^{42}Ti ε decay (208.65 ms) 2015Mo01,1969Ga27,1980HoZO

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen[#] and Balraj Singh	NDS 135, 1 (2016)	31-May-2016

Parent: ^{42}Ti: E=0; $J^\pi=0^+$; $T_{1/2}$=208.65 ms *80*; Q(ε)=7016.48 *22*; %ε+%$β^+$ decay=100.0

^{42}Ti-$T_{1/2}$: From Adopted Levels of ^{42}Ti. 2015Ha07 review gives 208.09 ms *55*.

^{42}Ti-Q(ε): From 2012Wa38. 2015Ha07 review gives 7016.83 *25*.

42TI decays mainly (>99%) through B+ decay.

2015Mo01: ^{42}Ti ions were produced from fragmentation of 680 MeV/nucleon ^{58}Ni beam with 400 mg/cm^2 ^{9}Be target using SIS-18 synchrotron at GSI facility. Reaction fragments were separated in-flight using the fragment separator FRS. The identification of nuclei was achieved by measurement of magnetic rigidity and velocity of fragments from time-of-flight method. Separated ions were implanted in one of six double-sided silicon strip detectors (DSSSDs). The β-decay signals were detected in the same DSSSD. Surrounding the implantation setup was the RISING array of 15 Euroball cluster detectors for γ detection. Measured Eγ, Iγ, γγ-coin, βγ-coin, and β-decay half-life. Deduced levels, J, π, β feedings, log *ft* values, Gamow-Teller strengths. 2012Fu02 is an earlier report without any data.

1969Ga27: ^{42}Ti isotope was produced via ^{40}Ca(^{3}He,n) reaction using ^{3}He beam from the 5.5-MV Van de Graaff at Strasbourg. γ-rays were detected with Ge(Li) detectors (FWHM=4 keV at 1.22 MeV). Measured Eγ, Iγ, $T_{1/2}$. Deduced levels, branchings.

1980HoZO: measured G, limit of delayed proton decay.

2009Ku19: ^{42}Ti produced in ^{40}Ca(^{3}He,nγ) E=17 MeV, beam from the Ion Guide Isotope Separator On-Line (IGISOL) facility at the Accelerator Laboratory of the University of Jyvaskyla. Target of a 1.5 mg/cm^2 natural Ca. Measured Eγ, βγ-coin, $T_{1/2}$, mass differences using JYFLTRAP Penning-trap spectrometer. Measured Q(ε)=7016.83 keV *25*.

2015Ha07: review of superallowed decays; evaluated Q value, $T_{1/2}$ branching ratios, *ft* value, isospin-symmetry-breaking corrections.

Others:

$T^{1/2}$(^{42}Ti), γ: 1972Zi02, 1969Al12, 1969Ni03.

E$β^+$: 1962Ob03.

Additional information 1.

A 2222 *2* (Iγ=1.2 *4*) γ reported by 1969Ga27 is omitted here since it is assigned (by 1980HoZO) to ^{1}H(n,γ) line related to background. Thus the 2222 level proposed by 1969Ga27 is also omitted.

%εp<0.001 (1980HoZO).

^{42}Sc Levels

E(level)	J^π[†]	$T_{1/2}$[†]
0	0^+	680.79 ms *28*
611.0 *1*	1^+	
1888.4 *2*	1^+	

[†] From Adopted Levels.

ε,$β^+$ radiations

E(decay)	E(level)	I$β^+$ [†]	Iε[†]	Log *ft*	I(ε+$β^+$)[†]	Comments
(5128.1 *3*)	1888.4	0.41 *6*	0.0011 *2*	4.80 *7*	0.41 *6*	av Eβ=1877.91; εK=0.0023317 *5*; εL=0.0002343; εM+=3.9905×10^{-5} *9* B(GT+)=0.059 *9* (2015Mo01). Other: 0.080 *2* from (^{3}He,t) (2007Ad27) adjusted for new $T_{1/2}$.
(6405.48 *24*)	611.0	56 *4*	0.065 *4*	3.21 *3*	55.9 *36*	av Eβ=2500.41; εK=0.0010443 *2*; εL=0.0001049; εM+=1.7867×10^{-5} *3* B(GT+)=2.31 *15* (2015Mo01). Other: 2.08 *6* from (^{3}He,t) (2007Ad27) adjusted for new $T_{1/2}$.
(7016.48 *22*)	0	47.7 *12*	0.0405 *11*	3.495 *11*	47.7 *12*	av Eβ=2800.06; εK=0.0007595; εL=7.6284×10^{-5} *9*;

Continued on next page (footnotes at end of table)

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ε,β+ radiations (continued)

E(decay)	E(level)	Comments
		εM+=1.2991×10^{-5} *2* I(ε+β+): measured by 2009Ku19. Other: 43.7 *36* (2015Mo01). E(decay): measured Eβ+=6.0 MeV *6* (1962Ob03). From measured Q(ε)=7016.83 *25*, %β+=47.7 *12*, and $T_{1/2}$=208.14 ms *45*, 2009Ku19 deduce *ft*=3114 s *79* (or log *ft*=3.493 11, corrected *Ft*=3122 s *79* for 0+ to 0+ superallowed β transition.

† Absolute intensity per 100 decays.

γ(^{42}Sc)

Iγ normalization: From determination of number of 937-keV γ rays emitted per ^{54}Ni decay (2015Mo01). Other: 0.56 *14* (1969Al12).

E_γ †	I_γ †‡	E_i(level)	J^π_i	E_f	J^π_f	Comments
611.0 *1*	100.0 *35*	611.0	1+	0	0+	E_γ: others: 611.6 *5* (1980HoZO) and 610.7 *5* (1969Ga27). I_γ: other: Iγ(611γ)/Iβ(total)=0.56 *14* (1969Al12).
1888.4 *2*	0.73 *10*	1888.4	1+	0	0+	E_γ,I_γ: others: 1888.0 *8*, Iγ=0.7 (1980HoZO), 1885 *2*, Iγ<2 (1969Ga27).

† From 2015Mo01.
‡ For absolute intensity per 100 decays, multiply by 0.559 *36*.

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Decay Scheme

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