^{71}Zn β^- decay (2.42 min) 1970Zo01,1961Th04

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 188,1 (2023)	17-Jan-2023

Parent: ^{71}Zn: E=0.0; $J^\pi=1/2^-$; $T_{1/2}$=2.42 min *10*; Q(β^-)=2810.3 *28*; %β^- decay=100

^{71}Zn-J^π,$T_{1/2}$: From Adopted Levels of ^{71}Zn.

^{71}Zn-Q(β^-): From 2021Wa16.

1970Zo01: ^{71}Zn source was produced by ^{70}Zn(n,γ) with neutrons from the MIT reactor on an enriched ^{70}Zn target. Measured Eγ, Iγ, $\gamma\gamma$-coin with NaI and Ge(Li) detectors. Deduced levels, J, π, β-decay branching ratios, log *ft*. Comparisons with available data and theoretical calculations.

1961Th04: measured Eγ, Iγ, $\gamma\gamma$, $\beta\gamma$ coin, $T_{1/2}$, β^- spectrum and β-γ coincidences; Fermi-Kurie analysis.

Other measurements:

Eγ, Iγ data: 1967Li01, 1955Le03.

$\beta\gamma$, $\gamma\gamma$ coin: 1955Le03.

$T_{1/2}$ of ^{71}Zn g.s. decay: 1962Ma24, 1958Le26, 1955Le03.

The decay scheme is from 1970Zo01, and considered as incomplete by the evaluators due to a large gap between Q-value and the highest observed excited states.

^{71}Ga Levels

E(level)†	J^π‡	$T_{1/2}$‡
0.0	$3/2^-$	stable
390.05 *9*	$1/2^-$	0.40 ps *+28−12*
487.3 *1*	$5/2^-$	62 ps *38*
511.59 *8*	$3/2^-$	1.5 ps *7*
910.34 *8*	$3/2^-$	0.46 ps *22*
964.79 *13*	$5/2^-$	1.3 ps *2*
1109.3 *5*	$1/2^-$	95 fs *12*
1631.61 *10*	$3/2^-$	0.15 ps *+12−6*
2064.63 *19*	$1/2^-$,$3/2^-$	82 fs *40*
2294.49 *24*	$1/2^-$	

† From a least-squares fit to Eγ data.

‡ From the Adopted Levels.

β^- radiations

E(decay)	E(level)	Iβ^-†‡	Log *ft*†	Comments
(515.8 *28*)	2294.49	0.23	4.9	av Eβ=166.0 *11*
(745.7 *28*)	2064.63	0.07	6.0	av Eβ=255.7 *12*
(1178.7 *28*)	1631.61	4.1	4.9	av Eβ=438.0 *13*
(1701.0 *29*)	1109.3	0.16	7.0	av Eβ=671.5 *14*
(1845.5 *28*)	964.79	≤0.08	≥7.4	av Eβ=737.8 *14*
(1900.0 *28*)	910.34	8.0	5.5	av Eβ=762.9 *14*
(2298.7 *28*)	511.59	32	5.2	av Eβ=948.6 *14*
(2323.0 *28*)	487.3	<0.02	>8.4	av Eβ=960.0 *14*
(2420.3 *28*)	390.05	0.4	7.2	av Eβ=1005.7 *14*
2.61×10^3 *5*	0.0	55	5.4	av Eβ=1190.4 *14*
				Iβ^-: 82 *4* from 1961Th04.

† β^- feedings from intensity balance of γ rays. Values are only approximate, with no uncertainty estimate given for Iγ normalization due to incomplete decay scheme.

‡ Absolute intensity per 100 decays.

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$\gamma(^{71}Ga)$

Iγ normalization: from measurement of β-ray spectrum and separation of ^{71}Zn isomer from decay curves, 1970Zo01 determined that 512γ is emitted in 32% of the 2.45-min ^{71}Zn β^- activity. No uncertainty was given by 1970Zo01. This value is disagrees with the earlier less complete data of 1961Th04 which give Iγ(512γ)=13%.

E_γ[†]	I_γ[†#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[‡]	α[@]	Comments
121.52 *5*	9.3 *9*	511.59	3/2$^-$	390.05	1/2$^-$	(M1(+E2))	−0.01 *+13−16*	0.041 *8*	α(K)=0.037 *7*; α(L)=0.0039 *9*; α(M)=0.00057 *13* α(N)=3.0×10^{-5} *6*
390.0 *3*	12 *1*	390.05	1/2$^-$	0.0	3/2$^-$	(M1+E2)	0.0047 *+35−30*	2.21×10^{-3} *3*	α(K)=0.001976 *28*; α(L)=0.0002022 *29*; α(M)=2.96×10^{-5} *4* α(N)=1.596×10^{-6} *23*
398.6 *2*	1.9 *2*	910.34	3/2$^-$	511.59	3/2$^-$				
423.2 *3*	0.12 *1*	910.34	3/2$^-$	487.3	5/2$^-$				
453.1 *2*	0.55 *6*	964.79	5/2$^-$	511.59	3/2$^-$				
487.3 *1*	0.37 *4*	487.3	5/2$^-$	0.0	3/2$^-$	(M1+E2)	−0.024 *13*	1.32×10^{-3} *2*	α(K)=0.001181 *17*; α(L)=0.0001203 *17*; α(M)=1.760×10^{-5} *25* α(N)=9.52×10^{-7} *13*
511.6 *1*	100	511.59	3/2$^-$	0.0	3/2$^-$	M1+E2	−0.37 *6*	1.28×10^{-3} *4*	α(K)=0.001146 *31*; α(L)=0.0001171 *33*; α(M)=1.71×10^{-5} *5* α(N)=9.21×10^{-7} *24*
520.5 *2*	0.25 *2*	910.34	3/2$^-$	390.05	1/2$^-$				
575.1 *5*	0.09 *1*	964.79	5/2$^-$	390.05	1/2$^-$				
666.8 *2*	2.8 *3*	1631.61	3/2$^-$	964.79	5/2$^-$				
721.4 *3*	1.7 *2*	1631.61	3/2$^-$	910.34	3/2$^-$				
910.3 *1*	24.5 *20*	910.34	3/2$^-$	0.0	3/2$^-$	(M1+E2)	0.09 *5*	0.000339 *5*	α(K)=0.000303 *4*; α(L)=3.06×10^{-5} *4*; α(M)=4.48×10^{-6} *6* α(N)=2.430×10^{-7} *34*
964.8 *2*	2.4 *2*	964.79	5/2$^-$	0.0	3/2$^-$	M1+E2	+1.3 *3*	0.000333 *8*	α(K)=0.000298 *7*; α(L)=3.02×10^{-5} *8*; α(M)=4.41×10^{-6} *11* α(N)=2.38×10^{-7} *6*
1109.3 *5*	0.51 *8*	1109.3	1/2$^-$	0.0	3/2$^-$	(M1+E2)	0.19 *2*	0.0002278 *32*	α(K)=0.0002034 *29*; α(L)=2.046×10^{-5} *29*; α(M)=2.99×10^{-6} *4* α(N)=1.626×10^{-7} *23*; α(IPF)=7.58×10^{-7} *16*
1120.0 *1*	6.8 *7*	1631.61	3/2$^-$	511.59	3/2$^-$				
1144.2 *3*	0.25 *3*	1631.61	3/2$^-$	487.3	5/2$^-$				
1241.5 *5*	0.10 *1*	1631.61	3/2$^-$	390.05	1/2$^-$				
[x]1267.0 *10*	0.028 *3*								
1383.8 *5*	0.11 *1*	2294.49	1/2$^-$	910.34	3/2$^-$				
1553.0 *5*	0.08 *1*	2064.63	1/2$^-$,3/2$^-$	511.59	3/2$^-$				

$^{71}_{31}Ga_{40}$-2

^{71}Zn β^- decay (2.42 min) 1970Zo01,1961Th04 (continued)

$\gamma(^{71}Ga)$ (continued)

E_γ [†]	I_γ [†#]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	α [@]	Comments
1631.6 *2*	1.2 *1*	1631.61	3/2$^-$	0.0	3/2$^-$	(M1+E2)	0.000236 *17*	α(K)=9.84×10^{-5} *27*; α(L)=9.87×10^{-6} *28*; α(M)=1.44×10^{-6} *4* α(N)=7.84×10^{-8} *21*; α(IPF)=0.000126 *15*
1904.4 *3*	0.53 *5*	2294.49	1/2$^-$	390.05	1/2$^-$			
2064.6 *2*	0.14 *2*	2064.63	1/2$^-$,3/2$^-$	0.0	3/2$^-$			
2294.8 *5*	0.08 *1*	2294.49	1/2$^-$	0.0	3/2$^-$			

† From 1970Zo01.
‡ From the Adopted Gammas.
# For absolute intensity per 100 decays, multiply by 0.32.
@ 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.
x γ ray not placed in level scheme.

$^{71}_{31}Ga_{40}$-3

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Decay Scheme

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