## $^{37}$Al $\beta^-$ decay (10.7 ms) 2013StZY

History

| Type | Author | Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | Jun Chen and Balraj Singh | ENSDF | 31-May-2015 |

Parent: $^{37}$Al: E=0; $J^\pi$=(5/2$^+$); $T_{1/2}$=10.7 ms *13*; Q($\beta^-$)=16.40×10$^3$ *15*; %$\beta^-$ decay=100.0

$^{37}$Al-$J^\pi$: From shell-model predictions (2013StZY).

$^{37}$Al-$T_{1/2}$: From Adopted Levels (taken from 2004Gr20). 2013StZY report two values by using different methods: 11.8 ms *1*(stat)+*24*−*34*(syst), 11.5 ms *4*(stat).

$^{37}$Al-Q($\beta^-$): From 2012Wa38.

2013STZY: $^{37}$Al ions were produced by fragmentation of a 345 MeV/nucleon $^{48}$Ca beam from the RIBF facility at RIKEN on a 2.8 g/cm$^2$ beryllium target. Fragments were separated and identified using the BigRIPS spectrometer, with energy loss measured by a multi-sampling ionization chamber (MUSIC) and positions by PPACs. Ions after separation and selection were implanted into the CAITEN detector consisting of a segmented movable hollow-cylindrical-shape plastic scintillator and a stationary ring of 24 position-sensitive photomultiplier tubes (PSPMTs). $\gamma$ rays were detected by three HPGe detectors (FWHM=2.1 keV at 1.33 MeV, 1.05 keV at 122 keV). Measured E$\gamma$, I$\gamma$, implantation-decay-correlation, $\beta\gamma$-coin, $\gamma\gamma$-coin, $\beta\gamma$(t). Deduced levels, J, $\pi$, half-life, $\gamma$-ray branching ratios, $\beta$-decay branching ratios. Comparison with shell-model calculations.

$^{37}$Al also decays to $^{36}$Si by $\beta^-$n (≥38% *3*) and probably to $^{35}$Si by $\beta^-$2n (≥1% *1*) (2013StZY). Since these $\beta$-delayed neutron decay branches were not measured, the decay scheme given here is incomplete.

### $^{37}$Si Levels

| E(level)[†] | $J^\pi$[‡] |
|---|---|
| 0 | (5/2$^-$) |
| 68 | (7/2$^-$) |
| 156 | (3/2$^-$) |
| 717 | (3/2$^+$) |
| 1270 | (5/2$^+$) |

† From a least-squares fit to $\gamma$-ray energies.

‡ From shell-model predictions (2013StZY), same values in Adopted Levels.

### $\beta^-$ radiations

| E(decay) | E(level) | I$\beta^-$[†‡] | Log *ft* | Comments |
|---|---|---|---|---|
| (1.513×10$^4$ *15*) | 1270 | ≤16 | ≥4.6 | av E$\beta$=6159 *40* |
| (1.568×10$^4$ *15*) | 717 | ≤54 | ≥4.1 | av E$\beta$=6432 *40* |

† Upper limits obtained by 2013StZY based on measured relative I$\gamma$ in $^{36}$Si and $^{37}$Si assuming no $\beta$n decay to $^{36}$Si ground state.

‡ Absolute intensity per 100 decays.

### $\gamma$($^{37}$Si)

I$\gamma$ normalization: From upper limits of absolute I$\gamma$ given in 2013StZY.

| E$_\gamma$[†] | I$_\gamma$[†#] | E$_i$(level) | J$_i^\pi$ | E$_f$ | J$_f^\pi$ | Mult.[†] | $\alpha$[‡] | Comments |
|---|---|---|---|---|---|---|---|---|
| 156 | 100 *4* | 156 | (3/2$^-$) | 0 | (5/2$^-$) | [M1] | 0.00127 *7* | I$_\gamma$: absolute I$\gamma$≤40 *2* (2013StZY). |
| 562 | 95 *6* | 717 | (3/2$^+$) | 156 | (3/2$^-$) | | | I$_\gamma$: absolute I$\gamma$≤38 *2* (2013StZY). |
| 717 | 40 *4* | 717 | (3/2$^+$) | 0 | (5/2$^-$) | | | I$_\gamma$: absolute I$\gamma$≤16 *2* (2013StZY). |
| 1115 | 14 *4* | 1270 | (5/2$^+$) | 156 | (3/2$^-$) | | | I$_\gamma$: absolute I$\gamma$≤6 *2* (2013StZY). |

Continued on next page (footnotes at end of table)

## $^{37}$Al $\beta^-$ decay (10.7 ms) 2013StZY (continued)

### $\gamma(^{37}Si)$ (continued)

| $E_\gamma$ [†] | $I_\gamma$ [†#] | $E_i$(level) | $J_i^\pi$ | $E_f$ | $J_f^\pi$ | $\alpha$ [‡] | Comments |
|---|---|---|---|---|---|---|---|
| 1202 | 11 *4* | 1270 | $(5/2^+)$ | 68 | $(7/2^-)$ | | $I_\gamma$: absolute I$\gamma\leq$4 *2* (2013StZY). |
| 1270 | 16 *4* | 1270 | $(5/2^+)$ | 0 | $(5/2^-)$ | $1.14\times10^{-4}$ | $I_\gamma$: absolute I$\gamma\leq$6 *2* (2013StZY). |

† From 2013StZY.
‡ From BrIcc v2.3a (10-Sep-2014) 2008Ki07, "Frozen Orbitals" appr.
# For absolute intensity per 100 decays, multiply by ≤0.4.

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### Decay Scheme

Intensities: $I_\gamma$ per 100 parent decays