^{167}Hf ε decay (2.05 min)   1973Me09

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 191,1 (2023)	22-Aug-2023

Parent: ^{167}Hf: E=0.0; J$^{\pi}$=(5/2$^-$); T$_{1/2}$=2.05 min 5; Q(ε)=4060 50; %ε+%β^+ decay=100

^{167}Hf-J$^{\pi}$,T$_{1/2}$: From ^{167}Hf Adopted Levels.

^{167}Hf-Q(ε): From 2021Wa16.

1973Me09: ^{167}Hf source from ^{170}Yb(^{3}He,6n) reaction, with the targets enriched to 67% in ^{170}Yb, followed by chemical separation. Measured Eγ, Iγ using Compton-suppression Ge(Li) spectrometer, K x rays using surface-barrier Ge(Li) detector, and conversion electrons using Si(Li) detector.

1989Br19 (also 1987Es08), 1970At01, 1969Ar23: half-life of decay of ^{167}Hf measured from γ-decay curves.

The decay scheme is tentative, and considered incomplete by evaluators, thus no meaningful γ-normalization and ε feedings can be deduced.

^{167}Lu Levels

E(level)	J$^{\pi\dagger}$	T$_{1/2}{}^{\dagger}$	Comments
0.0	7/2$^+$	51.46 min 15	
139.87 15	9/2$^+$		
315.25 10	(7/2)$^-$		J$^{\pi}$: E1 γ to 7/2$^+$; tentative 7/2[523] bandhead assignment from B(E1)(315.2γ)/B(E1)(175.4γ)(exp)=2.9 5, compared to 3.5 from Alaga rule, where B(E1)=Iγ/Eγ^3.

† From the Adopted Levels.

ε,β^+ radiations

E(decay)	E(level)	Comments
(3.75×10^{3†} 5)	315.25	1973Me09 estimated >65% ε+β^+ branching to 315.2 level from Iγ(K x ray)=58 29 and I($\gamma^{\pm}$)=60 30, relative to Iγ=100 for 315.2γ.
(3.92×10^{3†} 5)	139.87	Intensity imbalance at 139.9 level indicates at the most 1.4% 17 ε+β^+ feeding to 139.9 level.
(4.06×10^{3†} 5)	0.0	1973Me09 listed <35% ε+β^+ branching to the g.s., based on estimated >65% ε+β^+ feeding to the 315 level.

† Existence of this branch is questionable.

γ(^{167}Lu)

I(K x ray)=58 29, I($\gamma^{\pm}$)=60 30, relative to Iγ=100 for 315.2γ.

E$_\gamma$	I$_\gamma$	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.	$\alpha^{\dagger}$	Comments
139.9 2	3.8 8	139.87	9/2$^+$	0.0	7/2$^+$	[M1,E2]	1.19 23	α(K)=0.8 4; α(L)=0.29 11; α(M)=0.07 3; α(N)=0.016 7 α(O)=0.0021 7; α(P)=6.E−5 4
175.4 2	6 1	315.25	(7/2)$^-$	139.87	9/2$^+$	[E1]	0.0803 12	α(K)=0.0669 10; α(L)=0.01041 15; α(M)=0.00233 4; α(N)=0.000544 8 α(O)=7.66×10^{-5} 11; α(P)=3.90×10^{-6} 6
315.24 10	100	315.25	(7/2)$^-$	0.0	7/2$^+$	E1	0.0183 3	α(K)=0.01537 22; α(L)=0.00228 4; α(M)=0.000510 8; α(N)=0.0001194 17 α(O)=1.720×10^{-5} 25; α(P)=9.55×10^{-7} 14 Mult.: from α(K)exp=0.014 3, as deduced

Continued on next page (footnotes at end of table)

^{167}**Hf ε decay (2.05 min)**   **1973Me09 (continued)**

$\gamma(^{167}$Lu$)$ (continued)

E$_\gamma$	E$_i$(level)	Comments
		from a simultaneous measurement of Ice(315.2γ) and Iγ(315.2γ), using α(L)=0.0823 (E2 theory) for 198.8γ in ^{168}Yb for calibration of detector.

† 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: Relative I$_\gamma$

Legend

$\longrightarrow$ I$_\gamma$ <   2%×I$_\gamma^{max}$
$\longrightarrow$ I$_\gamma$ < 10%×I$_\gamma^{max}$
$\longrightarrow$ I$_\gamma$ > 10%×I$_\gamma^{max}$

(5/2$^-$)   0.0   2.05 min 5

%ε + %β^+=100   Q$_\varepsilon$=4060 50

$^{167}_{72}$Hf$_{95}$

315,24 E1 100
175,4 [E1] 6

(7/2)$^-$ 315.25

139,9 [M1,E2] 3,8

9/2$^+$ 139.87

7/2$^+$ 0.0   51.46 min 15

$^{167}_{71}$Lu$_{96}$