^{68}Co β^- decay (1.6 s) 2000Mu10

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. A. Mccutchan	NDS 113, 1735 (2012)	1-Mar-2012

Parent: ^{68}Co: E=x; $J^\pi=(1^+)$; $T_{1/2}$=1.6 s *3*; $Q(\beta^-)$=1.155×10^4 *13*; $\%\beta^-$ decay=100.0

^{238}U(p,F), E(p) = 30 MeV. Isotopes separated using the Leuven ion-guide laser-ion source (LIGLIS) coupled to the LISOL mass separator. Measured Eγ, Iγ, $T_{1/2}$, β-γ and $\gamma\gamma$ coincidences using two HPGe detectors and three ΔE plastic detectors.

Others: 1999MuZZ, 2002Ko31 (details on LIGLIS).

The total average radiation energy released by ^{68}Co β-decay (1.6 s) is 9700 *300* (calculated by evaluator using computer program radlst), 16% lower than 11550 *130*, suggesting an incomplete decay scheme. This is supported by β-γ coincidence measurements which estimate≈50% of the β-decay proceeds via unresolved levels that subsequently γ-decay to low-lying levels in ^{68}Ni (2000Mu10).

α: Additional information 1.

^{68}Ni Levels

E(level)†	J^π#	$T_{1/2}$#	Comments
0.0	0^+	29 s *2*	$\%\beta^-$=100
2034.07 *16*	2^+	0.31 ps *5*	
2511.9 *3*	(0^+)‡	<15 ns	$T_{1/2}$: assuming that observed 511γ's correspond to (e^-,e^+) transitions to the g.s.
2743.82 *16*	$(2)^+$‡		
2849.1?@ *3*	5^-	0.86 ms *5*	%IT=100
3149.2 *3*	(4^+)		
3543.4?@ *3*			
3988.5?@ *3*			
4026.7 *3*	(1,2)		
4165.8 *3*	(0,1,2)		
5513.2 *20*	$(0^+,1^+,2^+)$		
5550.2 *20*	$(0^+,1^+,2^+)$		
5775.2 *20*	$(0^+,1^+,2^+)$		

† From a least-squares fit to Eγ's by evaluator.

‡ Low-lying J=1 states are not expected from the available neutron fp orbitals. A strong γ to the g.s. indicates $J^\pi=2^+$ for the 2744 state. Lack of a similar transition from the 2512 state and the possible E0 transition to the g.s. supports a $J^\pi=0^+$ assignment.

From the Adopted Levels.

@ Identification of the 3543 and 3989 levels is based on the observation of a 694γ and 1139γ with $T_{1/2}$≈1.6 s which are non-coincident with any other transitions, suggesting they directly populate the 5^- 2849 isomeric level (2000Mu10). This, however, is in disagreement with the direct population of these levels from $J^\pi=(1^+)$ and thus, the evaluator considers their existence tentative.

γ(^{68}Ni)

Iγ(511γ)=20.8 *5*. Nearly all the intensity is coincident with β particles and can be accounted for as 511-511 coincidences. The 511γ's are prompt with β particles within the ≈ 15 ns time resolution; thus it can be ruled out that the 511γ originates from the 1770 0^+ state which has $T_{1/2}$=211 ns *50*. 2000Mu10 propose the source of the 511γ may be an E0 transition from the decay of the 2511 state to the g.s.

Continued on next page (footnotes at end of table)

^{68}Co β^- decay (1.6 s) 2000Mu10 (continued)

$\gamma(^{68}Ni)$ (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α	Comments
477.8 *2*	15.5 *7*	2511.9	(0^+)	2034.07	2^+	[E2]	0.00191 *3*	α(K)=0.001717 *25*; α(L)=0.0001711 *24*; α(M)=2.40×10^{-5} *4*; α(N+..)=1.005×10^{-6} *1*
[x]663.2 *5*	3.4 *2*							
694.3[#] *2*	7.6 *3*	3543.4?		2849.1?	5^-			
708.9 *2*	6.0 *4*	2743.82	$(2)^+$	2034.07	2^+			From coincidence and $T_{1/2}$ measurements, this transition is a doublet also observed in ^{68}Co β^- decay (0.20 s).
815.0[#] *2*	13.8 *5*	2849.1?	5^-	2034.07	2^+	E3	0.000928 *13*	α=0.000928 *13*; α(K)=0.000832 *12*; α(L)=8.36×10^{-5} *12*; α(M)=1.176×10^{-5} *17*; α(N+..)=4.92×10^{-7} E_γ: from ^{68}Co β^- decay (0.20 s). I_γ: from $\Sigma I\gamma$(to 2849) by evaluator.
1115.1 *2*	9.7 *5*	3149.2	(4^+)	2034.07	2^+	(E2)	0.000188 *3*	α=0.000188 *3*; α(K)=0.0001683 *24*; α(L)=1.645×10^{-5} *23*; α(M)=2.32×10^{-6} *4*; α(N+..)=1.431×10^{-6}
1139.4[#] *2*	6.2 *4*	3988.5?		2849.1?	5^-	D,Q		
1422.0 *2*	10.6 *6*	4165.8	(0,1,2)	2743.82	$(2)^+$			
1514.8 *2*	10.2 *5*	4026.7	(1,2)	2511.9	(0^+)			
2033.2 *2*	100 *2*	2034.07	2^+	0.0	0^+	[E2]	0.000383 *6*	α=0.000383 *6*; α(K)=4.96×10^{-5} *7*; α(L)=4.81×10^{-6} *7*; α(M)=6.77×10^{-7} *10*; α(N+..)=0.000328 *5*
2511.9[#]		2511.9	(0^+)	0.0	0^+	(E0)		The source of the observed 511γ's (see above) may be from an E0 transition from the 2512 state to the 0^+ g.s.; however, no 1511γ-511γ coincidences were observed. ρ^2>0.24 if all the Iγ(511γ) originates from the 2512 level.
2744.6 *2*	14.7 *8*	2743.82	$(2)^+$	0.0	0^+	(E2)	0.000700 *10*	α=0.000700 *10*; α(K)=2.95×10^{-5} *5*; α(L)=2.85×10^{-6} *4*; α(M)=4.01×10^{-7} *6*; α(N+..)=0.000668 *10*
3479 *2*	7.4 *7*	5513.2	$(0^+,1^+,2^+)$	2034.07	2^+			
3516 *2*	5.5 *7*	5550.2	$(0^+,1^+,2^+)$	2034.07	2^+			
3741 *2*	10.3 *7*	5775.2	$(0^+,1^+,2^+)$	2034.07	2^+			

[†] Normalized to Iγ(2033γ)=100.
[‡] From Adopted Gammas.
[#] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

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Decay Scheme

Intensities: Type not specified