^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	S. -c. Wu	NDS 106, 367 (2005)	31-Aug-2005

2002Bo41,2002Pr08: E=thermal. Enriched target; two HPGe detectors; Measured Eγ, Iγ, $\gamma\gamma$.

All data are from 2002Bo41. Data presented in tables 5 and 6 are from the analysis of the coincidence relationships and are of a more definitive nature, while those from table 1 are based primarily on the single spectrum. In the list below, data from tables 5 and 6 are preferred for the level scheme over corresponding values in table 1, in case of differences. (private communication with the first author 2003BoZW).

Others: 2001Va11, 2001Ch38, 2000Va13, 1999Su03, 1999Bo14, 1997Su29, 1997Ka47, 1993Bo27, 1991Bo56, 1985Ma51, 1983Ya06, 1983Ah01, 1982Be47, 1975Ma19, 1973Si45, 1973Al06, 1972St25, 1971Al22, 1967Pr08, 1966Na03, 1967Na07.

^{181}Hf Levels

Additional information 1.

E(level)[†]	J$^{\pi}$[‡]	Comments
0.0[@]	1/2$^-$	
45.769[@] *25*	3/2$^-$	
98.58[@] *3*	5/2$^-$	
203.99[@] *3*	7/2$^-$	
252.000[&] *23*	3/2$^-$	
303.83[@] *4*	9/2$^-$	
329.297[&] *23*	5/2$^-$	
440.65[&] *3*	7/2$^-$	
465.89[@] *5*	11/2$^-$	
573.80[&] *13*	9/2$^-$	
595.22 *4*	9/2$^+$	T$_{1/2}$: measured value=1.1 μs *+22–4*; but it may belong to another level since it is in disagreement with 80 μs *5* reported in ^{180}Hf(^{238}U,^{237}Uγ) (2001Sh36). Configuration=ν9/2[624].
663.54[l] *3*	7/2$^-$	
799.8[l] *3*	9/2$^-$	
904.33[a] *7*	7/2$^-$	
1045.02[k] *7*	1/2$^-$	
1055.96[b] *5*	5/2$^-$	
1086.22[k] *5*	3/2$^-$	
1117.20[c] *5*	3/2$^-$	
1134.65[k] *10*	5/2$^-$	
1153.15[d] *7*	1/2$^-$	
1157.38[b] *19*	7/2$^-$	
1178.18[c] *14*	5/2$^-$	
1210.48 *9*	5/2$^+$	K-2 γ-vibrational state based on 9/2[624].
1229.81[d] *9*	3/2$^-$	
1260.68[d] *10*	5/2$^-$	
1287.3[b] *6*	9/2$^-$	
1321.87[e] *3*	3/2$^-$	
1328.96 *9*	1/2,3/2,5/2$^-$	
1347.82 *9*	1/2,3/2,5/2	
1357.03[i] *10*	3/2$^-$	
1362.99 *8*	1/2,3/2,5/2$^-$	

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^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

^{181}Hf Levels (continued)

E(level)[†]	Jπ[‡]	Comments
1396.91[e] 15	5/2−	
1424.43[f] 10	5/2−	
1451.99[g] 20	5/2+	
1453.5[g] 3	1/2+	
1492.64[e] 12	7/2−	
1494.19[i] 9	1/2−	
1505.14[h] 22	1/2+	
1615.74[g] 8	3/2+	
1629.47[j] 6	1/2−	
1635.89 15	(5/2)	
1641.54 7	1/2−,3/2+	
1656.53[h] 12	3/2+	
1682.88[j] 12	3/2−	
1712.65[m] 7	1/2−,(3/2−)	
1716.99[m] 6	3/2−	
1737.00 12	3/2−	
1746.6[j] 5	5/2−	
1770.04[#] 11	1/2,3/2	
1805.38 7	1/2,3/2	
1842.55[m] 6	1/2−,(3/2−)	
1847.57[m] 12	3/2−	
1867.17 12	1/2,3/2	
1895.68 7	1/2−,3/2−	
1920.7 3	(3/2+)	Configuration=ν3/2[642].
1941.27 10	1/2,3/2	
1951.33 12	(1/2−)	
1962.75 12	1/2,3/2	
1986.75 17	1/2,3/2	
1997.88 12	1/2,3/2	
2032.70[n] 14	1/2−	
2140.42 8	1/2−,3/2−	
2147.47 25	1/2−,3/2+	
2162.0 4	3/2+,(5/2−)	
2194.94 12	3/2−	
2202.98 15	(1/2),3/2−	
2215.9 5	1/2−	
2257.87 13	1/2−,3/2−	
2271.24 10	3/2−	
2282.4[n] 4	1/2,3/2	
2285.4 3	1/2,3/2	
2324.19 21	(3/2−)	
2343.52[#] 19	1/2,3/2	
2352.37 3	(3/2−)	
2365.52[#] 11	(3/2−)	
2369.4 4	1/2(−),3/2	
2396.0[#] 4	1/2,3/2	
2398.52 23	(3/2−)	
2404.61 23	1/2(−),3/2	
2407.17[#] 16	(3/2−)	
2435.01 22	1/2,3/2	
2439.6 3	1/2,3/2	E(level): from γ-transition table from single spectrum (2002Bo41); not listed in the table of decay of high lying levels.

Continued on next page (footnotes at end of table)

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

^{181}Hf Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	Comments
2449.08 *23*	1/2$^-$,3/2	
2455.76 *17*	1/2$^-$,3/2	
2508.9 *5*	1/2,3/2	J$^{\pi}$: from the table of decay of high lying levels (2002Bo41).
2566.89 *16*	1/2$^-$,3/2	
2575.12 *17*	3/2$^-$	
2597.7 *4*	1/2,3/2	
2602.09 *19*	1/2$^-$,3/2	
2610.42[#] *19*	1/2$^-$,3/2	
2613.6 *4*	1/2,3/2	
2626.58 *10*	(1/2$^-$),3/2$^-$	
2642.54[#] *9*	1/2,3/2	
2672.1 *3*	(1/2$^-$,3/2$^-$)	
2678.0 *5*		
2692.84[#] *20*	1/2,3/2	
2758.6 *4*	1/2,3/2	E(level): from γ-table from single spectrum (2002Bo41); not listed in the table of decay of high lying levels.
2764.72 *11*	1/2$^-$,3/2	
2772.27 *10*	1/2$^-$,3/2$^-$	
2795.1? *15*	3/2	E(level): from the table summarizing the ^{181}Hf levels (2002Bo41), listed as populated by primary γ, but no primary γ is listed in the γ-transition table from single spectrum Also no secondary γ's are listed in any of the tables In an e-mail communication of Oct 23, 2003 from V. Bondarenko, three possible weak transitions are related to this level: 2899γ as a primary transition; and in 2899 gate, they claim to see two weak peaks which could from 2795 level.
2833.07 *18*	3/2	
2850.66 *11*	1/2$^-$,3/2	
2866.2 *6*	1/2,3/2	E(level): from the table summarizing the ^{181}Hf levels (2002Bo41).
2896.8 *3*	1/2,3/2	
2935.8 *5*	1/2,3/2	E(level): from the table summarizing the ^{181}Hf levels (2002Bo41).
2951.5 *3*	(1/2$^-$,3/2$^+$)	
2983.83 *16*	1/2,3/2	
2987.0 *10*	(1/2$^-$,3/2$^+$)	E(level): level from the table summarizing the ^{181}Hf levels (2002Bo41). Level energy=2985.9 *6* and 2986.1 3 are given in in this table, but these values cannot be reproduced from γ-ray data in the paper. Only the 2987γ is given in $\gamma\gamma$-coin. table.
3001.81 *21*	(3/2$^-$)	
3007.9 *4*	1/2,3/2	E(level): from γ-transition table from single spectrum (2002Bo41); not listed in the table of decay of high lying levels.
3052.2 *8*	(3/2$^-$)	E(level): from γ-transition table from single spectrum (2002Bo41); not listed in the table of decay of high lying levels.
3097.01 *8*	(1/2$^-$)	
(5694.80 *7*)	1/2$^+$	J$^{\pi}$: s-wave capture in 0$^+$.

[†] From least-squares fit to Eγ's A systematic uncertainty of 50 eV should be added in quadrature to each level energy.
[‡] Assigned by the authors of 2002Bo41 based on $\gamma\gamma$-coin. information and band structures. Additional information from ^{181}Hf(pol d,p) of 2002Bo41 is used.
[#] Probable doublet.
[@] Band(A): ν1/2[510].
[&] Band(B): ν3/2[512].
[a] Band(C): ν7/2[514].
[b] Band(D): ν5/2[512].
[c] Band(E): γ-vibrational band based on ν1/2[510].
[d] Band(F): ν1/2[521].

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^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

^{181}Hf Levels (continued)

[e] Band(G): admixture of the ν3/2[501] and (ν7/2[503]−2).
[f] Band(H): ν5/2[503].
[g] Band(I): ν1/2[651].
[h] Band(J): ν1/2[660].
[i] Band(K): ν1/2[770].
[j] Band(L): ν1/2[501].
[k] Band(M): β-vibrational states based on ν1/2[510].
[l] Band(N): ν7/2[503].
[m] Configuration=ν1/2[770]+Q.
[n] Configuration=ν1/2[501]+Q.

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

$\gamma(^{181}Hf)$

All placements in the level scheme are from $\gamma\gamma$ spectra. A few transitions which were not seen in $\gamma\gamma$ coin data are noted. The detailed results are given in table 2 of 2002Bo41.

E_γ[†]	I_γ[‡e]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#]	α[f]	Comments
45.80 *20*	4.5 *22*	45.769	3/2$^-$	0.0	1/2$^-$	M1+E2	0.19 *4*	10.4 *16*	α(L)=8.0 *12*; α(M)=1.9 *3* ce(L1)/ce(L2)=50/20.
52.72 *21*	1.9 *9*	98.58	5/2$^-$	45.769	3/2$^-$	M1+E2	0.25 *5*	7.5 *12*	α(L)=5.7 *10*; α(M)=1.35 *23*; α(N+..)=0.39 *7* ce(L1)/ce(M)=20/10.
77.22 *23*	0.10 *5*	329.297	5/2$^-$	252.000	3/2$^-$				
98.55 *6*	2.0 *10*	98.58	5/2$^-$	0.0	1/2$^-$	E2		3.79	α(K)=1.00; α(L)=2.12; α(M)=0.527; α(N+..)=0.151 ce(L2):ce(L3):ce(M23)=30:30:5.
99.8 *3*	0.030 *15*	303.83	9/2$^-$	203.99	7/2$^-$				
105.48 *7*	1.3 *7*	203.99	7/2$^-$	98.58	5/2$^-$				
x108[@]									
111.6 *3*	0.030 *15*	440.65	7/2$^-$	329.297	5/2$^-$				
125.32 *2*	1.1 *6*	329.297	5/2$^-$	203.99	7/2$^-$				
129.37 *4*	0.45 *22*	595.22	9/2$^+$	465.89	11/2$^-$				
133.13 *14*	≤0.01	573.80	9/2$^-$	440.65	7/2$^-$				
136.3 *3*	≤0.01	799.8	9/2$^-$	663.54	7/2$^-$				
136.83 *19*	0.011 *3*	440.65	7/2$^-$	303.83	9/2$^-$				
x139[@]									
x141[@]									
x145[@]									
153.34 *5*	0.85 *18*	252.000	3/2$^-$	98.58	5/2$^-$				
154.57 *3*	0.16 *5*	595.22	9/2$^+$	440.65	7/2$^-$				
155.5[d] *7*	0.030 *15*	1210.48	5/2$^+$	1055.96	5/2$^-$				
158.39 *21*	0.37 *11*	203.99	7/2$^-$	45.769	3/2$^-$				
162.16 *7*	0.08 *3*	465.89	11/2$^-$	303.83	9/2$^-$				
x171[@]									
x184[@]									
189.02 *9*	0.07 *2*	440.65	7/2$^-$	252.000	3/2$^-$				E_γ: level-energy difference=188.65.
205.42 *7*	0.54 *17*	303.83	9/2$^-$	98.58	5/2$^-$				
206.23 *2*	6.6 *15*	252.000	3/2$^-$	45.769	3/2$^-$				
211.68 *10*	0.41 *12*	1328.96	1/2,3/2,5/2$^-$	1117.20	3/2$^-$				
x220[@]									
223.02 *4*	0.084 *16*	663.54	7/2$^-$	440.65	7/2$^-$				E_γ: level-energy difference=222.90.
230.66 *12*	0.11 *4*	1347.82	1/2,3/2,5/2	1117.20	3/2$^-$				
230.89 *23*	0.11 *3*	329.297	5/2$^-$	98.58	5/2$^-$				
231.3 *6*	0.030 *15*	1287.3	9/2$^-$	1055.96	5/2$^-$				
x233[@]									

$^{181}_{72}Hf_{109}$-5

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

γ(^{181}Hf) (continued)

E_γ [†]	I_γ [‡e]	E_i(level)	J_i^π	E_f	J_f^π	Comments
236.79 *8*	0.14 *3*	440.65	7/2$^-$	203.99	7/2$^-$	
240.58 *21*	0.023 *7*	904.33	7/2$^-$	663.54	7/2$^-$	
244.6 *3*	0.024 *6*	573.80	9/2$^-$	329.297	5/2$^-$	
245.86 *13*	0.11 *4*	1362.99	1/2,3/2,5/2$^-$	1117.20	3/2$^-$	
251.88 *5*	0.62 *9*	252.000	3/2$^-$	0.0	1/2$^-$	
261.93 *7*	0.09 *3*	465.89	11/2$^-$	203.99	7/2$^-$	
283.28 *26*	0.20 *4*	329.297	5/2$^-$	45.769	3/2$^-$	
291.39 *1*	0.66 *10*	595.22	9/2$^+$	303.83	9/2$^-$	
308.3 *3*	0.10 *10*	1629.47	1/2$^-$	1321.87	3/2$^-$	
329.41 *3*	1.69 *17*	329.297	5/2$^-$	0.0	1/2$^-$	E_γ: level-energy difference=329.30.
334.41 *3*	0.38 *11*	663.54	7/2$^-$	329.297	5/2$^-$	E_γ: level-energy difference=334.25.
342.09 *5*	0.61 *15*	440.65	7/2$^-$	98.58	5/2$^-$	
x350[@]						
x357[@]						
359.77 *18*	0.045 *14*	663.54	7/2$^-$	303.83	9/2$^-$	
391.07 *6*	0.27 *5*	595.22	9/2$^+$	203.99	7/2$^-$	
394.82 *11*	0.10 *3*	440.65	7/2$^-$	45.769	3/2$^-$	
411.56 *12*	0.11 *3*	663.54	7/2$^-$	252.000	3/2$^-$	
459.58 *10*	0.12 *3*	663.54	7/2$^-$	203.99	7/2$^-$	
463.52 *16*	0.012 *5*	904.33	7/2$^-$	440.65	7/2$^-$	
482.9 *3*	0.048 *22*	1712.65	1/2$^-$,(3/2$^-$)	1229.81	3/2$^-$	
x502[@]						
545.86 *24*	0.05 *3*	1997.88	1/2,3/2	1451.99	5/2$^+$	
559.43 *8*	0.038 *19*	1712.65	1/2$^-$,(3/2$^-$)	1153.15	1/2$^-$	
565.3 *3*	0.10 *2*	663.54	7/2$^-$	98.58	5/2$^-$	
575.18 *13*	0.09 *3*	904.33	7/2$^-$	329.297	5/2$^-$	
579.72 *22*	0.082 *25*	1635.89	(5/2)	1055.96	5/2$^-$	E_γ: 579.27 in the table of decay of high lying levels (2002Bo41) is a misprint.
615.12 *9*	0.88 *9*	1210.48	5/2$^+$	595.22	9/2$^+$	
615.64 *24*	0.028 *6*	1055.96	5/2$^-$	440.65	7/2$^-$	
652.35 *8*	0.22 *6*	904.33	7/2$^-$	252.000	3/2$^-$	
658.58 *3*	0.34 *5*	1321.87	3/2$^-$	663.54	7/2$^-$	E_γ: level-energy difference=658.33.
669.6 *3*	0.068 *21*	1847.57	3/2$^-$	1178.18	5/2$^-$	
688.09[d] *20*	0.08 *2*	1805.38	1/2,3/2	1117.20	3/2$^-$	
694.1 *3*	0.023 *7*	1134.65	5/2$^-$	440.65	7/2$^-$	
700.4[c] *8*	0.020 *6*	904.33	7/2$^-$	203.99	7/2$^-$	
716.55 *23*	0.033 *11*	1157.38	7/2$^-$	440.65	7/2$^-$	
726.64 *19*	0.14 *4*	1055.96	5/2$^-$	329.297	5/2$^-$	
733.4 *3*	0.034 *10*	1396.91	5/2$^-$	663.54	7/2$^-$	
738.1 *4*	0.041 *12*	1178.18	5/2$^-$	440.65	7/2$^-$	
743.4 *5*	0.080 *20*	1895.68	1/2$^-$,3/2$^-$	1153.15	1/2$^-$	E_γ: γ not given in the table of decay of high lying levels (2002Bo41).
746.0[d] *5*	0.05 *3*	2642.54	1/2,3/2	1895.68	1/2$^-$,3/2$^-$	
752.7 *4*	0.041 *10*	1055.96	5/2$^-$	303.83	9/2$^-$	

$^{181}_{72}Hf_{109}$-6

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

γ(^{181}Hf) (continued)

E_γ †	I_γ ‡e	E_i(level)	J_i^π	E_f	J_f^π	Comments
787.66 *25*	0.14 *3*	1117.20	3/2$^-$	329.297	5/2$^-$	
792.8[d] *5*	0.034 *17*	1045.02	1/2$^-$	252.000	3/2$^-$	
803.94 *4*	0.31 *6*	1055.96	5/2$^-$	252.000	3/2$^-$	
806.0[c] *8*	0.064 *19*	904.33	7/2$^-$	98.58	5/2$^-$	
828.4 *3*	0.056 *10*	1157.38	7/2$^-$	329.297	5/2$^-$	
829.10 *11*	0.11 *2*	1492.64	7/2$^-$	663.54	7/2$^-$	
830.78 *13*	0.097 *18*	1134.65	5/2$^-$	303.83	9/2$^-$	
844.4[d] *3*	0.034 *17*	1997.88	1/2,3/2	1153.15	1/2$^-$	
851.9[d] *3*	0.075 *23*	1055.96	5/2$^-$	203.99	7/2$^-$	
858.5[c] *8*	0.06 *3*	904.33	7/2$^-$	45.769	3/2$^-$	
865.1 *4*	0.048 *24*	1117.20	3/2$^-$	252.000	3/2$^-$	
882.28 *13*	0.44 *4*	1086.22	3/2$^-$	203.99	7/2$^-$	
[x]887[@]						
901.89[d] *23*	0.034 *10*	3097.01	(1/2$^-$)	2194.94	3/2$^-$	
930.6 *5*	0.082 *16*	1134.65	5/2$^-$	203.99	7/2$^-$	
946.40 *8*	0.82 *8*	1045.02	1/2$^-$	98.58	5/2$^-$	
956.33 *22*	0.042 *14*	1396.91	5/2$^-$	440.65	7/2$^-$	
957.6 *5*	0.041 *12*	1055.96	5/2$^-$	98.58	5/2$^-$	
972.27 *22*	0.075 *23*	1635.89	(5/2)	663.54	7/2$^-$	
978.1 *6*	0.021 *10*	1229.81	3/2$^-$	252.000	3/2$^-$	
987.68 *20*	0.36 *4*	1086.22	3/2$^-$	98.58	5/2$^-$	
992.38 *8*	0.34 *9*	1321.87	3/2$^-$	329.297	5/2$^-$	
999.33 *14*	0.94 *5*	1045.02	1/2$^-$	45.769	3/2$^-$	
1010.12 *26*	0.15 *4*	1055.96	5/2$^-$	45.769	3/2$^-$	
1019.2 *4*	0.12 *4*	1117.20	3/2$^-$	98.58	5/2$^-$	E_γ: 1018.23 *20* in the γ-transition table of 2002Bo41 may be contributed by an impurity also.
1025.7[d] *6*	0.027 *14*	1229.81	3/2$^-$	203.99	7/2$^-$	
1035.9 *3*	0.26 *3*	1134.65	5/2$^-$	98.58	5/2$^-$	
1040.41 *20*	0.61 *6*	1086.22	3/2$^-$	45.769	3/2$^-$	
1055.7 *7*	0.15 *6*	1055.96	5/2$^-$	0.0	1/2$^-$	
1056.68 *9*	0.28 *6*	1260.68	5/2$^-$	203.99	7/2$^-$	
1060.51 *12*	0.37 *8*	2271.24	3/2$^-$	1210.48	5/2$^+$	
1067.47 *26*	0.026 *13*	1396.91	5/2$^-$	329.297	5/2$^-$	
1069.65 *3*	0.43 *13*	1321.87	3/2$^-$	252.000	3/2$^-$	E_γ: level-energy difference=1069.87.
1071.43 *7*	0.60 *6*	1117.20	3/2$^-$	45.769	3/2$^-$	
1079.62 *19*	0.43 *15*	1178.18	5/2$^-$	98.58	5/2$^-$	
1086.18 *5*	0.82 *8*	1086.22	3/2$^-$	0.0	1/2$^-$	
[x]1093[@]						
1104.7 *4*	0.12 *6*	2365.52	(3/2$^-$)	1260.68	5/2$^-$	
1105.1 *4*	0.047 *16*	1357.03	3/2$^-$	252.000	3/2$^-$	
1107.26 *14*	1.26 *13*	1153.15	1/2$^-$	45.769	3/2$^-$	
1111.03 *10*	0.12 *4*	1362.99	1/2,3/2,5/2$^-$	252.000	3/2$^-$	

$^{181}_{72}Hf_{109}$-7

γ(^{181}Hf) (continued)

E_γ [†]	I_γ [‡e]	E_i(level)	J_i^π	E_f	J_f^π	Comments
1117.13 *7*	1.66 *7*	1117.20	3/2$^-$	0.0	1/2$^-$	
1130.87 *21*	0.21 *11*	1229.81	3/2$^-$	98.58	5/2$^-$	
1132.28 *26*	0.28 *10*	1178.18	5/2$^-$	45.769	3/2$^-$	
1134.58[d] *18*	0.25 *12*	1134.65	5/2$^-$	0.0	1/2$^-$	
1135.7[&] *5*	0.08[&] *4*	2365.52	(3/2$^-$)	1229.81	3/2$^-$	
1150.8 *5*	0.041 *20*	2194.94	3/2$^-$	1045.02	1/2$^-$	
1155.0 *5*	0.041 *20*	2365.52	(3/2$^-$)	1210.48	5/2$^+$	
1172.0 *3*	0.29 *6*	2257.87	1/2$^-$,3/2$^-$	1086.22	3/2$^-$	
1184.11 *22*	0.46 *9*	1229.81	3/2$^-$	45.769	3/2$^-$	
1212.45 *20*	0.10 *4*	2365.52	(3/2$^-$)	1153.15	1/2$^-$	
1213.1 *3*	0.10 *5*	2257.87	1/2$^-$,3/2$^-$	1045.02	1/2$^-$	
1215.3 *5*	0.12 *6*	2271.24	3/2$^-$	1055.96	5/2$^-$	
1229.73 *13*	0.63 *13*	1229.81	3/2$^-$	0.0	1/2$^-$	
1230.4 *3*	0.17 *5*	2365.52	(3/2$^-$)	1134.65	5/2$^-$	E_γ: not listed in the table of decay of high lying levels (2002Bo41).
[x]1243[@]						
1247.1 *4*	0.06 *3*	2365.52	(3/2$^-$)	1117.20	3/2$^-$	E_γ: 1247.81 *12* in γ-transition table from single spectrum. E_γ: level-energy difference=1248.3.
1248.4 *7*	0.09 *3*	1451.99	5/2$^+$	203.99	7/2$^-$	
[x]1256.4 *4*	0.24 *7*					
1259.0 *7*	0.10 *5*	1357.03	3/2$^-$	98.58	5/2$^-$	
[x]1271[@]						
1276.28 *10*	0.35 *7*	1321.87	3/2$^-$	45.769	3/2$^-$	
1282.6 *3*	0.07 *3*	1328.96	1/2,3/2,5/2$^-$	45.769	3/2$^-$	
1286.1 *4*	0.038 *12*	1615.74	3/2$^+$	329.297	5/2$^-$	
[x]1290[@]						
1299.35 *26*	0.10 *3*	1629.47	1/2$^-$	329.297	5/2$^-$	E_γ: level-energy difference=1300.16.
1301.51 *23*	0.17 *6*	1347.82	1/2,3/2,5/2	45.769	3/2$^-$	
1311.4 *5*	0.34 *4*	1357.03	3/2$^-$	45.769	3/2$^-$	I_γ: 0.034 in table of rotational band (2002Bo41) is a misprint.
1318.9 *4*	0.032 *11*	2772.27	1/2$^-$,3/2$^-$	1453.5	1/2$^+$	
1321.86 *5*	0.62 *6*	1321.87	3/2$^-$	0.0	1/2$^-$	
1326.23 *16*	0.21 *4*	1424.43	5/2$^-$	98.58	5/2$^-$	
1329.27 *17*	0.65 *20*	1328.96	1/2,3/2,5/2$^-$	0.0	1/2$^-$	
[x]1345[@]						
1353.7 *4*	0.08 *2*	1682.88	3/2$^-$	329.297	5/2$^-$	
1357.10 *12*	0.39 *8*	1357.03	3/2$^-$	0.0	1/2$^-$	
1362.44 *24*	0.06 *3*	1362.99	1/2,3/2,5/2$^-$	0.0	1/2$^-$	
1363.97 *10*	0.19 *4*	1615.74	3/2$^+$	252.000	3/2$^-$	
1365.6 *6*	0.06 *4*	2575.12	3/2$^-$	1210.48	5/2$^+$	
[x]1369.4 *3*	0.050 *15*					
1377.51 *7*	0.14 *4*	1629.47	1/2$^-$	252.000	3/2$^-$	
1378.48 *11*	0.16 *5*	1424.43	5/2$^-$	45.769	3/2$^-$	
1383.8 *4*	0.054 *26*	1712.65	1/2$^-$,(3/2$^-$)	329.297	5/2$^-$	

$^{181}_{72}Hf_{109}$-8

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

$\gamma(^{181}Hf)$ (continued)

E_γ †	I_γ ‡e	E_i(level)	J_i^π	E_f	J_f^π	Comments
1384.8d 4	0.048 24	1635.89	(5/2)	252.000	3/2$^-$	
1389.67 7	0.16 5	1641.54	1/2$^-$,3/2$^+$	252.000	3/2$^-$	
x1393.1 3	0.080 24					
1406.1 3	0.29 10	1451.99	5/2$^+$	45.769	3/2$^-$	
1407.5 6	0.019 9	1737.00	3/2$^-$	329.297	5/2$^-$	
1408.8 5	0.036 14	2772.27	1/2$^-$,3/2$^-$	1362.99	1/2,3/2,5/2$^-$	
1415.6 3	0.033 13	2772.27	1/2$^-$,3/2$^-$	1357.03	3/2$^-$	
1424.31 13	0.09 2	2772.27	1/2$^-$,3/2$^-$	1347.82	1/2,3/2,5/2	
1443.0 3	0.18 5	2772.27	1/2$^-$,3/2$^-$	1328.96	1/2,3/2,5/2$^-$	
1448.33 18	0.39 8	1494.19	1/2$^-$	45.769	3/2$^-$	
1453.6a 6	0.05 2	1453.5	1/2$^+$	0.0	1/2$^-$	
1459.6 3	0.32 12	1505.14	1/2$^+$	45.769	3/2$^-$	
1460.67 10	0.13 3	1712.65	1/2$^-$,(3/2$^-$)	252.000	3/2$^-$	
1465.36 15	0.11 4	1716.99	3/2$^-$	252.000	3/2$^-$	
1478.9 5	0.07 5	1682.88	3/2$^-$	203.99	7/2$^-$	
1494.19 11	0.50 8	1494.19	1/2$^-$	0.0	1/2$^-$	
1504.9d 3	0.09 3	1505.14	1/2$^+$	0.0	1/2$^-$	
1512.95 20	0.06 2	1716.99	3/2$^-$	203.99	7/2$^-$	
1542.51 13	0.19 4	1641.54	1/2$^-$,3/2$^+$	98.58	5/2$^-$	E_γ: level-energy difference=1542.95.
1557.90 13	0.23 5	1656.53	3/2$^+$	98.58	5/2$^-$	
1565.3 5	0.053 21	1895.68	1/2$^-$,3/2$^-$	329.297	5/2$^-$	
1570.19 26	0.14 4	1615.74	3/2$^+$	45.769	3/2$^-$	
x1574.84 23	0.14 4					
1583.73 12	0.51 10	1629.47	1/2$^-$	45.769	3/2$^-$	
1585.0 5	0.12 6	1682.88	3/2$^-$	98.58	5/2$^-$	
x1587.7 9	0.050 25					
1614.0 3	0.23 7	1712.65	1/2$^-$,(3/2$^-$)	98.58	5/2$^-$	
1615.22 15	0.32 9	1615.74	3/2$^+$	0.0	1/2$^-$	E_γ: level-energy difference=1615.74.
1618.40 11	0.41 8	1716.99	3/2$^-$	98.58	5/2$^-$	
x1626.6 4	0.08 4					
1629.36 12	0.40 8	1629.47	1/2$^-$	0.0	1/2$^-$	
1637.07 16	0.035 10	1682.88	3/2$^-$	45.769	3/2$^-$	
1638.48 17	0.18 5	1737.00	3/2$^-$	98.58	5/2$^-$	
1656.59 23	0.041 16	1656.53	3/2$^+$	0.0	1/2$^-$	
1659.5d 6	0.09 3	2324.19	(3/2$^-$)	663.54	7/2$^-$	
1667.09 14	0.048 19	1712.65	1/2$^-$,(3/2$^-$)	45.769	3/2$^-$	
1668.39 25	0.22 6	1997.88	1/2,3/2	329.297	5/2$^-$	
1671.11 9	0.81 10	1716.99	3/2$^-$	45.769	3/2$^-$	
1682.5 5	0.076 23	1682.88	3/2$^-$	0.0	1/2$^-$	
1690.9 7	0.23 7	1737.00	3/2$^-$	45.769	3/2$^-$	
1700.8 5	0.062 18	1746.6	5/2$^-$	45.769	3/2$^-$	
x1705.92 21	0.12 3					

$^{181}_{72}Hf_{109}$-9

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

γ(^{181}Hf) (continued)

E_γ [†]	I_γ [‡e]	E_i(level)	J_i^π	E_f	J_f^π	Comments
1710.52 *23*	0.28 *8*	1962.75	1/2,3/2	252.000	3/2$^-$	
1712.0 *5*	0.26 *5*	1712.65	1/2$^-$,(3/2$^-$)	0.0	1/2$^-$	
1716.93 *11*	0.62 *12*	1716.99	3/2$^-$	0.0	1/2$^-$	
[x]1721.7 *3*	0.14 *4*					
1723.71 *17*	0.23 *7*	1770.04	1/2,3/2	45.769	3/2$^-$	E_γ: level-energy difference=1724.26.
1736.77 *21*	0.11 *3*	1737.00	3/2$^-$	0.0	1/2$^-$	
1740.5 *3*	0.075 *23*	3097.01	(1/2$^-$)	1357.03	3/2$^-$	
1744.09 *26*	0.028 *9*	1842.55	1/2$^-$,(3/2$^-$)	98.58	5/2$^-$	
1746.6 *4*	0.11 *3*	1997.88	1/2,3/2	252.000	3/2$^-$	
[x]1750.8 *3*	0.04 *2*					
1760.6 *5*	0.12 *4*	1805.38	1/2,3/2	45.769	3/2$^-$	
1762.9 *3*	0.023 *4*	2202.98	(1/2),3/2$^-$	440.65	7/2$^-$	
1768.27 *23*	0.10 *5*	1867.17	1/2,3/2	98.58	5/2$^-$	
1770.78 *20*	0.18 *5*	1770.04	1/2,3/2	0.0	1/2$^-$	E_γ: level-energy difference=1770.03.
1780.0 *7*	0.10 *5*	2032.70	1/2$^-$	252.000	3/2$^-$	
1796.71 *8*	0.22 *3*	1842.55	1/2$^-$,(3/2$^-$)	45.769	3/2$^-$	
1797.20 *20*	0.27 *5*	1895.68	1/2$^-$,3/2$^-$	98.58	5/2$^-$	
1802.22 *24*	0.12 *3*	1847.57	3/2$^-$	45.769	3/2$^-$	
1805.40 *8*	0.58 *6*	1805.38	1/2,3/2	0.0	1/2$^-$	
[x]1816.89 *23*	0.11 *3*					
1821.4 *7*	0.012 *6*	1920.7	(3/2$^+$)	98.58	5/2$^-$	
[x]1830.8 *3*	0.17 *5*					
[x]1839.5 *3*	0.27 *8*					
1842.52 *8*	0.48 *5*	1842.55	1/2$^-$,(3/2$^-$)	0.0	1/2$^-$	
1842.63 *20*	0.21 *7*	1941.27	1/2,3/2	98.58	5/2$^-$	
1847.17 *18*	0.09 *4*	1847.57	3/2$^-$	0.0	1/2$^-$	
1849.87 *8*	0.49 *16*	1895.68	1/2$^-$,3/2$^-$	45.769	3/2$^-$	
1864.1[d] *6*	0.075 *23*	1962.75	1/2,3/2	98.58	5/2$^-$	
1867.06 *19*	0.27 *5*	1867.17	1/2,3/2	0.0	1/2$^-$	
[x]1871.1 *4*	0.12 *3*					
1873.5 *3*	0.11 *3*	2202.98	(1/2),3/2$^-$	329.297	5/2$^-$	
1875.0 *3*	0.014 *7*	1920.7	(3/2$^+$)	45.769	3/2$^-$	
1889.0 *3*	0.16 *5*	2140.42	1/2$^-$,3/2$^-$	252.000	3/2$^-$	
[x]1893.0 *4*	0.19 *6*					
1894.5 *5*	0.18 *9*	2147.47	1/2$^-$,3/2$^+$	252.000	3/2$^-$	
1895.4 *5*	0.23 *5*	1895.68	1/2$^-$,3/2$^-$	0.0	1/2$^-$	
1895.57 *15*	0.42 *13*	1941.27	1/2,3/2	45.769	3/2$^-$	
1905.43 *16*	0.12 *4*	1951.33	(1/2$^-$)	45.769	3/2$^-$	
1917.33 *25*	0.20 *10*	1962.75	1/2,3/2	45.769	3/2$^-$	
1920.8 *7*	0.008 *4*	1920.7	(3/2$^+$)	0.0	1/2$^-$	
[x]1928.3 *4*	0.11 *5*					
[x]1937.40 *23*	0.17 *9*					
1940.7 *2*	0.05 *3*	1986.75	1/2,3/2	45.769	3/2$^-$	

$^{181}_{72}Hf_{109}$-10

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

γ(^{181}Hf) (continued)

E_γ [†]	I_γ [‡ e]	E_i(level)	J_i^π	E_f	J_f^π	Comments
1941.4 *4*	0.04 *2*	1941.27	1/2,3/2	0.0	1/2⁻	
1942.31 *17*	0.33 *6*	2271.24	3/2⁻	329.297	5/2⁻	
1942.83 *18*	0.083 *25*	2194.94	3/2⁻	252.000	3/2⁻	
1951.3 *4*	0.036 *18*	2202.98	(1/2),3/2⁻	252.000	3/2⁻	
1951.50 *20*	0.11 *3*	1951.33	(1/2⁻)	0.0	1/2⁻	
1952.20 *20*	0.13 *5*	1997.88	1/2,3/2	45.769	3/2⁻	
1963.8 *5*	0.08 *3*	1962.75	1/2,3/2	0.0	1/2⁻	
[x]1972.3 *4*	0.10 *5*					
[x]1976.0 *4*	0.13 *7*					
1979.7 *3*	0.10 *5*	3097.01	(1/2⁻)	1117.20	3/2⁻	
1986.3 *8*	0.07 *4*	1986.75	1/2,3/2	0.0	1/2⁻	
1987.12 *18*	0.21 *7*	2032.70	1/2⁻	45.769	3/2⁻	
[x]1990.9 *3*	0.16 *6*					
2011.0[d] *6*	0.048 *24*	3097.01	(1/2⁻)	1086.22	3/2⁻	
[x]2013.2 *3*	0.12 *6*					
[x]2015.6 *6*	0.13 *4*					
2031.6 *6*	0.07 *4*	2032.70	1/2⁻	0.0	1/2⁻	
2036.6 *4*	0.03 *2*	2365.52	(3/2⁻)	329.297	5/2⁻	
2040.3[&] *12*	0.01[&] *1*	2369.4	1/2(⁻),3/2	329.297	5/2⁻	
2041.80 *15*	0.13 *4*	2140.42	1/2⁻,3/2⁻	98.58	5/2⁻	
[x]2057.4 *6*	0.080 *24*					
[x]2061.8 *5*	0.10 *5*					
2063.3 *6*	0.03 *2*	2162.0	3/2⁺,(5/2⁻)	98.58	5/2⁻	
[x]2065.4 *9*	0.10 *5*					
2076.8[g] *4*	≈0.04[g]	2404.61	1/2(⁻),3/2	329.297	5/2⁻	E_γ: level-energy difference=2075.3.
2076.8[g] *4*	≈0.04[g]	2407.17	(3/2⁻)	329.297	5/2⁻	
[x]2080.1 *3*	0.16 *8*					
2094.84 *23*	0.51 *10*	2140.42	1/2⁻,3/2⁻	45.769	3/2⁻	
2113.4 *4*	0.03 *2*	2365.52	(3/2⁻)	252.000	3/2⁻	
2116.6 *6*	0.07 *6*	2162.0	3/2⁺,(5/2⁻)	45.769	3/2⁻	
2117.1[&] *5*	0.04[&] *2*	2369.4	1/2(⁻),3/2	252.000	3/2⁻	
2117.6 *6*	0.16 *5*	2215.9	1/2⁻	98.58	5/2⁻	
2119.5 *4*	0.08 *4*	2449.08	1/2⁻,3/2	329.297	5/2⁻	
[x]2123.2 *3*	0.16 *8*					
[x]2131.6 *4*	0.12 *6*					
2140.31 *11*	0.36 *5*	2140.42	1/2⁻,3/2⁻	0.0	1/2⁻	
2148.6 *4*	0.08 *4*	2147.47	1/2⁻,3/2⁺	0.0	1/2⁻	
2149.1 *4*	0.11 *3*	2194.94	3/2⁻	45.769	3/2⁻	
2152.5 *5*	0.01 *1*	2404.61	1/2(⁻),3/2	252.000	3/2⁻	
2156.8 *5*	0.014 *7*	2202.98	(1/2),3/2⁻	45.769	3/2⁻	
2157.8 *4*	0.04 *3*	2407.17	(3/2⁻)	252.000	3/2⁻	E_γ: poor fit; level-energy difference=2155.2.
2188.4 *6*	0.11 *6*	2439.6	1/2,3/2	252.000	3/2⁻	E_γ: from γ-transition table from single spectrum of 2002Bo41; not listed in the table of decay of high lying levels.

$^{181}_{72}Hf_{109}$-11

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

γ(^{181}Hf) (continued)

E_γ[†]	I_γ[‡e]	E_i(level)	J_i^π	E_f	J_f^π	Comments
2194.7 *3*	0.16 *8*	2194.94	3/2$^-$	0.0	1/2$^-$	
2202.8 *4*	0.052 *26*	2202.98	(1/2),3/2$^-$	0.0	1/2$^-$	
2211.5 *3*	0.05 *3*	2257.87	1/2$^-$,3/2$^-$	45.769	3/2$^-$	
2237.1 *5*	0.07 *3*	2282.4	1/2,3/2	45.769	3/2$^-$	
2239.5 *3*	0.10 *5*	2285.4	1/2,3/2	45.769	3/2$^-$	
2258.4 *6*	0.10 *5*	2257.87	1/2$^-$,3/2$^-$	0.0	1/2$^-$	
2266.6 *3*	0.10 *4*	2365.52	(3/2$^-$)	98.58	5/2$^-$	
2271.4 *3*	0.09 *4*	2271.24	3/2$^-$	0.0	1/2$^-$	
2272.70 *23*	0.029 *15*	2602.09	1/2$^-$,3/2	329.297	5/2$^-$	
2279.2 *3*	0.32 *21*	2324.19	(3/2$^-$)	45.769	3/2$^-$	
2280.84 *24*	0.027 *13*	2610.42	1/2$^-$,3/2	329.297	5/2$^-$	
2282.0 *5*	0.06 *3*	2282.4	1/2,3/2	0.0	1/2$^-$	
2285.7 *5*	0.02 *1*	2285.4	1/2,3/2	0.0	1/2$^-$	
2297.8 *3*	0.09 *3*	2626.58	(1/2$^-$),3/2$^-$	329.297	5/2$^-$	
2300.8[&] *4*	0.04[&] *3*	2398.52	(3/2$^-$)	98.58	5/2$^-$	
2307.5 *4*	0.09 *5*	2352.37	(3/2$^-$)	45.769	3/2$^-$	
2320.7 *8*	0.03 *2*	2365.52	(3/2$^-$)	45.769	3/2$^-$	
2323.3 *4*	0.23 *5*	2324.19	(3/2$^-$)	0.0	1/2$^-$	
2323.4 *8*	0.02 *1*	2369.4	1/2$^{(-)}$,3/2	45.769	3/2$^-$	Eγ=2321.9 *4*; Iγ=0.05 *2* (doublet in γ-transition table from single spectrum of 2002Bo41). Most likely corresponds to 2320.7+2323.4.
2346.1 *4*	0.022 *12*	2597.7	1/2,3/2	252.000	3/2$^-$	
2350.2 *4*	0.14 *6*	2396.0	1/2,3/2	45.769	3/2$^-$	
2350.6 *6*	0.04 *3*	2449.08	1/2$^-$,3/2	98.58	5/2$^-$	
2352.35 *3*	0.26 *8*	2352.37	(3/2$^-$)	0.0	1/2$^-$	
2353[b]		2678.0		329.297	5/2$^-$	E_γ: poor fit; level-energy difference=2349.4.
2353.5[a] *6*	0.18 *6*	2398.52	(3/2$^-$)	45.769	3/2$^-$	I_γ: 0.35 *7* in γ-transition table from single spectrum (2002Bo41).
2355.2[&] *5*	0.09[&] *4*	2455.76	1/2$^-$,3/2	98.58	5/2$^-$	E_γ: poor fit; level-energy difference=2357.2.
2358.0 *5*	0.06 *3*	2404.61	1/2$^{(-)}$,3/2	45.769	3/2$^-$	
2361.6 *5*	0.04 *2*	2407.17	(3/2$^-$)	45.769	3/2$^-$	
2366.3 *6*	0.04 *2*	2365.52	(3/2$^-$)	0.0	1/2$^-$	
2370.7 *9*	0.02 *1*	2369.4	1/2$^{(-)}$,3/2	0.0	1/2$^-$	Eγ=2368.5 *5*; Iγ=0.06 *3* (doublet in γ-transition table from single spectrum of 2002Bo41). Most likely corresponds to 2366.3+2370.7.
2374.48 *15*	0.075 *23*	2626.58	(1/2$^-$),3/2$^-$	252.000	3/2$^-$	
2389.2 *5*	0.03 *2*	2435.01	1/2,3/2	45.769	3/2$^-$	
2396.1 *5*	0.16 *6*	2396.0	1/2,3/2	0.0	1/2$^-$	
2403.7 *4*	0.04 *2*	2404.61	1/2$^{(-)}$,3/2	0.0	1/2$^-$	
2409.3[&] *5*	0.08[&] *4*	2455.76	1/2$^-$,3/2	45.769	3/2$^-$	
2409.6 *9*	0.03 *2*	2407.17	(3/2$^-$)	0.0	1/2$^-$	
2426[b]		2678.0		252.000	3/2$^-$	
2434.92 *25*	0.07 *2*	2435.01	1/2,3/2	0.0	1/2$^-$	
2435.42 *15*	0.19 *9*	2764.72	1/2$^-$,3/2	329.297	5/2$^-$	

$^{181}_{72}Hf_{109}$-12

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

γ(^{181}Hf) (continued)

E_γ[†]	I_γ[‡e]	E_i(level)	J_i^π	E_f	J_f^π	Comments
[x]2439[@]						
2447.6 *5*	0.08 *4*	2449.08	1/2⁻,3/2	0.0	1/2⁻	
[x]2456[@]						
2456.2[&] *2*	0.11[&] *4*	2455.76	1/2⁻,3/2	0.0	1/2⁻	E_γ: from priv. comm. (2003BoZW).
2462.6 *9*	0.06 *3*	2508.9	1/2,3/2	45.769	3/2⁻	
2467.35 *23*	0.07 *3*	2566.89	1/2⁻,3/2	98.58	5/2⁻	E_γ: poor fit; level-energy difference=2468.28.
2503.57 *25*	0.16 *5*	2833.07	3/2	329.297	5/2⁻	
2503.9 *6*	0.016 *8*	2602.09	1/2⁻,3/2	98.58	5/2⁻	
2512.2 *5*	0.04 *3*	2764.72	1/2⁻,3/2	252.000	3/2⁻	
2520.8 *7*	0.04 *3*	2566.89	1/2⁻,3/2	45.769	3/2⁻	
2521.4 *4*	0.05 *3*	2850.66	1/2⁻,3/2	329.297	5/2⁻	
2528.3 *4*	0.06 *3*	2575.12	3/2⁻	45.769	3/2⁻	
2536[b]		2866.2	1/2,3/2	329.297	5/2⁻	
2550.4 *8*	0.024 *16*	2597.7	1/2,3/2	45.769	3/2⁻	
2557.3 *5*	0.052 *26*	2602.09	1/2⁻,3/2	45.769	3/2⁻	
2566[b]		2896.8	1/2,3/2	329.297	5/2⁻	
2567.1 *8*	0.12 *10*	2613.6	1/2,3/2	45.769	3/2⁻	
2568.0 *3*	0.09 *4*	2566.89	1/2⁻,3/2	0.0	1/2⁻	E_γ: poor fit; level-energy difference=2566.9.
2574[b]		2672.1	(1/2⁻,3/2⁻)	98.58	5/2⁻	
2574.5 *5*	0.11 *6*	2575.12	3/2⁻	0.0	1/2⁻	
2581.2 *5*	0.077 *23*	2626.58	(1/2⁻),3/2⁻	45.769	3/2⁻	
2596.68[a] *11*	0.12 *5*	2642.54	1/2,3/2	45.769	3/2⁻	
2597.59 *11*	0.64 *18*	(5694.80)	1/2⁺	3097.01	(1/2⁻)	
2597.7 *7*	0.09 *5*	2597.7	1/2,3/2	0.0	1/2⁻	
2598.59 *16*	0.15 *5*	2850.66	1/2⁻,3/2	252.000	3/2⁻	
2602.2 *7*	0.043 *17*	2602.09	1/2⁻,3/2	0.0	1/2⁻	
2613.7 *4*	0.27 *10*	2613.6	1/2,3/2	0.0	1/2⁻	
2620[b]		2951.5	(1/2⁻,3/2⁺)	329.297	5/2⁻	
2626.30 *23*	0.16 *4*	2626.58	(1/2⁻),3/2⁻	0.0	1/2⁻	
2642.0 *3*	0.07 *2*	2642.54	1/2,3/2	0.0	1/2⁻	
2642.5 *8*	0.23 *12*	(5694.80)	1/2⁺	3052.2	(3/2⁻)	
2646[b]		2896.8	1/2,3/2	252.000	3/2⁻	
2647.1 *3*	0.24 *6*	2692.84	1/2,3/2	45.769	3/2⁻	
[x]2670[@]						
2670[b]		2672.1	(1/2⁻,3/2⁻)	0.0	1/2⁻	
2677[b]		2678.0		0.0	1/2⁻	
[x]2680[@]						
2686.2 *6*	0.20 *10*	(5694.80)	1/2⁺	3007.9	1/2,3/2	
2691.9 *5*	0.25 *8*	(5694.80)	1/2⁺	3001.81	(3/2⁻)	
2692.4 *5*	0.10 *6*	2692.84	1/2,3/2	0.0	1/2⁻	

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

γ(^{181}Hf) (continued)

E_γ †	I_γ ‡e	E_i(level)	J_i^π	E_f	J_f^π	Comments
2710.4a 3	0.65 19	(5694.80)	1/2+	2983.83	1/2,3/2	
x2713@						
2719.09 23	0.16 4	2764.72	1/2−,3/2	45.769	3/2−	
x2728@						
2733.9 4	0.28 8	2833.07	3/2	98.58	5/2−	
2742.9 3	0.33 10	(5694.80)	1/2+	2951.5	(1/2−,3/2+)	
2751.0 10	0.05 3	2850.66	1/2−,3/2	98.58	5/2−	E_γ: from γ-transition table from single spectrum (2002Bo41); not listed in the table of decay of high lying levels.
2758.6 5	0.38 8	2758.6	1/2,3/2	0.0	1/2−	
2759b		(5694.80)	1/2+	2935.8	1/2,3/2	
2764.7 3	0.21 4	2764.72	1/2−,3/2	0.0	1/2−	
2768b		2866.2	1/2,3/2	98.58	5/2−	
2772.09 26	0.17 4	2772.27	1/2−,3/2−	0.0	1/2−	
x2784@						
2797.9 3	0.20 10	(5694.80)	1/2+	2896.8	1/2,3/2	
2805.25 21	0.14 3	2850.66	1/2−,3/2	45.769	3/2−	
x2810@						
x2815@						
2821abh		2866.2	1/2,3/2	45.769	3/2−	
2828b		(5694.80)	1/2+	2866.2	1/2,3/2	
x2835@						
2837b		2935.8	1/2,3/2	98.58	5/2−	
2844.2 2	0.29 9	(5694.80)	1/2+	2850.66	1/2−,3/2	
2844.70 20	0.13 3	3097.01	(1/2−)	252.000	3/2−	
2849.6 6	0.05 3	2850.66	1/2−,3/2	0.0	1/2−	
2851b		2951.5	(1/2−,3/2+)	98.58	5/2−	
2861.1 3	0.24 8	(5694.80)	1/2+	2833.07	3/2	I_γ: 0.28 5 in table 3 of 2002Bo41.
x2879@						
x2885@						
2891b		2935.8	1/2,3/2	45.769	3/2−	
2896b		2896.8	1/2,3/2	0.0	1/2−	
x2914@						
x2917@						
2922.26 15	1.45 14	(5694.80)	1/2+	2772.27	1/2−,3/2−	
2930.1 3	0.59 12	(5694.80)	1/2+	2764.72	1/2−,3/2	
2935b		2935.8	1/2,3/2	0.0	1/2−	
2936.2 4	0.42 8	(5694.80)	1/2+	2758.6	1/2,3/2	
2938.1 5	0.15 8	2983.83	1/2,3/2	45.769	3/2−	

$^{181}_{72}Hf_{109}$-14

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

$\gamma(^{181}Hf)$ (continued)

E_γ [†]	I_γ [‡e]	E_i(level)	J_i^π	E_f	J_f^π
2952[b]		2951.5	$(1/2^-,3/2^+)$	0.0	$1/2^-$
2956.1 *5*	0.05 *4*	3001.81	$(3/2^-)$	45.769	$3/2^-$
[x]2959[@]					
[x]2962[@]					
[x]2968[@]					
2983.56 *20*	0.19 *6*	2983.83	1/2,3/2	0.0	$1/2^-$
[x]2987[@]					
2987[b]		2987.0	$(1/2^-,3/2^+)$	0.0	$1/2^-$
2998.5[&] *4*	0.08[&] *4*	3097.01	$(1/2^-)$	98.58	$5/2^-$
3001.48 *26*	0.15 *8*	3001.81	$(3/2^-)$	0.0	$1/2^-$
3001.8 *3*	0.20 *10*	(5694.80)	$1/2^+$	2692.84	1/2,3/2
3007.4 *5*	0.16 *5*	3007.9	1/2,3/2	0.0	$1/2^-$
[x]3013[@]					
3016.6 *7*	0.08	(5694.80)	$1/2^+$	2678.0	
3022.5 *3*	0.23 *6*	(5694.80)	$1/2^+$	2672.1	$(1/2^-,3/2^-)$
3051.00 *20*	0.22 *7*	3097.01	$(1/2^-)$	45.769	$3/2^-$
3051.88 *15*	0.51 *15*	(5694.80)	$1/2^+$	2642.54	1/2,3/2
3068.13 *20*	0.49 *5*	(5694.80)	$1/2^+$	2626.58	$(1/2^-),3/2^-$
[x]3081[@]					
3083.9 *3*	0.39 *4*	(5694.80)	$1/2^+$	2610.42	$1/2^-,3/2$
3094.1[a] *6*	0.33 *12*	(5694.80)	$1/2^+$	2602.09	$1/2^-,3/2$
3096.7 *3*	0.19 *4*	3097.01	$(1/2^-)$	0.0	$1/2^-$
3119.37 *20*	0.23 *5*	(5694.80)	$1/2^+$	2575.12	$3/2^-$
3127.4 *3*	0.20 *6*	(5694.80)	$1/2^+$	2566.89	$1/2^-,3/2$
3185.7 *5*	0.06 *3*	(5694.80)	$1/2^+$	2508.9	1/2,3/2
3239.2 *5*	0.29 *9*	(5694.80)	$1/2^+$	2455.76	$1/2^-,3/2$
3244.5 *4*	0.33 *7*	(5694.80)	$1/2^+$	2449.08	$1/2^-,3/2$
3255.3 *3*	0.23 *5*	(5694.80)	$1/2^+$	2439.6	1/2,3/2
3259.1 *7*	0.10 *3*	(5694.80)	$1/2^+$	2435.01	1/2,3/2
3288.10[a] *20*	0.47 *5*	(5694.80)	$1/2^+$	2407.17	$(3/2^-)$
[x]3291[@]					
3296.9[a] *3*	0.48 *5*	(5694.80)	$1/2^+$	2398.52	$(3/2^-)$
3328.61[a] *25*	0.56 *6*	(5694.80)	$1/2^+$	2365.52	$(3/2^-)$
[x]3341[@]					
3351.21[a] *18*	0.24 *5*	(5694.80)	$1/2^+$	2343.52	1/2,3/2
3370.6 *5*	0.28 *5*	(5694.80)	$1/2^+$	2324.19	$(3/2^-)$
[x]3413[@]					
3423.3 *3*	0.42 *4*	(5694.80)	$1/2^+$	2271.24	$3/2^-$
3436.92 *20*	0.55 *6*	(5694.80)	$1/2^+$	2257.87	$1/2^-,3/2^-$
3479.6 *9*	0.10 *5*	(5694.80)	$1/2^+$	2215.9	$1/2^-$

$^{181}_{72}Hf_{109}$-15

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

γ(^{181}Hf) (continued)

E_γ [†]	I_γ [‡e]	E_i(level)	J_i^π	E_f	J_f^π	Comments
3492.4 *4*	0.41 *4*	(5694.80)	$1/2^+$	2202.98	$(1/2),3/2^-$	
3499.9 *3*	0.66 *7*	(5694.80)	$1/2^+$	2194.94	$3/2^-$	
3533.0 *7*	0.09 *5*	(5694.80)	$1/2^+$	2162.0	$3/2^+,(5/2^-)$	
3547.8 *4*	0.26 *3*	(5694.80)	$1/2^+$	2147.47	$1/2^-,3/2^+$	
3554.30 *18*	1.1 *3*	(5694.80)	$1/2^+$	2140.42	$1/2^-,3/2^-$	
3662.10 *23*	0.29 *3*	(5694.80)	$1/2^+$	2032.70	$1/2^-$	
3696.9 *4*	0.34 *7*	(5694.80)	$1/2^+$	1997.88	1/2,3/2	
3707.3 *3*	0.12 *3*	(5694.80)	$1/2^+$	1986.75	1/2,3/2	
3732.15 *18*	0.41 *4*	(5694.80)	$1/2^+$	1962.75	1/2,3/2	
[x]3738[@]						
3743.4 *4*	0.10 *3*	(5694.80)	$1/2^+$	1951.33	$(1/2^-)$	
3753.55 *18*	0.49 *5*	(5694.80)	$1/2^+$	1941.27	1/2,3/2	
3774.8 *17*	0.030 *15*	(5694.80)	$1/2^+$	1920.7	$(3/2^+)$	
3798.99 *18*	1.29 *13*	(5694.80)	$1/2^+$	1895.68	$1/2^-,3/2^-$	
3827.17 *21*	0.22 *4*	(5694.80)	$1/2^+$	1867.17	1/2,3/2	
3847.08 *20*	0.65 *14*	(5694.80)	$1/2^+$	1847.57	$3/2^-$	
3851.82 *18*	1.95 *10*	(5694.80)	$1/2^+$	1842.55	$1/2^-,(3/2^-)$	
3889.50 *18*	0.68 *7*	(5694.80)	$1/2^+$	1805.38	1/2,3/2	
3924.68 *18*	0.47 *5*	(5694.80)	$1/2^+$	1770.04	1/2,3/2	
3957.53 *23*	0.77 *8*	(5694.80)	$1/2^+$	1737.00	$3/2^-$	
3977.59 *23*	2.58 *13*	(5694.80)	$1/2^+$	1716.99	$3/2^-$	
3982.5 *4*	0.92 *18*	(5694.80)	$1/2^+$	1712.65	$1/2^-,(3/2^-)$	
4011.88 *23*	0.340 *20*	(5694.80)	$1/2^+$	1682.88	$3/2^-$	
4037.3 *8*	0.06 *3*	(5694.80)	$1/2^+$	1656.53	$3/2^+$	
4054.0 *8*	0.12 *3*	(5694.80)	$1/2^+$	1641.54	$1/2^-,3/2^+$	
4065.31 *17*	0.97 *10*	(5694.80)	$1/2^+$	1629.47	$1/2^-$	
4079.2 *4*	0.17 *2*	(5694.80)	$1/2^+$	1615.74	$3/2^+$	
4200.47 *17*	0.62 *3*	(5694.80)	$1/2^+$	1494.19	$1/2^-$	
4240.9 *6*	0.23 *7*	(5694.80)	$1/2^+$	1453.5	$1/2^+$	
4337.4 *3*	0.24 *7*	(5694.80)	$1/2^+$	1357.03	$3/2^-$	
4373.06 *11*	1.8 *3*	(5694.80)	$1/2^+$	1321.87	$3/2^-$	
4464.52 *18*	0.33 *3*	(5694.80)	$1/2^+$	1229.81	$3/2^-$	
4541.61 *14*	0.60 *6*	(5694.80)	$1/2^+$	1153.15	$1/2^-$	
4577.4 *3*	0.16 *3*	(5694.80)	$1/2^+$	1117.20	$3/2^-$	
4608.32 *11*	0.78 *4*	(5694.80)	$1/2^+$	1086.22	$3/2^-$	
4649.0 *3*	0.15 *5*	(5694.80)	$1/2^+$	1045.02	$1/2^-$	
5442.92 *10*	1.15 *5*	(5694.80)	$1/2^+$	252.000	$3/2^-$	
5649.22 *9*	5.7 *3*	(5694.80)	$1/2^+$	45.769	$3/2^-$	E_γ: level-energy difference=5648.91.
5694.93 *10*	21.3 *13*	(5694.80)	$1/2^+$	0.0	$1/2^-$	

[†] Recoil correction removed from primary Eγ's given in table 1 of 2002Bo41.

$^{181}_{72}Hf_{109}$-16

$\gamma(^{181}Hf)$ (continued)

‡ Systematic uncertainty of 16% should be added in quadrature.
# Calculated by the evaluator from ce data (1967Pr08) assuming 30% uncertainty in the ce intensities.
@ γ listed only in $\gamma\gamma$ coin (table 2) of 2002Bo41. Uncertainty is probably 1 keV.
& From table 6, the decay of high lying levels; not listed in table of the single spectrum.
a Doublet, multiple placement.
b γ from $\gamma\gamma$-coin. (2002Bo41), placement based on priv. comm. (2003BoZW) and $\gamma\gamma$ coin table.
c From β decay, transition not observed in the coincidence work (private communication, 2003BoZW).
d γ not seen in $\gamma\gamma$ coin data.
e Intensity per 100 neutron captures.
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 Multiply placed with undivided intensity.
h Placement of transition in the level scheme is uncertain.
x γ ray not placed in level scheme.

$^{181}_{72}Hf_{109}$-17

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08

Level Scheme

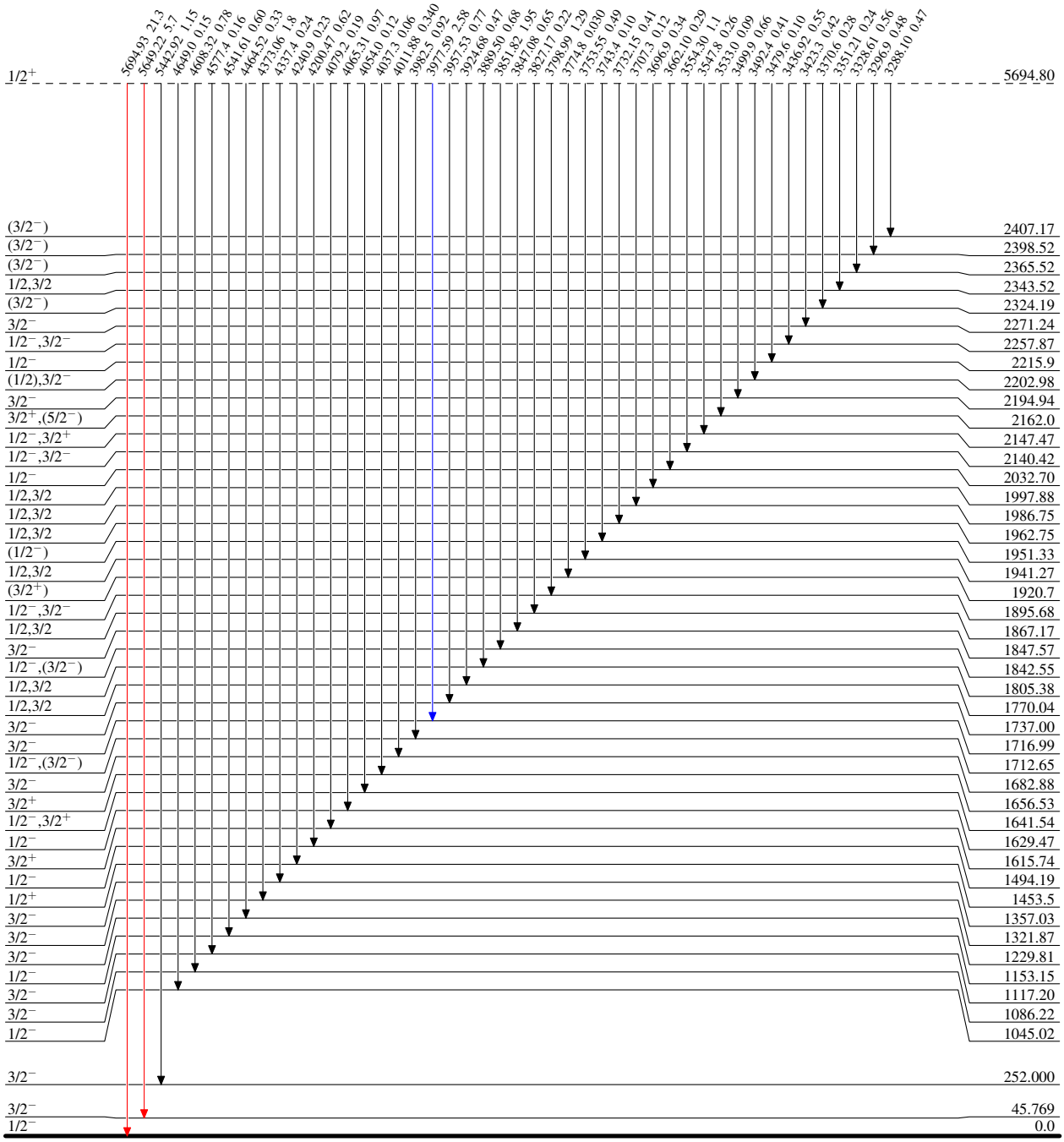
Intensities: per 100 neutron captures

Legend

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

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

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



$^{181}_{72}Hf_{109}$

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08

Level Scheme (continued)

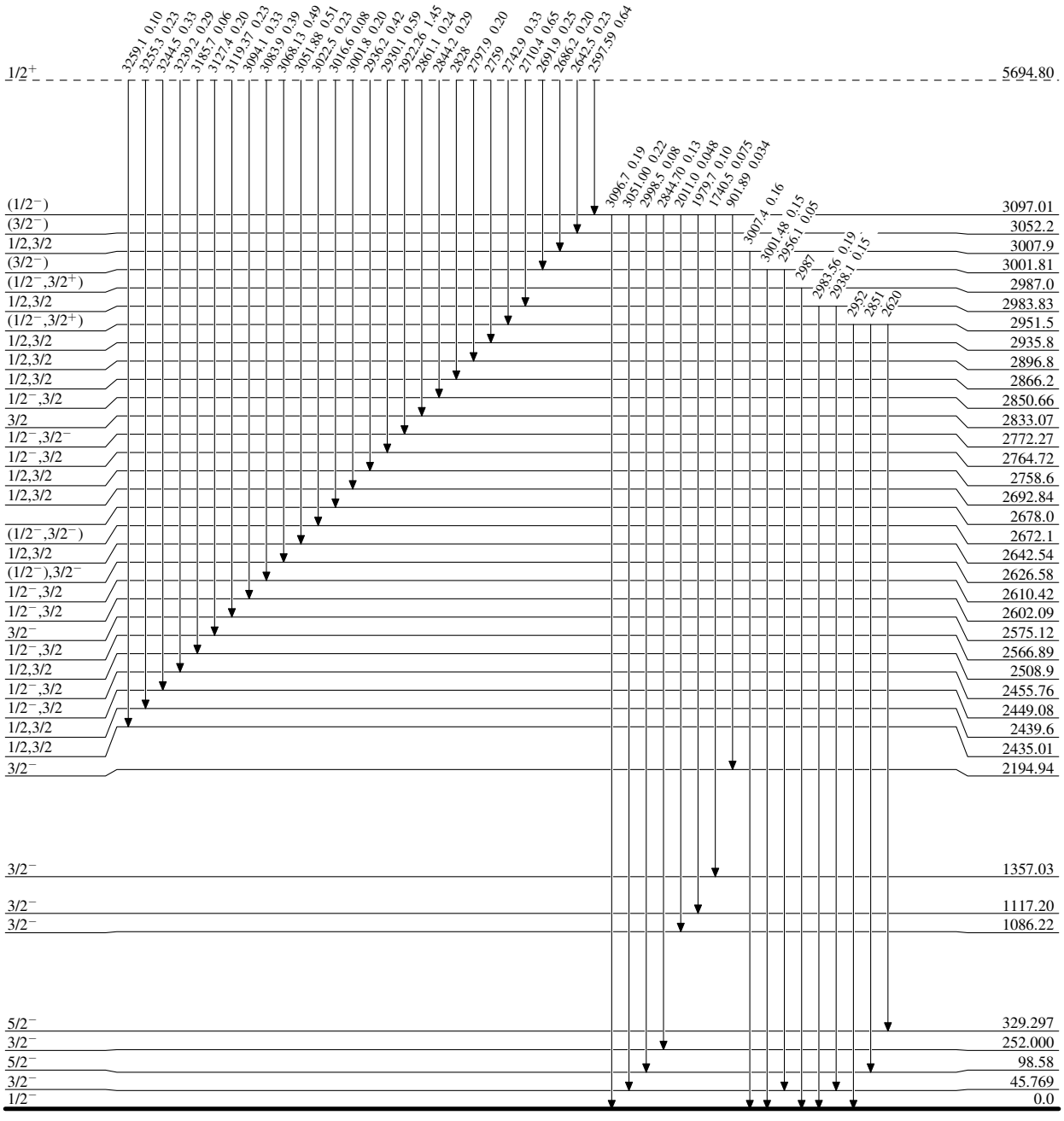
Intensities: per 100 neutron captures

Legend

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

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

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



$^{181}_{72}Hf_{109}$

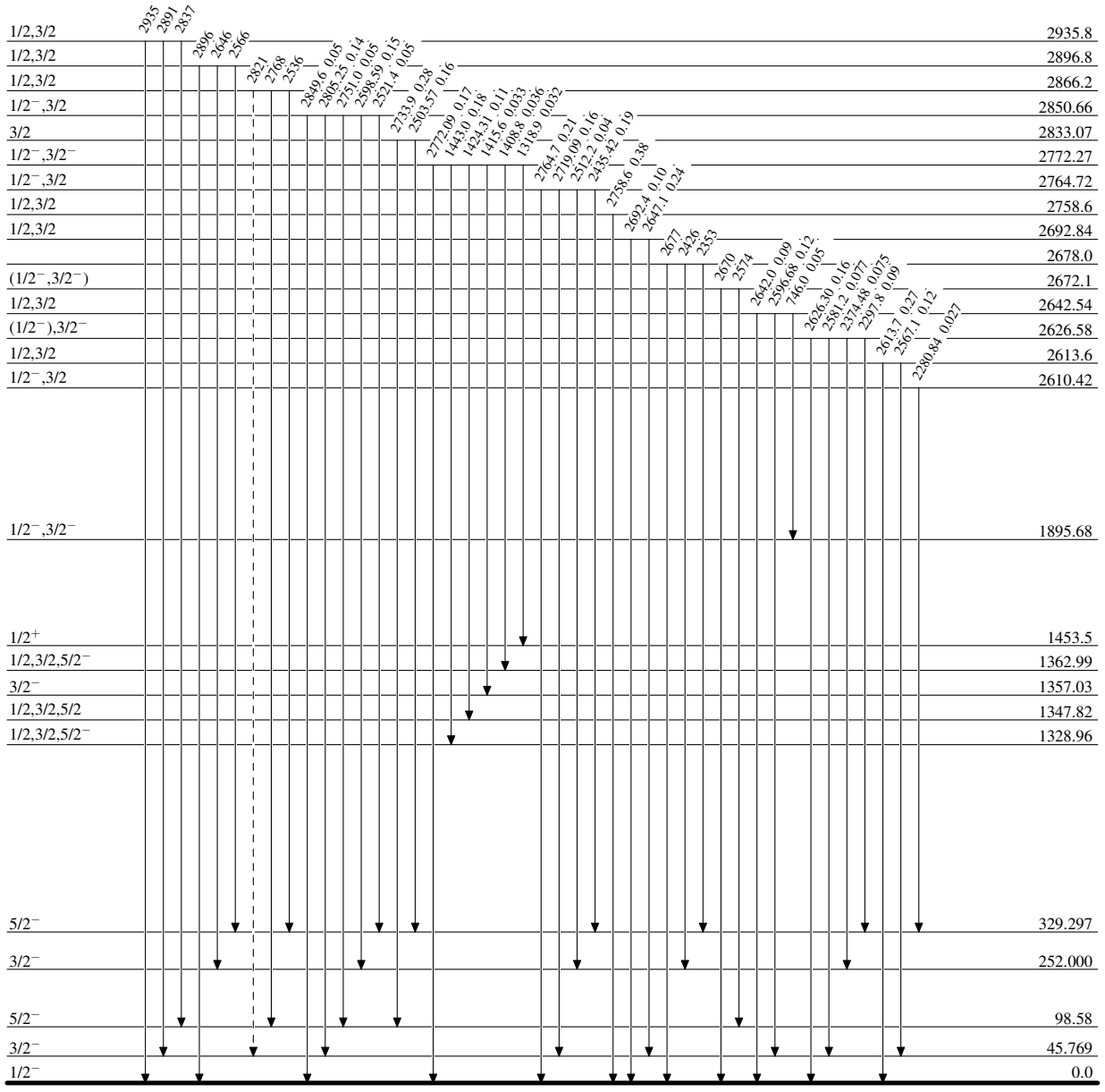
^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08

Level Scheme (continued)

Intensities: per 100 neutron captures

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)



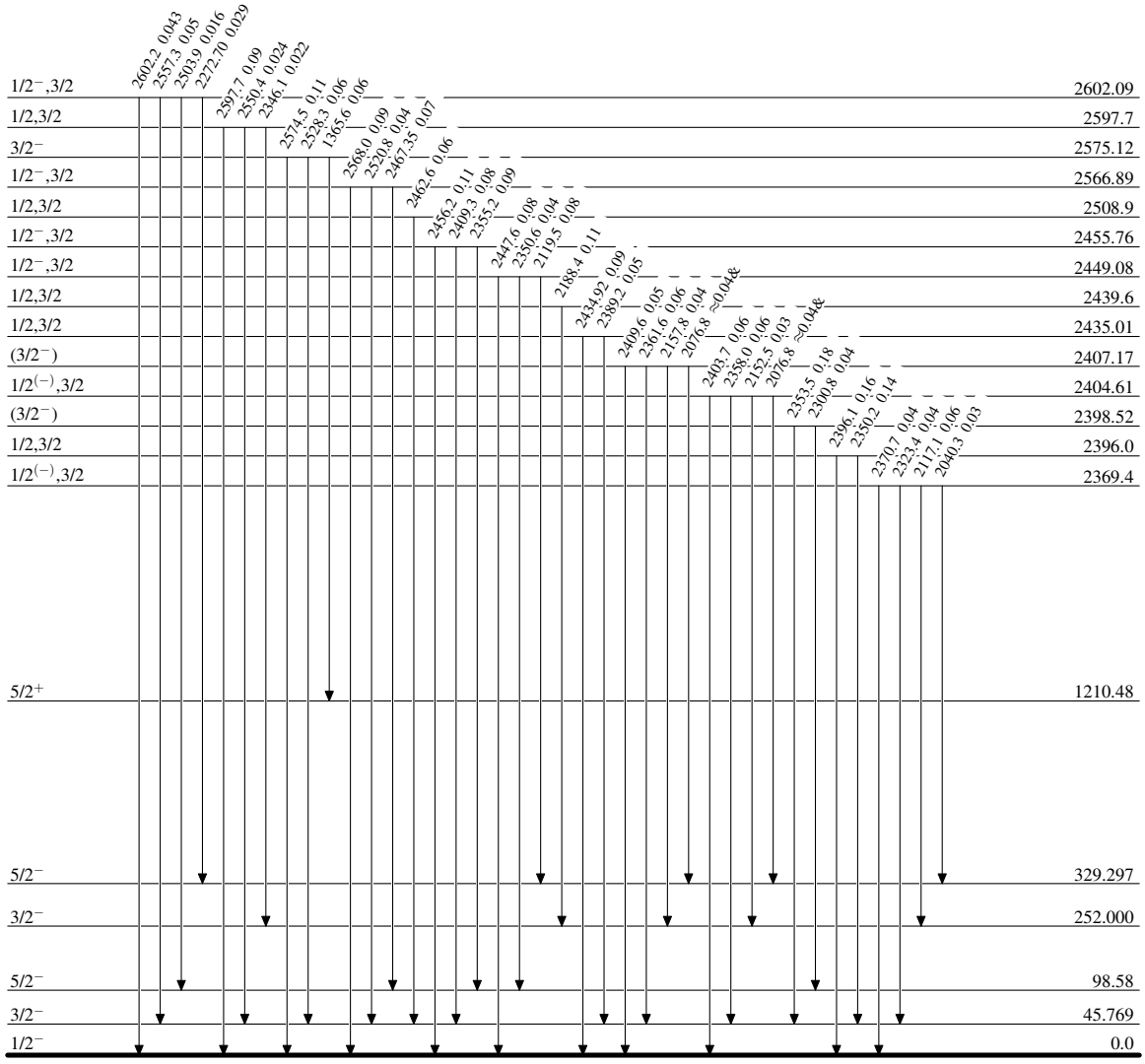
$^{181}_{72}Hf_{109}$

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08

Level Scheme (continued)

Intensities: per 100 neutron captures
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



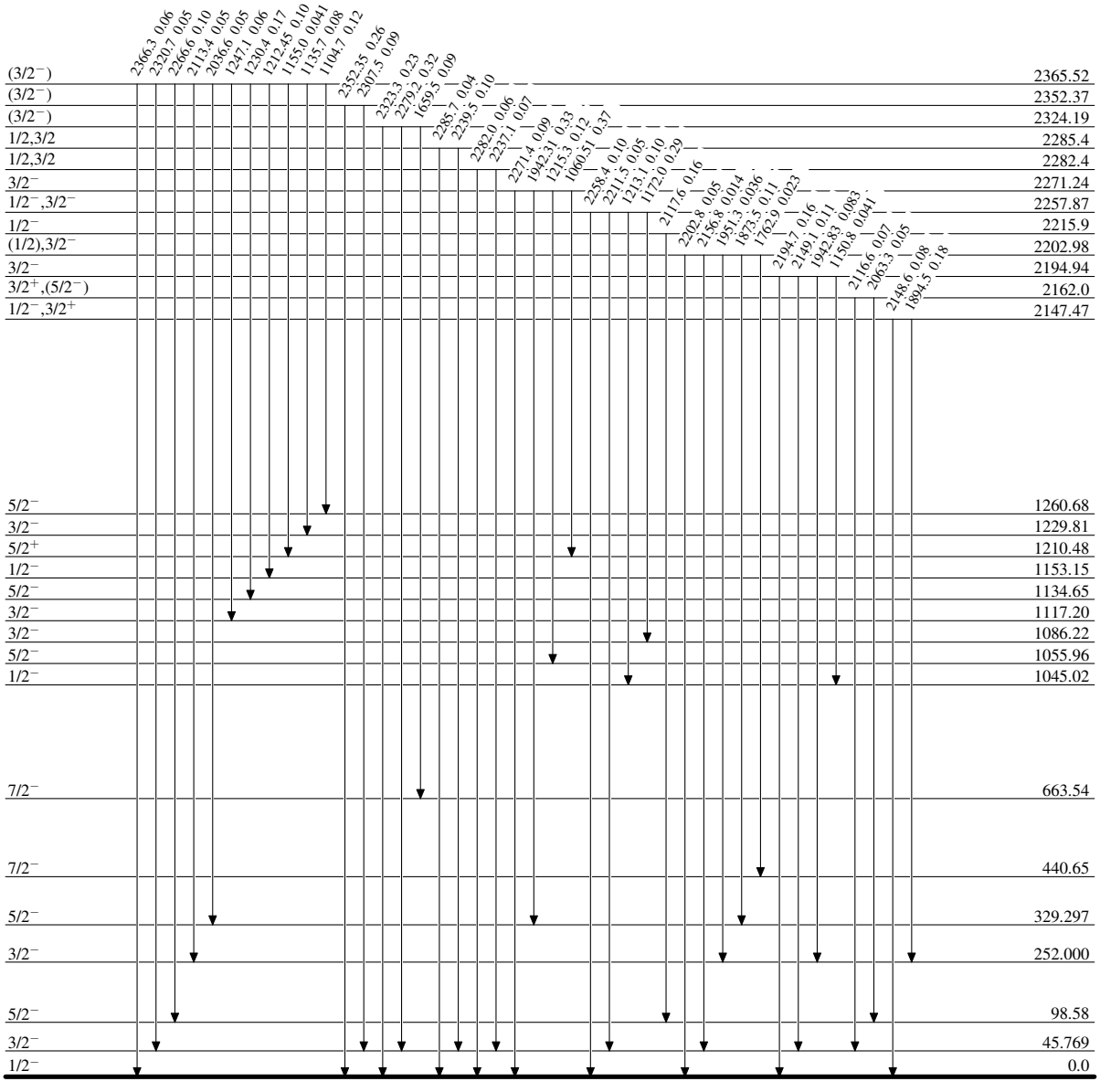
$^{181}_{72}Hf_{109}$

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08

Level Scheme (continued)

Intensities: per 100 neutron captures
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



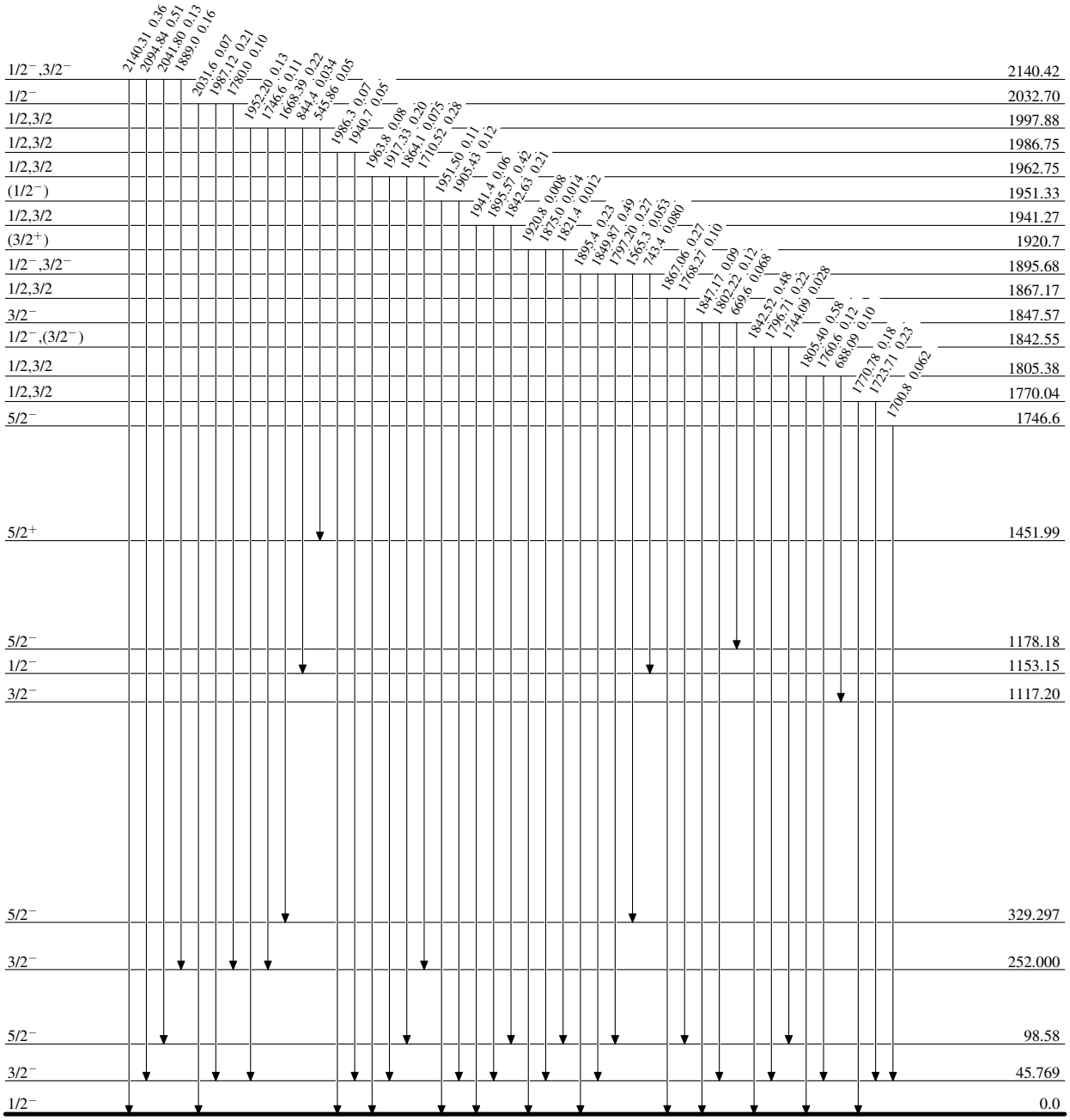
$^{181}_{72}Hf_{109}$

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08

Level Scheme (continued)

Intensities: per 100 neutron captures
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



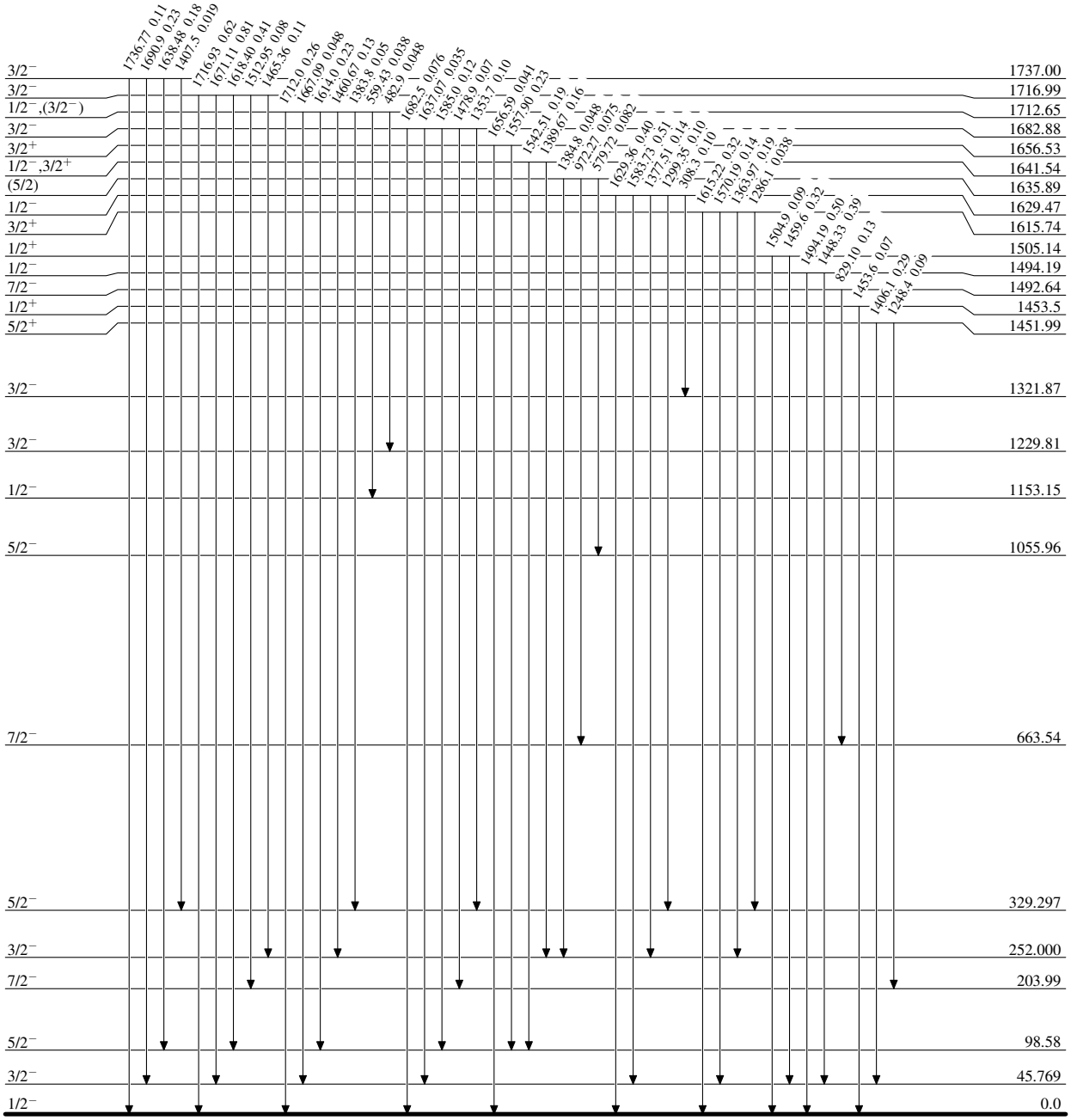
$^{181}_{72}Hf_{109}$

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08

Level Scheme (continued)

Intensities: per 100 neutron captures
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



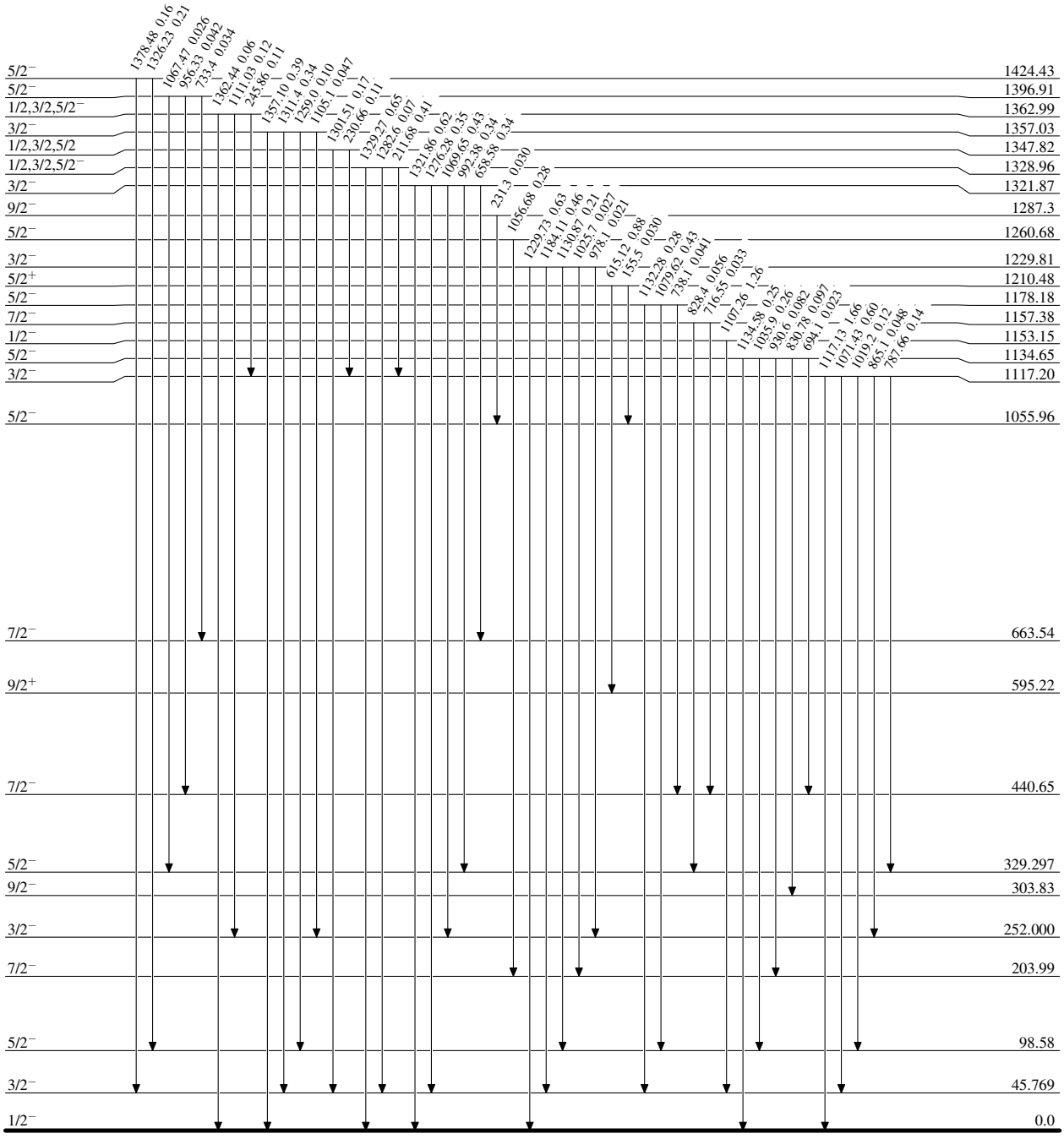
$^{181}_{72}Hf_{109}$

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08

Level Scheme (continued)

Intensities: per 100 neutron captures
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



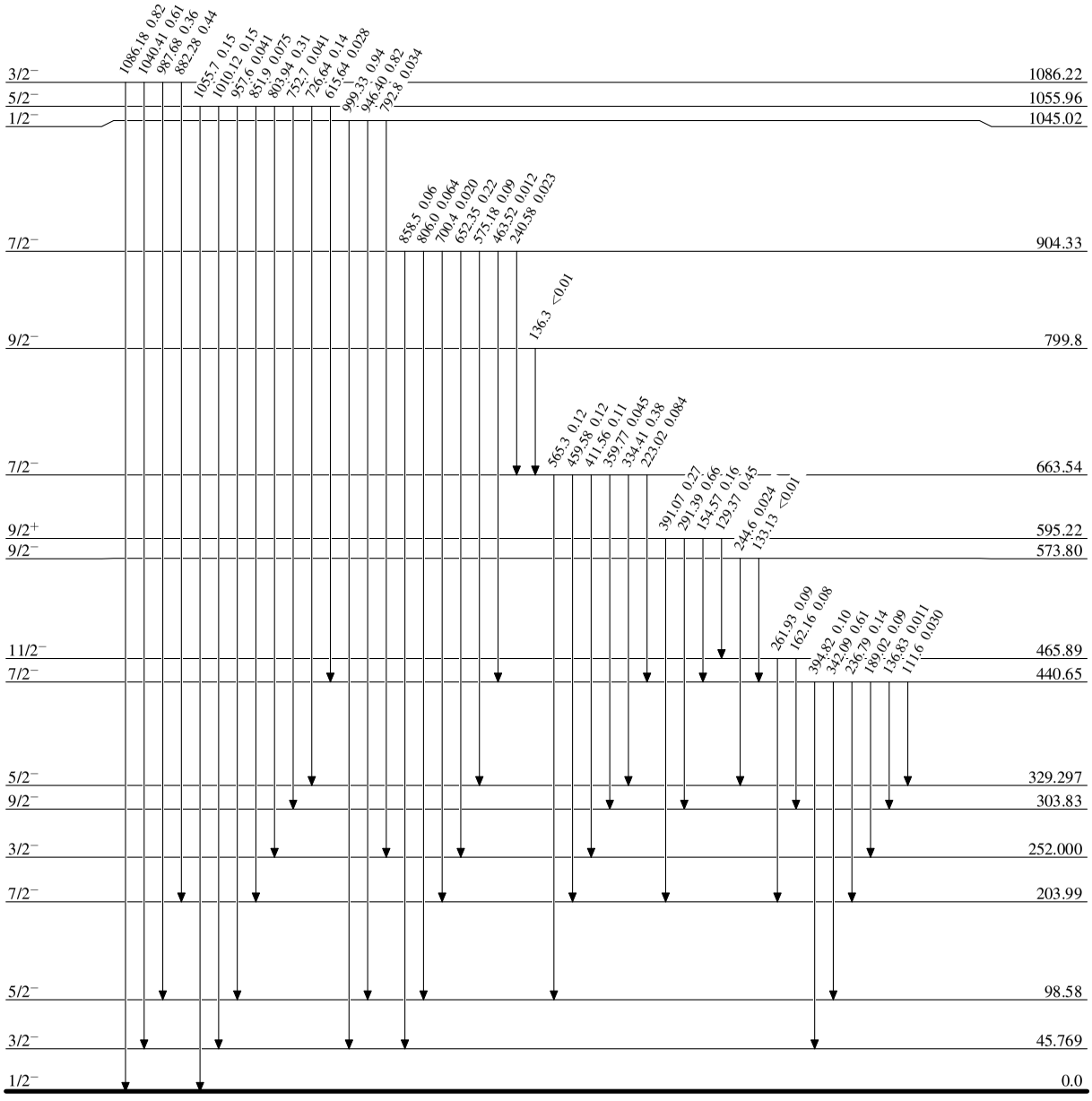
$^{181}_{72}Hf_{109}$

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08

Level Scheme (continued)

Intensities: per 100 neutron captures
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



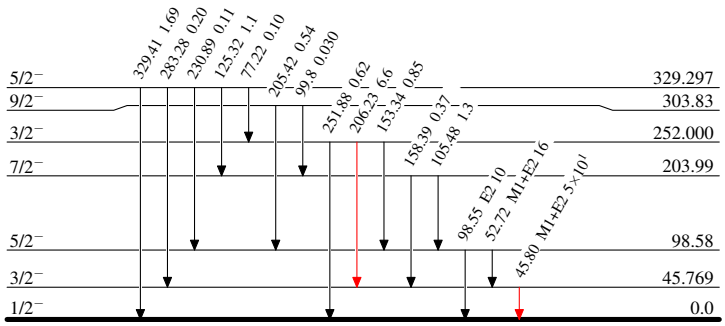
$^{181}_{72}Hf_{109}$

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08

Level Scheme (continued)

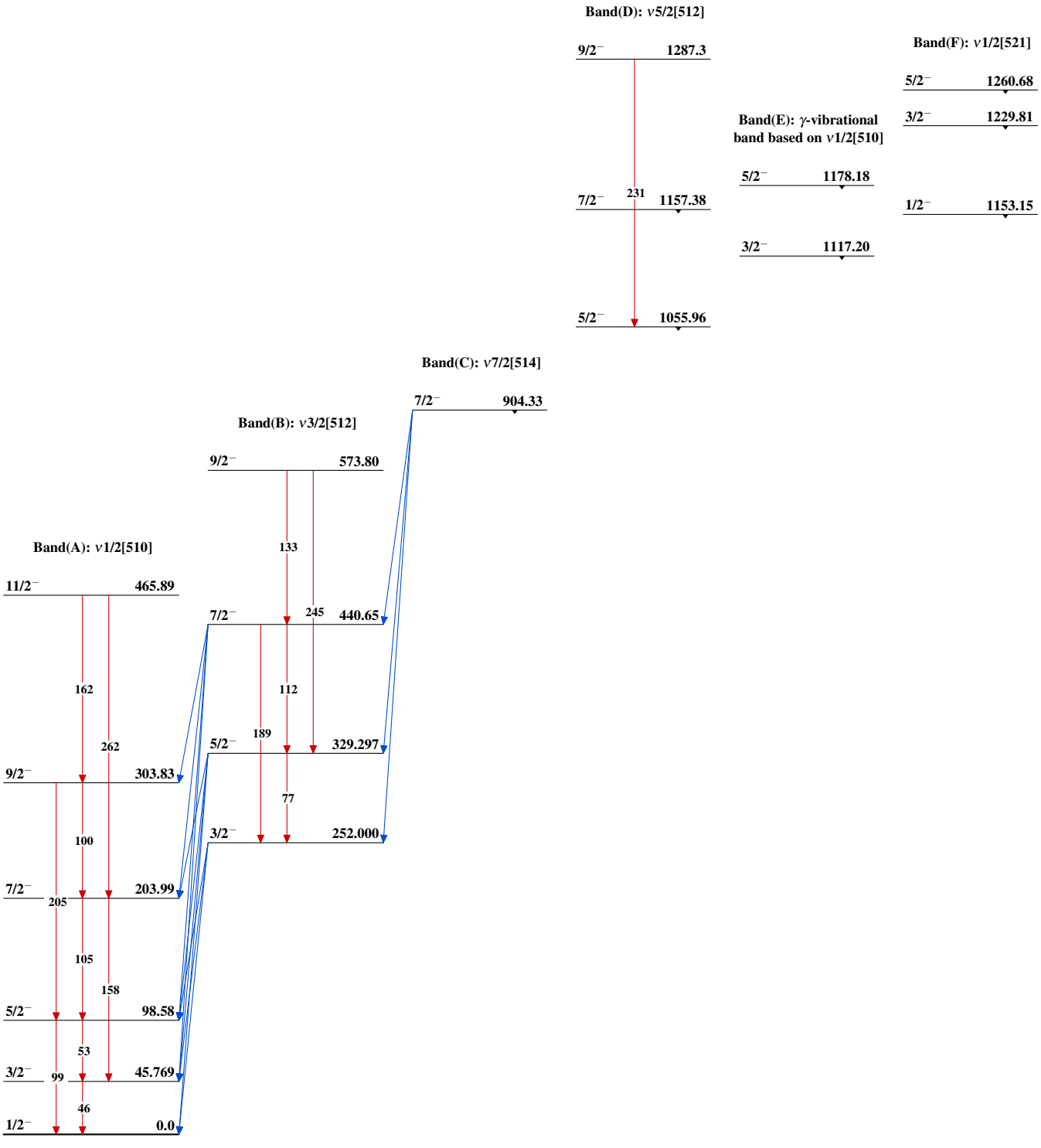
Intensities: per 100 neutron captures
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



$^{181}_{72}Hf_{109}$

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08



$^{181}_{72}Hf_{109}$

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

Band(G): Admixture of the *ν*3/2[501] and (*ν*7/2[503]−2)

7/2⁻ 1492.64

Band(H): *ν*5/2[503]

5/2⁻ 1424.43

5/2⁻ 1396.91

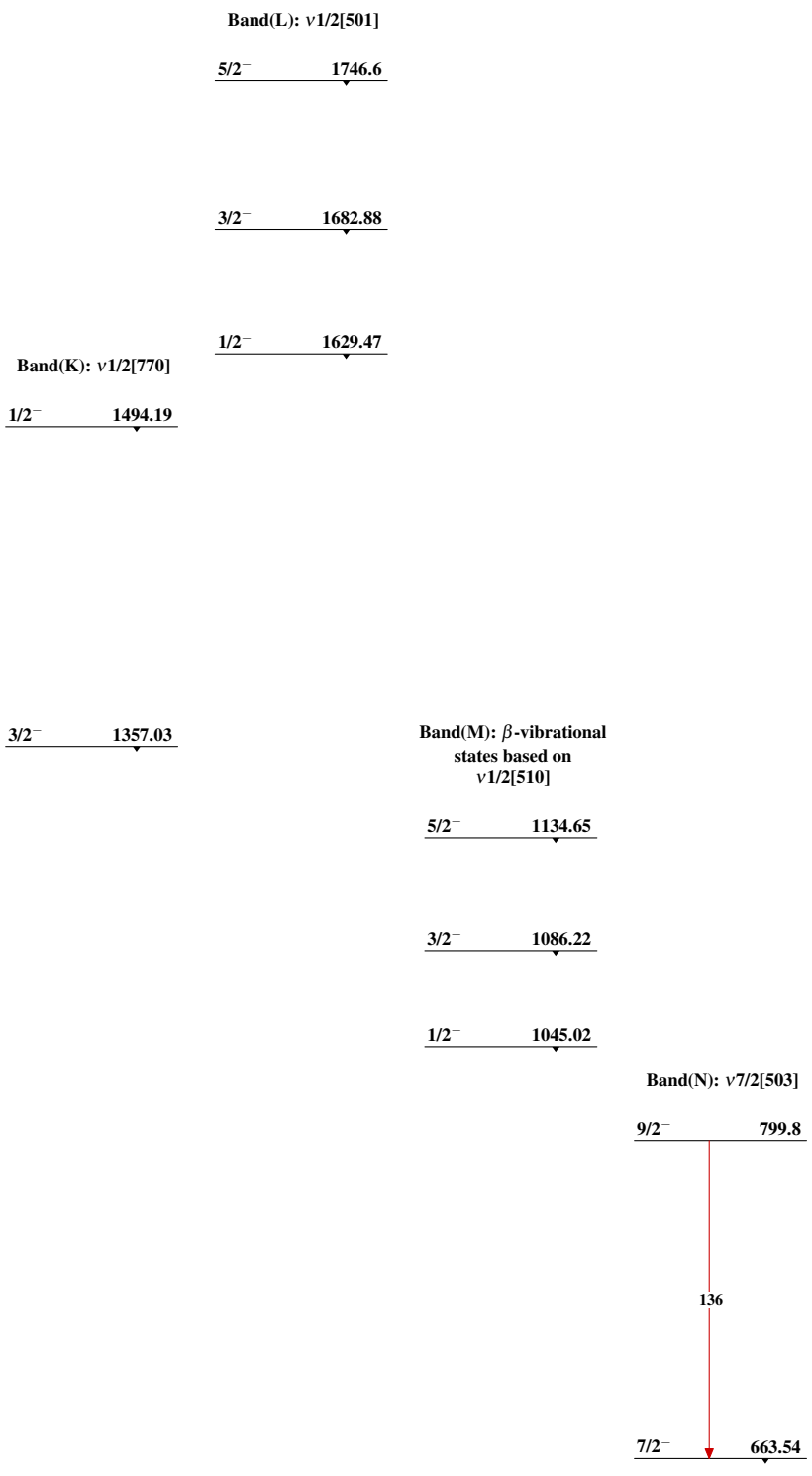
3/2⁻ 1321.87

$^{181}_{72}Hf_{109}$

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)

$^{181}_{72}Hf_{109}$

^{180}Hf(n,γ) E=thermal 2002Bo41,2002Pr08 (continued)



$^{181}_{72}Hf_{109}$