^{216}Th IT decay (135 μs) 2001Ha46,2005Ku31

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. Morse	NDS 209,409 (2026)	5-Aug-2025

Parent: ^{216}Th: E=2039 *7*; $J^{\pi}=(8^+)$; $T_{1/2}$=135 μs *4*; %IT decay=97.2 *9*

^{216}Th-%IT decay: From b_{α}=0.028 *9* (2005Ku31).

2001Ha46: ^{216}Th produced in two experiments at the Accelerator Laboratory of the University of Jyväskylä. The reactions used were ^{180}Hf(^{40}Ar,4n) at 185 MeV beam energy and ^{172}Yb(^{48}Ca,4n) at 217 MeV. Fusion-evaporation residues were identified at the focal plane of RITU by the recoil-decay technique according to their characteristic α decays. Measured prompt γ rays at the target position using JURO-SPHERE II and delayed γ rays using five Compton-suppressed Ge detectors at the focal plane of RITU.

2005Ku31: ^{216}Th produced via the ^{170}Er(^{50}Ti,4n) reaction at GSI. Evaporation residues were separated by SHIP and implanted into a position-sensitive PIPS detector. Evaporation residues were identified using the recoil-decay technique and delayed γ rays measured with a HPGe clover detector placed behind the silicon detector.

^{216}Th Levels

E(level)†	J^{π}‡	$T_{1/2}$	Comments
0	0^+	26.3 ms *2*	$T_{1/2}$: From Adopted Levels.
1478.21 *10*	(2^+)		
1687.71 *15*	(3^-)		
1813.81 *18*	(4^+)		
2013.71 *20*	(6^+)		
2039 *7*	(8^+)	135 μs *4*	%α=2.8 *9* (2005Ku31); %IT=97.2 *9* (2005Ku31) E(level),$T_{1/2}$: From Adopted Levels.

† From a least-squares fit to E_{γ}, unless noted otherwise.

‡ From Adopted Levels.

γ(^{216}Th)

Additional information 1.

E_{γ}†	I_{γ}#	E_i(level)	J_i^{π}	E_f	J_f^{π}	Mult.@	α&	Comments
(26)		2039	(8^+)	2013.71	(6^+)			E_{γ}: Not observed, energy from level-energy difference.
126.1 *1*	100 *12*	1813.81	(4^+)	1687.71	(3^-)	E1	0.283 *4*	α(K)=0.2190 *31*; α(L)=0.0484 *7*; α(M)=0.01171 *17*; α(N)=0.00308 *4*; α(O)=0.000705 *10* α(P)=0.0001262 *18*; α(Q)=7.82×10^{-6} *11*
199.9 *1*	70 *7*	2013.71	(6^+)	1813.81	(4^+)	E2	0.660 *9*	α(K)=0.1585 *22*; α(L)=0.367 *5*; α(M)=0.1002 *14*; α(N)=0.0268 *4*; α(O)=0.00602 *9* α(P)=0.001017 *14*; α(Q)=1.226×10^{-5} *17*
209.5 *1*	100 *16*	1687.71	(3^-)	1478.21	(2^+)	E1	0.0846 *12*	α(K)=0.0671 *9*; α(L)=0.01329 *19*; α(M)=0.00320 *4*; α(N)=0.000845 *12*; α(O)=0.0001953 *27* α(P)=3.59×10^{-5} *5*; α(Q)=2.55×10^{-6} *4*
335.8[a] *3*	4.7 *14*	1813.81	(4^+)	1478.21	(2^+)	(E2)	0.1207 *17*	α(K)=0.0583 *8*; α(L)=0.0460 *7*; α(M)=0.01227 *18*; α(N)=0.00328 *5*; α(O)=0.000744 *11* α(P)=0.0001290 *19*; α(Q)=3.52×10^{-6} *5* This transition is placed here in 2001Ha46, but only weakly observed. 2005Ku31 also observe it, but with intensity consistent with

Continued on next page (footnotes at end of table)

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γ(^{216}Th) (continued)

E_γ[†]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	α[&]	Comments
								γ-ray summing, possibly suggesting this is not a real transition. I_γ: Deduced during evaluation based on statement in 2005Ha46 that this γ ray has an intensity of 6.2% *15* relative to the 1478-keV γ ray.
[x]466[‡]								
[x]517[‡]								
1478.2 *1*	74 *14*	1478.21	(2$^+$)	0	0$^+$	(E2)	0.00487 *7*	α(K)=0.00382 *5*; α(L)=0.000751 *11*; α(M)=0.0001814 *25*; α(N)=4.83×10^{-5} *7* α(O)=1.135×10^{-5} *16*; α(P)=2.167×10^{-6} *30*; α(Q)=1.848×10^{-7} *26*

† From 2005Ku31, unless noted otherwise.
‡ Reported in 2001Ha46; not observed in 2005Ku31. An additional 665-keV γ ray is seen in prompt spectroscopy.
# From 2001Ha46.
@ From Adopted Gammas.
& Additional information 2.
a Placement of transition in the level scheme is uncertain.
x γ ray not placed in level scheme.

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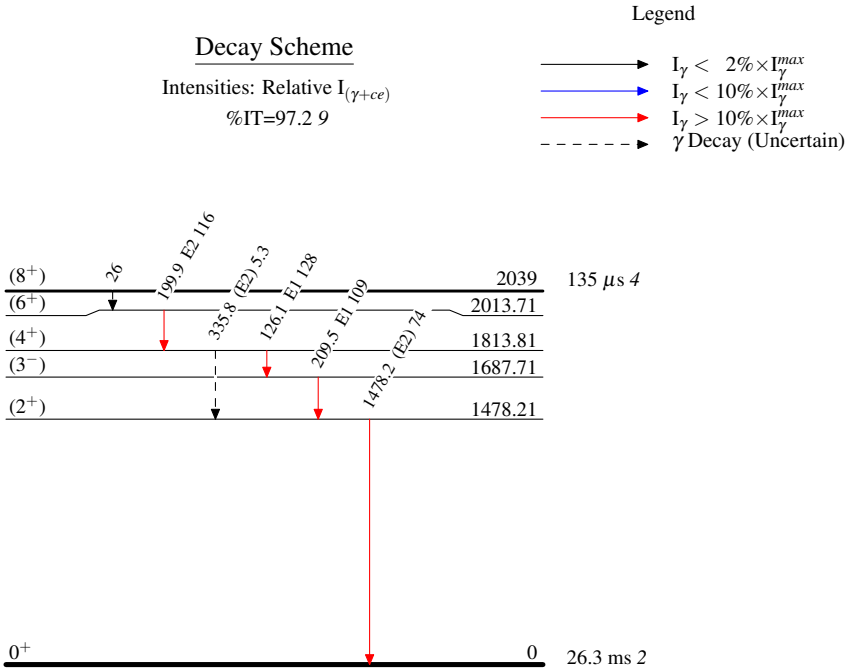
Decay Scheme

Intensities: Relative $I_{(\gamma+ce)}$

%IT=97.2 *9*



$^{216}_{90}Th_{126}$