^{178}Hf IT decay (4.0 s) 1980Va04,1989Ki24

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Achterberg, O. A. Capurro, G. V. Marti	NDS 110, 1473 (2009)	31-May-2008

Parent: ^{178}Hf: E=1147.423 *5*; $J^\pi=8^-$; $T_{1/2}$=4.0 s *2*; %IT decay=100.0

^{178}Hf-E(ex) from 2003Au02.

Most of the decay studies of ^{178}Hf (4.0 s) were done with radioactive sources of ^{178}Lu (23.1 min), ^{178}Hf (31 y), and ^{178}Ta (2.2 h).

Measured Eγ, Iγ, ce, γγ coin. Detectors: hyperpure germanium. Ge(Li) anti-Compton, Si(Li) (1980Va04).

Measured Eγ, Iγ, γγ coin. Detectors: Ge(Li), scin (1968He10).

Measured Eγ, Iγ, Ice. Detectors: hyperpure germanium, magnetic spectrometer (1989Ki24).

^{178}Hf Levels

E(level)†	J^π	$T_{1/2}$	Comments
0.0‡	0^+		
93.185‡ *5*	2^+	1.49 ns *3*	$T_{1/2}$: weighted average of 1.49 ns *5* (1962Bo13), 1.50 ns *3* (1962Ka14), 1.47 ns *6* (1963Fo02), and 1.5 ns *1* (1967Ab06).
306.619‡ *7*	4^+		
632.176‡ *9*	6^+		
1058.537‡ *12*	8^+		
1147.399# *14*	8^-	4.0 s *2*	$T_{1/2}$: weighted average of 4.3 s *1* (1962Al08), and 3.79 s *7* (1965BuZZ).

† From a least-squares fit to γ-ray energies.
‡ $K^\pi=0^+$ g.s. rotational band.
# $K^\pi=8^-$ band.

γ(^{178}Hf)

Iγ normalization: From decay scheme if I(γ+ce)(325.6γ)=100%.

E_γ†	I_γ†#	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	α@	Comments
88.862 *6*	68.4 *11*	1147.399	8^-	1058.537	8^+	E1	0.487	B(E1)(W.u.)=5.1×10^{-14} *3* δ(M2/E1)≤0.036 from α(exp)=0.52 *3* (1980Va04). δ(E3/E1)≤0.007 from ce(L1)/ce(L2) exp=0.32 (1960Ha18,1980Va04). Mult.: from α(exp)=0.52 *3*, α(L12)exp=0.058 *13*, and α(M)exp=0.019 *6* (1980Va04). α(K)exp=0.59 *9*, α(L)exp=0.089 *21*, and α(M)exp=0.030 *7* from 1976De20 indicate a possible M2 admixture of 0.24% *11*. Other values: α(exp)=0.480 *9*, α(K)exp=0.398 *9*, α(L1)exp=0.0378 *19*, α(L2)exp=0.0130 *7*, α(L3)exp=0.0148 *8* (1989Ki24). Values are relative to α(K)(93γ,E2)=1.11 and α(K)(325γ,E2)=0.0444 from theory. I_γ: Iγ(88γ)/Iγ(93γ)=3.864 *24* (1989Ki24).
93.185 *5*	18.3 *3*	93.185	2^+	0.0	0^+	E2	4.66	B(E2)(W.u.)=161 *4* Mult.: from α(K)exp=0.59 *9*, α(L)exp=0.089 *21*, and α(M)exp=0.030 *7* (1976De20).
213.434 *4*	86.5 *12*	306.619	4^+	93.185	2^+	E2	0.232	Mult.: from α(K)exp=0.148 *7*, α(L)exp=0.071 *4*, and α(M)exp=0.020 *1* (1976De20).

Continued on next page (footnotes at end of table)

^{178}Hf IT decay (4.0 s) 1980Va04,1989Ki24 (continued)

$\gamma(^{178}Hf)$ (continued)

E_γ [†]	I_γ [†#]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	α [@]	Comments
325.557 *6*	100.0 *12*	632.176	6^+	306.619	4^+	E2	0.0622	Mult.: from α(K)exp=0.044 *2*, α(L)exp=0.0124 *8*, and α(M)exp=0.0050 *8* (1976De20).
426.360 *8*	103.1 *14*	1058.537	8^+	632.176	6^+	E2	0.0292	Mult.: from α(K)exp=0.022 *1*, α(L)exp=0.0056 *7*, and α(M)exp=0.0015 *4* (1976De20).
(515.2)	<0.016	1147.399	8^-	632.176	6^+			I_γ: not observed. Iγ<0.016% at 90% confidence level. Other values from Ice(K)(515γ)/Ice(K)(426γ)≤0.00073: Iγ(515γ)≤0.046, (if E3), Iγ(515γ)≤0.014 (if M2) (1989Ki24).

† Weighted averages of data from 1989Ki24, 1980Va04, 1976De20, 1975Ka15, 1975Wa24, 1973Or03, and 1968He10.
‡ Consistent with $\gamma\gamma(\theta)$ results assuming a cascade (8^-) (8^+) (6^+) (4^+) (2^+) (0^+) with δ(88.8γ)≈0 (1960De26).
# For absolute intensity per 100 decays, multiply by 0.941 *12*.
@ 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.

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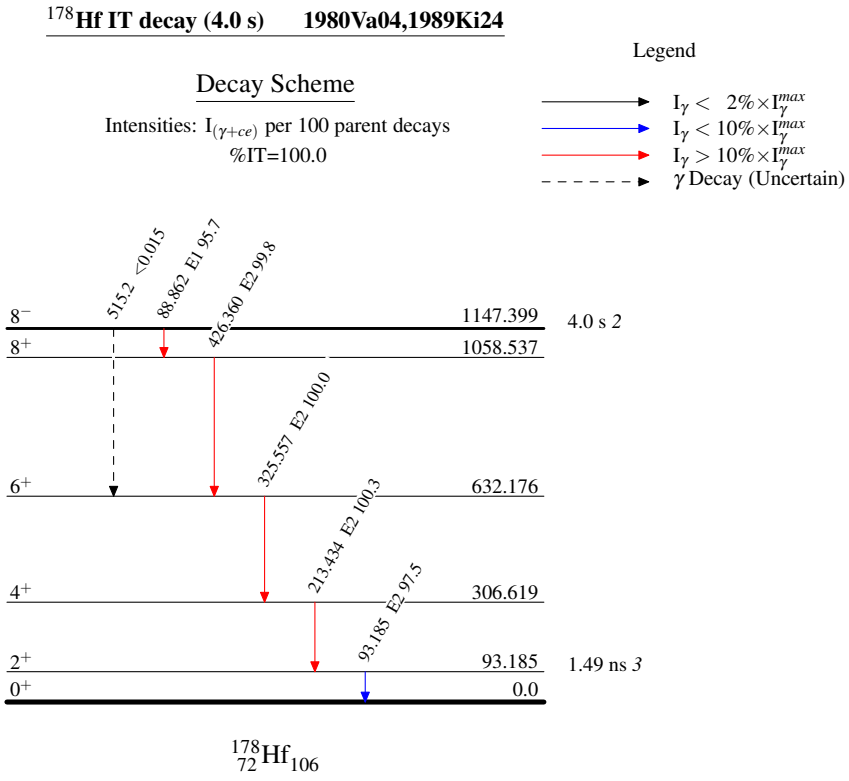
Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
%IT=100.0



$^{178}_{72}Hf_{106}$