Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 191,1 (2023)	22-Aug-2023

Q(β^-)=−1953 *4*; S(n)=8728 *12*; S(p)=4907.9 *12* 2021Wa16
Q(ε)=746.1 *13*, S(2n)=15755.7 *19*, S(2p)=12223.0 *14* (2021Wa16).
hyperfine structure and isotope-shift measurements: 1986Al32, 1987Mi31, 1988Al04.
Mass measurement: 1954Mi01.
Theoretical structure calculations:
2021Al30: calculated rotational bandhead energies, J^π, relative correction to energies in bands, energies and energy residuals for ground-state and higher bands using Effective field theory approach.
2020Zh17: calculated high-spin levels, J^π, Nilsson configurations, kinematic moment of inertia versus angular frequency plots for the ground-state band, β and γ deformation parameters, proton and neutron pairing energies, total- and neutron and proton single particle Routhians, angular momentum alignments, and neutron occupation probabilities using cranked relativistic Hartree-Bogoliubov (CRHB) with Lipkin-Nogami method, the cranking covariant density functional theory (CDFT) with pairing correlations treated by a shell-model-like approach (SLAP), and the cranked shell model based on the Nilsson potential with pairing correlations from particle-number conserving (CSM-PNC) method.
2019Ta09: calculated g.s. magnetic moment, effective spin gyromagnetic factors, rotational decoupling parameter of K=1/2 states using quasiparticle phonon nuclear model (QPNM).
2017As01: calculated total Routhian surfaces (TRS), quasineutron energy levels, crossing frequency and interaction strength at the band crossing in 1/2[411] band using cranked shell model.
1994Ha22: calculated fractional changes in dynamical moments of inertia using cranking HFB theory.
1993Ha11: calculated levels, B(λ), Eγ, octupole softness using one-quasiparticle coupled to axially symmetric rotor.
1989Ja05: calculated levels, J^π, band structures, B(λ) using quasiparticle-plus-rotor mixing.
1987Ad03: analyzed B(λ) data and B(E1) systematics.
1987Ba07: calculated ground state elctric quadrupole and magnetic dipole moments, charge radius, binding energy using Hartree-Fock theory.
1977Sc22, 1976An03: calculated and analyzed B(E1) and variations of the hexadecapole deformation parameter using Nilsson model.
1972So12: calculated levels, J^π, K, B(E2).
1970Hj01: calculated deformation, decoupling, and rotational parameters, non-adiabatic coupling using Nilsson model.
Other theory references: 26 for structure and two for decay retrieved from the NSR database are listed in this dataset as 'document' records.
Additional information 1.

^{167}Tm Levels

Cross Reference (XREF) Flags

A	^{167}Yb ε decay (17.5 min)	E	^{166}Er(α,t)
B	^{164}Dy(^{7}Li,4nγ)	F	^{167}Er(p,nγ)
C	^{165}Ho(α,2nγ)	G	^{169}Tm(p,t)
D	^{166}Er(^{3}He,d)		

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$	XREF	Comments
0.0[@]	1/2$^+$	9.25 d *2*	ABCDEFG	%ε=100 μ=−0.197 *2* (1973Ek01,1988Al04,2019StZV) J$^\pi$: spin from atomic beam (1961Wa04); parity from μ and Schmidt diagram. T$_{1/2}$: weighted average of 9.25 d *2* (1970Ka23, γ-decay curve, 12 measurements); 9.24 d *2* (1968Ne02, six measurements); 9.25 d *10* (1962Bo12); and 9.3 d *1* (1961Bj02). Others: 9.6 d *2* (1963Ra15), 9.58 d *5* (1960Na14), 9.6 d (1960Bu27), 9.6 d (1955Ne01), 9.6 d (1954Mi01), 9.4 d (1954Ha16), 9.6 d *1* (1949Wi03, also 9 d in 1948Wi02). Higher values of 9.6 d are probably due to presence of a longer-lived impurity.

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Adopted Levels, Gammas (continued)

^{167}Tm Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$	XREF	Comments
				μ: μ=−0.197 *2* from laser resonance photoionization spectroscopy (1988Al04, also 1987Mi31 and 1986Al32), where hyperfine structure constant a_1 was used from 1973Ek01. Value of μ=−0.197 *2* is listed in analysis paper by 1973Ek01 citing a private communication from G. Andersson and A. Rosen for measurement (probably 1973An12 in the NSR database). Evaluated rms charge radius=5.2129 fm *36* (2013An02). Evaluated δ<r²>(^{169}Tm,^{167}Tm)=−0.134 fm² *2* (2013An02). Δ<r²>(167-169)=−0.126 *3* (1987Mi31,1988Al04).
10.417[&] *21*	3/2⁺	0.95 ns *5*	ABCDEFG	Jπ: 10.419 γ M1+E2 to 1/2⁺. $T_{1/2}$: from (ce)γ(t) and γγ(t) in ε decay (1980AlZE).
116.594[@] *24*	5/2⁺	66 ps *7*	ABCDEFG	Jπ: 116.68γ E2 to 1/2⁺, 106.18γ M1+E2 to 3/2⁺. $T_{1/2}$: from ce-ce(t) in ^{167}Er(p,nγ) (1976Li07,1976Sv01). Other value: ≤100 ps (ceγ(t), γγ(t) (1980AlZE)). 1974Ch44 noted that their deduced experimental nuclear structure factors in (^{3}He,d) and (α,t) transfer reactions were two to three times larger than the predicted value for the 5/2⁺, π1/2[411] state, as also was the case for this configuration in ^{165}Tm, ^{169}Tm and ^{171}Tm. Authors further stated that their Coriolis mixing calculations could not explain this strength in terms of admixtures of other Nilsson states.
142.441[&] *25*	7/2⁺	343 ps *15*	ABCDEFG	Jπ: 132.05γ E2 to 3/2⁺, 25.83γ M1+E2 to 5/2⁺. $T_{1/2}$: from ce-ce(t) in ^{167}Er(p,nγ) (1976Li07,1976Sv01).
171.76[a] *4*	(1/2)⁻		ABC F	Jπ: 171.77γ E1 to 1/2⁺; 1/2⁻ from band assignment.
179.501[d] *24*	7/2⁺	1.16 μs *6*	ABCdeF	%IT=100 Jπ: 169.04γ E2 to 3/2⁺, 62.90γ M1+E2 to 5/2⁺, 37.05γ M1+E2 to 7/2⁺. $T_{1/2}$: from Xγ(t) in ^{167}Yb ε decay (1964Lo04). Other: 1.1 μs *1* (Xγ(t),1965Ta01).
187.660[a] *24*	5/2⁻		ABCdeF	Jπ: 177.26γ E1 to 3/2⁺; 105.19γ M1 from 7/2⁻.
282.24 *5*	(3/2)		A	Jπ: 95.5γ to 5/2⁻, 282.4γ to 1/2⁺, 110.49γ to (1/2)⁻; 1298.2γ from (5/2⁺,7/2⁺) 1581 level.
285.90[a] *3*	9/2⁻		ABCdeF	Jπ: 98.25γ E2 to 5/2⁻, 143.46γ E1 to 7/2⁺; band assignment.
290.94[b] *4*	(3/2⁻)		ABCdeF	Jπ: 290.92γ (E1) to 1/2⁺, 174.26 γ (E1) to 5/2⁺.
292.844[f] *24*	7/2⁻	0.9 μs *1*	ABCdeF	Jπ: 176.26γ E1 to 5/2⁺; 203.76γ E2 from 11/2⁻. $T_{1/2}$: from (x ray)γ(t) in ^{167}Yb ε decay (1965Ta01).
296.21[c] *3*	9/2⁺		ABC F	Jπ: 116.69γ M1 to 7/2⁺; 139.8γ M1+E2 from 11/2⁺.
326.50[@] *3*	9/2⁺		ABCDEFG	Jπ: 209.93γ E2, ΔJ=2 to 5/2⁺, 184.13γ D+Q to 7/2⁺.
371.05[&] *3*	11/2⁺		BC FG	Jπ: 228.6γ (E2) to 7/2⁺, 85.16γ D to 9/2⁻; 251.03γ M1+E2 from 13/2⁺.
383.70[e] *4*	9/2⁻		ABC F	Jπ: 90.86γ M1 to 7/2⁻; 112.89γ D+Q from 11/2⁻.
436.07[d] *3*	11/2⁺		BC F	Jπ: 256.57γ E2, ΔJ=2 to 7/2⁺; band assignment.
459.92[b] *4*	7/2⁻[#]		BCDEF	
470.26[a] *3*	13/2⁻		BC F	Jπ: 184.42γ E2, ΔJ=2 to 9/2⁻, 99.21γ E1 to 11/2⁺; band assignment.
470.89[g] *5*	3/2⁺[#]		A CDEFG	
496.64[f] *4*	11/2⁻[#]		ABCDEF	
522.25[h] *5*	5/2⁺[#]		A CDEF	
557.93[g] *5*	5/2⁺[#]		A CDEF	
597.48[c] *3*	13/2⁺		BC F	Jπ: 301.26γ E2, ΔJ=2 to 9/2⁺, 161.4γ D+Q to 11/2⁺.
601.99[g] *4*	(7/2⁺)		CDE G	Jπ: 131.06γ 3/2⁺, possible 257.57γ to 9/2⁺; band assignment.
622.09[@] *3*	13/2⁺		BC FG	Jπ: 295.59γ E2, ΔJ=2 to 9/2⁺; band assignment.
631.82[e] *4*	13/2⁻		BC F	Jπ: 248.12γ E2, ΔJ=2 to 9/2⁻, 135.20γ D+Q to 11/2⁻.
657.84?[h] *5*	(7/2⁺)		C FG	XREF: G(663). Jπ: 541.28γ (M1) to 5/2⁺, 331.21γ (M1+E2) to 9/2⁺.

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Adopted Levels, Gammas (continued)

^{167}Tm Levels (continued)

E(level)[†]	Jπ[‡]	XREF	Comments
682		G	
689.19[&] *3*	15/2+	BC F	Jπ: 318.14γ E2, ΔJ=2 to 11/2+, 218.90γ D to 13/2−.
699.17[b] *4*	(11/2−)	BCDEFg	XREF: g(706). Jπ: 413.41γ (M1+E2) to 9/2−; band assignment.
709.12[g] *4*	(9/2+)	C g	XREF: g(706). Jπ: 338.01γ to (11/2+), 186.68γ to 5/2+; band assignment.
717 *2*		DE	E(level): from (^{3}He,d).
741.37[a] *3*	17/2−	BC F	Jπ: 271.12γ E2, ΔJ=2 to 13/2−; band assignment.
771 *2*		DE	E(level): from (^{3}He,d). Other: 770 *2* from (α,t).
779.01[d] *3*	15/2+	BC F	Jπ: 181.50γ M1+E2 to 13/2+; 199.56γ M1+E2 from 17/2+; band assignment.
780.48?[h] *5*	(9/2+)	C	Jπ: 453.97γ D to 9/2+; band assignment.
787.81[f] *4*	15/2−	BC F	Jπ: 156.04γ M1+E2 to 13/2−; 177.95γ M1+E2 from 17/2−; band assignment.
840.18[g] *4*	(11/2+)	C F	Jπ: 469.25γ (M1) to 11/2+; band assignment.
852.79[i] *4*	(3/2−)	C F	Jπ: 680.86γ to (1/2)−; band assignment.
867.77? *14*	(5/2+,7/2,9/2−)	A	Jπ: 680.3γ to 5/2−, 571.3γ to 9/2+.
882.12[i] *18*	(5/2−)	C F	Jπ: 694.46γ (M1+E2) to 5/2−; band assignment.
927.87[h] *4*	(11/2+)	C F	Jπ: 556.74γ (M1) to 11/2+; band assignment.
929.74?[j] *7*	(9/2−)	C F	Jπ: 636.5γ (M1) to 7/2−; 114.32γ from 11/2− suggests assignment as bandhead for 9/2[514] band.
935.24[i] *4*	(7/2−)	C F	Jπ: 649.38γ (M1) to 9/2−; band assignment.
944.89[k] *4*	(11/2+)	C F	Jπ: 765.42γ E2 to 7/2+; band assignment.
965.77[e] *4*	17/2−	BC F	Jπ: 333.96γ E2, ΔJ=2 to 13/2−; band assignment.
978.55[c] *4*	17/2+	BC F	Jπ: 380.81γ E2, ΔJ=2 to 13/2+; 199.56γ to π=+; band assignment.
993.60[@] *3*	(17/2+)	BC FG	Jπ: 371.52γ (E2) to 13/2+, 304.41γ D+Q to 15/2+; band assignment.
1001.23[g] *3*	(13/2+)	C F	Jπ: 630.14γ (M1) to 11/2+; band assignment.
1007.62[b] *3*	(15/2−)	BC F	Jπ: 537.39γ (M1) to 13/2−, 308.46γ (Q), ΔJ=(2) to (11/2)−; band assignment.
1008.50[i] *4*	(9/2−)	C FG	XREF: G(1010). Jπ: 722.60γ (E2) to 9/2−; band assignment.
1044.06[j] *5*	11/2−[#]	CDEF	
1086.57[&] *3*	19/2+	BC F	Jπ: 397.38γ E2, ΔJ=2 to 15/2+, 345.20γ D to 17/2−; band assignment.
1092		G	
1096.22[a] *3*	21/2−	BC F	Jπ: 354.85γ E2, ΔJ=2 to 17/2−; band assignment.
1096.47[h] *4*	(13/2+)	C	
1101.24[k] *4*	(13/2+)	C	
1105.33[i] *4*	(11/2−)	C G	XREF: G(1092).
1125 *2*	1/2+	DE	Jπ: L=0 in ^{166}Er(^{3}He,d), (α,t).
1154		G	
1160.96[f] *4*	19/2−	BC F	Jπ: 372.96γ E2, ΔJ=2 to 15/2−; band assignment.
1163.96[g] *5*	(15/2+)	C	
1168 *2*		D	
1192		G	
1194.82[d] *3*	19/2+	BC F	Jπ: 415.79γ E2, ΔJ=2 to 15/2+, 216.29γ D+Q to 17/2+; band assignment.
1216.56 *6*	7/2+	A G	XREF: G(1210). Jπ: 920.32γ M1 to 9/2+, 1037.07γ M1 to 7/2+; 9/2+ disfavored by direct β feeding (log *ft*=5.99) from 5/2−.
1223.11[i] *4*	(13/2−)	C	
1229.85 *10*	(7/2−)	A	Jπ: 672.1γ to 5/2+, possible 733.2γ to 11/2−; (9/2+) disfavored by direct β feeding (log *ft*=6.93) from 5/2−.
1235 *2*		D	
1276.78[k] *4*	(15/2+)	C	

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Adopted Levels, Gammas (continued)

^{167}Tm Levels (continued)

E(level)†	Jπ‡	XREF	Comments
1281.46[h] 6	(15/2+)	C	
1283		G	
1320		G	
1358.75[i] 4	(15/2−)	C	
1372.75[g] 3	(17/2+)	C	
1374 2		D G	XREF: G(1380).
1378.19[e] 4	21/2−	BC	Jπ: 412.39γ E2, ΔJ=2 to 17/2−, 217.27γ D+Q to 19/2−; band assignment.
1380.98[b] 4	(19/2−)	BC	Jπ: 387.26γ D to (17/2+), 284.73γ to 21/2−, 373.42γ to (15/2)−; band assignment.
1403 2	1/2+	DE G	Jπ: L=0 in ^{166}Er(^{3}He,d), (α,t).
1424.67[c] 4	21/2+	BC	Jπ: 446.11γ E2, ΔJ=2 to 17/2+; 229.85γ D+Q to 19/2+; band assignment.
1429.52[@] 3	21/2(+)	BC	Jπ: 435.94γ ΔJ=2 to 17/2+, 342.95γ to 19/2+; band assignment.
1432.33? 10	(5/2−,7/2)	A G	Jπ: 1139.5γ to 7/2−, 1048.5γ to 9/2−; direct β feeding (log ft=6.82) from 5/2−.
1457		G	
1470.16[k] 5	(17/2+)	C	
1486		G	
1487.36[h] 8	(17/2+)	C	
1524.93[i] 4	(17/2−)	C	
1527.45 7	(5/2−)	A DE G	Jπ: L=(3) in ^{166}Er(^{3}He,d), (α,t); 1517.0γ to 3/2+.
1528.69[a] 4	25/2−	BC	Jπ: 432.47γ E2, ΔJ=2 to 21/2−; band assignment.
1543.80 16	(5/2+,7/2+)	A	1533.1γ to 3/2+, 1217.1γ to 9/2+.
1549 2		DE	E(level): from (^{3}He,d).
1550.03[&] 4	23/2(+)	BC	Jπ: 463.44γ ΔJ=2, (E2) to 19/2+; band assignment.
1562.93[g] 4	(19/2+)	C	
1580.97 6	(5/2+,7/2+)	A DE G	XREF: G(1574). Jπ: 1110.3γ to 3/2+, 1254.5γ to 9/2+.
1597.58 7	(5/2−,7/2+)	A DE G	Jπ: 1587.1γ to 3/2+, 1213.3γ to 9/2−.
1606.80[f] 4	(23/2−)	BC	
1629.65 13	(5/2+,7/2+)	A DE G	XREF: G(1625). Jπ: 1332.5γ to 9/2+, 1618.2γ to 3/2+.
1644 2		D	
1654.33 9	(5/2+,7/2+)	A G	Jπ: 1358.3γ to 9/2+, 1643.8γ to 3/2+.
1668.93[d] 4	(23/2+)	BC	
1672 2		D	
1678.90[k] 5	(19/2+)	C	
1691.24[i] 4	(19/2−)	C	
1701 2		D	
1705.57[h] 6	(19/2+)	C	
1718 2		D	
1808.66[b] 4	(23/2−)	BC	
1813.96[g] 4	(21/2+)	C	Jπ: 251.03γ (D) to (19/2+); band assignment.
1858.66[e] 5	(25/2−)	BC	
1901.27[k] 6	(21/2+)	C	
1915.39[@] 5	(25/2+)	BC	
1916.61[i] 6	(21/2−)	C	
1922.39[c] 4	(25/2+)	BC	Jπ: 497.71γ (Q) to 21/2+, 253.43γ (D) to (23/2+); band assignment.
2022.25[g] 9	(23/2+)	C	
2030.77[a] 5	29/2(−)	BC	Jπ: 502.09γ ΔJ=2 to 25/2−; band assignment.
2065.45[&] 5	(27/2+)	BC	
2098.06[i] 5	(23/2−)	C	
2113.89[f] 6	(27/2−)	BC	

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Adopted Levels, Gammas (continued)

^{167}Tm Levels (continued)

E(level)†	Jπ‡	XREF	E(level)†	Jπ‡	XREF	E(level)†	Jπ‡	XREF
2135.94[k] 7	(23/2+)	C	2799.06[b] 11	(31/2−)	BC	3916.2[d] 13	(39/2+)	B
2186.45[d] 5	(27/2+)	BC	2972.4[e] 10	(33/2−)	B	4196.5[@] 18	(41/2+)	B
2279.75[b] 7	(27/2−)	BC	2993.5[@] 10	(33/2+)	B	4196.5?[c] 16	(41/2+)	B
2321.08?[g] 6	(25/2+)	C	3013.5[c] 7	(33/2+)	B	4494.8[&] 16	(43/2+)	B
2381.92?[k] 13	(25/2+)	C	3208.8[&] 8	(35/2+)	B	4565.2[d] 17	(43/2+)	B
2394.45[e] 6	(29/2−)	BC	3210.5[a] 10	(37/2−)	B	4596.5[a] 18	(45/2−)	B
2396.42[i] 7	(25/2−)	C	3261.6[f] 10	(35/2−)	B	4868.5?[@] 20	(45/2+)	B
2440.46[@] 7	(29/2+)	BC	3311.2[d] 8	(35/2+)	B	5204.8[&] 19	(47/2+)	B
2455.62[c] 9	(29/2+)	BC	3575.5[@] 15	(37/2+)	B	5365.5[a] 20	(49/2−)	B
2573.30[i] 7	(27/2−)	C	3579.4[e] 15	(37/2−)	B	5970.8[&] 22	(51/2+)	B
2593.46[a] 12	(33/2−)	BC	3600.5[c] 12	(37/2+)	B	6185.5[a] 23	(53/2−)	B
2620.14[&] 8	(31/2+)	BC	3832.8[&] 13	(39/2+)	B	7055.5[a] 25	(57/2−)	B
2670.64[f] 7	(31/2−)	BC	3877.5[a] 15	(41/2−)	B	7979.5[a] 27	(61/2−)	B
2735.83[d] 9	(31/2+)	BC	3878.6[f] 15	(39/2−)	B	8952.5[a] 29	(65/2−)	B

† From a least-squares fit to γ-ray energies for levels connected with γ transitions, assuming ΔEγ=0.10 keV for Eγ, when not stated, with questionable γ rays omitted in the fitting. Seven γ rays out of a total of 344 γ rays fitted poorly, with reduced χ^2=1.86, as compared to χ^2=1.23 at 95% confidence level, with one γ ray deviating by 4-5 σ, six γ rays deviating by 3-4 σ, and 16 by 2-3 σ. Uncertainties for the following γ-ray energies were increased, resulting in reduced χ^2=1.48, with 18 γ rays deviating by 2-3 σ: double the uncertainties for 228.67 *7* from 699 level, 372.96 *5* from 1160 level, 175.34 *6* and 332.11 *6* from 1276 level, 1332.5 *2* from 1629 level; and triple the uncertainty for 639.89 *4* from 1381 level. For levels not populated in γ-ray studies, values are from particle transfer reactions, with exceptions noted.

‡ Ascending J^π assumed from yrast pattern of levels populated in (α,2nγ) and (^{7}Li,4nγ), and also from rotational band structures with cascades of coincident and interlocking stretched (ΔJ=2) quadrupole and stretched (ΔJ=1) dipole (or dipole+quadrupole) γ transitions determined based on measured γ(θ) in (α,2nγ) where available. Where no arguments are given specifically for levels from (α,2nγ) and/or (^{7}Li,4nγ), assignments are from band assignments.

From angular-distribution and cross-section data in (^{3}He,d) and (α,t).

@ Band(A): π1/2[411],α=+1/2.

& Band(a): π1/2[411],α=−1/2.

a Band(B): π1/2[541],α=+1/2. Band crossing by a pair of $i_{13/2}$ neutrons observed by 1997Je07, see ^{164}Dy(^{7}Li,4nγ) dataset.

b Band(b): π1/2[541],α=−1/2.

c Band(C): π7/2[404],α=+1/2.

d Band(c): π7/2[404],α=−1/2.

e Band(D): π7/2[523],α=+1/2.

f Band(d): π7/2[523],α=−1/2.

g Band(E): π3/2[411] band. Strongly mixed with π5/2[402] band.

h Band(F): π5/2[402] band. Strongly mixed with π3/2[411] band.

i Band(G): π3/2[532]+(π1/2[541]), K-2 band. Coriolis perturbed level spacing.

j Band(H): π9/2[514] band.

k Band(I): π7/2[404], K+2 band. A=13.0, B=−11.7 (J=11/2, 13/2, and 15/2 levels).

Adopted Levels, Gammas (continued)

γ(^{167}Tm)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	δ[&]	α[d]	Comments
10.417	3/2$^+$	10.419[‡] *25*	100	0.0	1/2$^+$	M1+E2[a]	0.043[a] *+4−3*	648 *38*	B(M1)(W.u.)=0.0315 *+26−23*; B(E2)(W.u.)=2.5×10^2 *+5−4* α: measured value from ^{167}Yb ε decay.
116.594	5/2$^+$	106.18 *2*	100 *5*	10.417	3/2$^+$	M1+E2[a]	0.116[a] *+27−20*	2.61 *4*	B(M1)(W.u.)=0.070 *+8−7*; B(E2)(W.u.)=24 *+7−6* E_γ: weighted average of 106.16 *2* from ^{167}Yb ε decay, 106.18 *1* from (α,2nγ), and 106.25 *4* from (p,nγ). I_γ: from ^{167}Yb ε decay. Others: 100 *9* from (α,2nγ) and 100 *7* from (p,nγ).
		116.68 *6*	12.55 *27*	0.0	1/2$^+$	E2[a]		1.721 *24*	B(E2)(W.u.)=231 *+31−24* E_γ: unweighted average of 116.57 *2* from ^{167}Yb ε decay, 116.69 *1* from (α,2nγ), and 116.77 *5* from (p,nγ). I_γ: from ^{167}Yb ε decay. Others: 12.6 *13* from (α,2nγ); 39.2 *26* from (p,nγ) for a doublet.
142.441	7/2$^+$	25.83 *2*	1.7 *5*	116.594	5/2$^+$	M1+E2	0.035	28.5 *4*	B(M1)(W.u.)=0.024 *6*; B(E2)(W.u.)=21 *+11−9* E_γ: from ^{167}Yb ε decay. Other: 25.80 *20* from (p,nγ). I_γ: weighted average of 1.6 *5* from ^{167}Yb ε decay and 2.0 *10* from (p,nγ). α=29.4 *+23−14* for a 50% uncertainty in δ. 50% uncertainty assumed for δ when calculating B(M1)(W.u.) and B(E2)(W.u.).
		132.05 *4*	100.0 *30*	10.417	3/2$^+$	E2[a]		1.096 *15*	B(E2)(W.u.)=290 *+23−20* E_γ: unweighted average of 131.99 *2* from ^{167}Yb ε decay, 132.05 *2* from (α,2nγ), and 132.12 *5* from (p,nγ). I_γ: from ^{167}Yb ε decay. Others: 100 *5* from (α,2nγ) and 100 *7* from (p,nγ).
171.76	(1/2)$^-$	161.32[‡] *8*	94[‡] *28*	10.417	3/2$^+$	(E1)[a]		0.0942 *13*	E_γ,I_γ: 161.45 *6* with Iγ=244 *19* from (p,nγ) for a triplet; 161.25 with Iγ=100 *46* from (α,2nγ).
		171.77 *5*	100 *9*	0.0	1/2$^+$	E1		0.0799 *11*	E_γ: weighted average of 171.75 *8* from ^{167}Yb ε decay, 171.76 *5* from (α,2nγ), and 171.80 *6* from (p,nγ). I_γ: from (p,nγ). Others: 100 *28* from ^{167}Yb ε decay and 100 *18* from (α,2nγ).
179.501	7/2$^+$	37.05[‡] *2*	3.9[‡] *14*	142.441	7/2$^+$	M1+E2[a]	0.326[a] *5*	31.3 *8*	B(M1)(W.u.)=9.4×10^{-7} *32*; B(E2)(W.u.)=0.034 *12*
		62.91 *1*	100 *11*	116.594	5/2$^+$	M1+E2[a]	0.065[a] *5*	11.78 *17*	B(M1)(W.u.)=5.39×10^{-6} *+36−33*; B(E2)(W.u.)=0.00271 *+48−43*

$^{167}_{69}Tm_{98}$-6

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	α[d]	Comments
								E_γ,I_γ: others: 62.90 *2* with Iγ=100 *17* from ^{167}Yb ε decay; 62.95 *4* from (p,nγ).
179.501	7/2$^+$	169.04[‡] *3*	3.21[‡] *29*	10.417	3/2$^+$	E2[a]	0.460 *6*	B(E2)(W.u.)=1.47×10^{-4} *+24−20*
187.660	5/2$^-$	177.26 *2*	100	10.417	3/2$^+$	E1[a]	0.0735 *10*	E_γ: weighted average of 177.22 *3* from ^{167}Yb ε decay, 177.27 *2* from (α,2nγ), and 177.33 *6* from (p,nγ).
282.24	(3/2)	94.53[‡] *5*		187.660	5/2$^-$			
		110.49[‡] *5*		171.76	(1/2)$^-$			
		272.1[‡] *2*	32[‡] *10*	10.417	3/2$^+$			
		282.4[‡] *2*	100[‡] *20*	0.0	1/2$^+$			
285.90	9/2$^-$	98.25 *2*	3.4 *3*	187.660	5/2$^-$	E2[a]	3.28 *5*	E_γ: others: 98.24 *3* from ^{167}Yb ε decay and 98.30 *10* from (p,nγ). I_γ: weighted average of 3.9 *4* from ^{167}Yb ε decay and 3.20 *29* from (α,2nγ). Other: 9.1 *31* from (p,nγ) is discrepant.
		143.46 *1*	100.0 *29*	142.441	7/2$^+$	E1	0.1284 *18*	E_γ: others: 143.46 *2* from ^{167}Yb ε decay and 143.53 *5* from (p,nγ). I_γ: from ^{167}Yb ε decay. Others: 100 *4* from (α,2nγ) and 100 *7* from (p,nγ).
290.94	(3/2$^-$)	103.32 *5*	30 *13*	187.660	5/2$^-$			E_γ: γ masked by neighboring intense γ rays in ^{167}Yb ε decay. I_γ: from Iγ(280.55γ) and adopted I(103.32γ)/I(280.5γ)=2.9 *10* in (α,2nγ).
		174.26 *7*	22 *9*	116.594	5/2$^+$	(E1)	0.0769 *11*	E_γ: weighted average of 174.25 *7* from (α,2nγ) and 174.27 *7* from (p,nγ). γ masked by neighboring intense γ rays in ^{167}Yb ε decay. I_γ: from Iγ(280.55γ) and adopted I(174.26γ)/I(280.5γ)=2.04 *63*, taken from average of values in (α,2nγ) and (p,nγ).
		280.55 *20*	10.6 *25*	10.417	3/2$^+$			E_γ: weighted average of 280.5 *2* from ^{167}Yb ε decay and 280.60 *20* from (p,nγ). I_γ: from ^{167}Yb ε decay, 35 *11* from (α,2nγ), and 13 *4* from (p,nγ).
		290.92 *8*	100 *11*	0.0	1/2$^+$	(E1)	0.02073 *29*	E_γ: weighted average of 290.86 *7* from ^{167}Yb ε decay and 291.02 *9* from (p,nγ). I_γ: from ^{167}Yb ε decay. No intensity is reported in (α,2nγ). Most intense γ in (p,nγ) for an unresolved doublet.
292.844	7/2$^-$	(6.93)		285.90	9/2$^-$			E_γ: from level energy difference. I(γ+ce)=4.96 *15* from intensity balance from ^{167}Yb ε decay.
		105.19[‡] *2*	1.07[‡] *11*	187.660	5/2$^-$	M1[a]	2.68 *4*	B(M1)(W.u.)=1.40×10^{-7} *+24−20* E_γ,I_γ: other: 105.14 *7* from (α,2nγ), with a discrepant Iγ=6.3 *4*.
		113.34 *1*	100 *4*	179.501	7/2$^+$	E1[a]	0.2396 *34*	B(E1)(W.u.)=1.06×10^{-7} *+14−11* E_γ: from (α,2nγ). Others: 113.32 *2* from ^{167}Yb ε decay and 113.41 *5* from (p,nγ).

$^{167}_{69}Tm_{98}$-7

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	δ[&]	α[d]	Comments
									I_γ: from ^{167}Yb ε decay. Others: 100 *9* from (α,2nγ) and 100 *7* from (p,nγ). Small reduced transition probability attributed to pairing effects (1968Ta05).
292.844	7/2$^-$	150.40[‡] *3*	0.067[‡] *19*	142.441	7/2$^+$	E1[a]		0.1133 *16*	B(E1)(W.u.)=3.0×10^{-11} *+10−9*
		176.26 *2*	30.2 *11*	116.594	5/2$^+$	E1[a]		0.0746 *10*	B(E1)(W.u.)=8.5×10^{-9} *+11−9*
									E_γ: from (α,2nγ). Others: 176.23 *3* from ^{167}Yb ε decay and 176.34 *6* from (p,nγ). I_γ: weighted average of 30.7 *11* from (α,2nγ) and 28.2 *22* from (p,nγ).
296.21	9/2$^+$	116.69 *2*	96 *14*	179.501	7/2$^+$	M1		1.993 *28*	E_γ: weighted average of 116.66 *3* from ^{167}Yb ε decay, 116.69 *1* from (α,2nγ), and 116.77 *5* from (p,nγ). I_γ: from ^{167}Yb ε decay.
		179.55[‡] *5*	100[‡] *41*	116.594	5/2$^+$				
326.50	9/2$^+$	184.13 *8*	100 *5*	142.441	7/2$^+$	(M1+E2)	−0.12 *+11−18*	0.548 *16*	E_γ: weighted average of 184.1 *2* from ^{167}Yb ε decay, 184.01 *15* from (α,2nγ), and 184.17 *8* from (p,nγ). I_γ: others: 100 *57* from ^{167}Yb ε decay and 100 *5* from (p,nγ).
		209.93 *3*	44.8 *12*	116.594	5/2$^+$	E2[b]		0.2214 *31*	E_γ: weighted average of 209.92 *2* from (α,2nγ) and 210.01 *7* from (p,nγ). I_γ: weighted average of 44.6 *12* from (α,2nγ) and 47 *4* from (p,nγ). Other: 43 *29* from ^{167}Yb ε decay.
371.05	11/2$^+$	44.4[h]		326.50	9/2$^+$				E_γ: from level energy difference.
		85.16 *6*	12.6 *12*	285.90	9/2$^-$	(E1)		0.509 *7*	E_γ: unweighted average of 85.10 *1* from (α,2nγ) and 85.21 *4* from (p,nγ). Mult.: D from γ(θ) in (α,2nγ); (E1) from level scheme.
		228.61[g] *1*	100[g] *15*	142.441	7/2$^+$	(E2)[b]		0.1675 *23*	E_γ: other: 228.67 *7* from (p,nγ). Mult.: for a doublet in (α,2nγ).
383.70	9/2$^-$	90.86 *3*	100	292.844	7/2$^-$	M1[a]		4.08 *6*	E_γ: unweighted average of 90.83 *6* from ^{167}Yb ε decay, 90.84 *1* from (α,2nγ), and 90.91 *2* from (p,nγ). Mult.: also supported by γ(θ) from (α,2nγ).
436.07	11/2$^+$	139.83 *2*	100 *5*	296.21	9/2$^+$	M1+E2	+0.46 *3*	1.140 *17*	E_γ: weighted average of 139.83 *1* from (α,2nγ) and 139.91 *5* from (p,nγ). I_γ: from (α,2nγ). Other: 100 *8* from (p,nγ). Mult.,δ: D+Q and δ from γ(θ) in (α,2nγ); M1 from ce data in (p,nγ).
		256.57 *1*	77.5 *15*	179.501	7/2$^+$	E2[b]		0.1158 *16*	E_γ: other: 256.67 *8* from (p,nγ). I_γ: weighted average of 77.3 *15* from (α,2nγ) and 86 *9* from (p,nγ).

$^{167}_{69}Tm_{98}$-8

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	δ[&]	α[d]	Comments
459.92	7/2$^-$	169.20[h] *10*	72 *12*	290.94	(3/2$^-$)	[E2]		0.458 *6*	E_γ,I_γ: from (p,nγ).
		174.0[h] *2*		285.90	9/2$^-$	(M1)		0.645 *9*	E_γ: from (p,nγ).
		272.30 *10*	100 *40*	187.660	5/2$^-$				E_γ,I_γ: from (p,nγ). Other: Eγ=272.29 *8* in (α,2nγ).
		343.37		116.594	5/2$^+$				E_γ: weak γ from (α,2nγ). In (p,nγ) a 343.28 *15* γ is an unresolved doublet, placed from 460 and 779 levels. See comment for 342.95γ from 779 level.
470.26	13/2$^-$	99.21 *1*	40.3 *35*	371.05	11/2$^+$	E1		0.341 *5*	E_γ: other: 99.25 *6* from (p,nγ). I_γ: weighted average of 38.2 *30* from (α,2nγ) and 46 *5* from (p,nγ). Mult.: D also from γ(θ) in (α,2nγ).
		184.42 *9*	100.0 *30*	285.90	9/2$^-$	E2[c]		0.341 *5*	E_γ: unweighted average of 184.33 *4* from (α,2nγ) and 184.51 *7* from (p,nγ). I_γ: from (α,2nγ). Other: 100 *10* from (p,nγ).
470.89	3/2$^+$	354.57		116.594	5/2$^+$				
		460.48 *14*	100 *13*	10.417	3/2$^+$	(M1)		0.0468 *7*	E_γ: unweighted average of 460.36 *9* from ^{167}Yb ε decay, 460.77 *3* from (α,2nγ), and 460.32 *20* from (p,nγ). I_γ: from ^{167}Yb ε decay.
		470.62 *9*	85 *11*	0.0	1/2$^+$	(M1)		0.0442 *6*	E_γ: weighted average of 470.65 *9* from ^{167}Yb ε decay and 470.40 *25* from (p,nγ). I_γ: from ^{167}Yb ε decay. level-energy difference=471.02.
496.64	11/2$^-$	112.89 *4*	100 *7*	383.70	9/2$^-$	M1+E2[c]	+0.16 *1*	2.185 *31*	E_γ: weighted average of 112.88 *4* from (α,2nγ) and 112.95 *10* from (p,nγ). I_γ: from (p,nγ). Other: 100 *8* from (α,2nγ).
		203.76 *5*	11.3 *8*	292.844	7/2$^-$	E2[b]		0.2443 *34*	E_γ: weighted average of 203.75 *4* from (α,2nγ) and 204.00 *20* from (p,nγ). I_γ: weighted average of 11.1 *6* from (α,2nγ) and 14.7 *26* from (p,nγ).
522.25	5/2$^+$	379.69 *20*	30 *10*	142.441	7/2$^+$	M1		0.0774 *11*	E_γ: weighted average of 379.9 *3* from ^{167}Yb ε decay and 379.60 *20* from (p,nγ). I_γ: from ^{167}Yb ε decay.
		405.57[‡] *8*	100[‡] *14*	116.594	5/2$^+$	(M1)		0.0651 *9*	E_γ: others: 405.69 *4* from (α,2nγ) and 405.50 *20* from (p,nγ), for a doublet.
		511.70 *20*		10.417	3/2$^+$				E_γ: from (p,nγ).
557.93	5/2$^+$	35.69 *3*		522.25	5/2$^+$				
		415.50 *20*	33 *8*	142.441	7/2$^+$	(M1+E2)		0.045 *17*	E_γ: weighted average of 415.4 *2* from ^{167}Yb ε decay and 415.60 *20* from (p,nγ). I_γ: from ^{167}Yb ε decay. Other: 53 *7* from (p,nγ) for a doublet. Mult.: from ce data for a doublet in (p,nγ).
		441.2[‡] *1*	90[‡] *18*	116.594	5/2$^+$	(M1)		0.0523 *7*	E_γ,I_γ: other: 441.22 *3* with Iγ=100 *8* from (α,2nγ) and 440.92

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	δ[&]	α[d]	Comments
									15 with Iγ=70 *9* from (p,nγ), for a doublet. Mult.: from ce data for a doublet in (p,nγ).
557.93	5/2+	547.5[‡] *1*	100[‡] *17*	10.417	3/2+	M1[a]		0.0300 *4*	E_γ,I_γ: others: 547.43 *3* with Iγ=100 *11* from (α,2nγ), and 547.20 *20* with Iγ=100 *9* from (p,nγ), for a doublet.
597.48	13/2+	161.40 *1*	62.2 *25*	436.07	11/2+	M1+E2[c]	+0.40 *+1−3*	0.760 *12*	E_γ: other: 161.45 *6* from (p,nγ) for a triplet.
		301.26 *1*	100.0 *18*	296.21	9/2+	E2[b]		0.0705 *10*	E_γ: other: 301.26 *9* from (p,nγ).
601.99	(7/2+)	79.56 *9*	17 *4*	522.25	5/2+				
		131.06[f] *4*	<252[f]	470.89	3/2+				
		275.57		326.50	9/2+				
		459.63[f] *19*	<65[f]	142.441	7/2+				
		485.39 *12*	100 *18*	116.594	5/2+				
622.09	13/2+	251.07 *8*	61 *6*	371.05	11/2+	M1+E2	−0.13 *3*	0.2326 *34*	E_γ,I_γ: from (p,nγ). Other: 251.03 *1* with Iγ=85 *8* from (α,2nγ) for a doublet. Mult.: D+Q from γ(θ) in (α,2nγ); M1 from ce data in (p,nγ).
		295.59 *1*	100.0 *17*	326.50	9/2+	E2[b]		0.0747 *10*	E_γ,I_γ: other: 295.67 *9*, Iγ=100 *11* from (p,nγ). Mult.,δ: for a doublet in (α,2nγ); Mult=M1 for a single line in (p,nγ).
631.82	13/2−	135.20 *2*	100 *6*	496.64	11/2−	M1+E2[c]	+0.13 *2*	1.306 *18*	E_γ: weighted average of 135.20 *1* from (α,2nγ) and 135.27 *5* from (p,nγ). I_γ: other: 100 *7* from (p,nγ).
		248.12 *1*	33 *8*	383.70	9/2−	E2[b]		0.1288 *18*	E_γ: other: 247.98 *15* from (p,nγ). I_γ: unweighted average of 25.7 *11* from (α,2nγ) and 41 *4* from (p,nγ).
657.84?	(7/2+)	331.21 *22*		326.50	9/2+	(M1+E2)		0.082 *29*	E_γ: unweighted average of 330.99 *9* from (α,2nγ) and 331.43 *20* from (p,nγ). I_γ: other: 100 *24* from (p,nγ) for a doublet.
		515.42[e] *4*		142.441	7/2+				E_γ: from (α,2nγ). Other: 515.60 *20* from (p,nγ). I_γ: 860 *140* from (α,2nγ) for a doublet.
		541.28 *25*		116.594	5/2+	(M1)		0.0308 *4*	E_γ,Mult.: from (p,nγ) for an unresolved doublet; not reported in (α,2nγ).
689.19	15/2+	67.02 *5*	6.1 *31*	622.09	13/2+				E_γ,I_γ: from (p,nγ).
		218.90 *2*	25.0 *6*	470.26	13/2−	(E1)		0.0425 *6*	E_γ: other: 218.77 *20* from (p,nγ). I_γ: weighted average of 25.1 *6* from (α,2nγ) and 23.9 *25* from (p,nγ). Mult.: D also from γ(θ) in (α,2nγ).
		318.14 *1*	100 *4*	371.05	11/2+	E2[b]		0.0599 *8*	E_γ,I_γ: other: 318.15 *15* with Iγ=100 *12* from (p,nγ).
699.17	(11/2−)	228.67[#] *7*	<1350	470.26	13/2−				E_γ,I_γ: from (p,nγ); for double placement, other from 371

$^{167}_{69}Tm_{98}$-10

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	δ[&]	α[d]	Comments
									level. Other Eγ=228.92 from (α,2nγ). Uncertainty doubled in the fitting of level scheme.
699.17	(11/2$^-$)	239.26 *2*	86 *5*	459.92	7/2$^-$				E_γ,I_γ: other: 238.79 *15* with Iγ=98 *8* from (p,nγ) for an unresolved doublet.
		372.70 *10*		326.50	9/2$^+$	(E1)		0.01139 *16*	E_γ,I_γ: other: 372.43 *15* with Iγ=183 *11* from (p,nγ) probably for a doublet with 372.96γ from 1161 level seen in (α,2nγ). Mult.: from ce data in (p,nγ) for a doublet.
		413.41 *12*	100 *11*	285.90	9/2$^-$	(M1+E2)		0.045 *17*	E_γ: weighted average of 413.39 *12* from (α,2nγ) and 413.50 *25* from (p,nγ). I_γ: from (p,nγ). Other: 100 *14* from (α,2nγ).
709.12	(9/2$^+$)	107.13 *4*	100 *50*	601.99	(7/2$^+$)				
		186.68 *11*	70 *25*	522.25	5/2$^+$				
		338.01 *22*	35 *10*	371.05	11/2$^+$				
		382.41 *30*	30 *15*	326.50	9/2$^+$				
		566.83 *11*	30 *5*	142.441	7/2$^+$				
741.37	17/2$^-$	271.12 *2*	100	470.26	13/2$^-$	E2[c]		0.0975 *14*	E_γ: weighted average of 271.12 *1* from (α,2nγ) and 271.26 *10* from (p,nγ). Mult.: (E2) also from ce data in (p,nγ) for a doublet.
779.01	15/2$^+$	181.50 *2*	34.2 *14*	597.48	13/2$^+$	M1+E2[c]	+0.45 *11*	0.537 *17*	Other: Eγ=181.47 *8* and Iγ in (p,nγ) are not reliable as the peak is contaminated by other γ rays.
		342.95[g] *1*	100[g] *6*	436.07	11/2$^+$	(E2)[b]		0.0480 *7*	E_γ: from (α,2nγ) for a doublet. Other: 343.28 *15* from (p,nγ) for a doublet placed from 460 and 779 levels. From data in (α,2nγ), main placement of this γ is from 779 and a minor placement from 1430 level, while a weak 343.37γ is placed from 460 level. Mult.: for a doublet in (α,2nγ).
780.48?	(9/2$^+$)	222.50[f h] *19*	<17[f]	557.93	5/2$^+$	[E2]		0.1829 *26*	
		453.97 *4*	100 *5*	326.50	9/2$^+$	(M1)		0.0485 *7*	Mult.: D from γ(θ) in (α,2nγ); (M1) from level scheme.
787.81	15/2$^-$	156.04 *3*	100 *4*	631.82	13/2$^-$	M1+E2[c]	+0.11 *2*	0.872 *12*	E_γ: weighted average of 156.03 *2* from (α,2nγ) and 156.11 *6* from (p,nγ). I_γ: other: 100 *9* from (p,nγ).
		291.150 *10*	47 *3*	496.64	11/2$^-$	(E2)[b]		0.0783 *11*	E_γ,I_γ: other: 291.02 *9* with Iγ=202 *22* from (p,nγ) for a doublet. Mult.: for a multiplet in (α,2nγ).
840.18	(11/2$^+$)	131.06[f] *4*	<242[f]	709.12	(9/2$^+$)				
		218.07[f] *17*	<96[f]	622.09	13/2$^+$				
		238.13 *4*	50 *4*	601.99	(7/2$^+$)				
		469.25 *6*	100 *25*	371.05	11/2$^+$	(M1)		0.0445 *6*	E_γ: weighted average of 469.26 *4* from (α,2nγ) and 468.91 *25* from (p,nγ).
		513.66 *5*	75 *8*	326.50	9/2$^+$				E_γ: other: 513.90 *30* from (p,nγ).

$^{167}_{69}Tm_{98}$-11

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	δ[&]	α[d]	Comments
852.79	(3/2$^-$)	665.13[f] *3*	<276[f]	187.660	5/2$^-$	(E2)		0.00856 *12*	E_γ: from (α,2nγ). Other: 664.79 *20* from (p,nγ); doublet in both. I_γ: 263 *13* for a doublet in (α,2nγ). γ not reported in (p,nγ).
		680.86 *16*	100 *25*	171.76	(1/2)$^-$				
867.77?	(5/2$^+$,7/2,9/2$^-$)	571.3[‡] *2*	56[‡] *12*	296.21	9/2$^+$				
		680.3[‡] *5*	37[‡] *12*	187.660	5/2$^-$				
		688.5[‡] *2*	100[‡] *28*	179.501	7/2$^+$				
882.12	(5/2$^-$)	694.46 *17*	100	187.660	5/2$^-$	(M1+E2)		0.012 *4*	E_γ: other: 693.71 *30* from (p,nγ) for a doublet. Mult.: for a doublet in (p,nγ).
927.87	(11/2$^+$)	270.14		657.84?	(7/2$^+$)				
		305.91 *27*	24 *6*	622.09	13/2$^+$				
		556.74[e] *5*	<189	371.05	11/2$^+$	(M1)		0.0287 *4*	I_γ: 165 *24* for a doublet in (α,2nγ).
		601.48 *5*	100 *12*	326.50	9/2$^+$				
929.74?	(9/2$^-$)	636.5 *5*	100	292.844	7/2$^-$	(M1)		0.02042 *29*	E_γ: unweighted average of 636.95 *20* from (α,2nγ) and 636.00 *35* from (p,nγ).
935.24	(7/2$^-$)	475.25[f] *6*	<209[f]	459.92	7/2$^-$	(M1)		0.0431 *6*	E_γ: other: 474.71 *25* from (p,nγ) for an unresolved doublet. Mult.: for a doublet.
		649.38 *4*	100 *32*	285.90	9/2$^-$	(M1)		0.01942 *27*	E_γ: other: 649.36 *20* from (p,nγ).
		747.50 *9*	18 *5*	187.660	5/2$^-$				
944.89	(11/2$^+$)	508.81 *14*	48 *9*	436.07	11/2$^+$				
		648.43 *11*	48 *9*	296.21	9/2$^+$				
		765.42 *3*	100 *9*	179.501	7/2$^+$	(E2)		0.00623 *9*	E_γ: other: 765.23 *25* from (p,nγ).
965.77	17/2$^-$	177.95 *2*	100.0 *34*	787.81	15/2$^-$	M1+E2[c]	+0.12 *1*	0.602 *8*	
		333.96 *1*	67 *7*	631.82	13/2$^-$	E2[b]		0.0519 *7*	E_γ: other: 333.36 *20* from (p,nγ).
978.55	17/2$^+$	199.56 *4*	24.3 *13*	779.01	15/2$^+$	M1+E2[c]	+0.46 *+7−9*	0.409 *11*	E_γ: weighted average of 199.56 *2* from (α,2nγ) and 199.00 *30* from (p,nγ).
		356.40 *14*	5.1 *9*	622.09	13/2$^+$				
		380.81 *21*	100.0 *21*	597.48	13/2$^+$	E2[b]		0.0356 *5*	E_γ: unweighted average of 381.01 *1* from (α,2nγ) and 380.60 *15* from (p,nγ). I_γ: other: 100 *12* from (p,nγ).
993.60	(17/2$^+$)	304.41 *1*	100 *6*	689.19	15/2$^+$	(M1+E2)	−0.23 *+16−17*	0.136 *7*	I_γ: from (^{7}Li,4nγ). E_γ: other: 304.50 *20* from (p,nγ).
		371.52[g] *1*	113.7[g] *33*	622.09	13/2$^+$	(E2)[b]		0.0382 *5*	E_γ,Mult.: for a doublet. Other: 371.26 *30* from (p,nγ) for a doublet. I_γ: from (^{7}Li,4nγ). Doublet in (α,2nγ), where intensity is divided in two placements, based on branching ratio in (^{7}Li,4nγ).

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	δ[&]	α[d]	Comments
1001.23	(13/2$^+$)	161.45[h] *6*		840.18	(11/2$^+$)				E_γ,I_γ: from (p,nγ) with Iγ=830 *60* for a triplet. level-energy difference=161.02.
		292.07		709.12	(9/2$^+$)				
		312.11 *11*	26.7 *33*	689.19	15/2$^+$				
		379.15[f] *2*	<173[f]	622.09	13/2$^+$				
		630.14 *3*	100 *7*	371.05	11/2$^+$	(M1)		0.02095 *29*	E_γ,I_γ: other: 630.00 *40* with Iγ=100 *31* from (p,nγ).
1007.62	(15/2$^-$)	266.40 *11*	18.5 *19*	741.37	17/2$^-$				
		308.46 *2*	56 *4*	699.17	(11/2$^-$)	(E2)		0.0657 *9*	Mult.: (Q) from γ(θ) in (α,2nγ); (E2) from level scheme.
		385.50 *2*	100 *6*	622.09	13/2$^+$	(E1)		0.01052 *15*	Mult.: D from γ(θ) in (α,2nγ); (E1) from level scheme.
		537.39 *3*	72 *6*	470.26	13/2$^-$	(M1)		0.0314 *4*	E_γ: from (α,2nγ). Other: 537.59 *35* from (p,nγ).
1008.50	(9/2$^-$)	722.60 *3*	100	285.90	9/2$^-$	(E2)		0.00708 *10*	E_γ: other: 722.54 *25* from (p,nγ). Mult.: from ce data in (p,nγ).
1044.06	11/2$^-$	114.32 *5*	100 *42*	929.74?	(9/2$^-$)				E_γ: not reported in (p,nγ).
		547.42 *3*	<97	496.64	11/2$^-$	(M1)		0.0300 *4*	E_γ,I_γ: from (α,2nγ) with Iγ=87 *10* for a doublet. Other: 547.20 *20* from (p,nγ).
		660.36 *5*	65 *7*	383.70	9/2$^-$	(M1)		0.01861 *26*	E_γ,I_γ: other: 660.70 *25* with Iγ=61 *9* from (p,nγ).
		751.21[f] *10*	<84[f]	292.844	7/2$^-$	(E2)		0.00649 *9*	α(K)=0.00533 *7*; α(L)=0.000903 *13*; α(M)=0.0002038 *29* α(N)=4.74×10^{-5} *7*; α(O)=6.57×10^{-6} *9*; α(P)=3.00×10^{-7} *4* E_γ: other: 751.50 *50* from (p,nγ).
1086.57	19/2$^+$	345.20 *2*	74.2 *25*	741.37	17/2$^-$	(E1)		0.01367 *19*	I_γ: from (^{7}Li,4nγ). Other: 27.4 *8* in (α,2nγ) is in disagreement. Mult.: D from γ(θ) in (α,2nγ), E1 from level scheme.
		397.38 *2*	100.0 *19*	689.19	15/2$^+$	E2[c]		0.0316 *4*	E_γ: weighted average of 397.38 *1* from (α,2nγ) and 397.57 *15* from (p,nγ). Mult.: (E2) also from ce data in (p,nγ).
1096.22	21/2$^-$	354.85 *1*	100	741.37	17/2$^-$	E2[c]		0.0435 *6*	E_γ: other: 354.80 *10* from (p,nγ).
1096.47	(13/2$^+$)	168.66 *4*	100 *8*	927.87	(11/2$^+$)				
		315.79 *17*	17 *4*	780.48?	(9/2$^+$)				
		407.27[h]		689.19	15/2$^+$				
		474.38		622.09	13/2$^+$				
		725.34 *4*	75 *13*	371.05	11/2$^+$				
1101.24	(13/2$^+$)	156.33		944.89	(11/2$^+$)				
		503.84 *13*	28 *8*	597.48	13/2$^+$				
		665.13[f] *3*	<88[f]	436.07	11/2$^+$				
		805.07 *4*	100 *8*	296.21	9/2$^+$				
1105.33	(11/2$^-$)	635.07 *3*		470.26	13/2$^-$				
		819.41		285.90	9/2$^-$				
1160.96	19/2$^-$	195.20 *1*	67.5 *21*	965.77	17/2$^-$	(M1+E2)	≈0.15	≈0.464	
		372.96[#] *5*	100.0 *25*	787.81	15/2$^-$	E2[c]		0.0377 *5*	E_γ: other: 371.26 *30* from (p,nγ) for a doublet. Uncertainty

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	δ[&]	α[d]	Comments
									doubled in the fitting of level scheme. level-energy difference=373.156.
1163.96	(15/2$^+$)	162.82 *9*	100 *5*	1001.23	(13/2$^+$)				
		323.34 *19*	29 *5*	840.18	(11/2$^+$)				
		474.77		689.19	15/2$^+$				
		541.87 *7*	57 *14*	622.09	13/2$^+$				
1194.82	19/2$^+$	216.29 *4*	66.5 *31*	978.55	17/2$^+$	(M1+E2)	≈0.46	≈0.326	I_γ: from (^{7}Li,4nγ). Other: 15.2 *20* in (α,2nγ) is in disagreement.
		415.79 *2*	100.0 *20*	779.01	15/2$^+$	E2[c]		0.0279 *4*	E_γ: other: 415.60 *20* from (p,nγ).
1216.56	7/2$^+$	832.9[‡] *3*	1.70[‡]	383.70	9/2$^-$				
		920.32[‡] *8*	19.0[‡] *29*	296.21	9/2$^+$	M1[a]		0.00815 *11*	
		923.7[‡] *4*	1.0[‡] *4*	292.844	7/2$^-$				
		1037.07[‡] *7*	100[‡] *12*	179.501	7/2$^+$	M1[a]		0.00608 *9*	
1223.11	(13/2$^-$)	523.93		699.17	(11/2$^-$)				
		752.85 *3*		470.26	13/2$^-$				
1229.85	(7/2$^-$)	672.1[‡] *2*	21[‡] *5*	557.93	5/2$^+$				
		707.7[‡] *4*	8[‡] *5*	522.25	5/2$^+$				
		733.2[‡h] *3*	18[‡] *5*	496.64	11/2$^-$				
		846.1[‡] *2*	34[‡] *6*	383.70	9/2$^-$				
		903.3[‡] *2*	17[‡] *5*	326.50	9/2$^+$				
		933.8[‡] *3*	14[‡] *5*	296.21	9/2$^+$				
		936.7[‡] *3*	18[‡] *6*	292.844	7/2$^-$				
		1050.3[‡] *2*	100[‡] *24*	179.501	7/2$^+$				
1276.78	(15/2$^+$)	175.34[#] *6*	100 *7*	1101.24	(13/2$^+$)				Uncertainty doubled in the fitting of level scheme.
		332.11[#] *6*	54 *7*	944.89	(11/2$^+$)				Uncertainty doubled in the fitting of level scheme.
		497.71[e] *4*	<161	779.01	15/2$^+$				I_γ: 150 *11* for a doublet.
		679.43 *7*	71 *7*	597.48	13/2$^+$				
		840.70 *6*	68 *7*	436.07	11/2$^+$				
1281.46	(15/2$^+$)	185.11[h] *17*	127 *46*	1096.47	(13/2$^+$)				
		287.70 *11*	27 *8*	993.60	(17/2$^+$)				
		353.42 *15*	100 *35*	927.87	(11/2$^+$)				
		592.27		689.19	15/2$^+$				
		659.18 *24*	19 *4*	622.09	13/2$^+$				
1358.75	(15/2$^-$)	253.43[e] *4*	<58	1105.33	(11/2$^-$)				I_γ: 53 *5* for a doublet.
		617.33 *4*	100 *10*	741.37	17/2$^-$				
		888.37 *12*	38 *5*	470.26	13/2$^-$				
1372.75	(17/2$^+$)	208.86[f] *7*	<21[f]	1163.96	(15/2$^+$)				I_γ: 16 *5* for the doublet.

$^{167}_{69}Tm_{98}$-14

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	δ[&]	α[d]	Comments
1372.75	(17/2$^+$)	286.25 *17*	7.7 *23*	1086.57	19/2$^+$				
		371.52[g] *1*	100[g] *12*	1001.23	(13/2$^+$)	(E2)		0.0382 *5*	Mult.: from (α,2nγ) for a doublet.
		379.15[f] *2*	<40.0[f]	993.60	(17/2$^+$)				I_γ: 37.7 *23* for the doublet.
		683.54 *4*	16.2 *16*	689.19	15/2$^+$				
1378.19	21/2$^-$	217.27 *2*	29.8 *15*	1160.96	19/2$^-$	(M1+E2)	≈0.17	≈0.344	I_γ: from (^{7}Li,4nγ). Other: 80.0 *31* in (α,2nγ) is in disagreement.
		412.39 *2*	100.0 *23*	965.77	17/2$^-$	E2[c]		0.0285 *4*	
1380.98	(19/2$^-$)	284.73 *16*	12.9 *32*	1096.22	21/2$^-$				
		373.42 *12*	71 *23*	1007.62	(15/2$^-$)				
		387.26 *5*	51.6 *32*	993.60	(17/2$^+$)	(E1)		0.01041 *15*	Mult.: D from γ(θ) in (α,2nγ); (E1) from level scheme.
		639.89[#] *4*	100 *5*	741.37	17/2$^-$				Uncertainty tripled in the fitting of level scheme. level-energy difference=639.63.
1424.67	21/2$^+$	229.85 *4*	10.8 *6*	1194.82	19/2$^+$	(M1+E2)	≈0.30	≈0.287	I_γ: from (^{7}Li,4nγ). Other: 27.2 *10* in (α,2nγ) is in disagreement.
		431.11[f] *4*	<21[f]	993.60	(17/2$^+$)				I_γ: 18.4 *20* for the doublet. This γ not reported in (^{7}Li,4nγ).
		446.11 *5*	100.0 *30*	978.55	17/2$^+$	E2[c]		0.02307 *32*	I_γ: from (^{7}Li,4nγ). Other: 100 *46* in (α,2nγ).
1429.52	21/2$^{(+)}$	334 *1*		1096.22	21/2$^-$				γ from (^{7}Li,4nγ) only, Iγ not available.
		342.95[g] *1*	61[g] *4*	1086.57	19/2$^+$				I_γ: from (^{7}Li,4nγ).
		435.94 *2*	100.0 *31*	993.60	(17/2$^+$)	(E2)		0.02454 *34*	Mult.: γ(θ) in (α,2nγ) consistent with ΔJ=2; most likely E2.
		450.81 *21*	3.1 *8*	978.55	17/2$^+$				γ not reported in (^{7}Li,4nγ).
1432.33?	(5/2$^-$,7/2)	1048.5[‡] *3*	31[‡] *16*	383.70	9/2$^-$				
		1139.5[‡] *1*	100[‡] *14*	292.844	7/2$^-$				
1470.16	(17/2$^+$)	193.45 *7*	100 *5*	1276.78	(15/2$^+$)				
		368.99 *12*	75 *10*	1101.24	(13/2$^+$)				
		491.70		978.55	17/2$^+$				
		691.20		779.01	15/2$^+$				
		872.62 *8*	80 *10*	597.48	13/2$^+$				
1487.36	(17/2$^+$)	206.18[h] *10*	144 *22*	1281.46	(15/2$^+$)				
		390.61 *12*	100 *22*	1096.47	(13/2$^+$)				
		400.56 *15*	67 *22*	1086.57	19/2$^+$				
		798.46 *10*	78 *11*	689.19	15/2$^+$				
1524.93	(17/2$^-$)	301.84		1223.11	(13/2$^-$)				
		517.34		1007.62	(15/2$^-$)				
		783.57 *3*		741.37	17/2$^-$				
1527.45	(5/2$^-$)	1234.63[‡] *7*	100[‡] *12*	292.844	7/2$^-$				
		1340.1[‡] *4*	2.6[‡] *9*	187.660	5/2$^-$				

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	α[d]	Comments
1527.45	(5/2⁻)	1384.8[‡] *2*	5.3[‡] *12*	142.441	7/2⁺			
		1410.7[‡] *4*	2.0[‡] *7*	116.594	5/2⁺			
		1517.0[‡] *2*	5.5[‡] *10*	10.417	3/2⁺			
1528.69	25/2⁻	432.47 *2*	100	1096.22	21/2⁻	E2[c]	0.02507 *35*	
1543.80	(5/2⁺,7/2⁺)	1217.1[‡] *2*	100[‡] *30*	326.50	9/2⁺			
		1427.8[‡] *3*	46[‡] *15*	116.594	5/2⁺			
		1533.1[‡] *4*	24[‡] *9*	10.417	3/2⁺			
1550.03	23/2[(+)]	453.77	62.56 *31*	1096.22	21/2⁻			I_γ: from (^{7}Li,4nγ).
		463.44 *3*	100.0 *31*	1086.57	19/2⁺	(E2)	0.02086 *29*	I_γ: from (^{7}Li,4nγ). Mult.: γ(θ) in (α,2nγ) consistent with ΔJ=2.
1562.93	(19/2⁺)	190.14 *9*	41 *9*	1372.75	(17/2⁺)			
		398.65 *13*	55 *14*	1163.96	(15/2⁺)			
		476.35 *9*	100 *18*	1086.57	19/2⁺			
		569.35[f] *6*	<82[f]	993.60	(17/2⁺)			
1580.97	(5/2⁺,7/2⁺)	1022.9[‡] *2*	32[‡] *6*	557.93	5/2⁺			
		1110.3[‡] *1*	31[‡] *6*	470.89	3/2⁺			
		1254.5[‡] *4*	7.7[‡] *30*	326.50	9/2⁺			
		1288.1[‡] *1*	100[‡] *14*	292.844	7/2⁻			
		1298.2[‡] *6*	6.6[‡] *30*	282.24	(3/2)			
		1393.1[‡] *2*	18[‡] *4*	187.660	5/2⁻			
		1401.9[‡] *3*	8.3[‡] *30*	179.501	7/2⁺			
		1438.3[‡] *1*	64[‡] *10*	142.441	7/2⁺			
		1464.8[‡] *2*	17[‡] *4*	116.594	5/2⁺			
		1570.4[‡] *2*	83[‡] *13*	10.417	3/2⁺			
1597.58	(5/2⁻,7/2⁺)	1213.3[‡] *2*	19[‡] *6*	383.70	9/2⁻			
		1304.9[‡] *1*	100[‡] *15*	292.844	7/2⁻			
		1455.1[‡] *1*	69[‡] *10*	142.441	7/2⁺			
		1481.1[‡] *3*	7.5[‡] *31*	116.594	5/2⁺			
		1587.1[‡] *2*	85[‡] *11*	10.417	3/2⁺			
1606.80	(23/2⁻)	228.61[g] *1*	100[g] *5*	1378.19	21/2⁻			I_γ: from (^{7}Li,4nγ).
		445.82 *4*	28.7 *14*	1160.96	19/2⁻			I_γ: from (^{7}Li,4nγ).
1629.65	(5/2⁺,7/2⁺)	1332.5[‡#] *2*	48[‡] *13*	296.21	9/2⁺			Uncertainty doubled in the fitting of level scheme. level-energy difference=1333.43.
		1337.2[‡] *5*	25[‡] *13*	292.844	7/2⁻			

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	α[d]	Comments
1629.65	(5/2$^+$,7/2$^+$)	1487.4[‡] *2*	77[‡] *18*	142.441	7/2$^+$			
		1511.9[‡h] *2*		116.594	5/2$^+$			level-energy difference=1513.05.
		1619.2[‡] *2*	100[‡] *14*	10.417	3/2$^+$			
1654.33	(5/2$^+$,7/2$^+$)	1358.3[‡] *4*	6.0[‡]	296.21	9/2$^+$			
		1361.5[‡] *1*	100[‡] *19*	292.844	7/2$^-$			
		1511.9[‡] *2*	71[‡] *11*	142.441	7/2$^+$			
		1537.5[‡] *4*	17[‡] *8*	116.594	5/2$^+$			
		1643.8[‡] *2*	80[‡] *10*	10.417	3/2$^+$			
1668.93	(23/2$^+$)	244.27 *3*	86 *5*	1424.67	21/2$^+$			I_γ: from (^{7}Li,4nγ). Other: 13 *4* in (α,2nγ) is in disagreement.
		474.09 *3*	100.0 *25*	1194.82	19/2$^+$			I_γ: from (^{7}Li,4nγ). Other: 100 *14* in (α,2nγ).
1678.90	(19/2$^+$)	208.86[f] *7*	124[f] *35*	1470.16	(17/2$^+$)			
		402.07 *5*	71 *12*	1276.78	(15/2$^+$)			
		484.08 *11*	59 *18*	1194.82	19/2$^+$			
		700.36 *7*	100 *12*	978.55	17/2$^+$			
1691.24	(19/2$^-$)	332.36 *6*	61 *6*	1358.75	(15/2$^-$)			
		595.05 *3*	100 *6*	1096.22	21/2$^-$			
		950.11 *21*	44.4 *28*	741.37	17/2$^-$			
1705.57	(19/2$^+$)	218.07[fh] *17*	<180[f]	1487.36	(17/2$^+$)			
		276.22[e] *11*	<82	1429.52	21/2$^{(+)}$			
		424.05 *5*	82 *9*	1281.46	(15/2$^+$)			
		619.04 *7*	100 *18*	1086.57	19/2$^+$			
		1016.62 *29*	55 *9*	689.19	15/2$^+$			
1808.66	(23/2$^-$)	279.96		1528.69	25/2$^-$			
		379.15[f] *2*	<114[f]	1429.52	21/2$^{(+)}$			
		427.66 *3*	65.2 *22*	1380.98	(19/2$^-$)	(E2)	0.0258 *4*	
		712.41 *3*	100 *4*	1096.22	21/2$^-$			γ not reported in (^{7}Li,4nγ).
1813.96	(21/2$^+$)	251.03 *1*	<3220	1562.93	(19/2$^+$)	(D)		E_γ,I_γ: from (α,2nγ) with Iγ=2930 *290* for a doublet. Mult.: D for a doublet from (α,2nγ).
		384.44[h]		1429.52	21/2$^{(+)}$			
		441.22 *3*	<415	1372.75	(17/2$^+$)			E_γ,I_γ: from (α,2nγ) with Iγ-386 *29* for a doublet.
		727.63 *11*	100 *29*	1086.57	19/2$^+$			
1858.66	(25/2$^-$)	251.84 *2*	20.6 *18*	1606.80	(23/2$^-$)			I_γ: from (^{7}Li,4nγ). Other Iγ: see comment for 480.5γ.
		480.50[e] *17*	100 *6*	1378.19	21/2$^-$			Eγ is for a doublet in (α,2nγ). I_γ: from (^{7}Li,4nγ). Other: Iγ is a doublet in (α,2ng), Iγ(480.5)/Iγ(252.8)=0.82 *20* versus 4.86 *51* in (^{7}Li,4nγ).
1901.27	(21/2$^+$)	222.50[f] *19*	<88[f]	1678.90	(19/2$^+$)			
		431.11[f] *4*	<263[f]	1470.16	(17/2$^+$)			

$^{167}_{69}Tm_{98}$-17

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	α[d]	Comments
1901.27	(21/2$^+$)	706.35 *15*	100 *25*	1194.82	19/2$^+$			
1915.39	(25/2$^+$)	365.35 *3*	25.6 *20*	1550.03	23/2$^{(+)}$			I_γ: from (^{7}Li,4nγ). Other: 32.6 *23* in (α,2nγ).
		386.67		1528.69	25/2$^-$			γ not reported in (^{7}Li,4nγ).
		485.98 *13*	100 *8*	1429.52	21/2$^{(+)}$			I_γ: from (^{7}Li,4nγ). Other: 100 *9* in (α,2nγ).
		491.02 *26*	35 *5*	1424.67	21/2$^+$			γ not reported in (^{7}Li,4nγ).
1916.61	(21/2$^-$)	391.72 *5*		1524.93	(17/2$^-$)			
		535.61		1380.98	(19/2$^-$)			
		820.44		1096.22	21/2$^-$			
1922.39	(25/2$^+$)	253.43[e] *4*	11.1 *12*	1668.93	(23/2$^+$)	(D)		I_γ: from (^{7}Li,4nγ). Other: 50 *5* for a doublet in (α,2nγ). Mult.: D for a doublet from (α,2nγ).
		492.89 *6*	≈36	1429.52	21/2$^{(+)}$			γ not reported in (^{7}Li,4nγ). Iγ(493)/Iγ(498)=1.5 *2*/4.2 *3* in (α,2nγ), 498γ is doublet.
		497.71[e] *4*	100 *4*	1424.67	21/2$^+$	(E2)	0.01733 *24*	I_γ: from (^{7}Li,4nγ). Other: 100 *7* for a doublet in (α,2nγ). Mult.: Q for a doublet from (α,2nγ).
2022.25	(23/2$^+$)	459.63[f] *19*	<88[f]	1562.93	(19/2$^+$)			
		472.17 *8*	100 *24*	1550.03	23/2$^{(+)}$			
2030.77	29/2$^{(-)}$	502.09 *4*	100	1528.69	25/2$^-$	(E2)	0.01695 *24*	Mult.: γ(θ) from (α,2nγ) consistent with ΔJ=2.
2065.45	(27/2$^+$)	515.42[e] *4*	56.6 *24*	1550.03	23/2$^{(+)}$			I_γ: from (^{7}Li,4nγ). Iγ not available in (α,2nγ).
		536.72	100.0 *34*	1528.69	25/2$^-$			I_γ: from (^{7}Li,4nγ). Iγ not available in (α,2nγ).
2098.06	(23/2$^-$)	406.84 *4*	100 *8*	1691.24	(19/2$^-$)			
		569.35[f] *6*	<45[f]	1528.69	25/2$^-$			
		1001.70 *23*	15.0 *25*	1096.22	21/2$^-$			
2113.89	(27/2$^-$)	255.12 *6*	100 *10*	1858.66	(25/2$^-$)			I_γ: from (^{7}Li,4nγ). Other: 100 *14* in (α,2nγ).
		507.14[e] *4*	113 *6*	1606.80	(23/2$^-$)			I_γ: from (^{7}Li,4nγ). Other: 145 *9* for a doublet in (α,2nγ).
2135.94	(23/2$^+$)	234.68 *7*	24 *6*	1901.27	(21/2$^+$)			
		457.05 *6*	100 *12*	1678.90	(19/2$^+$)			
		711.34[h]		1424.67	21/2$^+$			
2186.45	(27/2$^+$)	264.02 *8*	20.2 *24*	1922.39	(25/2$^+$)			I_γ: from (^{7}Li,4nγ). Other: 30.3 *30* in (α,2nγ).
		517.53 *3*	100.0 *33*	1668.93	(23/2$^+$)			I_γ: from (^{7}Li,4nγ). Other: 100 *18* in (α,2nγ).
2279.75	(27/2$^-$)	471.01 *7*	100 *24*	1808.66	(23/2$^-$)			I_γ: from (α,2nγ).
		751.21[f] *10*	<124[f]	1528.69	25/2$^-$			γ not reported in (^{7}Li,4nγ). Other: Iγ=110 *14* for a doublet in (α,2nγ).
2321.08?	(25/2$^+$)	405.69 *4*	47 *13*	1915.39	(25/2$^+$)			I_γ: for a doublet.
		507.14[eh] *4*	100 *6*	1813.96	(21/2$^+$)			I_γ: for a doublet.
2381.92?	(25/2$^+$)	246.10 *16*	100 *33*	2135.94	(23/2$^+$)			
		480.50[e] *17*	<1430	1901.27	(21/2$^+$)			
2394.45	(29/2$^-$)	280.56	23.7 *23*	2113.89	(27/2$^-$)			I_γ: from (^{7}Li,4nγ). Iγ not available in (α,2nγ).
		535.79 *3*	100 *6*	1858.66	(25/2$^-$)			I_γ: from (^{7}Li,4nγ). Other: Iγ=100 *9* in (α,2nγ).
2396.42	(25/2$^-$)	479.88 *6*	100 *12*	1916.61	(21/2$^-$)			

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Comments
2396.42	(25/2$^-$)	587.45 *15*	10.0 *20*	1808.66	(23/2$^-$)	
		867.36 *26*	8.0 *20*	1528.69	25/2$^-$	
2440.46	(29/2$^+$)	375.02		2065.45	(27/2$^+$)	γ not reported in (^{7}Li,4nγ).
		518.17[h]		1922.39	(25/2$^+$)	γ not reported in (^{7}Li,4nγ).
		525.07 *5*	100 *8*	1915.39	(25/2$^+$)	I_γ: from (^{7}Li,4nγ). Other: 100 *14* in (α,2nγ).
2455.62	(29/2$^+$)	269.17 *11*	8.2 *8*	2186.45	(27/2$^+$)	I_γ: from (^{7}Li,4nγ). Other: 100 *12* in (α,2nγ).
		533.18 *12*	100 *5*	1922.39	(25/2$^+$)	I_γ: from (^{7}Li,4nγ). Other: 100 *12* in (α,2nγ).
2573.30	(27/2$^-$)	475.25[f] *6*	<380[f]	2098.06	(23/2$^-$)	
		542.51 *15*	100 *25*	2030.77	29/2$^{(-)}$	
		1044.60		1528.69	25/2$^-$	
2593.46	(33/2$^-$)	562.68 *10*	100	2030.77	29/2$^{(-)}$	
2620.14	(31/2$^+$)	554.66 *7*	63.7 *27*	2065.45	(27/2$^+$)	I_γ: from (^{7}Li,4nγ). Other: 100 *14* in (α,2nγ).
		589.47 *12*	100 *5*	2030.77	29/2$^{(-)}$	I_γ: from (^{7}Li,4nγ). Other: 100 *14* in (α,2nγ).
2670.64	(31/2$^-$)	276.22[e] *11*	100 *16*	2394.45	(29/2$^-$)	I_γ: from (^{7}Li,4nγ). Other: 25 *7* for a doublet in (α,2nγ).
		556.74[e] *5*	88 *5*	2113.89	(27/2$^-$)	I_γ: from (^{7}Li,4nγ). Other: 100 *14* for a doublet in (α,2nγ). I_γ: for a doublet.
2735.83	(31/2$^+$)	280.21 *2*	32 *4*	2455.62	(29/2$^+$)	I_γ: from (^{7}Li,4nγ). Other: 100 *4* in (α,2nγ).
		549.50 *19*	100 *4*	2186.45	(27/2$^+$)	I_γ: from (^{7}Li,4nγ). Other: 32 *8* in (α,2nγ).
2799.06	(31/2$^-$)	519.31		2279.75	(27/2$^-$)	
		768.28 *22*	100 *20*	2030.77	29/2$^{(-)}$	I_γ: from (α,2nγ). This γ is not reported in (^{7}Li,4nγ).
2972.4	(33/2$^-$)	578 *1*	100	2394.45	(29/2$^-$)	
2993.5	(33/2$^+$)	553 *1*	100	2440.46	(29/2$^+$)	
3013.5	(33/2$^+$)	277 *1*	8.2 *14*	2735.83	(31/2$^+$)	
		559 *1*	100 *7*	2455.62	(29/2$^+$)	
3208.8	(35/2$^+$)	589 *1*	100 *5*	2620.14	(31/2$^+$)	
		615 *1*		2593.46	(33/2$^-$)	
3210.5	(37/2$^-$)	617 *1*	100	2593.46	(33/2$^-$)	
3261.6	(35/2$^-$)	591 *1*	100	2670.64	(31/2$^-$)	
3311.2	(35/2$^+$)	298 *1*	18.1 *36*	3013.5	(33/2$^+$)	
		575 *1*	100 *6*	2735.83	(31/2$^+$)	
3575.5	(37/2$^+$)	582 *1*	100	2993.5	(33/2$^+$)	
3579.4	(37/2$^-$)	607 *1*	100	2972.4	(33/2$^-$)	
3600.5	(37/2$^+$)	587 *1*	100	3013.5	(33/2$^+$)	
3832.8	(39/2$^+$)	624 *1*	100	3208.8	(35/2$^+$)	
3877.5	(41/2$^-$)	667 *1*	100	3210.5	(37/2$^-$)	
3878.6	(39/2$^-$)	617 *1*	100	3261.6	(35/2$^-$)	
3916.2	(39/2$^+$)	605 *1*	100	3311.2	(35/2$^+$)	
4196.5	(41/2$^+$)	621 *1*	100	3575.5	(37/2$^+$)	
4196.5?	(41/2$^+$)	596[h] *1*		3600.5	(37/2$^+$)	

$^{167}_{69}Tm_{98}$-19

Adopted Levels, Gammas (continued)

γ(^{167}Tm) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π
4196.5?	(41/2$^+$)	596[h] *1*		3600.5	(37/2$^+$)	5970.8	(51/2$^+$)	766 *1*	100	5204.8	(47/2$^+$)
4494.8	(43/2$^+$)	662 *1*	100	3832.8	(39/2$^+$)	6185.5	(53/2$^-$)	820 *1*	100	5365.5	(49/2$^-$)
4565.2	(43/2$^+$)	649 *1*	100	3916.2	(39/2$^+$)	7055.5	(57/2$^-$)	870 *1*	100	6185.5	(53/2$^-$)
4596.5	(45/2$^-$)	719 *1*	100	3877.5	(41/2$^-$)	7979.5	(61/2$^-$)	924 *1*	100	7055.5	(57/2$^-$)
4868.5?	(45/2$^+$)	672[h] *1*		4196.5	(41/2$^+$)	8952.5	(65/2$^-$)	973		7979.5	(61/2$^-$)
5204.8	(47/2$^+$)	710 *1*	100	4494.8	(43/2$^+$)						
5365.5	(49/2$^-$)	769 *1*	100	4596.5	(45/2$^-$)						

[†] From (α,2nγ) up to 2799 level and from (^{7}Li,4nγ) above that, unless otherwise noted. Intensities are relative photon branching from each level and upper limits are reported for photon branchings affected by multiple placement.

[‡] From ^{167}Yb ε decay.

[#] Poor fit in the level scheme; uncertainty increased as noted in comments for the γ ray.

[@] From ce data in (p,nγ), unless otherwise noted. For Mult=(M1+E2) or (E1+M2) quoted from (α,2nγ), D+Q is from $\gamma(\theta)$ and electric/magnetic nature is from level scheme.

[&] From $\gamma(\theta)$ in (α,2nγ), unless otherwise noted.

[a] From ce data in ^{167}Yb ε decay. δ is deduced by evaluators using the BrIccMixing code.

[b] E2 or (E2) from ce data in (p,nγ); $\gamma(\theta)$ in (α,2nγ) consistent with $\Delta J=2$. Where a firm E2 is adopted while (E2) from (p,nγ), it is because M2 is ruled out by RUL since it would require an isomeric lifetime of $\approx$ or $>$ 100 ns.

[c] D+Q (or Q) from $\gamma(\theta)$ in (α,2nγ), with E1+M2 (or M2) ruled out by RUL since a large M2 component would require half−life of $\approx$ or $>$ 100 ns, which is very unlikely.

[d] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

[e] Multiply placed.

[f] Multiply placed with undivided intensity.

[g] Multiply placed with intensity suitably divided.

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

$^{167}_{69}Tm_{98}$-20

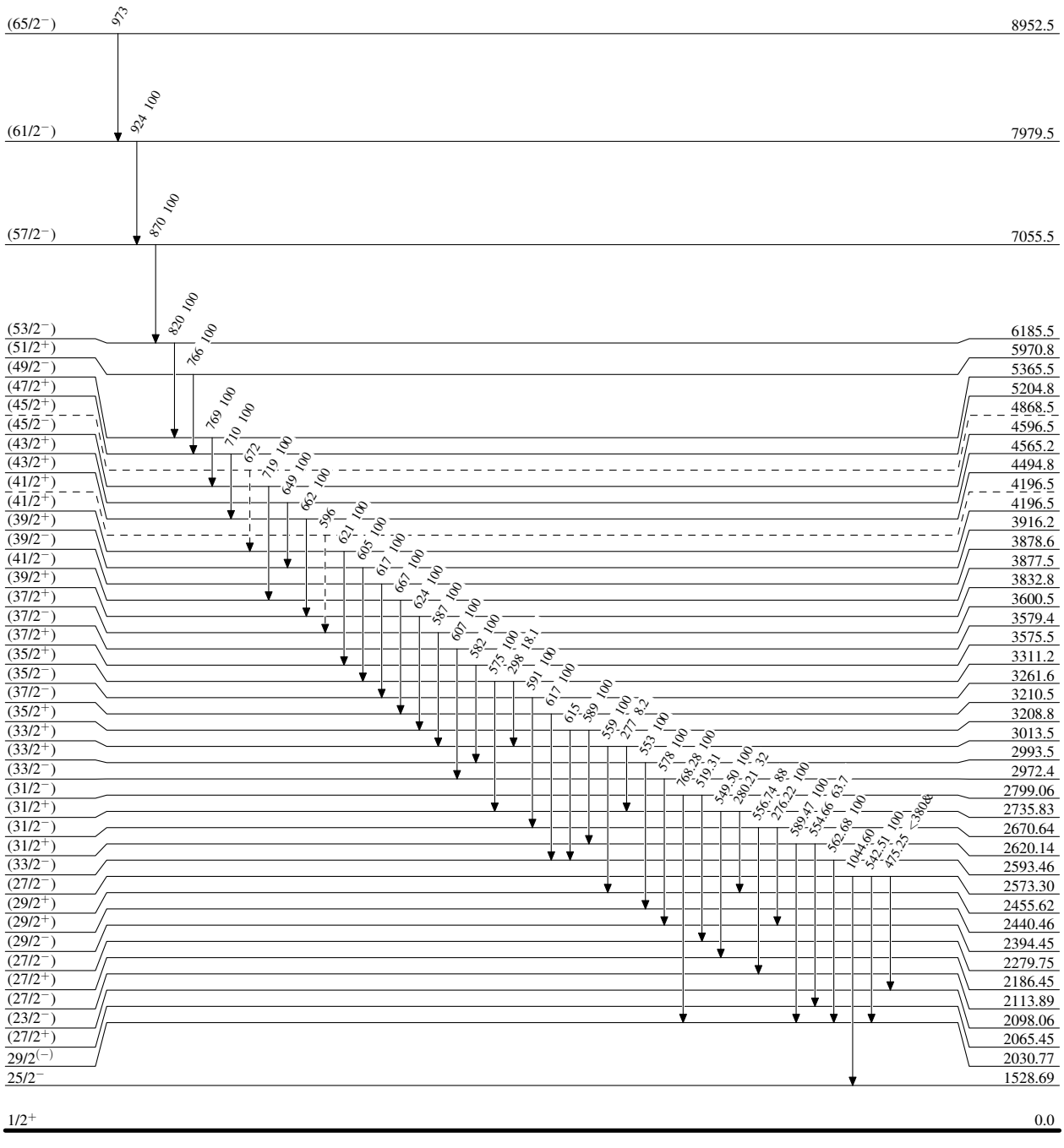
Adopted Levels, Gammas

Legend

Level Scheme

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

- - - - - - ► γ Decay (Uncertain)



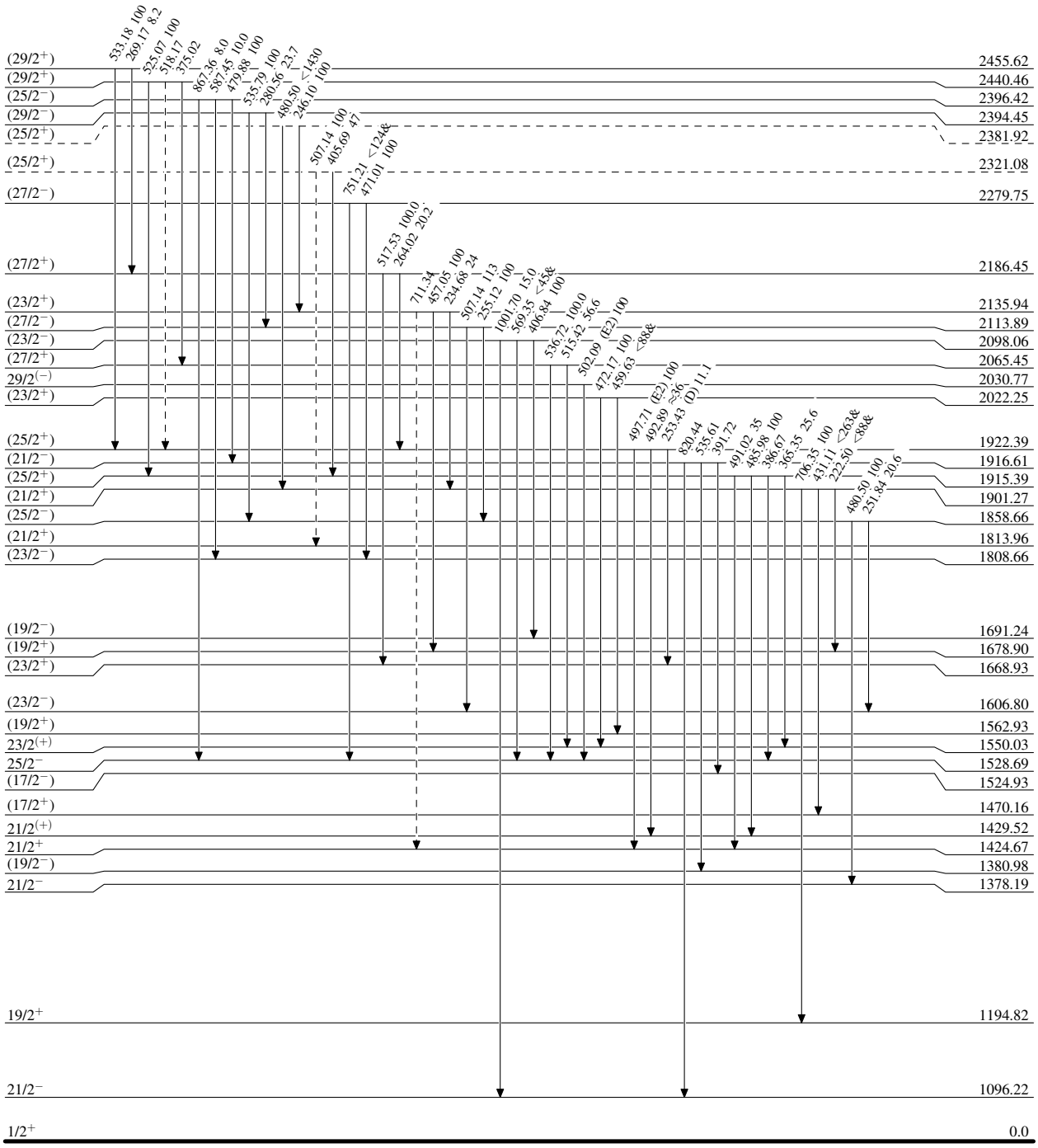
Adopted Levels, Gammas

Legend

Level Scheme (continued)

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

- - - - - - ► γ Decay (Uncertain)



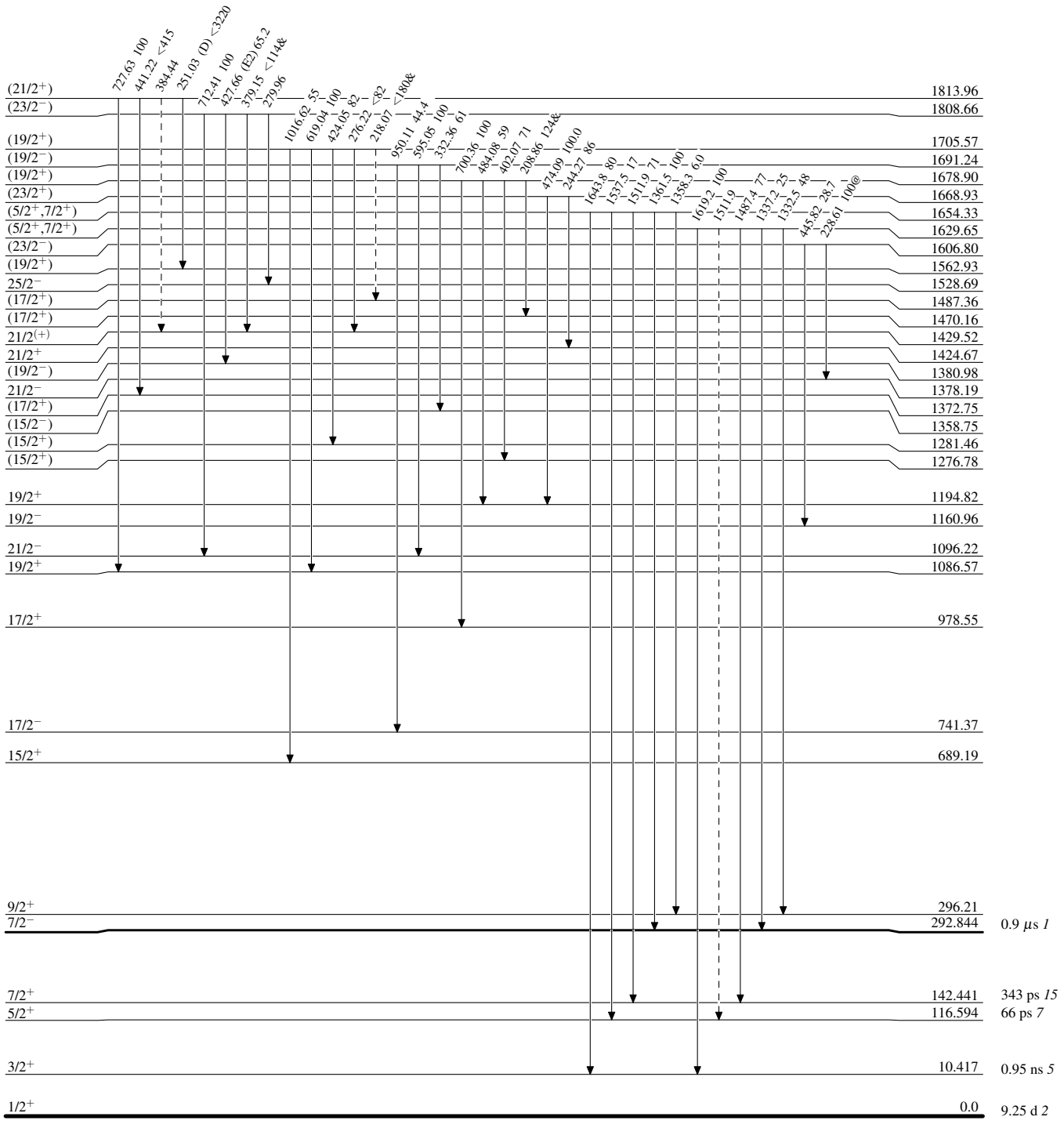
$^{167}_{69}Tm_{98}$

Adopted Levels, Gammas

Level Scheme (continued)

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

Legend: ------► γ Decay (Uncertain)

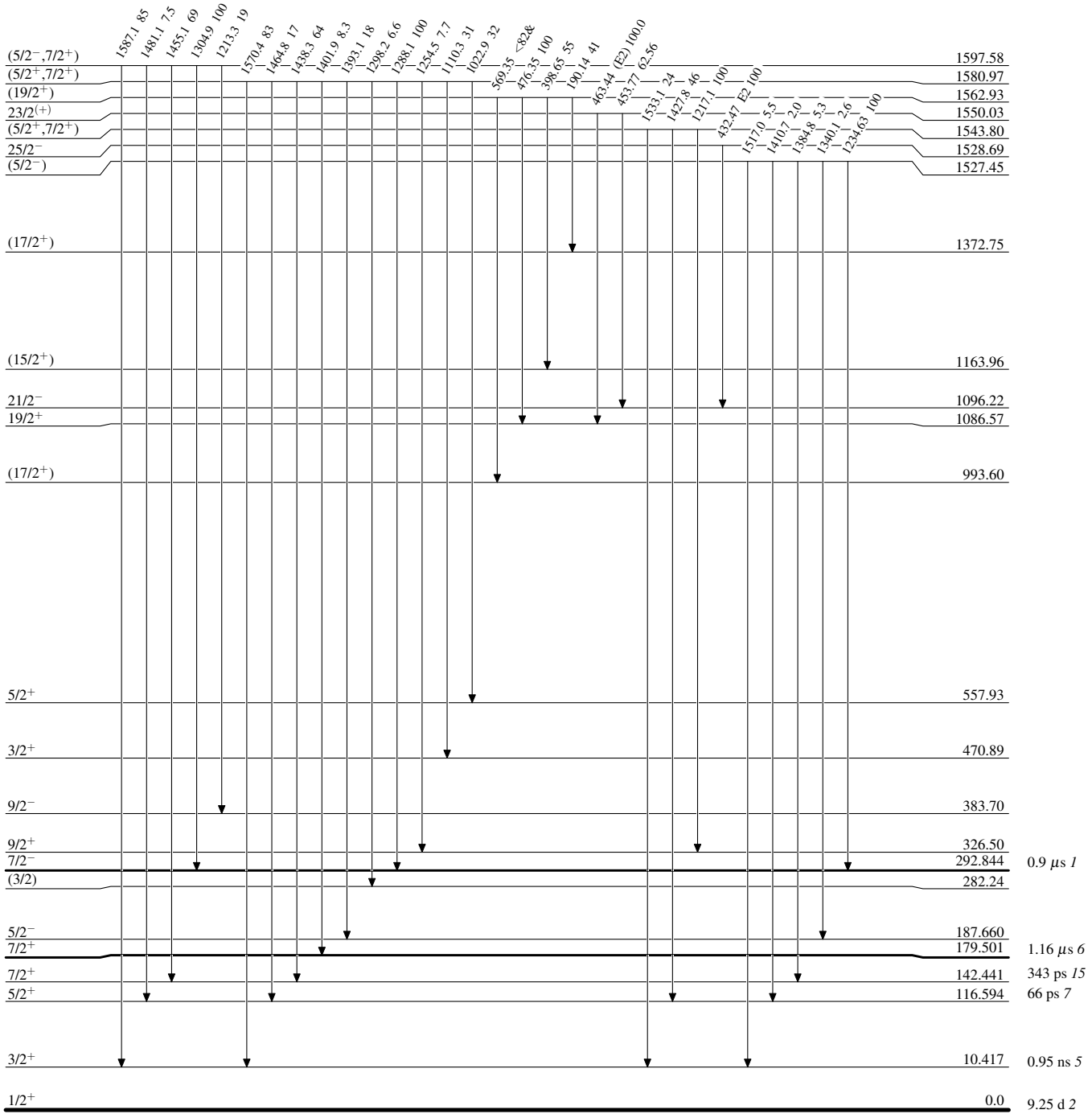


$^{167}_{69}Tm_{98}$

Adopted Levels, Gammas

Level Scheme (continued)

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



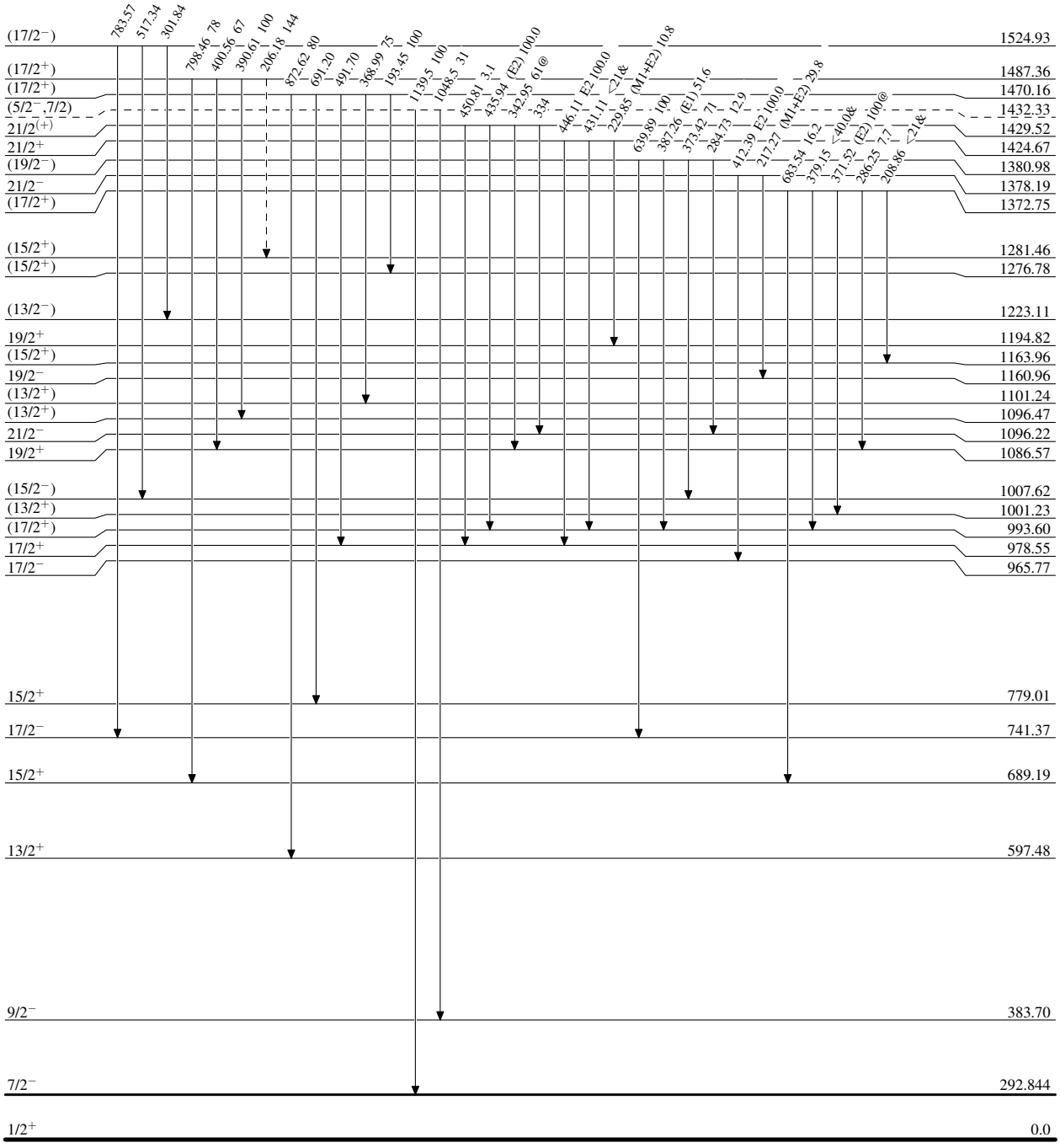
$^{167}_{69}Tm_{98}$

Adopted Levels, Gammas

Level Scheme (continued)

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

Legend
- - - - - - ► γ Decay (Uncertain)



$^{167}_{69}Tm_{98}$

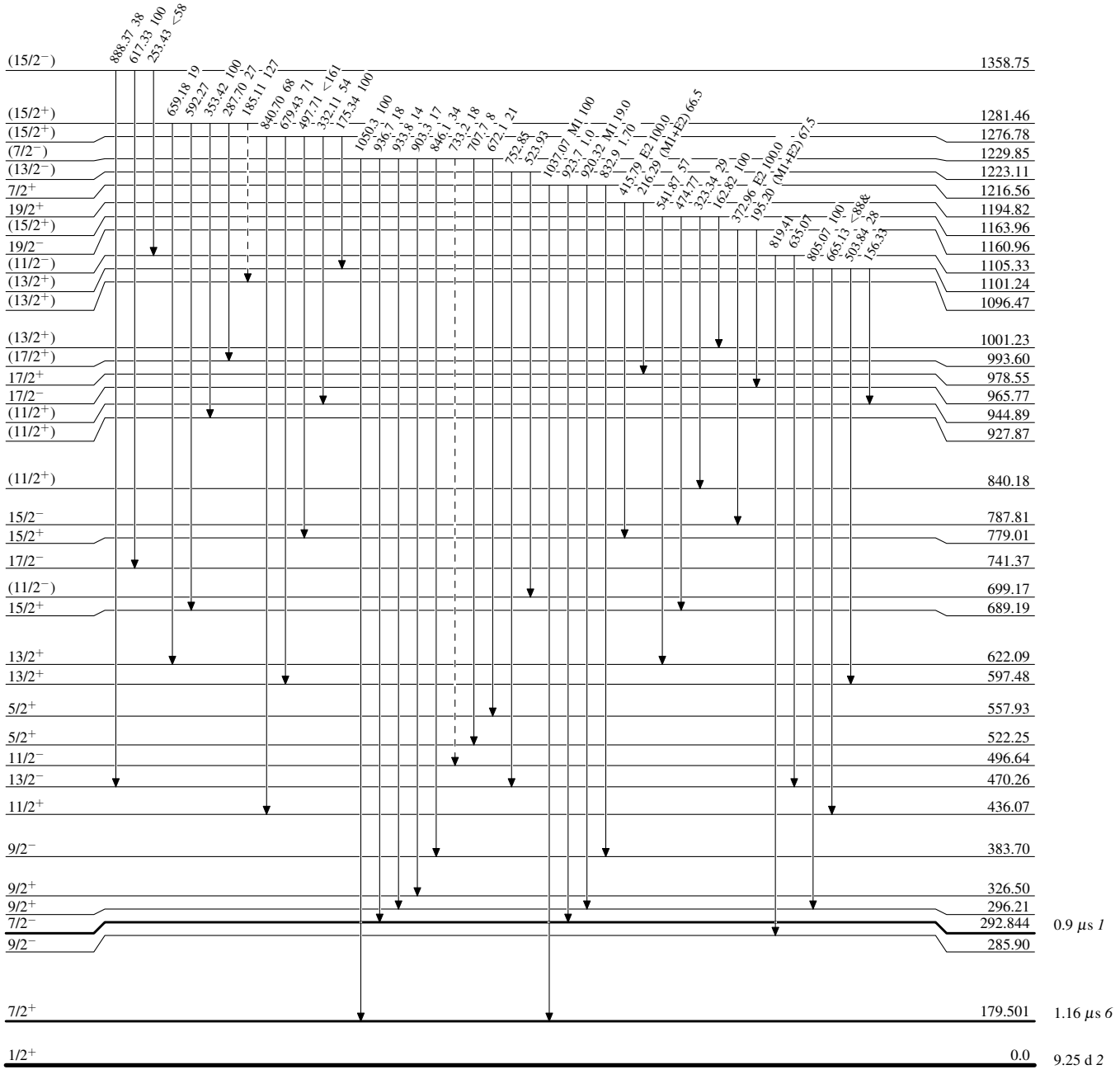
Adopted Levels, Gammas

Level Scheme (continued)

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

Legend

- - - - - - ► γ Decay (Uncertain)



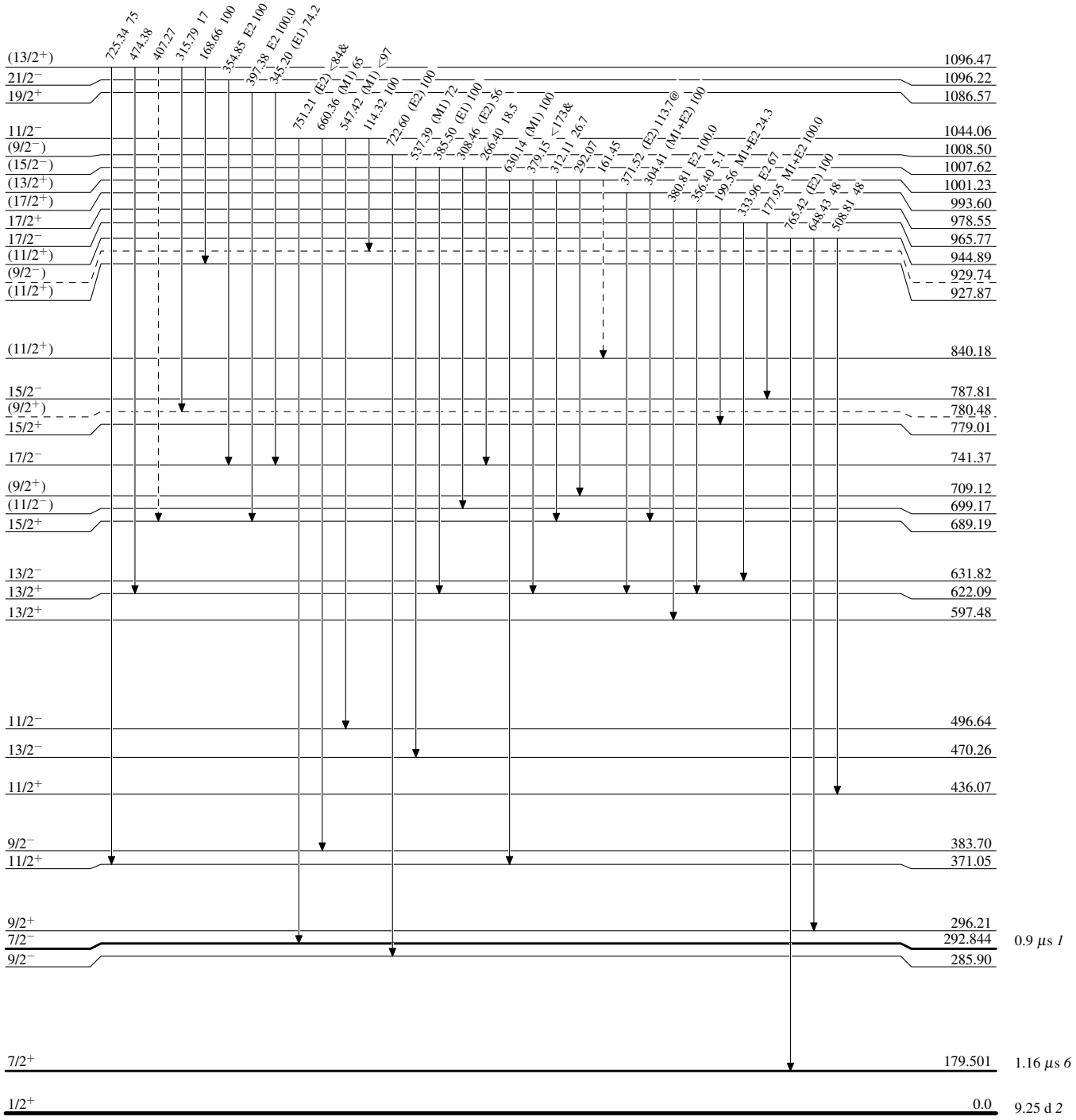
$^{167}_{69}Tm_{98}$

Adopted Levels, Gammas

Level Scheme (continued)

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

Legend
γ Decay (Uncertain)

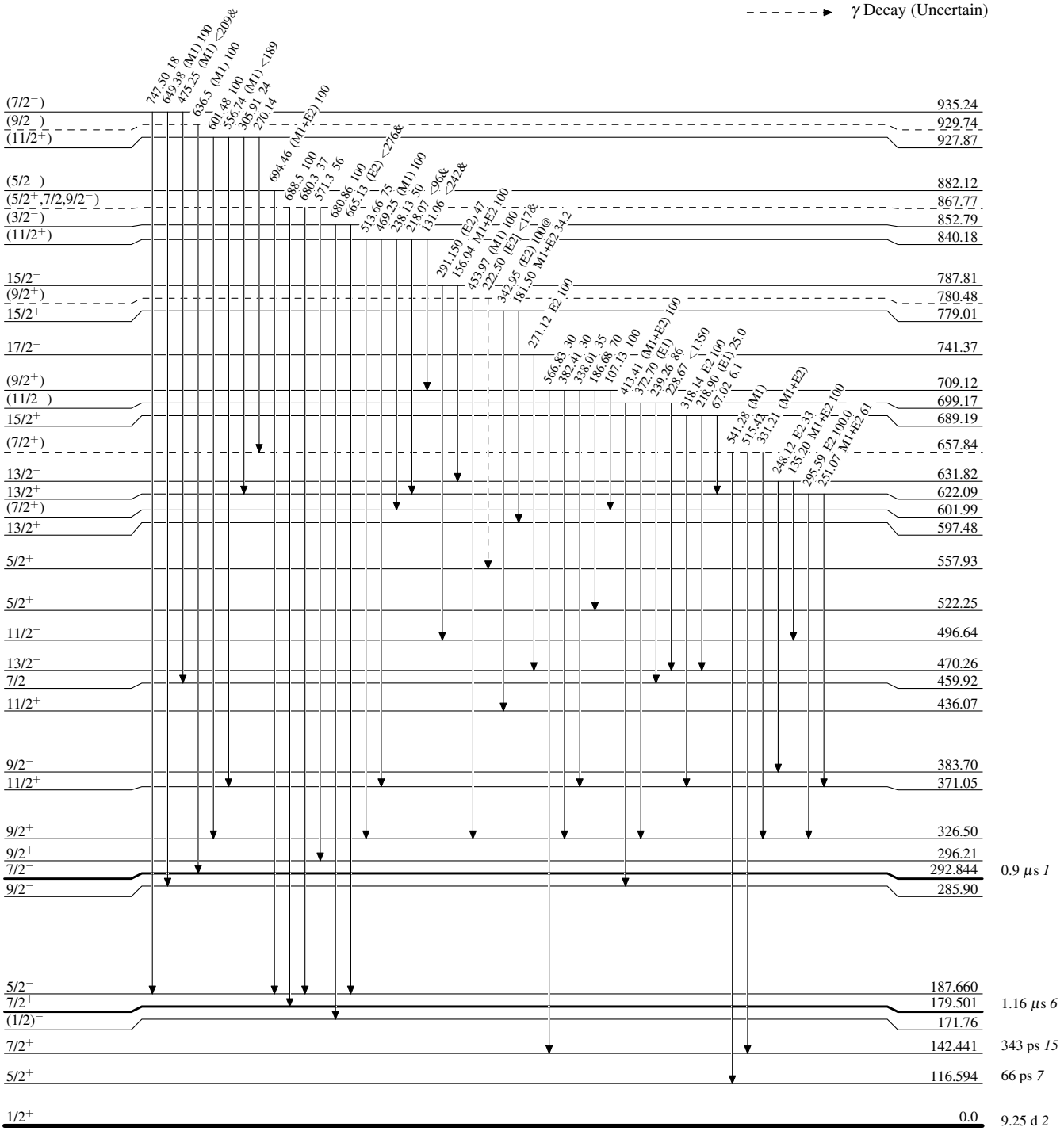


Adopted Levels, Gammas

Level Scheme (continued)

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

Legend: ► γ Decay (Uncertain)



$^{167}_{69}Tm_{98}$

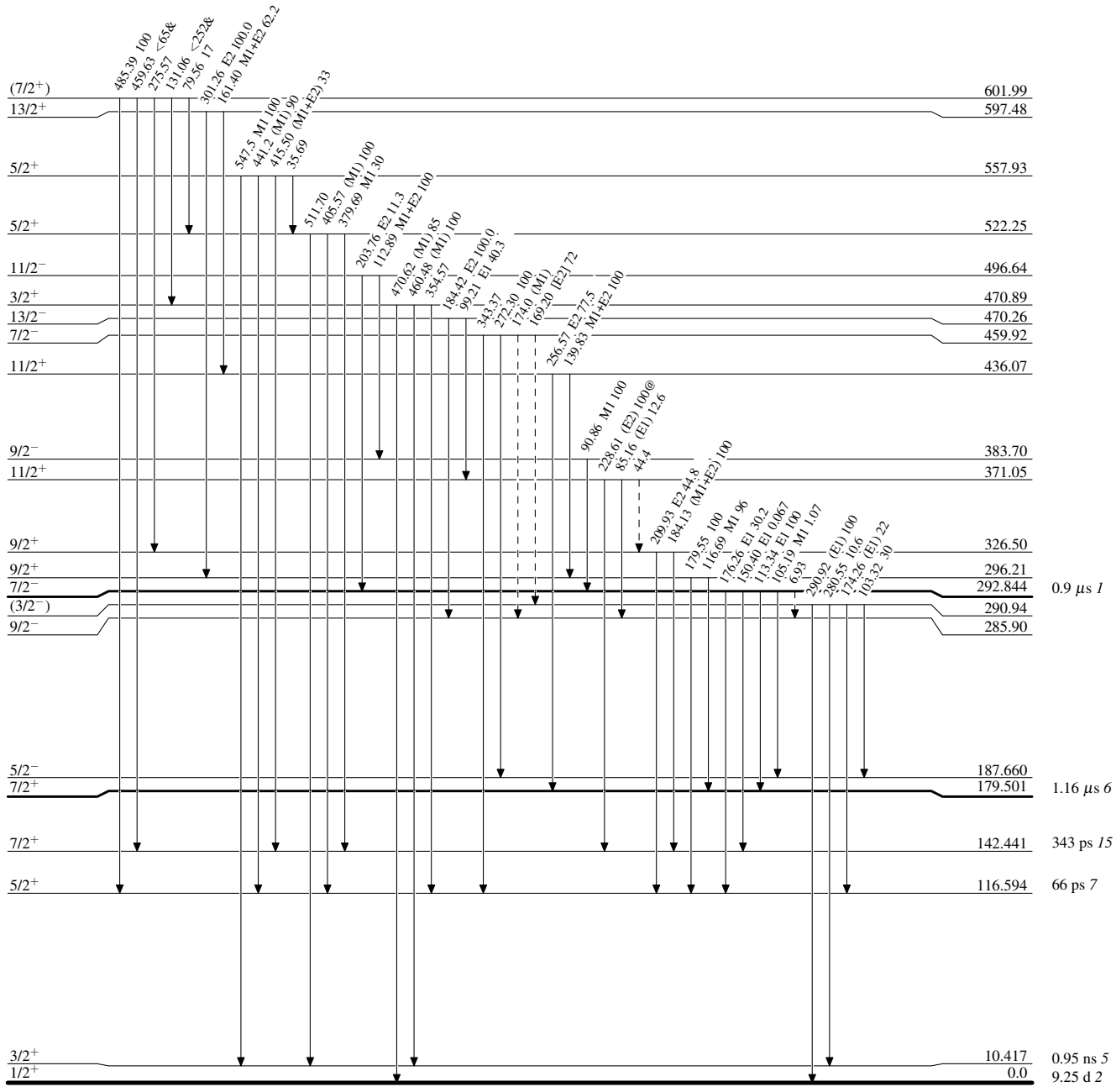
Adopted Levels, Gammas

Level Scheme (continued)

Legend

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

γ Decay (Uncertain)

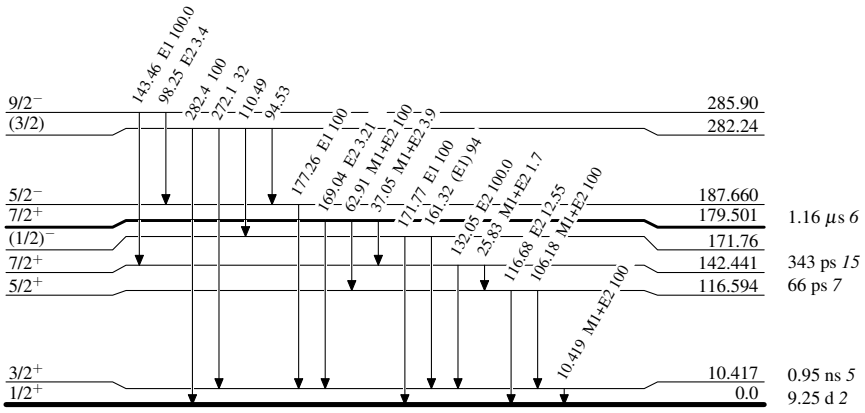


$^{167}_{69}Tm_{98}$

Adopted Levels, Gammas

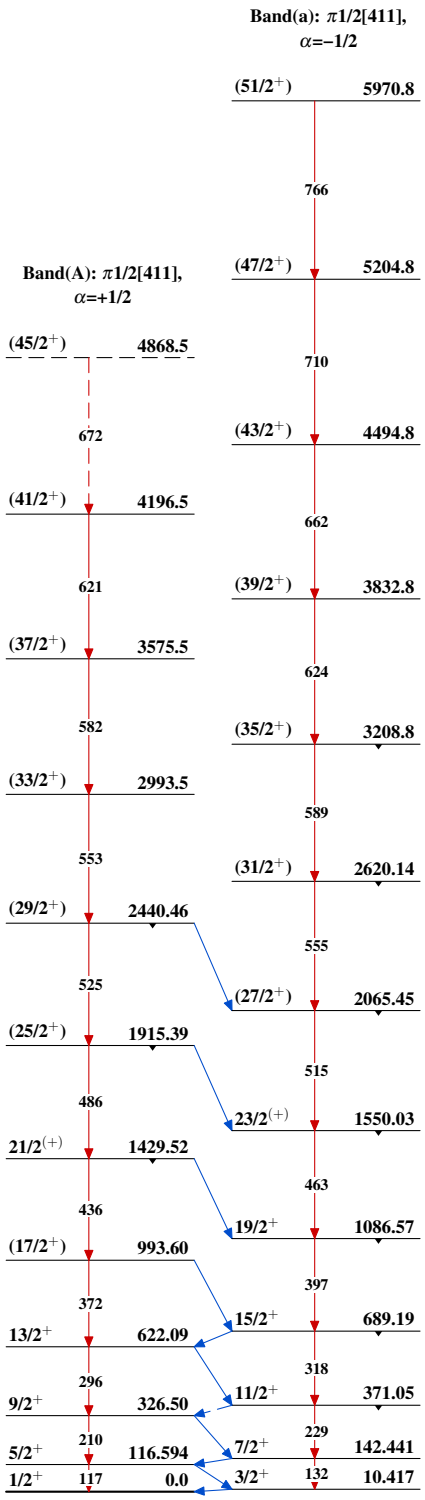
Level Scheme (continued)

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



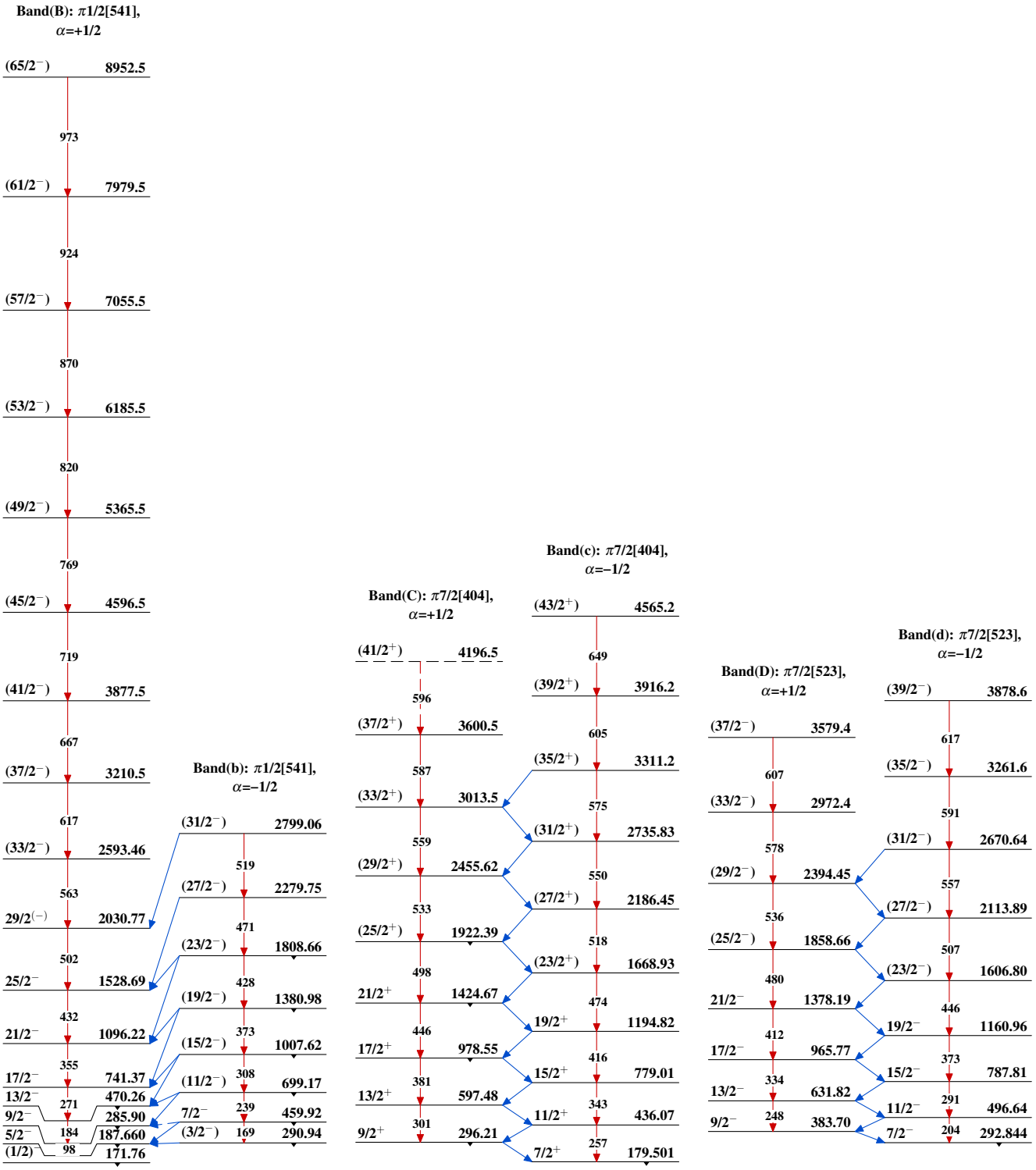
$^{167}_{69}Tm_{98}$

Adopted Levels, Gammas



$^{167}_{69}Tm_{98}$

Adopted Levels, Gammas (continued)



Adopted Levels, Gammas (continued)