^{115}Cd β^- decay (53.46 h) 1978He08,1967Ba18,1974Bo26

Type	Author	History Citation	Literature Cutoff Date
Update	Balraj Singh	ENSDF	03-Jun-2019

Parent: ^{115}Cd: E=0.0; $J^\pi=1/2^+$; $T_{1/2}$=53.46 h *5*; Q(β^-)=1451.9 *7*; %β^- decay=100.0

^{115}Cd-J^π,$T_{1/2}$: From ^{115}Cd Adopted Levels.

^{115}Cd-Q(β^-): From 2017Wa10.

Previous dataset in 2012Bl10 evaluation corrected and updated by B. Singh (McMaster), June 03, 2019.

Literature (NSR) search did not indicate any newer experimental studies of this decay. The Q value has been adopted from 2017Wa10. Revised mixing ratio of 35.6-keV transition has been deduced using BrIccMixing code. E5 admixture in the 336-keV transition from the isomer is deduced from conversion data, and discussed in terms of realistic B(E5) transition probability. The β feedings and log *ft* values have been re-evaluated. 2013Ha24 is a theoretical study of ^{115}Cd decay with the calculation of partial half-lives of possible 4th-forbidden decays to 1418 and 1449 levels, both with $J^\pi=9/2^+$. Note that none of these two levels have been populated in the available experimental studies of the decay of the ground state of ^{115}Cd.

Additional information 1.

1978He08: measured Eγ, Iγ using Compton-suppressed Ge detectors.

1967Ba18: measured Eγ, Iγ, ce, $\beta\gamma$(t) and γ(ce)(t).

1974Bo26: measured Eγ, Iγ, x rays, ce, $\beta\gamma$-coin.

Others (γ and ce data): 1974HeYW, 1973Is03, 1967Mc13, 1966Gr14, 1966Pa07, 1964Bo19, 1963Ha24.

$\gamma\gamma(\theta)$: 1975Bo29, 1973Ba29, 1970Be79, 1968Ba32, 1963Ha24.

^{115}In Levels

E(level)[†]	J^π[‡]	$T_{1/2}$	Comments
0.0	$9/2^+$	4.41×10^{14}[‡] y *25*	
336.242 *25*	$1/2^-$	4.486[‡] h *4*	%IT=95.0 *7*; %β^-=5.0 *7* Decay modes from the Adopted Levels.
597.14 *3*	$3/2^-$	≤0.25[#] ns	$T_{1/2}$: from $\beta\gamma$(t),$\gamma\gamma$(t) (1967Na04). Other: ≤0.17 ns (1967Be57).
828.59[@] *3*	$3/2^+$	5.78[#] ns *6*	$T_{1/2}$: from $\beta\gamma$(t) (1971Sv01). Others: 5.99 ns *3* (1967Na04), 5.65 ns *15* (1967Mc13), 6.00 ns *12* (1967Hr02), 5.6 ns *1* (1967Be57), 5.4 ns *2* (1967Ba18), 5.5 ns *2* (1964Ta09), 5.9 ns *3* (1960Go21). g factor=+0.50 *8* if $T_{1/2}$=5.78 ns (1974Ba24) (35γ)(492γ)(θ,H). Deduced electric quadrupole interaction (1976Lu06,1973RaZG) $\beta\gamma(\theta$,H,t).
864.14[@] *3*	$1/2^+$	0.91[#] ns *3*	$T_{1/2}$: from $\beta\gamma$(t) (1971Sv01). Others: 1.15 ns *4* (1967Na04), 0.95 ns *3* (1967Mc13), 1.13 ns *6* (1967Hr02), 1.52 ns *8* (1967Be57), 1.1 ns *1* (1967Ba18).
941.424 *11*	$5/2^+$		
1041.4 *3*	$5/2^-$		
1078.2?	$5/2^+$		Level added in this update. Population of this level in this decay is tentative, although, definite in Coulomb excitation, (γ,γ'); (n,n$'\gamma$) and (d,d$'$). See Adopted Levels for details.
1192.50 *3*	$(1/2^+,3/2)$		J^π: γ rays to $1/2^-$, $1/2^+$ and $5/2^+$; β feeding from $1/2^+$. Note that $J^\pi=(3/2)$ in Adopted Levels.
1287.39 *5*	$1/2,3/2,5/2^-$		J^π: γ to $1/2^-$; β feeding from $1/2^+$. Note that $J^\pi=1/2,3/2^-,5/2^-$ in Adopted Levels.

[†] From least-squares fit to Eγ data.

[‡] From the Adopted Levels, unless otherwise stated.

[#] Level half-lives in the Adopted Levels are from this dataset.

[@] Possible member of $\pi1/2[431]$ band, as characterized by E2 enhancement of intraband transitions of 35.6 and 105.2 keV. See also 2002Lu15 for details.

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β^- radiations

Total β^- feeding adds to 98.9% *12*, slightly below 100%.

E(decay)	E(level)	Iβ^-[†]	Log *ft*	Comments
(164.5 *7*)	1287.39	0.0009 *1*	9.13 *5*	av Eβ=44.52 *21*
(259.4 *7*)	1192.50	0.013 *1*	8.60 *4*	av Eβ=73.24 *22*
(373.7[‡] *7*)	1078.2?	$<2\times10^{-6}$	>12.9	av Eβ=110.41 *24*
(410.5 *8*)	1041.4	0.00008 *2*	11.4[1u] *1*	av Eβ=140.71 *29*
(587.8 *7*)	864.14	33.1 *4*	6.38 *1*	av Eβ=186.19 *26* Eβ=593 *2* semi-semi $\beta\gamma$-coin (1974Bo26) β shape factor determined. Others: 590 *20* (1952Ha24), 580 (1952La02).
(623.3 *7*)	828.59	3.3 *3*	7.47 *4*	av Eβ=199.42 *27* E(decay): Eβ=636 *2* semi-semi $\beta\gamma$-coin (1974Bo26) β shape factor determined.
(854.8 *7*)	597.14	1.165 *17*	8.41 *1*	av Eβ=289.21 *28* $\beta(261\gamma)(\theta)$, A_2=−0.16 *2* (1966Pa07) scintillation detector.
(1115.7 *7*)	336.242	61.3 *10*	7.11 *1*	av Eβ=396.22 *30* E(decay): Eβ=1110 *10* (1952Ha24,1952La02), 1130 *30* (1940La07). Iβ^-: I(γ+ce) imbalance of 58.2% *9* at the 336 level, representing 95.0% *7* of the intensity from the isomer, gives Iβ feeding of 61.3% *10*, instead of the 62.6 *18* in 2012Bl10.

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

$\gamma(^{115}In)$

Iγ normalization: Absolute photon intensities (Iγ/10^4 decays) given in 1978He08. Note that from the decay scheme, γ-normalization factor is deduced as 0.01011 *9* by equating I(γ+ce)(336γ), I(γ(941γ), and β^- decay branching from the 336.2-keV isomer to 100.

α(K)exp normalized to α(K)(336γ)=0.84 (M4 theory). Note that α(K)=0.856 from BrIcc with frozen orbit, 0.845 for no hole, and and 0.87 from HSICC. To conform to BrIcc with frozen orbit, experimental K-conversion coefficients listed in this dataset should be adjusted upwards by 1.9%.

E$_\gamma$ †	I$_\gamma$ †@	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.‡	δ‡	α&	Comments
35.57 *6*	42.1 *3*	864.14	1/2$^+$	828.59	3/2$^+$	M1+E2	−0.193 *24*	12.1 *6*	%Iγ=0.421 *3* α(K)=9.10 *16*; α(L)=2.5 *4*; α(M)=0.49 *7* α(N)=0.085 *12*; α(O)=0.00372 *21* Iγ corrected to 42.1 *3* (1978He08) from previous value of 1.534 *11* in 2012Bl10 evaluation. E$_\gamma$: unweighted average of 35.514 *3* (1978He08) and 35.63 *5* (1967Ba18). (35.6γ)(231.4γ)(θ): A$_2$=−0.021 *8* (1975Bo29). (35.6γ)(492.4γ)(θ): A$_2$=+0.096 *15* (1975Bo29). L1:L2:L3:M=100 *10*:51 *13*:62 *9*:57 *17* (1967Ba18). α(K)exp=ce(K)/Iγ (coin with 492γ) corrected for ω(K): 8.2 *8* (1974Bo26), 8.5 *4* (1969Ca16), 7.7 *8* (1967Mc13), 9.6 *12* (1966Gr14). Others: 1963Ha24, 1964Bo19, 1964Ta09. δ: deduced in the present update from a fit to all the available K-conversion coefficients, subshell ratios, and the δ(E2/M1) value in 1977Kr13 evaluation using the BrIccMixing code. Previous value in 2012Bl10 was −0.173 *16*, where magnitude was deduced from only the L1/L3 ratio in 1967Ba18. Sign of δ is from $\gamma\gamma(\theta)$. δ=−0.20 *1* (1977Kr13 evaluation) weighted average of δ values from 1975Bo29, 1973Ba29, 1970Be79, 1968Ba32 and 1963Ha24.
231.443 *3*	74 *1*	828.59	3/2$^+$	597.14	3/2$^-$	E1		0.01639	%Iγ=0.74 *1* α(K)=0.01427 *20*; α(L)=0.001726 *25*; α(M)=0.000333 *5* α(N)=6.04×10^{-5} *9*; α(O)=4.22×10^{-6} *6* Eγ=231.41 *3*, Iγ=1.40 *11* relative to 100 for 336γ (1974HeYW). α(K)exp=0.016 *5* (1967Ba18). Analog: HF(E1,87γ,^{111}Ag)=1.2×10^6 W.u.
252 *1*	0.009 *7*	1192.50	(1/2$^+$,3/2)	941.424	5/2$^+$				%Iγ=9.E−5 *7*
260.896 *3*	194 *1*	597.14	3/2$^-$	336.242	1/2$^-$	M1+E2	−0.09 *6*	0.0376	%Iγ=1.94 *1* α(K)=0.0326 *5*; α(L)=0.00404 *8*; α(M)=0.000783 *14* α(N)=0.0001434 *25*; α(O)=1.065×10^{-5} *16* Eγ=260.85 *6*, Iγ=3.86 *25* relative to 100 for 336γ (1974HeYW).

^{115}Cd β^- decay (53.46 h) 1978He08,1967Ba18,1974Bo26 (continued)

$\gamma(^{115}In)$ (continued)

E_γ [†]	I_γ [†@]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	α [&]	Comments
								δ: from (231γ)(261γ)(θ) (1973Ba29): A_2=−0.260 *35*, A_4=−0.007 *47*. Other: −0.08 *9* from (267γ)(231γ)(θ) (1973Ba29). Other $\gamma\gamma(\theta)$ data: 1970Be79, 1963Ha24. From α(K)exp, mult=M1+E2, δ<1.5. α(K)exp=0.035 *5* (1967Ba18). Other: 0.043 *9* (1973Is03). Other δ=−0.08 *9* (1973Ba29), 267γ(261γ)(θ); 1970Be79, 1963Ha24.
266.985 *10*	9.2 *3*	864.14	1/2$^+$	597.14	3/2$^-$	[E1]	0.01112	%Iγ=0.092 *3* α(K)=0.00968 *14*; α(L)=0.001166 *17*; α(M)=0.000225 *4* α(N)=4.09×10^{-5} *6*; α(O)=2.88×10^{-6} *4* Eγ=266.90 *8*, Iγ=0.18 *1* relative to 100 for 336γ (1974HeYW). HF(E1,267γ)=2.2×10^7 W.u.
328.38 *10*	0.33 *5*	1192.50	(1/2$^+$,3/2)	864.14	1/2$^+$			%Iγ=0.0033 *5*
336.241 *25*	4602 *20*	336.242	1/2$^-$	0.0	9/2$^+$	M4	1.081	%Iγ=46.02 *20* α(K)=0.856 *12*; α(L)=0.181 *3*; α(M)=0.0369 *6* α(N)=0.00664 *10*; α(O)=0.000392 *6* Iγ corrected to 4602 *20* (1978He08) from the previous value of 100 in 2012Bl10 evaluation. δ(E5/M4)<0.36 by fitting all the available ce data for K-shell conversion coefficients and subshell ratios by the BrIccMixing code. However, δ(E5/M4)=0.36 gives an unrealistically large B(E5)(W.u.) value of 2.1×10^4. Considering maximum B(E5)(W.u.)=143 *25* (for a transition in ^{199}Hg) in the ENSDF database, δ(E5/M4) should be less than 0.03, which does not change the total conversion coefficient. E$_\gamma$: from 1974HeYW. Others: 336.301 *3* (1978He08), 336.23 *5* (1967Ba18), 336.25 *10* (1967Mu08). I$_\gamma$: per 1×10^4 decays: 4590 *10* (1974Ha39); 4602 *20* (1978He08, transient equilibrium, measured Iγ=4969 *22* measured). K:L:M+=100 *9*:21 *2*:3 *1* (1974Bo26), 100:22 *1*:4 *1* (1967Ba18). α(K)exp=0.843 *12* and α(total)exp=1.073 *14* (1974Ha39, in ^{115}In IT decay); 0.91 *8* (1974Bo26), 0.90 *9* (1967Mc13), 0.91 *6* (1966Gr14), 0.84 *9* (1963Ha24). Others: 1955Es15, 1955Va04, 1966Jh01.
(344.2)	0.0008 *1*	941.424	5/2$^+$	597.14	3/2$^-$	E1 [#]	0.00568	%Iγ=8×10^{-6} *1* α(K)=0.00495 *7*; α(L)=0.000593 *9*; α(M)=0.0001144 *16* α(N)=2.08×10^{-5} *3*; α(O)=1.489×10^{-6} *21* I$_\gamma$: from Iγ(344γ)/Iγ(941γ)=0.11 *1* (1976Tu02) Coul. ex.
363.95 *10*	0.61 *6*	1192.50	(1/2$^+$,3/2)	828.59	3/2$^+$			%Iγ=0.0061 *6*
492.351 *4*	803 *9*	828.59	3/2$^+$	336.242	1/2$^-$	E1	0.00234	%Iγ=8.03 *9* α(K)=0.00204 *3*; α(L)=0.000242 *4*; α(M)=4.67×10^{-5} *7* α(N)=8.53×10^{-6} *12*; α(O)=6.19×10^{-7} *9* Eγ=492.274 *35*, Iγ=17.0 *14* relative to 100 for 336γ (1974HeYW). α(K)exp=0.0019 *3*. 2% M2 admixture deduced from α(K)exp=0.0028 (1967Ba18); pure E1 if α(K)exp=0.0019 (1973Is03).
527.901 *7*	2745 *18*	864.14	1/2$^+$	336.242	1/2$^-$	E1	0.00199	%Iγ=27.45 *18*

$^{115}_{49}In_{66}$-4

^{115}Cd β^- decay (53.46 h) 1978He08,1967Ba18,1974Bo26 (continued)

$\gamma(^{115}In)$ (continued)

E_γ [†]	I_γ [†@]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	α [&]	Comments
								α(K)exp=0.017 *1* α(K)=0.001734 *25*; α(L)=0.000205 *3*; α(M)=3.96×10^{-5} *6* α(N)=7.23×10^{-6} *11*; α(O)=5.26×10^{-7} *8* Eγ=527.807 *35*, Iγ=3.86 *25* relative to 100 for 336γ (1974HeYW). α(K)exp=0.0020 *3* (1967Ba18), 0.0017 *1* (1973Is03).
595.375 *24*	0.17 *2*	1192.50	(1/2$^+$,3/2)	597.14	3/2$^-$			%Iγ=0.0017 *2*
690.23 *4*	0.061 *6*	1287.39	1/2,3/2,5/2$^-$	597.14	3/2$^-$			%Iγ=0.00061 *6*
705.18 *25*	0.008 *2*	1041.4	5/2$^-$	336.242	1/2$^-$			%Iγ=8×10^{-5} *2*
856.245 *13*	0.22 *1*	1192.50	(1/2$^+$,3/2)	336.242	1/2$^-$			%Iγ=0.00220 *10*
941.420 *11*	0.007 *1*	941.424	5/2$^+$	0.0	9/2$^+$	E2[#]	1.39×10^{-3}	%Iγ=7×10^{-5} *1* α(K)=0.001207 *17*; α(L)=0.0001475 *21*; α(M)=2.86×10^{-5} *4* α(N)=5.21×10^{-6} *8*; α(O)=3.79×10^{-7} *6*
951.19 *6*	0.028 *3*	1287.39	1/2,3/2,5/2$^-$	336.242	1/2$^-$			%Iγ=0.00028 *3*
1078.2[a]	<0.0002	1078.2?	5/2$^+$	0.0	9/2$^+$			%Iγ<2.0×10^{-4} Tentative γ from 1978He08 added in this update.

[†] From measurements by 1978He08, except as noted. Photon intensities are per 1×10^4 decays of parent (1978He08).
[‡] Deduced from α(K)exp and ce-ratio data. Assignments are the same in the Adopted Gammas.
[#] From the Adopted Gammas.
[@] For absolute intensity per 100 decays, multiply by 0.0100.
[&] 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.
[a] Placement of transition in the level scheme is uncertain.

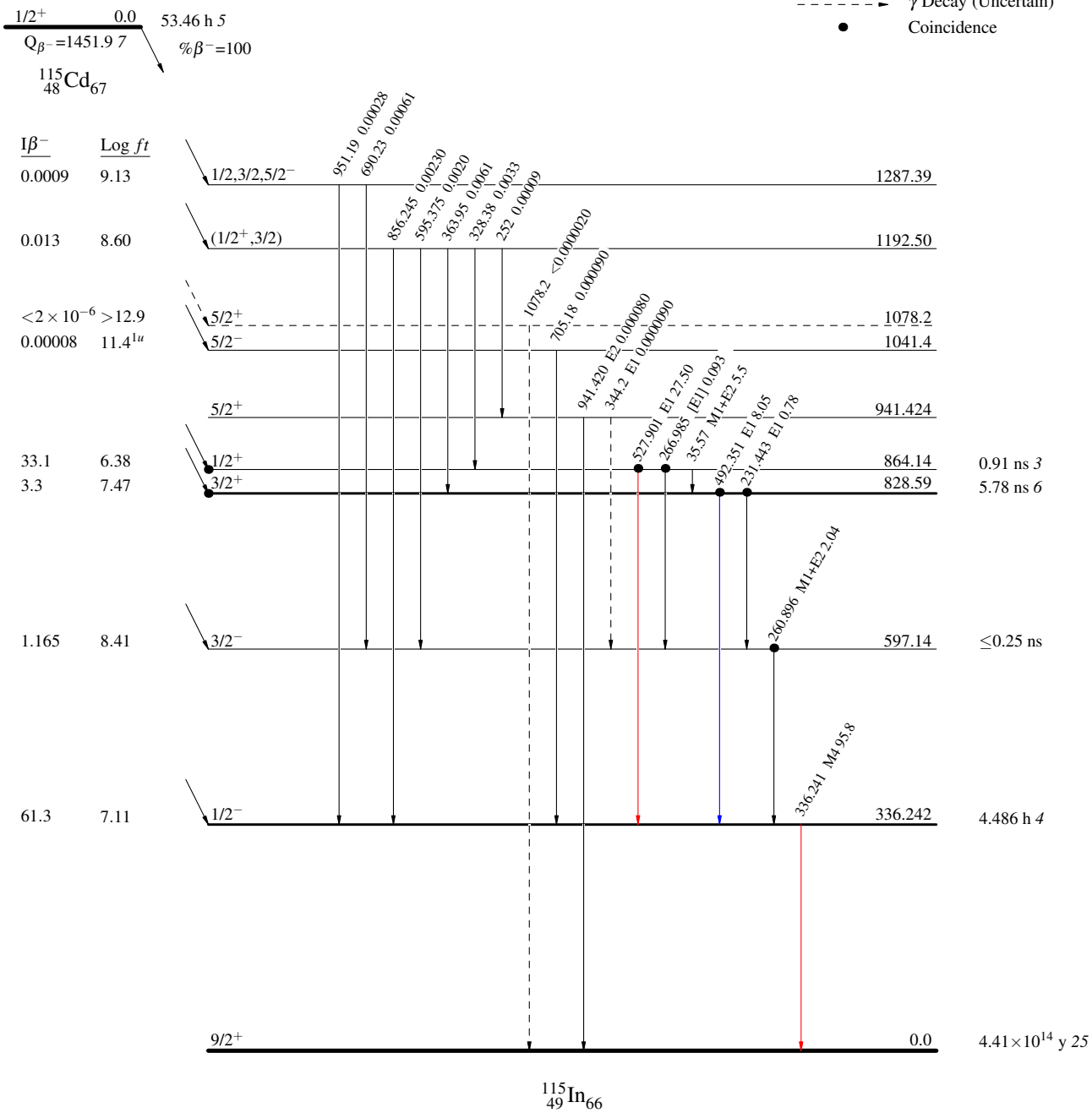
$^{115}_{49}In_{66}$-5

^{115}Cd β^- decay (53.46 h) 1978He08,1967Ba18,1974Bo26

Decay Scheme

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

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)
- Coincidence



$^{115}_{49}In_{66}$