$^{31}Al\ \beta^-$ decay (644 ms) 1973Go22,1979De02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 184, 29 (2022)	24-Jun-2022

Parent: ^{31}Al: E=0; $J^\pi=5/2^{(+)}$; $T_{1/2}$=644 ms *25*; $Q(\beta^-)$=7998.3 *22*; $\%\beta^-$ decay=100.0

^{31}Al-J^π,$T_{1/2}$: From Adopted Levels of ^{31}Al.

^{31}Al-$Q(\beta^-)$: From 2021Wa16.

1973Go22: ^{31}Al from ^{18}O(^{18}O,αp) and ^{15}N(^{18}O,2pγ), E(^{18}O)=41 MeV, Brookhaven, measured Eγ, Iγ, $\beta\gamma$ coin, β-spectra, ^{31}Al half-life, level half-lives.

1979De02: ^{31}Al from the decay of ^{31}Mg produced in U(p,X) E(p)=24 GeV, CERN, measured Eγ, isotopic half-life, $\beta\gamma$ coin, $\beta\gamma\gamma$ coin. 1980De26 from the same group produced the source using 600 MeV protons, measured Eγ, Iγ, β-delayed nn(t).

^{31}Si Levels

E(level)†	J^π‡	$T_{1/2}$‡
0.0	$3/2^+$	157.24 min *20*
752.20 *24*	$1/2^+$	0.53 ps *12*
1694.83 *24*	$5/2^+$	0.57 ps *15*
2316.70 *24*	$3/2^+$	38 fs *17*
2787.7? *8*	$5/2^+$	14 fs *14*

† From a least-squares fit to Eγ values.
‡ From Adopted Levels.

γ(^{31}Si)

Iγ normalization: Original intensity values per 100 parent decays in 1979De02 are deduced by the authors from measured γ intensities and the total number of ^{31}Al, as follows: 1. determine the number of ^{30}Mg from the ^{30}Al activity; 2. determine the number of ^{31}Mg from the number of ^{30}Mg using $\%\beta^-$n(^{31}Na)=30 *8* (1974Ro31) and assuming $\%\beta^-$2n(^{31}Na)=0; 3. determine the number of ^{31}Al from the decay of ^{31}Mg assuming $\%\beta^-$n(^{31}Mg)=0.

Eγ‡	Iγ#&	E_i(level)	J^π_i	E_f	J^π_f	Mult.@	δ@	α†	Comments
621.81 *30*	5.3 *18*	2316.70	$3/2^+$	1694.83	$5/2^+$				Additional information 3. I$_\gamma$: original %Iγ=3.0 *10* (1979De02). Iγ(relative)=9.9 *7* (1973Go22).
752.23 *30*	12.3 *35*	752.20	$1/2^+$	0.0	$3/2^+$				Additional information 1. I$_\gamma$: original %Iγ=7 *2* (1979De02). Iγ(relative)=18.5 *8* (1973Go22).
1564.49 *30*	10.9 *35*	2316.70	$3/2^+$	752.20	$1/2^+$				Additional information 4. I$_\gamma$: original %Iγ=6.2 *20* (1979De02). Iγ(relative)=17.3 *16* (1973Go22).
1694.73 *30*	19 *5*	1694.83	$5/2^+$	0.0	$3/2^+$	M1+E2	+4.4 *10*	0.0001785 *29*	α=0.0001785 *29*; α(K)=9.35×10^{-6} *14*; α(L)=6.68×10^{-7} *10*; α(M)=4.40×10^{-8} *6* α(IPF)=0.0001684 *27*

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γ(^{31}Si) (continued)

E_γ[‡]	I_γ[#&]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[@]	δ[@]	α[†]	Comments
2316.64 *40*	30 *9*	2316.70	3/2+	0.0	3/2+	M1+E2	+0.41 *22*	0.000395 *14*	Additional information 2. I_γ: original %Iγ=10.5 *30* (1979De02). Iγ(relative)=58.9 *16* (1973Go22). α=0.000395 *14*; α(K)=4.94×10^{-6} *9*; α(L)=3.53×10^{-7} *7*; α(M)=2.32×10^{-8} *4* α(IPF)=0.000390 *14*
2787.6[a] *8*	1.5 *8*	2787.7?	5/2+	0.0	3/2+	M1+E2	+0.20 *5*	0.000582 *8*	Additional information 5. I_γ: original %Iγ=17 *5* (1979De02). Iγ(relative)=72.8 *18* (1973Go22). α=0.000582 *8*; α(K)=3.68×10^{-6} *5*; α(L)=2.63×10^{-7} *4*; α(M)=1.733×10^{-8} *24* α(IPF)=0.000578 *8* E_γ: 1973Go22 state it is unclear if the γ from this level which they detected is unambiguously from the decay of ^{31}Al, 1979De02 do not report this state being populated. I_γ: from I(2786.6γ)/I(2316.6γ)=3.6 *15*/72.8 *18* in 1973Go22 and I(2316.6γ)=30 *9* (1979De02).

† Additional information 6.

‡ From 1973Go22. It is unclear if 1979De02 actually measured the energies of the γ-rays they report, there is a confusing footnote (in their table 7) saying the energies come from 1973Go22 but they report slightly different values from those in 1973Go22.

From 1979De02, unless otherwise noted. Original values are deduced by the authors based on %β^-n(^{31}Na)=30 *8* (1974Ro31), assuming %β^-2n(^{31}Na)=0 and %β^-n(^{31}Mg)=0, and the quoted values and uncertainties are obtained (by the evaluators) by scaling original values using the adopted %β^-n=39 *5*, %β^-2n=0.7 *1* for ^{31}Na and adopted %β^-n=6.2 *19* for ^{31}Mg. Values reported by 1973Go22 given under comments are relative intensities normalized to I(621.8γ)+I(1564.5γ)+I(2316.6γ)=100, and are used to deduce branching ratios in Adopted Gammas because of their higher precisions than values of absolute intensities in 1979De02.

@ From Adopted Gammas.

& Absolute intensity per 100 decays.

a Placement of transition in the level scheme is uncertain.

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