^{32}Mg β^- decay (80.4 ms) 2004Gr08,1984Gu19

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

Parent: ^{32}Mg: E=0; $J^\pi=0^+$; $T_{1/2}$=80.4 ms *4*; Q(β^-)=10270 *8*; %β^- decay=100

^{32}Mg-$T_{1/2}$: From Adopted Levels of ^{32}Mg. Adopted value is taken from 2017Ha23 in this study. Other values from this study: 86 ms *5* (2004Gr08), 120 ms *20* (1984La03), 85 ms *13* (1995ReZZ), 1999YoZW.

^{32}Mg-Q(β^-): From 2021Wa16.

^{32}Mg-%β^- decay: %β^-n=5.5 *5* (2004Gr08) is adopted in Adopted Levels of ^{32}Mg. Others: %β^-n=4.3 *21* (1995ReZZ,2008ReZZ), 2.4 *5* (1984La03), 6 *4* (1999YoZW,preliminary).

2004Gr08: source of ^{32}Mg was produced by fragmentation of 50 MeV/nucleon ^{36}S beam on a Be target, selected by the LISE3 spectrometer at GANIL. γ rays were detected with two Ge detector and a LEPS detector; delayed neutrons were detected with the TONNERRE array consisting of 19 plastic scintillators. Measured Eγ, Iγ, $\gamma\gamma$-coin, γ(t), delayed neutrons. Deduced levels, J, π, delayed-neutron emission probabilities, β-decay branching ratios.

1984La03, 1984Gu19: ^{32}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, Iγ, delayed neutrons. Deduced levels, parent $T_{1/2}$, delayed-neutron and γ-ray emission probabilities.

Others:

2017Ha23: E=69.2 MeV/nucleon ^{40}Ar beam was produced from the Heavy Ion Research Facility in Lanzhou (HIRFL). Target was 182.6 mg/cm^2 thick ^{9}Be. Fragments were identified based on energy loss, time-of-flight, and magnetic rigidity on an event-by-event basis, and implanted into a 1500−μm-thick double-sided Si strip detector (DSSD) between two plastic scintillators. Measured implant-β(t). Deduced parent $T_{1/2}$. Comparisons with available data.

1999YoZW: ^{32}Mg from ^{9}Be,^{181}Ta(^{48}Ca,X) E=70 MeV/nucleon, measured half-life and delayed neutron probability.

1993Kl02: source of ^{32}Mg from U(p,X) at 600 MeV. Measured Eγ, $\gamma\gamma$-coin. Three γ rays of 735.5, 2466.9 and 2765.3 keV with coincidence relationship between 735γ and 2467γ established.

1979De02: two observed γ rays of 731 *2* (Iγ=36 *15*) and 2750 *5* (Iγ=100) possibly were from decay of ^{32}Mg.

From RADLIST code, deduced energy balance=9330 keV *100* as compared to 9705 keV *52* from Q-value=10270 *8* and branching of 94.5% for population of levels in ^{32}Al by β^- decay.

This decay scheme is considered incomplete due to a large gap between the highest observed level at E=3202 and the Q-value=10270 *8* (2021Wa16). S(n)=4220 *8* and S(2n)=11378 *7* (2021Wa16) for ^{32}Al.

^{32}Al Levels

E(level)†	J^π‡	$T_{1/2}$‡	Comments
0	1^+	32.3 ms *4*	
735.1 *7*	(2^+)		
956.7 *9*	(4^+)	186.9 ns *7*	
1178.6 *11*	(4^-)		
1743.5? *8*			
2765.3 *7*	1^+		
3202.2 *8*	1^+		
4220+x			E(level): x<6050 *11* from Q(β^-)(^{32}Mg)-S(n)(^{32}Al), where Q(β^-)=10270 *8* and S(n)=4220 *8* from 2021Wa16. This represents a range of unobserved levels that subsequently decay to ^{31}Al via one-neutron emission.

† From a least-squares fit to γ-ray energies, assuming ΔEγ=1 keV where not given.

‡ From Adopted Levels.

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β^- radiations

E(decay)	E(level)	Iβ^-[†‡]	Log *ft*	Comments
(3.1×10^3[#] *31*)	4220+x	5.5 *5*		Iβ^-: from adopted %β^-n=5.5 *5* for the decay of ^{32}Mg g.s.
(7068 *8*)	3202.2	10.7 *10*	4.4	av Eβ=3237 *46*
(7505 *8*)	2765.3	24.6 *8*	4.1	av Eβ=3453 *46*
(10270 *8*)	0	≈55	≈4.4	av Eβ=4818 *46*
				Iβ^-: estimated by 2004Gr08 assuming <5% for feedings to other excited levels, 35.3% for feedings to 2765 and 3202 levels, and measured %β^-n=5.5 *5*.

† From 2004Gr08 based on γ intensity balance, unless otherwise noted.
‡ Absolute intensity per 100 decays.
# Estimated for a range of levels.

γ(^{32}Al)

E$_\gamma$[†]	I$_\gamma$[†#]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Comments
222[@]	2.1[@] *2*	956.7	(4$^+$)	735.1	(2$^+$)	
222[@]	2.1[@] *2*	1178.6	(4$^-$)	956.7	(4$^+$)	
565	0.6 *1*	1743.5?		1178.6	(4$^-$)	
735.5[‡] *12*	9.0 *2*	735.1	(2$^+$)	0	1$^+$	E$_\gamma$: others: 731 *2* (1979De02), 735 (2004Gr08). I$_\gamma$: other: 10.6 *24* (1984Gu19). Relative intensity=42 *9* (1984Gu19), 36 *15* (1979De02).
787	0.9 *1*	1743.5?		956.7	(4$^+$)	
1743[&]	≤2.8	1743.5?		0	1$^+$	I$_\gamma$: also contributed by double escape of 2765γ.
2030	1.4 *3*	2765.3	1$^+$	735.1	(2$^+$)	
2466.9[‡] *12*	7.2 *7*	3202.2	1$^+$	735.1	(2$^+$)	E$_\gamma$: other: 2466 (2004Gr08). I$_\gamma$: other: 4 *2* (1984Gu19), (2467γ)(735γ) coin seen by 1993Kl02. Relative intensity=16 *8* (1984Gu19).
2765.3[‡] *9*	23.2 *5*	2765.3	1$^+$	0	1$^+$	E$_\gamma$: others: 2750 *5* (1979De02), 2765 (2004Gr08). I$_\gamma$: other: 25 *1* (1984Gu19). Relative intensity=100 (1984Gu19, 1979De02).
3202	3.5 *4*	3202.2	1$^+$	0	1$^+$	

† From 2004Gr08, unless otherwise noted.
‡ From 1984Gu19.
# Absolute intensity per 100 decays.
@ Multiply placed with undivided intensity.
& Placement of transition in the level scheme is uncertain.

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Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given