

^{59}Ni ε decay [1991Ja02,2015Pf02](#)

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia		NDS 151, 1 (2018)	1-Apr-2018

Parent: ^{59}Ni : $E=0.0$; $J^\pi=3/2^-$; $T_{1/2}=7.6\times 10^4$ y 5; $Q(\varepsilon)=1073.00$ 19; $\% \varepsilon + \% \beta^+$ decay=100.0

Others: [1951Br05](#), [1951Wi14](#), [1956Sa32](#), [1963Sc06](#), [1974Ch06](#), [1976Be02](#).

[1991Ja02](#): ^{59}Ni activity was prepared by neutron irradiation of 188 mg Ni metal enriched to 99.927% in ^{58}Ni for 167 days at a neutron flux of $1.3 \times 10^{14} \text{ cm}^{-2} \text{ s}^{-1}$. After chemical separation from contaminant activities, 10 mm diameter pellets were prepared. K x-rays were measured with a Si(Li) detector. Also internal bremsstrahlung in coincidence with K x-ray was measured using Si(Li) detector and a proportional counter.

[2015Pf02](#): Re-analysis of γ spectrum coincident with cobalt K x-rays observed in the decay of ^{59}Ni from [1991Ja02](#). The high energy side, $E_\gamma > 600$ keV, cannot be reproduced with a radiative electron capture calculation. A considerably better description is obtained when a virtual β^- transition to the 1099 keV level is introduced.

 ^{59}Co Levels

E(level)	$J^\pi^\dagger$	Comments
0.0	$7/2^-$	
1099.256 3	$3/2^-$	E(level): The energy of this level exceeds the decay $Q(\beta^-)$ value. From re-analysis of γ spectrum coincident with cobalt K x-rays observed in the decay of ^{59}Ni in 1991Ja02 , 2015Pf02 propose the population through virtual or 'detour' transitions.

† From Adopted Levels.

 ε, β^+ radiations

For studies of internal bremsstrahlung spectrum, see [1956Sa32](#), [1963Sc06](#), [1976Be02](#), [1991Ja02](#).

E(decay)	E(level)	$I\beta^+^\dagger$	$I\varepsilon^\dagger$	Log ft	$I(\varepsilon + \beta^+)^\dagger$	Comments
(-26.26 19)	1099.256		$\approx 3.41 \times 10^{-3}$		≈ 0.00341	$I\varepsilon$: The energy of this level exceeds the decay $Q(\beta^-)$ value, therefore it can be populated only through virtual or 'detour' transitions. From the statement that the virtual and interference of 2% and 2.3%, respectively, of the integrated radiative electron capture gamma spectrum above 195 keV, a branching ratio of 3.41×10^{-3} per 100 decays of ^{59}Ni is deduced in 2015Pf02 .
(1073.00 19)	0.0	3.7×10^{-5} 12	99.99696 1	11.89 3	99.997 3	av $E\beta=24.69$ 27; $\varepsilon K=0.8872$; $\varepsilon L=0.09607$; $\varepsilon M+=0.01672$ $I\beta^+$: $\%I\beta+=3.7 \times 10^{-5}$ 12 from $I(\beta^+)/I(\varepsilon K(\text{exp}))=4.2 \times 10^{-7}$ 13 (1991Ja02), assuming $\varepsilon K/\varepsilon=0.887$. Other: $I(\beta^+)/I(\varepsilon)=1.5 \times 10^{-7}$ (1976Be02). Note that allowed β decay theory gives $\%I\beta+=0.00152$ 9, ≈ 2 orders of magnitude larger than experiment. $I\varepsilon$: $99.997 - \%I\beta+$. $\varepsilon L(\text{exp})/\varepsilon K(\text{exp})=0.121$ 2 (1974Ch06).

† Absolute intensity per 100 decays.