

^{72}Co β^- n decay:mixed 2016Mo07

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

Parent: ^{72}Co : $E=0+x$; $J^\pi=(6^-, 7^-)$; $T_{1/2}=51.5$ ms 3; $Q(\beta^-n)=7040$ syst; $\% \beta^-n$ decay ≈ 16.0

Parent: ^{72}Co : $E=0+y$; $J^\pi=(0^+, 1^+)$; $T_{1/2}=47.8$ ms 5; $Q(\beta^-n)=7040$ syst; $\% \beta^-n$ decay ≈ 16.0

$^{72}\text{Co}(0+x)-J^\pi, T_{1/2}$: From 2016Mo07. Half-life measured from decay curve of β^- -decay activity gated on 454γ . Others: 52.8 ms 16 (2014Xu07), 55 ms 4 (2014Ra20), 62 ms 3 (2011Da08, 2003Sa40), 59 ms 2 (2005Ma59), where only one activity was reported.

$^{72}\text{Co}(0+x)-Q(\beta^-n)$: 7040 300 (syst, 2021Wa16).

$^{72}\text{Co}(0+x)-\% \beta^-n$ decay: $\% \beta^-n \approx 16$ 2 (2020MoZS). Other: <2.7 9 for decay of ^{72}Co (2012Ra10). Considered by evaluators as combined for the two activities.

$^{72}\text{Co}(0+y)-J^\pi, T_{1/2}$: From 2016Mo07. Half-life measured from decay curve of β^- -decay activity gated on 1680γ , 1689γ , 1732γ , 2023γ , 2538γ , 2650γ , 2885γ , 3040γ and 3383γ .

$^{72}\text{Co}(0+y)-Q(\beta^-n)$: 7040 300 (syst, 2021Wa16).

$^{72}\text{Co}(0+y)-\% \beta^-n$ decay: $\% \beta^-n \approx 16$ 2 (2020MoZS). Other: <2.7 9 for decay of ^{72}Co (2012Ra10). Considered by evaluators as combined for the two activities.

2016Mo07: ^{72}Co isotope produced in $^9\text{Be}(^{238}\text{U}, f)$, $E=345$ MeV/nucleon at RIBF-RIKEN facility. Fission fragments were separated and analyzed through ΔE -B ρ -tof technique using BigRIPS separator and ZeroDegree spectrometer. The implanted residues were counted using the WAS3ABi setup equipped with DSSSDs for ion, β , conversion electrons and EURICA array of 12 seven-element HPGe detectors for γ -ray detection. Fast-timing scintillation detectors BC-418 plastic and 18 LaBr₃ were used in an attempt to determine level lifetimes of ≈ 100 ps or so. Measured E_γ , I_γ , $\beta\gamma\gamma$ -coin, (^{72}Co implants) β correlations, half-lives of two activities of ^{72}Co , a high-spin and a low-spin.

2020MoZS: one of the evaluators (B. Singh) enquired from the first author (A. Morales) about the possibility of extracting $\% \beta^-n$ for the decay of ^{72}Co investigated by 2016Mo07. Dr. A. Morales in her e-mail communication of May 26, 2020 sent us extracted decay branches for $\% \beta^-n$ and $\% \beta^-2n$ for $^{70,71,72,73,74}\text{Co}$ from analysis of intensities of γ rays emitted in the decay chains of several isotopes, including granddaughters and great-granddaughters. However, some concern was expressed by A. Morales about the quality of the deduced $\% \beta^-n$ and $\% \beta^-2n$ branching ratios, thus the value of $\% \beta^-n$ is listed by the evaluators here as approximate.

2014Ra20 (also 2005Ma95): ^{72}Co isotope produced in fragmentation of ^{86}Kr beam in ^9Be target at $E=140$ MeV/nucleon. Reaction products were selected according to their momentum over charge ratio using the A1900 spectrometer at the NSCL-MSU facility. Measured E_γ , I_γ , $\gamma\gamma$ -, and $\beta\gamma$ -coin, (fragment) γ -coin, TOF and ΔE using the NSCL beta-counting system, Si strip detector for particle detection and SeGA array of Ge detectors for γ rays.

2016Mo07 do not provide a decay scheme for ^{72}Co β^- n decay. Based on level scheme from ^{71}Co decay, and γ rays identified by 2016Mo07 in ^{72}Co decay, and assigned to ^{71}Ni from β -delayed one-neutron decay mode (Fig. 1 in 2016Mo07), evaluators have constructed a decay scheme for ^{72}Co β^- n decay.

 ^{71}Ni Levels

E(level) [†]	J^π [‡]	$T_{1/2}$ [‡]	Comments
0.0	(9/2 ⁺)	2.56 s 3	
280.3 5	(7/2 ⁺)		
499	(1/2 ⁻)	2.3 s 3	$\% \beta^- = 100$
813	(5/2 ⁺)		
1066	(5/2 ⁻)		
1273	(5/2 ⁻)		

[†] From E_γ values.

[‡] From the Adopted Levels.

^{72}Co β^- n decay:mixed 2016Mo07 (continued) $\gamma(^{71}\text{Ni})$

$E_\gamma^\dagger$	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Comments
280.3 5	280.3	(7/2 ⁺)	0.0	(9/2 ⁺)	E_γ : from 2014Ra20. Other: 281 (2016Mo07). I γ =13 3 (2014Ra20), relative to 100 for 1095.1 γ in ^{72}Ni from ^{72}Co β^- decay.
567	1066	(5/2 ⁻)	499	(1/2 ⁻)	
^x 641					
774	1273	(5/2 ⁻)	499	(1/2 ⁻)	
813	813	(5/2 ⁺)	0.0	(9/2 ⁺)	
^x 915					

[†] From β -gated singles γ spectrum (Fig. 1 in 2016Mo07), assigned by the authors to ^{71}Ni from the β^- -n decay of ^{72}Co .

^x γ ray not placed in level scheme.

 ^{72}Co β^- n decay:mixed 2016Mo07Decay Scheme