^{81}Ge β^- decay (7.6 s): (1/2$^+$) 1981Ho24

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 109, 2257 (2008)	15-Aug-2008

Parent: ^{81}Ge: E=679.14 *4*; J^π=(1/2$^+$); $T_{1/2}$=7.6 s; Q(β^-)=6242 *4*; %β^- decay=100.0

Others: 1972De43, 1981Al20, 1981ZeZY, 1990Ru05.

See also 1980HoZN, in which Eγ, Iγ and $\gamma\gamma$ coin data used in 1981Ho24 are tabulated (without differentiation between their ^{81}Ge parentages).

Source: from mass-separated fission products.

1981Ho24, 1980HoZN: single γ and $\gamma\gamma$ coincidences measured with Ge(Li); x-ray detector for low energy γ search (E$\gamma\geq$15 keV); Si(Li) detector for simultaneous measurement of ce and γ spectra (for α(K)exp determination).

From analysis of ^{81}Ga decay and $\beta\gamma$-coin measurements, it is evident that there are two β^- decaying isomers of ^{81}Ge; but, in a multispectrum analysis of mass number 81, 1981Ho24 were unable to differentiate between their half-lives. Hence, 1981Ho24 conclude that there exist two isomers of ^{81}Ge which possess similar $T_{1/2}$ values. The evaluator, therefore, assigns $T_{1/2}$ from 1981Ho24 to each isomer. Presumably other authors also report $T_{1/2}$ relevant to a mixture of these isomers.

1981Ho24 propose tentative decay schemes for the two isomers, consistent with $\gamma\gamma$ and $\beta\gamma$ coin data and supported by arguments based on the large spin differences of the decaying isomers and on analogies with ^{83}Se decay. However, J^π based on the resulting log *ft* value and observed γ deexcitation patterns are in conflict with L(t,α) for the 758 level unless separate levels with almost identical energy are assumed to be excited in β^- decay and In (t,α).

^{81}As Levels

E(level)[†]	J^π[‡]	$T_{1/2}$	Comments
0	3/2$^-$		
93.08 *5*	1/2$^-$,3/2$^-$,5/2$^-$		
290.39 *4*	(3/2)$^-$		
335.97 *4*	(5/2)$^-$	<0.7 ns	$T_{1/2}$: from $\gamma\gamma$(t) (1981Ho24).
737.72 *4*	(5/2$^-$)		
758.41 *7*	(3/2$^+$,5/2$^-$)		
864.20 *13*			
1041.99 *8*	(7/2$^-$)		
1869.85 *17*	(1/2,3/2)		
2862.46 *17*	(1/2$^-$,3/2)		
2911.98 *13*	(3/2$^-$)		
3136.27 *13*	(3/2$^+$)		
3195.31 *14*	(3/2$^+$)		
3368.28 *24*	(1/2,3/2)		
3531.13 *21*	(1/2$^-$,3/2)		
3562.72 *15*	(1/2$^+$,3/2$^+$)		

[†] From least-squares fit to Eγ.
[‡] From Adopted Levels.

β^- radiations

From γ-gated β endpoint measurements, 1981Al20 determine Q(β) values of 6220 *130* and 6930 *280* for g.s. and isomeric state β^- decay, respectively. These imply E(isomeric state, ^{81}Ge)=710 *310*, consistent with its identification as the 679 level of ^{81}Ge. Assuming E(isomer)=679, the weighted average Q is 6230 *120* for ^{81}Ge g.s. β^- decay, as quoted in 2003Au03.

Measured average Eβ=1580 *150* (1990Ru05).

Continued on next page (footnotes at end of table)

^{81}Ge β^- decay (7.6 s): (1/2$^+$) 1981Ho24 (continued)

β^- radiations (continued)

E(decay)	E(level)	Iβ^-[†]	Log *ft*	Comments
(3358 *4*)	3562.72	6.1 *24*	5.39 *17*	av Eβ=1448.4 *20*
(3390 *4*)	3531.13	1.1	6.2	av Eβ=1463.6 *20*
(3553 *4*)	3368.28	1.8 *8*	6.03 *20*	av Eβ=1541.7 *20*
(3726 *4*)	3195.31	10 *4*	5.37 *18*	av Eβ=1624.7 *20*
(3785 *4*)	3136.27	10 *4*	5.40 *18*	av Eβ=1653.1 *20*
(4009 *4*)	2911.98	6.0 *24*	5.73 *18*	av Eβ=1761.1 *20*
(4059 *4*)	2862.46	4.8 *19*	5.86 *18*	av Eβ=1785.0 *20*
(5051 *4*)	1869.85	3.4 *14*	6.43 *18*	av Eβ=2264.7 *20*
(6163 *4*)	758.41	4.9 *23*	6.66 *21*	av Eβ=2803.5 *20*
(6183 *4*)	737.72	8 *4*	8.44[1*u*] *22*	av Eβ=2812.1 *20*
(6631 *4*)	290.39	12 *5*	6.42 *18*	av Eβ=3030.6 *20*
(6828 *4*)	93.08	7 *5*	6.7 *4*	av Eβ=3126.4 *20*
(6921 *4*)	0	<54	>5.9	av Eβ=3171.5 *20*

[†] Absolute intensity per 100 decays.

^{81}Ge β^- decay (7.6 s): (1/2$^+$) 1981Ho24 (continued)

$\gamma(^{81}As)$

Iγ normalization: approximate value from Σ (I(γ+ce) to g.s.)=73% 27, deduced assuming log *ft*>5.9 to g.s., which implies Iβ(g.s.)<54%.
Measured average Eγ=2000 *222* (1990Ru05).

E$_\gamma$ [†]	I$_\gamma$ [†a]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult. [‡]	δ	α [b]	Comments
93.10 *10*	34 *4*	93.08	1/2$^-$,3/2$^-$,5/2$^-$	0	3/2$^-$	M1+E2	0.24 *6*	0.16 *3*	α(K)exp=0.141 *21* α(K)=0.140 *23*; α(L)=0.017 *4*; α(M)=0.0025 *5*; α(N+..)=0.00018 *4* α(N)=0.00018 *4* δ: from α(K)exp.
197.30 *5*	16.4 *10*	290.39	(3/2)$^-$	93.08	1/2$^-$,3/2$^-$,5/2$^-$	(M1)		0.01490	α(K)exp=0.010 *5* α(K)=0.01326 *19*; α(L)=0.001411 *20*; α(M)=0.000215 *3*; α(N+..)=1.633×10^{-5} *23* α(N)=1.633×10^{-5} *23*
242.84 *9*	0.7 *4*	335.97	(5/2)$^-$	93.08	1/2$^-$,3/2$^-$,5/2$^-$				
290.35 *5*	8.6 *7*	290.39	(3/2)$^-$	0	3/2$^-$				
335.98 *5*	17 *3*	335.97	(5/2)$^-$	0	3/2$^-$	M1,E2		0.007 *3*	α(K)exp=0.0064 *32* α(K)=0.0059 *24*; α(L)=0.0006 *3*; α(M)=0.00010 *4*; α(N+..)=7.E−6 *3* α(N)=7.E−6 *3* δ: both α(K)(M1) and α(K)(E2) lie within limits of experimental uncertainty.
401.75 *5*	5.7 *5*	737.72	(5/2$^-$)	335.97	(5/2)$^-$				
456.3 *2*	2.4 *4*	3368.28	(1/2,3/2)	2911.98	(3/2$^-$)				
[x]463.1 *3*	1.9 *4*								
467.98 *6*	3.4 *10*	758.41	(3/2$^+$,5/2$^-$)	290.39	(3/2)$^-$				
[x]609.1 *3*	1.9 *4*								
665.9[#] *3*	3	758.41	(3/2$^+$,5/2$^-$)	93.08	1/2$^-$,3/2$^-$,5/2$^-$				
706.07 *10*	1.0 *7*	1041.99	(7/2$^-$)	335.97	(5/2)$^-$				
737.74 *5*	14 *1*	737.72	(5/2$^-$)	0	3/2$^-$				
751.51 *10*	1.0 *7*	1041.99	(7/2$^-$)	290.39	(3/2)$^-$				
758.5 *6*	7.4 *7*	758.41	(3/2$^+$,5/2$^-$)	0	3/2$^-$				
771.26 *15*	6.1 *5*	864.20		93.08	1/2$^-$,3/2$^-$,5/2$^-$				
1005.7 *3*	1.6 *4*	1869.85	(1/2,3/2)	864.20					
[x]1038.5 *4*	1.7 *5*								
[x]1056.5 *2*	4.2 *4*								
[x]1095.5 *3*	3.0 *3*								
[x]1225.8 *2*	4.1 *5*								
[x]1238.9 *3*	2.4 *4*								
[x]1256.1 *2*	1.1 *3*								
[x]1297.4 *3*	2.8 *4*								
[x]1435.7 *2*	4.5 *5*								

$^{81}_{33}As_{48}$-3

^{81}Ge β^- decay (7.6 s): (1/2$^+$) 1981Ho24 (continued)

$\gamma(^{81}As)$ (continued)

E_γ †	I_γ †[a]	E_i(level)	J_i^π	E_f	J_f^π	Comments
[x]1686.5 *3*	1.1 *2*					
1869.8[c@] *2*	3[c]	1869.85	(1/2,3/2)	0	3/2$^-$	
1869.8[c@] *2*	2[c]	2911.98	(3/2$^-$)	1041.99	(7/2$^-$)	
2103.9 *3*	2.7 *4*	2862.46	(1/2$^-$,3/2)	758.41	(3/2$^+$,5/2$^-$)	
2174.32 *15*	8.6 *6*	2911.98	(3/2$^-$)	737.72	(5/2$^-$)	
2331.3 *2*	4.5 *5*	3195.31	(3/2$^+$)	864.20		
2377.4 *4*	3.4 *10*	3136.27	(3/2$^+$)	758.41	(3/2$^+$,5/2$^-$)	
2436.6	≈1	3195.31	(3/2$^+$)	758.41	(3/2$^+$,5/2$^-$)	E_γ: from fig. 11 of 1981Ho24.
2526.5 *2*	3.9 *4*	2862.46	(1/2$^-$,3/2)	335.97	(5/2)$^-$	
[x]2754.8 *3*	4.5 *5*					
2800.2 *2*	5.7 *6*	3136.27	(3/2$^+$)	335.97	(5/2)$^-$	
2845.8 *2*	2.8 *4*	3136.27	(3/2$^+$)	290.39	(3/2)$^-$	
2859.1	≈1	3195.31	(3/2$^+$)	335.97	(5/2)$^-$	E_γ: from fig. 11 of 1981Ho24.
2904.7 *3*	1.8 *3*	3195.31	(3/2$^+$)	290.39	(3/2)$^-$	
3136.6 *3*	1.7 *3*	3136.27	(3/2$^+$)	0	3/2$^-$	
3195.1[c&] *2*	5.3[c]	3195.31	(3/2$^+$)	0	3/2$^-$	
3195.1[c&] *2*	1.5[c]	3531.13	(1/2$^-$,3/2)	335.97	(5/2)$^-$	
3469.5 *2*	2.9 *3*	3562.72	(1/2$^+$,3/2$^+$)	93.08	1/2$^-$,3/2$^-$,5/2$^-$	
3562.7 *2*	5.4 *4*	3562.72	(1/2$^+$,3/2$^+$)	0	3/2$^-$	

† All data for unplaced γ rays and all uncertainties are from 1980HoZN; other data are from 1981Ho24, except as noted.
‡ From α(K)exp (1981Ho24).
# Iγ from drawing in 1981Ho24; Eγ from table 11 of 1980HoZN. Iγ=11.0 *20* for multiplet (1980HoZN, both isomers combined).
@ Iγ from drawing in 1981Ho24; Eγ from table 11 in 1980HoZN. Iγ=5.0 *5* for doublet (1980HoZN).
& Iγ from drawing in 1981Ho24; Eγ from table 11 in 1980HoZN. Iγ=6.8 *6* for doublet (1980HoZN).
[a] For absolute intensity per 100 decays, multiply by 0.73 *28*.
[b] 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.
[c] Multiply placed with intensity suitably divided.
[x] γ ray not placed in level scheme.

$^{81}_{33}As_{48}$-4

^{81}Ge β^- decay (7.6 s): (1/2$^+$) 1981Ho24

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
@ Multiply placed: intensity suitably divided