^{149}Cs β^- decay (107 ms) 2017Li06

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 185, 2 (2022)	23-Aug-2022

Parent: ^{149}Cs: E=0; $T_{1/2}$=107 ms *6*; Q(β^-)=953×10[1] *SY*; %β^- decay=100.0

^{149}Cs-$T_{1/2}$: From ^{149}Cs Adopted Levels.

^{149}Cs-Q(β^-): 9530 *400* (syst,2021Wa16).

^{149}Cs-%β^- decay: %β^-n=25 *4* (2017Li06, from the ratio of number of ^{148}Ba and ^{149}Cs nuclei using absolute γ-ray intensities in ^{149}Ba, ^{148}La and ^{148}Cs, the latter two from β^-n decay modes).

2017Li06: ^{149}Cs produced at ISOLDE-CERN facility through U(p,X) reaction with E(p)=1.4 GeV beam from the PS-Booster incident on UC_x target. Measured yield, Eγ, Iγ, $\beta\gamma$-coin, $\gamma\gamma$-coin, half-life of ground state of ^{149}Cs isotope from γ-decay curves using plastic scintillation detectors for β particles, two $LaBr_3$(Ce) and four HPGe clover detectors for γ detection. Deduced levels, β feedings.

Total decay energy deposit of 7.38 MeV *50* calculated by RADLIST code is lower than the systematics value of 9.53 MeV (2021Wa16), which indicates the incompleteness of the decay scheme.

^{149}Ba Levels

E(level)[†]	J^π[‡]	$T_{1/2}$[#]	Comments
0.0	(5/2$^-$,3/2$^-$)	352 ms *6*	J^π: 5/2$^-$ proposed by 2017Li06 based on comparison with J^π=(5/2$^-$) for ^{147}Ba g.s., but mention that 3/2$^-$ is also possible, as 2005Sy01 assigned 3/2$^-$ for g.s. of ^{147}Ba. $T_{1/2}$: from the Adopted Levels.
46.87 *10*	(1/2 to 7/2)[$^-$]	0.6 ns *2*	
68.19 *9*	(1/2 to 7/2)[$^-$]	0.6 ns *5*	
124.93 *13*			
164.79 *20*	(1/2 to 7/2)$^{(+)}$		
236.45 *10*			
279.27 *12*			
282.73 *10*			
316.56 *9*			
362.29 *23*			
389.64 *13*			
481.83 *25*			
488.05 *10*			
665.33 *9*			
682.56 *17*			
727.05 *16*			
911.3 *21*			
917.7 *4*			
3357.0+x			S(n)(^{149}Ba)=3357.0 *29* (2021Wa16). x<[Q(β^-)−S(n)] i.e. x<6173 *300*. This represents a range of unobserved levels that subsequently decay to ^{148}Ba via one-neutron emission.

[†] From a least-squares fit to Eγ values. Uncertainties of 205.9γ and 487.7γ were doubled to 0.24 and 0.22 keV, respectively to obtain a better fit for the 488-keV level.

[‡] From the Adopted Levels.

[#] From $\beta\gamma$(t) (2017Li06) for excited states. Values are adopted in the Adopted Levels.

^{149}Cs β^- decay (107 ms) 2017Li06 (continued)

β^- radiations

E(decay)	E(level)	Iβ^-[†][#]	Log *ft*[‡]	Comments
(3086[&] *SY*)	3357.0+x	25 *4*		Iβ^-: %β^-n=25 *4* (2017Li06, from the ratio of number of ^{148}Ba and ^{149}Cs nuclei using absolute γ-ray intensities in ^{149}Ba, ^{148}La and ^{148}Cs, the latter two from β^-n decay modes.
(8612 *SY*)	917.7	0.58 *12*	6.7	av Eβ=3.86×10^3 *19*
(8618 *SY*)	911.3	0.25 *7*	7.1	av Eβ=3.86×10^3 *19*
(8802 *SY*)	727.05	0.64 *12*	6.7	av Eβ=3.95×10^3 *19*
(8847 *SY*)	682.56	0.32 *8*	7.0	av Eβ=3.97×10^3 *19*
(8864 *SY*)	665.33	3.1 *6*	6.0	av Eβ=3.97×10^3 *19*
(9041 *SY*)	488.05	4.0 *7*	6.0	av Eβ=4.06×10^3 *19*
(9048 *SY*)	481.83	0.27 *8*	7.1	av Eβ=4.06×10^3 *19*
(9140 *SY*)	389.64	0.23 *13*	7.2	av Eβ=4.10×10^3 *19*
(9167 *SY*)	362.29	0.61 *21*	6.8	av Eβ=4.12×10^3 *19*
(9213 *SY*)	316.56	3.4 *7*	6.1	av Eβ=4.14×10^3 *19*
(9247 *SY*)	282.73	1.6 *4*	6.4	av Eβ=4.15×10^3 *19*
(9250 *SY*)	279.27	0.91 *18*	6.7	av Eβ=4.15×10^3 *19*
(9293 *SY*)	236.45	1.7 *4*	6.4	av Eβ=4.17×10^3 *19*
(9365 *SY*)	164.79	0.31 *6*	7.2	av Eβ=4.21×10^3 *19*
(9405[@] *SY*)	124.93	1.0 *8*	6.6	av Eβ=4.23×10^3 *19*
(9461 *SY*)	68.19	5.3 *10*	5.9	av Eβ=4.25×10^3 *19*
(9483 *SY*)	46.87	5.6 *13*	5.9	av Eβ=4.26×10^3 *19*
(9530 *SY*)	0.0	45 *6*	5.02 *11*	av Eβ=4.28×10^3 *19*

[†] Deduced by evaluators from intensity balances and adopting %β^-n=25 *4*. All values, except for the 25% feeding to levels above the neutron-separation energy, should be treated as apparent i.e. as upper limits, since a significant contribution is expected from higher levels populated due to large Q(β) values.
[‡] Deduced by evaluators using the log *ft* code. All values should be treated as lower limits. See comment for Iβ feedings.
[#] Absolute intensity per 100 decays.
[@] Existence of this branch is questionable.
[&] Estimated for a range of levels.

$\gamma(^{149}Ba)$

Iγ normalization: From 2017Li06, based on normalizing total number of decays to the number of daughter nuclei ^{149}La and ^{149}Ce.

E$_\gamma$[†]	I$_\gamma$[†@]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.[‡]	α[&]	Comments
46.80 *18*	14.0 *5*	46.87	(1/2 to 7/2)[−]	0.0	(5/2$^-$,3/2$^-$)	[M1][#]	8.87 *16*	%Iγ=0.84 *14* α(K)=7.57 *14*; α(L)=1.031 *19*; α(M)=0.213 *4* α(N)=0.0459 *8*; α(O)=0.00700 *13*; α(P)=0.000502 *9*
68.10 *13*	35.8 *11*	68.19	(1/2 to 7/2)[−]	0.0	(5/2$^-$,3/2$^-$)	[M1][#]	2.98 *4*	%Iγ=2.1 *4* α(K)=2.55 *4*; α(L)=0.344 *5*; α(M)=0.0710 *11* α(N)=0.01531 *23*; α(O)=0.002338 *35*; α(P)=0.0001681 *25*
78.20 *13*	5.3 *14*	124.93		46.87	(1/2 to 7/2)[−]	[D,E2]	2.6 *21*	%Iγ=0.32 *10*
96.60 *18*	5.2 *5*	164.79	(1/2 to 7/2)$^{(+)}$	68.19	(1/2 to 7/2)[−]	(E1)	0.250 *4*	%Iγ=0.31 *3*

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^{149}Cs β^- decay (107 ms) 2017Li06 (continued)

$\gamma(^{149}Ba)$ (continued)

E_γ [†]	I_γ [†@]	E_i(level)	E_f	J^π_f	Mult.[‡]	α[&]	Comments
							α(K)=0.2135 *32*; α(L)=0.0291 *4*; α(M)=0.00597 *9* α(N)=0.001267 *19*; α(O)=0.0001857 *28*; α(P)=1.106×10^{-5} *16* Mult.: from lack of observation of Ba x-rays in coincidence with the 68.1γ.
[x]118.00 *13*	7.9 *15*						%Iγ=0.47 *12* E_γ: its assignment to ^{149}Ba is from similar time behavior as for the other gamma rays, and even though there can be two possible locations (between 165 to 47 level and/or 283 to 165 levels) based on energy matching, the $\gamma\gamma$-coincidence data do not permit such placement, thus kept as an unplaced γ ray, as per e-mail reply of July 4, 2017 from R. Lica to B. Singh, which mentioned that the coincidence data were reanalyzed for the 118γ.
124.70 *23*	4.1 *6*	124.93	0.0	(5/2$^-$,3/2$^-$)	[D,E2]	0.5 *4*	%Iγ=0.25 *5*
168.10 *11*	20.7 *26*	236.45	68.19	(1/2 to 7/2)[$^-$]	[D,E2]	0.18 *13*	%Iγ=1.24 *26*
171.60 *13*	20.8 *13*	488.05	316.56		[D,E2]	0.17 *12*	%Iγ=1.25 *22*
189.50 *30*	8.5 *13*	236.45	46.87	(1/2 to 7/2)[$^-$]	[D,E2]	0.12 *8*	%Iγ=0.51 *12*
205.90 *12*	10.5 *9*	488.05	282.73				%Iγ=0.63 *12*
211.20 *11*	9.6 *13*	279.27	68.19	(1/2 to 7/2)[$^-$]			%Iγ=0.58 *12*
236.70 *13*	5.0 *14*	236.45	0.0	(5/2$^-$,3/2$^-$)			%Iγ=0.30 *10*
248.20 *46*	5.3 *10*	316.56	68.19	(1/2 to 7/2)[$^-$]			%Iγ=0.32 *8*
275.90 *21*	4.4 *6*	665.33	389.64				%Iγ=0.26 *6*
279.00 *17*	5.5 *8*	279.27	0.0	(5/2$^-$,3/2$^-$)			%Iγ=0.33 *7*
282.90 *13*	57.5 *34*	282.73	0.0	(5/2$^-$,3/2$^-$)			%Iγ=3.4 *6*
294.10 *21*	10.2 *30*	362.29	68.19	(1/2 to 7/2)[$^-$]			%Iγ=0.61 *21*
316.6 *1*	100.0 *54*	316.56	0.0	(5/2$^-$,3/2$^-$)			%Iγ=6.0 *11*
342.90 *19*	5.9 *9*	389.64	46.87	(1/2 to 7/2)[$^-$]			%Iγ=0.35 *8*
348.60 *24*	5.6 *8*	665.33	316.56				%Iγ=0.34 *7*
356.90 *21*	4.5 *10*	481.83	124.93				%Iγ=0.27 *7*
363.30 *21*	4.5 *13*	488.05	124.93				%Iγ=0.27 *9*
366.00 *14*	5.3 *10*	682.56	316.56				%Iγ=0.32 *8*
382.60 *11*	19.7 *10*	665.33	282.73				%Iγ=1.18 *21*
389.70 *21*	2.4 *17*	389.64	0.0	(5/2$^-$,3/2$^-$)			%Iγ=0.14 *10*
441.00 *12*	9.8 *9*	488.05	46.87	(1/2 to 7/2)[$^-$]			%Iγ=0.59 *11*
487.70 *11*	17.4 *12*	488.05	0.0	(5/2$^-$,3/2$^-$)			%Iγ=1.04 *19*
490.60 *13*	10.7 *9*	727.05	236.45				%Iγ=0.64 *12*
594.7 *21*	4.1 *8*	911.3	316.56				%Iγ=0.25 *6* E_γ: value of 595.7 in level-scheme Fig. 7 of 2017Li06 seems a misprint, as the level-energy difference suggests. Value listed here is from e-mail reply from the authors.
601.10 *32*	9.6 *10*	917.7	316.56				%Iγ=0.58 *11*
665.30 *11*	21.4 *13*	665.33	0.0	(5/2$^-$,3/2$^-$)			%Iγ=1.28 *23*

[†] From e-mail reply of April 18, 2017 from R. Lica to B. Singh.
[‡] Mult=[D,E2] assumed by evaluators to account for conversion coefficients.
[#] From analogy with ^{147}Ba structure. Pure E2 is not allowed by RUL.
[@] For absolute intensity per 100 decays, multiply by 0.06.

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^{149}Cs β^- decay (107 ms) 2017Li06 (continued)

$\gamma(^{149}Ba)$ (continued)

[&] 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.

^{149}Cs β^- decay (107 ms) 2017Li06

Decay Scheme

Intensities: I_γ per 100 parent decays