^{73}Ga β^- decay (4.86 h)   1976Fo07

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 158, 1 (2019)	16-May-2019

Parent: ^{73}Ga: E=0.0; J^π=1/2$^-$; T$_{1/2}$=4.86 h 3; Q(β^-)=1598.2 17; %β^- decay=100.0

^{73}Ga-J^π,T$_{1/2}$: From Adopted Levels of ^{73}Ga.

^{73}Ga-Q(β^-): From 2017Wa10.

1976Fo07: ^{73}Ga source was produced from irradiation of natural Ge powder with neutrons provided by the neutron generator of the University of Helsinki and the betatron of the Department of Radiotherapy. γ rays were detected with Ge(Li) detectors. Measured Eγ, Iγ, $\gamma\gamma$-coin. Deduced levels, J, π, β-decay branchings, log ft.

1970Wa21: ^{73}Ga source was produced via fast neutron (n,p) reaction on enriched ^{73}Ge and (n,fission) reaction on ^{232}Th and ^{238}U with neutrons from the University of Arkansas 400-KV Cockcroft-Walton linear accelerator. γ rays were detected Ge(Li) and NaI(Tl) detectors and β particles were detected with a cylindrical plastic detector. Measured Eγ, Iγ, Eβ, Iβ, $\gamma\gamma$-coin, $\beta\gamma$-coin, β(t). Deduced levels, J, π, β-decay branchings, parent T$_{1/2}$.

1969Cl11: Measured Eγ with Si(Li) detectors. No level scheme is given.

Others: 1958Yt22, 1959Ma04, 1972Er05, 1960Ku04, 1966Sc14, 1979BeYN.

Level scheme is from 1976Fo07.

^{73}Ge Levels

E(level)[†]	J^{π}[‡]	T$_{1/2}$[‡]	E(level)[†]	J^{π}[‡]
0.0	9/2$^+$		392.46 6	3/2$^-$
13.2845 15	5/2$^+$	2.91 μs 3	554.93 10	1/2$^+$
66.75 5	1/2$^-$	0.499 s 11	894.1 4	1/2$^-$,3/2$^-$
68.72 19	7/2$^+$	1.78 ns 11	915.5 4	5/2$^+$
353.6 3	(5/2)$^-$		1131.88 7	1/2$^-$
364.07 7	3/2$^-$		1386.1 3	(3/2$^-$)

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

[‡] From Adopted Levels.

β^- radiations

E(decay)	E(level)	Iβ^{-}[†‡]	Log ft	Comments
(212.1 17)	1386.1	0.14 4	5.9 1	av Eβ=60.03 55
(466.3 17)	1131.88	7.2 3	5.32 2	av Eβ=147.24 63
(682.7[#] 18)	915.5	0.08 5	7.9^{1u} 3	av Eβ=229.91 70
(704.1 18)	894.1	0.15 5	7.6 2	av Eβ=238.45 70
(1043.3 17)	554.93	0.51 6	7.74 6	av Eβ=378.73 73
(1205.7 17)	392.46	7.1 4	6.83 3	av Eβ=448.90 75
(1234.1 17)	364.07	78.6 10	5.83 1	av Eβ=461.31 75
				Additional information 1.
(1244.6[#] 17)	353.6	0.14 7	8.6 2	av Eβ=465.89 76
				Iβ^-: none expected from 1/2$^-$ to (5/2)$^-$ β transition.
(1531.4 17)	66.75	5.9 10	7.32 8	av Eβ=593.52 77
				Iβ^-: from 100$-\Sigma$%I(γ+ce to 66.7+13.3+g.s. from levels above 66.7). A value of 9 1 is deduced by 1970Wa21 from 100$-$[%Iγ(297.3γ)+%Iγ(325.7γ)=91 1] with the latter from comparison of total Iβ and I($\beta\gamma$) on the 295-328 keV γ region, but this value does not exclude γ feedings to the 66.7 level and levels below from levels above 392 level as well as γ feedings to 13.3 level from 364 and 392 levels, since those γ rays are not observed in 1970Wa21 but are observed in 1976Fo07.

^{73}Ga β^- decay (4.86 h)   1976Fo07 (continued)

β^- radiations (continued)

[†] From γ+ce intensity imbalance at each level, unless otherwise noted.
[‡] Absolute intensity per 100 decays.
[#] Existence of this branch is questionable.

^{73}Ga β^- decay (4.86 h)   **1976Fo07** (continued)

$\gamma(^{73}\text{Ge})$

Iγ normalization: From Iγ(297.3γ)+Iγ(325.7γ)=91 *1* obtained from comparison of total Iβ and I($\beta\gamma$) in the 295-328 keV γ-spectral region (1970Wa21).

E_γ[†]	I_γ[†#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[‡]	α[@]	Comments
13.2845 *15*		13.2845	$5/2^+$	0.0	$9/2^+$	E2		1067	α(K)=299 *5*; α(L)=669 *11*; α(M)=97.0 *15* α(N)=1.536 *24* E$_\gamma$,Mult.: from ^{73}As ε decay, not seen in 1976Fo07.
53.45 *5*	13.12	66.75	$1/2^-$	13.2845	$5/2^+$	M2		8.41	α(K)=7.19 *11*; α(L)=1.053 *16*; α(M)=0.1599 *24* α(N)=0.00925 *14* %Iγ=10.47 *22* E$_\gamma$: others: 53.39 *20* (1969Cl11), 54 *1* (1970Wa21). I$_\gamma$: deduced by the evaluators from ΣI(γ+ce to 66.7 level)+I(β feeding to 66.7 level) relative to I(297γ)=100 and theoretical α=8.4. A value of 9.6 *12* is from weighted average of 9.1 *8* in 1970Wa21, 9 *1* in 1958Yt22 and 15 *2* in 1959Ma04. Note that 1976Fo07 give a discrepant value of 22 *5*, which implies a 44% β^- feeding to the 67 level inconsistent with β measurements (1970Wa21, 1958Yt22, 1959Ma04). The average value from β measurements, on the other hand, gives a negative intensity balance.
68.7 *2*	0.5 *1*	68.72	$7/2^+$	0.0	$9/2^+$	M1+E2	0.074 *4*	0.236 *5*	%Iγ=0.40 *8* α(K)=0.209 *4*; α(L)=0.0231 *5*; α(M)=0.00345 *8* α(N)=0.000217 *4* E$_\gamma$: other: 68.66 *30* (1969Cl11).
216.3 *4*	0.12 *3*	1131.88	$1/2^-$	915.5	$5/2^+$				%Iγ=0.096 *24*
284.9 *2*	0.40 *6*	353.6	$(5/2)^-$	68.72	$7/2^+$				%Iγ=0.32 *5* E$_\gamma$: other: 285.00 *30* (1969Cl11).
297.32 *5*	100 *2*	364.07	$3/2^-$	66.75	$1/2^-$				%Iγ=79.8 *10* E$_\gamma$: others: 297.37 *20* (1969Cl11), 295 *1* (1970Wa21).
325.70 *7*	14.0 *3*	392.46	$3/2^-$	66.75	$1/2^-$				%Iγ=11.2 *4* E$_\gamma$: others: 325.74 *25* (1969Cl11), 328 *1* (1970Wa21). I$_\gamma$: other: 17.5 *12* (1970Wa21).
351.0 *4*	0.26 *4*	364.07	$3/2^-$	13.2845	$5/2^+$				%Iγ=0.21 *4* I$_\gamma$: possibly partly due to background (1976Fo07).
379.2 *1*	0.61 *3*	392.46	$3/2^-$	13.2845	$5/2^+$				%Iγ=0.49 *3* E$_\gamma$: other: 379.3 *4* (1969Cl11).
488.2 *1*	0.45 *3*	554.93	$1/2^+$	66.75	$1/2^-$				%Iγ=0.36 *3*
501.6 *4*	0.19 *6*	894.1	$1/2^-,3/2^-$	392.46	$3/2^-$				%Iγ=0.15 *5*
541.7 *2*	0.38 *4*	554.93	$1/2^+$	13.2845	$5/2^+$				%Iγ=0.30 *4*
561.8 *4*	0.22 *5*	915.5	$5/2^+$	353.6	$(5/2)^-$				%Iγ=0.18 *4*
577.2 *3*	0.19 *5*	1131.88	$1/2^-$	554.93	$1/2^+$				%Iγ=0.15 *4*
739.42 *5*	5.3 *3*	1131.88	$1/2^-$	392.46	$3/2^-$				%Iγ=4.2 *3*

^{73}Ga β^- **decay (4.86 h)**   **1976Fo07 (continued)**

$\gamma(^{73}$Ge) (continued)

E_γ [†]	I_γ [†#]	E_i(level)	J_i^π	E_f	J_f^π	Comments
						E_γ: others: 739.37 25 (1969Cl11), 740 3.
						I_γ: other: 5.5 14 (1970Wa21).
767.8 1	1.8 1	1131.88	1/2$^-$	364.07	3/2$^-$	%Iγ=1.44 9
						E_γ: other: 767.9 4 (1969Cl11).
^{x}833.3 4						E_γ: from 1969Cl11.
993.6 3	0.18 4	1386.1	(3/2$^-$)	392.46	3/2$^-$	%Iγ=0.14 4
1065.1 1	1.6 1	1131.88	1/2$^-$	66.75	1/2$^-$	%Iγ=1.28 9

[†] From 1976Fo07, unless otherwise noted. Quoted values of intensities are relative to I(297.32γ)=100 2.

[‡] From Adopted Gammas.

[#] For absolute intensity per 100 decays, multiply by 0.798 17.

[@] 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.

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Decay Scheme

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

Legend

I$_\gamma$ <　2%×I$_\gamma^{max}$
I$_\gamma$ < 10%×I$_\gamma^{max}$
I$_\gamma$ > 10%×I$_\gamma^{max}$
● Coincidence

$^{73}_{31}$Ga$_{42}$

$^{73}_{32}$Ge$_{41}$