# $^{102}$Nb $\beta^-$ decay (4.3 s)

| Type | Author | History Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | D. De Frenne | NDS 110, 1745 (2009) | 31-Dec-2008 |

Parent: $^{102}$Nb: E=0.0; $J^\pi=(4^+)$; $T_{1/2}$=4.3 s *4*; Q($\beta^-$)=7210 *40*; %$\beta^-$ decay=100.0

1976Ah06: assignment by chemical separation of niobium from $^{235}$U,$^{239}$Pu,$^{249}$Cf(n,F); measured E$\gamma$, $\gamma\gamma$-coin, $T_{1/2}$.

1977SeZK: mass separation of fission fragments; measured $\gamma\gamma$ angular correlation.

1985Me13: source is a mixture of mass-separated $^{102}$Nb fission fragments from $^{235}$U(n,F). Measured: PAC for (296$\gamma$-400$\gamma$) cascade. Deduced: g-factor for 296-keV level.

1988GiZX: mass-separated samples of niobium fission fragments from $^{235}$U, $^{239}$Pu(n,F). Measured: E$\gamma$, I$\gamma$, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$.

Decay scheme very probably incomplete due to the high value for Q=7210 keV so all logft values should be treated as lower limits $T_{1/2}$. Deduced: $^{102}$Mo levels.

## $^{102}$Mo Levels

| E(level)† | $J^\pi$‡ | $T_{1/2}$ | Comments |
|---|---|---|---|
| 0.0 | $0^+$ | | |
| 295.92 *8* | $2^+$ | 125 ps *4* | g=0.42 *7* (1985Me13)<br>$T_{1/2}$: from 1991Li39.<br>g: From PAC for (296$\gamma$-400$\gamma$) cascade. |
| 697.05 *19* | $0^+$ | | |
| 743.03 *10* | $4^+$ | | |
| 847.48 *8* | $2^+$ | | |
| 1244.95 *11* | $(3^+)$ | | |
| 1249.10 *11* | $2^+$ | | |
| 1327.13 *23* | $6^+$ | | |
| 1397.85 *13* | $(4^+)$ | | |
| 1616.22 *14* | | | |
| 1747.08 *14* | | | |
| 1869.19 *14* | | | |
| 2480.28 *11* | $(3^+)$ | | $J^\pi$: J=3 from $\gamma\gamma(\theta)$ results of 1988GiZX if J(296)=2 and $\delta$=−0.5 for 2184$\gamma$. |

† From a least-squares fit to measured gammas.

‡ From Adopted Levels.

## $\beta^-$ radiations

| E(decay) | E(level) | I$\beta^-$† | Log *ft* | Comments |
|---|---|---|---|---|
| (4.73×10$^3$ *4*) | 2480.28 | 71 *6* | 4.86 | av E$\beta$= 2085 *34* |
| (5.34×10$^3$ *4*) | 1869.19 | 3.9 *7* | 6.36 | av E$\beta$= 2378 *34* |
| (5.46×10$^3$ *4*) | 1747.08 | 1.8 *7* | 6.74 | av E$\beta$= 2437 *34* |
| (5.81×10$^3$ *4*) | 1397.85 | 6.3 *11* | 6.31 | av E$\beta$= 2605 *34* |
| (5.88×10$^3$‡ *4*) | 1327.13 | 1.2 *3* | 7.06 | av E$\beta$= 2639 *34*<br>Log *ft*: This logft value is far too small for a second forbidden $\beta$ transition (see also general comment). |
| (5.97×10$^3$ *4*) | 1244.95 | 9 *3* | 6.21 | av E$\beta$= 2678 *34* |
| (6.47×10$^3$ *4*) | 743.03 | 7.6 *23* | 6.44 | av E$\beta$= 2919 *34* |

† Absolute intensity per 100 decays.

‡ Existence of this branch is questionable.

## $^{102}$Nb $\beta^-$ decay (4.3 s) (continued)

### $\gamma(^{102}Mo)$

Absolute intensities calculated with the assumption of no g.s. $\beta$ feeding and mult=E2 for 296$\gamma$.

| $E_\gamma$ [†] | $I_\gamma$ [†‡] | $E_i$(level) | $J_i^\pi$ | $E_f$ | $J_f^\pi$ | Mult. | $\delta$ | $\alpha$ [#] | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 151 [@] *1* | 1.5 *3* | 847.48 | $2^+$ | 697.05 | $0^+$ | [E2] | | 0.272 | |
| 296.0 *1* | 81 *8* | 295.92 | $2^+$ | 0.0 | $0^+$ | [E2] | | 0.0253 | |
| 367.3 *2* | 0.7 *2* | 1616.22 | | 1249.10 | $2^+$ | | | | |
| 397.4 *2* | 3.5 *7* | 1244.95 | $(3^+)$ | 847.48 | $2^+$ | | | | |
| 401.0 *3* | 1.9 *4* | 697.05 | $0^+$ | 295.92 | $2^+$ | | | | |
| 401.7 *3* | 0.2 *1* | 1249.10 | $2^+$ | 847.48 | $2^+$ | | | | |
| 447.1 *1* | 20 *2* | 743.03 | $4^+$ | 295.92 | $2^+$ | | | | |
| 501.9 *2* | 2.0 *4* | 1244.95 | $(3^+)$ | 743.03 | $4^+$ | | | | |
| 506.1 *2* | 0.2 *1* | 1249.10 | $2^+$ | 743.03 | $4^+$ | | | | |
| 550.1 *2* | 3.0 *6* | 1397.85 | $(4^+)$ | 847.48 | $2^+$ | | | | |
| 551.6 *1* | 31 *4* | 847.48 | $2^+$ | 295.92 | $2^+$ | | | | |
| 552.0 *2* | 0.4 *1* | 1249.10 | $2^+$ | 697.05 | $0^+$ | | | | |
| 584.1 *2* | 1.2 *3* | 1327.13 | $6^+$ | 743.03 | $4^+$ | | | | |
| 624.1 *2* | 0.9 *3* | 1869.19 | | 1244.95 | $(3^+)$ | | | | |
| 654.8 *2* | 3.6 *7* | 1397.85 | $(4^+)$ | 743.03 | $4^+$ | | | | |
| 733.1 *2* | 1.5 *3* | 2480.28 | $(3^+)$ | 1747.08 | | | | | |
| 847.4 *1* | 19 *2* | 847.48 | $2^+$ | 0.0 | $0^+$ | | | | |
| 864.3 *2* | 1.8 *4* | 2480.28 | $(3^+)$ | 1616.22 | | | | | |
| 873.5 *3* | 0.2 *1* | 1616.22 | | 743.03 | $4^+$ | | | | |
| 949.0 *1* | 18 *2* | 1244.95 | $(3^+)$ | 295.92 | $2^+$ | | | | |
| 953.2 *2* | 0.8 *2* | 1249.10 | $2^+$ | 295.92 | $2^+$ | | | | |
| 1004.0 *2* | 2.4 *5* | 1747.08 | | 743.03 | $4^+$ | | | | |
| 1021.9 *2* | 2.3 *5* | 1869.19 | | 847.48 | $2^+$ | | | | |
| 1082.6 *2* | 1.8 *4* | 2480.28 | $(3^+)$ | 1397.85 | $(4^+)$ | | | | |
| 1102.4 *2* | 1.5 *4* | 1397.85 | $(4^+)$ | 295.92 | $2^+$ | | | | |
| 1126.1 *2* | 0.7 *2* | 1869.19 | | 743.03 | $4^+$ | | | | |
| 1231.0 *2* | 1.5 *3* | 2480.28 | $(3^+)$ | 1249.10 | $2^+$ | | | | |
| 1235.3 *2* | 14 *2* | 2480.28 | $(3^+)$ | 1244.95 | $(3^+)$ | | | | |
| 1249.1 *2* | 0.6 *2* | 1249.10 | $2^+$ | 0.0 | $0^+$ | | | | |
| 1320.2 *2* | 0.9 *3* | 1616.22 | | 295.92 | $2^+$ | | | | |
| 1451.1 *2* | 0.9 *3* | 1747.08 | | 295.92 | $2^+$ | | | | |
| 1632.7 *2* | 42 *5* | 2480.28 | $(3^+)$ | 847.48 | $2^+$ | | | | |
| 1737.2 *2* | 2.1 *5* | 2480.28 | $(3^+)$ | 743.03 | $4^+$ | | | | |
| 2184.3 *2* | 6.3 *9* | 2480.28 | $(3^+)$ | 295.92 | $2^+$ | M1+E2 | −0.5 | | $\delta$: from $A_{22}$=−0.43 and $A_{44}$=0.0. No uncertainty given by the authors (1988GiZX). M1+E2 is the most probable multipolarity. |

[†] From 1988GiZX. Uncertainties on E$\gamma$,I$\gamma$ have been estimated by the evaluator after discussion with the authors.

[‡] For absolute intensity per 100 decays, multiply by 0.98.

[#] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on $\gamma$-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

[@] Placement of transition in the level scheme is uncertain.

## $^{102}$Nb $\beta^-$ decay (4.3 s)

### Decay Scheme

Intensities: Relative $I_\gamma$

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- $\gamma$ Decay (Uncertain)
- Coincidence