^{32}Al β^- decay (32.3 ms) 1986Du07,1984Gu19,1982Mu08

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

Parent: ^{32}Al: E=0; $J^\pi=1^+$; $T_{1/2}$=32.3 ms *4*; Q(β^-)=12978 *7*; %β^- decay=100

^{32}Al-J^π,$T_{1/2}$: From Adopted Levels of ^{32}Al.

^{32}Al-Q(β^-): from 2021Wa16.

^{32}Al-%β^- decay: %β^-n=0.7 *5* for ^{32}Al decay (2008ReZZ,1995ReZZ).

1986Du07: ^{32}Al source was produced by fragmentation of 60 MeV/nucleon ^{40}Ar beam on a 190 mg/cm^2 Be target, separated by the LISE spectrometer, and implanted into a thin movable film. β particles were detected with a plastic scintillator and γ rays were detected with a Ge detector. Measured Eγ, Iγ, $\beta\gamma$-coin, $\beta\gamma$(t). Deduced parent $T_{1/2}$.

1984Gu19: ^{32}Al 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. Deduced levels, β-decay and γ-ray emission probabilities.

1982Mu08: identified ^{32}Al isotope and measured $T_{1/2}$ at LBL.

Others: measured $T_{1/2}$: 2017Ha23, 2005Ue01, 2008ReZZ (1995ReZZ).

From RADLIST code, the total energy released is 12990 keV *150*, compared with 12887 keV *65* from Q-value=12978 *7* and branching of 99.3% for population of levels in ^{32}Al by β^- decay.

Placements of γ transitions are based on those in Adopted Levels, Gammas. No decay scheme is given in 1986Du07.

This decay scheme is considered incomplete due to a large gap between the highest observed level at E=5786 and the Q-value=12978 *7* (2021Wa16). S(n)=9200.0 *3* and S(2n)=15787.36 *30* (2021Wa16) for ^{32}Si.

^{32}Si Levels

E(level)[†]	J^π[‡]	$T_{1/2}$[‡]	Comments
0.0	0^+	157 y *7*	
1941.44 *30*	2^+	0.57 ps *9*	
4230.8 *8*	2^+	0.26 ps *9*	
4983.9 *11*	0^+	≤0.30 ps	
5785.7 *15*	$(0,1,2)^+$	≥0.83 ps	
9200.0+x			E(level): x<3778 *7* from Q(β^-)(^{32}Al)-S(n)(^{32}Si), where Q(β^-)=12978 *7* and S(n)=9200.0 *3* 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.

[‡] From Adopted Levels.

β^- radiations

E(decay)	E(level)	Iβ^-[†‡]	Log *ft*[†]	Comments
(1.9×10^3[#] *19*)	9200.0+x	0.7 *5*		Iβ^-: from adopted %β^-n=0.7 *5* for ^{32}Al decay (2008ReZZ,1995ReZZ).
(7192 *7*)	5785.7	1.7 *4*	4.8	av Eβ=3360.4 *35*
(7994 *7*)	4983.9	4.3 *6*	4.6	av Eβ=3756.0 *35* Iβ^-: other: 12 *3* (1984Gu19).
(8747 *7*)	4230.8	3.0 *5*	5.0	av Eβ=4129.7 *35*
(11037 *7*)	1941.44	4.7 *8*	5.3	av Eβ=5260.0 *35* Iβ^-: other: 3 *4* (1984Gu19).
(12978 *7*)	0.0	86.3 *7*	4.34	av Eβ=6217.8 *35* Iβ^-: from 100−ΣIβ(excited levels), assuming no missing/unobserved feedings. But due to the incomplete decay scheme, there could be unobserved γ feedings from possible levels within the gap between the highest observed level and the Q-value. Other: 85 *5* deduced by 1984Gu19 in the same way

Continued on next page (footnotes at end of table)

^{32}Al β^- decay (32.3 ms) 1986Du07,1984Gu19,1982Mu08 (continued)

β^- radiations (continued)

E(decay)	E(level)	Comments
		using their measured γ-ray intensities. Despite possible missing feedings, the β-feeding to g.s. is considered strong.

† β intensity from γ intensity balance at each level, unless otherwise noted. Quoted values should be considered as approximate due to incomplete decay scheme.
‡ Absolute intensity per 100 decays.
# Estimated for a range of levels.

$\gamma(^{32}Si)$

Iγ normalization: From absolute Iγ(1941.4γ)=12.0% *5*, determined in 1984Gu19 from measured counts of 1941.4γ transitions and ^{32}Al decays.

E_γ‡	I_γ‡@	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	δ#	α†	Comments
1941.4 *3*	100	1941.44	2^+	0.0	0^+	E2		0.000293 *4*	α(K)=7.28×10^{-6} *10*; α(L)=5.19×10^{-7} *7*; α(M)=3.42×10^{-8} *5* α(IPF)=0.000286 *4* %Iγ=12.0 *5* E_γ: from 1984Gu19. Other Eγ=1941.4 *5* (1986Du07).
2289.4 *8*	11 *3*	4230.8	2^+	1941.44	2^+	M1+E2	−0.84 *44*	0.000406 *24*	α(K)=5.15×10^{-6} *14*; α(L)=3.67×10^{-7} *10*; α(M)=2.42×10^{-8} *6* α(IPF)=0.000401 *24* %Iγ=1.3 *4*
3042.3 *10*	36 *5*	4983.9	0^+	1941.44	2^+				%Iγ=4.3 *6* E_γ: weighted average of 3042.6 *12* (1984Gu19) and 3042.1 *10* (1986Du07). I_γ: other: 74 *20* (1984Gu19). Additional information 1.
3844.0 *15*	14 *3*	5785.7	$(0,1,2)^+$	1941.44	2^+				%Iγ=1.7 *4*
4230.0 *15*	14 *3*	4230.8	2^+	0.0	0^+	(E2)			%Iγ=1.7 *4*

† Additional information 2.
‡ From 1986Du07, unless otherwise stated.
# From Adopted Gammas.
@ For absolute intensity per 100 decays, multiply by 0.120 *5*.

^{32}Al β^- decay (32.3 ms) 1986Du07,1984Gu19,1982Mu08

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays