^{179}Hf(n,γ) E=res: av 1974Bu22

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. A. Mccutchan	NDS 126, 151 (2015)	1-Feb-2015

J^π(^{179}Hf)=9/2$^+$.

En=50-10000 eV. Measured Eγ, Iγ using Ge(Li) detector located inside a split-ring NaI detector. Double escape peaks enhanced using triple coincidence between Ge(Li) detector and two opposite quarters of the NaI detector. Deduced multipolarities of primary transitions from relative γ-ray intensities.

Spins of levels populated by primary γ-rays are 1,2,3,4,5,6,7, based on the assumption that primary γ-rays are M1,E1, or E2 and that neutrons are captured in J^π=4$^+$,5$^+$ (s-wave) and J^π=3$^-$,4$^-$,5$^-$,6$^-$ (p-wave) resonance states. Level spins and parities are based on γ-ray multipolarities determined from a comparison of relative γ-ray intensities. Dipole γ-rays to J=4,5 final states are about twice as strong as those to J=3,6 final states because there are twice as many ways to populate a J=4 or 5 state as there are to populate a J=3 or 6 state. Final states with J=2 or 7 may be populated only by quadrupole γ-rays from s-wave resonance states, or by dipole γ-rays from p-wave resonance states, both with much lower intensity for similar reasons as those mentioned above. See 1970Bo29 for a detailed description of this method.

Others: 1972Si20 (En=25 keV), 1988Mu26 (En=2 keV), 2005Me01 (En=0.1-100 eV), 2005TrZY (En=0.005-200 eV), 2006Wi11 (En=3-225 keV).

Additional information 1.

^{180}Hf Levels

E(level)†	J^π‡	E(level)†	J^π‡	E(level)†	J^π‡
0.0	0$^+$	1380.9 *7*	3$^+$,6$^+$	1637.3 *7*	2$^+$,3$^+$,6$^+$,7$^+$
93.1 *5*	2$^+$	1409.4 *6*	4$^+$,5$^+$	1701.0 *6*	4$^+$,5$^+$
308.6 *4*	4$^+$	1430.5 *5*	3$^-$,6$^-$	1709.6 *5*	4$^-$,(5$^-$)
640.9 *5*	3$^+$,6$^+$	1472.5 *5*	2$^+$,3$^+$,6$^+$,7$^+$	1724.8 *11*	2$^+$,3$^+$
1192.4 *6*	3$^+$,6$^+$	1482.6 *5*	3$^-$,6$^-$	1813.7 *8*	3$^-$
1198.9 *6*	2$^+$,7$^+$	1484.9 *9*	4$^+$,5$^+$	1818.3 *6*	3$^-$,6$^-$
1260.5 *9*	2$^+$,7$^+$	1539.7 *5*	3$^-$,6$^-$	1910.6 *18*	4$^+$,5$^+$
1290.9 *6*	4$^+$,5$^+$	1557.6 *5*	4$^+$,5$^+$	2034.9 *14*	4$^+$,5$^+$
1300.6 *8*	2$^+$,7$^+$	1596.1 *9*	2$^+$,3$^+$,6$^+$,7$^+$	2152.0 *9*	3$^-$,(4$^-$)
1369.3 *5*	4$^+$,5$^+$	1608.9 *6*	3$^-$,4$^-$,5$^-$,6$^-$	2314.6 *9*	(4$^-$),5$^-$
1374.1 *5*	3$^-$,6$^-$	1612.3 *6*	3$^-$,4$^-$,5$^-$,6$^-$	7388.15# *40*	

† Level energies as determined by 1974Bu22 using the capture state energy (7388.15 keV) and the primary γ-ray energy (including recoil energy). To incorporate effects due to p-wave capture, the energy difference has been corrected for energy shifts between multipoles by decreasing the capture state energy by 0.79 keV for E1 transitions and increasing it by 0.69 keV for E2(+E1) transitions.

‡ From multipolarity of primary γ-ray transition and comparison of relative γ-ray intensities. See description of method in general comments.

Capture state. Level energy is determined from the energies of the 7079.4γ (including recoil energy) and the 308.58-keV level.

γ(^{180}Hf)

E_γ	I_γ†	E_i(level)	E_f	J^π_f	Mult.‡
5072.8 *8*	113 *11*	7388.15	2314.6	(4$^-$),5$^-$	E1
5235.3 *8*	143 *14*	7388.15	2152.0	3$^-$,(4$^-$)	E1
5353.2 *13*	36 *7*	7388.15	2034.9	4$^+$,5$^+$	M1
5477.5 *17*	34 *7*	7388.15	1910.6	4$^+$,5$^+$	M1
5569.0 *5*	127 *13*	7388.15	1818.3	3$^-$,6$^-$	E1
5573.7 *7*	138 *14*	7388.15	1813.7	3$^-$	E1
5664@ *1*	6.2 *31*	7388.15	1724.8	2$^+$,3$^+$	(E2)

Continued on next page (footnotes at end of table)

^{179}Hf(n,γ) E=res: av 1974Bu22 (continued)

γ(^{180}Hf) (continued)

E_γ	I_γ[†]	E_i(level)	E_f	J^π_f	Mult.[‡]
5677.7 *2*	194 *19*	7388.15	1709.6	4^-,(5^-)	E1
5687.0 *5*	18.6 *56*	7388.15	1701.0	4^+,5^+	M1
5751.4 *6*	10.0 *35*	7388.15	1637.3	2^+,3^+,6^+,7^+	M1,(E2)
5775.0[#] *4*	229[#] *80*	7388.15	1612.3	3^-,4^-,5^-,6^-	E1
5778.4[#] *4*	229[#] *80*	7388.15	1608.9	3^-,4^-,5^-,6^-	E1
5791.9 *8*	12.3 *43*	7388.15	1596.1	2^+,3^+,6^+,7^+	M1
5830.4 *2*	33.9 *51*	7388.15	1557.6	4^+,5^+	M1
5847.5 *2*	135 *7*	7388.15	1539.7	3^-,6^-	E1
5903.1 *8*	31.4 *63*	7388.15	1484.9	4^+,5^+	M1
5904.6 *2*	181 *7*	7388.15	1482.6	3^-,6^-	E1
5916.1 *3*	6.8 *27*	7388.15	1472.5	2^+,3^+,6^+,7^+	E2,(M1)
5956.7 *2*	126 *5*	7388.15	1430.5	3^-,6^-	E1
5978.6 *4*	31.6 *47*	7388.15	1409.4	4^+,5^+	M1
6007.1 *6*	19.7 *39*	7388.15	1380.9	3^+,6^+	M1
6013.1 *2*	190 *6*	7388.15	1374.1	3^-,6^-	E1
6018.9 *3*	36.5 *55*	7388.15	1369.3	4^+,5^+	M1
6088.1 *7*	7.6 *30*	7388.15	1300.6	2^+,7^+	E2
6097.2 *5*	30.2 *45*	7388.15	1290.9	4^+,5^+	M1
6128.2 *8*	7.2 *36*	7388.15	1260.5	2^+,7^+	E2
6189.8 *5*	6.1 *24*	7388.15	1198.9	2^+,7^+	E2
6196.3 *5*	7.7 *31*	7388.15	1192.4	3^+,6^+	E2
6747.1 *3*	41.3 *62*	7388.15	640.9	3^+,6^+	M1
7079.4 *2*	100 *5*	7388.15	308.6	4^+	M1
7295.6 *4*	15.5 *47*	7388.15	93.1	2^+	E2

† Intensities are given relative to 100 for the 7079.4γ.

‡ From a comparison of relative intensities; an E_γ^6 energy dependence is removed from Iγ to approximately equalize all transition intensities of a particular multipolarity.

\# Multiply placed with undivided intensity.

@ Placement of transition in the level scheme is uncertain.

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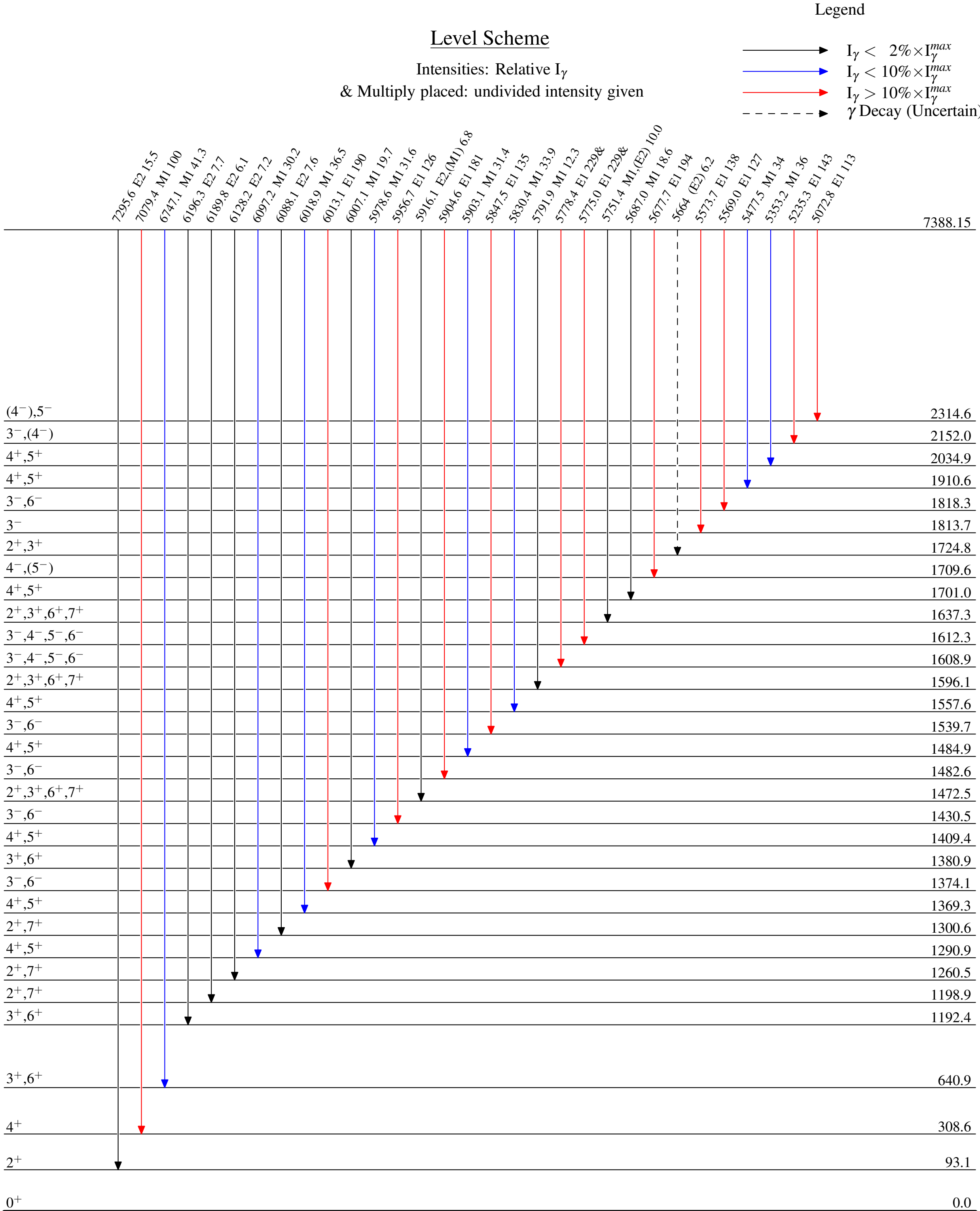
Level Scheme

Intensities: Relative I_γ

& Multiply placed: undivided intensity given



$^{180}_{72}Hf_{108}$