^{65}Co β^- decay (1.16 s) 2009Pa16

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 202,59 (2025)	25-Feb-2025

Parent: ^{65}Co: E=0; $J^\pi=(7/2)^-$; $T_{1/2}$=1.16 s *3*; Q(β^-)=5940.6 *21*; %β^- decay=100

^{65}Co-J^π,$T_{1/2}$: From Adopted Levels.

^{65}Co-Q(β^-): From 2021Wa16.

Adapted from the XUNDL dataset for 2009Pa16 compiled by by B. Karamy and B. Singh (McMaster) on May 12, 2009.

2009Pa16: ^{65}Co source was produced by ^{238}U(p,F) with 30 MeV protons from the LISOL facility of the Cyclotron Research Center (CRC) at Louvain-La-Neuve (Belgium) on a 10 mg/cm^2 ^{238}U target inside a gas catcher for stopping and thermalizing the recoiling fission products. Ions leaving the gas are transported through a SextuPole Ion Guide (SPIG), accelerated, mass separated, and implanted into a detection tape surrounded by three thin plastic ΔE detectors for detecting β particles and two MINIBALL clusters for detecting γ rays. Measured Eγ, Iγ, $\beta\gamma\gamma$-coin, γ(t). Deduced levels, J, π, parent $T_{1/2}$, β-decay branching ratios, log *ft*.

1988Bo06: ^{65}Co source was produced via ^{nat}W(^{76}Ge,X) reaction with E=11.5 MeV/nucleon ^{76}Ge primary beam from the UNILAC accelerator on a 36 mg/cm^2 natural tungsten target. Reaction products were mass separated by the GSI online mass separator and collected at individual tape-transport stations. β particles were detected with a 4π lucite detector and γ rays were detected with two Ge detectors. Measured Eγ, Iγ, $\beta\gamma$-coin, $\beta\gamma\gamma$-coin. Deduced levels, J, π, parent $T_{1/2}$, β-decay branching ratios, log *ft*.

1985Ru05: ^{65}Co source was produced via W(^{82}Se,X) with E=11.5 MeV/nucleon ^{82}Se beam from the UNILAC accelerator on a 46 mg/cm^2 natural tungsten target at GSI. Fragments were separated with the GSI on-line mass separator and transported to a measuring position inside a 4π plastic β-detector between two opposite Ge detectors. Measured Eγ, Iγ, $\beta\gamma$-coin, $\gamma\gamma$-coin. Deduced parent $T_{1/2}$. Report two transitions and no decay scheme.

The decay scheme is considered incomplete by the evaluator due to possible missing levels in a large energy gap of about 4.7 MeV between the highest observed level at E=1274 keV and Q-value=5940.6 keV *21*, mainly because of possible unobserved γ transitions from those levels.

^{65}Ni Levels

E(level)[†‡]	J^π[#]	$T_{1/2}$[#]	Comments
0.0	$5/2^-$	2.5175 h *5*	
63.18 *23*	$1/2^-$	68.6 μs *35*	The reported β feeding of %Iβ<1.5 (2009Pa16) and ≈0 (1988Bo06), and a small negative value of −0.8 from γ+ce intensity imbalance support the non−existence of a β decay branch to this level.
310.39 *10*	$3/2^-$		
694.19 *32*	$3/2^-$		
1141.1 *2*	$(5/2^-,7/2^-)$		
1273.74 *18*	$(5/2^-)$		

† Additional information 1.
‡ From a least-squares fit to γ-ray energies.
# From Adopted Levels.

β^- radiations

av Eβ: Additional information 3.

E(decay)	E(level)	Iβ^-[†‡]	Log *ft*	Comments
(4666.9 *23*)	1273.74	4.4	5.3	av Eβ=2084.5 *10* Iβ^-: 5.1 *9* (2009Pa16), 5 (1988Bo06).
(4799.5 *24*)	1141.1	2.89	5.5	av Eβ=2148.7 *10* Iβ^-: 3.2 *4* (2009Pa16), 3.2 (1988Bo06).

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^{65}Co β^- decay (1.16 s) 2009Pa16 (continued)

β^- radiations (continued)

E(decay)	E(level)	Iβ^-[†‡]	Log *ft*	Comments
(5246.4 *24*)	694.19	0.17	8.8	av Eβ=2365.6 *10* Iβ^-: 0.2 (1988Bo06).
(5630.2[#] *23*)	310.39	<0.3	>8.7	av Eβ=2551 *1* Iβ^-: <0.6 (2009Pa16), <0.1 (1988Bo06).
(5940.6 *25*)	0.0	91.7 *8*	4.45 *2*	av Eβ=2702.3 *10* Iβ^-: deduced by 2009Pa16 by comparing the off-resonant subtracted β activity with the total γ activity. Note that due to possible unobserved missing transitions from possible missing levels in this incomplete decay scheme, this value is considered as an upper limit. Others: 91 (1988Bo06), >97 (1985Ru05). Additional information 2. Log *ft*: even though this value is considered as an lower limit due to Iβ as an upper limit, this decay branch is considered as allowed because of the strong feeding.

† From γ+ce intensity balance at each level for excited levels. All β feedings should be considered as upper limits and thus associated log *ft* values as lower limits, due to possible missing γ rays in this incomplete decay scheme. Original values from 2009Pa16 deduced in the same way by the authors are given under comments.

‡ Absolute intensity per 100 decays.

Existence of this branch is questionable.

^{65}Co β^- decay (1.16 s) 2009Pa16 (continued)

$\gamma(^{65}Ni)$

Iγ normalization: 0.029 *4* from Σ[%I(γ+ce to g.s.)]=100−%Iβ(g.s.)=8.3 *8*. Due to possible missing unobserved transitions to g.s. in this incomplete decay scheme, this value should be considered as an upper limit. 2009Pa16 give 0.027 *7*.
The following transitions assigned to ^{65}Ni by 1988Bo06 have been confirmed by later studies to belong to ^{65}Co: 340.0 *3*, 882.6 *5*.

E_γ[‡]	I_γ[#&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ	α[†]	$I_{(\gamma+ce)}$[#&]	Comments
63.4 *4*	17 *4*	63.18	1/2$^-$	0.0	5/2$^-$	(E2)		3.23 *9*	71 *18*	%Iγ=0.49 ce(K)/(γ+ce)=0.665 *9*; ce(L)/(γ+ce)=0.0861 *30*; ce(M)/(γ+ce)=0.0119 *4* ce(N)/(γ+ce)=0.000346 *12* α(K)=2.82 *8*; α(L)=0.365 *11*; α(M)=0.0502 *15* α(N)=0.00147 *4* E_γ: other: 63.5 *8* (1988Bo06). I_γ: deduced by the evaluator from I(γ+ce) and α. Other: >5 (1988Bo06). $I_{(\gamma+ce)}$: from 2009Pa16. Additional information 4.
310.4 *1*	74 *5*	310.39	3/2$^-$	0.0	5/2$^-$	(M1+E2)	+0.191 *13*	0.0054 *28*		%Iγ=2.1 α(K)=0.0049 *25*; α(L)=4.9×10^{-4} *26*; α(M)=7 α(N)=2.8×10^{-6} *14* E_γ: others: 310.6 *3* (1988Bo06), 310.8 *4* (1985Ru05). I_γ: weighted average of 86 *11* (2009Pa16) and 72 *4* (1988Bo06). Additional information 5.
[x]351.3[a] *4*										E_γ: from 1985Ru05 only.
383.8[a] *3*	5.8 *22*	694.19	3/2$^-$	310.39	3/2$^-$	[M1,E2]		0.0028 *12*		%Iγ=0.17 α(K)=0.0025 *11*; α(L)=2.5×10^{-4} *11*; α(M)=3.5×10^{-5} *15* α(N)=1.5×10^{-6} *6* E_γ,I_γ: from 1988Bo06 only. It could be questionable that this γ is seen in ^{65}Co β^- decay, because the much stronger 629γ and 693γ seen also from this level in other studies are not seen here.
963.4 *2*	69 *8*	1273.74	(5/2$^-$)	310.39	3/2$^-$					%Iγ=2.0 E_γ: other: 963.7 *8* (1988Bo06). I_γ: weighted average of 84 *13* (2009Pa16) and 65 *7*. Additional information 7.
1141.1 *2*	100	1141.1	(5/2$^-$,7/2$^-$)	0.0	5/2$^-$					%Iγ=2.9

From ENSDF

^{65}Co β^- decay (1.16 s) 2009Pa16 (continued)

$\gamma(^{65}Ni)$ (continued)

E_γ[‡]	I_γ[#&]	E_i(level)	J_i^π	E_f	J_f^π	Comments
						E_γ: other: 1141.7 *8* (1988Bo06). I_γ: from 2009Pa16. Other: 100 *7* (1988Bo06). Additional information 6.
1210.6 *2*	42 *6*	1273.74	(5/2$^-$)	63.18	1/2$^-$	%Iγ=1.2 E_γ: other: 1210.9 *8* (1988Bo06). I_γ: weighted average of 45 *12* (2009Pa16) and 41 *6* (1988Bo06). Additional information 8.
1273.3 *4*	42 *5*	1273.74	(5/2$^-$)	0.0	5/2$^-$	%Iγ=1.2 E_γ: weighted aveage of 1273.2 *3* (2009Pa16) and 1274.4 *9* (1988Bo06). I_γ: weighted average of 48 *10* (2009Pa16) and 40 *5* (1988Bo06). Additional information 9.

† Additional information 10.
‡ From 2009Pa16, unless otherwise noted.
# Values quoted from 2009Pa16 are from weighted average of values from decay of ^{65}Co directly from the production (data set II) and decay of ^{65}Co from ^{65}Fe decay (data set I; reported relative to Iγ=100 for 882.5γ in ^{65}Co and re-normalized by the evaluator to Iγ=100 for 1141.1γ). Values quoted from 1988Bo06 are renormalization of original values reported relative to Iγ=100 for 310.6γ.
@ From Adopted Gammas.
& For absolute intensity per 100 decays, multiply by 0.0289 *34*.
a Placement of transition in the level scheme is uncertain.
x γ ray not placed in level scheme.

From ENSDF

$^{65}_{28}Ni_{37}$-4

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Decay Scheme

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