^{33}Mg β^-n decay (90.5 ms)   2006AnZW,1984La03

	Type	Author	History Citation	Literature Cutoff Date
	Full Evaluation	Jun Chen	NDS 201,1 (2025)	31-Oct-2024

Parent: ^{33}Mg: E=0; J^π=3/2$^-$; $T_{1/2}$=90.5 ms *16*; Q(β^-n)=7991 *8*; %β^-n decay=15 *2*

^{33}Mg-J^π,$T_{1/2}$: From Adopted Levels of ^{33}Mg in ENSDF database (2011 update).

^{33}Mg-Q(β^-n): From 2021Wa16.

^{33}Mg-%β^-n decay: Weighted average of 14 *2* (2006AnZW), 25 *13* (1995ReZZ,2008ReZZ), and 17 *5* (1984La03,1984Gu19). Others: 19 *2* estimated from absolute intensities of 8 *1* and 11 *2* for 735γ and 2765γ to g.s., respectively, in ^{32}Al from ^{33}Mg β^-n decay as measured by 2008Tr07; 50 *16* (1999YoZW,preliminary).

2006AnZW: ^{33}Mg ions were produced by fragmentation of 78 MeV/nucleon ^{36}S beam at GANIL, selected by the LISE3 spectrometer, and focused onto a telescope of a silicon detector and a plastic scintillator. γ rays were detected with two EXOGAM clover modules and a LEPS detector; neutrons were detected with the TONNERRE array of 19 plastic scintillators. Measured Eγ, E(n), $\beta\gamma$-coin, βn-coin. Deduced levels, decay branching ratios.

1984La03 (also 1984Gu19): ^{33}Mg source was produced by fragmentation of a 30 g/cm^2 iridium target by 10 GeV protons from the CERN synchrotron, separated by a mass spectrometer, and transported into a thin stainless steel tube. γ rays were detected with Ge(Li) detectors and delayed-neutrons were detected with a ^{3}He proportional counter. Measured Eγ, delayed neutrons. Deduced levels, parent $T_{1/2}$, decay branching ratio.

2019Li41, 2017LiZZ: measured β and γ spectroscopic data for decay chains of ^{34}Mg and ^{33}Al at CERN-ISOLDE.

Preliminary decay scheme is from 2006AnZW.

^{32}Al Levels

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[‡]	Comments
0	1$^+$	32.3 ms *4*	
734	(2$^+$)		
956	(4$^+$)	186.9 ns *7*	
1179	(4$^-$)		
2765?	1$^+$		E(level): rounded value from Adopted Levels.

[†] From 2006AnZW, unless otherwise noted.
[‡] From Adopted Levels.

γ(^{32}Al)

E$_\gamma$[†]	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Comments
222	956	(4$^+$)	734	(2$^+$)	
223	1179	(4$^-$)	956	(4$^+$)	
734	734	(2$^+$)	0	1$^+$	
2765	2765?	1$^+$	0	1$^+$	E$_\gamma$,I$_\gamma$: 2017LiZZ report an absolute intensity of 3.3 *8* per 100 ^{33}Mg decays using the adopted %β^-n=14 *2* and measured counts of ^{33}Mg decays and 2765γ transition. This transition is not seen in other β^-n studies but is seen in ^{32}Mg β^- decay.

[†] From level-energy difference.

Delayed Neutrons (^{32}Al)

E(^{32}Al)	I(n)[†‡]	E(^{33}Al)[†]
0	1.9 *2*	5930
0	3.3 *3*	5980
734	0.71 *4*	6820
734	1.32 *4*	7250

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Delayed Neutrons (continued)

E(^{32}Al)	I(n)[†‡]	E(^{33}Al)[†]	Comments
734	0.90 3	7470	
734	1.96 5	8870	
1179			This decay branch is shown in Figure 2 of 2006AnZW, but no information is given.

[†] From 2006AnZW. Note that the sum of all I(n) intensities is less than %β^-n=14 2 also reported in 2006AnZW, most likely because %β^-n is determined from the integration of the whole neutron spectrum.

[‡] Absolute intensity per 100 decays.

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Decay Scheme

I(n) Intensities: I(n) per 100 parent decays

E(n)	I(n)	E($^{33}_{13}$Al)	E($^{32}_{13}$Al)
	1.9	5930	0
	3.3	5980	0
	0.71	6820	734
	1.32	7250	734
	0.90	7470	734
	1.96	8870	734

3/2$^-$ 0   90.5 ms *16*

Q$_{\beta^- n}$=7991 *8*

%β^-n=15

$^{33}_{12}$Mg$_{21}$

8870

2765

1$^+$ 2765

7470

7250

6820

(4$^-$)   223   1179

(4$^+$)   222   956

(2$^+$)   734   734

5980

5930

1$^+$ 0

$^{33}_{13}$Al$_{20}$

$^{32}_{13}$Al$_{19}$