^{177}Hf IT decay (51.4 min) 1972Ch48,1971Wa16

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	F. G. Kondev	NDS 159, 1 (2019)	30-Aug-2019

Parent: ^{177}Hf: E=2740.02 *15*; J^π=37/2$^-$; $T_{1/2}$=51.4 min *5*; %IT decay=100.0

1971Wa16, 1972Ch48: Activity produced using the ^{176}Yb(α,3n) reaction at E=46 MeV. Target: ^{176}Yb, enriched up to 96%. Detectors: Ge(Li). Measured: Eγ, Iγ, $\gamma\gamma$ coin, ce.

Others: 1976ReZH, 2002AlZY, 2002AlZX, 2004Al04, 2014Mu03.

^{177}Hf Levels

E(level)†	J^π‡	$T_{1/2}$‡	Comments
0.0#	7/2$^-$	stable	
1315.4502@ *8*	23/2$^+$	1.09 s *5*	Additional information 1. E(level): From Adopted Levels.
1592.76@ *8*	25/2$^+$		
1887.84@ *8*	27/2$^+$		
2199.31@ *10*	29/2$^+$		
2526.02@ *11*	31/2$^+$		
2740.02& *15*	37/2$^-$	51.4 min *5*	$T_{1/2}$: From 1972Ch48. Others: 51.6 min *16* (1971Wa16, superseded by 1972Ch48) and 76 min *+16−9* in 2004Al04. μ: 7.33 *9* from 2014Mu03 using the NMR on oriented nuclei method.

† From a least-squares fit to Eγ.
‡ From Adopted Levels.
# K^π=7/2$^-$, ν7/2[514] band.
@ Band(A): K^π=23/2$^+$, ν(7/2[514])⊗π^2(7/2[404],9/2[514]).
& K^π=37/2$^-$, ν^3(5/2[512],7/2[514],9/2[624])⊗ π^2(7/2[404],9/2[514]).

γ(^{177}Hf)

Iγ normalization: From I(γ+ce)(277.3γ) + I(γ+ce)(572.4γ)=100%.

E$_\gamma$†	I$_\gamma$†#	E$_i$(level)	J^π_i	E$_f$	J^π_f	Mult.†‡	α@	Comments
x120.5	1.3 *3*							%Iγ=0.99 *23* E$_\gamma$: Transition energy close to that of 120.4γ, depopulating the J^π=25/2$^-$ level of the K^π=25/2$^-$ band (1998Mu14). This may imply that additional delayed feeding exists to the K^π=25/2$^-$ band.
214.0 *1*	54.0 *35*	2740.02	37/2$^-$	2526.02	31/2$^+$	E3	1.512	%Iγ=41.1 *27* α(K)=0.425 *6*; α(L)=0.821 *12*; α(M)=0.211 *3* α(N)=0.0492 *7*; α(O)=0.00630 *9*; α(P)=4.04×10^{-5} *6* Mult.: K/L exp=0.526 *17* and ce(L1):ce(L2):ce(L3) exp=0.139 *14*:1.00 *5*:0.520 *26* (1972Ch48).
x254.8	1.8 *2*							%Iγ=1.37 *15* E$_\gamma$: Transition energy overlaps with that of 254.8γ, depopulating the J^π=27/2$^-$ level of the K^π=25/2$^-$ band (1998Mu14). This may imply that additional delayed feeding exists to the K^π=25/2$^-$ band.

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γ(^{177}Hf) (continued)

E_γ [†]	I_γ [†#]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [†‡]	δ [‡]	α [@]	Comments
277.3 *1*	100	1592.76	25/2$^+$	1315.4502	23/2$^+$	M1+E2	+0.302 *4*	0.219	%Iγ=76.1 *4* α(K)=0.182 *3*; α(L)=0.0291 *4*; α(M)=0.00659 *10* α(N)=0.001564 *22*; α(O)=0.000238 *4*; α(P)=1.520×10^{-5} *22* Mult.: From (K/L)exp=6.29 *39* (1972Ch48) and γ(θ) (2014Mu03).
295.1 *1*	91.6 *75*	1887.84	27/2$^+$	1592.76	25/2$^+$	M1+E2		0.194	%Iγ=70 *6* α(K)=0.1622 *23*; α(L)=0.0248 *4*; α(M)=0.00560 *8* α(N)=0.001331 *19*; α(O)=0.000204 *3*; α(P)=1.364×10^{-5} *20* Mult.: From (K/L)exp=6.55 *47* (1972Ch48). δ: 0.28 *2*.
311.5 *1*	77.5 *65*	2199.31	29/2$^+$	1887.84	27/2$^+$	M1+E2	0.285 *5*	0.1606	%Iγ=59 *5* α(K)=0.1334 *19*; α(L)=0.0210 *3*; α(M)=0.00476 *7* α(N)=0.001131 *16*; α(O)=0.0001725 *25*; α(P)=1.117×10^{-5} *16* Mult.: (K/L)exp=6.24 *51* (1972Ch48). δ: From 2014Mu03. Other: 0.27 *2*, by assuming a pure K=23/2.
326.7 *1*	90.6 *78*	2526.02	31/2$^+$	2199.31	29/2$^+$	M1+E2	0.278 *5*	0.1415	%Iγ=69 *6* α(K)=0.1177 *17*; α(L)=0.0185 *3*; α(M)=0.00418 *6* α(N)=0.000992 *14*; α(O)=0.0001515 *22*; α(P)=9.85×10^{-6} *14* Mult.: (K/L)exp=6.26 *60* (1972Ch48). δ: From 2014Mu03. Other: 0.26 *2*, by assuming a pure K=23/2.
572.4 *1*	9.4 *7*	1887.84	27/2$^+$	1315.4502	23/2$^+$	E2		0.01388	%Iγ=7.2 *5* α(K)=0.01097 *16*; α(L)=0.00225 *4*; α(M)=0.000523 *8* α(N)=0.0001232 *18*; α(O)=1.781×10^{-5} *25*; α(P)=8.47×10^{-7} *12* Mult.: From (K/L)exp=4.89 *64* (1972Ch48).
606.5 *1*	15.2 *12*	2199.31	29/2$^+$	1592.76	25/2$^+$	E2		0.01210	%Iγ=11.6 *9* α(K)=0.00963 *14*; α(L)=0.00191 *3*; α(M)=0.000443 *7* α(N)=0.0001045 *15*; α(O)=1.518×10^{-5} *22*; α(P)=7.45×10^{-7} *11* Mult.: (K/L)exp=4.9 *6* (1972Ch48).
638.2 *1*	26.7 *20*	2526.02	31/2$^+$	1887.84	27/2$^+$	E2		0.01075	%Iγ=20.3 *15* α(K)=0.00860 *12*;

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$\gamma(^{177}Hf)$ (continued)

E_γ [†]	E_i(level)	Comments
		α(L)=0.001663 *24*; α(M)=0.000385 *6* α(N)=9.07×10^{-5} *13*; α(O)=1.323×10^{-5} *19*; α(P)=6.67×10^{-7} *10* Mult.: (K/L)exp=4.9 *6* (1972Ch48).

† From 1972Ch48.
‡ From adopted gammas.
# For absolute intensity per 100 decays, multiply by 0.761 *4*.
@ 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.
x γ ray not placed in level scheme.

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Decay Scheme

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

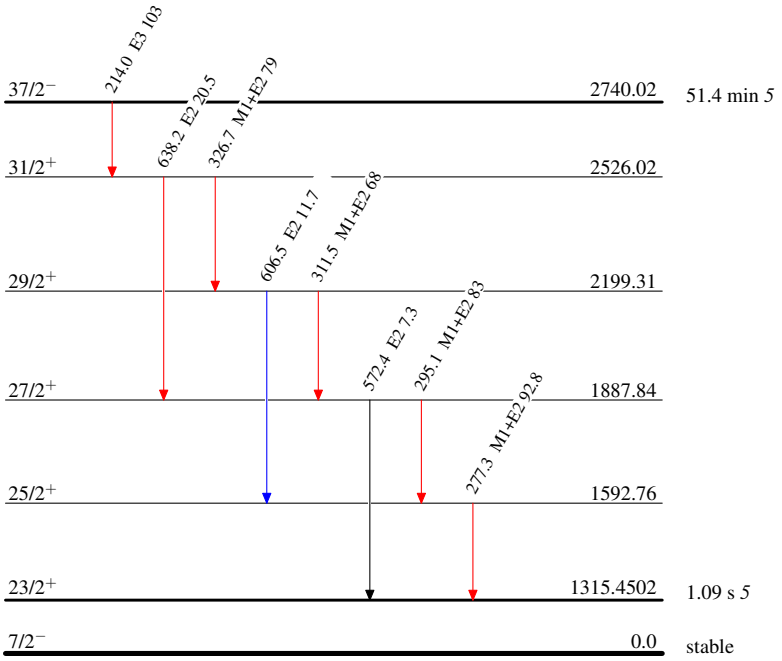
%IT=100.0

Legend

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

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

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



$^{177}_{72}Hf_{105}$

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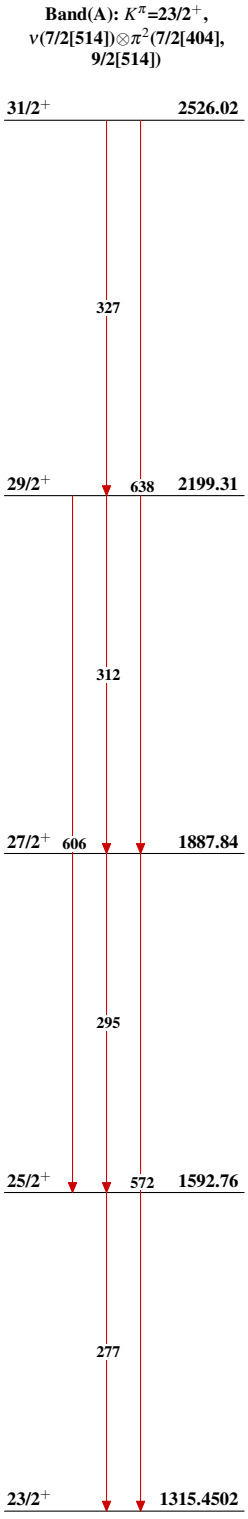

$^{177}_{72}Hf_{105}$