^{69}Ni β^- decay (11.4 s) 2001Fr21,1988Bo06

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. D. Nesaraja	NDS 115, 1 (2014)	31-Jul-2013

Parent: ^{69}Ni: E=0.0; J$^\pi$=(9/2$^+$); $T_{1/2}$=11.4 s *3*; Q(β^-)=5758 *4*; %β^- decay=100.0

2001Fr21,1998Fr15: ^{69}Ni produced from 30 MeV proton induced fission reaction on ^{238}U. Extracted selectively by resonant laser ionization and mass separator (LIGIS-LISOL) facility at Leuven. Measured $\beta\gamma$ and $\gamma\gamma$ coincidence spectra with high purity Ge detectors and plastic scintillators. Measured $T_{1/2}$ from timing of β delayed γ intensity.

1999Pr10,1998PrZY: ^{69}Ni produced by fragmentation of 70 MeV/nucleon ^{76}Ge beam on Be target using the A1200 separator at NSCL, MSU. β delay γ measured with two thin plastic scintillators and two large-volume Ge detectors.

1988Bo06,1987BoZW: ^{69}Ni produced by irradiation of thick W target with 11.5 MeV/u ^{76}Ge beam followed by on-line mass separation; measured Eγ, Iγ, $\beta\gamma$, $\gamma\gamma$ coincidences using 300μm Si detector, NE102A plastic scintillator, 33 % efficiency Ge and 4π lucite detectors.

1985Bo49: ^{69}Ni produced and identified in W(^{76}Ge,X) reaction at 11.4 MeV/nucleon followed by mass separation at GSI facility. Measured γ, β, $\beta\gamma$ coin on the decay of 205γ, 680γ and 1213γ, and isotopic half-life using Ge, Si detectors and plastic scintillators.

1985Bo49: ^{69}Ni produced by irradiation of W target with 11.4 MeV/u ^{76}Ge beam. On-line mass separation; measured Eγ, Iγ, $T_{1/2}$, $\beta\gamma$ coincidences.

1985Ru05: ^{69}Ni produced by irradiation of W target with 11.5 MeV/nucleon ^{76}Se beam followed by on-line mass separation. Measured Eγ, Iγ, $T_{1/2}$, $\beta\gamma$ coincidences using 4π plastic β and Ge detectors.

^{69}Cu Levels

M: From Adopted Levels.

E(level)‡	J$^\pi$†	$T_{1/2}$	Comments
0	3/2$^-$	2.85 min *15*	$T_{1/2}$: weighted average of 2.7 m 1 (1985Ru05) and 3.0 m 1 (1966Va12).
1213.53 *10*	(5/2,7/2)$^-$		J$^\pi$: For 5/2$^-$, one expects log $f^{1u}t$>8.5 with β- feeding <1 %. Limit of β- feeding by author could be accounted for by the existence of high energy γ's that have escaped detection.
1711.4 *3*	7/2$^-$		
1871.3 *3*	7/2$^-$		
2182.1 *3*	9/2$^-$		
2551.8 *3*	(9/2$^+$)		
2602.9 *3*	(9/2$^-$)		
2696.9 *3*	(7/2$^+$,9/2$^+$,11/2$^+$)		
2757.0 *3*	(7/2$^+$,9/2$^+$,11/2$^+$)		
2800.9 *3*	(7/2$^+$,9/2$^+$,11/2$^+$)		
3063.7 *4*			

† From Adopted Levels.
‡ From least-square fit to γ's.

β^- radiations

E(decay)	E(level)	Iβ^-‡	Log *ft*†	Comments
(2694 *4*)	3063.7	0.1	>6.9	av Eβ=1138.5 *19*
(2957 *4*)	2800.9	6.0	>5.3	av Eβ=1263.6 *20*
(3001 *4*)	2757.0	40.6	>4.5	av Eβ=1284.6 *20*
(3061 *4*)	2696.9	33.2	>4.6	av Eβ=1313.4 *20*
(3155 *4*)	2602.9	0.01	>8.2	av Eβ=1358.4 *20*
(3206 *4*)	2551.8	10.3	>5.2	av Eβ=1382.8 *20*

Continued on next page (footnotes at end of table)

^{69}Ni β^- decay (11.4 s) 2001Fr21,1988Bo06 (continued)

β^- radiations (continued)

E(decay)	E(level)	Iβ^-‡	Log *ft*†	Comments
(3576 *4*)	2182.1	0.3	>6.9	av Eβ=1560.4 *20*
(3887 *4*)	1871.3	0.01	>8.6	av Eβ=1710.3 *20*
(4047 *4*)	1711.4	1.7	>6.4	av Eβ=1787.6 *20*
(4544 *4*)	1213.53	7.9	>6.0	av Eβ=2028.7 *20* Log *ft*: log $f^{1u}t$>7.7.

† Authors give lower limits to account for possible unobserved feeding from higher levels.
‡ Absolute intensity per 100 decays.

γ(^{69}Cu)

Iγ normalization: From ΣIγ(gs)=100, one gets NR=0.42 and this gives Iβ values close to those given here.

E_γ[‡]	I_γ[‡&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	α[†]	Comments
104.1 *2*	2.4 *5*	2800.9	(7/2$^+$,9/2$^+$,11/2$^+$)	2696.9	(7/2$^+$,9/2$^+$,11/2$^+$)			
154.1 *1*	4.5 *6*	2757.0	(7/2$^+$,9/2$^+$,11/2$^+$)	2602.9	(9/2$^-$)			
^{x}183.2 *5*	10 *1*							E_γ,I: From 1988Bo06. Looked for but not seen by 2001Fr21.
205.1 *1*	61.5 *21*	2757.0	(7/2$^+$,9/2$^+$,11/2$^+$)	2551.8	(9/2$^+$)			
^{x}231.4 *10*	0.9 *3*							
249.1 *1*	9.5 *17*	2800.9	(7/2$^+$,9/2$^+$,11/2$^+$)	2551.8	(9/2$^+$)			
262.8 *2*	0.1 *2*	3063.7		2800.9	(7/2$^+$,9/2$^+$,11/2$^+$)			
470.7 *1*	28.0 *16*	2182.1	9/2$^-$	1711.4	7/2$^-$	(M1)	0.001128 *16*	α=0.001128 *16*; α(K)=0.001013 *15*; α(L)=0.0001009 *15*; α(M)=1.419×10^{-5} *20* α(N)=4.33×10^{-7} *6* E_γ: 1988Bo06 placed 470.5 γ transition from 2755.8 level.
574.9 *1*	27.2 *15*	2757.0	(7/2$^+$,9/2$^+$,11/2$^+$)	2182.1	9/2$^-$			E_γ: 1988Bo06 placed 574.6 γ transition from 2285.4 level.
^{x}584.8 *3*	≤1.0							
680.5 *1*	94.6 *22*	2551.8	(9/2$^+$)	1871.3	7/2$^-$	(E1)	0.000258 *4*	α=0.000258 *4*; α(K)=0.000232 *4*; α(L)=2.29×10^{-5} *4*; α(M)=3.21×10^{-6} *5*; α(N+..)=9.77×10^{-8} *14* α(N)=9.77×10^{-8} *14*
^{x}780.8 *3*	1.2 *6*							
1089.3 *4*	2.0 *8*	2800.9	(7/2$^+$,9/2$^+$,11/2$^+$)	1711.4	7/2$^-$			
1213.5 *1*	100.0	1213.53	(5/2,7/2)$^-$	0	3/2$^-$			
1336.0[#] *7*	1.1 *5*	2551.8	(9/2$^+$)	1213.53	(5/2,7/2)$^-$			E_γ: Poor fit to level energy difference.
1389.5 *5*	3.3 *8*	2602.9	(9/2$^-$)	1213.53	(5/2,7/2)$^-$			
1483.6[#] *4*	79 *3*	2696.9	(7/2$^+$,9/2$^+$,11/2$^+$)	1213.53	(5/2,7/2)$^-$			
1711.9 *6*	33.9 *21*	1711.4	7/2$^-$	0	3/2$^-$	(E2)	0.000261 *4*	α=0.000261 *4*; α(K)=7.57×10^{-5} *11*; α(L)=7.44×10^{-6} *11*; α(M)=1.046×10^{-6} *15*; α(N+..)=0.0001763 α(N)=3.21×10^{-8} *5*; α(IPF)=0.0001763 *25*
1872.3 *8*	94.6 *32*	1871.3	7/2$^-$	0	3/2$^-$	(E2)	0.000321 *5*	α=0.000321 *5*; α(K)=6.39×10^{-5} *9*; α(L)=6.27×10^{-6} *9*; α(M)=8.82×10^{-7} *13*; α(N+..)=0.000250 *4* α(N)=2.71×10^{-8} *4*; α(IPF)=0.000250 *4*
^{x}2285	1.7 *7*							
2550[#] *2*	5.8 *7*	2551.8	(9/2$^+$)	0	3/2$^-$			
2695[#] *2*	3.9 *7*	2696.9	(7/2$^+$,9/2$^+$,11/2$^+$)	0	3/2$^-$			

† Additional information 1.

$^{69}_{29}$Cu$_{40}$-3

$\gamma(^{69}$Cu) (continued)

‡ From 2001Fr21, except as noted otherwise. Due to limited statistics and decreasing detector efficiency for high energy transitions, γ's to g.s. from levels above 2 MeV may have be missed.
# From 1988Bo06.
@ From Adopted Levels.
& For absolute intensity per 100 decays, multiply by ≈0.42.
x γ ray not placed in level scheme.

$^{69}_{29}$Cu$_{40}$-4

^{69}Ni β^- decay (11.4 s) 2001Fr21,1988Bo06

Decay Scheme

Intensities: Relative I_γ