^{173}Yb(^{11}B,5nγ) 2002Th12

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 110, 265 (2009)	15-Nov-2008

2002Th12: E(^{11}B)=73 MeV; 95% enriched ^{173}Yb target, chopped and/or bunched beam, CAESAR detector array (six Compton-suppressed coaxial Ge detectors At ±48°, ±97°, ±145°, and two unsuppressed planar LEPS Ge detectors At 45° and 135°), Si(Li) detector, superconducting solenoid In lens mode; measured excit (E=73, 76, 79 MeV); measured (out of beam) Eγ, Iγ, γ(t), $\gamma\gamma$(t), Ice, I(K x ray), $\gamma\gamma$ coin. Beam timing conditions: 1 ns on, 1712 ns off for excit, γ-t, γ-γ-t; 0.54 μs on, 19.8 μs off, prompt veto for γ-t; 640 μs on, 5.30 ms off, prompt veto for ce data; 300 μs on, 3 ms off, prompt veto for off-beam γ-γ-t. Blocked BCS calculations performed.

2002Th12 also took some data using the ^{165}Ho(^{18}O,4nγ) reaction At E=82 MeV using bunched and chopped beam (0.11 ms on, 6.4 ms off for γ-time data; 1 ns on, 1712 ns off for γ-γ-time data); however, the (^{11}B,5nγ) reaction populated states with higher angular momenta so most data presented In 2002Th12 were obtained from the latter reaction.

^{179}Re Levels

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]	Comments
0.0[g]	5/2$^+$		
64.6[f] *6*	5/2$^-$	95 μs *25*	T$_{1/2}$: from Adopted Levels.
86.9[e] *5*	9/2$^-$		
115.0[f] *5*	9/2$^-$		
124.20[g] *16*	7/2$^+$		
252.4[e] *5*	11/2$^-$		
279.80[g] *16*	9/2$^+$		
283.8[f] *5*	13/2$^-$		
446.6[e] *5*	13/2$^-$		
465.89[g] *19*	11/2$^+$		
569.8[f] *5*	17/2$^-$		
664.3[e] *5*	15/2$^-$		
677.03[g] *21*	13/2$^+$		
905.6[e] *5*	17/2$^-$		
913.72[g] *23*	15/2$^+$		
962.0[f] *4*	21/2$^-$		
1164.0[e] *5*	19/2$^-$		
1166.21[g] *25*	17/2$^+$		
1297.6 *5*	15/2$^-$		Suggested Configuration=((π 9/2[514])+(ν 7/2[514])-(ν 1/2[521])).
1436.4[g] *3*	19/2$^+$		
1445.8[f] *4*	25/2$^-$		
1544.1 *5*	(17/2$^-$)		possible J=17/2 member of band built on 1298 level; supported by implied moment of inertia for band. however, 1618 level could, alternatively, Be that member.
1617.8 *5*	(17/2$^-$)		see comment on 1544 level.
1713.8[g] *3*	21/2$^+$		
1771.8 *5*	(19/2$^-$)		Suggested Configuration=((π 5/2[402])+(ν 7/2[514])+(ν 7/2[633])).
1771.8+x[c] *5*	(23/2$^+$)	408 ns *12*	T$_{1/2}$: from time spectrum measured with gates on 866γ and 1107γ below level, using pulsed beam (0.54 μs on, 19.8 μs off) and the (^{11}B,5nγ) reaction.
1813.7[d] *5*	(17/2$^+$)		
1826.4[b] *6*	(19/2$^+$)		
1902.00+x[c] *20*	(25/2$^+$)		
1978.0[b] *5*	(21/2$^+$)		
1986.2[g] *3*	23/2$^+$		
1988.3[d] *5*	(19/2$^+$)		
2005.1[f] *4*	29/2$^-$		

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^{173}Yb(^{11}B,5nγ) 2002Th12 (continued)

^{179}Re Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	Comments
2053.2 *3*	(23/2+)		possible collective state In a band which accommodates the 565γ and the unplaced 502γ, 441γ and 377γ.
2096.7+x[c] *3*	(27/2+)		
2182.6[d] *5*	(21/2+)		
2186.5[b] *6*	(23/2+)		
2251.3[g] *3*	25/2+		
2325.6+x[c] *4*	(29/2+)		
2396.5[d] *5*	(23/2+)		
2416.4[b] *6*	(25/2+)		
2555.4 *4*	(27/2+)		
2580.7+x[c] *4*	(31/2+)		
2618.7 *3*	(27/2+)		
2623.9[f] *4*	33/2−		
2627.5[d] *5*	(25/2+)		
2633.9 *4*	(27/2+)		
2693.4[b] *6*	(27/2+)		
2876.9[d] *5*	(27/2+)		
3130.8[d] *4*	(29/2+)		
3159.5 *4*	(29/2+)	<1 ns	possible five quasiparticle state with configuration ((π 5/2[402])+(ν 9/2[624])+(ν 7/2[514])+(ν 7/2[633])+(ν 1/2[521])).
3252.4[b] *6*	(31/2+)		
3277.1 *4*	(31/2+)	<1 ns	possible five quasiparticle state with configuration ((π 9/2[514])+(ν 9/2[624])+(ν 7/2[514])+(ν 5/2[512])+(ν 1/2[521])). $T_{1/2}$: from analysis of time-difference spectra (2002Th12). an intensity imbalance of 65 *23* exists for this level, but 2002Th12 indicate that an additional, unidentified branch exists to the Kπ=(23/2+) band based on the 1772+x level.
3455.5[@] *4*	(33/2+)		
3541.8[&] *5*	(33/2−)		
3703.1[a] *5*	(35/2+)		
3765.8[@] *4*	(35/2+)		
3840.2[&] *5*	(35/2−)		
3994.8[a] *5*	(37/2+)		
4079.9[@] *4*	(37/2+)		
4152.3[&] *5*	(37/2−)		
4307.7[a] *5*	(39/2+)		
4398.0[@] *4*	(39/2+)		
4480.0[&] *5*	(39/2−)		
4719.9[@] *5*	(41/2+)		
4732.9[a] *5*	(41/2+)		
4824.2[&] *5*	(41/2−)		
5049.5[@] *5*	(43/2+)		
5162.8[a] *6*	(45/2+)		
5186.0[&] *5*	(43/2−)		
5351.2 *6*	(45/2+)		drawn As member of Kπ=33/2− band In table II but neither parity nor energy nor discussion In text is consistent with that assignment.
5389.3[@] *5*	(45/2+)		
5407.7 *6*	(47/2,49/2+)	0.466 ms *15*	Jπ: γ to (45/2+); seven-quasiparticle state with configuration ((π 11/2[505])+(π 9/2[514])+(π 7/2[404])+(π 5/2[402])+(π 1/2[541]) +(ν 7/2[514])+(ν

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^{173}Yb(^{11}B,5nγ) 2002Th12 (continued)

^{179}Re Levels (continued)

E(level)[†]	J^{π}[‡]	$T_{1/2}$[#]	Comments
			7/2[633]))47/2$^+$ expected near this energy. However, J^{π}=47/2$^-$ or 49/2$^+$ cannot Be ruled out. $T_{1/2}$: from (^{18}O,4nγ) data, using pulsed and chopped beam, 0.11 ms on and 6.4 ms off (2002Th12).

[†] From least-squares fit to measured Eγ.

[‡] Authors′ values based on deduced band characteristics, level $T_{1/2}$, photon branching and inferred multipolarity, and comparison with structure In neighboring nuclides and with band properties calculated for various possible K^{π}.

[#] Using background subtracted time spectra obtained from γ-time matrices, plots of γ event times relative to prompt beam pulses were fitted to an exponential decay if transitions contained No prompt component; for shorter $T_{1/2}$ or for time-difference spectra from the γ-γ-Δt cube, the fitted function was an exponential convoluted with a prompt-Gaussian function.

[@] Band(A): K^{π}=(33/2$^+$) band. Possible five-quasiparticle band with configuration ((π 5/2[402])+(ν 9/2[624])+(ν 7/2[514])+(ν 5/2[512])+(ν 7/2[633])) analogous to that built on 2826 level In ^{177}Ta.

[&] Band(B): K^{π}=(33/2$^-$) band. Possible five-quasiparticle band with configuration ((π 9/2[514])+(ν 9/2[624])+(ν 7/2[514])+(ν 1/2[521])+(ν 7/2[633])) based primarily on authors′ g-factor analysis.

[a] Band(C): K^{π}=(35/2$^+$) band. Possible five-quasiparticle band with configuration ((π 7/2[404])+(ν 9/2[624])+(ν 7/2[514])+(ν 5/2[512])+(ν 7/2[633])) based primarily on authors′ g-factor analysis and on multiquasiparticle calculations which predict E=4010 for this configuration′s bandhead.

[b] Band(D): K^{π}=(19/2$^+$) band. Suggested Configuration=((π 9/2[514])+(ν 9/2[624])+(ν 1/2[521])). Weakly populated.

[c] Band(E): K^{π}=(23/2$^+$) band. Suggested Configuration=((π 9/2[514])+(ν 7/2[633])+(ν 7/2[514])). Intraband transition energies are similar to those of analogous band In ^{177}Ta (2002Th12).

[d] Band(F): K^{π}=(17/2$^+$) band. Suggested Configuration=((π 5/2[402])+(ν 7/2[514])+(ν 5/2[512])), consistent with g-factor analysis, alignment and relative excitation energy.

[e] Band(G): 9/2[514] band.

[f] Band(H): 1/2[541] band. α=+1/2.

[g] Band(I): 5/2[402] g.s. band.

^{173}Yb(^{11}B,5nγ) 2002Th12 (continued)

γ(^{179}Re)

E_γ	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	α[&]	$I_{(\gamma+ce)}$	Comments
(x)		1771.8+x	(23/2+)	1771.8	(19/2−)	[M2]		25 *4*	$I_{(\gamma+ce)}$: from intensity balance At 1772+x level assuming mult(130.2γ) is M1.
(18.4 *8*)		5407.7	(47/2,49/2+)	5389.3	(45/2+)			323 *9*	E_γ: from level energy difference. I_γ: based on I(γ+ce) deexciting the 5389 level, Ti(18)=323 *9*, so Iγ=36.7 *10* if E1 (α=7.80), 2.32 *7* if M1 (α=138.2) or 0.0228 *6* if E2 (α=1.415×10^4).
(24.7 *7*)		3277.1	(31/2+)	3252.4	(31/2+)			8.0 *15*	E_γ: from level energy difference. $I_{(\gamma+ce)}$: from intensity balance At 3252 level.
50.4 *2*	1.8 *10*	115.0	9/2−	64.6	5/2−	E2	87.0 *21*		Mult.: mult=E2 for both 50.4γ and 168.8γ based on intensity balance At the 115 level.
56[a] *1*		5407.7	(47/2,49/2+)	5351.2	(45/2+)				placement shown As uncertain due to inconsistent coincidences with transitions In band(S) below the 5408 level (2002Th12). I_γ: based on I(γ+ce) deexciting the 5186 level, Ti(56)=70 *4*, so Iγ=52 *3* if E1 (α=0.3525), 12.0 *6* if M1 (α=4.828) or 1.32 *7* (α=52.1) if E2. However, based on I(γ+ce) deexciting the 5351 level, Ti(56)=44 *7* if mult=E1 for 165.2γ, implying Iγ(56γ)=33 *5* if E1, 7.6 *12* if M1, 0.83 *15* if E2.
117 *1*	25 *3*	3277.1	(31/2+)	3159.5	(29/2+)	M1	3.30 *10*		E_γ: line contaminated by close-lying, unplaced 119γ. Mult.: α(exp)=3.7 *7* from intensity balance (2002Th12).
^{x}119[#]									
124.2 *2*	30.0 *3*	124.20	7/2+	0.0	5/2+				
130.2 *2*	7.0 *10*	1902.00+x	(25/2+)	1771.8+x	(23/2+)	(M1)	2.43		Mult.: from Adopted Gammas.
146.3 *2*	19.4 *8*	3277.1	(31/2+)	3130.8	(29/2+)	M1	1.75		Mult.: α(exp)=2.7 *5* from intensity balance (2002Th12).
151.6 *2*	2.15 *23*	1978.0	(21/2+)	1826.4	(19/2+)				
153.7 *2*	8.2 *14*	1771.8	(19/2−)	1617.8	(17/2−)				
155.6 *2*	44 *6*	279.80	9/2+	124.20	7/2+				
165.2 *2*	40 *6*	5351.2	(45/2+)	5186.0	(43/2−)	[E1]	0.1050		coincident with transitions In K^π=33/2− band. Mult.: I(γ+ce) balance At 5186 level implies α(exp)(165.2)=0.75 *28*, mult=E2(+M1), but level scheme requires E1. Possibly Iγ is unreliable due to proximity of transitions with similar Eγ.
165.5 *2*	80.0 *10*	252.4	11/2−	86.9	9/2−				
168.8 *2*	100 *4*	283.8	13/2−	115.0	9/2−	E2	0.574		Mult.: see comment on mult(50.4γ).
174.5 *2*	15.9 *21*	1988.3	(19/2+)	1813.7	(17/2+)				
178.3 *2*	71 *4*	3455.5	(33/2+)	3277.1	(31/2+)	M1	1.000		Mult.: α(exp)=1.4 *4* from intensity balance (2002Th12).
186.1 *2*	49 *6*	465.89	11/2+	279.80	9/2+				
194.3 *2*	127 *9*	446.6	13/2−	252.4	11/2−				
194.3 *2*	6.6 *10*	2182.6	(21/2+)	1988.3	(19/2+)				
194.7 *2*	14.0 *10*	2096.7+x	(27/2+)	1902.00+x	(25/2+)				
206.2 *2*	10.1 *17*	1978.0	(21/2+)	1771.8	(19/2−)				
208.6 *2*	13 *4*	2186.5	(23/2+)	1978.0	(21/2+)				

From ENSDF

$^{179}_{75}Re_{104}$-4

γ(^{179}Re) (continued)

E_γ	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	δ[‡]	α[&]	Comments
211.1 *2*	38 *3*	677.03	13/2+	465.89	11/2+				
214.0 *2*	8.1 *14*	2396.5	(23/2+)	2182.6	(21/2+)				
217.9 *2*	98 *6*	664.3	15/2−	446.6	13/2−				
228.9 *2*	13.5 *10*	2325.6+x	(29/2+)	2096.7+x	(27/2+)				
229.9 *2*	10 *3*	2416.4	(25/2+)	2186.5	(23/2+)				
231.0 *2*	16.6 *15*	2627.5	(25/2+)	2396.5	(23/2+)				
236.8 *2*	16 *3*	913.72	15/2+	677.03	13/2+				
241.4 *2*	41 *4*	905.6	17/2−	664.3	15/2−				
244.9 *2*	58 *5*	5407.7	(47/2,49/2+)	5162.8	(45/2+)				Mult.: E1 (α=0.0388) or E2 (α=0.1645) is favored based on intensity deexciting the 5163 level.
246.1 *2*	4.9 *14*	1544.1	(17/2−)	1297.6	15/2−				
249.5 *2*	3.6 *11*	2876.9	(27/2+)	2627.5	(25/2+)				
252.7 *2*	22.7 *22*	1166.21	17/2+	913.72	15/2+				
254.1 *2*	13.1 *14*	3130.8	(29/2+)	2876.9	(27/2+)				
255.1 *2*	15.4 *10*	2580.7+x	(31/2+)	2325.6+x	(29/2+)				
258.1 *2*	34 *3*	1164.0	19/2−	905.6	17/2−				
264.7 *2*	77 *6*	3541.8	(33/2−)	3277.1	(31/2+)	[E1]		0.0320	Mult.: E1 from level scheme; however, I(γ+ce) balance At 3542 level implies α(exp)(264.7γ)=0.55 *15* consistent with mult=M1.
265.2 *2*	14.2 *16*	2251.3	25/2+	1986.2	23/2+				
269.8 *2*	5.3 *16*	1813.7	(17/2+)	1544.1	(17/2−)				
270.2 *2*	17.8 *19*	1436.4	19/2+	1166.21	17/2+				
272.3 *2*	6.1 *13*	1986.2	23/2+	1713.8	21/2+				
277.0 *2*	7.4 *10*	2693.4	(27/2+)	2416.4	(25/2+)				
277.6 *2*	15.3 *16*	1713.8	21/2+	1436.4	19/2+				
279.8 *2*	5.9 *21*	279.80	9/2+	0.0	5/2+				
286.1 *2*	150 *13*	569.8	17/2−	283.8	13/2−	[E2]		0.1016	
291.7 *2*	59 *7*	3994.8	(37/2+)	3703.1	(35/2+)	(M1)		0.257	Mult.: α(exp)=0.5 *3* from I(γ+ce) balance At 3703 level.
^{x}294[#]									
296.0 *2*	130 *7*	3455.5	(33/2+)	3159.5	(29/2+)				
298.5 *2*	78 *5*	3840.2	(35/2−)	3541.8	(33/2−)	M1		0.241	Mult.: from α(exp)=0.41 *11* from I(γ+ce) balance At 3840 level if 312.0γ is M1.
304.0 *2*	10.7 *20*	2555.4	(27/2+)	2251.3	25/2+				
310.3 *2*	220 *16*	3765.8	(35/2+)	3455.5	(33/2+)	M1		0.217	α(K)exp=0.25 *3*; α(L)exp=0.024 *6*
312.0 *2*	52 *3*	4152.3	(37/2−)	3840.2	(35/2−)	[M1]		0.214	
313.0 *2*	55 *6*	4307.7	(39/2+)	3994.8	(37/2+)				
314.2 *2*	214 *8*	4079.9	(37/2+)	3765.8	(35/2+)	M1+E2	0.37 *+25−37*	0.194 *22*	α(K)exp=0.16 *2*; α(L)exp=0.030 *6* δ: from α(K)exp; <0.9 from α(L)exp.
318.3 *2*	169 *7*	4398.0	(39/2+)	4079.9	(37/2+)	M1+E2	1.2 *+21−6*	0.13 *5*	α(K)exp=0.10 *4*; α(L)exp=0.024 *6*
320.3 *2*	11.3 *21*	1617.8	(17/2−)	1297.6	15/2−				
322.1 *2*	165 *6*	4719.9	(41/2+)	4398.0	(39/2+)	M1(+E2)	≤0.31	0.191 *7*	α(K)exp=0.16 *3*; α(L)exp=0.030 *5* δ: 0.17 *+47−17* from α(K)exp;≤0.31 from α(L)exp.

From ENSDF

γ(^{179}Re) (continued)

E_γ	I_γ†	E_i(level)	J^π_i	E_f	J^π_f	Mult.‡	δ‡	α&	Comments
327.8 *2*	33.3 *23*	4480.0	(39/2$^-$)	4152.3	(37/2$^-$)	[M1]		0.187	
329.9 *2*	125 *5*	5049.5	(43/2$^+$)	4719.9	(41/2$^+$)	M1+E2	0.55 *15*	0.157 *12*	α(K)exp≤0.10 *4*; α(L)exp=0.033 *12* δ: 1.0 +*15*−*6* from α(K)exp;≤0.7 from α(L)exp.
339.7 *2*	20 *5*	2053.2	(23/2$^+$)	1713.8	21/2$^+$				
339.9 *2*	188 *7*	5389.3	(45/2$^+$)	5049.5	(43/2$^+$)	M1(+E2)	≤0.84	0.148 *23*	α(K)exp=0.13 *3*; α(L)exp=0.017 *7* δ: from α(K)exp. α(L)exp overlaps both α(L)(M1) and α(L)(E2).
341.7 *2*	15 *7*	465.89	11/2$^+$	124.20	7/2$^+$				
344.4 *2*	10.0 *14*	4824.2	(41/2$^-$)	4480.0	(39/2$^-$)				
359.8 *2*	16 *3*	446.6	13/2$^-$	86.9	9/2$^-$				
361.7 *2*	22.8 *17*	5186.0	(43/2$^-$)	4824.2	(41/2$^-$)	[M1]		0.1440	
367.5 *2*	9.6 *8*	2618.7	(27/2$^+$)	2251.3	25/2$^+$				
368.9 *2*	22.5 *24*	2182.6	(21/2$^+$)	1813.7	(17/2$^+$)				
^{x}377@									
392.2 *2*	141 *10*	962.0	21/2$^-$	569.8	17/2$^-$				
397.2 *2*	29 *3*	677.03	13/2$^+$	279.80	9/2$^+$				
408.1 *2*	9.4 *16*	2396.5	(23/2$^+$)	1988.3	(19/2$^+$)				
411.8 *2*	18 *4*	664.3	15/2$^-$	252.4	11/2$^-$				
425.2 *2*	54 *8*	4732.9	(41/2$^+$)	4307.7	(39/2$^+$)				
426.0 *2*	90 *14*	3703.1	(35/2$^+$)	3277.1	(31/2$^+$)	[E2]		0.0329	
429.9 *2*	55 *9*	5162.8	(45/2$^+$)	4732.9	(41/2$^+$)	[E2]		0.0321	
^{x}441@									
444.8 *2*	29.2 *23*	2627.5	(25/2$^+$)	2182.6	(21/2$^+$)				
447.9 *2*	21 *3*	913.72	15/2$^+$	465.89	11/2$^+$				
459.3 *2*	20 *3*	905.6	17/2$^-$	446.6	13/2$^-$				
474.0 *2*	9.0 *22*	1771.8	(19/2$^-$)	1297.6	15/2$^-$				
480.6 *2*	6.5 *15*	2876.9	(27/2$^+$)	2396.5	(23/2$^+$)				
483.8 *2*	114 *8*	1445.8	25/2$^-$	962.0	21/2$^-$				
489.0 *2*	24.8 *24*	1166.21	17/2$^+$	677.03	13/2$^+$				
500.4 *2*	17 *3*	1164.0	19/2$^-$	664.3	15/2$^-$				
^{x}502@									
503.0 *2*	51 *3*	3130.8	(29/2$^+$)	2627.5	(25/2$^+$)				
506.9 *2*	5.6 *12*	2693.4	(27/2$^+$)	2186.5	(23/2$^+$)				
515.4 *2*	2.5 *8*	1813.7	(17/2$^+$)	1297.6	15/2$^-$				
522.7 *2*	27 *3*	1436.4	19/2$^+$	913.72	15/2$^+$				
525.9 *2*	29.4 *17*	3159.5	(29/2$^+$)	2633.9	(27/2$^+$)				
537.4 *2*	21.0 *20*	2251.3	25/2$^+$	1713.8	21/2$^+$				
540.6 *2*	23.1 *12*	3159.5	(29/2$^+$)	2618.7	(27/2$^+$)				
547.7 *2*	23.1 *24*	1713.8	21/2$^+$	1166.21	17/2$^+$				
549.9 *2*	13.8 *21*	1986.2	23/2$^+$	1436.4	19/2$^+$				
559.0 *2*	8.0 *15*	3252.4	(31/2$^+$)	2693.4	(27/2$^+$)				
559.3 *2*	82 *6*	2005.1	29/2$^-$	1445.8	25/2$^-$				
565.3 *2*	23.0 *12*	2618.7	(27/2$^+$)	2053.2	(23/2$^+$)				

$^{179}_{75}$Re$_{104}$-6

γ(^{179}Re) (continued)

E_γ	I_γ†	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	α&	Comments
581.0 *2*	5.7 *7*	2633.9	(27/2+)	2053.2	(23/2+)			
604.0 *2*	6.3 *16*	3159.5	(29/2+)	2555.4	(27/2+)			
604[a] *1*	4.0 *24*	4307.7	(39/2+)	3703.1	(35/2+)			
608.2 *2*	14.6 *19*	1771.8	(19/2−)	1164.0	19/2−			
610.4 *2*	22 *3*	4152.3	(37/2−)	3541.8	(33/2−)			
616.3 *2*	6.2 *22*	2053.2	(23/2+)	1436.4	19/2+			
618.9 *2*	25 *4*	2623.9	33/2−	2005.1	29/2−			
624.4 *2*	27 *3*	4079.9	(37/2+)	3455.5	(33/2+)			
632.2 *2*	38 *3*	4398.0	(39/2+)	3765.8	(35/2+)			
632.7 *2*	8.8 *21*	1297.6	15/2−	664.3	15/2−			
639.9 *2*	47 *3*	4480.0	(39/2−)	3840.2	(35/2−)			
640.0 *2*	66 *4*	4719.9	(41/2+)	4079.9	(37/2+)			
651.3 *2*	52 *3*	5049.5	(43/2+)	4398.0	(39/2+)			
653.4 *2*	31.4 *25*	3277.1	(31/2+)	2623.9	33/2−	[E1]	0.00422 *6*	
669.3 *2*	107 *5*	5389.3	(45/2+)	4719.9	(41/2+)			
671.6 *2*	16.7 *21*	4824.2	(41/2−)	4152.3	(37/2−)			
706.1 *2*	44 *3*	5186.0	(43/2−)	4480.0	(39/2−)			
727.8 *2*		1297.6	15/2−	569.8	17/2−			observed only In the short-pulsing data (1 ns on, 1712 ns off).
738.1 *2*	5 *3*	4732.9	(41/2+)	3994.8	(37/2+)			
850.6 *2*	1.1 *8*	1297.6	15/2−	446.6	13/2−			
866.3 *2*	16.8 *22*	1771.8	(19/2−)	905.6	17/2−			
908.5 *2*	4.1 *12*	1813.7	(17/2+)	905.6	17/2−			
953.4 *2*	3.4 *14*	1617.8	(17/2−)	664.3	15/2−			
1013.8 *2*		1297.6	15/2−	283.8	13/2−			observed only In the short-pulsing data (1 ns on, 1712 ns off).
1045.0 *2*	0.5 *11*	1297.6	15/2−	252.4	11/2−			
1098.0 *2*	3.6 *16*	1544.1	(17/2−)	446.6	13/2−			
1107.3 *2*	17.6 *25*	1771.8	(19/2−)	664.3	15/2−			
1149.6 *2*	3.1 *9*	1813.7	(17/2+)	664.3	15/2−			
1171.0 *2*	1 *1*	1617.8	(17/2−)	446.6	13/2−			
1188.1 *2*	19.5 *11*	2633.9	(27/2+)	1445.8	25/2−			
1271.8 *2*	49 *3*	3277.1	(31/2+)	2005.1	29/2−	(E1)	1.26×10^{-3} *2*	α(K)exp=0.0026 *9* Mult.: E1 or E2 from α(K)exp; level scheme requires the former.

† Relative out-of-beam photon intensities from (^{11}B,5nγ), E=73 MeV.

‡ Based on α(K)exp and/or α(L)exp In 2002Th12, except As noted.

Could not Be placed due to its close proximity to another γ; May Be link to g.s. band from one of the 2053, 2556, 2619, 2634, 3160 levels.

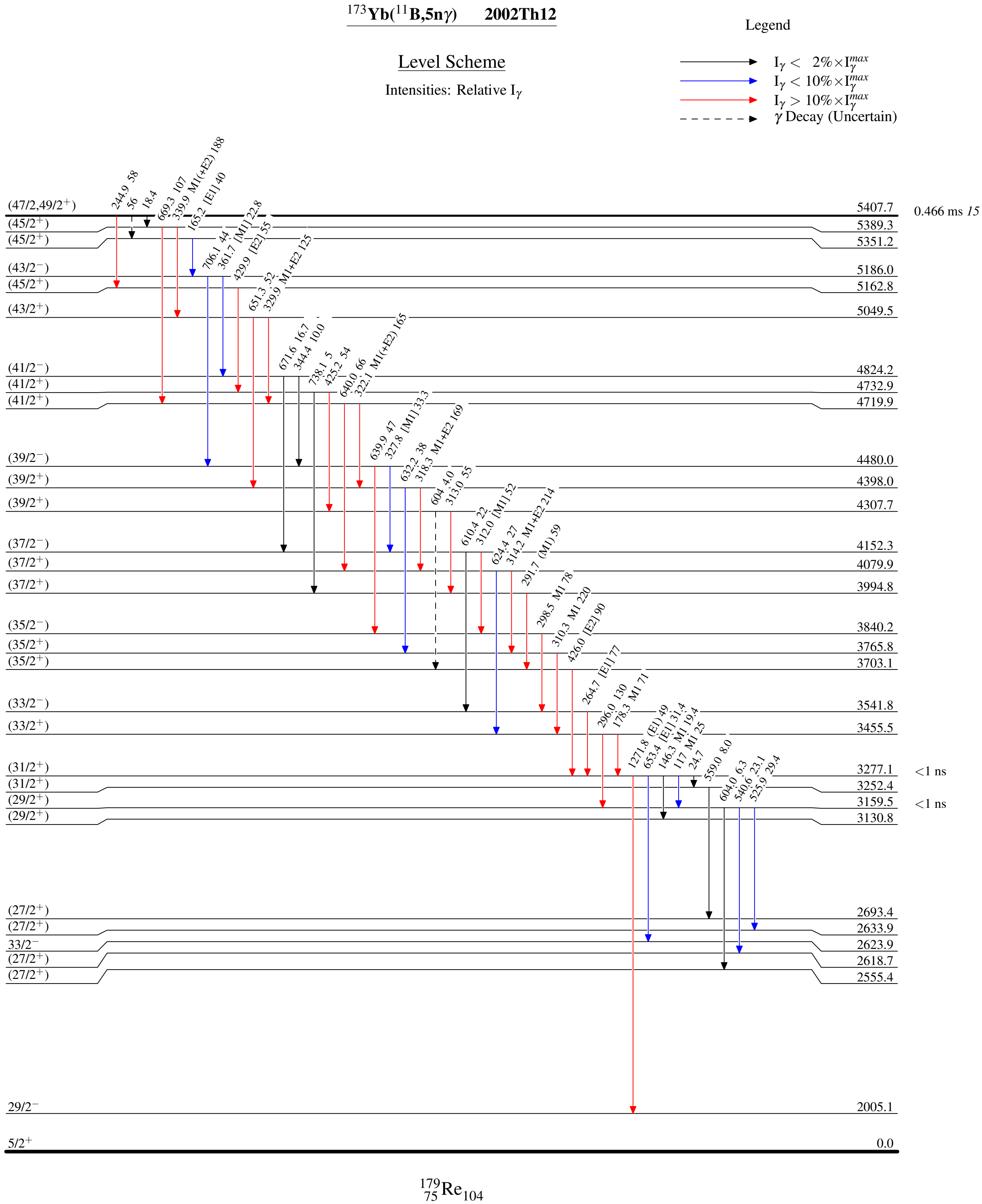
@ A 377γ-441γ-502γ cascade is coincident with the 565γ feeding the 2053 level and with the 124γ In g.s. band. However, 2002Th12 do not include this cascade In their level scheme because the connection of those transitions to the g.s. band could not Be established.

& Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies,

γ(^{179}Re) (continued)

assigned multipolarities, and mixing ratios, unless otherwise specified.
[a] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

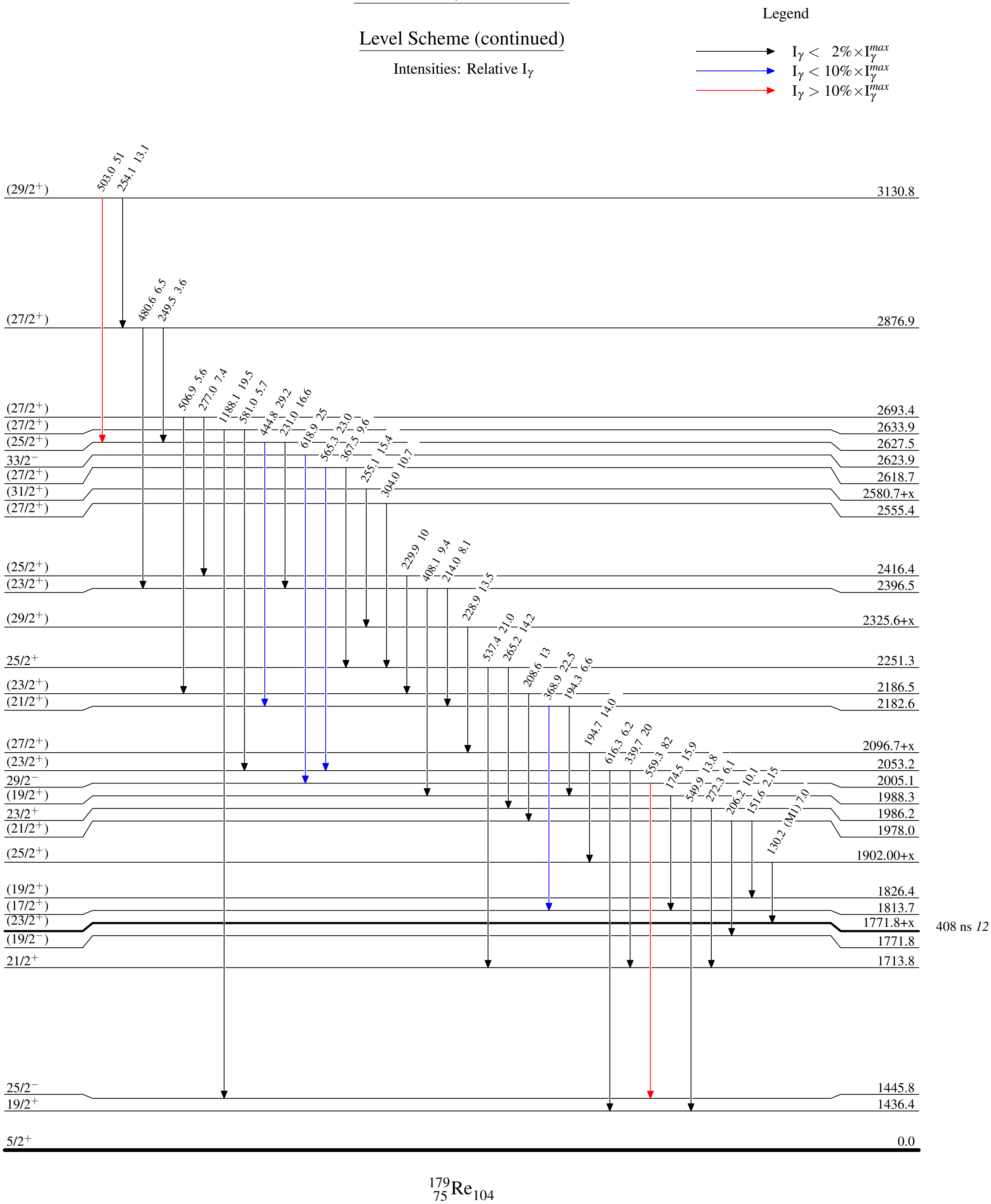
From ENSDF
$^{179}_{75}Re_{104}$-8


^{173}Yb(^{11}B,5nγ) 2002Th12
Level Scheme
Intensities: Relative I_γ
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)
(47/2,49/2$^+$) 5407.7 0.466 ms 15
(45/2$^+$) 5389.3
(45/2$^+$) 5351.2
(43/2$^-$) 5186.0
(45/2$^+$) 5162.8
(43/2$^+$) 5049.5
(41/2$^-$) 4824.2
(41/2$^+$) 4732.9
(41/2$^+$) 4719.9
(39/2$^-$) 4480.0
(39/2$^+$) 4398.0
(39/2$^+$) 4307.7
(37/2$^-$) 4152.3
(37/2$^+$) 4079.9
(37/2$^+$) 3994.8
(35/2$^-$) 3840.2
(35/2$^+$) 3765.8
(35/2$^+$) 3703.1
(33/2$^-$) 3541.8
(33/2$^+$) 3455.5
(31/2$^+$) 3277.1 <1 ns
(31/2$^+$) 3252.4
(29/2$^+$) 3159.5 <1 ns
(29/2$^+$) 3130.8
(27/2$^+$) 2693.4
(27/2$^+$) 2633.9
33/2$^-$ 2623.9
(27/2$^+$) 2618.7
(27/2$^+$) 2555.4
29/2$^-$ 2005.1
5/2$^+$ 0.0
244.9 58
56
18.4
669.3 107
339.9 M1(+E2) 188
165.2 [E1] 40
706.1 44
361.7 [M1] 22.8
429.9 [E2] 55
651.3 52
329.9 M1+E2 125
671.6 16.7
344.4 10.0
738.1 5
425.2 54
640.0 66
322.1 M1(+E2) 165
639.9 47
327.8 [M1] 33.3
632.2 38
318.3 M1+E2 169
604 4.0
313.0 55
610.4 22
312.0 [M1] 52
624.4 27
314.2 M1+E2 214
291.7 (M1) 59
298.5 M1 78
310.3 M1 220
426.0 [E2] 90
264.7 [E1] 77
296.0 130
178.3 M1 71
1271.8 (E1) 49
653.4 [E1] 31.4
146.3 M1 19.4
117 M1 25
24.7
559.0 8.0
604.0 6.3
540.6 23.1
525.9 29.4
$^{179}_{75}Re_{104}$

^{173}Yb(^{11}B,5nγ) 2002Th12

Level Scheme (continued)

Intensities: Relative I_γ



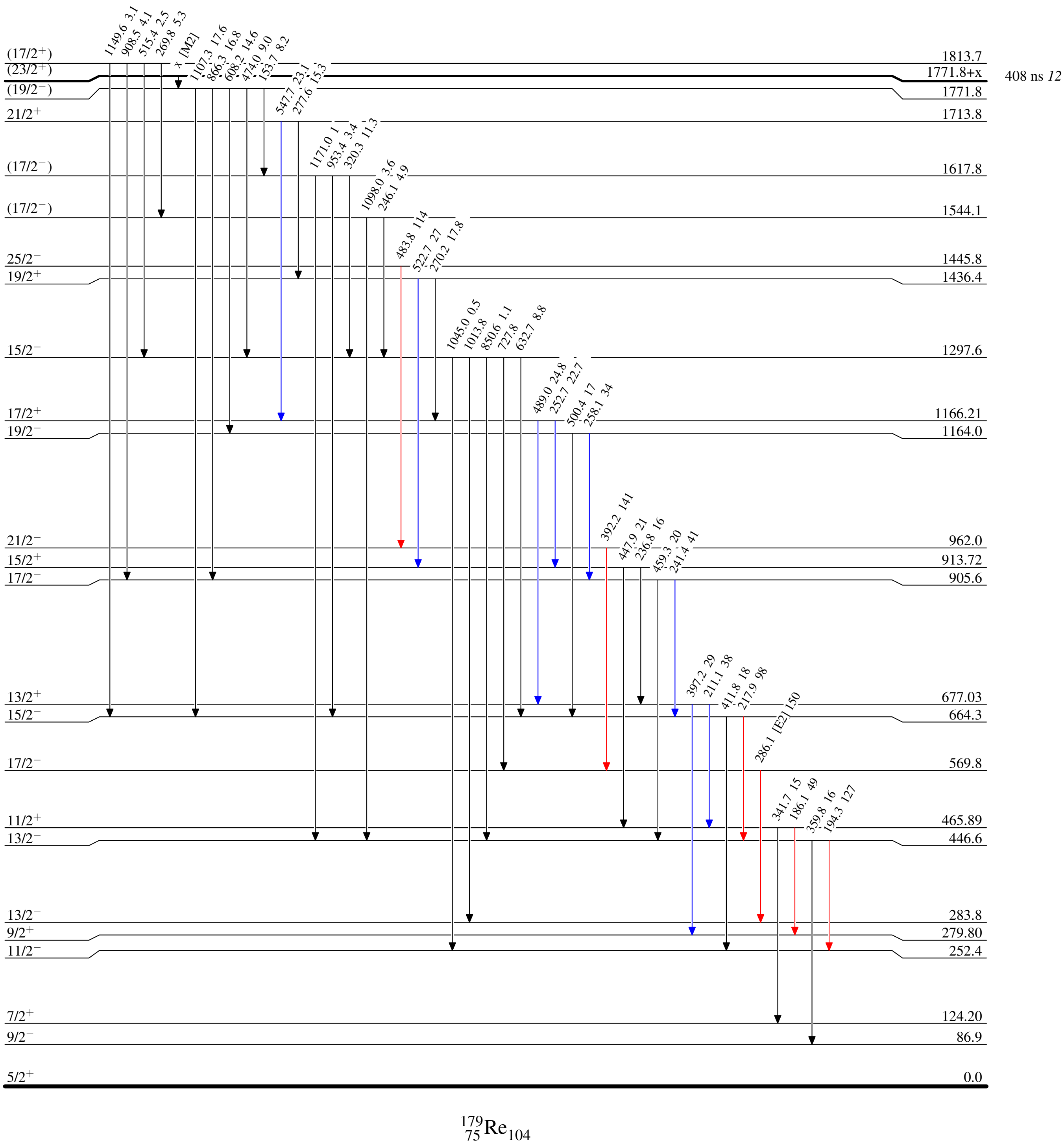
^{173}Yb(^{11}B,5nγ) 2002Th12

Level Scheme (continued)

Intensities: Relative I_γ

Legend

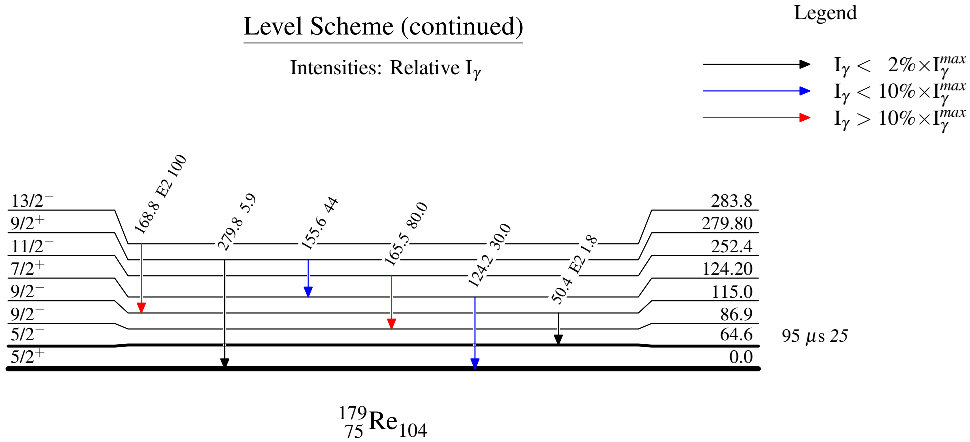
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



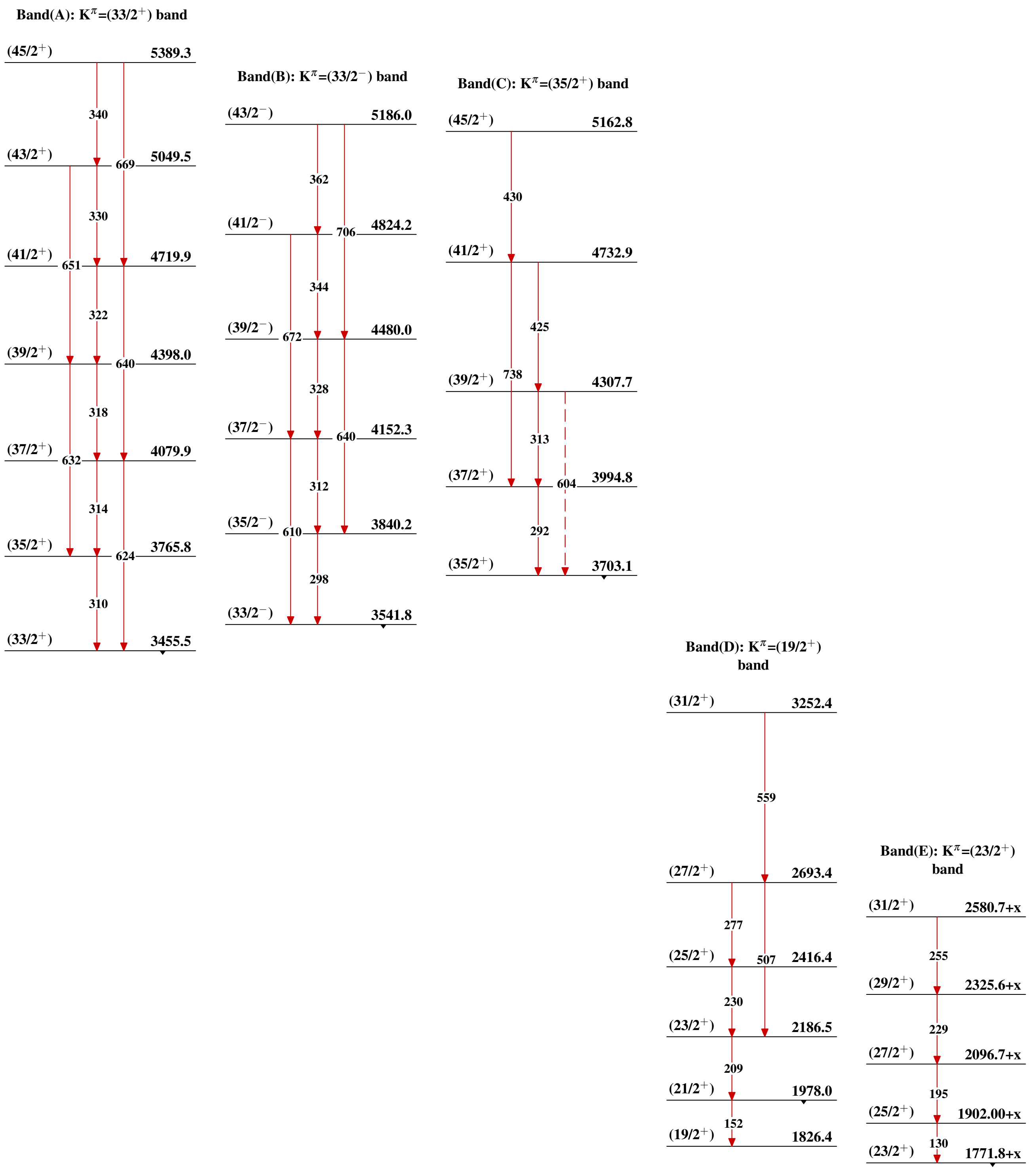
^{173}Yb(^{11}B,5nγ) 2002Th12

Level Scheme (continued)

Intensities: Relative I_γ

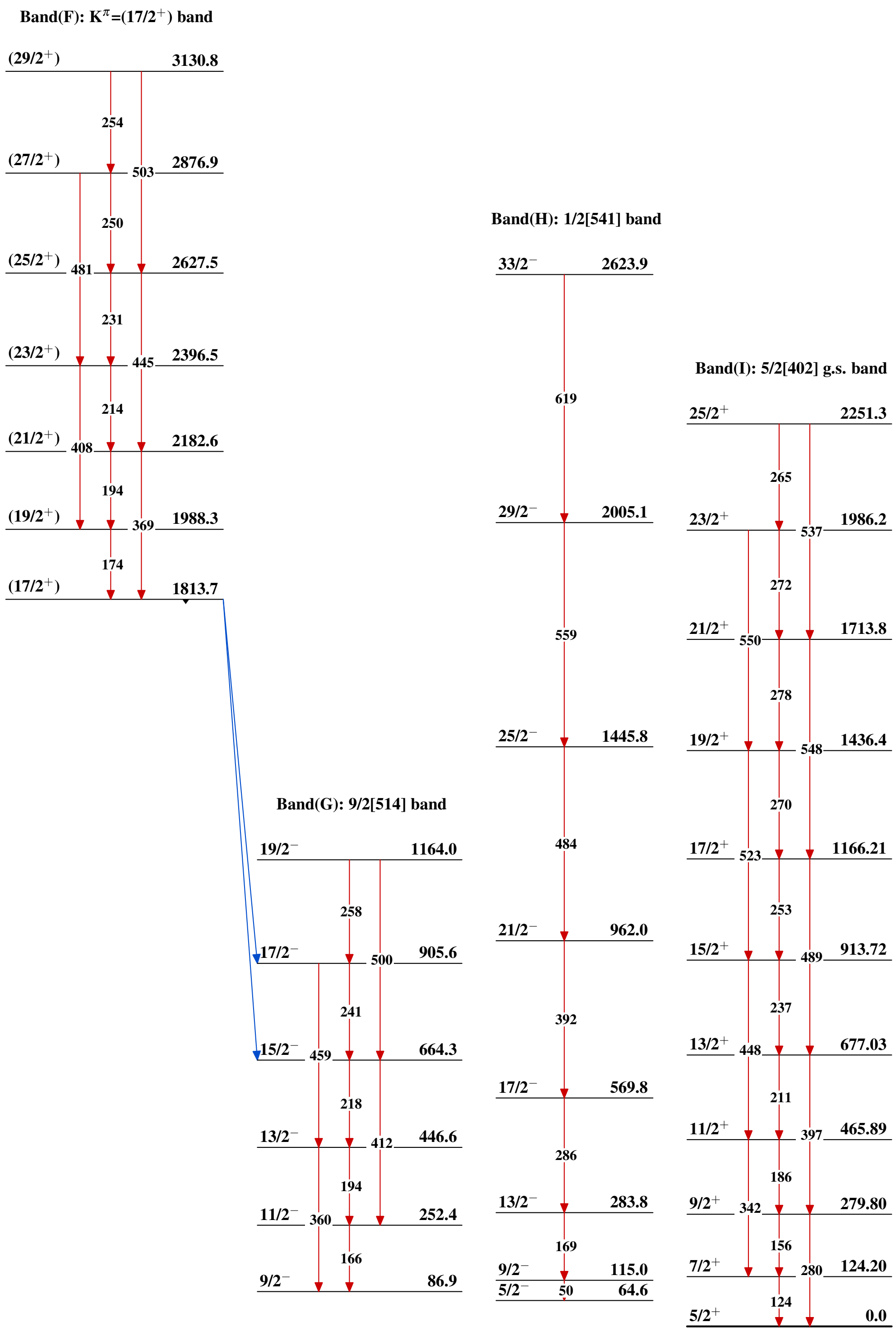


^{173}Yb(^{11}B,5nγ) 2002Th12



$^{179}_{75}Re_{104}$

$^{173}Yb(^{11}B,5n\gamma)$ 2002Th12 (continued)



$^{179}_{75}Re_{104}$