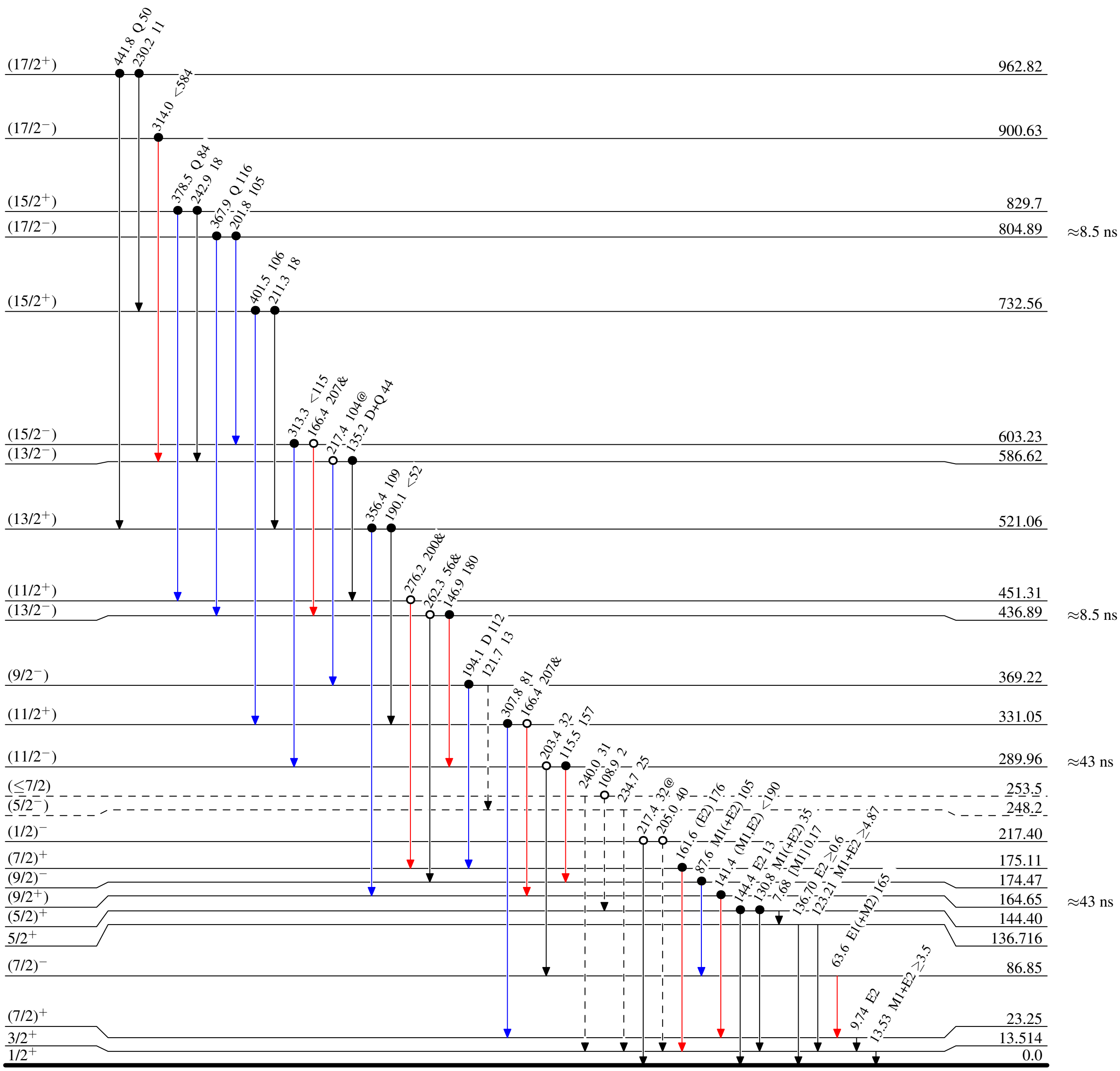
Intensities: Relative I_γ

& Multiply placed: undivided intensity given

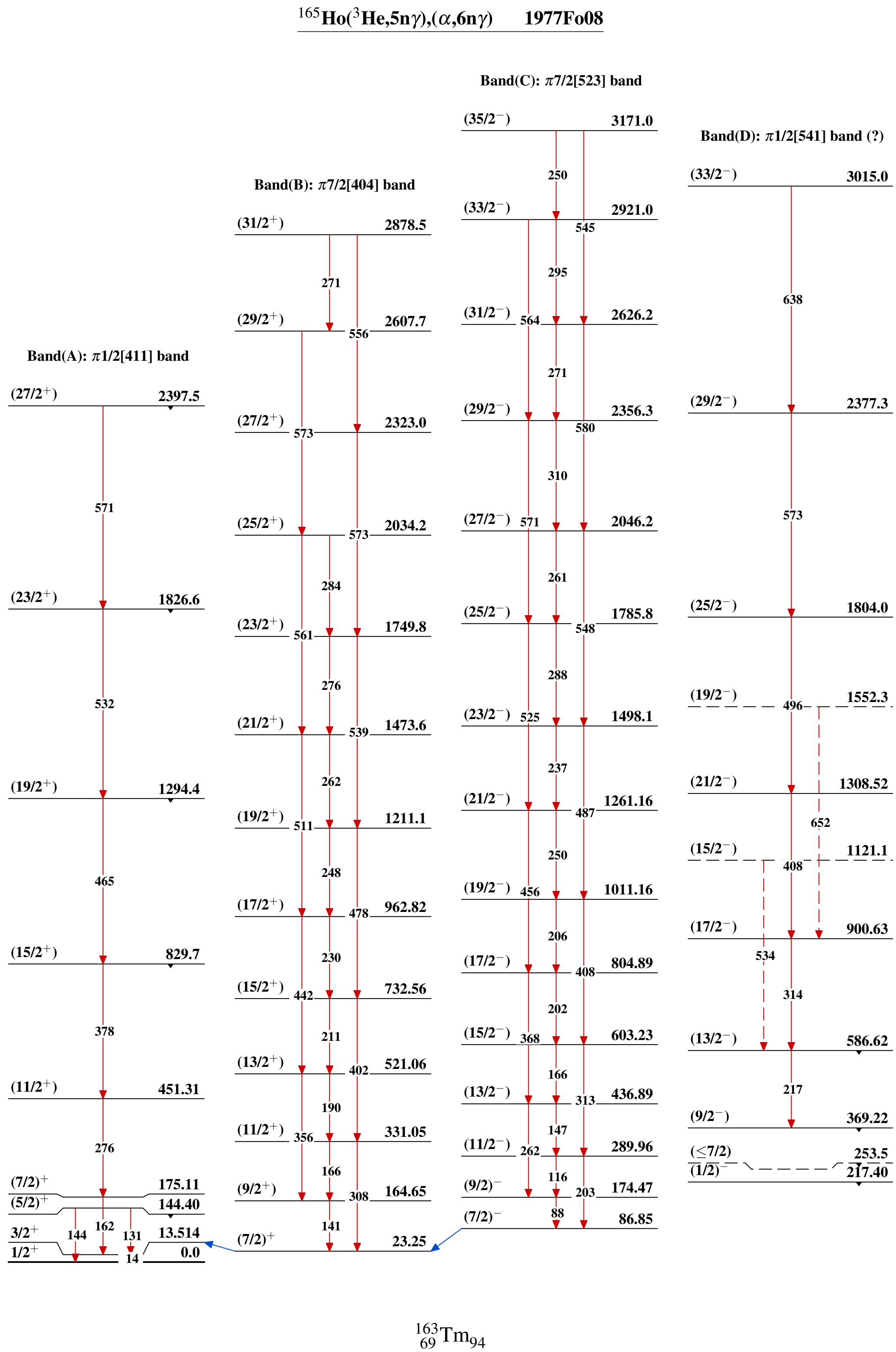
@ Multiply placed: intensity suitably divided

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)
- Coincidence
- Coincidence (Uncertain)



$^{163}_{69}Tm_{94}$


^{165}Ho(^{3}He,5nγ),(α,6nγ) 1977Fo08
Band(A): π1/2[411] band
Band(B): π7/2[404] band
Band(C): π7/2[523] band
Band(D): π1/2[541] band (?)
(27/2+) 2397.5
(23/2+) 1826.6
(19/2+) 1294.4
(15/2+) 829.7
(11/2+) 451.31
(7/2)+ 175.11
(5/2)+ 144.40
3/2+ 13.514
1/2+ 0.0
571
532
465
378
276
144
162
131
14
(31/2+) 2878.5
(29/2+) 2607.7
(27/2+) 2323.0
(25/2+) 2034.2
(23/2+) 1749.8
(21/2+) 1473.6
(19/2+) 1211.1
(17/2+) 962.82
(15/2+) 732.56
(13/2+) 521.06
(11/2+) 331.05
(9/2+) 164.65
(7/2)+ 23.25
271
556
573
573
284
561
276
539
262
511
248
478
230
442
211
402
190
356
166
308
141
(35/2−) 3171.0
(33/2−) 2921.0
(31/2−) 2626.2
(29/2−) 2356.3
(27/2−) 2046.2
(25/2−) 1785.8
(23/2−) 1498.1
(21/2−) 1261.16
(19/2−) 1011.16
(17/2−) 804.89
(15/2−) 603.23
(13/2−) 436.89
(11/2−) 289.96
(9/2)− 174.47
(7/2)− 86.85
250
545
295
564
271
580
310
571
261
548
288
525
237
487
250
456
206
408
202
368
166
313
147
262
116
203
88
(33/2−) 3015.0
(29/2−) 2377.3
(25/2−) 1804.0
(19/2−) 1552.3
(21/2−) 1308.52
(15/2−) 1121.1
(17/2−) 900.63
(13/2−) 586.62
(9/2−) 369.22
(≤7/2) 253.5
(1/2)− 217.40
638
573
496
652
408
534
314
217
$^{163}_{69}$Tm$_{94}$