^{167}Yb ε decay 1971Fu10

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 90, 431 (2000)	5-Jul-2000

Parent: ^{167}Yb: E=0.0; J$^\pi$=5/2$^-$; T$_{1/2}$=17.5 min *2*; Q(ε)=1954 *4*; %ε+%β^+ decay=100.0

Others: 1954Ha16, 1958Ar59, 1959Ha09, 1960Ba32, 1964Wa04, 1966Pa17, 1967Pa04, 1978Cr06, 1987BaZB, 1993AbZZ.

The decay scheme and most data are from 1971Fu10 (sources from ^{168}Yb(γ,n) (bremsstrahlung from 30-MeV electron accelerator), Yb oxide targets enriched to 20% in ^{168}Yb; sources also from spallation of metallic tantalum (E(p)=680 MeV), chemical separation; measured Eγ, Iγ (Ge(Li) detectors (several), high-resolution Ge(Li) x-ray spectrometer (FWHM=500 eV at 113 keV)), E(ce), Ice (mag spect, resolution=0.05%), prompt and delayed $\gamma\gamma$ coin (Ge(Li)-Ge(Li), Ge(Li)-NaI)).

^{167}Tm Levels

E(level)	J$^\pi$†	T$_{1/2}$	Comments
0.0‡	1/2$^+$	9.25 d *2*	
10.416‡ *21*	3/2$^+$	0.95 ns *5*	T$_{1/2}$: ceγ(t), $\gamma\gamma$(t) (1980AlZE).
116.575‡ *18*	5/2$^+$	66 ps *7*	T$_{1/2}$: from adopted gammas; other value:≤100 ps (ceγ(t), $\gamma\gamma$(t) (1980AlZE)).
142.411‡ *21*	7/2$^+$		
171.73# *5*	(1/2)$^-$		
179.469@ *22*	(7/2)$^+$	1.16 μs *6*	T$_{1/2}$: Xγ(t) (1964Lo04). Other value: 1.1 μs *1* (Xγ(t), 1965Ta01).
187.622# *24*	5/2$^-$		
282.20 *5*	(3/2)		Assigned as 3/2$^-$ 1/2[541] state by 1971Fu10; however, results from ^{165}Ho(α,2nγ), ^{167}Er(p,nγ) confirm the 291 level to be that state.
285.87# *3*	(9/2)$^-$		
290.89# *4*	(3/2$^-$)		See comment with 282.2 level.
292.802& *23*	7/2$^-$	0.9 μs *1*	T$_{1/2}$: from Xγ(t) (1965Ta01).
296.14@ *3*	(9/2)$^+$		
326.50‡ *3*	9/2$^+$		
383.68& *5*	(9/2$^-$)		
470.68a *6*	3/2$^+$		
496.56?& *5*	11/2$^-$		
522.15a *6*	5/2$^+$		
557.84b *6*	5/2$^+$		
867.72? *14*	(5/2$^+$,7/2)		
1216.51 *6*	(7/2)$^+$		
1229.81 *11*	(7/2$^-$)		
1432.29? *10*	(5/2$^-$,7/2)		
1527.42 *7*	(5/2$^-$)		
1580.89 *6*	5/2$^+$,7/2$^+$		
1597.55 *7*	(5/2$^-$,7/2$^+$)		
1629.74 *14*	5/2,7/2$^+$		
1654.29 *9*	5/2,7/2$^+$		

† Adopted values.
‡ Band(A): 1/2[411] band.
# Band(B): 1/2[541] band.
@ Band(C): 7/2[404] band.
& Band(D): 7/2[523] band.
a Band(E): 3/2[411] band.
b Band(F): 5/2[402] band.

^{167}Yb ε decay 1971Fu10 (continued)

ε,β^+ radiations

ε+β^+ feedings are from intensity imbalance at each level. It is assumed that there is no direct ε feeding to the g.s. or the 10.4 level.

E(decay)	E(level)	Iβ^+ †	Iε†	Log *ft*	I(ε+β^+)†	Comments
(300 *4*)	1654.29		0.049 *5*	6.25 *5*	0.049 *5*	εK=0.7767 *11*; εL=0.1699 *8*; εM+=0.0534 *3*
(324 *4*)	1629.74		0.023 *4*	6.66 *8*	0.023 *4*	εK=0.7823 *9*; εL=0.1657 *7*; εM+=0.05192 *23*
(356 *4*)	1597.55		0.091 *9*	6.15 *5*	0.091 *9*	εK=0.7883; εL=0.1614 *5*; εM+=0.05033 *18*
(373 *4*)	1580.89		0.126 *10*	6.06 *4*	0.126 *10*	εK=0.7909; εL=0.1595 *5*; εM+=0.04963 *16*
(427 *4*)	1527.42		0.181 *20*	6.03 *5*	0.181 *20*	εK=0.7976; εL=0.1545 *4*; εM+=0.04784 *12*
(522 *4*)	1432.29?		0.051 *9*	6.78 *8*	0.051 *9*	εK=0.8057; εL=0.14859 *20*; εM+=0.04568 *8*
(724 *4*)	1229.81		0.079 *13*	6.90 *8*	0.079 *13*	εK=0.8152; εL=0.1416; εM+=0.04318
(737 *4*)	1216.51		0.73 *9*	5.95 *6*	0.73 *9*	εK=0.8156; εL=0.1413; εM+=0.04307
(1086 *4*)	867.72?		0.022 *4*	7.83 *8*	0.022 *4*	εK=0.8227; εL=0.1361; εM+=0.04118
(1396 *4*)	557.84		0.092 *6*	7.44 *3*	0.092 *6*	εK=0.8255; εL=0.1336; εM+=0.04032
(1483 *4*)	470.68	5.8×10^{-5} *8*	0.043 *6*	7.82 *6*	0.043 *6*	av Eβ=223.6 *18*; εK=0.8255; εL=0.1331; εM+=0.04011
1661 *4*	292.802	0.47 *3*	95 *5*	4.580 *24*	95 *5*	av Eβ=302.3 *18*; εK=0.8236; εL=0.1318; εM+=0.03968 E(decay): from Eβ+=639 *4* (mag spect (1978Cr06)). Other: 1965Gr20 (640 *20*). %β^+(exp)=0.5 *1* (mag spect (1978Cr06)). Other: 1965Gr20 (0.4% 1).
(1663 *4*)	290.89	0.00070 *15*	0.14 *3*	7.41 *10*	0.14 *3*	av Eβ=303.1 *18*; εK=0.8236; εL=0.1318; εM+=0.03968
(1672 *4*)	282.20	0.0024 *1*	0.46 *2*	6.901 *20*	0.46 *2*	av Eβ=307.0 *18*; εK=0.8234; εL=0.1317; εM+=0.03965

† Absolute intensity per 100 decays.

γ(^{167}Tm)

Iγ normalization: From total I(γ+ce) to g.s.=100% (I(γ+ce) for 10.4γ deduced from total I(γ+ce) to 10.4 level) and assumption of no ε feeding from 5/2$^-$ parent to 1/2$^+$ g.s. or 3/2$^+$ 10.4 level (log $f^{1u}t$>8.5 implies %(ε+β^+)<0.2 to g.s.; log ft≥5.9 implies %(ε+β^+)≤6.5 to 10.4 level).

Iγ(Tm K x ray)≈1220, relative to Iγ=100 for 176.2γ (1960Wi15). The corresponding decay-scheme value is Iγ(Tm K x ray)=911.

E_γ	I_γ[e]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[†]	δ	α[f]	$I_{(\gamma+ce)}$[e]	Comments
(6.93 *4*)		292.802	7/2$^-$	285.87	(9/2)$^-$				13.4 *4*	α(M)=243 if M1, 1783 if E2. Added to account for observed values of Iγ(143.5γ) in prompt and delayed Xγ spectra. E_γ: from energy difference between 293 and 286 levels. $I_{(\gamma+ce)}$: from intensity balance at 286 level.
10.45 *5*	0.9 *3*	10.416	3/2$^+$	0.0	1/2$^+$	M1+E2	0.039	≈650		α(L2)≈93; α(L3)≈96; α(M)=108 *2* Mult.,δ: from M1:M2:M3=43 *5*:14 *2*:21 *3* (1993AbZZ,1981AbZR). E_γ: from 1993AbZZ; 10.41 *3* from energy difference between 116.57γ and 106.16γ. I_γ: from α and I(γ+ce)=450 *20* (from intensity balance at 10.4 level). α: estimated by evaluator based on extrapolations of α(L1) and α(L2) from higher energy and assuming α(M)/α(N+..)≈3. (α(L3)+α(M))=204 +*118*−*74* for a 50% uncertainty in δ.
25.83 *2*	0.22 *7*	142.411	7/2$^+$	116.575	5/2$^+$	M1+E2[@]	0.035[@]	29.4		α(L)=22.8; α(M)=5.10; α(N+..)=1.5 *2* α=29.4 +*23*−*14* for a 50% uncertainty in δ. I_γ: based on I(γ+ce)=6.6 *20* from Ti(132.0γ)=28.7 *8* and Ti(25.8γ)/Ti(132.0γ)=0.23 *7* (1971Fu10, from $\gamma\gamma$ coin), assuming α=29.4. L1:L2:L3=≈0.2:≈0.2:≈0.5 (1971Fu10).
35.69 *3*		557.84	5/2$^+$	522.15	5/2$^+$				>0.4	Mult.: L1:M1=0.3 *1*:≈0.1 (1993AbZZ). E_γ: from 1993AbZZ. $I_{(\gamma+ce)}$: lower limit from Ice(L1)+Ice(M1).
37.05 *2*	0.93 *33*	179.469	(7/2)$^+$	142.411	7/2$^+$	M1+E2[#]	0.31[#] *2*	30.0 *20*		α(L)=23.0 *19*; α(M)=5.4 *4*; α(N+..)=1.6 *2* I_γ: Ti(37γ)=29 *10* from Ti(62.9γ)=317 *54* and Ti(37.0γ)/Ti(62.9γ)=0.09 *3* (1971Fu10, from $\gamma\gamma$ coin). Iγ(exp)=0.5 *2*. L1:L2:L3:M1:M2:M3:N=2.5:3.5:4.0:1.0:1.1:1.2:0.4 (1971Fu10). L1:L2:L3=1.00:1.43 *6*:1.64 *5* (1987BaZB).
62.90 *2*	24 *4*	179.469	(7/2)$^+$	116.575	5/2$^+$	M1+E2[#]	0.071[#] *3*	12.2		α(K)=10.1; α(L)=1.61 *1*; α(M)=0.360 *1*; α(N+..)=0.103 L1:L2:L3:M1:M2:M3:N=40:4.6:1.9:11:2.4:0.2:2.9 (1971Fu10).

$\gamma(^{167}$Tm) (continued)

E_γ	I_γ[e]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ	α[f]	$I_{(\gamma+ce)}$[e]	Comments
[x]71.30 *3*									>1.5	Mult.: L1:M1=1.2 *2*:0.3 *1* (1993AbZZ). E_γ: from 1993AbZZ. $I_{(\gamma+ce)}$: lower limit from Ice(L1)+Ice(M1). Placed by 1993AbZZ from 188 level, but that placement requires Eγ=71.05 *2*.
[x]87.54[d] *4*										Additional information 1. E_γ: from 1993AbZZ.
90.83 *6*	0.09 *4*	383.68	(9/2⁻)	292.802	7/2⁻	M1(+E2)		4.35 *16*		α(K)=2.4 *11*; α(L)=1.5 *10*; α(M)=0.36 *24*; α(N+..)=0.10 *7* Mult.: from α(K)exp≈2.0 (1971Fu10). Other α(K)exp: 11 *5* (1993AbZZ).
94.53 *5*		282.20	(3/2)	187.622	5/2⁻				>1.5	Additional information 2. E_γ: from 1993AbZZ. $I_{(\gamma+ce)}$: lower limit from Ice(K)=1.0 *2* (1993AbZZ), assuming D,E2 G.
98.24 *3*	0.40 *4*	285.87	(9/2)⁻	187.622	5/2⁻	E2		3.33		α(K)=1.11; α(L)=1.70; α(M)=0.412; α(N+..)=0.115 Mult.: K:L2:L3:M3=<2:0.4:0.4:<0.1 (1971Fu10).
103.32 *5*	0.085 *33*	290.89	(3/2⁻)	187.622	5/2⁻	[M1,E2]		2.82 *8*		α(K)=1.7 *8*; α(L)=0.9 *5*; α(M)=0.20 *13*; α(N+..)=0.06 *4* Added from adopted gammas (γ masked by neighboring intense lines in ^{167}Yb ε decay). I_γ: from Iγ(280.5γ) and adopted relative branching from 291 level.
105.19 *2*	2.9 *3*	292.802	7/2⁻	187.622	5/2⁻	M1		2.75		α(K)=2.30; α(L)=0.348; α(M)=0.0773; α(N+..)=0.0226 Mult.: α(K)exp=2.8; K:L1:M1=8.2:0.8:0.1 (1971Fu10).
106.16 *2*	110 *5*	116.575	5/2⁺	10.416	3/2⁺	M1+E2[#]	0.090[#] *11*	2.68		α(K)=2.23; α(L)=0.346 *2*; α(M)=0.0770 *5*; α(N+..)=0.0225 *1* Mult.: K:L1:L2:L3:M1:M2:M3:N=240:40:4.2: 1.5:6.6:0.86:0.33:0.33 (1971Fu10). %Iγ=22.5 *4*.
110.49 *5*		282.20	(3/2)	171.73	(1/2)⁻				>0.7	Additional information 3. E_γ: from 1993AbZZ. Mult.: K:L1=0.4 *1*:0.05 *2* (1993AbZZ) rules out M2. $I_{(\gamma+ce)}$: lower limit from Ice(K)=1.0 *2* (1993AbZZ), assuming D,E2 G.
(112.88 *4*)	0.005 *5*	496.56?	11/2⁻	383.68	(9/2⁻)	(M1+E2)[‡]	+0.16[‡] *1*	2.24		α(K)=1.85; α(L)=0.299; α(M)=0.0670; α(N+..)=0.0195 E_γ: from adopted gammas; not resolved from

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γ(^{167}Tm) (continued)

E_γ	I_γ[e]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[†]	δ	α[f]	$I_{(\gamma+ce)}$[e]	Comments
										113.32γ in ^{167}Yb ε decay. I_γ: based on α and I(γ+ce)=0.017 *17* (from intensity balance at 497 level).
113.32 *2*	270 *10*	292.802	7/2$^-$	179.469	(7/2)$^+$	E1		0.242		α(K)=0.201; α(L)=0.0318; α(M)=0.00705; α(N+..)=0.00199 Mult.: K:L1:L2:L3:M1:M2:M3:N=69:8.7:1.2:1.3:1.6:0.19:0.21:0.5, α(K)exp=0.25 (1971Fu10); L1:L2:L3=1.00:0.244 *12*:0.270 *15* (1987BaZB).
116.57 *2*	13.8 *3*	116.575	5/2$^+$	0.0	1/2$^+$	E2		1.75		α(K)=0.734; α(L)=0.775; α(M)=0.188; α(N+..)=0.0525 Mult.: K:L1:L2:L3:M1:M2:M3:N=9.7:0.86:4.3:4.3:0.14:0.75:0.31, α(K)exp=0.72 (1971Fu10), 0.70 *7* (1993AbZZ).
116.66 *3*	0.21 *3*	296.14	(9/2)$^+$	179.469	(7/2)$^+$	M1		2.040		α(K)=1.707; α(L)=0.259; α(M)=0.057; α(N+..)=0.0168 E_γ: from 1993AbZZ. Eγ=116.6 *1* in 1971Fu10. I_γ: from α and I(γ+ce) (from intensity balance at 296 level), assuming no ε+β^+ branch to that level. Mult.: α(K)exp=2.4 *6* from Iγ here and I(ce) in 1993AbZZ.
131.99 *2*	13.6 *4*	142.411	7/2$^+$	10.416	3/2$^+$	E2		1.11		α(K)=0.531; α(L)=0.444; α(M)=0.107; α(N+..)=0.0299 Mult.: α(K)exp=0.48; K:L1:L2:L3:M2:M3=6.5:0.65:2.0:1.9:0.32:0.33 (1971Fu10).
143.46 *2*	10.3 *3*	285.87	(9/2)$^-$	142.411	7/2$^+$	E1		0.129		α(K)=0.108; α(L)=0.0167; α(M)=0.00369; α(N+..)=0.00104 Mult.: α(K)exp=0.08 (1971Fu10).
150.40 *3*	0.18 *5*	292.802	7/2$^-$	142.411	7/2$^+$	E1		0.114		α(K)=0.095; α(L)=0.0146; α(M)=0.00324; α(N+..)=0.00091 Mult.: α(K)exp=0.11 (1971Fu10).
161.32 *8*	0.17 *5*	171.73	(1/2)$^-$	10.416	3/2$^+$	(E1)		0.095		α(K)=0.0792; α(L)=0.0121; α(M)=0.00268; α(N+..)=0.00075 Mult.: α(K)exp=0.71 *27* from I(ce) in 1993AbZZ; however, authors assign E1 suggesting that quoted I(ce) is high by an order of magnitude.
169.04 *3*	0.77 *7*	179.469	(7/2)$^+$	10.416	3/2$^+$	E2		0.464		α(K)=0.267; α(L)=0.151; α(M)=0.0363; α(N+..)=0.0100 Mult.: α(K)exp=0.32 (1971Fu10).
171.75 *8*	0.18 *5*	171.73	(1/2)$^-$	0.0	1/2$^+$	E1		0.0803		α(K)=0.0672; α(L)=0.0102; α(M)=0.00226; α(N+..)=0.00063 Mult.: α(K)exp≈0.07 (1993AbZZ), consistent with multipolarity from adopted gammas.
174.25 *7*	0.062 *24*	290.89	(3/2$^-$)	116.575	5/2$^+$	(E1)[a]		0.0773		α(K)=0.0647; α(L)=0.0098; α(M)=0.00217; α(N+..)=0.00061 Added for consistency with Adopted Levels, gammas (γ masked by neighboring intense γ's in ^{167}Yb ε decay). I_γ: from Iγ(280.5γ) and adopted relative branching from 291 level.
176.23 *3*	100	292.802	7/2$^-$	116.575	5/2$^+$	E1		0.0751		α(K)=0.0629; α(L)=0.0095; α(M)=0.00211; α(N+..)=0.00059 Mult.: α(K)exp=0.036 (1971Fu10).
177.22 *3*	13.3 *5*	187.622	5/2$^-$	10.416	3/2$^+$	E1		0.0740		α(K)=0.0619; α(L)=0.0094; α(M)=0.00208; α(N+..)=0.00058 Mult.: α(K)exp=0.034 (1971Fu10); K:L1=0.45 *6*:0.06 *2* (1993AbZZ).
179.55 *5*	0.22 *9*	296.14	(9/2)$^+$	116.575	5/2$^+$	[E2]		0.377		α(K)=0.225; α(L)=0.117; α(M)=0.0281; α(N+..)=0.00775 E_γ: from 1993AbZZ. I_γ: from I(ce(K))=0.05 *2* (1993AbZZ), if E2 transition.

γ(^{167}Tm) (continued)

E_γ	I_γ[e]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[†]	δ	α[f]	Comments
184.1 2	0.07 4	326.50	$9/2^+$	142.411	$7/2^+$	(M1+E2)[‡]	−0.12[‡] +11−18	0.561 8	α(K)=0.469 18; α(L)=0.0714 13; α(M)=0.0159 4; α(N+..)=0.00457 17
(203.75 4)		496.56?	$11/2^-$	292.802	$7/2^-$	E2[‡]		0.246	α(K)=0.156; α(L)=0.0693; α(M)=0.0165; α(N+..)=0.00456 Added from Adopted Levels, gammas; Iγ negligible.
209.92 2	0.03 2	326.50	$9/2^+$	116.575	$5/2^+$	E2[‡]		0.223	α(K)=0.143; α(L)=0.0614; α(M)=0.0146; α(N+..)=0.00403 Added for consistency with Adopted Levels, gammas. I_γ: from Iγ(184.1γ) and adopted relative branching from 326.5 level.
272.1 2	0.013 4	282.20	(3/2)	10.416	$3/2^+$				Additional information 4.
280.5[&] 2	0.030 7	290.89	$(3/2^-)$	10.416	$3/2^+$				
282.4 2	0.041 8	282.20	(3/2)	0.0	$1/2^+$				Additional information 5.
290.86[&] 7	0.28 3	290.89	$(3/2^-)$	0.0	$1/2^+$	(E1)[a]		0.0208	α(K)=0.0175; α(L)=0.00256; α(M)=0.00057; α(N+..)=0.00016
[x]321.1 5	0.011 5								
[x]323.5 5	0.017 5								
[x]343.29 8	0.167 20								
[x]351.8 4	0.016 6								
354.0 4	0.012 6	470.68	$3/2^+$	116.575	$5/2^+$	[M1,E2]		0.07[b] 3	α(K)=0.057 24; α(L)=0.0102 17; α(M)=0.0023 4; α(N+..)=0.00064 10
[x]375.9 2	0.033 8								
379.9 3	0.021 7	522.15	$5/2^+$	142.411	$7/2^+$	M1		0.0792	α(K)=0.0666; α(L)=0.0098; α(M)=0.00218; α(N+..)=0.00061 Mult.: from adopted gammas; based on α(K)exp in (p,nγ).
[x]387.0 4	0.011 5								
[x]398.1 2	0.023 5								
405.57 8	0.070 10	522.15	$5/2^+$	116.575	$5/2^+$	[M1]		0.0667	α(K)=0.0561; α(L)=0.00825; α(M)=0.00183; α(N+..)=0.00051
415.4 2	0.020 5	557.84	$5/2^+$	142.411	$7/2^+$	[M1,E2]		0.045 18	α(K)=0.037 16; α(L)=0.0064 14; α(M)=0.0014 3; α(N+..)=0.00040 8
[x]421.4 2	0.020 5								
441.2 1	0.055 11	557.84	$5/2^+$	116.575	$5/2^+$	[M1]		0.0535	α(K)=0.0451; α(L)=0.00661; α(M)=0.00146; α(N+..)=0.00041
[x]446.8 3	0.012 4								
[x]457.0 1	0.033 7								
460.36 9	0.130 17	470.68	$3/2^+$	10.416	$3/2^+$	M1		0.0479	α(K)=0.0403; α(L)=0.00591; α(M)=0.00131; α(N+..)=0.00036 Mult.: α(K)exp≈0.04 (1993AbZZ), consistent with adopted multipolarity.
470.65 9	0.111 14	470.68	$3/2^+$	0.0	$1/2^+$	M1		0.0453	α(K)=0.0381; α(L)=0.00558; α(M)=0.00124; α(N+..)=0.00034 Mult.: α(K)exp≈0.04 (1993AbZZ), consistent with adopted multipolarity.

γ(^{167}Tm) (continued)

E_γ	I_γ[e]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[†]	α[f]	Comments
[x]486.6 *2*	0.033 *8*							
511[g]		522.15	5/2+	10.416	3/2+			511γ, if present, is not resolved from γ±.
[x]541.4 *2*	0.022 *6*							
547.5 *1*	0.061 *10*	557.84	5/2+	10.416	3/2+	M1	0.0309	α(K)=0.0258; α(L)=0.00377 Mult.: from α(K)exp≈0.05 (1993AbZZ).
[x]561.8 *4*	0.014 *5*							
571.3 *2*	0.032 *7*	867.72?	(5/2+,7/2)	296.14	(9/2)+			
[x]590.9 *4*	0.023 *8*							
[x]600.2 *4*	0.020 *6*							
[x]664.9 *2*	0.044 *12*							
672.1 *2*	0.039 *10*	1229.81	(7/2−)	557.84	5/2+			
680.3 *5*	0.021 *7*	867.72?	(5/2+,7/2)	187.622	5/2−			
[x]686.9 *5*	0.026 *13*							
688.5 *2*	0.057 *16*	867.72?	(5/2+,7/2)	179.469	(7/2)+			
[x]694.5 *6*	0.020 *13*							
[x]697.1 *6*	0.020 *14*							
707.7 *4*	0.016 *9*	1229.81	(7/2−)	522.15	5/2+			
[x]719.5 *3*	0.019 *6*							
733.2[g] *3*	0.034 *10*	1229.81	(7/2−)	496.56?	11/2−			
[x]791.5 *2*	0.063 *12*							
[x]829.4 *3*	0.034 *9*							
846.1 *2*	0.065 *12*	1229.81	(7/2−)	383.68	(9/2−)			
[x]903.3 *2*	0.033 *9*							
920.32 *8*	0.57 *9*	1216.51	(7/2)+	296.14	(9/2)+	M1	0.0084	α=0.0084; α(K)=0.00707; α(L)=0.00101 Mult.: from α(K)exp=0.0070 *20* (1993AbZZ).
923.7 *4*	0.030 *12*	1216.51	(7/2)+	292.802	7/2−			
[x]927.1 *8*	0.020 *9*							
933.8 *3*	0.026 *10*	1229.81	(7/2−)	296.14	(9/2)+			
936.7 *3*	0.035 *11*	1229.81	(7/2−)	292.802	7/2−			
[x]977.9 *3*	0.021 *7*							
[x]998.3 *3*	0.021 *7*							
[x]1008.6 *5*	0.018 *7*							
1022.9 *2*	0.053 *10*	1580.89	5/2+,7/2+	557.84	5/2+			
[x]1025.9 *3*	0.022 *8*							
1037.07 *7*	3.0 *4*	1216.51	(7/2)+	179.469	(7/2)+	M1	0.00628	α=0.00628; α(K)=0.00528; α(L)=0.00075 Mult.: from α(K)exp=0.0050 *18* (1993AbZZ).
1048.5 *3*	0.06 *3*	1432.29?	(5/2−,7/2)	383.68	(9/2−)			
1050.3 *2*	0.19 *5*	1229.81	(7/2−)	179.469	(7/2)+			
[x]1068.2 *4*	0.034 *13*							
[x]1070.3 *6*	0.017 *10*							
1110.3 *1*	0.052 *10*	1580.89	5/2+,7/2+	470.68	3/2+			
1139.5 *1*	0.19 *3*	1432.29?	(5/2−,7/2)	292.802	7/2−			
[x]1165.5 *4*	0.015 *6*							
1213.3 *2*	0.030 *10*	1597.55	(5/2−,7/2+)	383.68	(9/2−)			

^{167}Yb ε decay 1971Fu10 (continued)

γ(^{167}Tm) (continued)

E_γ	I_γ[e]	E_i(level)	J^π_i	E_f	J^π_f
^{x}1217.1 *2*	0.033 *10*				
1234.63 *7*	0.77 *9*	1527.42	(5/2$^-$)	292.802	7/2$^-$
^{x}1242.0 *1*	0.081 *14*				
1254.5 *4*	0.013 *5*	1580.89	5/2$^+$,7/2$^+$	326.50	9/2$^+$
1288.1 *1*	0.168 *24*	1580.89	5/2$^+$,7/2$^+$	292.802	7/2$^-$
1298.2 *6*	0.011 *5*	1580.89	5/2$^+$,7/2$^+$	282.20	(3/2)
1304.9 *1*	0.160 *24*	1597.55	(5/2$^-$,7/2$^+$)	292.802	7/2$^-$
^{x}1320.9 *1*	0.061 *10*				
^{x}1332.5 *2*	0.027 *7*				
1337.2 *5*	0.014 *7*	1629.74	5/2,7/2$^+$	292.802	7/2$^-$
1340.1 *4*	0.020 *7*	1527.42	(5/2$^-$)	187.622	5/2$^-$
^{x}1342.4 *4*	0.019 *7*				
1361.5 *1*	0.090 *17*	1654.29	5/2,7/2$^+$	292.802	7/2$^-$
^{x}1366.5 *7*	0.015 *6*				
^{x}1370.2 *1*	0.058 *11*				
1384.8 *2*	0.041 *9*	1527.42	(5/2$^-$)	142.411	7/2$^+$
1393.1 *2*	0.030 *6*	1580.89	5/2$^+$,7/2$^+$	187.622	5/2$^-$
1401.9 *3*	0.014 *5*	1580.89	5/2$^+$,7/2$^+$	179.469	(7/2)$^+$
1410.7 *4*	0.015 *5*	1527.42	(5/2$^-$)	116.575	5/2$^+$
^{x}1427.8 *3*	0.015 *5*				
^{x}1433.7 *3*	0.014 *5*				
1438.3 *1*	0.107 *16*	1580.89	5/2$^+$,7/2$^+$	142.411	7/2$^+$
1455.1 *1*	0.110 *16*	1597.55	(5/2$^-$,7/2$^+$)	142.411	7/2$^+$
1464.8 *2*	0.029 *6*	1580.89	5/2$^+$,7/2$^+$	116.575	5/2$^+$
1481.1 *3*	0.012 *5*	1597.55	(5/2$^-$,7/2$^+$)	116.575	5/2$^+$
1487.4 *2*	0.043 *10*	1629.74	5/2,7/2$^+$	142.411	7/2$^+$
^{x}1498.2 *3*	0.020 *6*				
1511.9[cg] *2*		1629.74	5/2,7/2$^+$	116.575	5/2$^+$
1511.9 *2*	0.064 *10*	1654.29	5/2,7/2$^+$	142.411	7/2$^+$
1517.0 *2*	0.042 *8*	1527.42	(5/2$^-$)	10.416	3/2$^+$
^{x}1525.7 *3*	0.010 *3*				
^{x}1533.1 *4*	0.008 *3*				
1537.5 *4*	0.015 *7*	1654.29	5/2,7/2$^+$	116.575	5/2$^+$
^{x}1542.0 *5*	0.005 *3*				
^{x}1549.5 *4*	0.006 *3*				
1570.4 *2*	0.140 *21*	1580.89	5/2$^+$,7/2$^+$	10.416	3/2$^+$
1587.1 *2*	0.136 *18*	1597.55	(5/2$^-$,7/2$^+$)	10.416	3/2$^+$
1619.2 *2*	0.056 *8*	1629.74	5/2,7/2$^+$	10.416	3/2$^+$
^{x}1631.7 *3*	0.007 *3*				
1643.8 *2*	0.072 *9*	1654.29	5/2,7/2$^+$	10.416	3/2$^+$
^{x}1675.0 *7*	0.003 *2*				
^{x}1680.7 *6*	0.005 *3*				
^{x}1693.6 *5*	0.004 *2*				
^{x}1793.4 *6*	0.003 *2*				
^{x}1807.8 *5*	0.006 *3*				

[†] From α(K)exp and/or ce subshell ratios, except where noted; the photon and ce intensity scales were normalized through α(K)=2.23 (M1+E2 theory, δ=0.090) for 106.2γ. Uncertainties in I(ce) data quoted from 1971Fu10 are typically 20-30%, but at low energies they may be much larger.

[‡] From adopted gammas; based on $\gamma(\theta)$ in ^{165}Ho(α,2nγ).

[#] From L subshell ratios (1965Gr20) adopted by 1976Kr21.

[@] Reported in 1981AbZR; experimental details not given.

[&] Placement from Adopted Levels, gammas.

[a] From adopted gammas; based on (p,2nγ)/(p,nγ) excitation-strength ratios.

[b] Value and uncertainty cover combined range for M1 and E2.

[c] No intensity is attributed to this questionable second placement of 1511.9γ.

[d] Placed by 1993AbZZ from 383 level, but Ice(L1)=2.0 *3* and Ice(M1)=0.5 *2* (1993AbZZ) imply I(γ+ce)=74 *8* for that E1 placement. Such an intense transition would, in turn, imply a %($\varepsilon+\beta^+$)=15 (ΔJ=2, $\Delta\pi$=no) branch to the 383 level and a −15% branch to the 296 level, which is untenable. Also, this γ is absent in (α,2nγ), whereas the 91γ (which does deexcite the 383 level) is observed strongly in that reaction. The evaluator; therefore, concludes that the placement of the 87.54γ by 1993AbZZ is incorrect.

[e] For absolute intensity per 100 decays, multiply by 0.204 *8*.

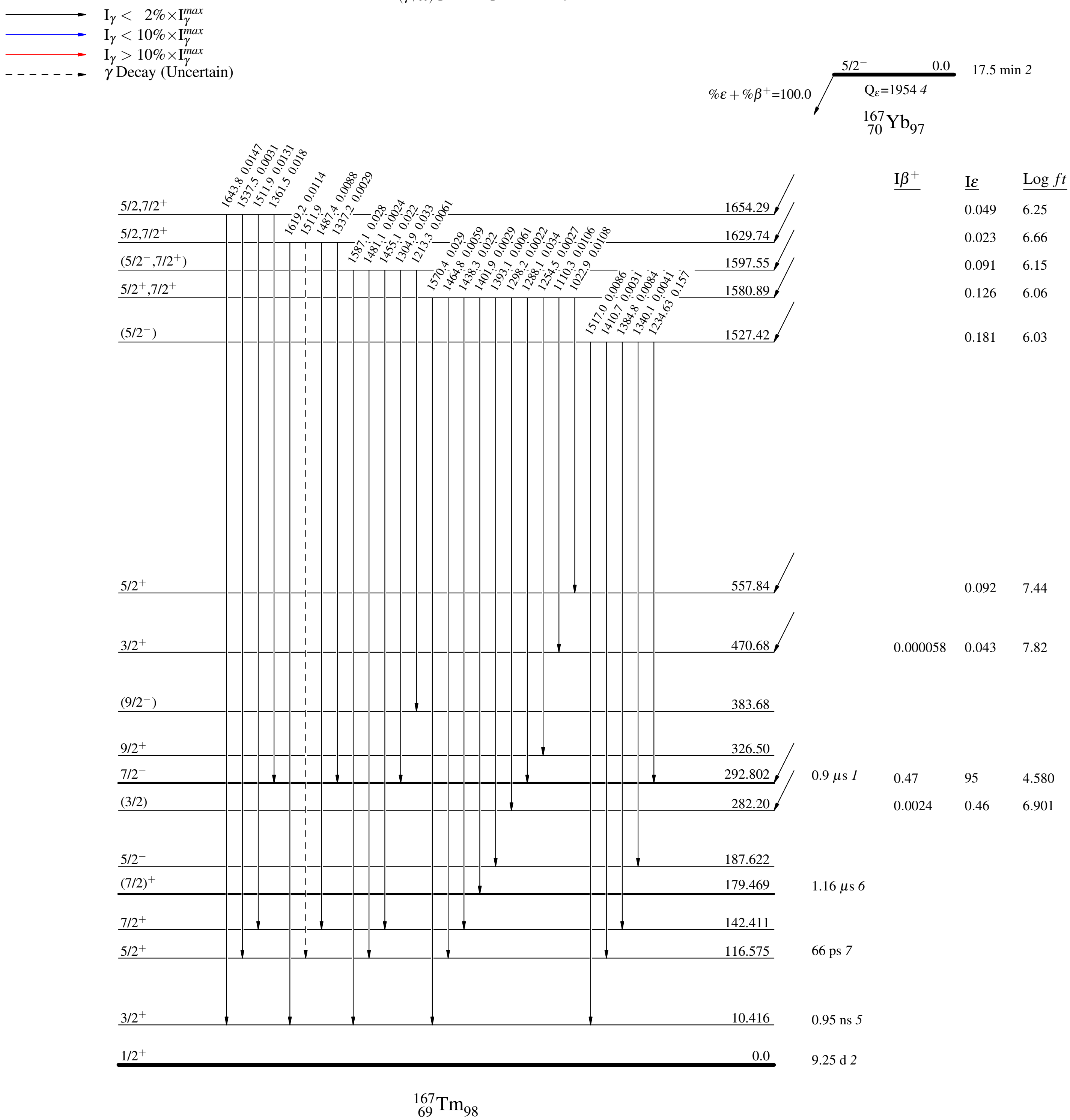
γ(^{167}Tm) (continued)

[f] 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.
[g] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{167}Yb ε decay 1971Fu10

Decay Scheme

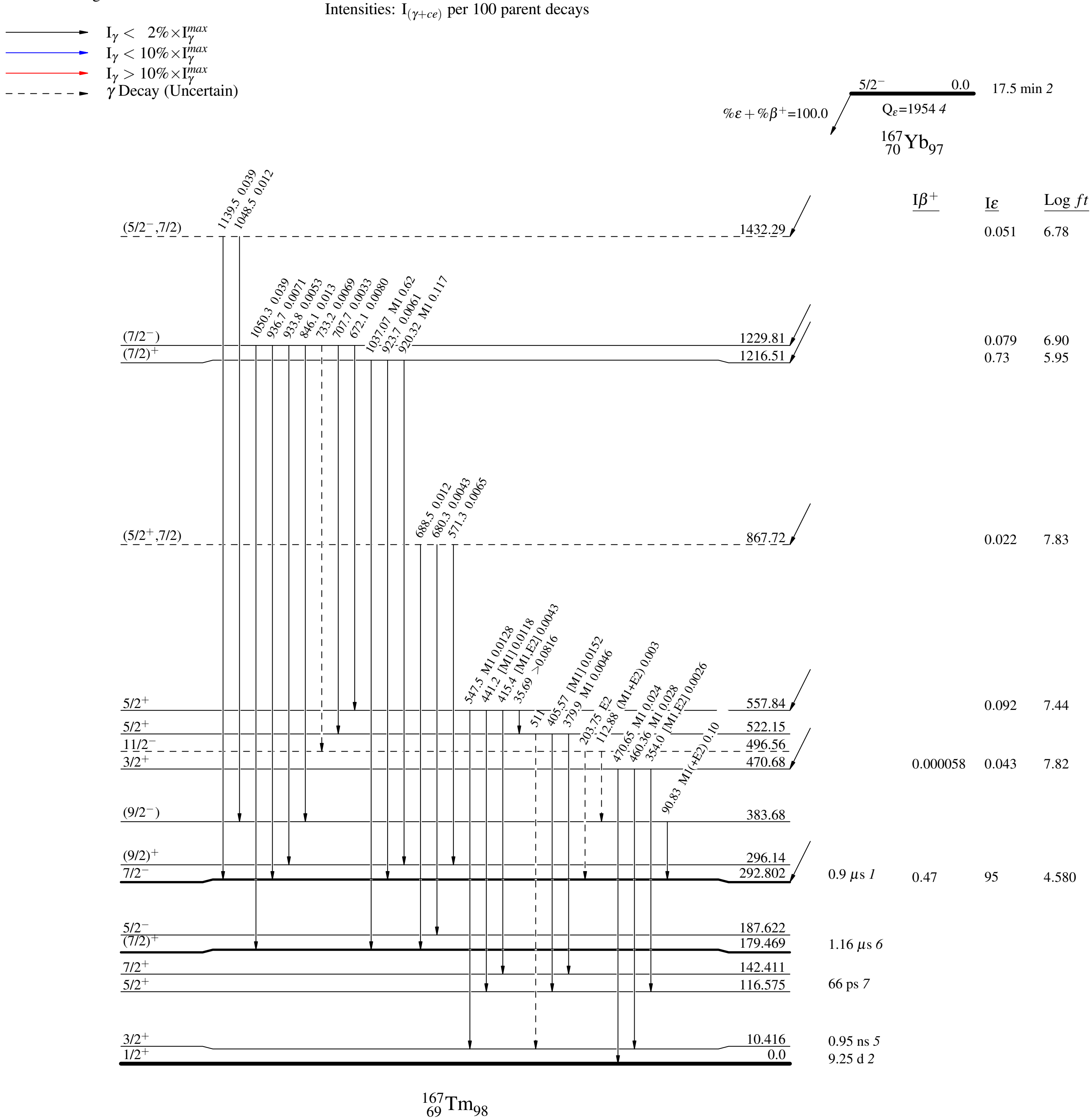
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



^{167}Yb ε decay 1971Fu10

Decay Scheme (continued)

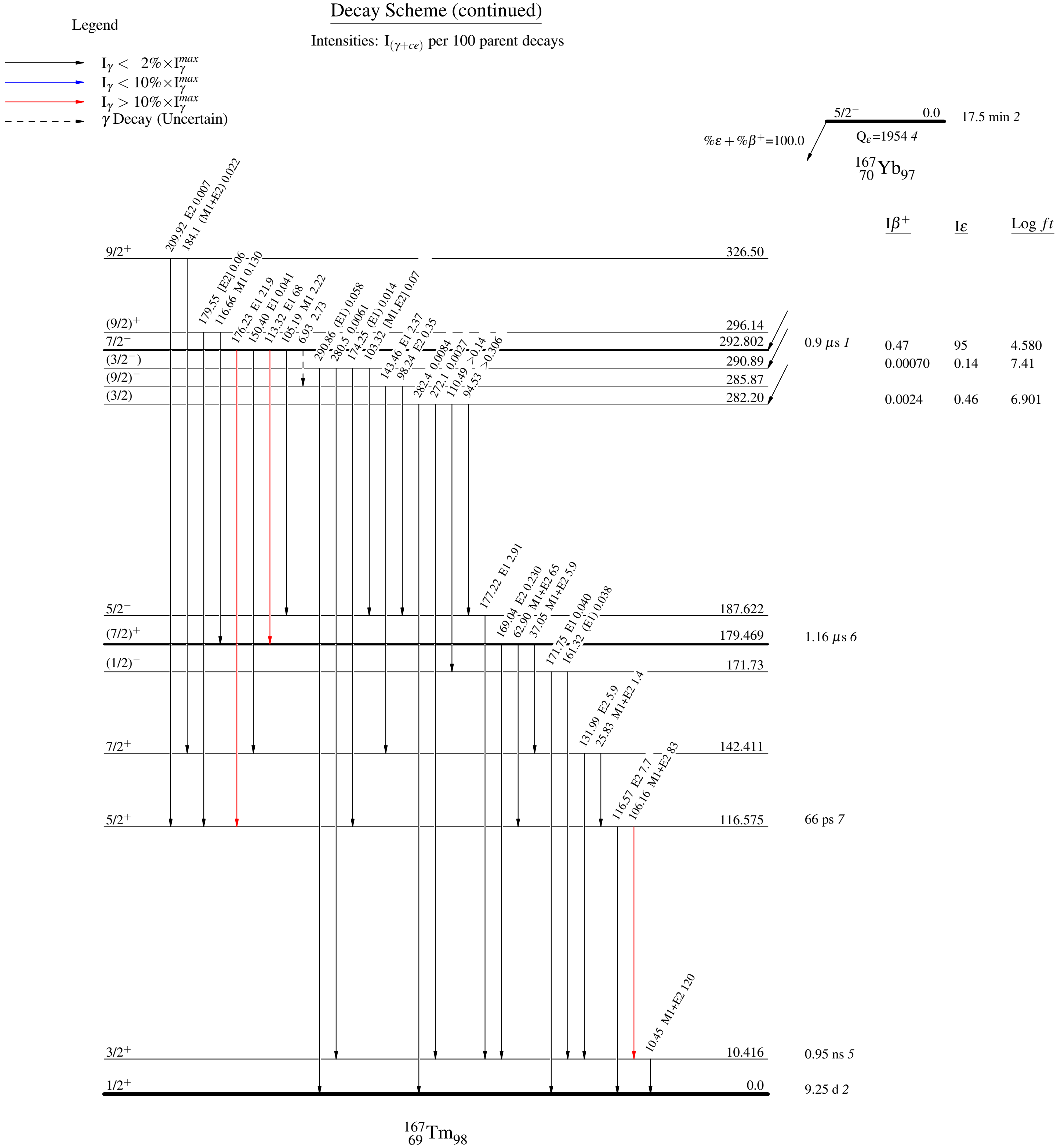
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays

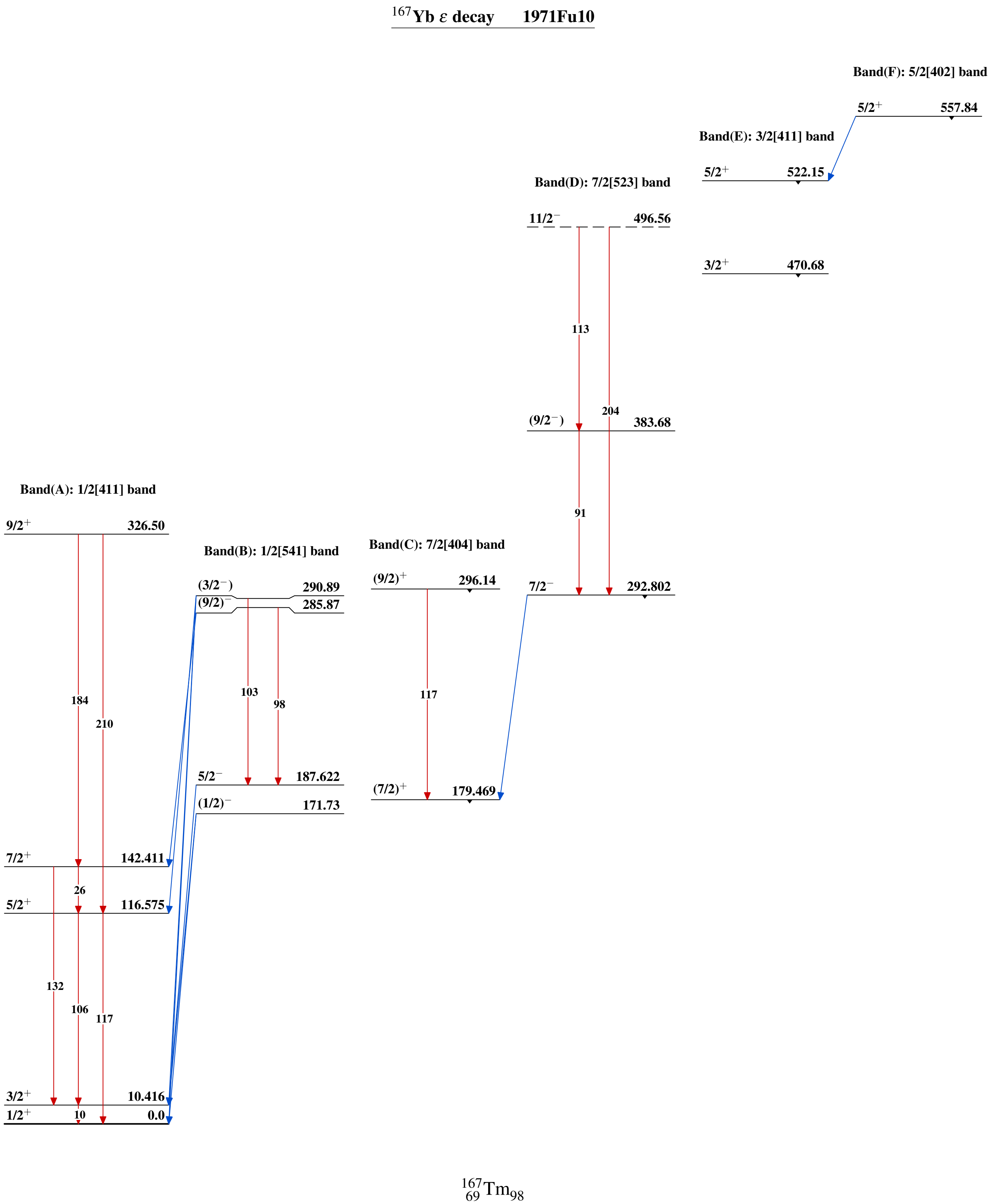


^{167}Yb ε decay 1971Fu10

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays




^{167}Yb ε decay 1971Fu10
Band(F): 5/2[402] band
5/2+ 557.84
Band(E): 3/2[411] band
5/2+ 522.15
3/2+ 470.68
Band(D): 7/2[523] band
11/2− 496.56
113
204
(9/2−) 383.68
91
7/2− 292.802
Band(A): 1/2[411] band
9/2+ 326.50
184
210
Band(B): 1/2[541] band
(3/2−) 290.89
(9/2)− 285.87
103
98
5/2− 187.622
(1/2)− 171.73
Band(C): 7/2[404] band
(9/2)+ 296.14
117
(7/2)+ 179.469
7/2+ 142.411
26
5/2+ 116.575
132
106
117
3/2+ 10.416
1/2+ 0.0
10
$^{167}_{69}Tm_{98}$