50 V ε decay (2.65×10 17 y) 2019La09,2011Do08,1989Si07

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Full Evaluation Jun Chen and Balraj Singh NDS 157, 1 (2019) 15-Apr-2019

Parent: 50 V: E=0.0; $J^{\pi}=6^{+}$; $T_{1/2}=2.65\times10^{17}$ y +16-18; $Q(\varepsilon)=2207.6$ 4; $\%\varepsilon+\%\beta^{+}$ decay=99.3 7

 $^{50}\text{V-J}^{\pi}$, $T_{1/2}$: From ^{50}V Adopted Levels.

 50 V-Q(ε): From 2017Wa10.

1553.77 6

 50 V-%ε+%β⁺ decay: %ε=99.3 7 based on %ε>98.6 deduced from $T_{1/2}(ε+β^+)=2.67\times10^{17}$ y +16–18 (68% confidence interval) and $T_{1/2}(β^-)>1.9\times10^{19}$ y (90% confidence interval) in 2019La09. Others: 96.5 35 based on >92.9 deduced by 2011Do08 from non-observation of $β^-$ decay activity through the 783γ in 52 Cr; %ε=83 11 in 1989Si07 was based on observed % $β^-$ =17 11. No $β^-$ decay has yet been confirmed, as e.g. in 2019La09 and 2011Do08. See also comment for 50 V g.s. in Adopted Levels.

2019La09: 50 V sample was produced from vanadium flakes by multifold electron beam melting (EBM) at the Gran Sasso Underground Laboratory (LNGS). The γ rays were detected with ultra-low background (ULB) HPGe detectors. Measured activities. Deduced parent partial half-life.

2011Do08: natural 255.82 g ⁵⁰V sample measured for 97.8 d (total detector mass measuring time product=185.8 kg.d). Ultralow background Ge-detector (ULB detector) at the underground laboratory for dosimetry and spectrometry of the PTB in Germany. Detector calibrated with solutions of known activity provided by PTB. Results corrected for contaminations from ²³⁸U and ²³²Th, mass of water (determined at PTB) and oxygen (determined at German Federal Institute for Materials Research) in sample resulting from exposure to air subtracted when calculating activity concentration. Measured partial half-life of ⁵⁰V ε decay.

1989Si07: measured 1554 γ and deduced $T_{1/2}(\varepsilon)$; three large Ge detectors in a salt mine; 337.5 g of natural V, 1109 h and a background run of 4206 h; corrections were made for Th and U contaminants.

1985Si02 (same group as 1989Si07): measured 1554 γ and deduced $T_{1/2}(\varepsilon)$; intrinsic Ge; 100.6 g of natural V, 193.3 h and background run of 100 d; correction for U contaminants.

1984A110: measured 1554 γ and deduced $T_{1/2}(\varepsilon)$; Ge(HP); 4250 g of natural V, 135.5 d.

⁵⁰Ti Levels

 $\begin{array}{c|c}
E(level) & J^{\pi} & Comments \\
\hline
0.0 & 0^{+}
\end{array}$

 J^{π} : from the Adopted Levels.

ε, β^+ radiations

<u>E(decay)</u> <u>E(level)</u> <u>I ε [†]</u> <u>Log ft</u> <u>I(ε + β +)</u> (653.8 4) 1553.77 99.3 7 23.63 6 99.3 7

Comments

 ε K=0.8925; ε L=0.09170; ε M+=0.01581

Is: deduced from partial $T_{1/2}$ of ε and β^- decay modes in 2019La09. Others: $\%\varepsilon > 92.9$ measured by 2011Do08 from observation of no β^- activity; $\%\varepsilon = 83$ 11 (1989Si07).

Log ft: calculated for allowed decay.

Iy normalization: From Iy(1554y)=100. From Q(ε) only the g.s. and 1554 state may be populated. $\Delta J=6$, $\Delta \pi=$ no to g.s. and $\Delta J=4$, $\Delta \pi=$ no to 1554 state; therefore, only the 1554 state is expected to be fed in this decay.

[†] Absolute intensity per 100 decays.

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γ (50Ti) (continued)

 E_{γ} I_{γ}^{\dagger} $E_{i}(\text{level})$ J_{i}^{π} E_{f} J_{f}^{π} Mult.

Comments

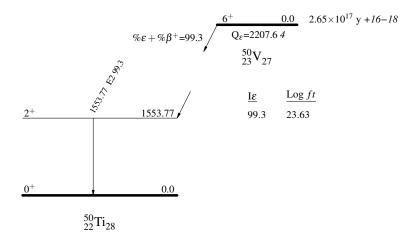
 E_{ν} : from 1984Al10.

Mult.: from the Adopted Gammas.

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Decay Scheme

Intensities: I_{γ} per 100 parent decays



 $^{^{\}dagger}$ For absolute intensity per 100 decays, multiply by 0.993 7.