^{176}Yb(^{14}C,α3nγ) 1999Sa60

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 134, 149 (2016)	15-Apr-2015

E=68 MeV; measured Eγ, Iγ, $\gamma\gamma$ coin, α-γ coin, $\gamma\gamma(\theta)$(DCO) (θ=37°, 79°) and lifetimes by beam-pulsing; NORDBALL Ge detector array and a 30-detector Si ball; blocked BCS theory calculations.

^{183}W Levels

E(level)†	Jπ‡	$T_{1/2}$	E(level)†	Jπ‡	$T_{1/2}$	E(level)†	Jπ‡	$T_{1/2}$
0.0#	1/2$^-$		1439.68& *14*	17/2$^-$		2590.72g *18*	27/2$^{(-)}$	
47.07@ *10*	3/2$^-$		1439.89d *15*	21/2$^+$		2648.90i *18*	27/2$^-$	
99.50# *9*	5/2$^-$		1466.8c *5*			2655.27& *18*	25/2$^-$	
207.75@ *10*	7/2$^-$		1595.83# *18*	21/2$^-$		2706.56d *19*	29/2$^+$	
209.40b *9*	3/2$^-$		1663.7c *4*			2724.2k *4*	(25/2$^+$)	
292.16b *11*	5/2$^-$		1713.46a *15*	19/2$^-$		2837.22j *17*	27/2$^-$	
309.34# *11*	9/2$^-$		1745.87j *14*	19/2$^-$	12.7 ns *20*	2874.1 *3*		
309.65e *14*	11/2$^+$		1746.27e *16*	23/2$^+$		2930.43# *23*	29/2$^-$	
412.50b *14*	7/2$^-$		1880.7c *5*			2932.04g *19*	29/2$^{(-)}$	
453.10a *10*	7/2$^-$	21.5 ns *20*	1901.23k *18*	(19/2$^+$)	<3.0 ns	2977.26i *19*	29/2$^-$	
475.70@ *13*	11/2$^-$		1901.42@ *18*	23/2$^-$		3010.7a *5*	27/2$^-$	
485.43d *15*	13/2$^+$		1989.18j *16*	21/2$^-$		3156.27j *17*	29/2$^-$	
595.04& *13*	9/2$^-$		2007.70& *15*	21/2$^-$		3161.20e *19*	31/2$^+$	
624.35f *17*	9/2$^+$		2043.38d *16*	25/2$^+$		3291.23@ *23*	31/2$^-$	
631.63# *13*	13/2$^-$		2050.09i *17*	23/2$^-$	<1.5 ns	3291.97g *21*	31/2$^{(-)}$	
687.71e *15*	15/2$^+$		2101.37 *17*	23/2$^{(+)}$		3348.86h *18*	31/2$^{(-)}$	<0.5 ns
766.12a *13*	11/2$^-$		2155.0k *3*	(21/2$^+$)		3423.77d *21*	33/2$^+$	
778.4f *3*	11/2$^+$		2222.33# *21*	25/2$^-$		3663.93h *20*	33/2$^{(-)}$	
850.52@ *14*	15/2$^-$		2252.85j *16*	23/2$^-$		3706.93# *25*	33/2$^-$	
914.93d *14*	17/2$^+$		2269.17g *17*	25/2$^{(-)}$	<3.0 ns	3980.8e *4*	35/2$^+$	
958.05f *20*	13/2$^+$		2324.49a *17*	23/2$^-$		3997.33h *23*	35/2$^{(-)}$	
964.90& *13*	13/2$^-$		2339.82i *18*	25/2$^-$		4043.0@ *3*	35/2$^-$	
1062.53# *15*	17/2$^-$		2413.19e *17*	27/2$^+$		4196.8d *3*	37/2$^+$	
1168.74e *15*	19/2$^+$		2430.6k *3*	(23/2$^+$)		4389.74 *25*		
1190.05a *14*	15/2$^-$		2535.63j *17*	25/2$^-$		4440.64 *25*		
1328.22@ *15*	19/2$^-$		2560.72@ *21*	27/2$^-$		4538.94 *25*		

† From least-squares fit to Eγ (by evaluator), omitting the 153.6γ, 307.0γ, 408.8γ which fit their placements particularly poorly; this reduces χ^2 from 16.7 (with 10 Eγ At least 5σ from expected value) to 4.9 (cf. χ^2(critical)=1.5) for the fit. it would appear that the precision of Eγ data from 1999Sa60 May have been overestimated.

‡ Authors′ values based on observed band structure.

Band(A): ν 1/2[510] band, α=+1/2.

@ Band(a): ν 1/2[510] band, α=−1/2.

& Band(B): ν 7/2[503] band, α=+1/2.

a Band(b): ν 7/2[503] band, α=−1/2.

b Band(C): ν 3/2[512] band.

c Band(D): band fragment. Feeds levels In 11/2[615] band.

d Band(E): ν 11/2[615] band, α=+1/2.

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^{176}Yb(^{14}C,α3nγ) 1999Sa60 (continued)

^{183}W Levels (continued)

[e] Band(e): ν 11/2[615] band, α=−1/2.
[f] Band(F): ν 9/2[624] band.
[g] Band(G): $K^{\pi}=25/2^{(-)}$ band. Possible configuration: $\pi^2(9/2[514]+5/2[402])+\nu 11/2[615]$.
[h] Band(H): $K^{\pi}=31/2^{(-)}$ band. Possible configuration: $\pi^2(7/2[404]+5/2[402])\otimes 19/2^-$.
[i] Band(I): $K^{\pi}=23/2^-$ band. Possible configuration: $\nu^3(9/2[624]+3/2[512]+11/2[615])$.
[j] Band(J): $K^{\pi}=19/2^-$ band. Possible configuration: $\nu^3(9/2[624]-1/2[510]+11/2[615])$ with 50% Coriolis-mixed K=21/2 component.
[k] Band(K): $K^{\pi}=(19/2^+)$ band. Possible configuration: $\nu^3(1/2[510]+7/2[514]+11/2[615])$.

$\gamma(^{183}W)$

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	Comments
(47.07 *10*)		47.07	$3/2^-$	0.0	$1/2^-$		E_γ: from level energy difference; transition not reported by 1999Sa60.
83.0 *2*	4.2 *9*	292.16	$5/2^-$	209.40	$3/2^-$		
84.1 *6*	2.4 *6*	292.16	$5/2^-$	207.75	$7/2^-$		
99.1 *1*	4.3 *4*	99.50	$5/2^-$	0.0	$1/2^-$		
107.8 *1*	5.7 *12*	207.75	$7/2^-$	99.50	$5/2^-$		
109.8 *4*	1.4 *12*	209.40	$3/2^-$	99.50	$5/2^-$		
112.1 *1*	12.2 *5*	2101.37	$23/2^{(+)}$	1989.18	$21/2^-$		
142.0 *1*	14.3 *7*	595.04	$9/2^-$	453.10	$7/2^-$		
143.8 *1*	1.33 *10*	453.10	$7/2^-$	309.34	$9/2^-$		
153.6[‡] *1*	1.20 *16*	1901.23	$(19/2^+)$	1745.87	$19/2^-$		
154.1 *2*	1.49 *20*	778.4	$11/2^+$	624.35	$9/2^+$		
161.0 *1*	3.4 *7*	207.75	$7/2^-$	47.07	$3/2^-$		E_γ: 160.68 *14* expected from level energy difference.
161.0 *1*	4.9 *4*	453.10	$7/2^-$	292.16	$5/2^-$		
162.0 *1*	6 *6*	209.40	$3/2^-$	47.07	$3/2^-$		
166.1 *1*	6.9 *3*	475.70	$11/2^-$	309.34	$9/2^-$		
167.5 *2*	1.04 *13*	2874.1		2706.56	$29/2^+$		
167.7 *1*	11.4 *4*	2269.17	$25/2^{(-)}$	2101.37	$23/2^{(+)}$	D	Mult.: DCO=1.54 *11* (ΔJ=2 322γ In gate).
171.0 *1*	18.0 *7*	766.12	$11/2^-$	595.04	$9/2^-$		
175.7 *1*	47.2 *16*	485.43	$13/2^+$	309.65	$11/2^+$		
192.6 *1*	4.94 *18*	3348.86	$31/2^{(-)}$	3156.27	$29/2^-$		
198.6 *1*	16.1 *6*	964.90	$13/2^-$	766.12	$11/2^-$		
202.2 *1*	80.3 *26*	687.71	$15/2^+$	485.43	$13/2^+$		
203.1 *1*	6.6 *7*	412.50	$7/2^-$	209.40	$3/2^-$		
209.7 *1*	19.9 *16*	309.34	$9/2^-$	99.50	$5/2^-$		
209.8 *1*	4 *4*	209.40	$3/2^-$	0.0	$1/2^-$		E_γ: 209.40 *9* expected from level energy difference.
218.7 *1*	3.59 *19*	850.52	$15/2^-$	631.63	$13/2^-$		
219.1 *1*	25.9 *8*	2269.17	$25/2^{(-)}$	2050.09	$23/2^-$		Mult.: intensity balance rules out pure M1.
224.9 *1*	15.7 *5*	1190.05	$15/2^-$	964.90	$13/2^-$		
227.1 *1*	57.5 *18*	914.93	$17/2^+$	687.71	$15/2^+$		
243.0 *1*	24.8 *8*	1989.18	$21/2^-$	1745.87	$19/2^-$		
245.1[#] *1*	8.7[#] *6*	292.16	$5/2^-$	47.07	$3/2^-$		second placement of 245γ suggested by evaluator, consistent with Adopted Levels, Gammas; see comment on 245γ from 453 level.
245.1[#] *1*	8.7[#] *6*	453.10	$7/2^-$	207.75	$7/2^-$		E_γ: 245.35 *14* expected from level energy difference. note that, In Adopted Levels, two transitions of similar energy deexcite the 453 and 292 levels, so the 245γ here is probably a doublet, consistent with the inordinately large branching implied if all Iγ is placed from this level.
249.7 *1*	7.9 *3*	1439.68	$17/2^-$	1190.05	$15/2^-$		
253.6 *1*	27.7 *9*	1168.74	$19/2^+$	914.93	$17/2^+$		
253.8 *2*	0.55 *22*	2155.0	$(21/2^+)$	1901.23	$(19/2^+)$		

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^{176}Yb(^{14}C,α3nγ) 1999Sa60 (continued)

$\gamma(^{183}W)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	Comments
263.4 *1*	8.6 *3*	2252.85	$23/2^-$	1989.18	$21/2^-$		
265.7 *1*	2.28 *13*	1328.22	$19/2^-$	1062.53	$17/2^-$		
268.1 *1*	11.6 *6*	475.70	$11/2^-$	207.75	$7/2^-$		
271.0 *1*	11.9 *4*	1439.89	$21/2^+$	1168.74	$19/2^+$		
273.6 *1*	2.79 *17*	1713.46	$19/2^-$	1439.68	$17/2^-$		
275.6 *1*	0.83 *12*	2430.6	$(23/2^+)$	2155.0	$(21/2^+)$		
282.8 *1*	6.8 *3*	2535.63	$25/2^-$	2252.85	$23/2^-$		
289.7 *1*	13.1 *5*	2339.82	$25/2^-$	2050.09	$23/2^-$		
293.3 *3*	0.80 *11*	2706.56	$29/2^+$	2413.19	$27/2^+$		
293.5 *2*	0.51 *10*	2724.2	$(25/2^+)$	2430.6	$(23/2^+)$		
294.4 *1*	2.15 *16*	2007.70	$21/2^-$	1713.46	$19/2^-$		
296.9 *1*	3.35 *19*	2043.38	$25/2^+$	1746.27	$23/2^+$		
301.5 *1*	3.92 *19*	2837.22	$27/2^-$	2535.63	$25/2^-$		
304.3 *1*	54.9 *17*	2050.09	$23/2^-$	1745.87	$19/2^-$		
306.1 *1*	6.94 *27*	1746.27	$23/2^+$	1439.89	$21/2^+$		
306.5 *1*	11.4 *4*	1745.87	$19/2^-$	1439.89	$21/2^+$		E_γ: 306.19 *22* expected from level energy difference.
307.0[‡] *1*	5.80 *26*	1745.87	$19/2^-$	1439.68	$17/2^-$		E_γ: 306.64 *22* expected from level energy difference.
308.8 *1*	8.1 *3*	2648.90	$27/2^-$	2339.82	$25/2^-$		
313.0 *1*	5.5 *3*	766.12	$11/2^-$	453.10	$7/2^-$		
314.7 *1*	7.0 *5*	624.35	$9/2^+$	309.65	$11/2^+$		
315.1 *1*	15.4 *5*	3663.93	$33/2^{(-)}$	3348.86	$31/2^{(-)}$		
317.2 *2*	1.35 *15*	2324.49	$23/2^-$	2007.70	$21/2^-$		
318.9 *1*	5.88 *24*	3156.27	$29/2^-$	2837.22	$27/2^-$		
321.5 *1*	30.8 *10*	2590.72	$27/2^{(-)}$	2269.17	$25/2^{(-)}$	D	Mult.: DCO=1.12 *6* (ΔJ=1 219γ In gate).
322.1 *1*	33.5 *12*	631.63	$13/2^-$	309.34	$9/2^-$		
328.1 *1*	3.46 *17*	2977.26	$29/2^-$	2648.90	$27/2^-$		
329.7 *6*	0.28 *11*	2655.27	$25/2^-$	2324.49	$23/2^-$		
333.4 *1*	7.7 *3*	3997.33	$35/2^{(-)}$	3663.93	$33/2^{(-)}$		
333.7 *1*	8.0 *5*	958.05	$13/2^+$	624.35	$9/2^+$		
341.3 *1*	21.9 *7*	2932.04	$29/2^{(-)}$	2590.72	$27/2^{(-)}$		
353.8 *1*	2.67 *22*	453.10	$7/2^-$	99.50	$5/2^-$		
355.4 *10*	0.05 *12*	2101.37	$23/2^{(+)}$	1745.87	$19/2^-$		
359.9 *1*	1.66 *13*	3291.97	$31/2^{(-)}$	2932.04	$29/2^{(-)}$		
369.8 *1*	1.76 *16*	2413.19	$27/2^+$	2043.38	$25/2^+$		
370.0 *1*	9.6 *4*	964.90	$13/2^-$	595.04	$9/2^-$		
371.6 *4*	0.38 *9*	3663.93	$33/2^{(-)}$	3291.97	$31/2^{(-)}$		
375.0 *1*	21.8 *8*	850.52	$15/2^-$	475.70	$11/2^-$		
378.1 *1*	29.4 *11*	687.71	$15/2^+$	309.65	$11/2^+$		
392.4 *1*	4.45 *18*	4389.74		3997.33	$35/2^{(-)}$		
408.8[‡] *1*	1.22 *12*	453.10	$7/2^-$	47.07	$3/2^-$		E_γ: 406.55 *14* expected from level energy difference, much closer to values reported In decay and (n,γ) studies; also branching here is significantly larger than adopted value. Possibly this γ is contaminated In (^{14}C,α3nγ).
416.8 *1*	15.0 *5*	3348.86	$31/2^{(-)}$	2932.04	$29/2^{(-)}$	D	Mult.: DCO=1.00 *7* (ΔJ=1 341γ In gate).
424.0 *1*	16.3 *6*	1190.05	$15/2^-$	766.12	$11/2^-$	Q	Mult.: DCO=0.94 *11* (gated on ΔJ=2 556γ).
429.5 *1*	48.2 *16*	914.93	$17/2^+$	485.43	$13/2^+$		
430.9 *1*	28.5 *10*	1062.53	$17/2^-$	631.63	$13/2^-$		
443.3 *1*	4.72 *19*	4440.64		3997.33	$35/2^{(-)}$		
454.7 *3*	0.53 *10*	3161.20	$31/2^+$	2706.56	$29/2^+$		
475.0 *1*	8.8 *3*	1439.68	$17/2^-$	964.90	$13/2^-$		
477.7 *1*	17.5 *6*	1328.22	$19/2^-$	850.52	$15/2^-$		
481.1 *1*	36.7 *12*	1168.74	$19/2^+$	687.71	$15/2^+$		
507.2 *1*	2.38 *17*	2252.85	$23/2^-$	1745.87	$19/2^-$		

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^{176}Yb(^{14}C,α3nγ) 1999Sa60 (continued)

$\gamma(^{183}W)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	Comments
523.4 *1*	3.95 *23*	1713.46	19/2$^-$	1190.05	15/2$^-$		
525.1 *1*	23.5 *8*	1439.89	21/2$^+$	914.93	17/2$^+$		
533.3 *1*	17.7 *6*	1595.83	21/2$^-$	1062.53	17/2$^-$		
541.6 *1*	1.65 *11*	4538.94		3997.33	35/2$^{(-)}$		
546.5 *1*	4.20 *20*	2535.63	25/2$^-$	1989.18	21/2$^-$		
555.6 *1*	14.7 *5*	1745.87	19/2$^-$	1190.05	15/2$^-$	Q	Mult.: DCO=1.04 *9* (ΔJ=2 304γ In gate).
568.0 *1*	2.98 *20*	2007.70	21/2$^-$	1439.68	17/2$^-$		
569.3 *3*	0.78 *14*	2724.2	(25/2$^+$)	2155.0	(21/2$^+$)		
573.2 *1*	13.4 *5*	1901.42	23/2$^-$	1328.22	19/2$^-$		
577.1 *1*	14.0 *5*	1745.87	19/2$^-$	1168.74	19/2$^+$		
577.6 *1*	18.8 *7*	1746.27	23/2$^+$	1168.74	19/2$^+$		
584.3 *1*	3.19 *18*	2837.22	27/2$^-$	2252.85	23/2$^-$		
598.9 *1*	2.85 *20*	2648.90	27/2$^-$	2050.09	23/2$^-$		
603.7 *1*	14.8 *5*	2043.38	25/2$^+$	1439.89	21/2$^+$		
610.6 *17*	0.21 *15*	2050.09	23/2$^-$	1439.89	21/2$^+$		
610.9 *1*	2.94 *19*	2324.49	23/2$^-$	1713.46	19/2$^-$		
620.8 *1*	6.32 *26*	3156.27	29/2$^-$	2535.63	25/2$^-$		
626.5 *1*	11.0 *4*	2222.33	25/2$^-$	1595.83	21/2$^-$		
637.7 *1*	1.44 *15*	2977.26	29/2$^-$	2339.82	25/2$^-$		
647.6 *1*	1.50 *15*	2655.27	25/2$^-$	2007.70	21/2$^-$		
659.3 *1*	9.5 *4*	2560.72	27/2$^-$	1901.42	23/2$^-$		
662.8 *2*	1.29 *15*	2932.04	29/2$^{(-)}$	2269.17	25/2$^{(-)}$		
663.2 *1*	6.8 *3*	2706.56	29/2$^+$	2043.38	25/2$^+$		
666.9 *1*	8.7 *4*	2413.19	27/2$^+$	1746.27	23/2$^+$		
686.2 *4*	0.45 *12*	3010.7	27/2$^-$	2324.49	23/2$^-$		
700.2 *2*	0.88 *10*	3348.86	31/2$^{(-)}$	2648.90	27/2$^-$		
708.1 *1*	5.64 *23*	2930.43	29/2$^-$	2222.33	25/2$^-$		
717.2 *1*	3.09 *18*	3423.77	33/2$^+$	2706.56	29/2$^+$		
730.5 *1*	4.62 *20*	3291.23	31/2$^-$	2560.72	27/2$^-$		
731.7 *17*	0.45 *11*	3663.93	33/2$^{(-)}$	2932.04	29/2$^{(-)}$		
748.0 *1*	2.81 *19*	3161.20	31/2$^+$	2413.19	27/2$^+$		
751.8 *2*	0.64 *9*	4043.0	35/2$^-$	3291.23	31/2$^-$		
758.1 *1*	2.56 *15*	3348.86	31/2$^{(-)}$	2590.72	27/2$^{(-)}$		
773.0 *2*	0.76 *10*	4196.8	37/2$^+$	3423.77	33/2$^+$		
776.5 *1*	1.41 *11*	3706.93	33/2$^-$	2930.43	29/2$^-$		
778.9 *8*	0.6 *3*	1466.8		687.71	15/2$^+$		
819.6 *3*	0.68 *12*	3980.8	35/2$^+$	3161.20	31/2$^+$		
830.9 *1*	20.7 *7*	1745.87	19/2$^-$	914.93	17/2$^+$	D	Mult.: DCO=0.60 *9* (ΔJ=2 430γ In gate), 1.8 *3* (ΔJ=2 304γ In gate).
965.8 *4*	1.2 *3*	1880.7		914.93	17/2$^+$		
976.0 *3*	1.6 *3*	1663.7		687.71	15/2$^+$		
981.4 *5*	1.9 *5*	1466.8		485.43	13/2$^+$		
986.3 *1*	3.5 *3*	1901.23	(19/2$^+$)	914.93	17/2$^+$		

[†] Based on DCO ratio measurements, except As noted.
[‡] Omitted from least-squares fit to determine level energies.
[#] Multiply placed with undivided intensity.

^{176}Yb(^{14}C,α3nγ) 1999Sa60

Level Scheme

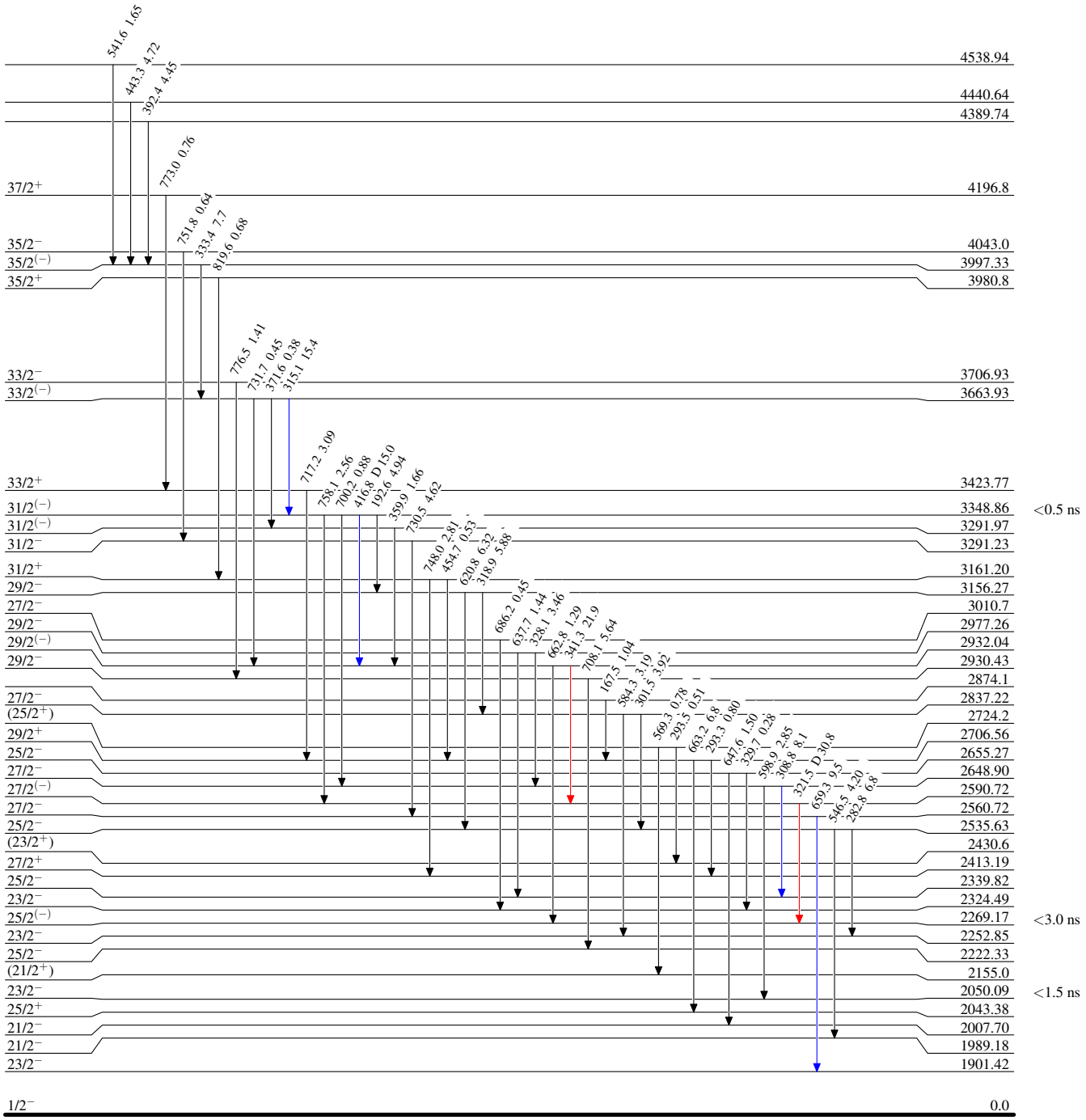
Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$

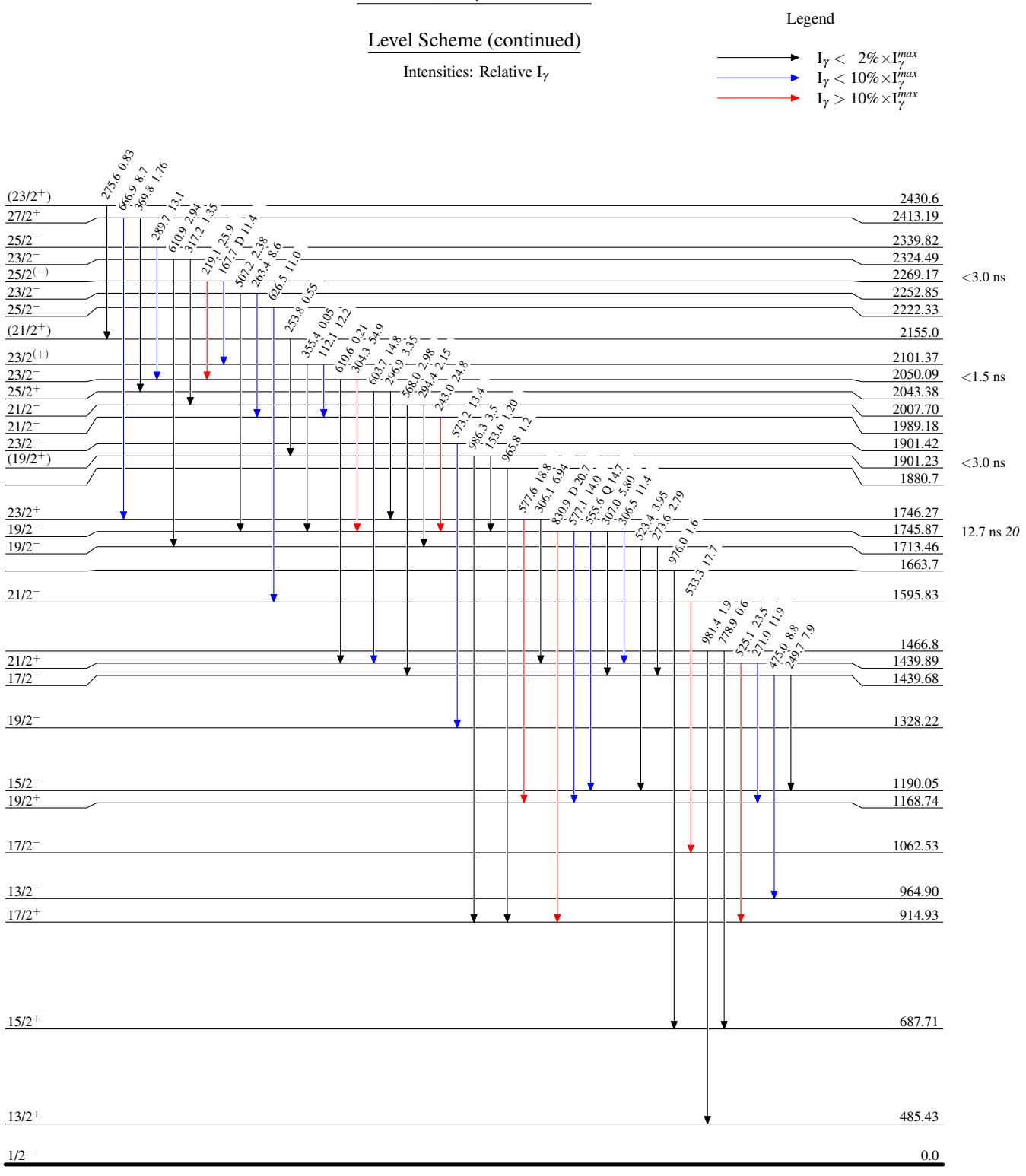


$^{183}_{74}W_{109}$

^{176}Yb(^{14}C,α3nγ) 1999Sa60

Level Scheme (continued)

Intensities: Relative I_γ



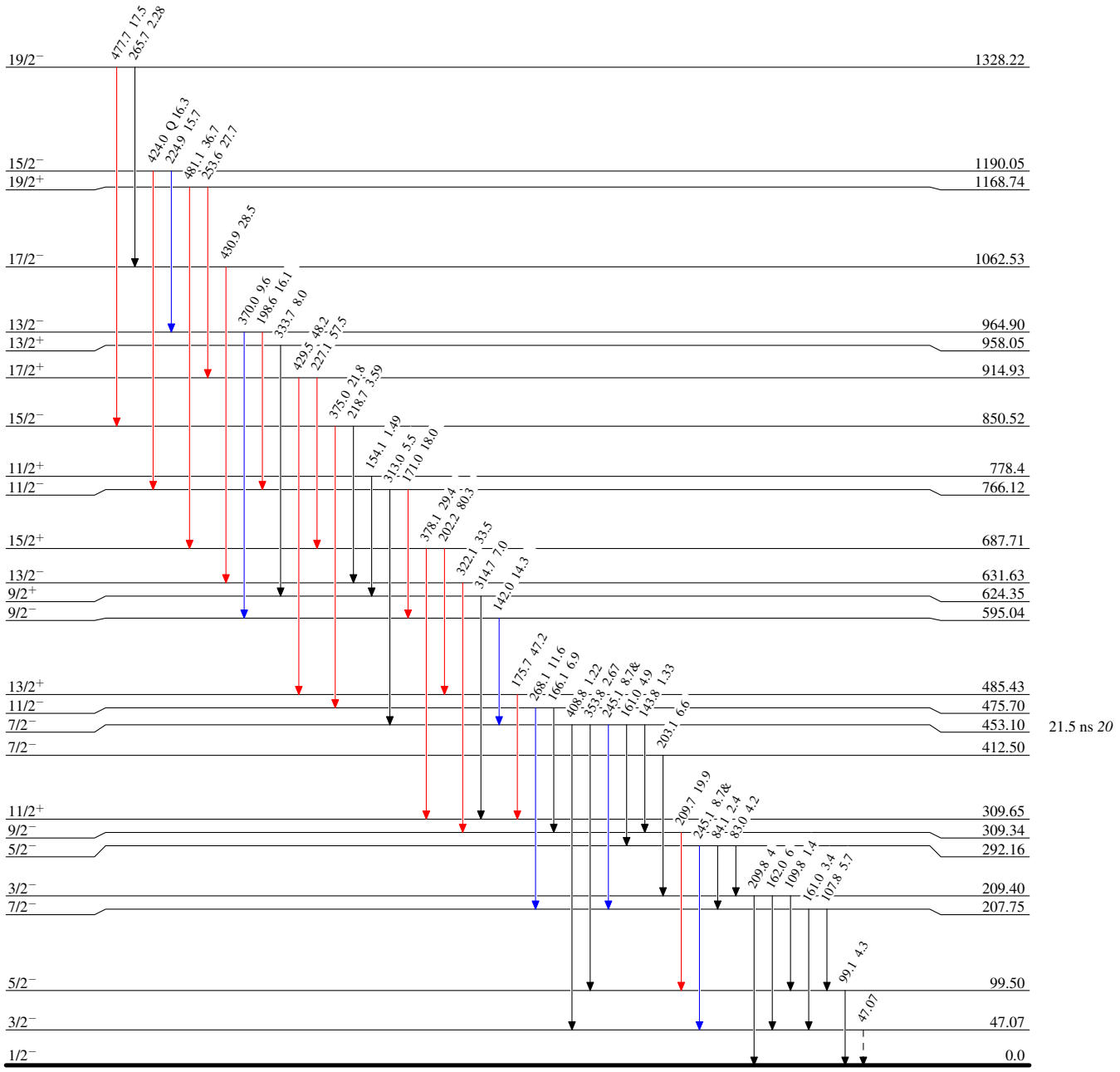
$^{183}_{74}W_{109}$

^{176}Yb(^{14}C,α3nγ) 1999Sa60

Level Scheme (continued)

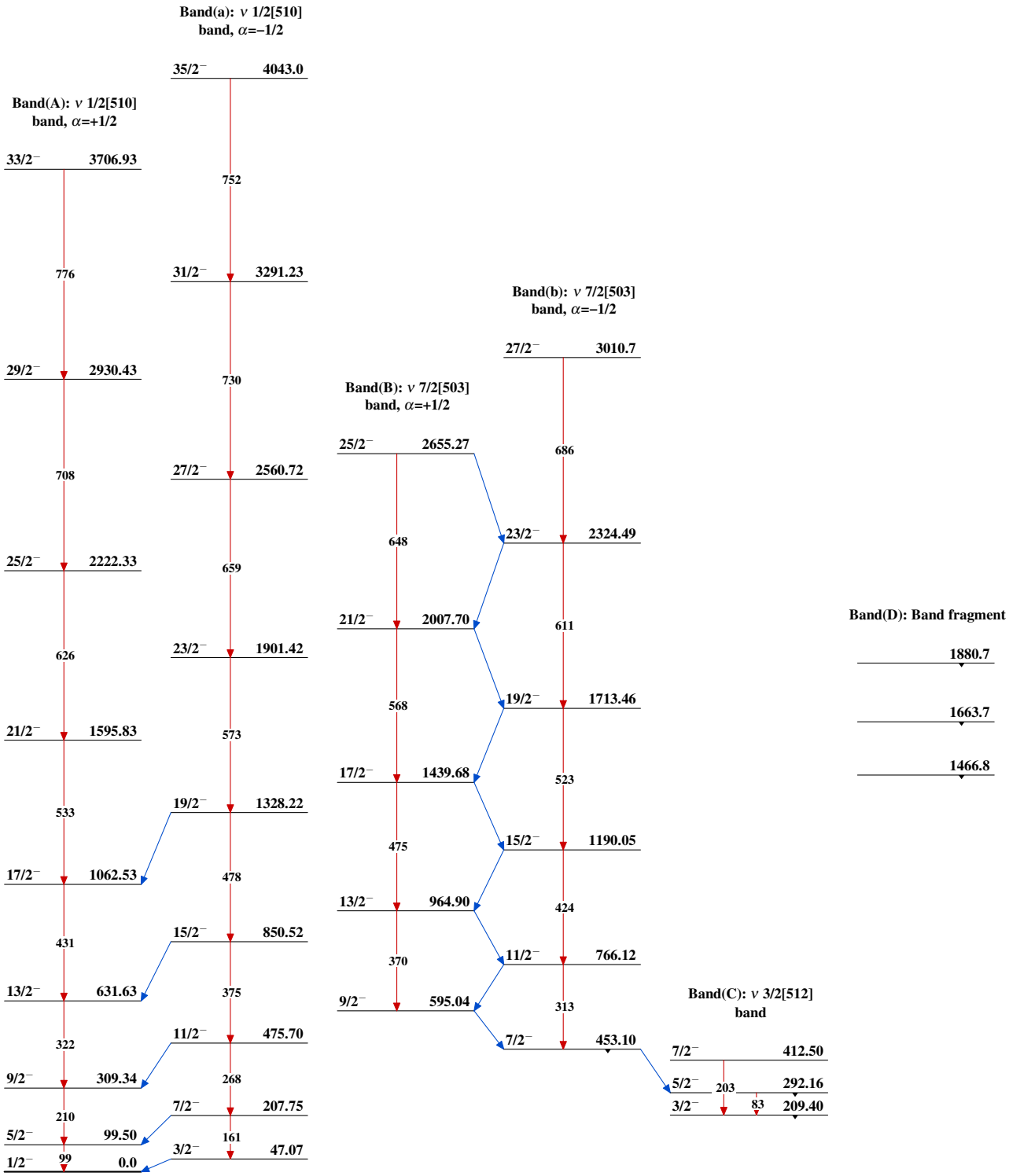
Intensities: Relative I_γ
& Multiply placed: undivided intensity given

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



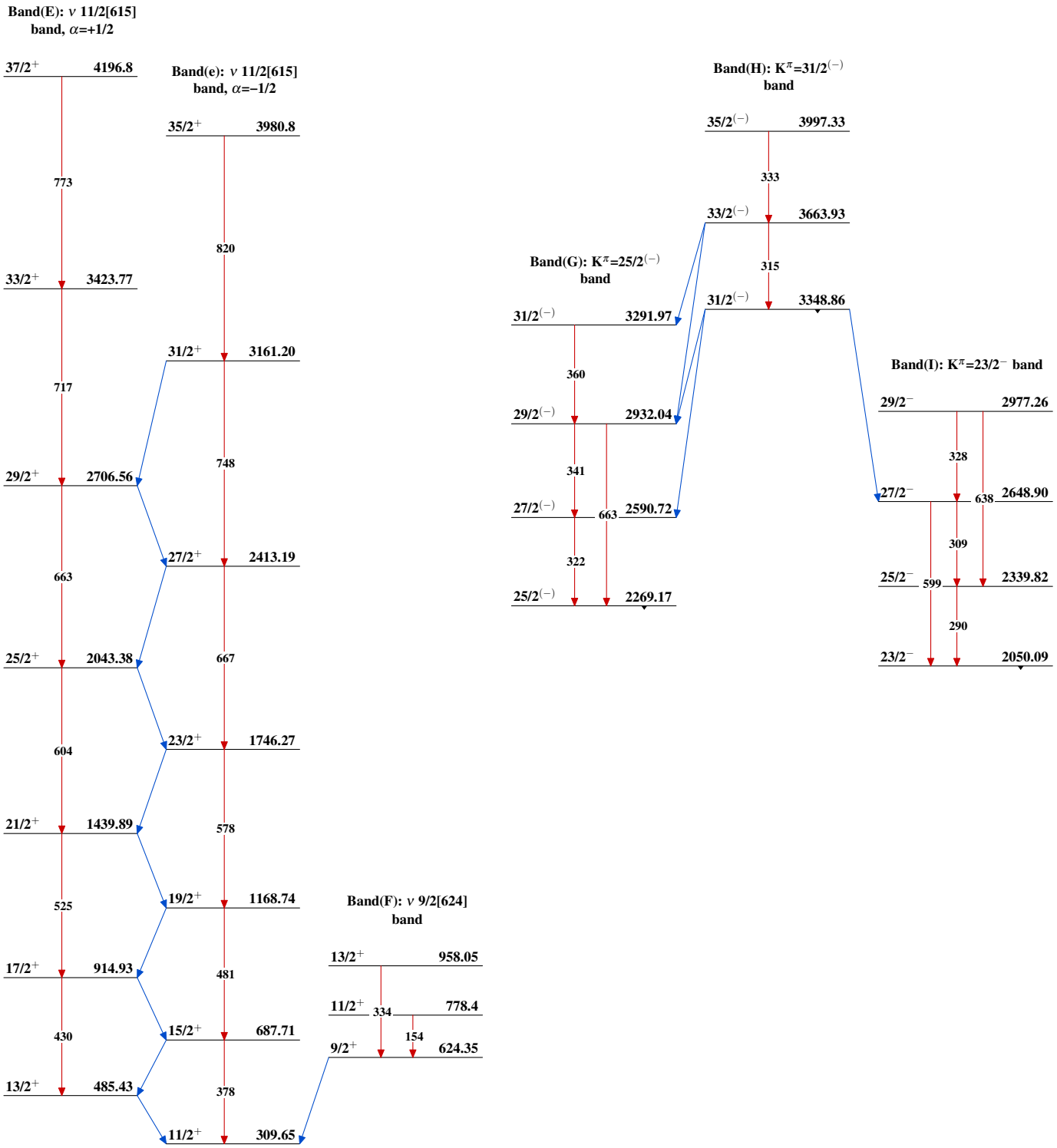
$^{183}_{74}W_{109}$

^{176}Yb(^{14}C,α3nγ) 1999Sa60



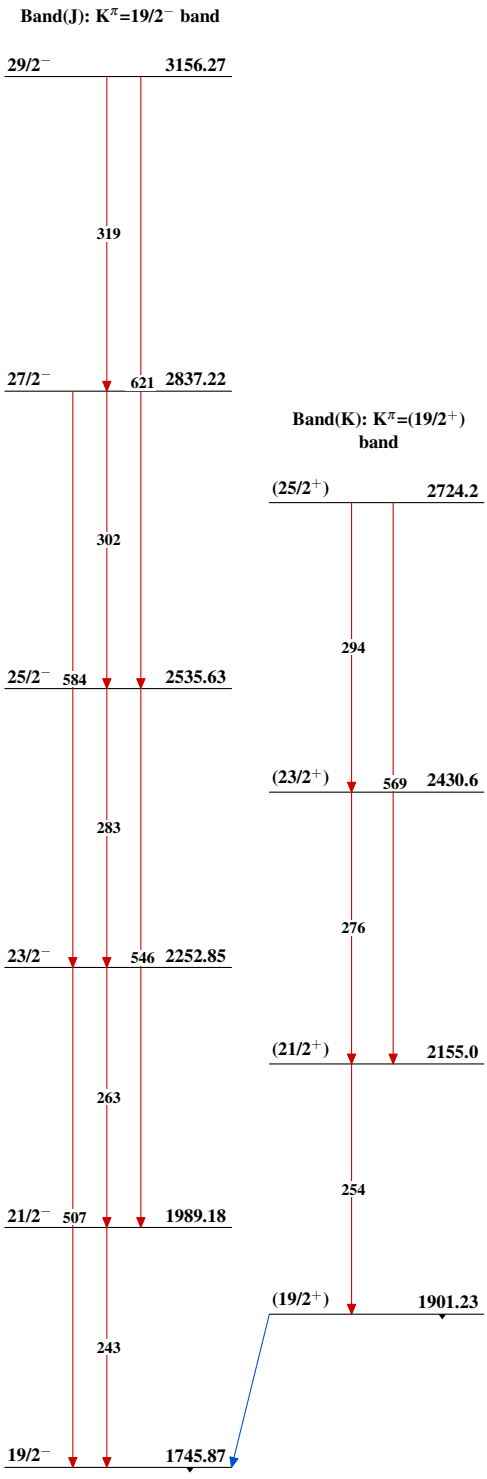
$^{183}_{74}W_{109}$

^{176}Yb(^{14}C,α3nγ) 1999Sa60 (continued)



$^{183}_{74}W_{109}$

^{176}Yb(^{14}C,α3nγ) 1999Sa60 (continued)



$^{183}_{74}W_{109}$