

⁶⁴Ge ε decay (63.7 s) 1974Ro16

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 178, 41 (2021).	12-Nov-2021

Parent: ⁶⁴Ge: E=0.0; J^π=0⁺; T_{1/2}=63.7 s 25; Q(ε)=4517 4; %ε+%β⁺ decay=100.0

⁶⁴Ge-T_{1/2}: From ⁶⁴Ge Adopted Levels.

⁶⁴Ge-Q(ε): From 2021Wa16.

1974Ro16 (also 1972Ro13): ⁶⁴Ge from ⁶⁴Zn(³He,3n),E=50 MeV and chemical separation. Measured E_γ, I_γ and T_{1/2} of ⁶⁴Ge.

Others:

1993Wi03: measured summed spectra.

1973Da01: source from ⁵⁴Fe(¹²C,2n),E=36 MeV. Measured γ, γβ⁺ coin, T_{1/2} of ⁶⁴Ge. Only one γ ray at 426.9 3 reported.

1972De09, 1972Cr02: search for ⁶⁴Ge isotope using ⁶⁴Zn(³He,3n) reaction not successful.

⁶⁴Ga Levels

E(level) [†]	J ^π [‡]	Comments
0.0	0 ⁺	
42.89 10	(2 ⁺)	
128.19 13	1 ⁺	
171.1? 2	(3 ⁺)	Direct population of this level is not expected if J=3.
427.00 22	1 ⁺	
667.1 3	1 ⁺	
817.4? 4	(1 ⁺)	Suggested level population (evaluators) on the basis of an 818 level reported in (p,nγ) and (³ He,t).

[†] From a least-squares fit to γ-ray energies.

[‡] From the Adopted Levels.

ε,β⁺ radiations

(427γ)β⁺ coin study (1973Da01) gives E(β⁺)=2960 250 implying Q(ε)=4410 250.

E(decay)	E(level)	Iβ ⁺ [‡]	Iε [‡]	Log f _t [†]	I(ε+β ⁺) ^{†‡}	Comments
(3700 [#] 4)	817.4?	≈6.7	≈0.27	≈5.2	≈7.0	av Eβ=1199.8 19; εK=0.03437 15; εL=0.003816 17; εM+=0.000692 3
(3850 4)	667.1	≈16	≈0.56	≈4.9	≈17	av Eβ=1270.8 19; εK=0.02931 13; εL=0.003255 14; εM+=0.0005904 2
3.98×10 ³ 25	427.00	≈41	≈1.1	≈4.6	≈42	av Eβ=1384.5 19; εK=0.02310 9; εL=0.002564 10; εM+=0.0004651 1 E(decay): E(β ⁺)=2960 250 from (427γ)(β ⁺) coin (1973Da01).
(4389 4)	128.19	≈18	≈0.36	≈5.2	≈18	av Eβ=1526.8 20; εK=0.01759 7; εL=0.001952 7; εM+=0.0003540 1
(4517 [#] 4)	0.0	<1.3	<0.023	>6.4	<1.3	av Eβ=1588.1 20; εK=0.01576 6; εL=0.001749 6; εM+=0.0003172 1

[†] Values should be considered as limits only since there is a large gap of about 3.7 MeV between Q(ε) value and highest known level at 817 keV. Evaluators consider the decay scheme as incomplete.

[‡] Absolute intensity per 100 decays.

[#] Existence of this branch is questionable.

${}^{64}\text{Ge}$ ε decay (63.7 s) 1974Ro16 (continued) $\gamma({}^{64}\text{Ga})$

I γ normalization: As given by 1974Ro16 from growth of ${}^{64}\text{Ga}$ activity and the present decay scheme. ε, β^+ feeding to g.s. is <1.3% (assuming $\log ft > 6.4$ for a possible isospin forbidden transition). According to 1974Ro16 only 85% I0 of the activity is accountable to ${}^{64}\text{Ge}$ in the decay chain.

E_γ	I_γ^\dagger	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult.	α^\ddagger	$I_{(\gamma+ce)}^\dagger$	Comments
(42.89 10)	0.7 3	42.89	(2 ⁺)	0.0	0 ⁺	(E2)	16.36	12 5	$\alpha(\text{K})=13.38$ 19; $\alpha(\text{L})=2.60$ 4; $\alpha(\text{M})=0.371$ 6; $\alpha(\text{N})=0.01080$ 16 E_γ : γ not reported in ${}^{64}\text{Ge}$ ε decay, taken from the Adopted Gammas. $I_{(\gamma+ce)}$: from intensity balance. Mult.: from the Adopted Gammas.
(85.29 14)	≈ 3.9	128.19	1 ⁺	42.89	(2 ⁺)	[M1+E2]	0.68 58		$\alpha(\text{K})=0.59$ 50; $\alpha(\text{L})=0.076$ 67; $\alpha(\text{M})=0.0110$ 96; $\alpha(\text{N})=4.6 \times 10^{-4}$ 38 E_γ, I_γ : γ not resolved from Pb K x ray in ${}^{64}\text{Ge}$ ε decay. Energy and intensity (based on branching ratio) from the Adopted Gammas.
128.2# 2	10.7# 7	128.19	1 ⁺	0.0	0 ⁺	[M1]	0.0359		$\alpha(\text{K})=0.0320$ 5; $\alpha(\text{L})=0.00337$ 5; $\alpha(\text{M})=0.000493$ 8 $\alpha(\text{N})=2.62 \times 10^{-5}$ 4
128.2#@ 2	#	171.1?	(3 ⁺)	42.89	(2 ⁺)	[M1+E2]	0.16 12		$\alpha(\text{K})=0.14$ 11; $\alpha(\text{L})=0.016$ 13; $\alpha(\text{M})=0.0023$ 19; $\alpha(\text{N})=1.06 \times 10^{-4}$ 80 E_γ, I_γ : γ mainly associated with 128.2 level; only a small fraction may belong with the decay of 171 level.
384.1 3	4.7 5	427.00	1 ⁺	42.89	(2 ⁺)	[M1+E2]	0.0037 14		$\alpha(\text{K})=0.0033$ 13; $\alpha(\text{L})=3.4 \times 10^{-4}$ 14; $\alpha(\text{M})=5.0 \times 10^{-5}$ 20; $\alpha(\text{N})=2.62 \times 10^{-6}$ 97
427.0 3	37.4 10	427.00	1 ⁺	0.0	0 ⁺	[M1]	0.00179		$\alpha(\text{K})=0.001599$ 23; $\alpha(\text{L})=0.0001633$ 23; $\alpha(\text{M})=2.39 \times 10^{-5}$ 4; $\alpha(\text{N})=1.291 \times 10^{-6}$ 19
667.1 3	16.9 10	667.1	1 ⁺	0.0	0 ⁺	[M1]	6.55×10^{-4}		$\alpha(\text{K})=0.000586$ 9; $\alpha(\text{L})=5.94 \times 10^{-5}$ 9; $\alpha(\text{M})=8.69 \times 10^{-6}$ 13; $\alpha(\text{N})=4.71 \times 10^{-7}$ 7
774.5@ 3	7.0 6	817.4?	(1 ⁺)	42.89	(2 ⁺)	[M1+E2]	0.00054 7		$\alpha(\text{K})=0.00049$ 7; $\alpha(\text{L})=5.0 \times 10^{-5}$ 7; $\alpha(\text{M})=7.2 \times 10^{-6}$ 10; $\alpha(\text{N})=3.9 \times 10^{-7}$ 5

Continued on next page (footnotes at end of table)

${}^{64}\text{Ge}$ ε decay (63.7 s) [1974Ro16](#) (continued)

$\gamma({}^{64}\text{Ga})$ (continued)

† For absolute intensity per 100 decays, multiply by 1.0 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.

Multiply placed with intensity suitably divided.

@ Placement of transition in the level scheme is uncertain.

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Decay Scheme

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)

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

