^{33}Al β^- decay (41.5 ms) 2002Mo29

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 199,1 (2025)	30-Sep-2024

Parent: ^{33}Al: E=0.0; $J^\pi=(5/2)^+$; $T_{1/2}$=41.5 ms *1*; Q(β^-)=12017 *7*; %β^- decay=100

^{33}Al-J^π,$T_{1/2}$: From the Adopted Levels of ^{33}Al.

^{33}Al-Q(β^-): From 2021Wa16.

^{33}Al-%β^- decay: %β^-n=8.5 *7* (1995ReZZ,2008ReZZ) for the decay of ^{33}Al.

2002Mo29: ^{33}Al was produced by projectile fragmentation of 140-MeV ^{40}Ar beam with a ^{9}Be target followed by fragment separation by A1900 fragment analyzer at NSCL facility. Fragments were implanted into a double-sided silicon strip detector (DSSD) for detection of fragments and β particles differentiated using three silicon PIN diodes and parallel-plate avalanche counter (PPAC) for position information. γ rays were detected with two HPGe detectors. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\beta\gamma$-coin, (particle)γ-coin, β(t). Deduced levels, J, π, parent $T_{1/2}$, β-decay branching ratios. Comparisons with shell-model calculations.

2017Ha23: measured parent $T_{1/2}$ from implant-β(t) at HIRFL, Lanzhou.

This decay scheme is incomplete due to a large gap (≈8 MeV) between the highest observed level at E=4341 and Q(β^-)value=12017 *7* (2021Wa16).

^{33}Si Levels

E(level)[†]	J^π[‡]	$T_{1/2}$	Comments
0.0	$(3/2)^+$	6.11 s *21*	$T_{1/2}$: from the Adopted Levels.
1010.2 *5*	$1/2^+$		This state is probably populated by γ rays from higher levels, since β feeding involving $\Delta J=2$, $\Delta\pi$=no is expected to be negligible.
4341 *11*	$(5/2^+)$		
4508+x			E(level): x<7509 *7* from Q(β^-)(^{33}Al)-S(n)(^{33}Si), where Q(β^-)=12017 *7* and S(n)=4508.0 *8* from 2021Wa16. This represents a range of unobserved levels that subsequently decay to ^{32}Si via one-neutron emission.

† From Eγ data.
‡ From the Adopted Levels.

β^- radiations

E(decay)	E(level)	Iβ^-[†‡]	Log *ft*	Comments
(4×10^3[#] *4*)	4508+x	8.5 *7*		Iβ^-: from adopted %β^-n=8.5 *7* for the decay of ^{33}Al (1995ReZZ,2008ReZZ).
(7676 *13*)	4341	1.3 *7*	5.2	av Eβ=3582 *6*
(12017 *7*)	0.0	89 *2*	4.3	av Eβ=5713.9 *34*
				Iβ^-: from 89 *+1−3* in 2002Mo29 obtained from 100−(β feeding of 2.3 *8* to 4341 level and higher levels + %β^-n of 8.5 *7*). This value should be considered as an upper limit due to possible feedings to unobserved high-lying levels while this feeding to g.s. should be considered strong.

† From Iγ intensity balance, unless otherwise noted. log *ft* values should be considered as approximate due to incomplete decay scheme.
‡ Absolute intensity per 100 decays.
# Estimated for a range of levels.

^{33}Al β^- decay (41.5 ms) 2002Mo29 (continued)

$\gamma(^{33}Si)$

Iγ normalization: Absolute intensities measured by 2002Mo29.

E_γ [†]	I_γ [†‡]	E_i(level)	J_i^π	E_f	J_f^π	Comments
1010.2 *5*	1.0 *3*	1010.2	$1/2^+$	0.0	$(3/2)^+$	
[x]1780.8 *18*						E_γ: from 1984Gu19 only, decaying with $T_{1/2}\approx$200 ms.
4341 *11*	1.3 *7*	4341	$(5/2^+)$	0.0	$(3/2)^+$	I_γ: 1.3 +*7*−*6* (2002Mo29).

[†] From 2002Mo29.
[‡] Absolute intensity per 100 decays.
[x] γ ray not placed in level scheme.

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Decay Scheme

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