(HI,xnγ) 2005Ku31,2001Ha46

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	S. -c. Wu	NDS 108, 1057 (2007)	1-Mar-2007

2005Ku31: ^{170}Er(^{50}Ti,4nγ): E=4.35 MeV/nucleon. ^{216}Th recoils were separated from the beam using a velocity filter SHIP at GSI facility and implanted into a position-sensitive 16-strip PIPS semiconductor detector. Measured Eγ, Iγ, (recoil)-γ-α-γ correlations and coincidences. 'Clover' Ge detector for γ rays.

2001Ha46: ^{180}Hf(^{40}Ar,4nγ), E=185 MeV; ^{172}Yb(^{48}Ca,4nγ), E=217 MeV. Measured Eγ, Iγ, γγ and lifetimes using JUROSPHERE detector array comprised of 26 Compton-suppressed Ge detectors. Recoiling residues were separated by gas-filled recoil-separator RITU.

^{216}Th Levels

E(level)[†]	J^π	$T_{1/2}$	Comments
0.0	0^+	26.0[‡] ms *2*	
1478.2 *1*	(2^+)		
1687.7 *2*	(3^-)		
1813.8 *2*	(4^+)		
2013.7 *2*	(6^+)		
2040 *9*	(8^+)	134[‡] μs *4*	%α=2.8 *9* %α from 2005Ku31. Other: 5 *+5−3* from 2001Ha46. E(level): from Adopted Levels. Configuration=$h_{9/2}f_{7/2}$.
2130.5 *2*	(8^+)		Configuration=$h^2_{9/2}$.
2646.8 *1*	(11^-)	0.58 μs *3*	$T_{1/2}$: weighted averages of 0.57 μs *3* from 2005Ku31 and 0.62 μs *6* from 2001Ha46. Configuration=$h_{9/2}i_{11/2}$.
3530.2 *4*	(12^+)		
3681.4 *7*	(14^+)	0.74 μs *7*	$T_{1/2}$: from 2005Ku31; Other: ≥0.13 μs from 2001Ha46.

[†] From least-squares fit to Eγ's, except as noted. For levels above the isomeric state at Ex=2040, uncertainties refer to the precision of the γ-measurements in 2005Ku31.

[‡] From Adopted Levels.

γ(^{216}Th)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	α[c]	Comments
(90.5 *3*)		2130.5	(8^+)	2040	(8^+)			
126.1[a] *1*	100 *12*	1813.8	(4^+)	1687.7	(3^-)	E1	0.283	α(K)=0.219 *3*; α(L)=0.0484 *7*; α(M)=0.01171 *17*; α(N+..)=0.00392 *6* α(N)=0.00308 *5*; α(O)=0.000705 *10*; α(P)=0.0001262 *18*; α(Q)=7.82×10^{-6} *11* E_γ: could be a doublet, including the transition from Ex=2136, $J^\pi=8^+$ to Ex=2013.7, $J^\pi=6^+$.
151.2 *6*		3681.4	(14^+)	3530.2	(12^+)	E2	1.94 *5*	α(K)=0.240 *4*; α(L)=1.24 *3*; α(M)=0.341 *8*; α(N+..)=0.115 *3* α(N)=0.0914 *21*; α(O)=0.0204 *5*; α(P)=0.00342 *8*; α(Q)=2.63×10^{-5} *5*
199.9[a] *1*	70 *7*	2013.7	(6^+)	1813.8	(4^+)	E2	0.660	α(K)=0.1585 *23*; α(L)=0.367 *6*; α(M)=0.1002 *15*; α(N+..)=0.0339 *5* α(N)=0.0268 *4*; α(O)=0.00602 *9*; α(P)=0.001017 *15*; α(Q)=1.227×10^{-5} *18*
209.5[a] *1*	100 *16*	1687.7	(3^-)	1478.2	(2^+)	E1	0.0846	α(K)=0.0670 *10*; α(L)=0.01329 *19*; α(M)=0.00320 *5*; α(N+..)=0.001079 *16* α(N)=0.000845 *12*; α(O)=0.000195 *3*; α(P)=3.59×10^{-5} *5*; α(Q)=2.55×10^{-6} *4*

Continued on next page (footnotes at end of table)

(HI,xnγ) 2005Ku31,2001Ha46 (continued)

γ(^{216}Th) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[c]	Comments
[x]325.8[@] *3*	4.9 *10*							
335[&]		1813.8	(4$^+$)	1478.2	(2$^+$)	E2	0.1216	α(K)=0.0586 *9*; α(L)=0.0464 *7*; α(M)=0.01238 *18*; α(N+..)=0.00420 *6* α(N)=0.00331 *5*; α(O)=0.000750 *11*; α(P)=0.0001302 *19*; α(Q)=3.53×10^{-6} *5*
[x]335.8[@] *3*	6.2 *15*							
[x]409.0[@] *4*	4.8 *11*							
[x]466[&]								
516.3 *2*	*b*	2646.8	(11$^-$)	2130.5	(8$^+$)			
[x]517[&]								
606.8 *1*	*b*	2646.8	(11$^-$)	2040	(8$^+$)	E3	0.0876	α(K)=0.0454 *7*; α(L)=0.0310 *5*; α(M)=0.00831 *12*; α(N+..)=0.00284 *4* α(N)=0.00224 *4*; α(O)=0.000511 *8*; α(P)=9.08×10^{-5} *13*; α(Q)=3.51×10^{-6} *5*
[x]665[&]								
883.4 *3*	*b*	3530.2	(12$^+$)	2646.8	(11$^-$)			
1478.2 *1*	74 *14*	1478.2	(2$^+$)	0.0	0$^+$	E2	0.00487	α(K)=0.00382 *6*; α(L)=0.000750 *11*; α(M)=0.000181 *3*; α(N+..)=0.0001142 *16* α(N)=4.83×10^{-5} *7*; α(O)=1.135×10^{-5} *16*; α(P)=2.17×10^{-6} *3*; α(Q)=1.85×10^{-7} *3*; α(IPF)=5.22×10^{-5} *8*

[†] From 2005Ku31, except as noted.
[‡] From 2001Ha46, except as noted.
[#] From intensity balance (2001Ha46), assignment from 2005Ku31 agree with those from 2001Ha46.
[@] From 2005Ku31, not observed in 2001Ha46. Iγ(325.8:335.8:409.0:1478.2)=4.9 *10*:6.2 *15*:4.8 *11*:100 Due to the possibility of summing peaks, these γ-ray lines are not assigned.
[&] From 2001Ha46, not observed in 2005Ku31.
[a] Strong γ ray seen in (recoil)(γ)(α) coin within 200 ms interval. Additional weak γ rays at 325.8 *3*, 335.8 and 409.0 were assigned as sum peaks. (2005Ku31).
[b] Iγ(516.3:606.8:883.4)=8 *2*:100 *4*:5 *1* from 2005Ku31.
[c] 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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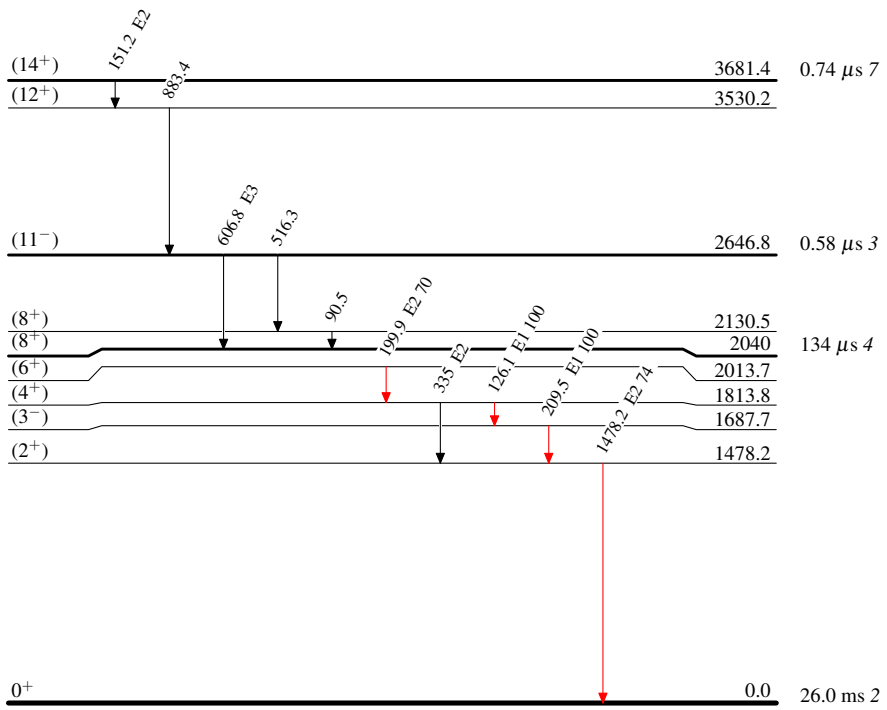
Level Scheme

Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)



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