

¹⁴⁶Ho ε decay (3.32 s) 1982Gu07

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Yu. Khazov, A. Rodionov and G. Shulyak		NDS 136, 163 (2016)	14-Jul-2016

Parent: ¹⁴⁶Ho: E=0.0+x; J^π=(6⁻); T_{1/2}=3.32 s 22; Q(ε)=11317 9; %ε+%β⁺ decay=100.0

¹⁴⁶Ho-J^π and %ε+%β from 2010Ma37, for details see comment for 2934.5 10⁺ isomer state and ¹⁴⁶Ho 'Adopted Levels' dataset, Qβ from 2012Wa38, T_{1/2} from ¹⁴⁶Ho 'Adopted Levels'.

1981NoZY,1982Gu07: ¹⁴⁶Ho(ε) [from ⁹⁰Zr(⁵⁸Ni,np), E=233, 250 MeV]; measured E_γ, I_γ, γγ, Xγ, (ce)γ coin, γ(t), T_{1/2}.

¹⁴⁶Dy; deduced levels, J^π, α(exp). Ge(Li), Si(Li) detectors, solenoid β spectrometer, pulsed beam.

Level scheme is as proposed by 1982Gu07. In ⁹⁰Zr(⁵⁸Ni,2p) reaction (1992De23), the levels at 2635.2, 2987.2, and 3161.4 keV were not fed by prompt transitions and were considered as populated in ε decay of ¹⁴⁶Ho. However, these levels are excited in ⁹²Mo(⁵⁸Ni,4p) reaction (2001Ro15) also; see (HI,xny) dataset.

If ε feeding is calculated assuming no ε decay to g.s. 0⁺ and excluding the 2635.2, 2987.2, and 3161.4 keV levels, ΣI_γ(g.s.)=100 gives ε branches as 36% 16 to 2936, 10⁺ and 18% 16 to 2809, 7⁻ levels. There is large uncertainty in other I_γ values which lead to net feedings with large uncertainties that overlap zero. No normalization has therefore been assigned, the level scheme is incomplete; J^π=(6⁻) for decaying state of ¹⁴⁶Ho is identified tentatively.

¹⁴⁶Dy Levels

E(level) [†]	J ^π #	T _{1/2}	Comments
0.0	0 ⁺		
682.62 3	2 ⁺		
1607.75 21	4 ⁺		
1782.8 3	3 ⁻		
2281.24 23	5 ⁻		
2518.1 4	7 ⁻		
2634.9 [‡] 4	(6 ⁺)		
2808.4 6	(4,5) ⁻		
2934.5 4	10 ⁺	150 ms 20	J ^π : 10 ⁺ state is the only possible seniority-two configuration for the T _{1/2} =150 ms half-life. Transitions feeding this state are not identified. If the 10 ⁺ state is populated by direct β-feeding the value log ft=4.8 would be typical for an allowed β-transition which corresponds 9 ⁺ , 10 ⁺ , or 11 ⁺ for ¹⁴⁶ Ho (3.9 s) (1982Gu07). Evaluators suppose this as less probable, see ¹⁴⁶ Ho 'Adopted Levels' dataset. T _{1/2} : from γ(t) (1982Gu07).
2986.0 [‡] 4	(8 ⁺)		
3160.0 [‡] 4	8 ⁻		

[†] From a least-squares fit to E_γ data. Where ΔE_γ is not known it is assumed to be 1 keV. Normalized χ²=0.09.

[‡] Suggested by 1992De23; the level is not fed by prompt transitions and is probably populated through ε decay.

From 'Adopted Levels, Gammas.

γ(¹⁴⁶Dy)

E _γ [†]	I _γ [†]	E _i (level)	J _i ^π	E _f	J _f ^π	Mult. [‡]	a [@]	Comments
127.0 3	1 1	2934.5	10 ⁺	2808.4	(4,5) ⁻	E3	13.34 25	α(K)exp=4.6 25; α(L)exp=8.7 17; α(M)exp=1.6 6 α(K)=2.16 4; α(L)=8.51 17; α(M)=2.13 5 α(N)=0.481 10; α(O)=0.0569 11; α(P)=0.0001219 20
237.2 3	52 7	2518.1	7 ⁻	2281.24	5 ⁻	E2	0.1350	α(K)exp=0.07 3 α(K)=0.0957 14; α(L)=0.0304 5; α(M)=0.00708 11 α(N)=0.001602 24; α(O)=0.000206 3; α(P)=4.75×10 ⁻⁶ 7

Continued on next page (footnotes at end of table)

^{146}Ho ε decay (3.32 s) **1982Gu07** (continued) $\gamma(^{146}\text{Dy})$ (continued)

E_γ †	I_γ †	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. ‡	α @	Comments
289.7 3	29 6	2808.4	(4,5) ⁻	2518.1	7 ⁻	M1+E2	0.10 3	$\alpha(\text{K})_{\text{exp}}=0.09$ 3 $\alpha(\text{K})=0.08$ 3; $\alpha(\text{L})=0.0147$ 5; $\alpha(\text{M})=0.00330$ 5 $\alpha(\text{N})=0.000756$ 15; $\alpha(\text{O})=0.000105$ 8; $\alpha(\text{P})=4.6\times 10^{-6}$ 19
352#	6.0# 21	2986.0	(8 ⁺)	2634.9	(6 ⁺)			
353#	3.4# 18	3160.0	8 ⁻	2808.4	(4,5) ⁻			
416.5 3	20 6	2934.5	10 ⁺	2518.1	7 ⁻	(E3)	0.0799	$\alpha(\text{K})_{\text{exp}}=0.06$ 3; $\alpha(\text{L})_{\text{exp}}=0.04$ 2 $\alpha(\text{K})=0.0532$ 8; $\alpha(\text{L})=0.0206$ 3; $\alpha(\text{M})=0.00488$ 7 $\alpha(\text{N})=0.001109$ 16; $\alpha(\text{O})=0.0001434$ 21; $\alpha(\text{P})=3.22\times 10^{-6}$ 5
499.0 3	13 7	2281.24	5 ⁻	1782.8	3 ⁻			
642#	2# 2	3160.0	8 ⁻	2518.1	7 ⁻			
673.7 3	55 10	2281.24	5 ⁻	1607.75	4 ⁺			
682.9 3	100	682.62	2 ⁺	0.0	0 ⁺	E2	0.00703	$\alpha(\text{K})=0.00580$ 9; $\alpha(\text{L})=0.000960$ 14; $\alpha(\text{M})=0.000213$ 3 $\alpha(\text{N})=4.90\times 10^{-5}$ 7; $\alpha(\text{O})=6.92\times 10^{-6}$ 10; $\alpha(\text{P})=3.31\times 10^{-7}$ 5
925.3 3	69 14	1607.75	4 ⁺	682.62	2 ⁺			
1027#	14# 3	2634.9	(6 ⁺)	1607.75	4 ⁺			
1100.0 3	13 7	1782.8	3 ⁻	682.62	2 ⁺			

† From **1982Gu07**, except as noted.‡ From $\alpha(\text{exp})$, for 682.9 γ is assumed E2 as the transition 2⁺→0⁺.# From **1992De23**; I_γ were taken by evaluators from fig. 2 of **1992De23** and normalized to **1982Gu07**.

@ Additional information 1.

^{146}Ho ϵ decay (3.32 s) 1982Gu07

Decay Scheme

Intensities: Relative I_γ

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$

$\% \epsilon + \% \beta^+ = 100$
 $(6^-) \quad 0.0+x$
 $Q_\epsilon = 11317.9$
 $3.32 \text{ s } 22$
 $^{146}_{67}\text{Ho}_{79}$

