^{159}Yb ε decay 1992Tl01,1995AdZS

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. W. Reich	NDS 113, 157 (2012)	31-Dec-2010

Parent: ^{159}Yb: E=0; J$^{\pi}$=5/2$^{(-)}$; $T_{1/2}$=1.67 min *9*; Q(ε)=4729 *33*; %ε+%β^{+} decay=100.0

^{159}Yb-Q(ε): Additional information 1.

Additional information 2.

All of the data are from 1992Tl01, unless otherwise noted. ^{159}Yb was produced by spallation of W target with 660-MeV protons with mass separation. Measured γ singles, $\gamma\gamma$ and $\gamma\gamma$(t) coincidences. 1995AdZS measured γ and ce singles and ce-γ coincidences; and 1995AdZU report unplaced γ's above 1650 keV. Others: 1980Al14 report 12 γ's; 1991TlZZ is by same authors as 1992Tl01.

^{159}Tm Levels

E(level)	J$^{\pi}$†	$T_{1/2}$	Comments
0.0‡	5/2$^{(+)}$		
52.98@ *8*	(7/2^{+})		
62.18#	(1/2^{+})		E(level): From 1995AdZS.
77.76# *7*	(3/2^{+})		
166.17& *5*	(7/2^{-})	37.5 ns *13*	$T_{1/2}$: From $\gamma\gamma$(t) from ^{159}Yb ε decay only (1992Tl01), see ^{159}Tm Adopted Levels for all measurements.
177.12‡ *5*	(7/2^{+})		
246.70@ *11*	(9/2^{+})		
253.79# *8*	(5/2^{+})		
316.89# *8*	(7/2^{+})		
374.52‡ *18*	(9/2^{+})		
479.88[a] *9*	(3/2^{+})		
496.38 *7*			
556.31 *9*			
572.66 *9*			
584.31 *10*			
638.93# *13*	(9/2^{+})		J$^{\pi}$: J$^{\pi}$ and band assignment by evaluator from calculated energies of levels in the 1/2^{+} band. 1992Tl01 and 1995AdZS assign this band member to the level at 584 keV.
644.67 *10*			
773.31 *13*			
813.19 *14*			
835.20 *17*			
902.90 *13*			
1018.02 *15*			
1062.73 *14*			
1212.82 *19*			
1296.45 *16*			
1392.68 *20*			
1399.84 *22*			
1551.65 *24*			

† From ^{159}Tm Adopted Levels.
‡ Band(A): K$^{\pi}$=5/2^{+}, π5/2[402] band.
# Band(B): K$^{\pi}$=1/2^{+}, π1/2[411] band.
@ Band(C): K$^{\pi}$=7/2^{+}, π7/2[404] band.
& Band(D): K$^{\pi}$=7/2^{-}, π7/2[523] bandhead.
[a] Band(E): K$^{\pi}$=3/2^{+}, π3/2[411] bandhead.

^{159}Yb ε decay 1992Tl01,1995AdZS (continued)

γ(^{159}Tm)

E_γ	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	δ[#]	α[&]	Comments
52.8		52.98	(7/2$^+$)	0.0	5/2$^{(+)}$	M1+E2	0.11 *2*	3.71 *19*	α(L)=2.88 *15*; α(M)=0.65 *4*; α(N+..)=0.174 *9* α(N)=0.152 *8*; α(O)=0.0211 *10*; α(P)=0.001011 *15* E_γ: From 1995AdZS.
62.18		62.18	(1/2$^+$)	0.0	5/2$^{(+)}$	E2		20.9	α(K)=1.763 *25*; α(L)=14.61 *21*; α(M)=3.59 *5*; α(N+..)=0.906 *13* α(N)=0.813 *12*; α(O)=0.0929 *13*; α(P)=0.0001229 *18* E_γ: From 1995AdZS.
77.70 *10*	6.9 *4*	77.76	(3/2$^+$)	0.0	5/2$^{(+)}$	(E2,M1)		7.3 *10*	α(K)=3.5 *19*; α(L)=2.9 *22*; α(M)=0.7 *6*; α(N+..)=0.18 *14* α(N)=0.16 *12*; α(O)=0.019 *13*; α(P)=0.00020 *13*
113.18 *6*	13.2 *7*	166.17	(7/2$^-$)	52.98	(7/2$^+$)	E1		0.241	α(K)=0.200 *3*; α(L)=0.0318 *5*; α(M)=0.00708 *10*; α(N+..)=0.00185 *3* α(N)=0.001626 *23*; α(O)=0.000217 *3*; α(P)=9.06×10^{-6} *13*
139.77 *9*	0.64 *12*	316.89	(7/2$^+$)	177.12	(7/2$^+$)	[M1,E2]		1.04 *15*	α(K)=0.7 *3*; α(L)=0.25 *10*; α(M)=0.058 *25*; α(N+..)=0.015 *6* α(N)=0.013 *6*; α(O)=0.0017 *6*; α(P)=4.0×10^{-5} *21*
^{x}151.1 *3*	0.93 *16*								
166.162 *23*	100	166.17	(7/2$^-$)	0.0	5/2$^{(+)}$	[E1]		0.0871	α(K)=0.0729 *11*; α(L)=0.01111 *16*; α(M)=0.00247 *4*; α(N+..)=0.000651 *10* α(N)=0.000570 *8*; α(O)=7.77×10^{-5} *11*; α(P)=3.49×10^{-6} *5* E_γ: from 1995AdZU.
176.01 *5*	14.2 *13*	253.79	(5/2$^+$)	77.76	(3/2$^+$)	E2		0.400	α(K)=0.236 *4*; α(L)=0.1260 *18*; α(M)=0.0304 *5*; α(N+..)=0.00779 *11* α(N)=0.00694 *10*; α(O)=0.000837 *12*; α(P)=1.073×10^{-5} *15*
177.12 *5*	31.7 *19*	177.12	(7/2$^+$)	0.0	5/2$^{(+)}$	M1		0.613	α(K)=0.514 *8*; α(L)=0.0773 *11*; α(M)=0.01722 *25*; α(N+..)=0.00464 *7* α(N)=0.00403 *6*; α(O)=0.000579 *9*; α(P)=3.14×10^{-5} *5*
^{x}191.79 *12*	4.4 *5*					E2		0.299	α(K)=0.185 *3*; α(L)=0.0880 *13*; α(M)=0.0212 *3*; α(N+..)=0.00543 *8* α(N)=0.00483 *7*; α(O)=0.000587 *9*; α(P)=8.57×10^{-6} *12*
193.72 *8*	7.0 *7*	246.70	(9/2$^+$)	52.98	(7/2$^+$)	M1		0.478	α(K)=0.401 *6*; α(L)=0.0601 *9*; α(M)=0.01340 *19*; α(N+..)=0.00361 *5*

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^{159}Yb ε decay 1992Tl01,1995AdZS (continued)

γ(^{159}Tm) (continued)

E$_\gamma$	I$_\gamma$[†]	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Mult.[‡]	α[&]	Comments
								α(N)=0.00314 *5*; α(O)=0.000451 *7*; α(P)=2.45×10^{-5} *4*
197.5 *2*	4.0 *10*	374.52	(9/2$^+$)	177.12	(7/2$^+$)	E2	0.271	α(K)=0.1696 *25*; α(L)=0.0779 *12*; α(M)=0.0187 *3*; α(N+..)=0.00481 *7* α(N)=0.00428 *7*; α(O)=0.000521 *8*; α(P)=7.93×10^{-6} *12*
225.85 *14*	3.0 *4*	479.88	(3/2$^+$)	253.79	(5/2$^+$)	[M1,E2]	0.24 *7*	α(K)=0.19 *8*; α(L)=0.042 *3*; α(M)=0.0098 *11*; α(N+..)=0.00257 *22* α(N)=0.00226 *22*; α(O)=0.000300 *7*; α(P)=1.1×10^{-5} *6*
[x]231.1 *2*	0.7 *2*							
239.17 *11*	11.6 *8*	316.89	(7/2$^+$)	77.76	(3/2$^+$)	E2	0.1448	α(K)=0.0979 *14*; α(L)=0.0361 *5*; α(M)=0.00859 *13*; α(N+..)=0.00222 *4* α(N)=0.00197 *3*; α(O)=0.000244 *4*; α(P)=4.79×10^{-6} *7*
[x]248.2 *3*	1.0 *3*							
253.4 *3*	3.0 *10*	253.79	(5/2$^+$)	0.0	5/2$^{(+)}$	[M1,E2]	0.17 *6*	α(K)=0.14 *6*; α(L)=0.0287 *5*; α(M)=0.0066 *3*; α(N+..)=0.00174 *4* α(N)=0.00153 *5*; α(O)=0.000205 *10*; α(P)=8.E−6 *4*
267.42 *14*	2.2 *2*	584.31		316.89	(7/2$^+$)			
293.34 *10*	3.5 *2*	773.31		479.88	(3/2$^+$)			
302.7 *2*	1.1 *2*	479.88	(3/2$^+$)	177.12	(7/2$^+$)	[E2]	0.0695	α(K)=0.0504 *8*; α(L)=0.01477 *21*; α(M)=0.00348 *5*; α(N+..)=0.000904 *13* α(N)=0.000799 *12*; α(O)=0.0001017 *15*; α(P)=2.59×10^{-6} *4*
[x]309.3 *2*	4.2 *7*							
314.1 *4*	0.5 *3*	479.88	(3/2$^+$)	166.17	(7/2$^-$)	[M2]	0.513	α(K)=0.411 *6*; α(L)=0.0786 *12*; α(M)=0.0181 *3*; α(N+..)=0.00487 *8* α(N)=0.00424 *7*; α(O)=0.000601 *9*; α(P)=3.06×10^{-5} *5*
319.1 *3*	0.71 *17*	572.66		253.79	(5/2$^+$)			
322.08 *11*	2.4 *2*	638.93	(9/2$^+$)	316.89	(7/2$^+$)			
330.24 *8*	19.9 *13*	496.38		166.17	(7/2$^-$)			
330.50 *10*	2.2 *8*	584.31		253.79	(5/2$^+$)			
340.2 *7*	0.6 *3*	835.20		496.38				
[x]371.40 *12*	2.8 *2*							
374.7 *3*	2.4 *5*	1392.68		1018.02				
390.20 *8*	22.5 *12*	556.31		166.17	(7/2$^-$)	M1	0.0721	α(K)=0.0606 *9*; α(L)=0.00893 *13*; α(M)=0.00198 *3*; α(N+..)=0.000535 *8* α(N)=0.000464 *7*; α(O)=6.69×10^{-5} *10*; α(P)=3.66×10^{-6} *6*
395.7 *2*	1.0 *3*	572.66		177.12	(7/2$^+$)			
402.15 *10*	3.7 *4*	479.88	(3/2$^+$)	77.76	(3/2$^+$)	[M1,E2]	0.049 *18*	α(K)=0.040 *17*; α(L)=0.0069 *14*; α(M)=0.0016 *3*; α(N+..)=0.00041 *8* α(N)=0.00036 *7*; α(O)=5.0×10^{-5} *12*; α(P)=2.3×10^{-6} *11*
406.54[a] *13*	3.2[a] *7*	572.66		166.17	(7/2$^-$)			
406.54[a] *13*	1.4[a] *5*	902.90		496.38				
[x]445.1 *2*	2.1 *4*							
461.9 *2*	3.7 *5*	1018.02		556.31				
467.6 *3*	0.76 *17*	644.67		177.12	(7/2$^+$)			
478.38[a] *13*	2.5[a] *5*	644.67		166.17	(7/2$^-$)			
478.38[a] *13*	1.0[a] *4*	1062.73		584.31				
[x]484.4 *4*	0.7 *3*							

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^{159}Yb ε decay 1992Tl01,1995AdZS (continued)

γ(^{159}Tm) (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π
496.30[a] 11	7.3[a] 6	496.38		0.0	5/2$^{(+)}$
496.30[a] 11	1.0[a] 4	813.19		316.89	(7/2$^+$)
[x]498.65 14	5.0 4				
[x]542.60 13	4.5 3				
[x]551.2 2	0.7 4				
[x]559.24 15	3.6 3				
572.46 14	4.4 3	572.66		0.0	5/2$^{(+)}$
580.3 10	0.4 2	835.20		253.79	(5/2$^+$)
[x]606.2 2	1.40 18				
[x]619.9 3	0.77 18				
[x]630.37 16	2.6 2				
638.6 3	0.56 16	638.93	(9/2$^+$)	0.0	5/2$^{(+)}$
644.83 16	2.7 2	644.67		0.0	5/2$^{(+)}$
656.8 3	0.67 16	1212.82		556.31	
[x]663.3 2	1.3 2				
668.98 17	2.8 2	835.20		166.17	(7/2$^-$)
[x]694.4 2	2.4 3				
[x]712.82 17	2.7 3				
[x]717.14 19	2.2 3				
[x]727.9 2	1.5 2				
[x]732.9 2	1.20 18				
736.7 2	1.6 2	902.90		166.17	(7/2$^-$)
740.2 3	1.01 17	1296.45		556.31	
[x]747.03 15	4.2 3				
764.1 3	1.0 3	1018.02		253.79	(5/2$^+$)
[x]770.3 2	1.4 2				
774.1 3	0.8 2	773.31		0.0	5/2$^{(+)}$
799.6 3	0.61 16	1296.45		496.38	
[x]815.6 2	1.9 2				
838.38 19	2.3 3	1212.82		374.52	(9/2$^+$)
[x]843.2 3	1.2 2				
[x]864.9 3	1.1 2				
885.7 2	1.06 15	1062.73		177.12	(7/2$^+$)
[x]893.05 19	1.41 16				
940.0 3	1.32 19	1018.02		77.76	(3/2$^+$)
[x]978.2 3	1.4 2				
[x]985.8 2	0.62 14				
[x]998.8 2	2.8 3				
[x]1016.72 16	2.19 17				
1034.8 4	0.9 2	1212.82		177.12	(7/2$^+$)
[x]1068.8 3	0.65 14				
[x]1073.20 17	1.54 16				
[x]1084.39 16	1.94 17				
[x]1108.41 16	1.78 15				
[x]1125.69 18	4.7 4				
[x]1133.4 4	1.0 3				
[x]1154.4 3	1.7 3				
1225.4 4	0.64 16	1392.68		166.17	(7/2$^-$)
1233.1 3	1.39 18	1399.84		166.17	(7/2$^-$)
1243.3 3	0.61 12	1296.45		52.98	(7/2$^+$)
1297.0 3	1.5 3	1296.45		0.0	5/2$^{(+)}$
1340.3 5	0.70 19	1392.68		52.98	(7/2$^+$)
1385.3 3	1.25 19	1551.65		166.17	(7/2$^-$)
1393.3 4	0.81 15	1392.68		0.0	5/2$^{(+)}$
1400.4 3	1.20 16	1399.84		0.0	5/2$^{(+)}$
[x]1460.0 4	4.0 3				

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^{159}Yb ε decay 1992Tl01,1995AdZS (continued)

γ(^{159}Tm) (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π
1499.0 *5*	1.4 *2*	1551.65		52.98	(7/2$^+$)
[x]1514.5 *5*	1.4 *2*				
1551.8 *5*	1.3 *2*	1551.65		0.0	5/2$^{(+)}$
[x]1599.5 *5*	1.8 *3*				
[x]1620.0 *5*	1.06 *12*				
[x]1672.5 *6*	1.15 *16*				
[x]1673.89[@] *21*	0.9[@] *11*				
[x]1688.3 *7*	1.2 *3*				
[x]1701.9 *10*	1.7 *6*				
[x]1704.24[@] *23*	1.82[@] *20*				
[x]1726.25[@] *21*	0.77[@] *12*				
[x]1729.8[@] *4*	0.97[@] *23*				
[x]1736.4[@] *3*	0.63[@] *14*				
[x]1741.2[@] *3*	0.91[@] *16*				
[x]1761.84[@] *21*	2.11[@] *16*				
[x]1780.38[@] *18*	0.98[@] *15*				
[x]1809.45[@] *18*	0.42[@] *6*				
[x]1819.62[@] *8*	1.10[@] *7*				
[x]1821.91[@] *25*	0.25[@] *5*				
[x]1842.94[@] *26*	0.34[@] *9*				
[x]1871.53[@] *13*	0.61[@] *8*				
[x]1877.6[@] *4*	0.23[@] *8*				
[x]1882.71[@] *21*	0.84[@] *14*				
[x]1898.0[@] *4*	0.29[@] *8*				
[x]1900.6[@] *4*	0.27[@] *8*				
[x]1909.74[@] *10*	1.11[@] *11*				
[x]1930.48[@] *12*	0.64[@] *7*				
[x]1944.77[@] *25*	0.27[@] *9*				
[x]1986.72[@] *29*	0.45[@] *9*				
[x]2009.06[@] *22*	0.43[@] *7*				
[x]2018.55[@] *21*	0.49[@] *7*				
[x]2021.52[@] *17*	0.70[@] *8*				
[x]2034.02[@] *23*	0.46[@] *7*				
[x]2042.2[@] *4*	0.21[@] *5*				
[x]2061.52[@] *26*	0.52[@] *10*				
[x]2064.9[@] *3*	0.45[@] *9*				
[x]2070.30[@] *12*	0.46[@] *10*				
[x]2081.15[@] *11*	1.23[@] *10*				
[x]2112.30[@] *20*	0.37[@] *8*				
[x]2120.20[@] *16*	0.52[@] *6*				
[x]2124.10[@] *20*	0.39[@] *6*				
[x]2127.8[@] *3*	0.21[@] *5*				
[x]2145.66[@] *23*	0.30[@] *6*				
[x]2152.49[@] *13*	0.68[@] *7*				
[x]2181.0[@] *3*	0.38[@] *9*				
[x]2219.48[@] *14*	0.74[@] *7*				
[x]2290.60[@] *25*	0.48[@] *8*				
[x]2316.67[@] *22*	0.38[@] *8*				
[x]2362.02[@] *25*	0.35[@] *12*				
[x]2460.72[@] *27*	0.36[@] *10*				
[x]2478.75[@] *17*	0.62[@] *8*				

† The intensities of the $\varepsilon+\beta^+$ branches to the 0, 53, and 77 levels are unknown, hence no useful normalization of the γ-ray intensities can be determined.
‡ From α_K(exp) and $L_{1,2}/L_3$ ratios (1995AdZS) or J^π assignments in ^{159}Tm Adopted Levels.
\# From $L_{1,2}/L_3$ ratio (1995AdZS).
@ From 1995AdZU.
& 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.
a Multiply placed with intensity suitably divided.
x γ ray not placed in level scheme.

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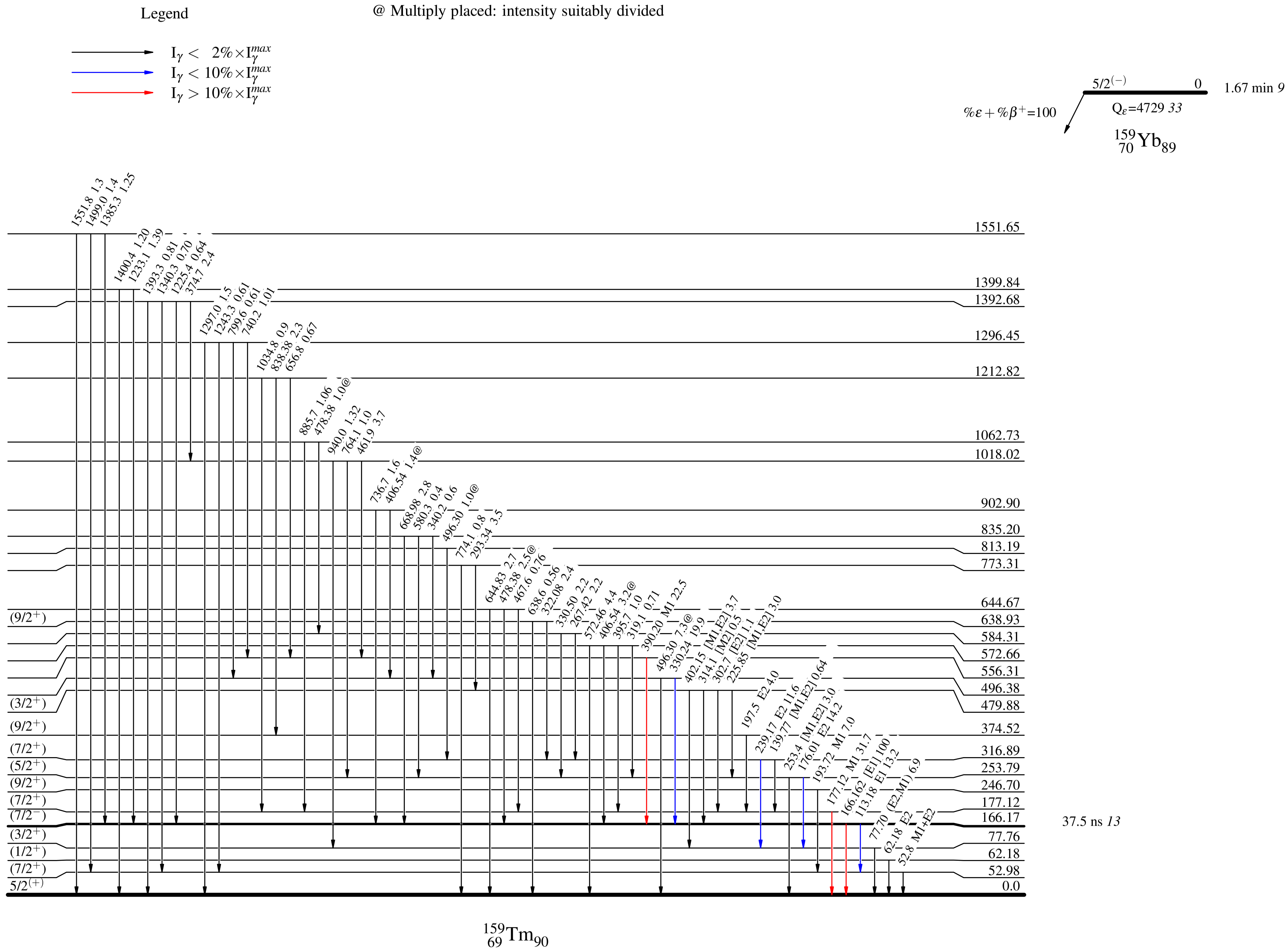
Decay Scheme

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided



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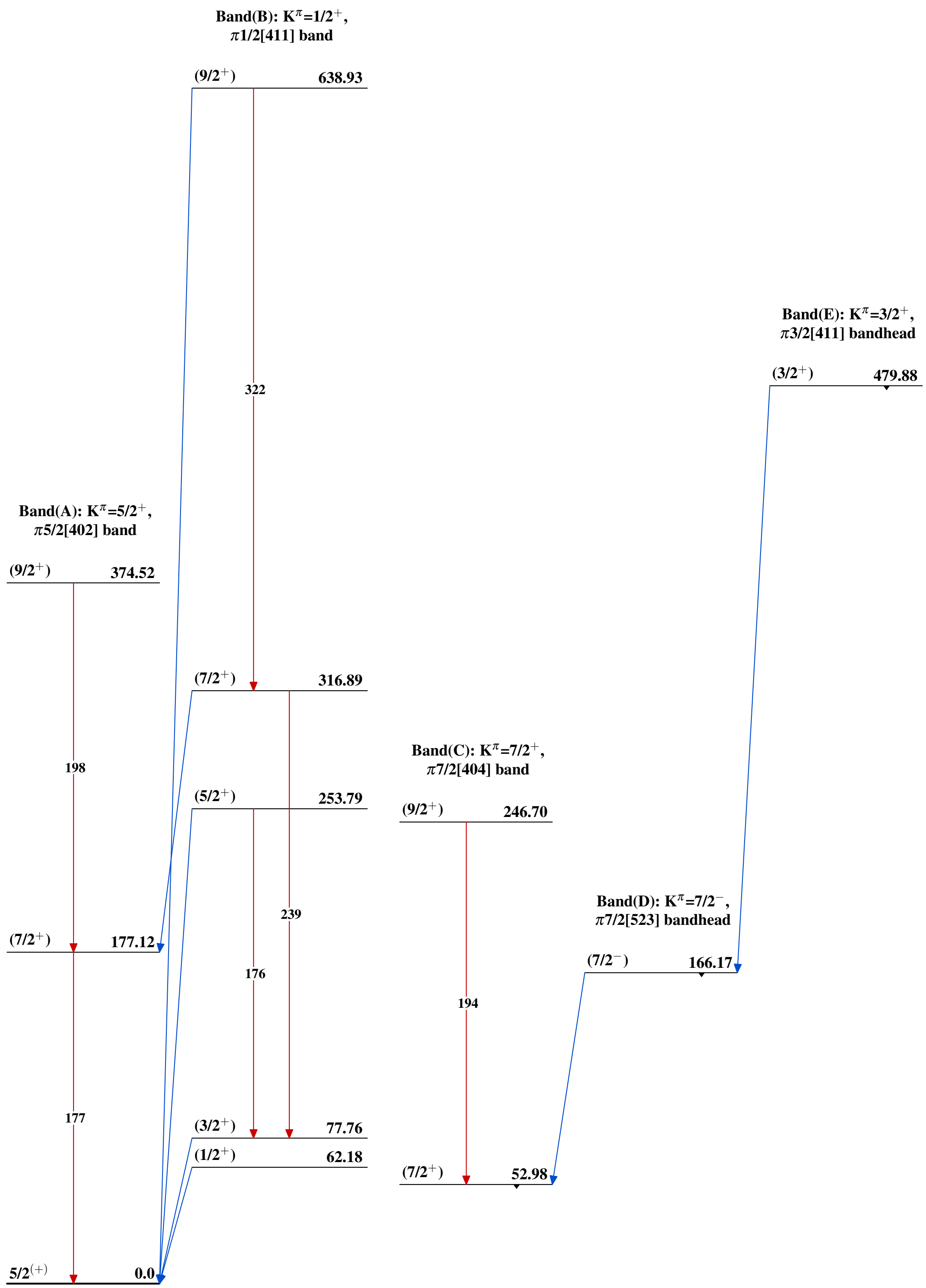

$^{159}_{69}Tm_{90}$