^{146}Gd ε decay 1981Ka07,1978Ma47

History

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

Parent: ^{146}Gd: E=0.0; J$^{\pi}$=0^{+}; T$_{1/2}$=48.27 d *9*; Q(ε)=1032 *7*; %ε+%β^{+} decay=100.0

^{146}Gd-T$_{1/2}$ from 'Adopted Levels', Q(g.s.) from 2012Wa38.

1981Ka07: ^{146}Gd ε decay [from ^{144}Sm(α,2n), E=27 MeV]; measured Eγ, Iγ, $\gamma\gamma$, γ(X-ray) coin. Deduced levels, J^{π}. Cyclotron, mass-separator, Ge(Li), X-ray detectors.

1978Ma47,1973Ga26: ^{146}Gd ε decay [from Ta(p,X), E=660 MeV]; measured Eγ, Iγ, E(ce), Ice, L-subshell ratios. Deduced levels, J^{π}, α, δ. Ge(Li) detector, magnetic β spectrometer.

1976Se02: ^{146}Gd ε decay [from ^{144}Sm(α,2n), E=27 MeV]; measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma(\theta)$, γ(X-ray) coin, γ(t), T$_{1/2}$. Deduced levels, J^{π}, δ.

1970An18: ^{146}Gd ε decay; measured Eγ, Iγ, Ice, K-, L-, M-subshell ratios. Deduced levels, α, J^{π}, δ.

2013Bh07: ^{146}Gd ε decay [from ^{144}Sm(α,2n), Eα=32 MeV]; measured Eγ, Iγ, $\gamma\gamma$-coin, level T$_{1/2}$ by $\gamma\gamma$(t). Deduced levels, J^{π}, β feedings, log *ft*, configurations. Measured T$_{1/2}$ by $\gamma\gamma$(t). Mirror symmetric centroid difference method for half-life.

Others: 1958Go86, 1963Fr02, 1963Bo44, 1966Av04, 1970Ag01, 1970Ch09, 1970Ko16, 1972Ho51.

The ^{146}Eu level scheme from ^{146}Gd ε decay is that proposed by 1981Ka07 on the basis of γ, $\gamma\gamma$, (X-ray)γ coin. It differs from the earlier proposed schemes by repositioning in the cascade of coincident γ rays: the 114.7 keV level decays by the 114.7 keV transition and the 230.2 keV level decays by 115.5 keV transition. Such a sequence is supported by the measurements of (p,2n) reactions and ^{146}Gd ε decay (2013Bh07). The analysis of the 2013Bh07 data shows that the work is done with a poor energy calibration.

Additional information 1.

^{146}Eu Levels

E(level)[†]	J$^{\pi}$[‡]	T$_{1/2}$	Comments
0.0	4^{-}		
114.712 *20*	3^{-}	3.7 ps *16*	T$_{1/2}$: from $\beta\gamma$(t) using mirror symmetric centroid (MSCD) analysis (2013Bh07). Others: <0.160 ns (1972Ho51), <0.3 ns (1976Se02).
230.23 *3*	2^{-}	5.8 ps *15*	T$_{1/2}$: from $\beta\gamma$(t) using mirror symmetric centroid (MSCD) analysis (2013Bh07). Others: <0.165 ns (1972Ho51), <0.3 ns (1976Se02).
384.80 *4*	1^{-}		
421.62 *7*	(3)$^{-}$		
498.16 *7*	(2^{-})		
690.71 *20*	(2)$^{-}$		

† From a least-squares fit to Eγ data; normalized χ^2=0.7.

‡ From 'Adopted Levels, Gammas.

ε,β^{+} radiations

E(decay)	E(level)	Iε[†]	Log *ft*	Comments
(341 *7*)	690.71	0.067 *10*	9.66 *7*	εK=0.8069 *10*; εL=0.1486 *8*; εM+=0.0445 *3*
(534 *7*)	498.16	0.23 *8*	9.53^{1u} *16*	εK=0.7849 *12*; εL=0.1647 *9*; εM+=0.0504 *3*
(647 *7*)	384.80	72.1 *14*	7.241 *14*	εK=0.8268 *3*; εL=0.13383 *17*; εM+=0.03933 *6*
(802 *7*)	230.23	26.5 *16*	8.22^{1u} *3*	εK=0.8100 *4*; εL=0.1463 *3*; εM+=0.04375 *11* Note that this value of log *ft* is lower than log *ft*>8.5 expected for 1u β transitions.

† Absolute intensity per 100 decays.

^{146}Gd ε decay 1981Ka07,1978Ma47 (continued)

$\gamma(^{146}Eu)$

Iγ normalization: assuming Σ(I(γ+ce) to g.s.)=100.

E_γ [†]	I_γ [†&]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	δ [@]	α [#]	Comments
76.54 *1*	0.05 *2*	498.16	(2$^-$)	421.62	(3)$^-$	[M1,E2]		5.3 *13*	α(K)=2.8 *6*; α(L)=1.9 *15*; α(M)=0.4 *4* α(N)=0.10 *8*; α(O)=0.014 *10*; α(P)=0.00027 *11*
114.71 *2*	94.5 *10*	114.712	3$^-$	0.0	4$^-$	M1+(E2)	<0.04	1.247	α(K)=1.055 *15*; α(L)=0.1510 *22*; α(M)=0.0326 *5* α(N)=0.00747 *11*; α(O)=0.001184 *17*; α(P)=0.0001167 *17* α(exp): ce(K)=204 *12* (1978Ma47); ce(K)=102 *5*, ce(L1)=13, ce(L2)=0.95 *15*, ce(L3)=0.26 *8* (1973Ga26); K:L1:L2:L3:M1:M2:M3$^+$:N:O+=100.0 *35*:13.6 *5*:1.00 *15*:<0.3:2.9 *4*:0.32 *16*:<0.2:0.80 *11*:0.18 *8* (1970An18). α: KC:L1C:L2C:L3C:M1C:M2C:M3C+:NC:(OC+PC)=100.0 *14*:13.05 *18*:1.025 *16*:0.1918 *60*:2.805 *40*:0.2474 *40*:0.0472 *40*:0.707 *12*:0.1233 *17* from exp. subshell ratios. δ: from 1973Ga26. δ<0.01 (1963Bo44). δ=0.000 *8* from exp. subshell ratios.
115.51 *2*	94.5 *10*	230.23	2$^-$	114.712	3$^-$	M1+(E2)	<0.022	1.223	α(K)=1.034 *15*; α(L)=0.1478 *21*; α(M)=0.0319 *5* α(N)=0.00731 *11*; α(O)=0.001160 *17*; α(P)=0.0001144 *16* α(exp): ce(K)=208 *12* (1978Ma47); ce(K)=104 *4*, ce(L1)=13.8 *4*, ce(L2)=1.1 *1*, ce(L3)=0.18 *2* (1973Ga26); K:L1:L2:L3:M1:M2:M3$^+$:N:O+P=102.2 *35*:13.6 *4*:1.02 *15*:0.10 *6*:3.0 *4*:0.27 *14*:<0.1:0.77 *9*:0.16 *8* (1970An18). α: α(K):α(L1):α(L2):α(L3):α(M1): α(M2):α(M3)$^+$:α(N):(α(O)+α(P))= 100.0 *14*:13.03 *18*: 1.071 *22*:0.204 *17*:2.794 *40*:0.2406 *50*:0.0501 *40*:0.708 *10*:0.1233 *17* from exp. subshell ratios. δ: from 1973Ga26. δ<0.01 (1963Bo44). δ=0.0000 *25* from exp. subshell ratios.
154.57 *2*	100 *1*	384.80	1$^-$	230.23	2$^-$	M1(+E2)	<0.071	0.537	α(K)=0.455 *7*; α(L)=0.0649 *10*; α(M)=0.01402 *21* α(N)=0.00321 *5*; α(O)=0.000509 *8*; α(P)=5.02$\times10^{-5}$ *7* I_γ: ΔIγ is not specified by the authors of 1981Ka07, the evaluators assumed ΔIγ=1 by analogy with the data for other transitions. α(exp): ce(K)=100 (1978Ma47); ce(K)=50 *3*, ce(L1)=6.5 *5*, ce(L2)=0.50 *7*, ce(L3)=0.085 *20* (1973Ga26); K:L1:L2:L3:M1:M2:M3$^+$:N:O+P=50.7 *30*:6.78 *20*:0.54 *9*:<0.1:1.44 *15*:0.15 *8*:<0.1:0.42 *8*:<0.1 (1970An18). α: α(K):α(L1):α(L2):α(L3):α(M1):

Continued on next page (footnotes at end of table)

^{146}Gd ε decay 1981Ka07,1978Ma47 (continued)

$\gamma(^{146}Eu)$ (continued)

E_γ †	I_γ †&	E_i(level)	J^π_i	E_f	J^π_f	Mult. ‡	α #	Comments
								14:13.02 *18*:1.04 *30*:0.206 *30*:2.789 *40*:0.2444 *80*:0.0507 *70*:0.708 *10*:0.1230 *17* from exp. subshell ratios. δ: from 1973Ga26. $-0.041<\delta<-0.018$ (1963Bo44). δ=0.08 *15* from exp. subshell ratios.
230.51 *20*	0.19 *10*	230.23	2^-	0.0	4^-	[E2]	0.1347	α(K)=0.0989 *14*; α(L)=0.0278 *4*; α(M)=0.00632 *10* α(N)=0.001417 *21*; α(O)=0.000204 *3*; α(P)=8.73×10^{-6} *13* E_γ: from 1976Se02; not observed by 1981Ka07. Eγ=230.2 *5*, Iγ≈0.02 (1978Ma47). I_γ: from 1976Se02, normalized to 1981Ka07 by the evaluators.
267.8 *2*	0.08 *4*	498.16	(2^-)	230.23	2^-	(M1,E2)	0.101 *18*	ce(K)=0.020 *8* (1978Ma47); α(K)exp=0.11 *6* α(K)=0.082 *19*; α(L)=0.0149 *8*; α(M)=0.00330 *25* α(N)=0.00075 *5*; α(O)=0.000114 *3*; α(P)=8.E−6 *3*
^{x}270.1	<0.01							E_γ: not observed by 1981Ka07. Eγ=269.28 *4*, Iγ=0.15 *6* (1978Ma47).
383.5 *1*	0.10 *4*	498.16	(2^-)	114.712	3^-			
421.6 *1*	0.174 *20*	421.62	$(3)^-$	0.0	4^-	M1	0.0361	ce(K)=0.016 *4*; α(K)exp=0.032 *6* (1978Ma47) α(K)=0.0307 *5*; α(L)=0.00425 *6*; α(M)=0.000914 *13* α(N)=0.000209 *3*; α(O)=3.33×10^{-5} *5*; α(P)=3.34×10^{-6} *5*
576.0 *2*	0.14 *2*	690.71	$(2)^-$	114.712	3^-	M1	0.01634	ce(K)=0.0038 *4*; α(K)exp=0.013 *4* (1978Ma47) α(K)=0.01392 *20*; α(L)=0.00190 *3*; α(M)=0.000410 *6* α(N)=9.38×10^{-5} *14*; α(O)=1.493×10^{-5} *21*; α(P)=1.507×10^{-6} *22*
^{x}742	<0.02							E_γ: not observed by 1981Ka07.

† From 1981Ka07, except as noted.
‡ from α(K)exp and subshell ratios; α(K)(154.6γ) of M1 mult. normalized to 0.455 (2008Ki07).
# Additional information 2.
@ If No value given it was assumed δ=1.00 for E2/M1.
& For absolute intensity per 100 decays, multiply by 0.469 *7*.
^{x} γ ray not placed in level scheme.

^{146}Gd ε decay 1981Ka07,1978Ma47

Decay Scheme