^{71}Cu β^- decay (19.4 s)   1983Ru06

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 188,1 (2023)	17-Jan-2023

Parent: ^{71}Cu: E=0.0; J^π=3/2$^{(-)}$; $T_{1/2}$=19.4 s 16; Q(β^-)=4618 3; %β^- decay=100

^{71}Cu-Q(β^-): From 2021Wa16.

^{71}Cu-J^π,$T_{1/2}$: From ^{71}Cu Adopted Levels.

1983Ru06: ^{71}Cu produced by W(^{72}Ge,X) at E=9 MeV/nucleon from UNILAC at GSI facility. The reaction products were stopped in a 30 mg/cm^2 graphite catcher in FEBIAD-E ion source of the on-line mass separator. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\beta$, β, isotopic half-life using two Ge(Li) detectors at θ=180° and a plastic scintillator.

1999Pr10: ^{71}Cu from fragmentation of ^{76}Ge beam with ^{9}Be target at NSCL facility. Measured Eγ, $\gamma\gamma$-coin, isotopic half-life. A 1298γ was seen in coin with 490γ and seven γ rays were shown in a spectrum between 1150 and 1660 keV. The authors stated that there were discrepancies between their data and those from 1983Ru06, but details of this study are not available.

The decay scheme given here from 1983Ru06 is considered incomplete in view of a gap of about 2.2 MeV between Q value and the highest level at 2377 keV, where additional levels and γ rays could be present. Moreover, some γ-ray spectra shown by 1999Pr10 show additional transitions assigned to this decay, albeit, unplaced at present.

^{71}Zn Levels

E(level)[†]	J^{π}[‡]	$T_{1/2}$[‡]	Comments
0.0	1/2$^-$	2.42 min 10	
155.62 6	9/2$^+$	4.140 h 15	%β^-=100; %IT<0.05
			E(level): from the Adopted Levels. Other: 157.7 13 (2021Ko07).
286.3 14	(5/2)$^+$	≈40 ns	
489.8 3	1/2$^-$,3/2$^-$	5.1 ps 14	
674.7 3	(3/2)$^-$	≤0.42 ps	
1261.3 5	(5/2)$^+$		
1791.3 8	(1/2,3/2,5/2$^-$)		
1856.5 6	(3/2$^+$,5/2$^+$)		
2179.5 5	(5/2)$^+$		
2377.0 5	1/2$^+$		

[†] From a least-squares fit to Eγ data.
[‡] From Adopted Levels.

γ(^{71}Zn)

All γ rays were observed in coincidence with β particles.

γ normalization factor cannot be deduced since work of 1999Pr10 suggests additional transitions as well as discrepancies with the data from 1983Ru06, but details of 1999Pr10 work are not available.

Eγ	Iγ	E$_i$(level)	J_i^π	E$_f$	J_f^π	Mult.	α[‡]	Comments
128.6 2	100 7	286.3	(5/2)$^+$	155.62	9/2$^+$	[E2]	0.254 4	α(K)=0.2241 34; α(L)=0.0257 4; α(M)=0.00364 6 α(N)=0.0001193 18
184.8 3	22 6	674.7	(3/2)$^-$	489.8	1/2$^-$,3/2$^-$	[M1,E2]	0.038 26	α(K)=0.034 23; α(L)=0.0037 26; α(M)=5.E−4 4 α(N)=1.9×10^{-5} 13
197.5 2	53 6	2377.0	1/2$^+$	2179.5	(5/2)$^+$	[E2]	0.0505 7	α(K)=0.0449 7; α(L)=0.00486 7; α(M)=0.000691 10 α(N)=2.46×10^{-5} 4
489.7[†] 4	416[†] 34	489.8	1/2$^-$,3/2$^-$	0.0	1/2$^-$			

Continued on next page (footnotes at end of table)

^{71}Cu β^- decay (19.4 s)   1983Ru06 (continued)

$\gamma(^{71}$Zn) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Comments
520.4 3	22 9	2377.0	$1/2^+$	1856.5	$(3/2^+,5/2^+)$	
586.5 4	126 9	1261.3	$(5/2)^+$	674.7	$(3/2)^-$	
595.2† 5	127† 8	1856.5	$(3/2^+,5/2^+)$	1261.3	$(5/2)^+$	
^{x}668.4 10	21 8					
674.8 3	106 10	674.7	$(3/2)^-$	0.0	$1/2^-$	
^{x}1233.6 5	52 20					
1298$^\#$		1791.3	$(1/2,3/2,5/2^-)$	489.8	$1/2^-,3/2^-$	E_γ: reported by 1999Pr10 in coin with 490γ, placement by the evaluators.
1504.8 5	42 11	2179.5	$(5/2)^+$	674.7	$(3/2)^-$	
1791.3 8	54 16	1791.3	$(1/2,3/2,5/2^-)$	0.0	$1/2^-$	
2021.7 12	15 10	2179.5	$(5/2)^+$	155.62	$9/2^+$	

† Unresolved doublet, the second component belongs to ^{71}Zn decay. 1983Ru06 probably divided the intensity amongst the two components.

‡ 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.

$^\#$ Placement of transition in the level scheme is uncertain.

^{x} γ ray not placed in level scheme.

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Decay Scheme

Intensities: Relative I_γ

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

$3/2^{(-)}$　　0.0　　　19.4 s *16*

$Q_{\beta^-}=4618$ *3*　　　%β^-=100

$^{71}_{29}Cu_{42}$

520.4 22

197.5 [E2] 53

2021.7 15

1504.8 42

595.2 127

1791.3 54

1298

586.5 126

674.8 106

184.8 [M1,E2] 22

489.7 416

128.6 [E2] 100

$1/2^+$	2377.0	
$(5/2)^+$	2179.5	
$(3/2^+,5/2^+)$	1856.5	
$(1/2,3/2,5/2^-)$	1791.3	
$(5/2)^+$	1261.3	
$(3/2)^-$	674.7	≤0.42 ps
$1/2^-,3/2^-$	489.8	5.1 ps *14*
$(5/2)^+$	286.3	≈40 ns
$9/2^+$	155.62	4.140 h *15*
$1/2^-$	0.0	2.42 min *10*

$^{71}_{30}Zn_{41}$