^{66}Mn β^-n decay 2017Ol08,2018St18

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 202,59 (2025)	25-Feb-2025

Parent: ^{66}Mn: E=0.0; J^π=(1$^+$); $T_{1/2}$=63.9 ms *11*; Q(β^-n)=6396 *12*; %β^-n decay=4.6 *10*

^{66}Mn-J^π: Proposed by 2011Li50 based on systematics of neighboring nuclei and adopted by 2017Ol08. Other: 2018St18 propose (2$^+$) from comparisons of observed β feedings with theoretical calculations with different J^π for ^{66}Mn g.s.

^{66}Mn-$T_{1/2}$: Weighted average of 64.1 ms *11* (2018St18), 70 ms *15* (2017Ol08), 60 ms *3* (2013Li04), 64 ms *2* (2003So21), 66 ms *4* (1999Ha05), and 90 ms *20* (1998Am04). 65 ms *2* from Adopted Levels of ^{66}Mn (2009 update).

^{66}Mn-Q(β^-n): From 2021Wa16.

^{66}Mn-%β^-n decay: Weighted average of 3.8 *8* (2017Ol08, obtained from analysis of ^{66}Mn and ^{65}Fe β-decay chains with decay data also from 2013Ol06 and 2012Li02), 7.3 *+14−11* (2018St18, extracted from analysis of decay curves of γ transitions in ^{65}Fe and ^{66}Fe), 4 *1* (2013Li04).

Adapted from the XUNDL dataset for 2017Ol08 compiled by B. Singh (McMaster) on December 14, 2017 and the XUNDL dataset for 2018St18 compiled by E.A. McCutchan (NNDC,BNL), on April 16, 2020.

2017Ol08: ^{66}Mn source was produced in bombardment of UC_x target by 1.4-GeV pulsed protons at the ISOLDE-CERN facility. Reaction products diffused out of the target were ionized by selective resonant ionization using RILIS, mass separated by General Purpose Separator (GPS), and implanted into a thin Al foil. β particles were detected with a fast-timing plastic scintillator and γ rays were detected with two $LaBr_3$(Ce) and two HPGe detectors. Measured Eγ, Iγ,$\gamma\gamma$-coin, $\beta\gamma$(t). Deduced levels, J, π, parent $T_{1/2}$, β-delayed neutron emission probability. Comparisons with available data and large-scale shell-model calculations with the Lenzi-Nowacki-Poves-Sieja (LNPS) interaction.

2018St18: ^{66}Mn activity was produced in U(p,F) reaction with E(p)=1.4 GeV reaction using UC_x target at ISOLDE-CERN facility. Mn atoms were ionized using the ISOLDE Resonance Ionization Laser Ion Source (RILIS) followed by mass separation. β particles were detected with three plastic ΔE detectors and γ rays were detected with two HPGe MiniBall cluster detectors. Measured Eγ, Iγ, $\beta\gamma$-coin, $\beta\gamma$(t). Deduced levels, J, π, parent $T_{1/2}$, isomer $T_{1/2}$, β-delayed neutron emission probability. Comparisons with available data and shell-model calculations.

2013Li04: ^{66}Mn source was produced at NSCL. Report data for ^{66}Mn β^- decay and β-delayed neutron emission probability.

^{65}Fe Levels

E(level)[†][‡]	J^π[#]	$T_{1/2}$[#]	Comments
0.0	(1/2$^-$)	0.805 s *10*	
363.70 *10*	(3/2$^-$)	93 ps *3*	E(level): feeding to the 364-keV level is sum of the 364 and 398 level feedings as the 34-keV transition depopulating the 398-keV level was below the measurable energy range of the experiment (2018St18).
398.0 *4*	(5/2$^+$)	420 ns *13*	$T_{1/2}$: value from this dataset: 409 ns *+29−27* from β-364γ(t) (2018St18).
455.8 *2*	(5/2$^-$)	350 ps *10*	
560.7 *2*	(3/2,5/2$^-$)	390 ps *30*	

[†] Additional information 1.
[‡] From Eγ data.
[#] From Adopted Levels.

γ(^{65}Fe)

Iγ normalization: Deduced by the evaluator assuming Σ[%I(γ to g.s.)]+%I(β^-n to g.s.)=100 per 100 β^-n decay.

Eγ	Iγ[†][‡]	E_i(level)	J_i^π	E_f	J_f^π	Comments
(34)		398.0	(5/2$^+$)	363.70	(3/2$^-$)	
162.7 *3*	0.30 *6*	560.7	(3/2,5/2$^-$)	398.0	(5/2$^+$)	%Iγ=0.11 *4* Eγ,Iγ: from 2018St18; not seen in 2017Ol08.
363.7 *1*	5.2 *3*	363.70	(3/2$^-$)	0.0	(1/2$^-$)	%Iγ=2.0 *5*

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^{66}Mn β^-n decay 2017Ol08,2018St18 (continued)

$\gamma(^{65}Fe)$ (continued)

E_γ	I_γ[†‡]	E_i(level)	J_i^π	E_f	J_f^π	Comments
455.8 *2*	0.79 *20*	455.8	(5/2$^-$)	0.0	(1/2$^-$)	E_γ: from 2017Ol08 and 2018St18. I_γ: weighted average of 5.2 *3* (2017Ol08) and 5.23 *37* (2018St18). %Iγ=0.30 *11* E_γ: weighted average of 455.6 *2* (2017Ol08) and 455.9 *2* (2018St18). I_γ: weighted average of 0.7 *2* (2017Ol08) and 0.89 *21* (2018St18). Tentative presence of this γ ray in ^{66}Mn β^-n decay in 2017Ol08.
560.7 *2*	1.11 *15*	560.7	(3/2,5/2$^-$)	0.0	(1/2$^-$)	%Iγ=0.42 *12* E_γ: weighted average of 560.8 *2* (2017Ol08) and 560.6 *2* (2018St18). I_γ: weighted average of 1.0 *2* (2017Ol08) and 1.17 *15* (2018St18).

† Relative to Iγ=100 of 573.5γ in ^{66}Fe from ^{66}Mn decay.
‡ For absolute intensity per 100 decays, multiply by 0.38 *+15−13*.

Delayed Neutrons (^{65}Fe)

E(^{65}Fe)	I(n)[†‡]	Comments
0.0	41 *8*	I(n): unweighted average of 33 *5* (2017Ol08) and 48 *6* (2018St18). This direct β^-n feeding to ground state is determined as the difference between the total intensity of ^{65}Fe β^- decay to ^{65}Co (using observed γ transitions in ^{65}Co) and the total intensity of γ transitions feeding the g.s. in ^{65}Fe.
363.70	41.5 *59*	I(n): others: 51 *4* (2017Ol08), 31 *4* (2018St18).
455.8	6.3 *17*	I(n): others: 7 *3* (2017Ol08), 7 *2* (2018St18).
560.7	11.2 *19*	I(n): others: 9.3 *11* (2017Ol08), 15 *3* (2018St18).

† Deduced by the evaluator from γ-ray intensity balance at each level for excited level, with Σ%I(β^-n to excited level)=100−%I(β^-n to g.s.)=59 *8*. Values from 2017Ol08 and 2018St18 are deduced in the same way and are given under comments.
‡ For absolute intensity per 100 decays, multiply by 0.046 *10*.

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Decay Scheme

Intensities: I_γ per 100 parent decays