^{149}Er ε decay (4 s) 1989Fi01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 185, 2 (2022)	23-Aug-2022

Parent: ^{149}Er: E=0.0; J^π=(1/2$^+$); $T_{1/2}$=4 s *2*; Q(ε)=7900 *30*; %ε+%$β^+$ decay=100.0

^{149}Er-J^π,$T_{1/2}$: From ^{149}Er Adopted Levels of ^{149}Er, where value is taken from 1989Fi01.

^{149}Er-Q(ε): From 2021Wa16.

1989Fi01: ^{149}Er ions were produced by the ^{94}Mo(^{58}Ni,2pn) reaction with 242 MeV (center of target) ^{58}Ni beam from the Lawrence Berkeley Laboratory SuperHILAC, separated with the OASIS facility online and collected on a moving tape of the counting station. γ rays were detected with a HPGe and two n-Ge detectors; charged particles were detected with a Si ΔE-E telescope on one side of the tape and a plastic scintillator on the other side. Measured Eγ, Iγ, E(x-ray), I(x-ray), γγ-coin, γ(t), E$β$, $β$-delayed proton spectra. Deduced levels, J^π, parent $T_{1/2}$, decay branching ratios, log *ft*.

Total decay energy deposit of 3722 keV *1525* calculated by RADLIST code is much lower than the expected value of 7900 keV *30*, which indicates the incompleteness of the decay scheme.

^{149}Ho Levels

E(level)	J^π‡	$T_{1/2}$‡	Comments
48.8 *2*	(1/2$^+$)	56 s *3*	%ε+%$β^+$=100
220.3 *2*	(3/2$^+$)		
564.2 *2*	(5/2$^+$)		
1797.4 *3*	(3/2$^+$)		
3790†	(1/2,3/2)#		E(level): E(p)=2653.
3990†	(1/2,3/2)#		E(level): E(p)=2850.
4240†	(1/2,3/2)#		E(level): E(p)=3105.
4470†	(1/2,3/2)#		E(level): E(p)=3330.
4970†	(1/2,3/2)#		E(level): E(p)=3830.
5050†	(1/2,3/2)#		E(level): E(p)=3909.

† Level decays by proton emission to ^{148}Dy, γ deexcitation is not known. Level energy is E(p)*[1+m_p/m(^{149}Er)]+S(p), with E(p) from 1989Fi01 (given under comments) and S(p)=1075 *12* (2021Wa16); 1989Fi01 use S(p)=1400. The energy uncertainty is ≈50 keV.

‡ From the Adopted Levels unless otherwise stated.

1989Fi01 assigned (1/2$^+$,3/2$^+$), assuming allowed ε transition from (1/2$^+$) parent.

ε,$β^+$ radiations

E(decay)	E(level)	I$β^+$ #	Iε#	Log *ft*†	I(ε+$β^+$)†#	Comments
(2.85×10^3@ *3*)	5050	≈0.08	≈0.37	≈5.0	≈0.45‡	av E$β$=826 *14*; εK=0.682 *7*; εL=0.1040 *11*; εM+=0.0307 *3*
(2.93×10^3@ *3*)	4970	≈0.06	≈0.22	≈5.2	≈0.28‡	av E$β$=862 *14*; εK=0.664 *7*; εL=0.1012 *11*; εM+=0.0299 *4*
(3.43×10^3@ *3*)	4470	≈0.03	≈0.05	≈6.0	≈0.08‡	av E$β$=1088 *14*; εK=0.547 *8*; εL=0.0829 *11*; εM+=0.0245 *4*
(3.66×10^3@ *3*)	4240	≈0.09	≈0.13	≈5.7	≈0.22‡	av E$β$=1192 *14*; εK=0.492 *7*; εL=0.0746 *11*; εM+=0.0220 *4*
(3.91×10^3@ *3*)	3990	≈0.076	≈0.084	≈5.9	≈0.16‡	av E$β$=1306 *14*; εK=0.436 *7*; εL=0.0660 *10*; εM+=0.0195 *3*
(4.11×10^3@ *3*)	3790	≈0.11	≈0.09	≈5.9	≈0.20‡	av E$β$=1398 *14*; εK=0.395 *6*; εL=0.0596 *10*; εM+=0.0176 *3*

Continued on next page (footnotes at end of table)

^{149}Er ε decay (4 s) 1989Fi01 (continued)

ε,β+ radiations (continued)

E(decay)	E(level)	Iβ+ #	Iε#	Log ft†	I(ε+β+)†#	Comments
(6.10×10³ @ 3)	1797.4	<77	<16	>4.0	<93	av Eβ=2327 15; εK=0.1447 21; εL=0.0217 3; εM+=0.00639 10

† There is a gap of about 3 MeV between Q value and last known level at 5090, and the gamma rays are known up to 1797 level only. This suggests that the level scheme is incomplete, and most likely there are additional levels and associated γ transitions populated by the decay of 4-s ^{149}Er. For this reason, all feedings and associated log *ft* values should be treated as approximate.
‡ From proton intensity (1989Fi01). Feeding does not include possible γ-ray deexcitation of the level.
# Absolute intensity per 100 decays.
@ Existence of this branch is questionable.

γ(^{149}Ho)

Iγ normalization: From I(γ+ce)(1748γ+171γ)=93 2, using %εp=7 2 (1989Fi01). There is no indication of ε feeding to 49 level; the level scheme is likely to be more complex than the one presented here, in view of the large Q(ε) value (≈7.7 MeV) for ^{149}Er decay.

Eγ†	Iγ†#	Ei(level)	J_i^π	Ef	J_f^π	Mult.‡	α@	Comments
171.5 1	7 3	220.3	(3/2+)	48.8	(1/2+)	M1	0.566 8	α(N)=0.00360 5; α(O)=0.000524 7; α(P)=2.94×10⁻⁵ 4 α(K)=0.476 7; α(L)=0.0702 10; α(M)=0.01549 22
343.9 1	≈2	564.2	(5/2+)	220.3	(3/2+)	(M1)	0.0853 12	α(K)=0.0720 10; α(L)=0.01043 15; α(M)=0.002297 32 α(N)=0.000534 7; α(O)=7.78×10⁻⁵ 11; α(P)=4.41×10⁻⁶ 6
1233.0& 10	≈2	1797.4	(3/2+)	564.2	(5/2+)			
1577.9 3	10 3	1797.4	(3/2+)	220.3	(3/2+)			
1748.4 1	36 4	1797.4	(3/2+)	48.8	(1/2+)			

† From 1989Fi01.
‡ From the Adopted Gammas.
# For absolute intensity per 100 decays, multiply by 2.0 2.
@ 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.
& Placement of transition in the level scheme is uncertain.

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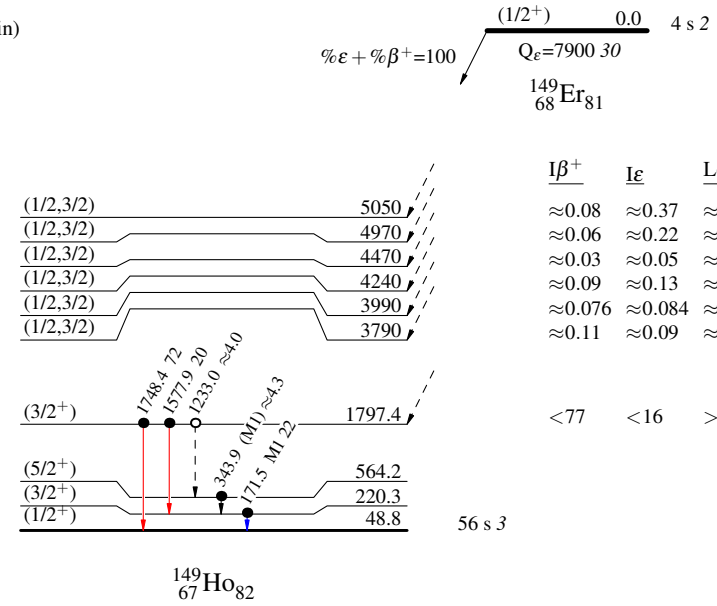
Legend

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

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



	Iβ+	Iε	Log *ft*
5050	≈0.08	≈0.37	≈5.0
4970	≈0.06	≈0.22	≈5.2
4470	≈0.03	≈0.05	≈6.0
4240	≈0.09	≈0.13	≈5.7
3990	≈0.076	≈0.084	≈5.9
3790	≈0.11	≈0.09	≈5.9
1797.4	<77	<16	>4.0