^{64}Co β^- decay (0.30 s) 2012Pa39,1974Ra31

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 178,41 (2021).	12-Nov-2021

Parent: ^{64}Co: E=0.0; $J^\pi=1^+$; $T_{1/2}$=0.30 s *3*; Q(β^-)=7307 *20*; %β^- decay=100

^{64}Co-J^π,$T_{1/2}$: From Adopted Levels of ^{64}Co.

^{64}Co-Q(β^-): From 2021Wa16.

2012Pa39: The ^{64}Co decay data were taken as part of β-decay of Mn isotopes at the CERN-ISOLDE. Pure and intense $^{58,60-68}$Mn ions were produced in an induced fission reaction of a 1.4 GeV proton beam impinging on a thick UC_x target of 45 g/cm^2 thick, ionized by the RILIS laser system, separated by the High Resolution Separator (HRS) and finally implanted into a movable tape surrounded by three thin plastic ΔE β detectors and two MINIBALL γ-detector clusters. Measured Eγ, Iγ, $\gamma\gamma$-coin, Eβ. Deduced levels, J^π, β-decay branching ratios, log*ft*, configurations.

1974Ra31: ^{64}Co ions were produced from ^{64}Ni(n,p) with 14 MeV neutrons from the AERE. Target was 30 mg metallic 96.44% enriched ^{64}Ni. γ rays were detected with a Ge(Li) and a NaI(Tl) detector; β particles were detected with a plastic scintillator. Measured Eγ, Iγ, Eβ, Iβ, $\beta\gamma$-coin, $\beta\gamma$(t). Deduced parent $T_{1/2}$, β-decay branching ratios.

Other: 2012Br15, 1969Wa15. Measured $T_{1/2}$, β^-, γ.

Activities of 28 s (1966St11), 2.0 min and 7.8 min (1960Pr05, 1962Va23), ≈4 min (1949Pa01) assigned to ^{64}Co decay later reassigned to other nuclides (1969Wa15,1966Le19).

β-strengths (theoretical): 1995Ko26, 1991Ka25.

The decay scheme is incomplete due to a large (≈3 MeV) gap between the highest observed level at 4556 keV and Q(β^-)value of 7307 keV.

^{64}Ni Levels

E(level)[†]	J^π[‡]	$T_{1/2}$[‡]	E(level)[†]	J^π[‡]	$T_{1/2}$[‡]
0.0	0^+		3153.73 *7*	2^+	
1345.77 *6*	2^+	1.086 ps *35*	3275.99 *8*	2^+	0.24 ps *3*
2276.58 *7*	2^+		3578.55 *8*	(1^+)	
2867.39 *12*	0^+	1.4 ps *6*	3856.54 *22*	0^+	
2972.09 *8*	$(1,2^+)$	0.13 ps *+13−5*	4268.12 *9*	0^+	
3025.89 *12*	0^+	3.6 ps *12*	4556.4 *4*	$(0^+,1^+,2^+)$	

[†] From a least-squares fit to γ-ray energies. Uncertainty of 688.0γ was doubled to 0.6 keV in the fitting procedure.
[‡] From the Adopted Levels.

β^- radiations

E(decay)	E(level)	Iβ^-[†#]	Log *ft*[‡]	Comments
(2751 *20*)	4556.4	≈0.09	≈5.4	av Eβ=1166.8 *96*
(3039 *20*)	4268.12	≈0.23	≈5.2	av Eβ=1304.4 *96*
(3451 *20*)	3856.54	≈0.48	≈5.1	av Eβ=1501.9 *97*
(3728[@] *20*)	3578.55	<0.03	>6.4	av Eβ=1635.9 *97*
(4031 *20*)	3275.99	≈0.19	≈5.8	av Eβ=1782.1 *97*
(4153[@] *20*)	3153.73	<0.03	>6.6	av Eβ=1841.3 *97*
(4281 *20*)	3025.89	≈0.23	≈5.8	av Eβ=1903.2 *97*
(4335 *20*)	2972.09	≈0.18	≈5.9	av Eβ=1929.3 *97*
(4440 *20*)	2867.39	≈0.57	≈5.5	av Eβ=1980.1 *97*
(5030 *20*)	2276.58	≈2.9	≈5.0	av Eβ=2267.1 *98*
				E(decay): measured: 4.8×10^3 *6* (1974Ra31).
(5961 *20*)	1345.77	≈3.2	≈5.3	av Eβ=2720.4 *98*
				E(decay): measured: 5.6×10^3 *5* (1974Ra31).
(7307 *20*)	0.0	92.0 *9*	4.26 *5*	av Eβ=3376.8 *98*
				E(decay): measured: 7.0×10^3 *4* (1974Ra31), 7.0×10^3 *5* (1969Wa15).

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^{64}Co β^- decay (0.30 s) 2012Pa39,1974Ra31 (continued)

β^- radiations (continued)

E(decay)	E(level)	Comments
		$I\beta^-$: deduced in 2012Pa39 by comparing the number of ^{64}Co decays to the ^{64}Co β-delayed γ-ray intensity. Other: 90 *+5−10* (1974Ra31).

† Deduced by evaluators from γ-ray intensity balances assuming g.s. β^- feeding $I\beta^-$=92.0 *9* measured by 2012Pa39. The values could be overestimated due to incomplete decay scheme and should be considered as approximate, except for $I\beta^-$(g.s.).
‡ Values are approximate due to incomplete decay scheme.
# Absolute intensity per 100 decays.
@ Existence of this branch is questionable.

$\gamma(^{64}Ni)$

$I\gamma$ normalization: From $\Sigma(I(\gamma+ce)$ to g.s.)=100−$I\beta^-$(g.s.), with the g.s. β^- feeding $I\beta^-$(g.s.)=92.0 *9* measured in 2012Pa39. Due to the incomplete decay scheme, the normalization is considered as approximate.

E_γ†	I_γ†#	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	δ	Comments
278.6 *3*	0.6 *3*	3856.54	0^+	3578.55	(1^+)			
688.0 *3*	0.5 *2*	4268.12	0^+	3578.55	(1^+)			
695.7 *3*	0.8 *3*	2972.09	$(1,2^+)$	2276.58	2^+			
702.2 *3*	5.8 *3*	3856.54	0^+	3153.73	2^+			
877.2 *1*	1.9 *3*	3153.73	2^+	2276.58	2^+			
930.8 *1*	40.7 *9*	2276.58	2^+	1345.77	2^+	(M1+E2)	≈−0.9	E_γ: weighted average of 930.8 *1* (2012Pa39) and 931.1 *3* (1974Ra31).
1114.6 *1*	2.3 *4*	4268.12	0^+	3153.73	2^+			
1345.8 *1*	100	1345.77	2^+	0.0	0^+	E2		E_γ: weighted average of 1345.8 *1* (2012Pa39) and 1346.1 *3* (1974Ra31).
1521.6 *1*	7.6 *6*	2867.39	0^+	1345.77	2^+	E2		
1626.3 *1*	1.0 *4*	2972.09	$(1,2^+)$	1345.77	2^+			
1680.1 *1*	3.1 *4*	3025.89	0^+	1345.77	2^+	E2		
1808.0 *1*	2.4 *4*	3153.73	2^+	1345.77	2^+			
1930.2 *1*	0.3 *2*	3275.99	2^+	1345.77	2^+	(M1+E2)		
2232.9 *1*	0.7 *5*	3578.55	(1^+)	1345.77	2^+			
2276.6 *1*	<1	2276.58	2^+	0.0	0^+			
2922.1 *1*	<0.5	4268.12	0^+	1345.77	2^+			
2972.0 *1*	0.6 *2*	2972.09	$(1,2^+)$	0.0	0^+			
3153.7 *1*	3.3 *6*	3153.73	2^+	0.0	0^+			
3210.5 *4*	1.2 *4*	4556.4	$(0^+,1^+,2^+)$	1345.77	2^+			
3275.9 *1*	2.2 *5*	3275.99	2^+	0.0	0^+			
3578.3 *1*	<0.3	3578.55	(1^+)	0.0	0^+			

† From 2012Pa39, unless otherwise noted.
‡ From the Adopted dataset.
# For absolute intensity per 100 decays, multiply by 0.075.

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Decay Scheme

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