

^{39}Ti εp decay (28.5 ms) 2001Gi01,2007Do17

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 152, 1 (2018)	30-Sep-2017

Parent: ^{39}Ti : $E=0$; $J^\pi=(3/2^+)$; $T_{1/2}=28.5$ ms 9; $Q(\varepsilon\text{p})=16970$ SY; $\% \varepsilon\text{p}$ decay=93.7 28

^{39}Ti - $J^\pi, T_{1/2}$: From Adopted Levels of ^{39}Ti . $T_{1/2}$ is adopted from 2007Do17. Others: 31 ms +6-4 (2001Gi01), 26 ms +8-7 (1990De43).

^{39}Ti - $Q(\varepsilon\text{p})$: 16970 200 (syst,2017Wa10).

^{39}Ti - $\% \varepsilon\text{p}$ decay: $\% \varepsilon\text{p}=93.7$ 28 from 2007Do17. Other: 85 15 (1990De43). Delayed 2 proton decay observed by 1992Mo15.

2001Gi01 (also 2001Gi02,2002Ch28): ^{39}Ti source was produced in fragmentation of $E=74.5$ MeV ^{58}Ni beam from GANIL on a natural Ni target. Fragments were selected with the Alpha spectrometer and the LISE3 separator and implanted into a silicon telescope. Measured delayed protons, decay-time distribution. Deduced parent $T_{1/2}$, IAS for ^{39}Sc . Report four proton groups.

2007Do17: ^{39}Ti source was produced via fragmentation of ^{58}Ni beam at 74.5 MeV/nucleon on a natural Ni target at SISSE/LISE3 facility in GANIL. Fragments were separated by the fragment separator α -LISE3, identified by energy loss, residual energy and time-of-flight measured using two micro-channel plate (MCP) detectors and Si detectors, and implanted into double-sided silicon-strip detectors (DSSSD) and a thick Si(Li) detector to detect implanted events, charged particles and β particles. γ rays were detected by four Ge detectors. Measured $E(\text{p})$, $I(\text{p})$, E_γ , I_γ , $\text{p}\gamma$ -coin, decay time distribution. Deduced levels, β -delayed proton emission probabilities, ^{39}Ti half-life. Report two proton groups.

Others:

1990De43: ^{39}Ti produced in $^{58}\text{Ni}(^{58}\text{Ni},\text{X})$ reaction at 65 MeV/nucleon. Measured β -delayed protons, $T_{1/2}$. No evidence found for delayed two-proton decay.

1992Mo15: ^{39}Ti produced in $\text{Ca}(^3\text{He},\text{X})$ reaction at 110 MeV. Measured β -delayed two-proton sum spectra. Deduced IAS for ^{39}Sc .

1994B110: ^{39}Ti produced in fragmentation of ^{58}Ni beam at 650 MeV/nucleon with a ^9Be target.

Additional information 1.

2001Gi01 interpreted 2440, 3575 and 3990 groups (lab system) as εp decay to ^{38}Ca , the 4880 group as $\varepsilon 2\text{p}$ decay to ^{37}K ; corresponding proton (sum) line (lab system) in 1992Mo15 is 4750 40.

Since ^{39}Sc is particle unbound, ^{39}Ti decays 100% by delayed proton emission, mostly by one-proton emission. The two-proton decay mode is expected from theoretical predictions but has not been established as yet.

 ^{38}Ca Levels

E(level)	J^π
0	0^+
2212.5 14	2^+

 $\gamma(^{38}\text{Ca})$

E_γ	I_γ^\dagger	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Comments
2212.5 14	28 9	2212.5	2^+	0	0^+	E_γ, I_γ : from 2007Do17. The 2212.5 γ is in coin with 3270-keV proton group. However, 2007Do17 do not assign this proton group due to low statistics and lack of detailed analysis.

† Absolute intensity per 100 decays.

Delayed Protons (^{38}Ca)

$E(\text{p})$	$E(^{38}\text{Ca})$	$I(\text{p})^\#$	Comments
2504 † 26		8 † 5	$E(\text{p})$: 2440 25 in lab system.
3270 ‡ 20		7 ‡ 2	The 3270 proton group is seen in coin with 2212.5 γ . However, 2007Do17 do not assign the proton group due to low statistics and lack of detailed analysis.

Continued on next page (footnotes at end of table)

^{39}Ti ε p decay (28.5 ms) [2001Gi01](#),[2007Do17](#) (continued)Delayed Protons (continued)

<u>E(p)</u>	<u>E(^{38}Ca)</u>	<u>I(p)[#]</u>	<u>Comments</u>
3669 [†] 31		6.5 [†] 45	E(p): 3575 30 in lab system.
4095 [†] 31		7.3 [†] 45	E(p): 3990 30 in lab system.
5170 [‡] 30		11 3	E(p): corresponding group reported by 2001Gi01 is 5008 41 (4880 40 in lab system).

[†] From [2001Gi01](#). Energies listed by [2001Gi01](#) are in the lab system. The evaluator have expressed these in the c.m. system. [2007Do17](#) mention that a weak group may be present with intensity <5%.

[‡] From [2007Do17](#), energy is in the c.m. system.

[#] Absolute intensity per 100 decays.

 ${}^{39}\text{Ti}$ ϵp decay (28.5 ms) 2001Gi01,2007Do17**Decay Scheme**Intensities: $I_{(\gamma+ce)}$ per 100 parent decays