^{34}Al β^- decay (56.3 ms) 2001Nu01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Ninel Nica, Balraj Singh	NDS 113, 1563 (2012)	28-May-2012

Parent: ^{34}Al: E=0; $J^\pi=(4^-)$; $T_{1/2}$=56.3 ms *5*; Q(β^-)=16910 *62*; %β^- decay=100.0

^{34}Al-J^π,$T_{1/2}$: From ^{34}Al Adopted Levels.

^{34}Al-Q(β^-): From 2011AuZZ; other: 17020 110 (2003Au03).

^{34}Al-%β^- decay: %β^-n=26 *4* (2001Nu01). Others: 27 *5* (1989Ba50), 54 *12* (1988Mu08), 12.5 *25* (1995ReZZ). Values from 1988Mu08 and 1995ReZZ are in serious disagreement with that from 2001Nu01.

2001Nu01 (also 2002Nu02): mass-separated ^{34}Al produced in U(p,X) E=1 GeV reaction using uranium carbide target, CERN-ISOLDE facility. Measured Eγ, Iγ, β, $\beta\gamma$, $\beta\gamma\gamma$, βnγ coin, $\beta\gamma$(t), $T_{1/2}$ and delayed neutron-emission probability using Ge and BaF_2 detectors for γ rays, plastic scintillation detectors for β rays and neutrons. No evidence was found for delayed two-neutron decay mode. Comparison with *sd-fp* shell-model calculations and Gamow-Teller strengths.

1989Ba50: previous experiment at CERN-ISOLDE facility, measured Eγ, Iγ, %β^-n, estimate of level half-life from $\beta\gamma$(t). Evaluators consider it superseded by 2001Nu01, an improved experiment from the same laboratory.

Energy balance: total decay energy of 12130 keV *890* deduced (using RADLIST code) from proposed decay scheme is much lower than the expected value of 16910 keV *62*, indicating that the decay scheme is incomplete.

^{34}Si Levels

A 2133, (0^+) level proposed in 2001Nu01 with possible population by 1193.3-keV transition from 3327, 2^+ level is not confirmed by 2003Iw01 who find 1193γ to be in coin with 3327γ. Thus 2133, (0^+) is omitted here.

E(level)†	J^π#	$T_{1/2}$	Comments
0.0	0^+		
3326.8 *15*	2^+		2001Nu01 proposed that 1193.3γ possibly populates excited 0^+ state at 2133 keV. 2002En02 in ^{9}Be(^{35}Si,^{34}SiXγ) reaction reported an 1193γ from 3327 level with a branching of about 13%, but 2002Mi44 set an upper limit of 1% for such a transition in their Si(^{34}Si,^{34}Si′γ) reaction study. 2003Iw02 observed 1193γ in coin with 3326γ, thus negating the placement of 1193 transition in parallel with 3326 transition as well as the existence of an excited 0^+ level at 2133 keV.
4255.8 *15*	(3^-)	<210 ns	$T_{1/2}$: estimated from $\beta\gamma$(t) (1989Ba50).
4379.8 *15*	(3^-)		
4520.2?‡ *15*			
4970.7 *15*	$(3^-,4^-,5^-)$		
5042.3?‡ *17*			
6023.3?‡ *19*			

† From least-squares fit to Eγ data.
‡ Level proposed in 2003Iw02 from ^{2}H(^{34}Si,^{34}Si′γ).
# From Adopted Levels.

β^- radiations

E(decay)	E(level)	Iβ^-†‡	Log *ft*	Comments
(1.089×10^4# *6*)	6023.3?	2.4 *7*	5.8 *1*	av Eβ=5181 *31*
(1.187×10^4# *6*)	5042.3?	1.2 *3*	6.3 *1*	av Eβ=5665 *31*
(1.194×10^4 *6*)	4970.7	3.9 *7*	5.8 *1*	av Eβ=5701 *31* Iβ^-: 2001Nu01 list 4.2 *4*.
(1.239×10^4# *6*)	4520.2?	3.3 *6*	5.9 *1*	av Eβ=5923 *31*

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^{34}Al β^- decay (56.3 ms) 2001Nu01 (continued)

β^- radiations (continued)

E(decay)	E(level)	Iβ^-[†‡]	Log *ft*	Comments
(1.253×10^4 *6*)	4379.8	25 *5*	5.1 *1*	av Eβ=5992 *31* Iβ^-: 2001Nu01 list 26 *3*.
(1.265×10^4 *6*)	4255.8	38 *8*	4.9 *1*	av Eβ=6053 *31* Iβ^-: 2001Nu01 list 44 *4*.
(1.358×10^{4}[#] *6*)	3326.8		1*u*	av Eβ=6526 *31* Iβ^-: evaluators obtain −11 *6*. 2001Nu01 give <12.

† From γ-ray intensity balance.
‡ Absolute intensity per 100 decays.
# Existence of this branch is questionable.

γ(^{34}Si)

Iγ normalization: deduced by evaluators from Iγ(4257)+Iγ(gammas feeding 3327 level)=74 *4*. Others: 0.55 (2001Nu01), 0.60 *8* (1989Ba50).

E$_\gamma$	I$_\gamma$[#]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.	α[†]	Comments
124.2 *4*	52 *4*	4379.8	(3$^-$)	4255.8	(3$^-$)	[M1+E2]	0.025 *23*	α(K)=0.023 *22*; α(L)=0.0017 *16*; α(M)=0.00011 *10* Additional information 4.
590.9 *3*	7.7 *8*	4970.7	(3$^-$,4$^-$,5$^-$)	4379.8	(3$^-$)			
929.0 *3*	104 *10*	4255.8	(3$^-$)	3326.8	2$^+$			Additional information 2.
1052.8 *4*	3.9 *6*	4379.8	(3$^-$)	3326.8	2$^+$			
1193.34[‡@] *20*	6.4 *8*	4520.2?		3326.8	2$^+$			I$_\gamma$: from $\beta\gamma$ coin (2001Nu01). The authors deduced the intensity as 3.2 *6* if 1193.3γ populated excited 0$^+$ state at 2133 keV.
1715.4[‡@] *8*	2.4 *4*	5042.3?		3326.8	2$^+$			E$_\gamma$: this transition was also considered by 2001Nu01 as a possible but less likely candidate for a transition from 3326.8 keV to an uncertain 2133, (0$^+$) state. But 2003Iw02 observe 1715γ in coin with 3326γ.
2696.4[‡@] *12*	4.8 *10*	6023.3?		3326.8	2$^+$			
3326.2 *16*	100	3326.8	2$^+$	0.0	0$^+$	[E2]		Additional information 1.
4257 *3*	24 *4*	4255.8	(3$^-$)	0.0	0$^+$	[E3]		Additional information 3.

† Additional information 5.
‡ Placement from 2003Iw02 from ^{2}H(^{34}Si,^{34}Si$'\gamma$).
# For absolute intensity per 100 decays, multiply by 0.51 *7*.
@ Placement of transition in the level scheme is uncertain.

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Decay Scheme

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