

^{60}Ga $\varepsilon+\beta^+$ decay: XUNDL-5 2025Ow01

Parent: ^{60}Ga : $E=0$; $J^\pi=2^+$; $T_{1/2}=69.4$ ms 2; $Q(\varepsilon+\beta^+)=14160$ 15; % $\varepsilon+\beta^+$ decay=100.0

$^{60}\text{Ga}-J^\pi$: from the Adopted Levels of ^{60}Ga .

$^{60}\text{Ga}-T_{1/2}$: unweighted average of 70 ms 15 (2001Ma96), 70 ms 13 (2002Lo13), 76 ms 3 (2017Ku12), 70.8 ms 20 (2017GoZT,2020Gi02), 69.4 ms 2 (2021Or01), and 57.7 ms 98 (2025Ow01).

$^{60}\text{Ga}-Q(\varepsilon+\beta^+)$: deduced by evaluators using ^{60}Zn mass excess (2021Wa16) and ^{60}Ga mass excess of -40015 15; weighted average of -40016 15 (2021Or01), -40005 30 (2021Pa44), and -40034 46 (2023Wa10).

Compiled (unevaluated) dataset from 2025Ow01: Phys Rev C 111, 065801 (2025).

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2025Ow01: ^{60}Ga was produced via the projectile fragmentation of a 150-MeV/nucleon $^{78}\text{Kr}^{36+}$ primary beam impinging on a 517-mg/cm² thick ^9Be target, filtered by the NSCL A1900 separator and the radio frequency fragment separator, identified by $B\rho$ - ΔE -ToF, and implanted into a 1-mm-thick 16×16 DSSD surrounded by the Summing NaI (SuN) detector. Ions and positrons were detected using the DSSD and γ rays were detected using the SuN detector. Measured implant-decay time and space correlations, γ -ray total absorption spectra (TAS), single sum of segments spectra (SoS), and multiplicity spectra. Deduced β -feeding intensities at various excitation energies by fitting simulated TAS, SoS, and multiplicity spectra to data. Deduced $T_{1/2}$ of parent ^{60}Ga . Compared with shell-model calculations using GXPF1A and KB3G Hamiltonians.

 ^{60}Zn Levels

<u>E(level)[†]</u>	<u>E(level)[†]</u>	<u>E(level)[†]</u>	<u>E(level)[†]</u>
0	3808	4913	≈7683
1004	3812	5200	≈8067
2193	3972	≈5460	≈8470
2559	4180	≈5733	≈8894
3035	4200	≈6020	≈9338
3200	4351	≈6321	≈9805
3510	4400	≈6637	
3627	4776	≈6969	
3710	4852	≈7317	

[†] For states below 5.3 MeV, 2025Ow01 adopts E(level) from the RIPL-3 library, originally from the Adopted Levels of ^{60}Zn (2013Br15) rounded to the nearest keV. For states above 5.3 MeV, E(level) is a sample of calculated continuum-state energies with energy spacing (273 keV) that followed the energy resolution of the SuN detector.

 ε, β^+ radiations

<u>E(decay)</u>	<u>E(level)</u>	<u>$I\beta^+$ [‡]</u>	<u>$I\varepsilon$ [‡]</u>	<u>Log f_t</u>	<u>$I(\varepsilon+\beta^+)$ ^{†‡}</u>	<u>Comments</u>
(4.36×10 ³)	≈9805	0.49	0.01	3.8	0.5	$I(\varepsilon+\beta^+)$: 0.5 +13−4.
(4.82×10 ³)	≈9338	1.18	0.02	3.7	1.2	$I(\varepsilon+\beta^+)$: 1.2 +9−12.
(5.27×10 ³)	≈8894	0.10	9.077×10 ^{−4}	5.0	0.1	$I(\varepsilon+\beta^+)$: 0.1 +4−1.
(5.69×10 ³)	≈8470	1.69	0.01	3.9	1.7	$I(\varepsilon+\beta^+)$: 1.7 +13−11.
(6.09×10 ³)	≈8067				0.0	
(6.48×10 ³)	≈7683				0.0	$I(\varepsilon+\beta^+)$: 0.0 +3−0.
(6.84×10 ³)	≈7317				0.0	
(7.19×10 ³)	≈6969				0.0	
(7.52×10 ³)	≈6637	0.10	2.641×10 ^{−4}	5.8	0.1	$I(\varepsilon+\beta^+)$: 0.1 +9−1.
(7.84×10 ³)	≈6321				0.0	
(8.14×10 ³)	≈6020	1.00	0.002	5.0	1.0	$I(\varepsilon+\beta^+)$: 1.0 +74−10.
(8.43×10 ³)	≈5733	4.89	0.01	4.4	4.9	$I(\varepsilon+\beta^+)$: 4.9 +13−49.
(8.70×10 ³)	≈5460	3.09	0.005	4.7	3.1	$I(\varepsilon+\beta^+)$: 3.1 +21−8.
(8960 15)	5200	4.69	0.01	4.5	4.7	$I(\varepsilon+\beta^+)$: 4.7 +15−47.
(9247 15)	4913	11.0	0.01	4.2	11.0	$I(\varepsilon+\beta^+)$: 11.0 +22−41.
(9308 15)	4852	37.7	0.05	3.7	37.7	$I(\varepsilon+\beta^+)$: 37.7 +75−47.
(9384 15)	4776				0.0	
(9760 15)	4400				0.0	

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^{60}Ga $\varepsilon+\beta^+$ decay: XUNDL-5 2025Ow01 (continued) ε, β^+ radiations (continued)

E(decay)	E(level)	$I\beta^+$ ‡	$I\varepsilon$ ‡	Log ft	$I(\varepsilon+\beta^+)$ ‡†	Comments
(9809 15)	4351				0.0	
(9960 15)	4200				0.0	
(9980 15)	4180				0.0	
(10188 15)	3972	8.59	0.01	4.6	8.6	$I(\varepsilon+\beta^+)$: 8.6 +28-16.
(10348 15)	3812	5.30	0.005	4.8	5.3	$I(\varepsilon+\beta^+)$: 5.3 +14-52.
(10352 15)	3808				0.0	
(10450 15)	3710				0.0	
(10533 15)	3627	5.79	0.005	4.8	5.8	$I(\varepsilon+\beta^+)$: 5.8 +11-12.
(10650 15)	3510	2.10	0.002	5.3	2.1	$I(\varepsilon+\beta^+)$: 2.1 +6-7.
(10960 15)	3200				0.0	
(11125 15)	3035	0.40	3.017×10^{-4}	6.1	0.4	$I(\varepsilon+\beta^+)$: 0.4 +3-4.
(11601 15)	2559	7.79	0.005	4.9	7.8	$I(\varepsilon+\beta^+)$: 7.8 +10-12.
(11967 15)	2193				0.0	
(13156 15)	1004	0.2		6.8	0.2	$I(\varepsilon+\beta^+)$: 0.2 +13-2.
(14160 15)	0	3.8 6	0.0014 2	5.7 1	3.8 6	

‡ 2025Ow01 extracts $I(\varepsilon+\beta^+)$ from the simultaneous χ^2 fit of the TAS, SoS, and multiplicity spectra and normalizes the sum to $\Sigma\%I(\varepsilon+\beta^+)=100$.

‡† Absolute intensity per 100 decays.