Coulomb excitation **2007Ha05,1961Ha21,1958Ch36**

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

Others: 1955Mc44, 1956Hu49, 1956Go47, 1956He78, 1959De29, 1960Bl10, 1962Ri09.

2007Ha05: ^{136}Xe, E=650 MeV; 89.14% 10 isotopically enriched ^{178}Hf target containing 2.90% 5 ^{179}Hf; GAMMASPHERE detector array (100 Ge detectors with Ta and Cu absorbers to attenuate low-energy photons); CHICO array (20 isobutane-filled parallel plate avalanche counters); measured Eγ, particle-particle-γ coin, $\gamma\gamma\gamma$ coin.

1996Lu07: ^{208}Pb, E=4.77 MeV/nucleon; 8 Ge detectors (θ(lab)=25°, 155°), 5 position-sensitive, parallel-plate avalanche detectors, 4 rectangular particle detectors; observed transitions from J=11/2 through J=21/2 members of g.s. band.

1961Ha21: protons and deuterons, E=4.5 MeV; measured B(E2).

1960Bl10: protons, E=2.5 MeV; measured ce, Ce(t). Detector: magnetic spectrometer.

1958Ch36: protons, E=3.7 MeV; measured Eγ. Detector: cryst.

^{179}Hf Levels

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	Comments
0.0[#]	9/2$^+$		J$^\pi$: from Adopted Levels.
122.66[@] *5*	11/2$^+$	37 ps *3*	E(level): from E(123γ). $T_{1/2}$: from ce delay (1960Bl10). B(E2)=1.76 *10* (1961Ha21). Others: 2.5 *6* (1959De29, if α=2.24); 2.4 (1956He78, if α=2.24); 1962Ri09.
269.4[#] *7*	13/2$^+$	21 ps *3*	E(level): from ^{179}Hf IT decay (25.05 d). B(E2)↑=0.41 *5* (1961Ha21). Others: 0.26 *14* (1959De29) (assuming adopted branching and α); 0.23 (1956He78). $T_{1/2}$: from adopted B(E2), and 268γ α and branching.
439.5[@] *8*	15/2$^+$		
632.5[#] *9*	17/2$^+$		
850.5[@] *10*	19/2$^+$		
1086.5[#] *11*	21/2$^+$		
1352.4[@] *12*	23/2$^+$		
1625.7[#] *13*	25/2$^+$		
1943.0[@] *14*	27/2$^+$		
2243.8?[#] *15*	(29/2$^+$)		
2619.0?[@] *17*	(31/2$^+$)		
3375.0?[@] *20*	(35/2$^+$)		
4206.0?[@] *22*	(39/2$^+$)		

[†] From least-squares fit to Eγ, assigning 1 keV uncertainty to all data for which authors did not state the uncertainty.
[‡] From Adopted Levels.
[#] Band(A): K$^\pi$=9/2$^+$, α=+1/2 g.s. band (2007Ha05).
[@] Band(a): K$^\pi$=9/2$^+$, α=−1/2 g.s. band (2007Ha05).

γ(^{179}Hf)

E_i(level)	J_i^π	Eγ[†]	Iγ[‡]	E_f	J_f^π	Mult.	δ	α[@]	Comments
122.66	11/2$^+$	122.66 *5*	100	0.0	9/2$^+$	M1+E2	−0.27 *3*	2.19 *4*	Eγ: from 1958Ch36. α(K)exp=1.69 *5* (1966As02); K/L=4.5 *6* (1960Bl10). Mult.: from α(K)exp and K/L.

Continued on next page (footnotes at end of table)

Coulomb excitation **2007Ha05,1961Ha21,1958Ch36** **(continued)**

$\gamma(^{179}Hf)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.	δ	α[@]	Comments
									δ: from $\gamma(\theta)$ (1966As02), value adopted by 1976Kr21. Other values: 0.309 *15*, from B(E2)=1.76 *10* (1961Ha21) and $T_{1/2}$=37 ps *3* (1960Bl10); 0.44 *6*, from α(K)exp; 0.44 *9* from K/L=4.5 *6* (1960Bl10 deduce 0.29 *3*).
269.4	13/2$^+$	147[#]	100	122.66	11/2$^+$	M1+E2	−0.41 *5*	1.263 *24*	Mult.: from α(K)exp=1.11 *5* (1966As02). δ: from $\gamma(\theta)$ (1966As02). Others: 0.26 *+12−26* from α(K)exp (1966As02); −0.34 *+32−15* from $\gamma(\theta)$ (1959De29); 1956Go47.
		269[#]	44	0.0	9/2$^+$	(E2)		0.1105	I_γ: other values: 50 *7* (1956Go47), 52 (1959De29). Adopted I(269γ)/I(147γ)=0.394 *16*.
439.5	15/2$^+$	170[#]		269.4	13/2$^+$				
		317[#]		122.66	11/2$^+$				
632.5	17/2$^+$	193[#]		439.5	15/2$^+$				
		363[#]		269.4	13/2$^+$				
850.5	19/2$^+$	218		632.5	17/2$^+$				E_γ: masked by ^{180}Hf γ In 1996Lu07.
		411[#]		439.5	15/2$^+$				
1086.5	21/2$^+$	236[#]		850.5	19/2$^+$				
		454[#]		632.5	17/2$^+$				
1352.4	23/2$^+$	266		1086.5	21/2$^+$				
		502		850.5	19/2$^+$				
1625.7	25/2$^+$	273		1352.4	23/2$^+$				
		539		1086.5	21/2$^+$				
1943.0	27/2$^+$	317[&]		1625.7	25/2$^+$				
		591		1352.4	23/2$^+$				
2243.8?	(29/2$^+$)	301[&]		1943.0	27/2$^+$				
		618[&]		1625.7	25/2$^+$				
2619.0?	(31/2$^+$)	676[&]		1943.0	27/2$^+$				
3375.0?	(35/2$^+$)	756[&]		2619.0?	(31/2$^+$)				
4206.0?	(39/2$^+$)	831[&]		3375.0?	(35/2$^+$)				

[†] From 2007Ha05, except As noted; uncertainty unstated by authors.
[‡] Photon branching ratios from 1956He78.
[#] From 2007Ha05, uncertainty unstated by authors. Transition is evident In fig. 1 of 1996Lu07, but those authors do not report Eγ.
[@] 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.
[&] Placement of transition in the level scheme is uncertain.

Coulomb excitation 2007Ha05,1961Ha21,1958Ch36

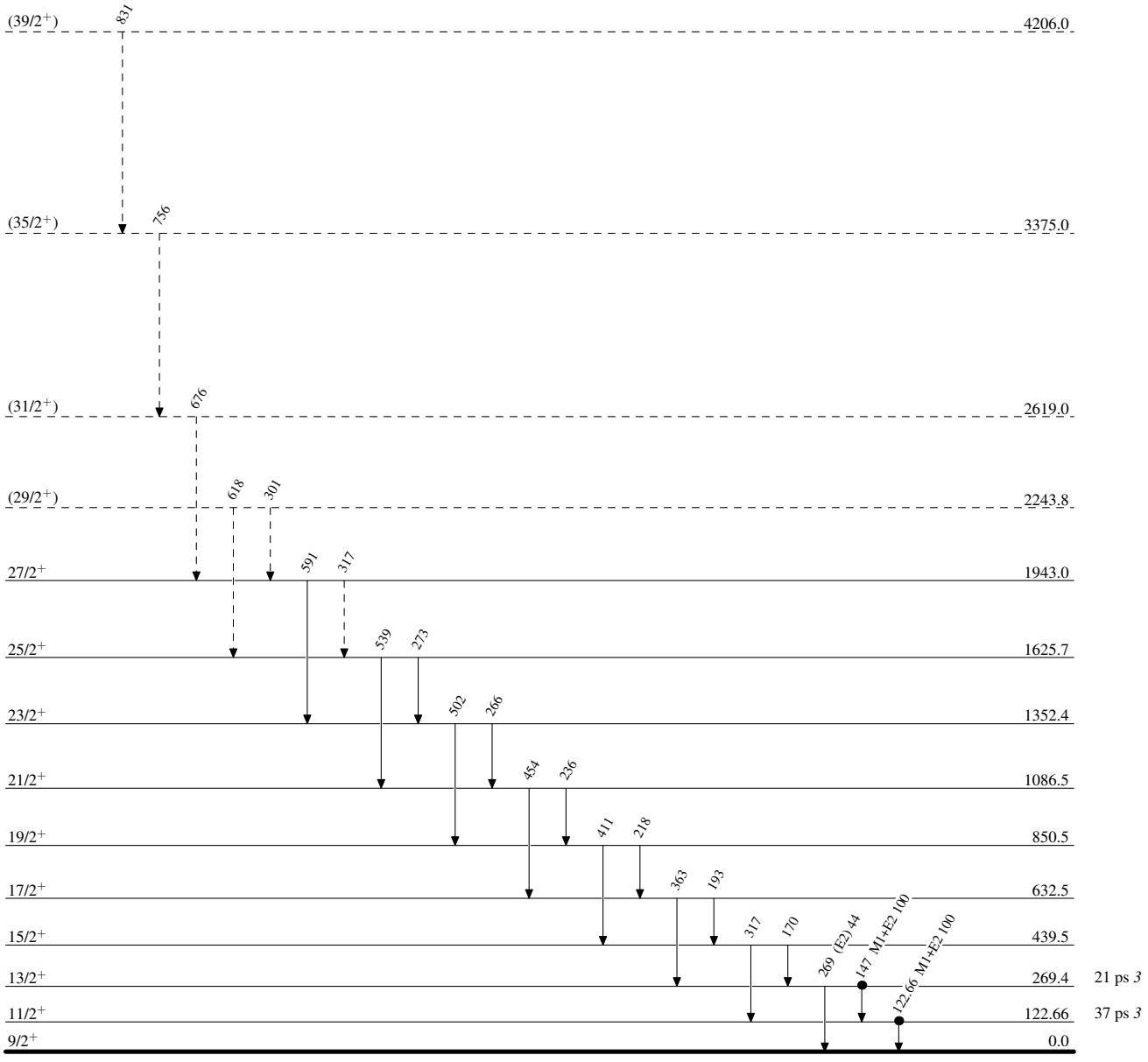
Legend

Level Scheme

Intensities: Relative photon branching from each level

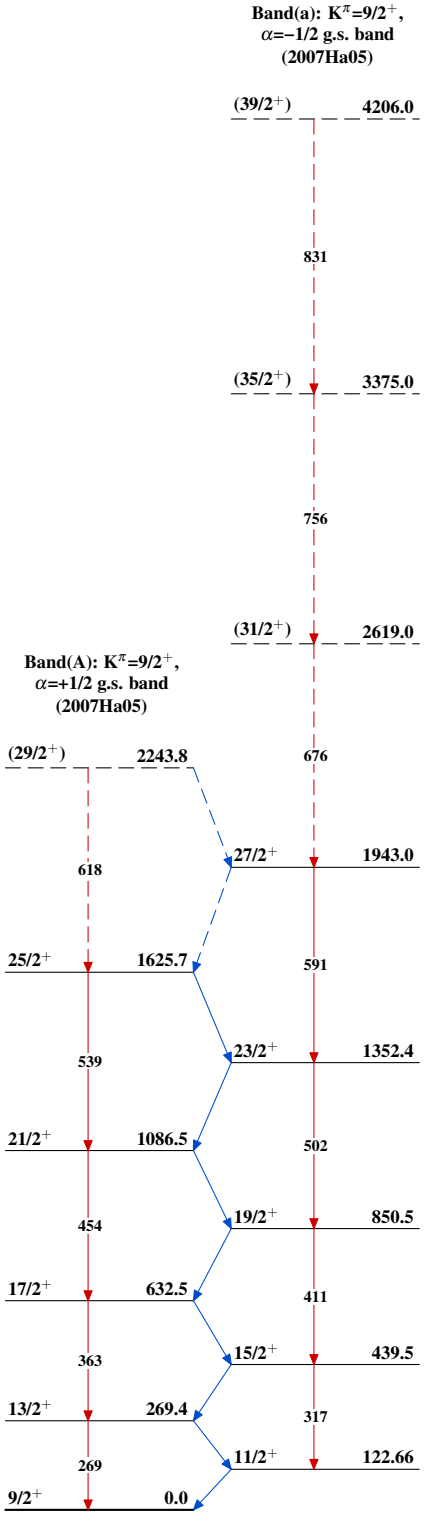
γ Decay (Uncertain)

Coincidence



$^{179}_{72}Hf_{107}$

Coulomb excitation 2007Ha05,1961Ha21,1958Ch36



$^{179}_{72}Hf_{107}$