^{123}Ag β^- decay 1989Hu10

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 174, 1 (2021)	15-Apr-2021

Parent: ^{123}Ag: E=0.0; J$^\pi$=(7/2$^+$); $T_{1/2}$=0.299 s *7*; Q(β^-)=7850 *30*; %β^- decay=100.0
^{123}Ag-J$^\pi$,$T_{1/2}$: From Adopted Levels of ^{123}Ag.
^{123}Ag-Q(β^-): From 2021Wa16.
1989Hu10: ^{123}Ag source was produced via U(n,F) with fast neutrons from the TANDAR accelerator. γ rays were detected with two HPGe detectors. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma\gamma$(t), γ(t). Deduced levels, J, π, $T_{1/2}$, β-decay branching ratios, log *ft*. Systematics of neighboring odd-A Cd isotopes. Comparisons with theoretical calculations.
Other: 1989Hu03, 1986Ma42.
The decay scheme is from that proposed by 1989Hu10 with the energy of the 11/2$^-$ isomer shifted from 316 keV to around 140 keV from a mass-excess measurement by 2013Ka08 and with upper levels shifted accordingly. Note that the energy, 316 keV, of the 11/2$^-$ isomer proposed by 1989Hu10 is from a search to maximize the number of shared levels that de-exciting to both the isomer and the ground state, without a direct experimental evidence. 2013Ka08 claim that the isomer should be at an energy of 144 keV *4* from their direct mass measurement in which the g.s. and the isomer are resolved, with support also from the energy systematics of the 11/2$^-$ states in neighboring odd-A Cd isotopes. 2013Ka08 further point out that many of the gating transitions used to deduced β-decay Q-value of ^{123}Cd g.s. by 1987Sp09 actually belong to the β decay of the isomer, based on a later study by 1989Hu03. With that being corrected, 2013Ka08 deduced Q-values for the g.s. and isomer β decays from the measured end-point energies in 1987Sp09, resulting in an energy of 135 keV *53* for the isomer that further supports their value of 144 keV *4*.
The decay scheme should be considered as incomplete due to a large gap between the highest observed level and the Q-value. Total decay energy deposit of 7835 keV *190* calculated by RADLIST code.

^{123}Cd Levels

E(level)†	J$^\pi$‡	$T_{1/2}$‡	Comments
0.0	3/2$^{(+)}$	2.10 s *3*	
116.40 *3*	(1/2$^+$)		
144 *4*	11/2$^{(-)}$	1.80 s *3*	E(level): from the mass measurement by 2013Ka08. Other: 316 keV in 1989Hu10. See detailed comments above on the position of this isomer.
263.866 *20*	(7/2$^+$)	80 ns *15*	$T_{1/2}$: adopted value from $\gamma\gamma$(t) in 1989Hu10.
409.76 *3*	(5/2$^+$,7/2$^+$)		
463.78 *7*	(5/2$^+$)		
514.65 *6*	(9/2$^+$)		E(level): it is the 691 level in 1989Hu10.
553.72 *15*	(5/2$^+$)		
591.29 *5*	(5/2$^+$,7/2$^+$)		
672.44 *12*	(5/2$^+$)		
704.92 *11*	(5/2,7/2,9/2)		
743.73 *5*	(5/2$^+$,7/2$^+$)		
829.75 *19*	(9/2$^+$)		E(level): it is the 1006 level in 1989Hu10.
885.2 *3*	(5/2,7/2,9/2)		
1010.08 *16*	(5/2,7/2,9/2)		
1061.44 *9*	(5/2,7/2,9/2)		
1528.86 *14*	(5/2$^+$,7/2$^+$)		
2239.88 *20*	(5/2$^+$,7/2$^+$,9/2$^+$)		
2601.0 *3*	(5/2$^+$,7/2$^+$,9/2$^+$)		
2787.37 *18*	(5/2$^+$,7/2$^+$,9/2$^+$)		
2902.42 *22*	(5/2$^+$,7/2$^+$)		
2910.22 *24*	(5/2$^+$,7/2$^+$)		

† From a least-squares fit to γ-ray energies.
‡ From Adopted Levels. Adopted spin-parity assignments here are mostly from those proposed by 1989Hu10 based on systematics of neighboring odd-A Cd isotopes.

^{123}Ag β^- decay 1989Hu10 (continued)

β^- radiations

E(decay)	E(level)	$I\beta^-$ †‡	Log *ft* †	Comments
(4.94×10^3 *3*)	2910.22	1.8 *4*	5.5 *1*	av Eβ=2167 *15*
(4.95×10^3 *3*)	2902.42	3.2 *6*	5.2 *1*	av Eβ=2171 *15*
(5.06×10^3 *3*)	2787.37	2.7 *5*	5.3 *1*	av Eβ=2225 *15*
(5.25×10^3 *3*)	2601.0	1.7 *5*	5.6 *1*	av Eβ=2314 *15*
(5.61×10^3 *3*)	2239.88	3.5 *5*	5.4 *1*	av Eβ=2486 *15*
(6.32×10^3 *3*)	1528.86	5.2 *5*	5.48 *5*	av Eβ=2824 *15*
(6.79×10^3 *3*)	1061.44	1.0 *7*	6.3 *3*	av Eβ=3046 *15*
(6.84×10^3 *3*)	1010.08	1.6 *3*	6.1 *1*	av Eβ=3071 *15*
(6.96×10^3 *3*)	885.2	2.1 *8*	6.1 *2*	av Eβ=3130 *15*
(7.02×10^3 *3*)	829.75	3.9 *4*	5.81 *5*	av Eβ=3157 *15*
(7.11×10^3 *3*)	743.73	5.1 *5*	5.71 *5*	av Eβ=3197 *15*
(7.15×10^3 *3*)	704.92	3.1 *3*	5.94 *5*	av Eβ=3216 *15*
(7.18×10^3 *3*)	672.44	2.2 *3*	6.1 *1*	av Eβ=3231 *15*
(7.26×10^3 *3*)	591.29	6.3 *6*	5.66 *5*	av Eβ=3270 *15*
(7.30×10^3 *3*)	553.72	2.7 *4*	6.0 *1*	av Eβ=3288 *15*
(7.34×10^3 *3*)	514.65	6.7 *3*	5.66 *3*	av Eβ=3306 *15*
(7.39×10^3 *3*)	463.78	3.6 *4*	5.94 *5*	av Eβ=3330 *15*
(7.44×10^3 *3*)	409.76	8.0 *7*	5.61 *4*	av Eβ=3356 *15*
(7.59×10^3 *3*)	263.866	30.8 *19*	5.06 *3*	av Eβ=3425 *15*
(7.73×10^3# *3*)	116.40	4.0 *22*	6.0 *3*	av Eβ=3495 *15* $I\beta^-$,Log *ft*: this branch is considered as questionable. The %$I\beta^-$ value is from γ-intensity imbalance at the daughter level; the imbalance could be accounted for by unobserved/unplaced transitions. 1989Hu10 claim no β feeding to this level.

† Deduced by the evaluator from intensity balance at each level. These values should be considered as approximate since the level scheme seems incomplete in view of a large gap of ≈5 MeV between the highest (known) populated level at 2910 and $Q(\beta^-)$=7870, allowing the possibility of a significant amount of additional levels and associated unobserved transitions (pandemonium effect).

‡ Absolute intensity per 100 decays.

Existence of this branch is questionable.

$\gamma(^{123}$Cd)

Iγ normalization: From ΣI(γ+ce to g.s.+141 isomer)=99.43 *9*, assuming no β feeding to g.s. and 141 isomer, and with adopted %β^-n=0.57 *9*.

E$_\gamma$ [‡]	I$_\gamma$ [‡@]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.	α [†]	Comments
116.41 *3*	8.30 *10*	116.40	(1/2$^+$)	0.0	3/2$^{(+)}$	[M1,E2]	0.6[#] *3*	%Iγ=6.85 *19* α(K)=0.47 *21*; α(L)=0.10 *7*; α(M)=0.019 *13* α(N)=0.0032 *21*; α(O)=0.00010 *4*
123.67[&] *6*	6.3 *4*	263.866	(7/2$^+$)	144	11/2$^{(-)}$	[M2]	2.19	%Iγ=5.2 *3* α(K)=1.81 *3*; α(L)=0.305 *5*; α(M)=0.0604 *9* α(N)=0.01068 *15*; α(O)=0.000545 *8* E$_\gamma$: the placements of 123.67γ and 263.87γ from the same level are proposed by 2013Ka08, with the 123.67γ feeding the 11/2$^-$ isomer at 144 keV *4* from their direct mass measurement. However, such placement of 123.67γ results in J^π=(7/2$^+$), thus Mult=[M2] and consequently an unreasonably large B(M2)(W.u.)=56 $^{17-11}$ greatly exceeding RUL=1. This γ is placed from a 440, (9/2$^-$) level to feed the 11/2$^-$ isomer at E=316 keV proposed in 1989Hu10. It could also be implied that the 123.67γ could de-excite a different level with a very close energy. It is the evaluator's option that the further investigation is needed to firmly make the placement of the 123.67γ and the level scheme as well.
250.78 *5*	2.30 *16*	514.65	(9/2$^+$)	263.866	(7/2$^+$)			%Iγ=1.90 *14*
263.87 *2*	39.3 *3*	263.866	(7/2$^+$)	0.0	3/2$^{(+)}$	[E2]	0.0498	%Iγ=32.4 *9* α(K)=0.0419 *6*; α(L)=0.00638 *9*; α(M)=0.001240 *18* α(N)=0.000214 *3*; α(O)=8.99$\times10^{-6}$ *13*
334.05 *5*	1.4 *4*	743.73	(5/2$^+$,7/2$^+$)	409.76	(5/2$^+$,7/2$^+$)	[M1,E2]	0.0205[#] *24*	%Iγ=1.2 *4* α(K)=0.0176 *19*; α(L)=0.0023 *5*; α(M)=0.00045 *9* α(N)=7.9$\times10^{-5}$ *14*; α(O)=4.04$\times10^{-6}$ *25*
347.38 *6*	4.3 *4*	463.78	(5/2$^+$)	116.40	(1/2$^+$)	[E2]	0.0202	%Iγ=3.5 *4* α(K)=0.01719 *24*; α(L)=0.00242 *4*; α(M)=0.000469 *7* α(N)=8.17$\times10^{-5}$ *12*; α(O)=3.79$\times10^{-6}$ *6*
374.00 *10*	5.80 *23*	514.65	(9/2$^+$)	144	11/2$^{(-)}$	[E1]	0.00435	%Iγ=4.79 *22* α(K)=0.00380 *6*; α(L)=0.000450 *7*; α(M)=8.60$\times10^{-5}$ *12* α(N)=1.525$\times10^{-5}$ *22*; α(O)=8.56$\times10^{-7}$ *12*
409.79 *3*	14.5 *5*	409.76	(5/2$^+$,7/2$^+$)	0.0	3/2$^{(+)}$	[M1,E2]	0.0114[#] *7*	%Iγ=12.0 *5* α(K)=0.0099 *5*; α(L)=0.00127 *14*; α(M)=0.00024 *3* α(N)=4.3$\times10^{-5}$ *5*; α(O)=2.29$\times10^{-6}$ *4*
437.54 *20*	2.2 *3*	553.72	(5/2$^+$)	116.40	(1/2$^+$)			%Iγ=1.8 *25*
441.05 *10*	3.8 *3*	704.92	(5/2,7/2,9/2)	263.866	(7/2$^+$)			%Iγ=3.1 *3*
470.19 *10*	1.4 *5*	1061.44	(5/2,7/2,9/2)	591.29	(5/2$^+$,7/2$^+$)			%Iγ=1.2 *4*

γ(^{123}Cd) (continued)

E_γ [‡]	I_γ [‡@]	E_i(level)	J_i^π	E_f	J_f^π	Comments
[x]520.8 *4*	0.70 *20*					%Iγ=0.58 *17*
553.50 *20*	1.10 *25*	553.72	(5/2$^+$)	0.0	3/2$^{(+)}$	%Iγ=0.91 *21*
556.10 *20*	1.8 *3*	672.44	(5/2$^+$)	116.40	(1/2$^+$)	%Iγ=1.5 *25*
591.30 *5*	9.0 *5*	591.29	(5/2$^+$,7/2$^+$)	0.0	3/2$^{(+)}$	%Iγ=7.4 *5*
600.31 *15*	1.9 *3*	1010.08	(5/2,7/2,9/2)	409.76	(5/2$^+$,7/2$^+$)	%Iγ=1.6 *25*
621.3 *3*	2.5 *9*	885.2	(5/2,7/2,9/2)	263.866	(7/2$^+$)	%Iγ=2.1 *8* E_γ: placed from 1061 level to a 440 level in 1989Hu10.
651.58 *15*	1.6 *4*	1061.44	(5/2,7/2,9/2)	409.76	(5/2$^+$,7/2$^+$)	%Iγ=1.3 *4*
672.40 *15*	0.90 *17*	672.44	(5/2$^+$)	0.0	3/2$^{(+)}$	%Iγ=0.74 *14*
689.10 *15*	4.7 *4*	829.75	(9/2$^+$)	144	11/2$^{(-)}$	%Iγ=3.9 *4*
743.40 *10*	4.8 *4*	743.73	(5/2$^+$,7/2$^+$)	0.0	3/2$^{(+)}$	%Iγ=4.0 *4*
[x]1096.50 *20*	1.9 *4*					%Iγ=1.6 *4*
[x]1234.30 *20*	2.0 *4*					%Iγ=1.7 *4* E_γ: this γ is placed from the 2240 level to a 1006 level in 1989Hu10, with the latter shifted to 830 in this dataset.
[x]1248.95 *20*	2.3 *5*					%Iγ=1.9 *4*
1265.15 *15*	3.4 *4*	1528.86	(5/2$^+$,7/2$^+$)	263.866	(7/2$^+$)	%Iγ=2.8 *4*
1528.2 *3*	2.9 *4*	1528.86	(5/2$^+$,7/2$^+$)	0.0	3/2$^{(+)}$	%Iγ=2.4 *4*
1725.90 *20*	1.8 *4*	2787.37	(5/2$^+$,7/2$^+$,9/2$^+$)	1061.44	(5/2,7/2,9/2)	%Iγ=1.5 *4*
1976.00 *20*	4.3 *6*	2239.88	(5/2$^+$,7/2$^+$,9/2$^+$)	263.866	(7/2$^+$)	%Iγ=3.5 *5*
2337.10 *25*	2.1 *5*	2601.0	(5/2$^+$,7/2$^+$,9/2$^+$)	263.866	(7/2$^+$)	%Iγ=1.7 *4*
2523.5 *3*	1.5 *4*	2787.37	(5/2$^+$,7/2$^+$,9/2$^+$)	263.866	(7/2$^+$)	%Iγ=1.2 *4*
2638.40 *25*	2.7 *6*	2902.42	(5/2$^+$,7/2$^+$)	263.866	(7/2$^+$)	%Iγ=2.2 *5*
2646.7 *3*	1.4 *4*	2910.22	(5/2$^+$,7/2$^+$)	263.866	(7/2$^+$)	%Iγ=1.2 *4*
2902.7 *4*	1.2 *4*	2902.42	(5/2$^+$,7/2$^+$)	0.0	3/2$^{(+)}$	%Iγ=1.0 *4*
2909.5 *4*	0.80 *19*	2910.22	(5/2$^+$,7/2$^+$)	0.0	3/2$^{(+)}$	%Iγ=0.66 *16*

[†] Additional information 1.
[‡] From 1989Hu10. Placements of some γ rays are adjusted due to the energy of the 11/2$^-$ isomer being shifted from 316 keV proposed in 1989Hu10 to 140 keV proposed in 2013Ka08 from their direct mass mass measurement.
[#] Calculated for δ=1.
[@] For absolute intensity per 100 decays, multiply by 0.825 *21*.
[&] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

$^{123}_{48}$Cd$_{75}$-4

^{123}Ag β^- decay 1989Hu10