^{61}Ga ε decay (167 ms) 1999Oi01,2002We07

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Kazimierz Zuber, Balraj Singh	NDS 125, 1 (2015)	25-Jan-2015

Parent: ^{61}Ga: E=0.0; J$^{\pi}$=3/2$^-$; $T_{1/2}$=167 ms *3*; Q(ε)=9210 *40*; %ε+%β^+ decay=100.0

^{61}Ga-J$^{\pi}$,$T_{1/2}$: From ^{61}Ga Adopted Levels.

^{61}Ga-Q(ε): From 2012Wa38.

1999Oi01: ^{61}Ga source produced in fusion-evaporation reaction using a 121-MeV ^{36}Ar beam from the heavy-ion accelerator UNILAC at GSI and 1.9 mg/cm^2 natural Si-target. Evaporation residues were stopped in FEBIAD-B2-C ion source and mass separated by on-line mass separator. Using two Ge detectors, cylindrical plastic scintillator for detection positrons and 2 mm thick plastic scintillator in front of Ge detectors. Measured β-gated γ spectrum, Eγ, Iγ, Iβ, γ(t),β(t).

2002We07: isotopes were produced in spallation reactions induced by a pulsed beam of 1.4 GeV protons from the CERN PS-booster and impinging on a zirconium oxide target (8 g/cm^2 of Zr). Ionization of Ga atoms was performed using the Resonance Ionization Laser Ion Source (RILIS). Ions are accelerated by a 60 kV voltage and mass separated using the high-resolution mass separator (HRS). Measured β(t), $\beta\gamma$ coin, half-life, deduced Q(ε) and S(p). Beta Gamow-Teller strength calculations in large-scale shell-model using the Strasbourg code ANTOINE and the effective interaction KB3G.

Others:

2014Ro14: measured half-life of ^{61}Ga g.s.

1993Wi18: Using the A1200 (achromatic projectile fragment separator) radioactive beam facility at the NSCL of Michigan State University. The radioactive isotopes was produced by fragmentation of E=75 MeV/nucleon ^{78}Kr beam by 98% enriched ^{58}Ni target a thin (3 mg/cm^2) aluminum backing. Using Si detector telescope and β segmented plastic scintillator, measured half-life.

From RADLIST code, deduced total decay energy is 9236 keV *98* agrees with 9210 keV *40* from Q(ε) value.

^{61}Zn Levels

Note that in 1999-NDS (1999Bh04), 88.2, 418.3, and 756.0 levels were erroneously assigned half-lives of <430 ms, 0.14 s *7* and <130 ms, respectively. These half-lives in 1999Oi01 simply refer to the half-life of the decaying ^{61}Ga isotope.

E(level)†	J$^{\pi}$‡
0.0	3/2$^-$
88.2 *7*	1/2$^-$
123.3 *7*	5/2$^-$
418.3 *6*	3/2$^-$
756.0 *7*	5/2$^-$
938.2 *7*	1/2$^-$
1362.0? *10*	

† From a least-squares fit to the Eγ data.

‡ From Adopted Levels.

ε,β^+ radiations

Experimental and theoretical Gamow-Teller (B(GT)) strengths listed here are from 2002We07.

E(decay)	E(level)	Iβ^+ †	Iε†	Log *ft*	I(ε+β^+)†	Comments
(7.85×10^3‡ *4*)	1362.0?	≤0.010	≤2.×10^{-5}	≥7.3	≤0.01	av Eβ=3208 *20*; εK=0.00193 *4*; εL=0.000212 *4*; εM+=3.77×10^{-5} *7*
(8.27×10^3 *4*)	938.2	0.68 *18*	0.0012 *3*	5.6	0.68 *18*	av Eβ=3416 *20*; εK=0.00161 *3*; εL=0.000178 *3*; εM+=3.16×10^{-5} *6* (B(GT))$_{exp}$=0.2 *1* (B(GT))$_{theor}$=0.18.

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ϵ,β^+ radiations (continued)

E(decay)	E(level)	Iβ^+ [†]	Iε[†]	Log *ft*	I($\varepsilon+\beta^+$)[†]	Comments
(8.45×10^3 *4*)	756.0	0.86 *24*	0.0015 *4*	5.5	0.86 *24*	av Eβ=3506 *20*; εK=0.001501 *25*; εL=0.000165 *3*; εM+=2.94×10^{-5} *5* (B(GT))$_{exp}$=0.02 *1* (B(GT))$_{theor}$=0.00033.
(8.79×10^3 *4*)	418.3	1.3 *4*	0.0019 *6*	5.4	1.3 *4*	av Eβ=3672 *20*; εK=0.001316 *21*; εL=0.0001448 *2*; εM+=2.57×10^{-5} *4* (B(GT))$_{exp}$=0.02 *1* (B(GT))$_{theor}$=0.0034.
(9.09×10^3 *4*)	123.3	1.2 *4*	0.0016 *5*	5.5	1.2 *4*	av Eβ=3818 *20*; εK=0.001179 *18*; εL=0.0001297 *2*; εM+=2.31×10^{-5} *4* (B(GT))$_{exp}$=0.02 *1* (B(GT))$_{theor}$=0.0012.
(9.12×10^3 *4*)	88.2	1.9 *6*	0.0025 *8*	5.4	1.9 *6*	av Eβ=3835 *20*; εK=0.001164 *18*; εL=0.0001280 *1*; εM+=2.28×10^{-5} *4* (B(GT))$_{exp}$=0.04 *1* (B(GT))$_{theor}$=0.0068.
(9.21×10^3 *4*)	0.0	93.9 *10*	0.120 *2*	3.7	94.0 *10*	av Eβ=3879 *20*; εK=0.001127 *17*; εL=0.0001240 *1*; εM+=2.20×10^{-5} *4* (B(GT))$_{exp}$=0.28 *7* (B(GT))$_{theor}$=0.35.

[†] Absolute intensity per 100 decays.
[‡] Existence of this branch is questionable.

$\gamma(^{61}Zn)$

Iγ normalization: Summed transition intensity=6 *1*, based on level scheme of 2002We07 with I($\varepsilon+\beta^+$)(g.s.)=94.0% *10* and upper limit for the delayed proton emission probability of 0.25% (2002We07).

E$_\gamma$[†]	I$_\gamma$[†&]	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Mult.[@]	δ[@]	α[a]	Comments
87.6[‡] *10*	100 *16*	88.2	1/2$^-$	0.0	3/2$^-$	(M1+E2)	≈0.2	0.126 *21*	α(K)=0.112 *19*; α(L)=0.0125 *23*; α(M)=0.0018 *4*; α(N)=6.3×10^{-5} *10* α: assuming 25% uncertainty on δ(E2/M1). δ: 2002We07 suggest δ=0.2 or 3.8 based on A$_2$=−0.03 *3* for the 88γ in $\gamma(\theta)$ data from 1982Sm01. Lower value is adopted here, higher value will suggest a long lifetime for the level. Additional information 1.
122.9[‡] *10*	62 *11*	123.3	5/2$^-$	0.0	3/2$^-$	M1+E2	−0.05 *2*	0.0352 *8*	Additional information 2. δ: from Adopted Gammas.
295.5[#b]	≤2[#]	418.3	3/2$^-$	123.3	5/2$^-$	(M1+E2)	−0.44 *37*	0.0051 *19*	
330	4 *1*	418.3	3/2$^-$	88.2	1/2$^-$	(M1+E2)	+0.27 *13*	0.0032 *4*	
337.5[#b]	≤2[#]	756.0	5/2$^-$	418.3	3/2$^-$				
418.4[‡] *8*	72 *12*	418.3	3/2$^-$	0.0	3/2$^-$	M1+E2	−0.10 *5*		Additional information 3.
520	9 *2*	938.2	1/2$^-$	418.3	3/2$^-$				
633[#b]	≤1[#]	756.0	5/2$^-$	123.3	5/2$^-$				
754.5[‡] *12*	44 *8*	756.0	5/2$^-$	0.0	3/2$^-$	M1+E2	−0.07 *4*		Additional information 4.

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$\gamma(^{61}Zn)$ (continued)

E_γ [†]	I_γ [†&]	E_i(level)	J^π_i	E_f	J^π_f	Comments
850	6 *2*	938.2	1/2⁻	88.2	1/2⁻	
938	21 *4*	938.2	1/2⁻	0.0	3/2⁻	Additional information 5.
1362 [#b]	≤0.5 [#]	1362.0?		0.0	3/2⁻	Additional information 6.

† From 2002We07 unless otherwise stated.

‡ From 1999Oi01. The corresponding value in 2002We07 is given without uncertainty.

2002We07 quote energy from high-spin studies by 1982Sm01 and 1984Th07. This γ not observed in 2002We07, only an upper limit of intensity is given.

@ From Adopted Gammas.

& For absolute intensity per 100 decays, multiply by 0.019 *4*.

a 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.

b Placement of transition in the level scheme is uncertain.

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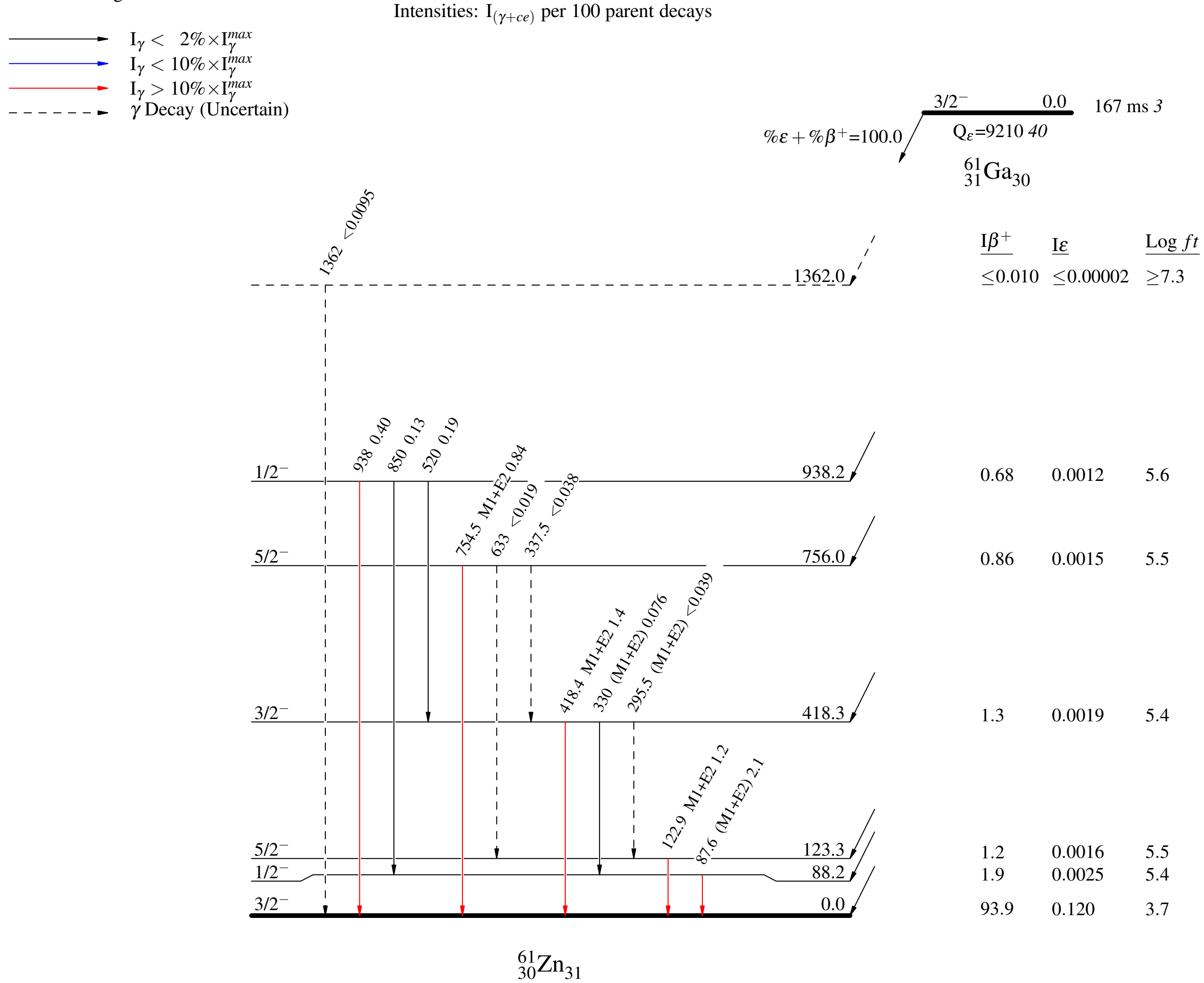
Decay Scheme

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



		Iβ⁺	Iε	Log ft
	1362.0	≤0.010	≤0.00002	≥7.3
1/2⁻	938.2	0.68	0.0012	5.6
5/2⁻	756.0	0.86	0.0015	5.5
3/2⁻	418.3	1.3	0.0019	5.4
5/2⁻	123.3	1.2	0.0016	5.5
1/2⁻	88.2	1.9	0.0025	5.4
3/2⁻	0.0	93.9	0.120	3.7