# *ANNEX I:*

# *RECOMMENDED DECAY DATA*

Tabulations of the recommended decay data for the 85 radionuclides are presented in this Annex. The radionuclides are ordered by atomic number.

Data presented include:

- recommended half-lives ($T_{1/2}$), $Q$ values and decay modes
- transition probabilities, nature and log $ft$ data for $\beta^-$ transitions
- transition probabilites, nature, log $ft$ and shell capture probabilities for electron capture (EC) transitions
- energies and emission probabilities for the different radiations
  - $\alpha$-particles
  - electrons ($\beta^-$ emission, Auger and conversion electrons)
  - X-rays
- $\gamma$-ray energies, transition and emission probabilities, multipolarities and total internal conversion coefficients.

*SYMBOLS AND NOTATION*

# 1 Units

| | |
|---|---|
| s | second |
| min | minute |
| h | hour |
| d | day |
| y | year (1 y = 365.242 198 78 d or 31 556 925.26 s) |
| eV | electronvolt (1 eV = 1.602 176 462 (63) $\times 10^{-19}$ J) |
| keV | kiloelectronvolt (1 keV = 1000 eV) |

# 2 Particles and quanta

| | |
|---|---|
| $\alpha$ | alpha particle |
| $\beta^+$ | positron from $\beta^+$ decay |
| $\beta^-$ | electron from $\beta^-$ decay |
| $\gamma$ | gamma quantum, photon emitted when a nucleus decays to a lower energy state |
| ec | internal conversion electron |
| $ec_K$ | internal conversion electron, ejected from the K shell |
| $ec_L$ | internal conversion electron, ejected from the L shell |
| $ec_M$ | internal conversion electron, ejected from the M shell |
| $ec_{M+}$ | internal conversion electron, ejected from the M and higher shells |
| $ec_N$ | internal conversion electron, ejected from the N shell |
| $ec_{N+}$ | internal conversion electron, ejected from the N and higher shells |
| $ec_O$ | internal conversion electron, ejected from the O shell |
| $e_A$ | Auger electron |
| $e_{AK}$ | K-Auger electron |
| $e_{AL}$ | L-Auger electron |
| KLL | KLL-Auger electron |
| KLX | KLX-Auger electron (X=M, N) |
| KXY | KXY-Auger electron (X=M, N; Y=M, N) |
| X | X-ray quantum, photon emitted during the rearrangement of the atomic shells |
| XK | X-ray quantum, photon emitted during the rearrangement of the atomic K shell |
| XL | X-ray quantum, photon emitted during the rearrangement of the atomic L shell |

# 3 Energies

| | |
|---|---|
| $Q_\alpha$ | total energy of alpha decay |
| $Q_{\beta^-}$ | total energy of $\beta^-$decay |
| $Q_{EC}$ | total energy of electron capture (EC) decay |
| $Q_{IT}$ | total energy of isomeric transition decay |

# 4 Transitions, probabilities, emission intensities and conversion coefficients

| | |
|---|---|
| $\alpha_{x,y}$ | transition by $\alpha$ decay between level $x$ and level $y$ |
| $\beta^-_{x,y}$ | transition by $\beta^-$ decay between level $x$ and level $y$ |
| $\epsilon_{x,y}$ | transition by electron capture (EC) between level $x$ and level $y$ |
| $P_K$ | K-shell capture probability for an electron capture (EC) transition |
| $P_L$ | L-shell capture probability for an electron capture (EC) transition |

| | |
|---|---|
| $P_M$ | M-shell capture probability for an electron capture (EC) transition |
| $P_{M+}$ | M- and higher-shells capture probability for an electron capture (EC) transition ($P_K + P_L + P_M + \ldots = 1$) |
| $\gamma_{x,y}$ | $\gamma$-ray emission between level $x$ and level $y$ |
| $P_\gamma$ | $\gamma$-ray emission probability for a given transition (not including conversion electrons) |
| $P_{ce}$ | conversion electron emission probability for a given transition |
| $P_{\gamma+ce}$ | total transition probability for a given transition (including conversion electrons) $P_{\gamma+ce} = P_\gamma + P_{ce}$ |
| $\alpha_K$ | K-shell internal conversion coefficient |
| $\alpha_L$ | total L-shell internal conversion coefficient |
| $\alpha_M$ | total M-shell internal conversion coefficient |
| $\alpha_{M+}$ | total M- and higher-shells internal conversion coefficient |
| $\alpha_N$ | total N-shell internal conversion coefficient |
| $\alpha_{N+}$ | total N- and higher-shells internal conversion coefficient |
| $\alpha_\pi$ | internal-pair formation coefficient |
| $\alpha_{T(ICC)}$ | total internal conversion coefficient ($\alpha_T = \alpha_K + \alpha_L + \alpha_M + \ldots$) |
| $\alpha_T$ | total conversion coefficient ($\alpha_T = \alpha_K + \alpha_L + \alpha_M + \ldots + \alpha_\pi$) |

## 5 Other physical quantities and abbreviations

| | |
|---|---|
| E0, E1, E2, EL | electric monopole, dipole, quadrupole, 2L-pole |
| log $ft$ | logarithm of the comparative half-life in $\beta^-$ or EC decay |
| $J$ | quantum number of total angular momentum |
| $K$, $L$, $M$, ... | electron shells |
| $K/L$ | ratio $P_{ce_K}/P_{ce_L} = \alpha_K/\alpha_L$ |
| $K/LM$ | ratio $P_{ce_K}/(P_{ce_L} + P_{ce_M}) = \alpha_K/(\alpha_L + \alpha_M)$ |
| $K/LMN$ | ratio $P_{ce_K}/(P_{ce_L} + P_{ce_M} + P_{ce_N}) = \alpha_K/(\alpha_L + \alpha_M + \alpha_N)$ |
| $KLX/KXY$ | ratio $P_{A_{KLX}}/P_{A_{KXY}}$ |
| $L$ | orbital angular momentum quantum number |
| $m_0$ | electron rest mass |
| max | maximum |
| min | minimum |
| avg | average |
| $Z$ | atomic number of an element |
| $A$ | mass number of an isotope |
| $N$ | number of neutrons in an isotope, $N = A - Z$ |
| M1, M2, ML | magnetic dipole, quadrupole, 2L-pole |
| $\bar{\nu}$ | average total number of spontaneous fission neutrons |
| $T_{1/2}$ | half-life (= total half-life for multiple decay modes) |
| $\lambda$ | decay constant, $\lambda = ln2/T_{1/2}$ |
| $\delta$ | mixing ratio of different multipolarities |
| $\pi$ | parity |

# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 8.32 | (7) | min |
| $Q_{\beta^-}$ | : | 1308 | (20) | keV |
| $\beta^-$ | : | 100 | | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,3}$ | 659 (20) | 3.0 (4) | 1st forbidden non-unique | 5.41 |
| $\beta^-_{0,2}$ | 1003 (20) | 35 (7) | 1st forbidden non-unique | 5.24 |
| $\beta^-_{0,0}$ | 1308 (20) | 62 (7) | 1st forbidden non-unique | 5.67 |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Tl) | 5.25 - 15.32 | 5.1 (4) | |
| $e_{AK}$ | (Tl) | | 0.30 (7) | |
| | KLL | 54.587 - 59.954 | } | |
| | KLX | 66.37 - 72.86 | } | |
| | KXY | 78.12 - 85.50 | } | |
| $ec_{2,0\ K}$ | (Tl) | 219.366 (6) | 8.0 (15) | |
| $ec_{2,0\ L}$ | (Tl) | 289.549 - 292.238 | 1.35 (26) | |
| $ec_{2,0\ M}$ | (Tl) | 301.192 - 302.507 | 0.31 (6) | |
| $ec_{2,0\ N}$ | (Tl) | 304.050 - 304.777 | 0.080 (15) | |
| $ec_{3,2\ K}$ | (Tl) | 258.99 (17) | 0.122 (24) | |
| $ec_{3,2\ L}$ | (Tl) | 329.17 - 331.86 | 0.0204 (41) | |
| $ec_{3,0\ K}$ | (Tl) | 563.89 (5) | 0.0906 (18) | |
| $ec_{3,0\ L}$ | (Tl) | 634.07 - 636.76 | 0.01498 (30) | |
| $\beta^-_{0,3}$ | max: | 659 (20) | 3.0 (4) | avg: 203 (7) |
| $\beta^-_{0,2}$ | max: | 1003 (20) | 35 (7) | avg: 330 (8) |
| $\beta^-_{0,0}$ | max: | 1308 (20) | 62 (7) | avg: 450 (8) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. | |
|---|---|---|---|---|
| XL | (Tl) | 8.9531 — 14.7362 | 2.9 (4) | |
| $XK\alpha_2$ | (Tl) | 70.8325 | 2.3 (5) | } $K\alpha$ |

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XK$\alpha_1$ | (Tl) | 72.8725 | | 3.9 (8) | } |
| XK$\beta_3$ | (Tl) | 82.118 | } | | |
| XK$\beta_1$ | (Tl) | 82.577 | } | 1.32 (25) | K$\beta_1'$ |
| XK$\beta_5''$ | (Tl) | 83.115 | } | | |
| XK$\beta_2$ | (Tl) | 84.838 | } | | |
| XK$\beta_4$ | (Tl) | 85.134 | } | 0.39 (8) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Tl) | 85.444 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Tl) | 265.832 (5) | 0.014 (7) | E2 | 0.1603 (23) | 0.012 (6) |
| $\gamma_{2,0}$(Tl) | 304.896 (6) | 36 (7) | M1 | 0.375 (6) | 26 (5) |
| $\gamma_{3,2}$(Tl) | 344.52 (17) | 0.70 (14) | M1 | 0.269 (4) | 0.55 (11) |
| $\gamma_{3,1}$(Tl) | 383.59 (6) | 0.014 (7) | M1(+E2) | 0.13 (8) | 0.012 (6) |
| $\gamma_{3,0}$(Tl) | 649.42 (5) | 2.3 (3) | M1 | 0.0501 (7) | 2.2 (3) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 4.202 | (11) | min |
| $Q_{\beta^-}$ | : | 1532.4 | (6) | keV |
| $\beta^-$ | : | 100 | | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,2}$ | 366.0 (8) | 0.110 (14) | 1st forbidden | 6 |
| $\beta^-_{0,1}$ | 729.3 (6) | 0.0051 (3) | 1st forbidden unique | 8.6 |
| $\beta^-_{0,0}$ | 1532.4 (6) | 99.885 (14) | 1st forbidden | 5.2 |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $e_{AK}$ | (Pb) | | | 0.0034 (6) | | |
| | KLL | 56.028 - 61.669 | } | | | |
| | KLX | 68.181 - 74.969 | } | | | |
| | KXY | 80.3 - 88.0 | } | | | |
| $ec_{2,0\ K}$ | (Pb) | 1078.4 | | 0.093 (11) | | |
| $ec_{2,0\ L}$ | (Pb) | 1150.54 - 1151.20 | | 0.017 (3) | | |
| $\beta^-_{0,2}$ | max: | 366.0 | (8) | 0.110 (14) | avg: | 104.52 (25) |
| $\beta^-_{0,1}$ | max: | 729.3 | (6) | 0.0051 (3) | avg: | 232.39 (21) |
| $\beta^-_{0,0}$ | max: | 1532.4 | (6) | 99.885 (14) | avg: | 538.86 (25) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pb) | 9.19 — 15.217 | | 0.035 (4) | |
| XK$\alpha_2$ | (Pb) | 72.8049 | | 0.026 (3) | } K$\alpha$ |
| XK$\alpha_1$ | (Pb) | 74.97 | | 0.044 (5) | } |
| XK$\beta_3$ | (Pb) | 84.451 | } | | |
| XK$\beta_1$ | (Pb) | 84.937 | } | 0.0150 (17) | K$\beta_1'$ |
| XK$\beta_5''$ | (Pb) | 85.47 | } | | |
| XK$\beta_2$ | (Pb) | 87.238 | } | | |
| XK$\beta_4$ | (Pb) | 87.58 | } | 0.0045 (6) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Pb) | 87.911 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{2,1}$(Pb) | 363.3 (5) | 0.00015 (15) | E2 | 0.0663 (20) | 0.00014 (14) |
| $\gamma_{1,0}$(Pb) | 803.06 (3) | 0.0051 (3) | E2 | 0.01030 (31) | 0.0050 (3) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 4.774 | (12) | min |
| $Q_{\beta^-}$ | : | 1418 | (5) | keV |
| $\beta^-$ | : | 100 | | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,2}$ | 520 (5) | 0.271 (10) | 1st forbidden non-unique | 6.15 |
| $\beta^-_{0,1}$ | 848 (5) | <0.00008 | 1st forbidden unique | >10.8 |
| $\beta^-_{0,0}$ | 1418 (5) | 99.729 (10) | 1st forbidden non-unique | 5.11 |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Pb) | 5.33 - 15.82 | 0.00333 (6) | |
| $e_{AK}$ | (Pb) | | 0.000202 (23) | |
| | KLL | 56.028 - 61.669 } | | |
| | KLX | 68.181 - 74.969 } | | |
| | KXY | 80.3 - 88.0 } | | |
| $\beta^-_{0,2}$ | max: | 520 (5) | 0.271 (10) | avg: 155.0 (17) |
| $\beta^-_{0,1}$ | max: | 848 (5) | <0.00008 | avg: 273.2 (18) |
| $\beta^-_{0,0}$ | max: | 1418 (5) | 99.729 (10) | avg: 492.5 (21) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. | |
|---|---|---|---|---|
| XL | (Pb) | 9.186 — 15.2169 | 0.00201 (6) | |
| XK$\alpha_2$ | (Pb) | 72.8049 | 0.00154 (6) | } K$\alpha$ |
| XK$\alpha_1$ | (Pb) | 74.97 | 0.00258 (10) | } |
| XK$\beta_3$ | (Pb) | 84.451 } | | |
| XK$\beta_1$ | (Pb) | 84.937 } | 0.00088 (4) | K$\beta_1'$ |
| XK$\beta_5''$ | (Pb) | 85.47 } | | |
| XK$\beta_2$ | (Pb) | 87.238 } | | |
| XK$\beta_4$ | (Pb) | 87.58 } | 0.000266 (12) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Pb) | 87.911 } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{2,1}$(Pb) | 328.10 (12) | 0.00189 (19) | [M1] | 0.334 (5) | 0.00142 (14) |
| $\gamma_{1,0}$(Pb) | 569.698 (2) | 0.00189 (19) | E2 | 0.0216 (3) | 0.00185 (19) |
| $\gamma_{2,0}$(Pb) | 897.77 (12) | 0.269 (9) | M1+0.8%E2 | 0.0233 (4) | 0.263 (9) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 3.058 | (6) | min |
| $Q_{\beta^-}$ | : | 4999.0 | (17) | keV |
| $\beta^-$ | : | 100 | | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,23}$ | 518.3 (17) | 0.052 (5) | 1st forbidden non-unique | 6.67 |
| $\beta^-_{0,21}$ | 615.7 (17) | 0.017 (5) | 1st forbidden non-unique | 7.41 |
| $\beta^-_{0,20}$ | 640.3 (17) | 0.045 (4) | 1st forbidden non-unique | 7.04 |
| $\beta^-_{0,19}$ | 675.1 (17) | 0.005 (2) | Allowed | 8.1 |
| $\beta^-_{0,18}$ | 702.4 (17) | 0.102 (11) | 1st forbidden non-unique | 6.82 |
| $\beta^-_{0,17}$ | 737.1 (17) | 0.002 (1) | 1st forbidden non-unique | 8.6 |
| $\beta^-_{0,13}$ | 818.6 (17) | 0.231 (9) | 1st forbidden non-unique | 6.7 |
| $\beta^-_{0,12}$ | 873.7 (17) | 0.174 (9) | 1st forbidden non-unique | 6.92 |
| $\beta^-_{0,8}$ | 1003.6 (17) | 0.007 (3) | 1st forbidden non-unique | 8.5 |
| $\beta^-_{0,7}$ | 1037.8 (17) | 3.17 (4) | 1st forbidden non-unique | 5.92 |
| $\beta^-_{0,6}$ | 1052.4 (17) | 0.048 (3) | 1st forbidden non-unique | 7.76 |
| $\beta^-_{0,5}$ | 1079.0 (17) | 0.63 (4) | 1st forbidden non-unique | 6.68 |
| $\beta^-_{0,4}$ | 1290.5 (17) | 24.1 (2) | 1st forbidden non-unique | 5.38 |
| $\beta^-_{0,3}$ | 1523.9 (17) | 22.1 (5) | 1st forbidden non-unique | 5.69 |
| $\beta^-_{0,2}$ | 1801.3 (17) | 49.2 (6) | 1st forbidden non-unique | 5.61 |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Pb) | 5.262 - 10.398 | 4.50 (13) | |
| $e_{AK}$ | (Pb) | | 0.27 (3) | |
| | KLL | 56.028 - 61.669 } | | |
| | KLX | 68.181 - 74.969 } | | |
| | KXY | 80.3 - 88.0 } | | |
| $ec_{3,2\ K}$ | (Pb) | 189.36 (2) | 2.86 (13) | |
| $ec_{3,2\ L}$ | (Pb) | 261.51 - 264.33 | 0.49 (2) | |
| $ec_{3,2\ M+}$ | (Pb) | 273.52 - 277.37 | 0.15 (1) | |
| $ec_{4,2\ K}$ | (Pb) | 422.73 (2) | 1.88 (2) | |
| $ec_{4,2\ L}$ | (Pb) | 494.88 - 497.70 | 0.32 | |
| $ec_{4,2\ M+}$ | (Pb) | 506.89 - 510.74 | 0.098 | |
| $ec_{2,1\ K}$ | (Pb) | 495.18 (2) | 1.25 (1) | |
| $ec_{2,1\ L}$ | (Pb) | 567.33 - 570.15 | 0.34 | |
| $ec_{2,1\ M+}$ | (Pb) | 579.33 - 583.19 | 0.109 | |
| $ec_{1,0\ \alpha}$ | (Pb) | 1592.51 (1) | 0.0369 (6) | |
| $ec_{1,0\ K}$ | (Pb) | 2526.51 (1) | 0.170 (3) | |
| $ec_{1,0\ L}$ | (Pb) | 2598.65 - 2601.48 | 0.0291 (4) | |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $\beta^-_{0,23}$ | max: | 518.3 | (17) | 0.052 (5) | avg: | 154.3 (6) |
| $\beta^-_{0,21}$ | max: | 615.7 | (17) | 0.017 (5) | avg: | 187.7 (6) |
| $\beta^-_{0,20}$ | max: | 640.3 | (17) | 0.045 (4) | avg: | 196.4 (6) |
| $\beta^-_{0,19}$ | max: | 675.1 | (17) | 0.005 (2) | avg: | 208.6 (6) |
| $\beta^-_{0,18}$ | max: | 702.4 | (17) | 0.102 (11) | avg: | 218.3 (6) |
| $\beta^-_{0,17}$ | max: | 737.1 | (17) | 0.002 (1) | avg: | 230.8 (6) |
| $\beta^-_{0,13}$ | max: | 818.6 | (17) | 0.231 (9) | avg: | 260.4 (6) |
| $\beta^-_{0,12}$ | max: | 873.7 | (17) | 0.174 (9) | avg: | 280.8 (6) |
| $\beta^-_{0,8}$ | max: | 1003.6 | (17) | 0.007 (3) | avg: | 329.7 (7) |
| $\beta^-_{0,7}$ | max: | 1037.8 | (17) | 3.17 (4) | avg: | 342.8 (7) |
| $\beta^-_{0,6}$ | max: | 1052.4 | (17) | 0.048 (3) | avg: | 348.4 (7) |
| $\beta^-_{0,5}$ | max: | 1079.0 | (17) | 0.63 (4) | avg: | 358.6 (7) |
| $\beta^-_{0,4}$ | max: | 1290.5 | (17) | 24.1 (2) | avg: | 441.5 (7) |
| $\beta^-_{0,3}$ | max: | 1523.9 | (17) | 22.1 (5) | avg: | 535.4 (7) |
| $\beta^-_{0,2}$ | max: | 1801.3 | (17) | 49.2 (6) | avg: | 649.5 (7) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pb) | 9.184 — 15.216 | | 2.75 (12) | |
| XK$\alpha_2$ | (Pb) | 72.8049 | | 2.03 (5) | } K$\alpha$ |
| XK$\alpha_1$ | (Pb) | 74.97 | | 3.42 (7) | } |
| XK$\beta_3$ | (Pb) | 84.451 | } | | |
| XK$\beta_1$ | (Pb) | 84.937 | } | 1.17 (3) | K$\beta_1'$ |
| XK$\beta_5''$ | (Pb) | 85.47 | } | | |
| XK$\beta_2$ | (Pb) | 87.238 | } | | |
| XK$\beta_4$ | (Pb) | 87.58 | } | 0.353 (11) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Pb) | 87.911 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{5,4}$(Pb) | 211.52 (2) | 0.38 (2) | M1+3%E2 | 1.096 (17) | 0.18 (1) |
| $\gamma_{4,3}$(Pb) | 233.37 (2) | 0.51 (2) | [M1+33%E2] | 0.66 (3) | 0.31 (1) |
| $\gamma_{7,4}$(Pb) | 252.71 (2) | 1.26 (3) | [M1+14%E2] | 0.616 (15) | 0.78 (2) |
| $\gamma_{3,2}$(Pb) | 277.37 (2) | 10.1 (5) | [M1+0.04%E2] | 0.529 (8) | 6.6 (3) |
| $\gamma_{7,3}$(Pb) | 486.08 (2) | 0.055 (4) | [M1] | 0.1164 (17) | 0.049 (4) |
| $\gamma_{4,2}$(Pb) | 510.74 (2) | 24.8 (2) | [M1+0.25%E2] | 0.1019 (16) | 22.5 (2) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{2,1}$(Pb) | 583.187 (2) | 86.7 (3) | E2 | 0.0205 (3) | 85.0 (3) |
| $\gamma_{18,4}$(Pb) | 588.108 (18) | 0.06 (1) | [M1] | 0.0704 (10) | 0.06 (1) |
| $\gamma_{12,3}$(Pb) | 650.27 (2) | 0.043 (5) | [M1] | 0.0541 (8) | 0.041 (5) |
| $\gamma_{13,3}$(Pb) | 705.34 (2) | 0.023 (4) | [M1] | 0.0438 (7) | 0.022 (4) |
| $\gamma_{5,2}$(Pb) | 722.26 (2) | 0.25 (4) | M1+8.8%E2 | 0.0387 (7) | 0.24 (4) |
| $\gamma_{6,2}$(Pb) | 748.87 (2) | 0.048 (3) | [M1] | 0.0375 (6) | 0.046 (3) |
| $\gamma_{7,2}$(Pb) | 763.45 (2) | 1.86 (2) | [M1+1.0%E2] | 0.0354 (5) | 1.80 (2) |
| $\gamma_{-1,1}$(Pb) | 808.32 (13) | 0.030 (7) | | | 0.030 (7) |
| $\gamma_{18,3}$(Pb) | 821.48 (2) | 0.042 (4) | M1 | 0.0295 (5) | 0.041 (4) |
| $\gamma_{-1,2}$(Pb) | 835.90 (11) | 0.076 (11) | | | 0.076 (11) |
| $\gamma_{3,1}$(Pb) | 860.53 (2) | 12.7 (1) | [M1+0.02%E2] | 0.0262 (4) | 12.4 (1) |
| $\gamma_{20,3}$(Pb) | 883.59 (2) | 0.032 (3) | [M1] | 0.0244 (4) | 0.031 (3) |
| $\gamma_{12,2}$(Pb) | 927.64 (2) | 0.131 (7) | [M1] | 0.0216 (3) | 0.128 (7) |
| $\gamma_{13,2}$(Pb) | 982.70 (2) | 0.208 (8) | [M1] | 0.0186 (3) | 0.204 (8) |
| $\gamma_{4,1}$(Pb) | 1093.90 (2) | 0.44 (1) | E2 | 0.00560 (8) | 0.44 (1) |
| $\gamma_{19,2}$(Pb) | 1126.24 (2) | 0.005 (2) | E1 | 0.00203 (3) | 0.005 (2) |
| $\gamma_{20,2}$(Pb) | 1160.96 (2) | 0.011 (3) | [M1] | 0.01214 (17) | 0.011 (3) |
| $\gamma_{21,2}$(Pb) | 1185.57 (2) | 0.017 (5) | [M1] | 0.01151 (17) | 0.017 (5) |
| $\gamma_{23,2}$(Pb) | 1283.04 (2) | 0.052 (5) | [M1] | 0.00943 (14) | 0.052 (5) |
| $\gamma_{8,1}$(Pb) | 1380.89 (2) | 0.007 (3) | [M1] | 0.00785 (11) | 0.007 (3) |
| $\gamma_{17,1}$(Pb) | 1647.32 (2) | 0.002 (1) | [M1] | 0.00518 (8) | 0.002 (1) |
| $\gamma_{20,12}$(Pb) | 1744.12 (2) | 0.002 (1) | [M1] | 0.00457 (7) | 0.002 (1) |
| $\gamma_{1,0}$(Pb) | 2614.511 (10) | 100 | E3 | 0.00246 (4) | 99.755 (4) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 2.161 | (7) | min |
| $Q_{\beta^-}$ | : | 3976 | (8) | keV |
| $\beta^-$ | : | 100 | | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,10}$ | 587 (8) | 0.420 (22) | | |
| $\beta^-_{0,9}$ | 615 (8) | 0.10 (3) | | |
| $\beta^-_{0,8}$ | 906 (8) | 0.645 (16) | 1st forbidden | 6.3 |
| $\beta^-_{0,7}$ | 1071 (8) | 0.70 (9) | 1st forbidden | 6.5 |
| $\beta^-_{0,6}$ | 1451 (8) | 0.070 (15) | Allowed | 8 |
| $\beta^-_{0,5}$ | 1515 (8) | 0.031 (16) | 1st forbidden unique | 9.2 |
| $\beta^-_{0,4}$ | 1660 (8) | 0.32 (11) | 1st forbidden | 7.5 |
| $\beta^-_{0,3}$ | 1827 (8) | 97.70 (15) | 1st forbidden | 5.2 |
| $\beta^-_{0,2}$ | 1944 (8) | <0.1 | Allowed | >8.3 |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Pb) | 5.34 - 15.82 | 13.23 (15) | |
| $e_{AK}$ | (Pb) | | 0.77 (9) | |
| | KLL | 56.028 - 61.669 | } | |
| | KLX | 68.181 - 74.969 | } | |
| | KXY | 80.3 - 88.0 | } | |
| $ec_{3,2\ K}$ | (Pb) | 29.22 (8) | 17.51 (48) | |
| $ec_{3,2\ L}$ | (Pb) | 101.36 - 104.18 | 3.39 (9) | |
| $ec_{3,2\ M}$ | (Pb) | 113.37 - 114.74 | 0.799 (20) | |
| $ec_{3,2\ N}$ | (Pb) | 116.33 - 117.08 | 0.200 (5) | |
| $ec_{4,2\ K}$ | (Pb) | 195.61 (14) | 0.057 (28) | |
| $ec_{2,1\ K}$ | (Pb) | 377.13 (8) | 2.34 (7) | |
| $ec_{2,1\ L}$ | (Pb) | 449.27 - 452.09 | 0.786 (23) | |
| $ec_{2,1\ M}$ | (Pb) | 461.28 - 462.65 | 0.197 (6) | |
| $ec_{2,1\ N}$ | (Pb) | 464.24 - 464.99 | 0.0497 (15) | |
| $ec_{3,1\ K}$ | (Pb) | 494.35 (8) | 0.0491 (40) | |
| $ec_{3,1\ L}$ | (Pb) | 566.49 - 569.31 | 0.0100 (8) | |
| $ec_{8,3\ K}$ | (Pb) | 832.43 (14) | 0.01142 (33) | |
| $ec_{1,0\ K}$ | (Pb) | 1478.94 (5) | 0.2340 (42) | |
| $ec_{1,0\ L}$ | (Pb) | 1551.08 - 1553.90 | 0.0396 (6) | |
| $\beta^-_{0,10}$ | max: | 587 (8) | 0.420 (22) | avg: 177.8 (28) |
| $\beta^-_{0,9}$ | max: | 615 (8) | 0.10 (3) | avg: 187.4 (28) |
| $\beta^-_{0,8}$ | max: | 906 (8) | 0.645 (16) | avg: 292.9 (30) |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $\beta^-_{0,7}$ | max: | 1071 | (8) | 0.70 (9) | avg: | 355.5 (31) |
| $\beta^-_{0,6}$ | max: | 1451 | (8) | 0.070 (15) | avg: | 505.9 (33) |
| $\beta^-_{0,5}$ | max: | 1515 | (8) | 0.031 (16) | avg: | 518.1 (31) |
| $\beta^-_{0,4}$ | max: | 1660 | (8) | 0.32 (11) | avg: | 591.2 (33) |
| $\beta^-_{0,3}$ | max: | 1827 | (8) | 97.70 (15) | avg: | 660.0 (34) |
| $\beta^-_{0,2}$ | max: | 1944 | (8) | <0.1 | avg: | 709.0 (34) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pb) | 9.186 — 15.2169 | | 8.04 (14) | |
| XK$\alpha_2$ | (Pb) | 72.8049 | | 5.85 (10) | } K$\alpha$ |
| XK$\alpha_1$ | (Pb) | 74.97 | | 9.84 (16) | } |
| XK$\beta_3$ | (Pb) | 84.451 | } | | |
| XK$\beta_1$ | (Pb) | 84.937 | } | 3.36 (8) | K$\beta_1'$ |
| XK$\beta_5''$ | (Pb) | 85.47 | } | | |
| XK$\beta_2$ | (Pb) | 87.238 | } | | |
| XK$\beta_4$ | (Pb) | 87.58 | } | 1.016 (28) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Pb) | 87.911 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{3,2}$(Pb) | 117.224 (7) | 100 | E1 | 0.295 (5) | 77.22 (27) |
| $\gamma_{4,2}$(Pb) | 284.04 (23) | 0.21 (10) | [M1] | 0.495 (7) | 0.14 (7) |
| $\gamma_{5,3}$(Pb) | 311.5 (3) | 0.031 (15) | [E2] | 0.1034 (15) | 0.028 (14) |
| $\gamma_{6,3}$(Pb) | 375.5 (2) | 0.070 (15) | | | 0.070 (15) |
| $\gamma_{2,1}$(Pb) | 465.128 (24) | 100 | E2 | 0.0350 (5) | 96.62 (5) |
| $\gamma_{-1,1}$(Pb) | 469.7 (3) | 0.12 (3) | | | 0.12 (3) |
| $\gamma_{3,1}$(Pb) | 582.4 (2) | 0.374 (29) | [M2] | 0.200 (3) | 0.312 (24) |
| $\gamma_{4,1}$(Pb) | 748.3 (2) | 0.080 (21) | [E1] | 0.00428 (6) | 0.080 (21) |
| $\gamma_{7,3}$(Pb) | 755.6 (3) | 0.114 (21) | [M1] | 0.0366 (6) | 0.11 (2) |
| $\gamma_{-1,2}$(Pb) | 860.5 (3) | 0.26 (4) | | | 0.26 (4) |
| $\gamma_{7,2}$(Pb) | 873.5 (4) | 0.59 (8) | [E1] | 0.00320 (5) | 0.59 (8) |
| $\gamma_{-1,3}$(Pb) | 890.0 (4) | 0.12 (3) | | | 0.12 (3) |
| $\gamma_{-1,4}$(Pb) | 902.8 (4) | 0.10 (2) | | | 0.10 (2) |
| $\gamma_{8,3}$(Pb) | 920.43 (11) | 0.645 (15) | [M1] | 0.0220 (3) | 0.631 (15) |
| $\gamma_{-1,5}$(Pb) | 970.3 | 0.054 (15) | | | 0.054 (15) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{10,3}$(Pb) | 1239.66 (11) | 0.420 (22) | | | 0.420 (22) |
| $\gamma_{9,2}$(Pb) | 1329.29 (16) | 0.10 (3) | | | 0.10 (3) |
| $\gamma_{1,0}$(Pb) | 1566.93 (5) | 100 | E2 | 0.00294 (5) | 99.707 (5) |
| $\gamma_{-1,6}$(Pb) | 1661.1 (5) | 0.10 (2) | | | 0.10 (2) |
| $\gamma_{-1,7}$(Pb) | 1673.2 (4) | 0.48 (4) | | | 0.48 (4) |
| $\gamma_{-1,8}$(Pb) | 1781.7 (5) | 0.04 (2) | | | 0.04 (2) |
| $\gamma_{-1,9}$(Pb) | 2005.3 (2) | 0.020 (5) | | | 0.020 (5) |
| $\gamma_{-1,10}$(Pb) | 2032.1 (5) | 0.001 | | | 0.001 |
| $\gamma_{3,0}$(Pb) | 2149 (1) | 0.015 (5) | [M4] | 0.01529 (22) | 0.015 (5) |
| $\gamma_{4,0}$(Pb) | 2315.80 (21) | 0.0289 (21) | [E3] | 0.00292 (4) | 0.0288 (21) |
| $\gamma_{-1,11}$(Pb) | 2548.2 | 0.015 (6) | | | 0.015 (6) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 1.30 | (3) | min |
| $Q_{\beta^-}$ | : | 5482 | (12) | keV |
| $\beta^-$ | : | 100 | | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,11}$ | 1380 (12) | ~2 | | 6.2 |
| $\beta^-_{0,10}$ | 1603 (12) | ~7 | | 5.9 |
| $\beta^-_{0,9}$ | 1860 (12) | ~24 | | 5.6 |
| $\beta^-_{0,8}$ | 2024 (12) | ~10 | Allowed | 6.1 |
| $\beta^-_{0,7}$ | 2413 (12) | ~10 | 2nd forbidden unique | 6.4 |
| $\beta^-_{0,3}$ | 4290 (12) | ~31 | Allowed | 6.9 |
| $\beta^-_{0,2}$ | 4386 (12) | ~13 | Allowed | 7.3 |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|
| $ec_{3,2\ K}$ | (Pb) | ~9 | ~16 | | |
| $ec_{3,2\ L}$ | (Pb) | 81.1392 - 83.9648 | ~12 | | |
| $ec_{3,2\ M}$ | (Pb) | 93.1493 - 94.5160 | ~3.2 | | |
| $ec_{2,1\ K}$ | (Pb) | 208 (3) | 5.3 (7) | | |
| $ec_{2,1\ L}$ | (Pb) | 280.1392 - 282.9648 | 3.15 (42) | | |
| $ec_{2,1\ M}$ | (Pb) | 292.1493 - 293.5160 | 0.81 (11) | | |
| $ec_{2,1\ N}$ | (Pb) | 295.1064 - 295.8637 | 0.205 (27) | | |
| $ec_{1,0\ K}$ | (Pb) | 711.6 (3) | 0.803 (12) | | |
| $ec_{1,0\ L}$ | (Pb) | 783.7 - 786.6 | 0.1746 (25) | | |
| $ec_{1,0\ M}$ | (Pb) | 795.7 - 797.1 | 0.0421 (6) | | |
| $ec_{1,0\ N}$ | (Pb) | 798.7 - 799.5 | 0.01066 (16) | | |
| $ec_{4,1\ K}$ | (Pb) | 982 (20) | 0.022 (9) | | |
| $ec_{-1,1\ L}$ | (Pb) | 67.1392 - 69.9648 | ~20 | | |
| $ec_{-1,1\ M}$ | (Pb) | 79.1493 - 80.5160 | ~6 | | |
| $ec_{-1,2\ K}$ | (Pb) | 268 (10) | 0.88 (45) | | |
| $ec_{-1,2\ L}$ | (Pb) | 340.1392 - 342.9648 | 0.15 (8) | | |
| $ec_{-1,2\ M}$ | (Pb) | 352.1493 - 353.5160 | 0.035 (18) | | |
| $ec_{-1,3\ K}$ | (Pb) | 294 (10) | 0.55 (37) | | |
| $ec_{-1,3\ L}$ | (Pb) | 366.1392 - 368.9648 | 0.09 (6) | | |
| $ec_{-1,3\ M}$ | (Pb) | 378.1493 - 379.5160 | 0.022 (15) | | |
| $\beta^-_{0,11}$ | max: | 1380 (12) | ~2 | avg: | 477 (13) |
| $\beta^-_{0,10}$ | max: | 1603 (12) | ~7 | avg: | 568 (14) |
| $\beta^-_{0,9}$ | max: | 1860 (12) | ~24 | avg: | 674 (10) |
| $\beta^-_{0,8}$ | max: | 2024 (12) | ~10 | avg: | 743 (10) |
| $\beta^-_{0,7}$ | max: | 2413 (12) | ~10 | avg: | 907 (7) |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $\beta^-_{0,3}$ | max: | 4290 | (12) | ∼31 | avg: | 1721 (11) |
| $\beta^-_{0,2}$ | max: | 4386 | (12) | ∼13 | avg: | 1763 (5) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pb) | 9.186 — 15.217 | | | |
| $XK\alpha_2$ | (Pb) | 72.805 | | 7 (4) | } $K\alpha$ |
| $XK\alpha_1$ | (Pb) | 74.97 | | 11 (6) | } |
| $XK\beta_3$ | (Pb) | 84.451 | } | | |
| $XK\beta_1$ | (Pb) | 84.937 | } | 3.8 (19) | $K\beta_1'$ |
| $XK\beta_5''$ | (Pb) | 85.47 | } | | |
| $XK\beta_2$ | (Pb) | 87.238 | } | | |
| $XK\beta_4$ | (Pb) | 87.58 | } | 1.1 (6) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Pb) | 87.911 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{-1,1}$(Pb) | 83 (30) | 30 (6) | [E2] | ∼14 | ∼1.98 (40) |
| $\gamma_{3,2}$(Pb) | 97 (30) | 40 (20) | M1+E2 | ∼9 | ∼4 (2) |
| $\gamma_{2,1}$(Pb) | 296 (3) | 89 (11) | E2 | 0.120 (5) | 79 (10) |
| $\gamma_{-1,2}$(Pb) | 356 (10) | 5.0 (25) | [M1] | 0.270 (22) | 4 (2) |
| $\gamma_{-1,3}$(Pb) | 382 (10) | 3.7 (24) | [M1] | 0.223 (17) | 3 (2) |
| $\gamma_{11,9}$(Pb) | 480 (36) | 2 (1) | | | 2 (1) |
| $\gamma_{-1,4}$(Pb) | 670 (20) | 2 (1) | | | 2 (1) |
| $\gamma_{1,0}$(Pb) | 799.6 (3) | 100 | E2 | 0.01042 (31) | 98.969 (30) |
| $\gamma_{7,5}$(Pb) | 860 (30) | 6.9 (20) | | | 6.9 (20) |
| $\gamma_{-1,5}$(Pb) | 910 (30) | 3 (2) | | | 3 (2) |
| $\gamma_{4,1}$(Pb) | 1070 (20) | 11.9 (49) | [E1] | 0.00222 (7) | 11.9 (49) |
| $\gamma_{5,2}$(Pb) | 1110 (20) | 6.9 (20) | | | 6.9 (20) |
| $\gamma_{9,6}$(Pb) | 1210 (20) | 16.8 (40) | | | 16.8 (40) |
| $\gamma_{6,2}$(Pb) | 1310 (20) | 20.8 (49) | | | 20.8 (49) |
| $\gamma_{5,1}$(Pb) | 1410 (20) | 4.9 (20) | | | 4.9 (20) |
| $\gamma_{-1,6}$(Pb) | 1490 (20) | 2 (1) | | | 2 (1) |
| $\gamma_{-1,7}$(Pb) | 1540 (30) | 2 (1) | | | 2 (1) |
| $\gamma_{8,4}$(Pb) | 1590 (30) | 2 (1) | | | 2 (1) |
| $\gamma_{-1,8}$(Pb) | 1650 (30) | 2 (1) | | | 2 (1) |
| $\gamma_{10,4}$(Pb) | 2010 (30) | 6.9 (20) | | | 6.9 (20) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{-1,9}$(Pb) | 2090 (30) | 4.9 (20) | | | 4.9 (20) |
| $\gamma_{7,1}$(Pb) | 2280 (12) | 3 (2) | | | 3 (2) |
| $\gamma_{8,2}$(Pb) | 2360 (30) | 7.9 (30) | | | 7.9 (30) |
| $\gamma_{9,3}$(Pb) | 2430 (30) | 8.9 (30) | | | 8.9 (30) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 3.277 | (15) | h |
| $Q_{\beta^-}$ | : | 644.0 | (12) | keV |
| $\beta^-$ | : | 100 | | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,0}$ | 644.0 (12) | 100 | 1st forbidden non-unique | 5.54 |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|
| $\beta^-_{0,0}$ | max: | 644.0 (12) | 100 | avg: | 197.35 (42) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 22.23 | (12) | y |
| $Q_{\beta^-}$ | : | 63.5 | (5) | keV |
| $Q_\alpha$ | : | 3792 | (20) | keV |
| $\beta^-$ | : | 100 | | % |
| $\alpha$ | : | 1.9 | (4) | $\times 10^{-6}$ % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,1}$ | 17.0 (5) | 80.2 (13) | 1st forbidden | 5.5 |
| $\beta^-_{0,0}$ | 63.5 (5) | 19.8 (13) | 1st forbidden | 7.8 |

# 3 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,0}$ | 3720 (20) | 0.0000019 (4) |

# 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Bi) | 5.3 - 10.7 | 36.0 (9) | |
| $e_{AK}$ | (Bi) | | | |
| $ec_{1,0\ L}$ | (Bi) | 30.152 - 33.120 | 58 (1) | |
| $ec_{1,0\ M}$ | (Bi) | 42.540 - 43.959 | 13.65 (25) | |
| $ec_{1,0\ N}$ | (Bi) | 45.601 - 46.382 | 3.50 (6) | |
| $\beta^-_{0,1}$ | max: | 17.0 (5) | 80.2 (13) | avg: 4.3 (1) |
| $\beta^-_{0,0}$ | max: | 63.5 (5) | 19.8 (13) | avg: 16.3 (1) |

# 5 Photon Emissions

## 5.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. |
|---|---|---|---|
| XL | (Bi) | 9.4207 — 15.7084 | 22.0 (5) |

### 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Bi) | 46.539 (1) | 80.2 (13) | M1 | 17.86 (25) | 4.252 (40) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 36.1 | (2) | min |
| $Q_{\beta^-}$ | : | 1367 | (6) | keV |
| $\beta^-$ | : | 100 | | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,10}$ | 96 (6) | 0.0172 (15) | 1st forbidden non-unique | 5.93 |
| $\beta^-_{0,9}$ | 133 (6) | 0.0009 (3) | | |
| $\beta^-_{0,8}$ | 171 (6) | 0.019 (4) | | |
| $\beta^-_{0,7}$ | 257 (6) | 1.06 (4) | 1st forbidden non-unique | 5.58 |
| $\beta^-_{0,6}$ | 263 (6) | 0.0047 (7) | | |
| $\beta^-_{0,5}$ | 286 (6) | 0.0570 (24) | | |
| $\beta^-_{0,3}$ | 535 (6) | 6.32 (9) | 1st forbidden non-unique | 5.73 |
| $\beta^-_{0,2}$ | 600 (6) | <0.09 | 1st forbidden non-unique | >7.7 |
| $\beta^-_{0,1}$ | 962 (6) | 1.57 (9) | 1st forbidden non-unique | 7.21 |
| $\beta^-_{0,0}$ | 1367 (6) | 91.28 (12) | 1st forbidden non-unique | 5.99 |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Bi) | 5.42 - 16.34 | 0.782 (18) | |
| $e_{AK}$ | (Bi) | | 0.029 (4) | |
| | KLL | 57.491 - 63.419 } | | |
| | KLX | 70.025 - 77.105 } | | |
| | KXY | 82.53 - 90.52 } | | |
| $ec_{7,4\ K}$ | (Bi) | 4.60 (5) | 0.050 (18) | |
| $ec_{7,4\ L}$ | (Bi) | 78.74 - 81.71 | 0.086 (17) | |
| $ec_{7,4\ M}$ | (Bi) | 91.13 - 92.55 | 0.0229 (44) | |
| $ec_{3,2\ L}$ | (Bi) | 48.916 - 51.885 | 0.389 (21) | |
| $ec_{3,2\ M}$ | (Bi) | 61.305 - 62.724 | 0.092 (5) | |
| $ec_{3,2\ N}$ | (Bi) | 64.366 - 65.147 | 0.0234 (13) | |
| $ec_{1,0\ K}$ | (Bi) | 314.308 (9) | 0.36 (3) | |
| $ec_{1,0\ L}$ | (Bi) | 388.446 - 391.415 | 0.079 (3) | |
| $ec_{1,0\ M}$ | (Bi) | 400.835 - 402.254 | 0.0191 (7) | |
| $ec_{3,1\ K}$ | (Bi) | 336.624 (15) | 0.264 (7) | |
| $ec_{3,1\ L}$ | (Bi) | 410.76 - 413.73 | 0.0451 (12) | |
| $ec_{3,1\ M}$ | (Bi) | 423.15 - 424.57 | 0.01059 (29) | |
| $ec_{7,1\ K}$ | (Bi) | 614.149 (25) | 0.01833 (48) | |
| $ec_{2,0\ K}$ | (Bi) | 676.154 (13) | 0.0194 (13) | |
| $ec_{3,0\ K}$ | (Bi) | 741.458 (12) | 0.080 (8) | |
| $ec_{3,0\ L}$ | (Bi) | 815.596 - 818.565 | 0.0136 (14) | |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $\beta^-_{0,10}$ | max: | 96 | (6) | 0.0172 (15) | avg: | 25.0 (17) |
| $\beta^-_{0,9}$ | max: | 133 | (6) | 0.0009 (3) | avg: | 35.0 (17) |
| $\beta^-_{0,8}$ | max: | 171 | (6) | 0.019 (4) | avg: | 45.6 (18) |
| $\beta^-_{0,7}$ | max: | 257 | (6) | 1.06 (4) | avg: | 71.0 (18) |
| $\beta^-_{0,6}$ | max: | 263 | (6) | 0.0047 (7) | avg: | 72.8 (18) |
| $\beta^-_{0,5}$ | max: | 286 | (6) | 0.0570 (24) | avg: | 79.7 (19) |
| $\beta^-_{0,3}$ | max: | 535 | (6) | 6.32 (9) | avg: | 159.8 (21) |
| $\beta^-_{0,2}$ | max: | 600 | (6) | <0.09 | avg: | 182.2 (21) |
| $\beta^-_{0,1}$ | max: | 962 | (6) | 1.57 (9) | avg: | 313.3 (23) |
| $\beta^-_{0,0}$ | max: | 1367 | (6) | 91.28 (12) | avg: | 470.9 (24) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Bi) | 9.4207 — 15.7084 | | 0.494 (13) | |
| $XK\alpha_2$ | (Bi) | 74.8157 | | 0.228 (10) | } $K\alpha$ |
| $XK\alpha_1$ | (Bi) | 77.1088 | | 0.381 (17) | } |
| $XK\beta_3$ | (Bi) | 86.835 | } | | |
| $XK\beta_1$ | (Bi) | 87.344 | } | 0.130 (6) | $K\beta'_1$ |
| $XK\beta''_5$ | (Bi) | 87.862 | } | | |
| $XK\beta_2$ | (Bi) | 89.732 | } | | |
| $XK\beta_4$ | (Bi) | 90.074 | } | 0.0399 (20) | $K\beta'_2$ |
| $XKO_{2,3}$ | (Bi) | 90.421 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{3,2}$(Bi) | 65.304 (18) | 0.59 (3) | M1 | 6.61 (10) | 0.077 (4) |
| $\gamma_{7,4}$(Bi) | 95.13 (5) | 0.19 (3) | M1+74.3%E2 | 9.3 (4) | 0.018 (3) |
| $\gamma_{5,2}$(Bi) | 313.96 (4) | 0.0268 (21) | | | 0.0268 (21) |
| $\gamma_{7,2}$(Bi) | 342.83 (3) | 0.035 (6) | [M1,E2] | 0.20 (12) | 0.029 (4) |
| $\gamma_{2,1}$(Bi) | 361.846 (16) | 0.049 (6) | [M1,E2] | 0.17 (11) | 0.042 (3) |
| $\gamma_{1,0}$(Bi) | 404.834 (9) | 4.30 (7) | M1+54.8%E2 | 0.122 (8) | 3.83 (6) |
| $\gamma_{3,1}$(Bi) | 427.150 (15) | 2.13 (5) | M1+0.05%E2 | 0.1783 (25) | 1.81 (4) |
| $\gamma_{8,2}$(Bi) | 429.65 (6) | 0.008 (3) | | | 0.008 (3) |
| $\gamma_{10,2}$(Bi) | 504.07 (6) | 0.0059 (8) | | | 0.0059 (8) |
| $\gamma_{4,1}$(Bi) | 609.55 (4) | 0.033 (9) | | | 0.033 (9) |
| $\gamma_{5,1}$(Bi) | 675.81 (4) | 0.0181 (9) | | | 0.0181 (9) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{7,1}$(Bi) | 704.675 (25) | 0.492 (10) | M1+0.05%E2 | 0.0476 (7) | 0.47 (1) |
| $\gamma_{2,0}$(Bi) | 766.680 (13) | 0.64 (4) | M1 | 0.0382 (6) | 0.62 (4) |
| $\gamma_{3,0}$(Bi) | 831.984 (12) | 3.60 (5) | M1+13.8%E2 | 0.028 (3) | 3.50 (5) |
| $\gamma_{10,1}$(Bi) | 865.92 (6) | 0.0046 (2) | | | 0.0046 (2) |
| $\gamma_{4,0}$(Bi) | 1014.38 (4) | 0.0173 (5) | | | 0.0173 (5) |
| $\gamma_{5,0}$(Bi) | 1080.64 (4) | 0.0121 (5) | | | 0.0121 (5) |
| $\gamma_{6,0}$(Bi) | 1103.52 (20) | 0.0047 (7) | | | 0.0047 (7) |
| $\gamma_{7,0}$(Bi) | 1109.509 (23) | 0.118 (3) | [M1] | 0.01472 (21) | 0.116 (3) |
| $\gamma_{8,0}$(Bi) | 1196.33 (5) | 0.0103 (4) | | | 0.0103 (4) |
| $\gamma_{9,0}$(Bi) | 1234.3 (4) | 0.0009 (3) | | | 0.0009 (3) |
| $\gamma_{10,0}$(Bi) | 1270.75 (6) | 0.0068 (12) | | | 0.0068 (12) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 10.64 | (1) | h |
| $Q_{\beta^-}$ | : | 569.9 | (19) | keV |
| $\beta^-$ | : | 100 | | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | | Nature | log $ft$ |
|---|---|---|---|---|---|
| $\beta^-_{0,3}$ | 154.6 (19) | 4.99 | (21) | 1st forbidden | 5.35 |
| $\beta^-_{0,2}$ | 331.3 (19) | 81.7 | (11) | 1st forbidden | 5.18 |
| $\beta^-_{0,0}$ | 569.9 (19) | 13.3 | (11) | 1st forbidden | 6.74 |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|
| $e_{AL}$ | (Bi) | 5.35 - 10.66 | 21.4 (7) | | |
| $e_{AK}$ | (Bi) | | 1.29 (15) | | |
| | KLL | 57.49 - 63.42 | } | | |
| | KLX | 70.03 - 77.11 | } | | |
| | KXY | 82.53 - 90.52 | } | | |
| $ec_{1,0\ K}$ | (Bi) | 24.657 (5) | 3.45 (16) | | |
| $ec_{1,0\ L}$ | (Bi) | 98.80 - 101.76 | 0.61 (3) | | |
| $ec_{1,0\ M+}$ | (Bi) | 111.18 - 115.18 | 0.19 (1) | | |
| $ec_{2,0\ K}$ | (Bi) | 148.106 (2) | 30.9 (10) | | |
| $ec_{2,0\ L}$ | (Bi) | 222.24 - 225.21 | 5.37 (17) | | |
| $ec_{2,0\ M+}$ | (Bi) | 234.63 - 238.63 | 1.73 (5) | | |
| $ec_{3,1\ K}$ | (Bi) | 209.563 (12) | 1.21 (20) | | |
| $ec_{3,1\ L}$ | (Bi) | 283.70 - 286.67 | 0.21 (4) | | |
| $ec_{3,1\ M+}$ | (Bi) | 296.090 - 300.086 | 0.066 (11) | | |
| $\beta^-_{0,3}$ | max: | 154.6 (19) | 4.99 (21) | avg: | 41.1 (5) |
| $\beta^-_{0,2}$ | max: | 331.3 (19) | 81.7 (11) | avg: | 93.5 (6) |
| $\beta^-_{0,0}$ | max: | 569.9 (19) | 13.3 (11) | avg: | 171.7 (7) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. | |
|---|---|---|---|---|
| XL | (Bi) | 9.42 — 15.709 | 13.8 (6) | |
| XK$\alpha_2$ | (Bi) | 74.8157 | 10.07 (18) | } K$\alpha$ |

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| $XK\alpha_1$ | (Bi) | 77.1088 | | 16.9 (3) | } |
| $XK\beta_3$ | (Bi) | 86.835 | } | | |
| $XK\beta_1$ | (Bi) | 87.344 | } | 5.77 (13) | $K\beta_1'$ |
| $XK\beta_5''$ | (Bi) | 87.862 | } | | |
| $XK\beta_2$ | (Bi) | 89.732 | } | | |
| $XK\beta_4$ | (Bi) | 90.074 | } | 1.77 (5) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Bi) | 90.421 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Bi) | 115.183 (5) | 4.87 (19) | [M1] | 6.8 (1) | 0.624 (23) |
| $\gamma_{2,1}$(Bi) | 123.449 (5) | 0.198 (19) | [E2] | 2.80 (4) | 0.052 (5) |
| $\gamma_{3,2}$(Bi) | 176.640 (11) | 0.157 (15) | [M1] | 2.02 (3) | 0.052 (5) |
| $\gamma_{2,0}$(Bi) | 238.632 (2) | 81.6 (11) | [M1] | 0.872 (13) | 43.6 (5) |
| $\gamma_{3,1}$(Bi) | 300.089 (12) | 4.66 (21) | [M1] | 0.464 (7) | 3.18 (14) |
| $\gamma_{3,0}$(Bi) | 415.272 (11) | 0.17 (3) | [M1] | 0.192 (3) | 0.144 (22) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 26.916 | (44) | min |
| $Q_{\beta^-}$ | : | 1019 | (11) | keV |
| $\beta^-$ | : | 100 | | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,9}$ | 180 (11) | 2.762 (22) | Allowed | 4.5 |
| $\beta^-_{0,8}$ | 222 (11) | 0.0196 (27) | Allowed | 6.9 |
| $\beta^-_{0,7}$ | 485 (11) | 1.047 (17) | 1st forbidden | 6.2 |
| $\beta^-_{0,5}$ | 667 (11) | 46.52 (37) | 1st forbidden | 5.1 |
| $\beta^-_{0,4}$ | 729 (11) | 41.09 (39) | 1st forbidden | 5.2 |
| $\beta^-_{0,0}$ | 1019 (11) | 9.2 (7) | 1st forbidden | 6.3 |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|
| $e_{AL}$ | (Bi) | 5.3 - 16.4 | 19.8 (3) | | |
| $e_{AK}$ | (Bi) | | 0.80 (9) | | |
| | KLL | 57.49 - 63.42 | } | | |
| | KLX | 70.02 - 77.10 | } | | |
| | KXY | 82.45 - 90.52 | } | | |
| $ec_{1,0\ L}$ | (Bi) | 36.8400 - 39.8089 | 10.39 (31) | | |
| $ec_{1,0\ M}$ | (Bi) | 49.2284 - 50.6479 | 2.46 (8) | | |
| $ec_{1,0\ N}$ | (Bi) | 52.2893 - 53.0704 | 0.641 (20) | | |
| $ec_{4,1\ K}$ | (Bi) | 151.471 (3) | 5.26 (16) | | |
| $ec_{4,1\ L}$ | (Bi) | 225.610 - 228.578 | 0.908 (28) | | |
| $ec_{4,1\ M}$ | (Bi) | 237.998 - 239.417 | 0.214 (7) | | |
| $ec_{4,1\ N}$ | (Bi) | 241.059 - 241.840 | 0.0560 (17) | | |
| $ec_{3,0\ K}$ | (Bi) | 168.34 (3) | 0.32 (1) | | |
| $ec_{3,0\ L}$ | (Bi) | 242.48 - 245.45 | 0.0551 (17) | | |
| $ec_{3,0\ M}$ | (Bi) | 254.87 - 256.29 | 0.01298 (38) | | |
| $ec_{4,0\ K}$ | (Bi) | 204.698 (2) | 7.22 (23) | | |
| $ec_{4,0\ L}$ | (Bi) | 278.836 - 281.805 | 1.291 (40) | | |
| $ec_{4,0\ M}$ | (Bi) | 291.225 - 292.644 | 0.305 (10) | | |
| $ec_{4,0\ N}$ | (Bi) | 294.286 - 295.067 | 0.0797 (25) | | |
| $ec_{5,0\ K}$ | (Bi) | 261.406 (2) | 9.26 (29) | | |
| $ec_{5,0\ L}$ | (Bi) | 335.544 - 338.513 | 1.584 (46) | | |
| $ec_{5,0\ M}$ | (Bi) | 347.933 - 349.352 | 0.373 (11) | | |
| $ec_{5,0\ N}$ | (Bi) | 350.994 - 351.775 | 0.0975 (29) | | |
| $\beta^-_{0,9}$ | max: | 180 (11) | 2.762 (22) | avg: | 50 (3) |
| $\beta^-_{0,8}$ | max: | 222 (11) | 0.0196 (27) | avg: | 62 (3) |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $\beta^-_{0,7}$ | max: | 485 | (11) | 1.047 (17) | avg: | 145 (4) |
| $\beta^-_{0,5}$ | max: | 667 | (11) | 46.52 (37) | avg: | 207 (4) |
| $\beta^-_{0,4}$ | max: | 724 | (11) | 41.09 (39) | avg: | 227 (4) |
| $\beta^-_{0,0}$ | max: | 1019 | (11) | 9.2 (7) | avg: | 337 (4) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Bi) | 9.42 — 16.36 | | 12.42 (22) | |
| XK$\alpha_2$ | (Bi) | 74.8157 | | 6.26 (12) | } K$\alpha$ |
| XK$\alpha_1$ | (Bi) | 77.1088 | | 10.47 (20) | } |
| XK$\beta_3$ | (Bi) | 86.835 | } | | |
| XK$\beta_1$ | (Bi) | 87.344 | } | 3.59 (9) | K$\beta'_1$ |
| XK$\beta''_5$ | (Bi) | 87.862 | } | | |
| XK$\beta_2$ | (Bi) | 89.732 | } | | |
| XK$\beta_4$ | (Bi) | 90.074 | } | 1.10 (4) | K$\beta'_2$ |
| XKO$_{2,3}$ | (Bi) | 90.421 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Bi) | 53.2275 (21) | 14.71 (42) | M1+E2 | 12.88 (39) | 1.060 (7) |
| $\gamma_{-1,0}$(Bi) | 107.22 (9) | 0.0068 (14) | | | 0.0068 (14) |
| $\gamma_{-1,1}$(Bi) | 137.45 (30) | 0.045 (18) | | | 0.045 (18) |
| $\gamma_{-1,2}$(Bi) | 141.3 (6) | 0.027 (14) | | | 0.027 (14) |
| $\gamma_{-1,3}$(Bi) | 170.07 (6) | 0.0146 (27) | | | 0.0146 (27) |
| $\gamma_{3,2}$(Bi) | 196.20 (5) | 0.069 (9) | | | 0.069 (9) |
| $\gamma_{3,1}$(Bi) | 205.68 (9) | 0.0114 (23) | | | 0.0114 (23) |
| $\gamma_{-1,4}$(Bi) | 216.47 (7) | 0.0100 (23) | | | 0.0100 (23) |
| $\gamma_{4,1}$(Bi) | 241.997 (3) | 13.72 (20) | M1(+E2) | 0.888 (27) | 7.268 (22) |
| $\gamma_{3,0}$(Bi) | 258.87 (3) | 0.924 (13) | M1 | 0.737 (22) | 0.5318 (36) |
| $\gamma_{7,3}$(Bi) | 274.80 (5) | 0.504 (15) | M1+E2 | 0.392 (12) | 0.362 (10) |
| $\gamma_{4,0}$(Bi) | 295.224 (2) | 27.29 (26) | M1+E2 | 0.482 (14) | 18.414 (36) |
| $\gamma_{9,7}$(Bi) | 305.26 (3) | 0.0324 (22) | [E1] | 0.0295 (9) | 0.0315 (21) |
| $\gamma_{6,2}$(Bi) | 314.32 (7) | 0.077 (6) | | | 0.077 (6) |
| $\gamma_{6,1}$(Bi) | 323.83 (4) | 0.0287 (32) | | | 0.0287 (32) |
| $\gamma_{5,0}$(Bi) | 351.932 (2) | 46.96 (37) | M1(+E2) | 0.319 (10) | 35.60 (7) |
| $\gamma_{9,6}$(Bi) | 462.00 (7) | 0.213 (6) | | | 0.213 (6) |
| $\gamma_{7,1}$(Bi) | 480.43 (2) | 0.3838 (49) | M1(+E2) | 0.1384 (42) | 0.3371 (41) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{9,5}$(Bi) | 487.09 (7) | 0.438 (6) | (E1) | 0.01058 (32) | 0.433 (6) |
| $\gamma_{7,0}$(Bi) | 533.66 (2) | 0.192 (10) | [M1,E2] | 0.06 (4) | 0.182 (6) |
| $\gamma_{8,3}$(Bi) | 538.41 (8) | 0.0196 (27) | | | 0.0196 (27) |
| $\gamma_{9,4}$(Bi) | 543.81 (7) | 0.050 (9) | E1+M2 | 0.00843 (25) | 0.050 (9) |
| $\gamma_{9,3}$(Bi) | 580.13 (3) | 0.372 (6) | (E1) | 0.00740 (22) | 0.369 (6) |
| $\gamma_{-1,5}$(Bi) | 765.96 (9) | 0.053 (8) | | | 0.053 (8) |
| $\gamma_{9,1}$(Bi) | 785.96 (9) | 1.068 (13) | E1 | 0.00410 (12) | 1.064 (13) |
| $\gamma_{9,0}$(Bi) | 839.04 (9) | 0.589 (8) | (E1) | 0.00363 (11) | 0.587 (8) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 5.012 | (5) | d |
| $Q_{\beta^-}$ | : | 1162.1 | (8) | keV |
| $Q_\alpha$ | : | 5042.7 | (18) | keV |
| $\beta^-$ | : | 99.99986 | (2) | % |
| $\alpha$ | : | 1.40 | (15) | $\times 10^{-4}$ % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,0}$ | 1162.1 (8) | 99.99986 (2) | 1st forbidden | 8 |

# 3 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,2}$ | 4650 (4) | 0.000084 (9) |
| $\alpha_{0,1}$ | 4687 (4) | 0.000056 (6) |

# 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|
| $\beta^-_{0,0}$ | max: | 1162.1 (8) | 99.99986 (2) | avg: | 389.2 (3) |

# 5 Photon Emissions

## 5.1 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Tl) | 265.832 (5) | 0.000056 (6) | E2 | 0.1603 (23) | 0.000048 (5) |
| $\gamma_{2,0}$(Tl) | 304.896 (6) | 0.000084 (9) | M1 | 0.375 (6) | 0.000061 (7) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 2.15 | (2) | min |
| $Q_\alpha$ | : | 6750.33 | (46) | keV |
| $Q_{\beta^-}$ | : | 574 | (5) | keV |
| $\alpha$ | : | 99.724 | (4) | % |
| $\beta^-$ | : | 0.276 | (4) | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,0}$ | 574 (5) | 0.276 (4) | 1st forbidden | 5.99 |

## 3 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,1}$ | 6278.5 (9) | 16.16 (23) |
| $\alpha_{0,0}$ | 6622.4 (6) | 83.56 (23) |

## 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Tl) | 5.18 - 15.31 | 1.617 (21) | |
| $e_{AK}$ | (Tl) | | 0.096 (11) | |
| | KLL | 54.587 - 59.954 | } | |
| | KLX | 66.37 - 72.86 | } | |
| | KXY | 78.12 - 85.50 | } | |
| $ec_{1,0\ K}$ | (Tl) | 265.50 (4) | 2.59 (5) | |
| $ec_{1,0\ L}$ | (Tl) | 335.68 - 338.37 | 0.446 (9) | |
| $ec_{1,0\ M}$ | (Tl) | 347.33 - 348.64 | 0.1044 (22) | |
| $ec_{1,0\ N}$ | (Tl) | 350.18 - 350.91 | 0.0263 (5) | |
| $\beta^-_{0,0}$ | max: | 574 (5) | 0.276 (4) | avg: 172.9 (18) |

# 5 Photon Emissions

## 5.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Tl) | 8.9531 — 14.7362 | | 0.929 (19) | |
| $XK\alpha_2$ | (Tl) | 70.8325 | | 0.726 (16) | } $K\alpha$ |
| $XK\alpha_1$ | (Tl) | 72.8725 | | 1.225 (27) | } |
| $XK\beta_3$ | (Tl) | 82.118 | } | | |
| $XK\beta_1$ | (Tl) | 82.577 | } | 0.417 (11) | $K\beta_1'$ |
| $XK\beta_5''$ | (Tl) | 83.115 | } | | |
| $XK\beta_2$ | (Tl) | 84.838 | } | | |
| $XK\beta_4$ | (Tl) | 85.134 | } | 0.124 (4) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Tl) | 85.444 | } | | |

## 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Tl) | 351.03 (4) | 16.16 (24) | M1+E2 | 0.243 (4) | 13.00 (19) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 60.54 | (6) | min |
| $Q_{\beta^-}$ | : | 2252.1 | (17) | keV |
| $Q_{\alpha}$ | : | 6207.26 | (3) | keV |
| $Q_{\alpha *}$ | : | 8954.12 | (11) | keV |
| $\beta^-$ | : | 64.06 | (7) | % |
| $\beta^-\alpha$ | : | 0.014 | (1) | % |
| $\alpha$ | : | 35.93 | (7) | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | | Nature | log $ft$ |
|---|---|---|---|---|---|
| $\beta^-_{0,6}$ | 446.1 (17) | 0.68 | (4) | 1st forbidden non-unique | 6.67 |
| $\beta^-_{0,5}$ | 451.2 (17) | 0.032 | (4) | 1st forbidden non-unique | 8.03 |
| $\beta^-_{0,4}$ | 572.7 (17) | 0.21 | (4) | 1st forbidden non-unique | 7.55 |
| $\beta^-_{0,3}$ | 631.4 (17) | 1.90 | (3) | 1st forbidden non-unique | 6.74 |
| $\beta^-_{0,2}$ | 739.4 (17) | 1.44 | (1) | 1st forbidden non-unique | 7.094 |
| $\beta^-_{0,1}$ | 1524.8 (17) | 4.50 | (6) | 1st forbidden non-unique | 7.718 |
| $\beta^-_{0,0}$ | 2252.1 (17) | 55.31 | (9) | 1st forbidden non-unique | 7.267 |

## 3 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,8}$ | 5302 (2) | 0.000040 (4) |
| $\alpha_{0,7}$ | 5344 (2) | 0.00036 (3) |
| $\alpha_{0,6}$ | 5481.4 (3) | 0.0050 (4) |
| $\alpha_{0,4}$ | 5606.60 (5) | 0.43 (3) |
| $\alpha_{0,3}$ | 5625.7 (4) | 0.060 (3) |
| $\alpha_{0,2}$ | 5768.29 (6) | 0.61 (3) |
| $\alpha_{0,1}$ | 6051.04 (3) | 25.1 (1) |
| $\alpha_{0,0}$ | 6090.14 (3) | 9.7 (1) |
| $^*\alpha_{1,0}$ | 9498.78 (11) | 0.0024 (2) |
| $^*\alpha_{4,0}$ | 10432.94 (11) | 0.0010 (1) |
| $^*\alpha_{5,0}$ | 10552.1 (2) | 0.0106 (7) |

* Long-range $\alpha$.

## 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Tl) | 5.182 - 10.132 | 12.2 (4) | |
| $e_{AK}$ | (Tl) | | 0.0069 (8) | |
| | KLL | 54.587 - 59.954 | } | |

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| | KLX | 66.37 - 72.86 | } | |
| | KXY | 78.12 - 85.50 | } | |
| $e_{AL}$ | (Po) | 5.434 - 10.934 | 0.0833 (25) | |
| $e_{AK}$ | (Po) | | 0.0048 (6) | |
| | KLL | 58.978 - 65.205 | } | |
| | KLX | 71.902 - 79.289 | } | |
| | KXY | 84.8 - 93.1 | } | |
| $ec_{1,0\ L}$ | (Tl) | 24.511 - 27.200 | 19.06 (23) | |
| $ec_{1,0\ M}$ | (Tl) | 36.154 - 39.469 | 4.46 (5) | |
| $\beta^-_{0,6}$ | max: | 446.1 (17) | 0.68 (4) | avg: 130.1 (6) |
| $\beta^-_{0,5}$ | max: | 451.2 (17) | 0.032 (4) | avg: 131.7 (6) |
| $\beta^-_{0,4}$ | max: | 572.7 (17) | 0.21 (4) | avg: 172.4 (6) |
| $\beta^-_{0,3}$ | max: | 631.4 (17) | 1.90 (3) | avg: 192.7 (6) |
| $\beta^-_{0,2}$ | max: | 739.4 (17) | 1.44 (1) | avg: 230.8 (6) |
| $\beta^-_{0,1}$ | max: | 1524.8 (17) | 4.50 (6) | avg: 533.1 (7) |
| $\beta^-_{0,0}$ | max: | 2252.1 (17) | 55.31 (9) | avg: 834.2 (7) |

# 5 Photon Emissions

## 5.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Tl) | 8.953 — 14.738 | | 7.1 (3) | |
| $XK\alpha_2$ | (Tl) | 70.8325 | | 0.0525 (23) | } $K\alpha$ |
| $XK\alpha_1$ | (Tl) | 72.8725 | | 0.089 (4) | } |
| $XK\beta_3$ | (Tl) | 82.118 | } | | |
| $XK\beta_1$ | (Tl) | 82.577 | } | 0.0301 (14) | $K\beta_1'$ |
| $XK\beta_5''$ | (Tl) | 83.115 | } | | |
| $XK\beta_2$ | (Tl) | 84.838 | } | | |
| $XK\beta_4$ | (Tl) | 85.134 | } | 0.0089 (5) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Tl) | 85.444 | } | | |
| XL | (Po) | 9.658 — 16.213 | | 0.0563 (24) | |
| $XK\alpha_2$ | (Po) | 76.864 | | 0.0388 (8) | } $K\alpha$ |
| $XK\alpha_1$ | (Po) | 79.293 | | 0.0647 (13) | } |
| $XK\beta_3$ | (Po) | 89.256 | } | | |
| $XK\beta_1$ | (Po) | 89.807 | } | 0.0223 (6) | $K\beta_1'$ |
| $XK\beta_5''$ | (Po) | 90.363 | } | | |
| $XK\beta_2$ | (Po) | 92.263 | } | | |
| $XK\beta_4$ | (Po) | 92.618 | } | 0.00693 (20) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Po) | 92.983 | } | | |

### 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Tl) | 39.858 (4) | 26.0 (3) | [M1] | 23.3 (4) | 1.07 (1) |
| $\gamma_{4,2}$(Tl) | 164.80 (6) | 0.010 (1) | (E2) | 0.816 (12) | 0.0055 (6) |
| $\gamma_{5,3}$(Po) | 180.2 (2) | 0.0095 (40) | M1 | 2.08 (3) | 0.0031 (12) |
| $\gamma_{2,1}$(Tl) | 288.18 (5) | 0.46 (3) | M1+0.64%E2 | 0.436 (7) | 0.32 (2) |
| $\gamma_{2,0}$(Tl) | 328.04 (5) | 0.158 (4) | [M1] | 0.308 (5) | 0.121 (3) |
| $\gamma_{3,1}$(Tl) | 433.5 (4) | 0.013 (1) | [M1] | 0.1453 (21) | 0.011 (1) |
| $\gamma_{4,1}$(Tl) | 452.98 (4) | 0.38 (3) | (M1) | 0.1293 (18) | 0.34 (3) |
| $\gamma_{3,0}$(Tl) | 473.4 (4) | 0.047 (3) | [M1+E2] | 0.074 (10) | 0.044 (3) |
| $\gamma_{4,0}$(Tl) | 492.84 (4) | 0.04 (1) | E2 | 0.0291 (4) | 0.039 (10) |
| $\gamma_{6,1}$(Tl) | 580.5 (3) | 0.0011 (2) | E2 | 0.0198 (3) | 0.0011 (2) |
| $\gamma_{6,0}$(Tl) | 620.4 (3) | 0.0039 (4) | [M1+E2] | 0.037 (5) | 0.0038 (4) |
| $\gamma_{1,0}$(Po) | 727.330 (9) | 6.74 (4) | E2 | 0.01393 (20) | 6.65 (4) |
| $\gamma_{2,1}$(Po) | 785.37 (9) | 1.15 (1) | M1+0.8%E2 | 0.0387 (6) | 1.11 (1) |
| $\gamma_{3,1}$(Po) | 893.408 (14) | 0.39 (1) | M1+0.2%E2 | 0.0278 (4) | 0.38 (1) |
| $\gamma_{4,1}$(Po) | 952.12 (2) | 0.14 (4) | M1+30%E2 | 0.0190 (3) | 0.14 (4) |
| $\gamma_{5,1}$(Po) | 1073.6 (2) | 0.0155 (6) | E2 | 0.00642 (9) | 0.0154 (6) |
| $\gamma_{6,1}$(Po) | 1078.63 (10) | 0.559 (20) | M1+1.8%E2 | 0.01692 (24) | 0.55 (2) |
| $\gamma_{2,0}$(Po) | 1512.70 (8) | 0.291 (10) | E2 | 0.00344 (5) | 0.29 (1) |
| $\gamma_{3,0}$(Po) | 1620.738 (10) | 1.52 (3) | [M1] | 0.00620 (9) | 1.51 (3) |
| $\gamma_{4,0}$(Po) | 1679.450 (14) | 0.07 (1) | E2 | 0.00291 (4) | 0.07 (1) |
| $\gamma_{6,0}$(Po) | 1805.96 (10) | 0.12 (3) | E2 | 0.00261 (4) | 0.12 (3) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 45.59 | (6) | min |
| $Q_{\beta^-}$ | : | 1423 | (5) | keV |
| $Q_\alpha$ | : | 5983 | (6) | keV |
| $\beta^-$ | : | 97.91 | (3) | % |
| $\alpha$ | : | 2.09 | (3) | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,9}$ | 95 (5) | 0.00039 (13) | | 7.68 |
| $\beta^-_{0,8}$ | 304 (5) | 0.0608 (20) | | 7.07 |
| $\beta^-_{0,7}$ | 323 (5) | 0.595 (17) | | 6.16 |
| $\beta^-_{0,6}$ | 377 (5) | 0.020 (4) | | 7.85 |
| $\beta^-_{0,5}$ | 419 (5) | 0.0648 (23) | | 7.494 |
| $\beta^-_{0,4}$ | 555 (5) | 0.0129 (6) | 1st forbidden unique | 8.597 |
| $\beta^-_{0,3}$ | 822 (5) | 0.0025 (19) | | 9.9 |
| $\beta^-_{0,2}$ | 983 (5) | 30.8 (4) | 1st forbidden | 6.07 |
| $\beta^-_{0,1}$ | 1130 (5) | 0.21 (9) | 1st forbidden | 8.45 |
| $\beta^-_{0,0}$ | 1423 (5) | 66.2 (4) | 1st forbidden | 6.316 |

# 3 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,1}$ | 5549 (10) | 0.186 (5) |
| $\alpha_{0,0}$ | 5869 (10) | 1.90 (4) |

# 4 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|---|
| $e_{AL}$ | (Po) | 5.43 - 16.86 | | 1.7 (3) | |
| $e_{AK}$ | (Po) | | | 0.121 (19) | |
| | KLL | 58.978 - 65.205 | } | | |
| | KLX | 71.902 - 79.289 | } | | |
| | KXY | 84.8 - 93.1 | } | | |
| $e_{AL}$ | (Tl) | 5.18 - 10.13 | | 0.0107 (13) | |
| $e_{AK}$ | (Tl) | | | 0.00076 (9) | |
| | KLL | 54.587 - 59.954 | } | | |
| | KLX | 66.37 - 72.86 | } | | |
| | KXY | 78.12 - 85.50 | } | | |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $ec_{2,1\ L}$ | (Po) | 130.8 - 133.9 | | 0.0109 (7) | | |
| $ec_{1,0\ K}$ | (Po) | 199.70 | (1) | 0.09 (7) | | |
| $ec_{1,0\ L}$ | (Po) | 275.9 - 279.0 | | 0.025 (8) | | |
| $ec_{2,0\ K}$ | (Po) | 347.34 | (1) | 3.81 (7) | | |
| $ec_{2,0\ L}$ | (Po) | 423.51 - 426.63 | | 0.653 (13) | | |
| $ec_{2,0\ M}$ | (Po) | 436.29 - 437.76 | | 0.1550 (27) | | |
| $ec_{2,0\ N}$ | (Po) | 439.45 - 440.26 | | 0.0392 (7) | | |
| $ec_{1,0\ K}$ | (Tl) | 238.17 | (2) | 0.0212 (22) | | |
| $\beta^-_{0,9}$ | max: | 95 | (5) | 0.00039 (13) | avg: | 24.6 (14) |
| $\beta^-_{0,8}$ | max: | 304 | (5) | 0.0608 (20) | avg: | 84.9 (16) |
| $\beta^-_{0,7}$ | max: | 323 | (5) | 0.595 (17) | avg: | 90.8 (16) |
| $\beta^-_{0,6}$ | max: | 377 | (5) | 0.020 (4) | avg: | 107.9 (16) |
| $\beta^-_{0,5}$ | max: | 419 | (5) | 0.0648 (23) | avg: | 121.4 (17) |
| $\beta^-_{0,4}$ | max: | 555 | (5) | 0.0129 (6) | avg: | 166.4 (17) |
| $\beta^-_{0,3}$ | max: | 822 | (5) | 0.0025 (19) | avg: | 260.8 (19) |
| $\beta^-_{0,2}$ | max: | 983 | (5) | 30.8 (4) | avg: | 320.4 (19) |
| $\beta^-_{0,1}$ | max: | 1130 | (5) | 0.21 (9) | avg: | 376.8 (20) |
| $\beta^-_{0,0}$ | max: | 1423 | (5) | 66.2 (4) | avg: | 492.2 (20) |

# 5 Photon Emissions

## 5.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Po) | 9.6576 — 16.2129 | | 1.14 (18) | |
| $XK\alpha_2$ | (Po) | 76.864 | | 0.99 (15) | } $K\alpha$ |
| $XK\alpha_1$ | (Po) | 79.293 | | 1.6 (3) | } |
| $XK\beta_3$ | (Po) | 89.256 | } | | |
| $XK\beta_1$ | (Po) | 89.807 | } | 0.56 (9) | $K\beta_1'$ |
| $XK\beta_5''$ | (Po) | 90.363 | } | | |
| $XK\beta_2$ | (Po) | 92.263 | } | | |
| $XK\beta_4$ | (Po) | 92.618 | } | 0.18 (3) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Po) | 92.983 | } | | |
| XL | (Tl) | 8.9531 — 14.7362 | | 0.0062 (8) | |
| $XK\alpha_2$ | (Tl) | 70.8325 | | 0.0058 (7) | } $K\alpha$ |
| $XK\alpha_1$ | (Tl) | 72.8725 | | 0.0098 (12) | } |
| $XK\beta_3$ | (Tl) | 82.118 | } | | |
| $XK\beta_1$ | (Tl) | 82.577 | } | 0.0033 (5) | $K\beta_1'$ |
| $XK\beta_5''$ | (Tl) | 83.115 | } | | |

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| $XK\beta_2$ | (Tl) | 84.838 | } | | |
| $XK\beta_4$ | (Tl) | 85.134 | } | 0.00098 (14) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Tl) | 85.444 | } | | |

## 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{2,1}$(Po) | 147.70 (4) | 0.0314 (20) | E2 | 1.453 (21) | 0.0128 (8) |
| $\gamma_{1,0}$(Po) | 292.80 (1) | 0.55 (8) | M1+E2 | 0.30 (18) | 0.421 (7) |
| $\gamma_{1,0}$(Tl) | 323.70 (2) | 0.1866 (37) | M1+E2 | 0.178 (15) | 0.1584 (24) |
| $\gamma_{5,3}$(Po) | 402.8 (3) | 0.00010 (4) | | | 0.00010 (4) |
| $\gamma_{2,0}$(Po) | 440.44 (1) | 30.77 (36) | M1 | 0.179 (3) | 26.1 (3) |
| $\gamma_{4,1}$(Po) | 574.9 (3) | 0.00068 (16) | | | 0.00068 (16) |
| $\gamma_{3,0}$(Po) | 600.9 (2) | 0.0026 (19) | | | 0.0026 (19) |
| $\gamma_{6,2}$(Po) | 604.93 (17) | 0.0014 (5) | | | 0.0014 (5) |
| $\gamma_{7,2}$(Po) | 659.75 (2) | 0.043 (6) | | | 0.043 (6) |
| $\gamma_{5,1}$(Po) | 710.82 (3) | 0.0112 (6) | | | 0.0112 (6) |
| $\gamma_{7,1}$(Po) | 807.37 (1) | 0.287 (14) | | | 0.287 (14) |
| $\gamma_{8,1}$(Po) | 826.55 (4) | 0.0065 (4) | | | 0.0065 (4) |
| $\gamma_{4,0}$(Po) | 867.96 (2) | 0.0122 (6) | | | 0.0122 (6) |
| $\gamma_{9,2}$(Po) | 886.66 (14) | 0.00102 (19) | | | 0.00102 (19) |
| $\gamma_{5,0}$(Po) | 1003.58 (2) | 0.0535 (22) | | | 0.0535 (22) |
| $\gamma_{6,0}$(Po) | 1045.67 (8) | 0.019 (4) | | | 0.019 (4) |
| $\gamma_{7,0}$(Po) | 1100.16 (1) | 0.265 (6) | | | 0.265 (6) |
| $\gamma_{8,0}$(Po) | 1119.42 (8) | 0.0543 (20) | | | 0.0543 (20) |
| $\gamma_{9,0}$(Po) | 1328.2 (3) | 0.00039 (13) | | | 0.00039 (13) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 19.8 | (1) | min |
| $Q_{\beta^-}$ | : | 3270 | (11) | keV |
| $Q_{\alpha}$ | : | 5621 | (3) | keV |
| $Q_{\alpha*}$ | : | 11105 | (11) | keV |
| $\beta^-$ | : | 99.979 | (13) | % |
| $\alpha$ | : | 0.021 | (13) | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,80}$ | 86 (11) | 0.0011 (5) | | 6.8 |
| $\beta^-_{0,79}$ | 99 (11) | 0.00014 (9) | 1st forbidden | 7.8 |
| $\beta^-_{0,77}$ | 110 (11) | 0.00079 (12) | | 7.2 |
| $\beta^-_{0,76}$ | 121 (11) | 0.00019 | | 8 |
| $\beta^-_{0,75}$ | 127 (11) | 0.00118 (9) | | 7.3 |
| $\beta^-_{0,73}$ | 176 (11) | 0.00037 (4) | | 8.2 |
| $\beta^-_{0,72}$ | 188 (11) | 0.0052 (7) | | 7.1 |
| $\beta^-_{0,70}$ | 204 (11) | 0.00141 (23) | 1st forbidden | 7.8 |
| $\beta^-_{0,69}$ | 216 (11) | 0.030 (5) | | 6.6 |
| $\beta^-_{0,65}$ | 256 (11) | 0.0252 (24) | | 6.9 |
| $\beta^-_{0,62}$ | 270 (11) | 0.0160 (16) | | 7.1 |
| $\beta^-_{0,61}$ | 284 (11) | 0.032 (5) | | 6.9 |
| $\beta^-_{0,60}$ | 291 (11) | 0.0165 (6) | | 7.2 |
| $\beta^-_{0,58}$ | 309 (11) | 0.00036 (14) | 1st forbidden | 9 |
| $\beta^-_{0,57}$ | 329 (11) | 0.041 (7) | | 7 |
| $\beta^-_{0,56}$ | 336 (11) | 0.00216 (32) | | 8.3 |
| $\beta^-_{0,55}$ | 341 (11) | 0.0025 (9) | | 8.3 |
| $\beta^-_{0,54}$ | 348 (11) | 0.0220 (9) | | 7.3 |
| $\beta^-_{0,53}$ | 353 (11) | 0.0014 (9) | 1st forbidden | 8.6 |
| $\beta^-_{0,52}$ | 373 (11) | 0.0046 (5) | 1st forbidden | 8.1 |
| $\beta^-_{0,51}$ | 376 (11) | 0.022 (3) | | 7.5 |
| $\beta^-_{0,50}$ | 390 (11) | 0.0115 (16) | | 7.8 |
| $\beta^-_{0,49}$ | 400 (11) | 0.0087 (4) | 1st forbidden | 7.9 |
| $\beta^-_{0,48}$ | 409 (11) | 0.0146 (20) | | 7.6 |
| $\beta^-_{0,47}$ | 443 (11) | 0.00218 (17) | | 8.7 |
| $\beta^-_{0,44}$ | 484 (11) | 0.0248 (31) | | 7.8 |
| $\beta^-_{0,43}$ | 500 (11) | 0.038 (5) | | 7.6 |
| $\beta^-_{0,42}$ | 541 (11) | 0.525 (16) | | 6.6 |
| $\beta^-_{0,41}$ | 551 (11) | 0.247 (8) | | 6.9 |
| $\beta^-_{0,39}$ | 571 (11) | 0.026 (4) | | 8 |
| $\beta^-_{0,40}$ | 573 (11) | 0.0471 (23) | 1st forbidden | 7.7 |
| $\beta^-_{0,38}$ | 575 (11) | 0.231 (15) | 1st forbidden | 7 |
| $\beta^-_{0,37}$ | 608 (11) | 0.098 (9) | | 7.5 |
| $\beta^-_{0,36}$ | 639 (11) | 0.0223 (21) | | 8.2 |
| $\beta^-_{0,35}$ | 665 (11) | 0.058 (4) | | 7.7 |
| $\beta^-_{0,34}$ | 710 (11) | 0.00018 (9) | 1st forbidden | 10.5 |
| $\beta^-_{0,32}$ | 727 (11) | 0.044 (7) | 1st forbidden | 8.1 |

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,31}$ | 764 (11) | 0.092 (9) | 1st forbidden | 7.9 |
| $\beta^-_{0,30}$ | 765 (11) | 0.169 (10) | 1st forbidden | 7.6 |
| $\beta^-_{0,29}$ | 788 (11) | 1.227 (27) | | 6.8 |
| $\beta^-_{0,28}$ | 822 (11) | 2.76 (6) | Allowed | 6.5 |
| $\beta^-_{0,27}$ | 847 (11) | 0.0620 (49) | | 8.1 |
| $\beta^-_{0,26}$ | 909 (11) | 0.0030 (8) | | 9.6 |
| $\beta^-_{0,25}$ | 922 (11) | 0.0014 (9) | | 9.9 |
| $\beta^-_{0,24}$ | 977 (11) | 0.558 (8) | 1st forbidden | 7.4 |
| $\beta^-_{0,23}$ | 1004 (11) | 0.187 (12) | 1st forbidden | 8 |
| $\beta^-_{0,21}$ | 1068 (11) | 5.642 (43) | 1st forbidden | 6.6 |
| $\beta^-_{0,20}$ | 1077 (11) | 0.851 (10) | 1st forbidden | 7.4 |
| $\beta^-_{0,19}$ | 1124 (11) | 0.433 (22) | 1st forbidden | 7.8 |
| $\beta^-_{0,18}$ | 1151 (11) | 4.339 (18) | 1st forbidden | 6.8 |
| $\beta^-_{0,17}$ | 1182 (11) | 0.114 (6) | | 8.4 |
| $\beta^-_{0,16}$ | 1253 (11) | 2.449 (10) | 1st forbidden | 7.2 |
| $\beta^-_{0,15}$ | 1261 (11) | 1.430 (9) | 1st forbidden | 7.4 |
| $\beta^-_{0,14}$ | 1275 (11) | 1.171 (18) | | 7.5 |
| $\beta^-_{0,13}$ | 1382 (11) | 1.584 (10) | 1st forbidden | 7.5 |
| $\beta^-_{0,12}$ | 1423 (11) | 8.147 (28) | 1st forbidden | 6.9 |
| $\beta^-_{0,11}$ | 1506 (11) | 17.10 (8) | 1st forbidden | 6.6 |
| $\beta^-_{0,10}$ | 1529 (11) | 0.116 (16) | 1st forbidden | 8.8 |
| $\beta^-_{0,9}$ | 1540 (11) | 17.494 (36) | 1st forbidden | 6.7 |
| $\beta^-_{0,8}$ | 1557 (11) | 0.170 (16) | | 8.7 |
| $\beta^-_{0,7}$ | 1609 (11) | 0.65 (6) | 1st forbidden | 8.2 |
| $\beta^-_{0,6}$ | 1727 (11) | 3.12 (4) | 1st forbidden | 7.6 |
| $\beta^-_{0,5}$ | 1857 (11) | 0.396 (46) | 1st forbidden | 8.6 |
| $\beta^-_{0,4}$ | 1894 (11) | 7.45 (5) | 1st forbidden | 7.4 |
| $\beta^-_{0,1}$ | 2661 (11) | 0.62 (20) | 1st forbidden | 9 |
| $\beta^-_{0,0}$ | 3270 (11) | 19.67 (20) | 1st forbidden | 7.9 |

## 3 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,5}$ | 4941 (3) | 0.000052 (3) |
| $\alpha_{0,4}$ | 5023 (3) | 0.000045 (3) |
| $\alpha_{0,3}$ | 5184 (3) | 0.00013 (1) |
| $\alpha_{0,2}$ | 5273 (9) | 0.00125 (7) |
| $\alpha_{0,1}$ | 5452 (3) | 0.0116 (7) |
| $\alpha_{0,0}$ | 5516 (3) | 0.0082 (5) |
| $^*\alpha_{1,0}$ | 8287 (6) | 0.00012 |
| $^*\alpha_{6,1}$ | 8430 (6) | 0.00006 |
| $^*\alpha_{2,0}$ | 8950 (6) | 0.00002 |
| $^*\alpha_{4,0}$ | 9080 (6) | 0.0022 |
| $^*\alpha_{6,0}$ | 9320 (6) | 0.00005 |
| $^*\alpha_{7,0}$ | 9378 (8) | 0.00002 |

| | Energy keV | Probability × 100 |
|---|---|---|
| $^*\alpha_{10,0}$ | 9500 (6) | 0.0001 |
| $^*\alpha_{14,0}$ | 9670 (8) | 0.00004 |
| $^*\alpha_{17,0}$ | 9802 (6) | 0.00012 |
| $^*\alpha_{21,0}$ | 9907 (6) | 0.00007 |
| $^*\alpha_{24,0}$ | 10082 (6) | 0.00014 |
| $^*\alpha_{26,0}$ | 10150 (8) | 0.00002 |
| $^*\alpha_{32,0}$ | 10332 (6) | 0.00008 |
| $^*\alpha_{38,0}$ | 10505 (10) | 0.00002 |

* Long-range $\alpha$.

## 4 Electron Emissions

| | | Energy keV | | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|---|
| $e_{AL}$ | (Po) | 5.43 | - | 16.86 | 0.934 (16) | | |
| $e_{AK}$ | (Po) | | | | 0.053 (7) | | |
| | KLL | 58.97 | - | 65.20 | } | | |
| | KLX | 71.93 | - | 76.60 | } | | |
| | KXY | 84.72 | - | 93.04 | } | | |
| $ec_{18,9\ K}$ | (Po) | 295.84 | | (5) | 0.0800 (16) | | |
| $ec_{18,9\ L}$ | (Po) | 372.01 | - | 375.13 | 0.01391 (26) | | |
| $ec_{1,0\ K}$ | (Po) | 516.216 | | (7) | 0.676 (10) | | |
| $ec_{1,0\ L}$ | (Po) | 592.388 | - | 595.510 | 0.1892 (28) | | |
| $ec_{1,0\ M}$ | (Po) | 605.164 | - | 606.640 | 0.0469 (7) | | |
| $ec_{1,0\ N}$ | (Po) | 608.329 | - | 609.138 | 0.01201 (19) | | |
| $ec_{4,1\ K}$ | (Po) | 675.259 | | (14) | 0.060 (9) | | |
| $ec_{5,1\ K}$ | (Po) | 713.07 | | (2) | 0.01094 (17) | | |
| $ec_{4,1\ L}$ | (Po) | 751.431 | - | 754.550 | 0.0127 (15) | | |
| $ec_{6,1\ K}$ | (Po) | 840.959 | | (16) | 0.0595 (25) | | |
| $ec_{6,1\ L}$ | (Po) | 917.131 | - | 920.250 | 0.01014 (40) | | |
| $ec_{9,1\ K}$ | (Po) | 1027.195 | | (15) | 0.1858 (29) | | |
| $ec_{9,1\ L}$ | (Po) | 1103.367 | - | 1106.490 | 0.03131 (45) | | |
| $ec_{12,1\ K}$ | (Po) | 1145.015 | | (12) | 0.0573 (8) | | |
| $ec_{11,0\ K}$ | (Po) | 1671.398 | | (14) | 0.0608 (9) | | |
| $ec_{11,0\ L}$ | (Po) | 1747.57 | - | 1750.69 | 0.01012 (16) | | |
| $\beta^-_{0,80}$ | max: | 86 | | (11) | 0.0011 (5) | avg: | 23 (3) |
| $\beta^-_{0,79}$ | max: | 97 | | (11) | 0.00014 (9) | avg: | 26 (3) |
| $\beta^-_{0,77}$ | max: | 110 | | (11) | 0.00079 (12) | avg: | 29 (3) |
| $\beta^-_{0,76}$ | max: | 121 | | (11) | 0.00019 | avg: | 32 (3) |
| $\beta^-_{0,75}$ | max: | 127 | | (11) | 0.00118 (9) | avg: | 34 (3) |
| $\beta^-_{0,73}$ | max: | 176 | | (11) | 0.00037 (4) | avg: | 48 (3) |
| $\beta^-_{0,72}$ | max: | 188 | | (11) | 0.0052 (7) | avg: | 51 (3) |
| $\beta^-_{0,70}$ | max: | 202 | | (11) | 0.00141 (23) | avg: | 55 (3) |
| $\beta^-_{0,69}$ | max: | 216 | | (11) | 0.030 (5) | avg: | 59 (3) |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $\beta^-_{0,65}$ | max: | 256 | (11) | 0.0252 (24) | avg: | 71 (3) |
| $\beta^-_{0,62}$ | max: | 270 | (11) | 0.0160 (16) | avg: | 75 (3) |
| $\beta^-_{0,61}$ | max: | 284 | (11) | 0.032 (5) | avg: | 80 (3) |
| $\beta^-_{0,60}$ | max: | 291 | (11) | 0.0165 (6) | avg: | 82 (3) |
| $\beta^-_{0,58}$ | max: | 307 | (11) | 0.00036 (14) | avg: | 87 (3) |
| $\beta^-_{0,57}$ | max: | 329 | (11) | 0.041 (7) | avg: | 93 (3) |
| $\beta^-_{0,56}$ | max: | 336 | (11) | 0.00216 (32) | avg: | 95 (3) |
| $\beta^-_{0,55}$ | max: | 341 | (11) | 0.0025 (9) | avg: | 97 (3) |
| $\beta^-_{0,54}$ | max: | 348 | (11) | 0.0220 (9) | avg: | 99 (3) |
| $\beta^-_{0,53}$ | max: | 350 | (11) | 0.0014 (9) | avg: | 100 (3) |
| $\beta^-_{0,52}$ | max: | 373 | (11) | 0.0046 (5) | avg: | 107 (3) |
| $\beta^-_{0,51}$ | max: | 376 | (11) | 0.022 (3) | avg: | 108 (3) |
| $\beta^-_{0,50}$ | max: | 390 | (11) | 0.0115 (16) | avg: | 113 (3) |
| $\beta^-_{0,49}$ | max: | 400 | (11) | 0.0087 (4) | avg: | 116 (3) |
| $\beta^-_{0,48}$ | max: | 409 | (11) | 0.0146 (20) | avg: | 119 (4) |
| $\beta^-_{0,47}$ | max: | 443 | (11) | 0.00218 (17) | avg: | 130 (4) |
| $\beta^-_{0,44}$ | max: | 484 | (11) | 0.0248 (31) | avg: | 143 (4) |
| $\beta^-_{0,43}$ | max: | 500 | (11) | 0.038 (5) | avg: | 149 (4) |
| $\beta^-_{0,42}$ | max: | 541 | (11) | 0.525 (16) | avg: | 162 (4) |
| $\beta^-_{0,41}$ | max: | 551 | (11) | 0.247 (8) | avg: | 166 (4) |
| $\beta^-_{0,40}$ | max: | 571 | (11) | 0.0471 (23) | avg: | 172 (4) |
| $\beta^-_{0,39}$ | max: | 571 | (11) | 0.026 (4) | avg: | 173 (4) |
| $\beta^-_{0,38}$ | max: | 575 | (11) | 0.231 (15) | avg: | 174 (4) |
| $\beta^-_{0,37}$ | max: | 608 | (11) | 0.098 (9) | avg: | 185 (4) |
| $\beta^-_{0,36}$ | max: | 639 | (11) | 0.0223 (21) | avg: | 196 (4) |
| $\beta^-_{0,35}$ | max: | 665 | (11) | 0.058 (4) | avg: | 205 (4) |
| $\beta^-_{0,34}$ | max: | 708 | (11) | 0.00018 (9) | avg: | 220 (4) |
| $\beta^-_{0,32}$ | max: | 725 | (11) | 0.044 (7) | avg: | 226 (4) |
| $\beta^-_{0,31}$ | max: | 762 | (11) | 0.092 (9) | avg: | 240 (4) |
| $\beta^-_{0,30}$ | max: | 765 | (11) | 0.169 (10) | avg: | 241 (4) |
| $\beta^-_{0,29}$ | max: | 788 | (11) | 1.227 (27) | avg: | 249 (3) |
| $\beta^-_{0,28}$ | max: | 822 | (11) | 2.76 (6) | avg: | 262 (4) |
| $\beta^-_{0,27}$ | max: | 847 | (11) | 0.0620 (49) | avg: | 271 (4) |
| $\beta^-_{0,26}$ | max: | 909 | (11) | 0.0030 (8) | avg: | 294 (4) |
| $\beta^-_{0,25}$ | max: | 922 | (11) | 0.0014 (9) | avg: | 298 (4) |
| $\beta^-_{0,24}$ | max: | 977 | (11) | 0.558 (8) | avg: | 319 (4) |
| $\beta^-_{0,23}$ | max: | 1004 | (11) | 0.187 (12) | avg: | 329 (4) |
| $\beta^-_{0,21}$ | max: | 1066 | (11) | 5.642 (43) | avg: | 353 (4) |
| $\beta^-_{0,20}$ | max: | 1077 | (11) | 0.851 (10) | avg: | 357 (4) |
| $\beta^-_{0,19}$ | max: | 1122 | (11) | 0.433 (22) | avg: | 375 (4) |
| $\beta^-_{0,18}$ | max: | 1151 | (11) | 4.339 (18) | avg: | 386 (4) |
| $\beta^-_{0,17}$ | max: | 1182 | (11) | 0.114 (6) | avg: | 398 (4) |
| $\beta^-_{0,16}$ | max: | 1253 | (11) | 2.449 (10) | avg: | 425 (4) |
| $\beta^-_{0,15}$ | max: | 1259 | (11) | 1.430 (9) | avg: | 428 (4) |
| $\beta^-_{0,14}$ | max: | 1275 | (11) | 1.171 (18) | avg: | 434 (4) |
| $\beta^-_{0,13}$ | max: | 1380 | (11) | 1.584 (10) | avg: | 476 (4) |
| $\beta^-_{0,12}$ | max: | 1423 | (11) | 8.147 (28) | avg: | 493 (4) |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $\beta^-_{0,11}$ | max: | 1506 | (11) | 17.10 (8) | avg: | 526 (4) |
| $\beta^-_{0,10}$ | max: | 1527 | (11) | 0.116 (16) | avg: | 535 (4) |
| $\beta^-_{0,9}$ | max: | 1540 | (11) | 17.494 (36) | avg: | 540 (4) |
| $\beta^-_{0,8}$ | max: | 1557 | (11) | 0.170 (16) | avg: | 547 (4) |
| $\beta^-_{0,7}$ | max: | 1609 | (11) | 0.65 (6) | avg: | 568 (4) |
| $\beta^-_{0,6}$ | max: | 1727 | (11) | 3.12 (4) | avg: | 616 (5) |
| $\beta^-_{0,5}$ | max: | 1855 | (11) | 0.396 (46) | avg: | 669 (5) |
| $\beta^-_{0,4}$ | max: | 1892 | (11) | 7.45 (5) | avg: | 685 (5) |
| $\beta^-_{0,1}$ | max: | 2661 | (11) | 0.62 (20) | avg: | 1008 (5) |
| $\beta^-_{0,0}$ | max: | 3270 | (11) | 19.67 (20) | avg: | 1270 (5) |

# 5 Photon Emissions

## 5.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Po) | 9.66 — 16.21 | | 0.627 (15) | |
| $XK\alpha_2$ | (Po) | 76.864 | | 0.426 (13) | } $K\alpha$ |
| $XK\alpha_1$ | (Po) | 79.293 | | 0.710 (22) | } |
| $XK\beta_3$ | (Po) | 89.256 | } | | |
| $XK\beta_1$ | (Po) | 89.807 | } | 0.244 (9) | $K\beta_1'$ |
| $XK\beta_5''$ | (Po) | 90.363 | } | | |
| $XK\beta_2$ | (Po) | 92.263 | } | | |
| $XK\beta_4$ | (Po) | 92.618 | } | 0.0760 (29) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Po) | 92.983 | } | | |

## 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Tl) | 62.5 (10) | 0.0116 (7) | (M1) | | 0.0116 (7) |
| $\gamma_{2,1}$(Tl) | 191.1 (18) | 0.00125 (7) | | | 0.00125 (7) |
| $\gamma_{11,6}$(Po) | 221 (1) | 0.106 (31) | [M1,E2] | 0.8 (5) | 0.059 (6) |
| $\gamma_{-1,0}$(Po) | 230 (1) | 0.0031 (11) | | 0.0585 (11) | 0.0029 (10) |
| $\gamma_{16,11}$(Po) | 252.80 (6) | 0.0212 (33) | [M1] | 0.809 (12) | 0.0117 (18) |
| $\gamma_{6,3}$(Po) | 268.8 (2) | 0.0168 (19) | [E1] | 0.0405 (6) | 0.0161 (18) |
| $\gamma_{29,22}$(Po) | 273.80 (5) | 0.120 (8) | | | 0.120 (8) |
| $\gamma_{42,28}$(Po) | 280.95 (5) | 0.062 (6) | | | 0.062 (6) |
| $\gamma_{-1,1}$(Po) | 304.2 (2) | 0.033 (6) | | 0.30 (19) | 0.0255 (23) |
| $\gamma_{14,7}$(Po) | 333.350 (42) | 0.0646 (41) | [E1] | 0.0247 (4) | 0.063 (4) |
| $\gamma_{-1,2}$(Po) | 334.78 (8) | 0.033 (5) | | | 0.033 (5) |
| $\gamma_{11,5}$(Po) | 348.92 (6) | 0.164 (43) | [M1] | 0.335 (5) | 0.123 (32) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{11,4}$(Po) | 386.77 (5) | 0.343 (30) | [M1,E2] | 0.16 (10) | 0.296 (5) |
| $\gamma_{18,9}$(Po) | 388.88 (5) | 0.493 (6) | (M1) | 0.250 (4) | 0.394 (5) |
| $\gamma_{29,17}$(Po) | 394.05 (8) | 0.0127 (18) | | | 0.0127 (18) |
| $\gamma_{35,22}$(Po) | 396.01 (8) | 0.0259 (18) | | | 0.0259 (18) |
| $\gamma_{2,1}$(Po) | 405.74 (3) | 0.180 (7) | [E2] | 0.0541 (8) | 0.171 (7) |
| $\gamma_{28,14}$(Po) | 452.92 (10) | 0.034 (5) | [M1,E2] | 0.10 (7) | 0.031 (4) |
| $\gamma_{9,3}$(Po) | 454.770 (12) | 0.292 (5) | [E1] | 0.01251 (18) | 0.288 (5) |
| $\gamma_{21,10}$(Po) | 461.0 (2) | 0.067 (9) | [M1] | 0.1581 (23) | 0.058 (8) |
| $\gamma_{12,4}$(Po) | 469.76 (7) | 0.145 (18) | [M1,E2] | 0.09 (6) | 0.133 (15) |
| $\gamma_{21,9}$(Po) | 474.41 (5) | 0.100 (9) | [M1,E2] | 0.09 (6) | 0.092 (6) |
| $\gamma_{38,22}$(Po) | 485.92 (11) | 0.021 (4) | | | 0.021 (4) |
| $\gamma_{29,14}$(Po) | 487.95 (13) | 0.028 (9) | [E1] | 0.01080 (16) | 0.028 (9) |
| $\gamma_{39,21}$(Po) | 494.2 (4) | 0.011 (3) | | | 0.011 (3) |
| $\gamma_{31,15}$(Po) | 496.90 (18) | 0.0068 (18) | | | 0.0068 (18) |
| $\gamma_{23,11}$(Po) | 501.96 (15) | 0.0181 (22) | | | 0.0181 (22) |
| $\gamma_{42,22}$(Po) | 519.90 (5) | 0.0166 (17) | | | 0.0166 (17) |
| $\gamma_{42,21}$(Po) | 524.6 (2) | 0.0169 (17) | | | 0.0169 (17) |
| $\gamma_{6,2}$(Po) | 528 (1) | 0.0112 (13) | [E2] | 0.0282 (5) | 0.0109 (13) |
| $\gamma_{23,9}$(Po) | 536.77 (4) | 0.061 (8) | | | 0.061 (8) |
| $\gamma_{21,7}$(Po) | 543.0 (2) | 0.093 (23) | [M1,E2] | 0.06 (4) | 0.088 (21) |
| $\gamma_{22,7}$(Po) | 547.6 (3) | 0.034 (3) | | | 0.034 (3) |
| $\gamma_{62,28}$(Po) | 551.9 (8) | 0.0055 (14) | | | 0.0055 (14) |
| $\gamma_{12,3}$(Po) | 572.76 (7) | 0.072 (8) | [E1] | 0.00779 (11) | 0.071 (8) |
| $\gamma_{15,5}$(Po) | 595.23 (7) | 0.0183 (17) | [M1,E2] | 0.05 (3) | 0.0174 (15) |
| $\gamma_{41,18}$(Po) | 600.0 (5) | 0.008 (4) | | | 0.008 (4) |
| $\gamma_{1,0}$(Po) | 609.312 (7) | 46.42 (19) | E2 | 0.0204 (3) | 45.49 (19) |
| $\gamma_{13,3}$(Po) | 615.73 (10) | 0.055 (7) | [E1] | 0.00674 (10) | 0.055 (7) |
| $\gamma_{14,4}$(Po) | 617.0 (2) | 0.027 (5) | [E1] | 0.00672 (10) | 0.027 (5) |
| $\gamma_{51,23}$(Po) | 626.4 (6) | 0.0041 (14) | | | 0.0041 (14) |
| $\gamma_{-1,3}$(Po) | 630.79 (7) | 0.0166 (14) | | | 0.0166 (14) |
| $\gamma_{15,4}$(Po) | 633.14 (10) | 0.057 (3) | [M1,E2] | 0.044 (25) | 0.055 (3) |
| $\gamma_{29,12}$(Po) | 634.72 (21) | 0.0067 (24) | [M1,E2] | 0.043 (25) | 0.0064 (23) |
| $\gamma_{16,4}$(Po) | 639.67 (10) | 0.035 (5) | [E2] | 0.0183 (3) | 0.034 (5) |
| $\gamma_{20,6}$(Po) | 649.18 (7) | 0.056 (7) | [M1,E2] | 0.041 (24) | 0.054 (7) |
| $\gamma_{27,11}$(Po) | 658.7 (2) | 0.017 (4) | | | 0.017 (4) |
| $\gamma_{21,6}$(Po) | 661.1 (2) | 0.056 (4) | [M1,E2] | 0.039 (22) | 0.054 (4) |
| $\gamma_{3,1}$(Po) | 665.453 (22) | 1.539 (7) | E1 | 0.00579 (9) | 1.530 (7) |
| $\gamma_{38,16}$(Po) | 677.41 (15) | 0.0055 (23) | | | 0.0055 (23) |
| $\gamma_{28,11}$(Po) | 683.22 (6) | 0.084 (6) | [E1] | 0.00551 (8) | 0.084 (6) |
| $\gamma_{39,15}$(Po) | 687.6 (3) | 0.0066 (14) | | | 0.0066 (14) |
| $\gamma_{27,9}$(Po) | 693.3 (5) | 0.0059 (15) | | | 0.0059 (15) |
| $\gamma_{8,2}$(Po) | 697.90 (25) | 0.069 (4) | [M1,E2] | 0.034 (19) | 0.067 (4) |
| $\gamma_{38,14}$(Po) | 699.82 (18) | 0.016 (5) | | | 0.016 (5) |
| $\gamma_{18,5}$(Po) | 703.11 (4) | 0.504 (12) | [M1] | 0.0519 (8) | 0.479 (11) |
| $\gamma_{28,10}$(Po) | 704.9 (3) | 0.051 (10) | [E1] | 0.00519 (8) | 0.051 (10) |
| $\gamma_{41,15}$(Po) | 708.8 (3) | 0.0119 (20) | | | 0.0119 (20) |
| $\gamma_{17,4}$(Po) | 710.67 (10) | 0.076 (4) | | | 0.076 (4) |
| $\gamma_{14,3}$(Po) | 719.86 (3) | 0.399 (10) | E2 | 0.01424 (20) | 0.393 (10) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{23,6}$(Po) | 722.98 (12) | 0.037 (7) | | | 0.037 (7) |
| $\gamma_{42,14}$(Po) | 733.80 (15) | 0.038 (3) | | | 0.038 (3) |
| $\gamma_{18,4}$(Po) | 740.73 (18) | 0.0440 (23) | [M1,E2] | 0.029 (16) | 0.0428 (21) |
| $\gamma_{29,9}$(Po) | 752.84 (3) | 0.130 (8) | [M1,E2] | 0.028 (16) | 0.126 (8) |
| $\gamma_{4,1}$(Po) | 768.356 (10) | 4.969 (19) | M1+E2 | 0.0157 (21) | 4.892 (16) |
| $\gamma_{28,7}$(Po) | 786.1 (4) | 0.31 (5) | [E1] | 0.00422 (6) | 0.31 (5) |
| $\gamma_{21,5}$(Po) | 788.6 (5) | 0.016 (5) | [M1] | 0.0385 (6) | 0.015 (5) |
| $\gamma_{5,1}$(Po) | 806.174 (18) | 1.276 (6) | E2 | 0.01127 (16) | 1.262 (6) |
| $\gamma_{20,4}$(Po) | 815.0 (1) | 0.0399 (31) | [M1,E2] | 0.023 (13) | 0.039 (3) |
| $\gamma_{29,7}$(Po) | 821.18 (3) | 0.172 (10) | M1 | 0.0346 (5) | 0.166 (10) |
| $\gamma_{21,4}$(Po) | 826.3 (2) | 0.133 (11) | M1 | 0.0341 (5) | 0.129 (11) |
| $\gamma_{12,2}$(Po) | 832.39 (11) | 0.0354 (20) | [E2] | 0.01057 (15) | 0.035 (2) |
| $\gamma_{38,12}$(Po) | 847.16 (11) | 0.016 (6) | | | 0.016 (6) |
| $\gamma_{19,3}$(Po) | 873.07 (19) | 0.019 (3) | | | 0.019 (3) |
| $\gamma_{24,5}$(Po) | 878.03 (12) | 0.0120 (28) | [M1,E2] | 0.019 (10) | 0.0118 (27) |
| $\gamma_{28,6}$(Po) | 904.29 (10) | 0.066 (8) | [E1] | 0.00326 (5) | 0.066 (8) |
| $\gamma_{24,4}$(Po) | 915.74 (15) | 0.023 (5) | [M1,E2] | 0.017 (9) | 0.023 (5) |
| $\gamma_{20,3}$(Po) | 917.8 (3) | 0.005 (3) | [E1] | 0.00317 (5) | 0.005 (3) |
| $\gamma_{38,11}$(Po) | 930.2 (2) | 0.043 (8) | | | 0.043 (8) |
| $\gamma_{6,1}$(Po) | 934.061 (12) | 3.173 (11) | M1+E2 | 0.0234 (10) | 3.10 (1) |
| $\gamma_{29,6}$(Po) | 939.6 (5) | 0.016 (4) | [M1,E2] | 0.016 (8) | 0.016 (4) |
| $\gamma_{35,7}$(Po) | 943.34 (12) | 0.017 (3) | | | 0.017 (3) |
| $\gamma_{37,8}$(Po) | 949.8 (5) | 0.0055 (23) | | | 0.0055 (23) |
| $\gamma_{38,10}$(Po) | 952.2 (8) | 0.0059 (23) | | | 0.0059 (23) |
| $\gamma_{30,6}$(Po) | 961.61 (17) | 0.0101 (14) | | | 0.0101 (14) |
| $\gamma_{42,11}$(Po) | 964.08 (3) | 0.363 (12) | | | 0.363 (12) |
| $\gamma_{41,10}$(Po) | 976.18 (12) | 0.0151 (21) | | | 0.0151 (21) |
| $\gamma_{23,3}$(Po) | 991.49 (19) | 0.011 (3) | [M1,E2] | 0.014 (7) | 0.011 (3) |
| $\gamma_{48,12}$(Po) | 1013.8 (2) | 0.0087 (19) | | | 0.0087 (19) |
| $\gamma_{44,11}$(Po) | 1021.0 (5) | 0.016 (3) | | | 0.016 (3) |
| $\gamma_{28,5}$(Po) | 1032.37 (8) | 0.061 (4) | [E1] | 0.00257 (4) | 0.061 (4) |
| $\gamma_{39,7}$(Po) | 1038.0 (3) | 0.0086 (15) | | | 0.0086 (15) |
| $\gamma_{27,4}$(Po) | 1045.6 (2) | 0.023 (3) | | | 0.023 (3) |
| $\gamma_{7,1}$(Po) | 1051.96 (3) | 0.328 (8) | [M1,E2] | 0.012 (6) | 0.324 (8) |
| $\gamma_{42,7}$(Po) | 1067.2 (3) | 0.024 (7) | | | 0.024 (7) |
| $\gamma_{28,4}$(Po) | 1069.96 (8) | 0.272 (10) | [E1] | 0.00241 (4) | 0.271 (10) |
| $\gamma_{8,1}$(Po) | 1103.64 (19) | 0.107 (15) | [M1,E2] | 0.011 (5) | 0.106 (15) |
| $\gamma_{29,4}$(Po) | 1104.79 (19) | 0.074 (14) | [M1,E2] | 0.011 (5) | 0.073 (14) |
| $\gamma_{37,6}$(Po) | 1118.9 (5) | 0.010 (4) | | | 0.010 (4) |
| $\gamma_{9,1}$(Po) | 1120.287 (10) | 15.14 (3) | M1+E2 | 0.01522 (23) | 14.91 (3) |
| $\gamma_{31,4}$(Po) | 1130.29 (19) | 0.036 (3) | | | 0.036 (3) |
| $\gamma_{10,1}$(Po) | 1133.66 (3) | 0.255 (8) | [E2] | 0.00578 (8) | 0.254 (8) |
| $\gamma_{11,1}$(Po) | 1155.19 (2) | 1.657 (7) | M1+E2 | 0.0135 (4) | 1.635 (7) |
| $\gamma_{32,4}$(Po) | 1167.3 (2) | 0.0123 (17) | | | 0.0123 (17) |
| $\gamma_{28,3}$(Po) | 1172.98 (10) | 0.055 (7) | [E2] | 0.00542 (8) | 0.055 (7) |
| $\gamma_{29,3}$(Po) | 1207.68 (3) | 0.455 (12) | [E1] | 0.00196 (3) | 0.454 (12) |
| $\gamma_{-1,4}$(Po) | 1226.7 (3) | 0.018 (8) | | | 0.018 (8) |
| $\gamma_{30,3}$(Po) | 1230.6 (4) | 0.007 (5) | | | 0.007 (5) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{12,1}$(Po) | 1238.111 (12) | 5.901 (14) | M1+E2 | 0.01200 (17) | 5.831 (14) |
| $\gamma_{13,1}$(Po) | 1280.96 (2) | 1.451 (6) | M1 | 0.01101 (16) | 1.435 (6) |
| $\gamma_{37,4}$(Po) | 1284 (1) | 0.013 (6) | | | 0.013 (6) |
| $\gamma_{41,5}$(Po) | 1303.76 (8) | 0.105 (5) | | | 0.105 (5) |
| $\gamma_{38,4}$(Po) | 1316.96 (15) | 0.077 (7) | | | 0.077 (7) |
| $\gamma_{35,3}$(Po) | 1330.0 (2) | 0.0120 (14) | | | 0.0120 (14) |
| $\gamma_{41,4}$(Po) | 1341.49 (16) | 0.0214 (27) | | | 0.0214 (27) |
| $\gamma_{42,4}$(Po) | 1351 (1) | 0.0042 (11) | | | 0.0042 (11) |
| $\gamma_{65,7}$(Po) | 1353.4 (8) | 0.0036 (9) | | | 0.0036 (9) |
| $\gamma_{4,0}$(Po) | 1377.669 (12) | 3.984 (11) | E2 | 0.00404 (6) | 3.968 (11) |
| $\gamma_{14,1}$(Po) | 1385.31 (3) | 0.796 (5) | [E1] | 0.001631 (23) | 0.795 (5) |
| $\gamma_{43,4}$(Po) | 1392.5 (4) | 0.0087 (19) | | | 0.0087 (19) |
| $\gamma_{15,1}$(Po) | 1401.50 (4) | 1.337 (7) | (M1+E2) | 0.0053 (9) | 1.330 (7) |
| $\gamma_{16,1}$(Po) | 1407.98 (4) | 2.398 (8) | (E2) | 0.00389 (6) | 2.389 (8) |
| $\gamma_{38,3}$(Po) | 1419.7 (3) | 0.0055 (10) | | | 0.0055 (10) |
| $\gamma_{65,6}$(Po) | 1470.9 (3) | 0.0094 (13) | | | 0.0094 (13) |
| $\gamma_{17,1}$(Po) | 1479.15 (14) | 0.051 (4) | | | 0.051 (4) |
| $\gamma_{18,1}$(Po) | 1509.228 (15) | 2.144 (10) | M1+E2 | 0.00732 (11) | 2.128 (10) |
| $\gamma_{51,4}$(Po) | 1515.5 (3) | 0.0072 (21) | | | 0.0072 (21) |
| $\gamma_{19,1}$(Po) | 1538.50 (6) | 0.401 (22) | | | 0.401 (22) |
| $\gamma_{6,0}$(Po) | 1543.32 (6) | 0.303 (13) | [E2] | 0.00333 (5) | 0.302 (13) |
| $\gamma_{20,1}$(Po) | 1583.22 (4) | 0.712 (5) | M1+E2 | 0.00642 (18) | 0.707 (5) |
| $\gamma_{21,1}$(Po) | 1594.73 (8) | 0.276 (15) | [M1] | 0.00644 (9) | 0.274 (15) |
| $\gamma_{22,1}$(Po) | 1599.31 (6) | 0.322 (15) | | | 0.322 (15) |
| $\gamma_{65,4}$(Po) | 1636.3 (2) | 0.0111 (16) | | | 0.0111 (16) |
| $\gamma_{23,1}$(Po) | 1657.00 (19) | 0.047 (5) | | | 0.047 (5) |
| $\gamma_{7,0}$(Po) | 1661.28 (6) | 1.051 (9) | E2 | 0.00296 (5) | 1.048 (9) |
| $\gamma_{57,3}$(Po) | 1665.8 (2) | 0.015 (6) | | | 0.015 (6) |
| $\gamma_{24,1}$(Po) | 1683.99 (4) | 0.217 (3) | | | 0.217 (3) |
| $\gamma_{61,3}$(Po) | 1711.0 (8) | 0.023 (5) | | | 0.023 (5) |
| $\gamma_{9,0}$(Po) | 1729.595 (15) | 2.852 (10) | E2 | 0.00278 (4) | 2.844 (10) |
| $\gamma_{26,1}$(Po) | 1751.4 (8) | 0.0009 (5) | | | 0.0009 (5) |
| $\gamma_{11,0}$(Po) | 1764.494 (14) | 15.39 (5) | M1 | 0.00511 (8) | 15.31 (5) |
| $\gamma_{27,1}$(Po) | 1813.73 (14) | 0.0108 (9) | | | 0.0108 (9) |
| $\gamma_{28,1}$(Po) | 1838.36 (5) | 0.343 (10) | | | 0.343 (10) |
| $\gamma_{12,0}$(Po) | 1847.420 (25) | 2.025 (12) | | | 2.025 (12) |
| $\gamma_{29,1}$(Po) | 1873.16 (6) | 0.212 (8) | | | 0.212 (8) |
| $\gamma_{13,0}$(Po) | 1890.30 (15) | 0.078 (4) | | | 0.078 (4) |
| $\gamma_{30,1}$(Po) | 1895.92 (14) | 0.146 (8) | | | 0.146 (8) |
| $\gamma_{31,1}$(Po) | 1898.7 (4) | 0.049 (8) | | | 0.049 (8) |
| $\gamma_{32,1}$(Po) | 1935.5 (2) | 0.032 (7) | | | 0.032 (7) |
| $\gamma_{35,1}$(Po) | 1994.6 (6) | 0.0024 (5) | | | 0.0024 (5) |
| $\gamma_{15,0}$(Po) | 2010.78 (12) | 0.0434 (17) | | | 0.0434 (17) |
| $\gamma_{36,1}$(Po) | 2021.6 (2) | 0.0214 (21) | | | 0.0214 (21) |
| $\gamma_{37,1}$(Po) | 2052.94 (12) | 0.069 (4) | | | 0.069 (4) |
| $\gamma_{38,1}$(Po) | 2085.1 (2) | 0.0082 (5) | | | 0.0082 (5) |
| $\gamma_{40,1}$(Po) | 2089.7 (2) | 0.0443 (22) | | | 0.0443 (22) |
| $\gamma_{41,1}$(Po) | 2109.92 (12) | 0.084 (3) | | | 0.084 (3) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{18,0}$(Po) | 2118.55 (3) | 1.162 (5) | M1 | 0.00356 (5) | 1.158 (5) |
| $\gamma_{19,0}$(Po) | 2147.9 (2) | 0.0134 (13) | | | 0.0134 (13) |
| $\gamma_{43,1}$(Po) | 2160.4 (3) | 0.007 (5) | | | 0.007 (5) |
| $\gamma_{44,1}$(Po) | 2176.5 (2) | 0.0033 (6) | | | 0.0033 (6) |
| $\gamma_{20,0}$(Po) | 2192.58 (16) | 0.038 (3) | | | 0.038 (3) |
| $\gamma_{21,0}$(Po) | 2204.21 (4) | 4.929 (23) | M1 | 0.00333 (5) | 4.913 (23) |
| $\gamma_{48,1}$(Po) | 2251.6 (2) | 0.0055 (5) | | | 0.0055 (5) |
| $\gamma_{49,1}$(Po) | 2260.3 (2) | 0.0087 (4) | | | 0.0087 (4) |
| $\gamma_{23,0}$(Po) | 2266.51 (13) | 0.0165 (8) | | | 0.0165 (8) |
| $\gamma_{50,1}$(Po) | 2270.9 (4) | 0.0014 (3) | | | 0.0014 (3) |
| $\gamma_{51,1}$(Po) | 2284.3 (2) | 0.0050 (4) | | | 0.0050 (4) |
| $\gamma_{52,1}$(Po) | 2287.65 (23) | 0.0046 (5) | | | 0.0046 (5) |
| $\gamma_{24,0}$(Po) | 2293.40 (12) | 0.306 (4) | | | 0.306 (4) |
| $\gamma_{53,1}$(Po) | 2310.2 (3) | 0.0014 (9) | | | 0.0014 (9) |
| $\gamma_{54,1}$(Po) | 2312.4 (2) | 0.0086 (8) | | | 0.0086 (8) |
| $\gamma_{55,1}$(Po) | 2319.3 (3) | 0.0014 (9) | | | 0.0014 (9) |
| $\gamma_{56,1}$(Po) | 2325.0 (3) | 0.0017 (3) | | | 0.0017 (3) |
| $\gamma_{57,1}$(Po) | 2331.3 (2) | 0.026 (4) | | | 0.026 (4) |
| $\gamma_{25,0}$(Po) | 2348.0 (13) | 0.0014 (9) | | | 0.0014 (9) |
| $\gamma_{58,1}$(Po) | 2353.5 (7) | 0.00036 (14) | | | 0.00036 (14) |
| $\gamma_{26,0}$(Po) | 2361.00 (19) | 0.0021 (6) | | | 0.0021 (6) |
| $\gamma_{60,1}$(Po) | 2369.0 (4) | 0.0028 (4) | | | 0.0028 (4) |
| $\gamma_{61,1}$(Po) | 2376.9 (2) | 0.0086 (8) | | | 0.0086 (8) |
| $\gamma_{62,1}$(Po) | 2390.8 (2) | 0.00156 (14) | | | 0.00156 (14) |
| $\gamma_{65,1}$(Po) | 2405.1 (5) | 0.0011 (7) | | | 0.0011 (7) |
| $\gamma_{27,0}$(Po) | 2423.27 (13) | 0.0048 (6) | | | 0.0048 (6) |
| $\gamma_{69,1}$(Po) | 2444.7 (8) | 0.008 (4) | | | 0.008 (4) |
| $\gamma_{28,0}$(Po) | 2447.86 (10) | 1.550 (7) | E1 | 0.001424 (20) | 1.548 (7) |
| $\gamma_{70,1}$(Po) | 2459.0 (8) | 0.00141 (23) | | | 0.00141 (23) |
| $\gamma_{29,0}$(Po) | 2482.8 (4) | 0.00096 (18) | | | 0.00096 (18) |
| $\gamma_{30,0}$(Po) | 2505.4 (2) | 0.0056 (6) | | | 0.0056 (6) |
| $\gamma_{77,1}$(Po) | 2550.7 (7) | 0.00032 (9) | | | 0.00032 (9) |
| $\gamma_{34,0}$(Po) | 2562.0 (6) | 0.00018 (9) | | | 0.00018 (9) |
| $\gamma_{79,1}$(Po) | 2564.0 (6) | 0.00014 (9) | | | 0.00014 (9) |
| $\gamma_{35,0}$(Po) | 2604.5 (5) | 0.00036 (9) | | | 0.00036 (9) |
| $\gamma_{36,0}$(Po) | 2630.9 (3) | 0.00086 (23) | | | 0.00086 (23) |
| $\gamma_{37,0}$(Po) | 2662.4 (10) | 0.000200 (41) | | | 0.000200 (41) |
| $\gamma_{38,0}$(Po) | 2694.7 (2) | 0.033 (3) | | | 0.033 (3) |
| $\gamma_{40,0}$(Po) | 2699.4 (3) | 0.00282 (23) | | | 0.00282 (23) |
| $\gamma_{41,0}$(Po) | 2719.3 (2) | 0.00170 (17) | | | 0.00170 (17) |
| $\gamma_{43,0}$(Po) | 2769.9 (2) | 0.0225 (8) | | | 0.0225 (8) |
| $\gamma_{44,0}$(Po) | 2785.9 (2) | 0.0055 (5) | | | 0.0055 (5) |
| $\gamma_{47,0}$(Po) | 2826.98 (20) | 0.00218 (17) | | | 0.00218 (17) |
| $\gamma_{48,0}$(Po) | 2861.08 (40) | 0.00041 (13) | | | 0.00041 (13) |
| $\gamma_{50,0}$(Po) | 2880.3 (2) | 0.0101 (16) | | | 0.0101 (16) |
| $\gamma_{51,0}$(Po) | 2893.5 (2) | 0.0057 (5) | | | 0.0057 (5) |
| $\gamma_{54,0}$(Po) | 2921.9 (2) | 0.0134 (5) | | | 0.0134 (5) |
| $\gamma_{55,0}$(Po) | 2928.6 (3) | 0.00109 (9) | | | 0.00109 (9) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{56,0}$(Po) | 2934.6 (3) | 0.00046 (12) | | | 0.00046 (12) |
| $\gamma_{60,0}$(Po) | 2978.9 (2) | 0.0137 (4) | | | 0.0137 (4) |
| $\gamma_{62,0}$(Po) | 2999.98 (20) | 0.0089 (7) | | | 0.0089 (7) |
| $\gamma_{69,0}$(Po) | 3053.88 (20) | 0.022 (3) | | | 0.022 (3) |
| $\gamma_{72,0}$(Po) | 3081.7 (3) | 0.0052 (7) | | | 0.0052 (7) |
| $\gamma_{73,0}$(Po) | 3093.98 (40) | 0.00037 (4) | | | 0.00037 (4) |
| $\gamma_{75,0}$(Po) | 3142.58 (40) | 0.00118 (9) | | | 0.00118 (9) |
| $\gamma_{76,0}$(Po) | 3149.0 (5) | 0.00019 | | | 0.00019 |
| $\gamma_{77,0}$(Po) | 3160.6 (6) | 0.00047 (8) | | | 0.00047 (8) |
| $\gamma_{80,0}$(Po) | 3183.57 (40) | 0.0011 (5) | | | 0.0011 (5) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 7.6 | (2) | min |
| $Q_{\beta^-}$ | : | 2189 | (15) | keV |
| $\beta^-$ | : | 100 | | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,18}$ | 790 (15) | 2.8 (1) | [1st forbidden non-unique] | 6 |
| $\beta^-_{0,17}$ | 895 (15) | 2.0 (2) | [1st forbidden non-unique] | 6.34 |
| $\beta^-_{0,16}$ | 1013 (15) | 0.2 (1) | [1st forbidden non-unique] | 7.5 |
| $\beta^-_{0,14}$ | 1111 (15) | 0.7 (1) | [1st forbidden non-unique] | 7.1 |
| $\beta^-_{0,9}$ | 1354 (15) | 1.5 (1) | [1st forbidden non-unique] | 7.1 |
| $\beta^-_{0,6}$ | 1512 (15) | 0.5 (1) | [1st forbidden non-unique] | 7.8 |
| $\beta^-_{0,5}$ | 1581 (15) | 0.7 (1) | (1st forbidden non-unique) | 7.7 |
| $\beta^-_{0,4}$ | 1671 (15) | 0.3 (2) | (1st forbidden non-unique) | 8.1 |
| $\beta^-_{0,3}$ | 1787 (15) | 0.5 (1) | (1st forbidden unique) | 9 |
| $\beta^-_{0,2}$ | 1895 (15) | 30 (6) | (1st forbidden non-unique) | 6.35 |
| $\beta^-_{0,0}$ | 2189 (15) | 61 (6) | (1st forbidden non-unique) | 6.28 |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Po) | 5.434 - 10.934 | 4.0 (4) | |
| $e_{AK}$ | (Po) | | 0.22 (5) | |
| | KLL | 58.978 - 65.205 | } | |
| | KLX | 71.902 - 79.289 | } | |
| | KXY | 84.8 - 93.1 | } | |
| $ec_{1,0\ K}$ | (Po) | 178.13 (1) | 0.22 (1) | |
| $ec_{1,0\ L}$ | (Po) | 254.30 - 257.42 | 0.13 (1) | |
| $ec_{1,0\ M+}$ | (Po) | 267.08 - 271.23 | 0.04 | |
| $ec_{2,0\ K}$ | (Po) | 200.46 (4) | 6.0 (4) | |
| $ec_{2,0\ L}$ | (Po) | 276.63 - 279.75 | 1.5 (1) | |
| $ec_{2,0\ M+}$ | (Po) | 289.41 - 293.56 | 0.7 (1) | |
| $\beta^-_{0,18}$ | max: | 790 (15) | 2.8 (1) | avg: 249 (6) |
| $\beta^-_{0,17}$ | max: | 895 (15) | 2.0 (2) | avg: 287 (6) |
| $\beta^-_{0,16}$ | max: | 1013 (15) | 0.2 (1) | avg: 332 (6) |
| $\beta^-_{0,14}$ | max: | 1111 (15) | 0.7 (1) | avg: 370 (6) |
| $\beta^-_{0,9}$ | max: | 1354 (15) | 1.5 (1) | avg: 465 (6) |
| $\beta^-_{0,6}$ | max: | 1512 (15) | 0.5 (1) | avg: 528 (6) |
| $\beta^-_{0,5}$ | max: | 1581 (15) | 0.7 (1) | avg: 556 (6) |
| $\beta^-_{0,4}$ | max: | 1671 (15) | 0.3 (2) | avg: 593 (6) |
| $\beta^-_{0,3}$ | max: | 1787 (15) | 0.5 (1) | avg: 619 (6) |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $\beta^-_{0,2}$ | max: | 1895 | (15) | 30 (6) | avg: | 685 (6) |
| $\beta^-_{0,0}$ | max: | 2189 | (15) | 61 (6) | avg: | 808 (6) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Po) | 9.658 — 16.213 | | 2.7 (3) | |
| $XK\alpha_2$ | (Po) | 76.864 | | 1.8 (3) | } $K\alpha$ |
| $XK\alpha_1$ | (Po) | 79.293 | | 3.0 (5) | } |
| $XK\beta_3$ | (Po) | 89.256 | } | | |
| $XK\beta_1$ | (Po) | 89.807 | } | 1.02 (16) | $K\beta_1'$ |
| $XK\beta_5''$ | (Po) | 90.363 | } | | |
| $XK\beta_2$ | (Po) | 92.263 | } | | |
| $XK\beta_4$ | (Po) | 92.618 | } | 0.32 (5) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Po) | 92.983 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{3,1}$(Po) | 130.58 (1) | 0.0505 (12) | M1+26.5%E2 | 4.44 (13) | 0.0093 (10) |
| $\gamma_{4,2}$(Po) | 224.04 (7) | 0.044 (7) | E2 | 0.319 (5) | 0.033 (5) |
| $\gamma_{1,0}$(Po) | 271.228 (10) | 2.34 (10) | M1+94%E2 | 0.201 (7) | 1.95 (7) |
| $\gamma_{2,0}$(Po) | 293.56 (4) | 32 (2) | M1+50%E2 | 0.34 (5) | 23.8 (9) |
| $\gamma_{6,2}$(Po) | 383.10 (8) | 0.14 (7) | | | 0.14 (7) |
| $\gamma_{3,0}$(Po) | 401.81 (1) | 0.50 (8) | E2 | 0.0555 (8) | 0.48 (7) |
| $\gamma_{6,1}$(Po) | 405.43 (7) | 0.006 (1) | | | 0.006 (1) |
| $\gamma_{4,0}$(Po) | 517.60 (6) | 1.10 (8) | M1+50%E2 | 0.073 (10) | 1.02 (8) |
| $\gamma_{9,2}$(Po) | 541.76 (22) | 0.21 (7) | | | 0.21 (7) |
| $\gamma_{9,1}$(Po) | 564.09 (22) | 0.67 (7) | | | 0.67 (7) |
| $\gamma_{5,0}$(Po) | 608.30 (7) | 0.67 (7) | (M1+E2) | | 0.67 (7) |
| $\gamma_{6,0}$(Po) | 676.66 (7) | 0.40 (7) | | | 0.40 (7) |
| $\gamma_{17,4}$(Po) | 776.9 (1) | 0.81 (14) | | | 0.81 (14) |
| $\gamma_{14,2}$(Po) | 784 (2) | 0.33 (7) | | | 0.33 (7) |
| $\gamma_{14,1}$(Po) | 806.4 (20) | 0.40 (7) | | | 0.40 (7) |
| $\gamma_{9,0}$(Po) | 835.32 (22) | 0.62 (7) | | | 0.62 (7) |
| $\gamma_{16,1}$(Po) | 905 (2) | 0.21 (7) | | | 0.21 (7) |
| $\gamma_{17,1}$(Po) | 1023.3 (1) | 0.62 (7) | | | 0.62 (7) |
| $\gamma_{18,2}$(Po) | 1105.2 (4) | 1.50 (7) | | | 1.50 (7) |
| $\gamma_{18,1}$(Po) | 1127.6 (4) | 0.48 (7) | | | 0.48 (7) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{17,0}$(Po) | 1294.5 (1) | 0.62 (7) | | | 0.62 (7) |
| $\gamma_{18,0}$(Po) | 1398.8 (4) | 0.81 (7) | | | 0.81 (7) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 138.3763 | (17) | d |
| $Q_\alpha$ | : | 5407.46 | (7) | keV |
| $\alpha$ | : | 100 | | % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,1}$ | 4516.66 (9) | 0.00124 (4) |
| $\alpha_{0,0}$ | 5304.33 (7) | 99.99876 (4) |

# 3 Photon Emissions

## 3.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pb) | 9.186 — 15.217 | | 0.00000384 (10) | |
| $XK\alpha_2$ | (Pb) | 72.805 | | 0.00000277 (10) | } $K\alpha$ |
| $XK\alpha_1$ | (Pb) | 74.97 | | 0.00000466 (17) | } |
| $XK\beta_3$ | (Pb) | 84.451 | } | | |
| $XK\beta_1$ | (Pb) | 84.937 | } | 0.00000159 (6) | $K\beta_1'$ |
| $XK\beta_5''$ | (Pb) | 85.47 | } | | |
| $XK\beta_2$ | (Pb) | 87.238 | } | | |
| $XK\beta_4$ | (Pb) | 87.58 | } | 0.000000481 (20) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Pb) | 87.911 | } | | |

## 3.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pb) | 803.10 (5) | 0.00124 (4) | E2 | 0.01033 (15) | 0.00123 (4) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 0.516 | (3) | s |
| $Q_\alpha$ | : | 7594.48 | (51) | keV |
| $\alpha$ | : | 100 | | % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability $\times$ 100 |
|---|---|---|
| $\alpha_{0,2}$ | 6568.4 (10) | 0.523 (9) |
| $\alpha_{0,1}$ | 6891.2 (10) | 0.541 (17) |
| $\alpha_{0,0}$ | 7450.2 (3) | 98.936 (19) |

## 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Pb) | 5.33 - 15.82 | | 0.01216 (17) |
| $e_{AK}$ | (Pb) | | | 0.00071 (8) |
| | KLL | 56.028 - 61.669 | } | |
| | KLX | 68.181 - 74.969 | } | |
| | KXY | 80.3 - 88.0 | } | |

## 4 Photon Emissions

### 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pb) | 9.186 — 15.2169 | | 0.00740 (16) | |
| $XK\alpha_2$ | (Pb) | 72.8049 | | 0.00535 (14) | } $K\alpha$ |
| $XK\alpha_1$ | (Pb) | 74.97 | | 0.00900 (24) | } |
| $XK\beta_3$ | (Pb) | 84.451 | } | | |
| $XK\beta_1$ | (Pb) | 84.937 | } | 0.00308 (10) | $K\beta_1'$ |
| $XK\beta_5''$ | (Pb) | 85.47 | } | | |
| $XK\beta_2$ | (Pb) | 87.238 | } | | |
| $XK\beta_4$ | (Pb) | 87.58 | } | 0.00093 (4) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Pb) | 87.911 | } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{2,1}$(Pb) | 328.2 (2) | 0.0043 (15) | M1 | 0.334 (5) | 0.0032 (11) |
| $\gamma_{1,0}$(Pb) | 569.65 (15) | 0.546 (17) | E2 | 0.0216 (3) | 0.534 (17) |
| $\gamma_{2,0}$(Pb) | 897.8 (2) | 0.519 (9) | M1+E2 | 0.0233 (4) | 0.507 (9) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 300 | (2) | $\times 10^{-9}$ s |
| $Q_\alpha$ | : | 8954.12 | (11) | keV |
| $\alpha$ | : | 100 | | % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,0}$ | 8785.17 (11) | 100 |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 3.70 | (5) | $\times 10^{-6}$ s |
| $Q_\alpha$ | : | 8536.1 | (26) | keV |
| $\alpha$ | : | 100 | | % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,1}$ | 7614 (10) | 0.0050 (5) |
| $\alpha_{0,0}$ | 8375.9 (25) | 99.9950 (5) |

# 3 Photon Emissions

## 3.1 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pb) | 778.8 (3) | 0.0050 (5) | M1 | 0.0339 (5) | 0.0048 (5) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 162.3 | (12) | $\times 10^{-6}$ s |
| $Q_\alpha$ | : | 7833.46 | (6) | keV |
| $\alpha$ | : | 100 | | % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,2}$ | 6610.1 (10) | 0.000058 (2) |
| $\alpha_{0,1}$ | 6902.6 (3) | 0.0105 (7) |
| $\alpha_{0,0}$ | 7686.82 (6) | 99.9895 (7) |

# 3 Photon Emissions

## 3.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pb) | 9.19 — 15.22 | | 0.0000347 (13) | |
| XK$\alpha_2$ | (Pb) | 72.8049 | | 0.0000246 (15) | } K$\alpha$ |
| XK$\alpha_1$ | (Pb) | 74.97 | | 0.0000414 (25) | } |
| XK$\beta_3$ | (Pb) | 84.451 | } | | |
| XK$\beta_1$ | (Pb) | 84.937 | } | 0.0000141 (9) | K$\beta_1'$ |
| XK$\beta_5''$ | (Pb) | 85.47 | } | | |
| XK$\beta_2$ | (Pb) | 87.238 | } | | |
| XK$\beta_4$ | (Pb) | 87.58 | } | 0.00000427 (27) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Pb) | 87.911 | } | | |

## 3.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{2,1}$(Pb) | 298 (1) | 0.000058 (20) | E2 | 0.1180 (21) | 0.000052 (18) |
| $\gamma_{1,0}$(Pb) | 799.7 (1) | 0.0105 (7) | E2 | 0.01042 (15) | 0.0104 (6) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 1.781 | (4) | $\times 10^{-3}$ s |
| $Q_\alpha$ | : | 7526.3 | (8) | keV |
| $Q_{\beta^-}$ | : | 715 | (7) | keV |
| $\alpha$ | : | 99.99977 | (2) | % |
| $\beta^-$ | : | 2.3 | (2) | $\times 10^{-4}$ % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,7}$ | 6509 (3) | 0.0003 |
| $\alpha_{0,6}$ | 6586 (3) | 0.0020 (6) |
| $\alpha_{0,5}$ | 6667 (3) | 0.0008 (3) |
| $\alpha_{0,4}$ | 6755 (3) | 0.0008 (3) |
| $\alpha_{0,3}$ | 6799 (3) | 0.0016 (5) |
| $\alpha_{0,2}$ | 6813 (3) | 0.0004 (2) |
| $\alpha_{0,1}$ | 6955.4 (8) | 0.06 (2) |
| $\alpha_{0,0}$ | 7386.1 (8) | 99.934 (20) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Pb) | 5.33 - 15.82 | | 0.00115 (14) |
| $e_{AK}$ | (Pb) | | | 0.000059 (21) |
| | KLL | 56.028 - 61.669 | } | |
| | KLX | 68.181 - 74.969 | } | |
| | KXY | 80.3 - 88.0 | } | |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pb) | 9.186 — 15.2169 | | 0.00071 (12) | |
| XK$\alpha_2$ | (Pb) | 72.8049 | | 0.00045 (15) | } K$\alpha$ |
| XK$\alpha_1$ | (Pb) | 74.97 | | 0.00075 (25) | } |
| XK$\beta_3$ | (Pb) | 84.451 | } | | |
| XK$\beta_1$ | (Pb) | 84.937 | } | 0.00026 (9) | K$\beta_1^{'}$ |
| XK$\beta_5^{''}$ | (Pb) | 85.47 | } | | |

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XK$\beta_2$ | (Pb) | 87.238 | } | | |
| XK$\beta_4$ | (Pb) | 87.58 | } | 0.000078 (26) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Pb) | 87.911 | } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pb) | 438.9 (2) | 0.06 (2) | E2 | 0.0405 (6) | 0.058 (19) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 0.148 | (4) | s |
| $Q_{\alpha}$ | : | 6906.3 | (5) | keV |
| $\alpha$ | : | 100 | | % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,1}$ | 5988.4 (7) | 0.0019 (3) |
| $\alpha_{0,0}$ | 6778.4 (5) | 99.9981 (3) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Pb) | 5.26 - 10.40 | | 0.0000097 (10) |
| $e_{AK}$ | (Pb) | | | 0.00000056 (11) |
| | KLL | 56.03 - 61.67 | } | |
| | KLX | 68.18 - 74.97 | } | |
| | KXY | 80.3 - 88.0 | } | |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pb) | 9.184 — 15.216 | | 0.0000059 (6) | |
| XK$\alpha_2$ | (Pb) | 72.8049 | | 0.0000043 (7) | } K$\alpha$ |
| XK$\alpha_1$ | (Pb) | 74.97 | | 0.0000072 (12) | } |
| XK$\beta_3$ | (Pb) | 84.451 | } | | |
| XK$\beta_1$ | (Pb) | 84.937 | } | 0.0000024 (4) | K$\beta_1'$ |
| XK$\beta_5''$ | (Pb) | 85.47 | } | | |
| XK$\beta_2$ | (Pb) | 87.238 | } | | |
| XK$\beta_4$ | (Pb) | 87.58 | } | 0.00000074 (12) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Pb) | 87.911 | } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pb) | 804.9 (5) | 0.0019 (3) | [E2] | 0.01027 (15) | 0.0019 (3) |

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(Theoretical ICC)

# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 3.071 | (22) | min |
| $Q_\alpha$ | : | 6114.68 | (9) | keV |
| $Q_{\beta^-}$ | : | 260 | (12) | keV |
| $\alpha$ | : | 99.978 | (3) | % |
| $\beta^-$ | : | 0.022 | (3) | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,0}$ | 260 (12) | 0.022 (3) | | |

# 3 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,1}$ | 5181 (2) | 0.0011 (11) |
| $\alpha_{0,0}$ | 6002.35 (9) | 99.9769 (32) |

# 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|
| $\beta^-_{0,0}$ | max: | 260 (12) | 0.022 (3) | avg: | 73 (4) |

# 5 Photon Emissions

## 5.1 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pb) | 836 (2) | 0.0011 (11) | (E2) | | 0.0011 (11) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 7.216 | (7) | h |
| $Q_{EC}$ | : | 785.4 | (25) | keV |
| $Q_{\alpha}$ | : | 5982.4 | (13) | keV |
| $EC$ | : | 58.22 | (8) | % |
| $\alpha$ | : | 41.78 | (8) | % |

## 2 Electron Capture Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ | $P_K$ | $P_L$ | $P_{M+}$ |
|---|---|---|---|---|---|---|---|
| $\epsilon_{0,1}$ | 98.2 (26) | 0.258 (13) | 1st forbidden non-unique | 5.77 | 0.015 (17) | 0.684 (10) | 0.301 (7) |
| $\epsilon_{0,0}$ | 785.4 (25) | 57.96 (8) | 1st forbidden non-unique | 5.97 | 0.7731 (2) | 0.1693 (1) | 0.05758 (4) |

## 3 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,5}$ | 4895.4 (13) | <0.00004 |
| $\alpha_{0,3}$ | 4993.4 (13) | ~0.0004 |
| $\alpha_{0,2}$ | 5140.3 (13) | 0.0011 (2) |
| $\alpha_{0,1}$ | 5211.9 (13) | 0.0039 (3) |
| $\alpha_{0,0}$ | 5869.0 (13) | 41.78 (8) |

## 4 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Po) | 5.434 - 10.934 | | 27.6 (8) |
| $e_{AK}$ | (Po) | | | 1.57 (18) |
| | KLL | 58.978 - 65.205 | } | |
| | KLX | 71.902 - 79.289 | } | |
| | KXY | 84.8 - 93.1 | } | |
| $e_{AL}$ | (Bi) | 5.35 - 10.66 | | 0.000211 (20) |
| $e_{AK}$ | (Bi) | | | 0.0000126 (24) |
| | KLL | 57.491 - 63.419 | } | |
| | KLX | 70.025 - 77.105 | } | |
| | KXY | 82.53 - 90.52 | } | |

# 5 Photon Emissions

## 5.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Po) | 9.658 — 16.213 | | 18.6 (8) | |
| XK$\alpha_2$ | (Po) | 76.864 | | 12.66 (9) | } K$\alpha$ |
| XK$\alpha_1$ | (Po) | 79.293 | | 21.08 (12) | } |
| XK$\beta_3$ | (Po) | 89.256 | } | | |
| XK$\beta_1$ | (Po) | 89.807 | } | 7.26 (12) | K$\beta_1'$ |
| XK$\beta_5''$ | (Po) | 90.363 | } | | |
| XK$\beta_2$ | (Po) | 92.263 | } | | |
| XK$\beta_4$ | (Po) | 92.618 | } | 2.26 (5) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Po) | 92.983 | } | | |
| XL | (Bi) | 9.42 — 15.709 | | 0.000136 (14) | |
| XK$\alpha_2$ | (Bi) | 74.8157 | | 0.000098 (15) | } K$\alpha$ |
| XK$\alpha_1$ | (Bi) | 77.1088 | | 0.000164 (25) | } |
| XK$\beta_3$ | (Bi) | 86.835 | } | | |
| XK$\beta_1$ | (Bi) | 87.344 | } | 0.000056 (9) | K$\beta_1'$ |
| XK$\beta_5''$ | (Bi) | 87.862 | } | | |
| XK$\beta_2$ | (Bi) | 89.732 | } | | |
| XK$\beta_4$ | (Bi) | 90.074 | } | 0.000017 (3) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Bi) | 90.421 | } | | |

## 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{3,2}$(Bi) | 149.72 (10) | ~0.0002 | M1+13.8%E2 | 3.0 (3) | ~0.00005 |
| $\gamma_{3,1}$(Bi) | 222.69 (10) | ~0.00008 | M1+13.8%E2 | 0.95 (5) | ~0.00004 |
| $\gamma_{1,0}$(Bi) | 669.77 (7) | 0.0040 (3) | [M1+5.9%E2] | 0.0520 (9) | 0.0038 (3) |
| $\gamma_{1,0}$(Po) | 687.2 (7) | 0.258 (13) | (M1+3.85%E2] | 0.0536 (9) | 0.245 (12) |
| $\gamma_{2,0}$(Bi) | 742.74 (7) | 0.0013 (2) | [M1+8.3%E2] | 0.0391 (7) | 0.00125 (19) |
| $\gamma_{3,0}$(Bi) | 892.46 (7) | ~0.00014 | [M1+66.2%E2] | 0.0145 (13) | ~0.00014 |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 0.10 | (2) | $\times 10^{-3}$ s |
| $Q_\alpha$ | : | 8178 | (4) | keV |
| $\alpha$ | : | 100 | | % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,1}$ | 7628 (4) | 0.05 (2) |
| $\alpha_{0,0}$ | 8026 (4) | 99.95 (2) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Bi) | 5.42 - 16.34 | | 0.0027 (5) |
| $e_{AK}$ | (Bi) | | | 0.00015 (7) |
| | KLL | 57.491 - 63.419 | } | |
| | KLX | 70.025 - 77.105 | } | |
| | KXY | 82.53 - 90.52 | } | |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Bi) | 9.4207 — 15.7084 | | 0.0017 (4) | |
| $XK\alpha_2$ | (Bi) | 74.8157 | | 0.0012 (5) | } $K\alpha$ |
| $XK\alpha_1$ | (Bi) | 77.1088 | | 0.0020 (9) | } |
| $XK\beta_3$ | (Bi) | 86.835 | } | | |
| $XK\beta_1$ | (Bi) | 87.344 | } | 0.00069 (28) | $K\beta_1'$ |
| $XK\beta_5''$ | (Bi) | 87.862 | } | | |
| $XK\beta_2$ | (Bi) | 89.732 | } | | |
| $XK\beta_4$ | (Bi) | 90.074 | } | 0.00021 (9) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Bi) | 90.421 | } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Bi) | 404.853 (9) | 0.05 (2) | M1+E2 | 0.122 (8) | 0.045 (18) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 32.3 | (4) | $\times 10^{-3}$ s |
| $Q_\alpha$ | : | 7201.3 | (12) | keV |
| $Q_{\beta^-}$ | : | 737 | (6) | keV |
| $\alpha$ | : | 99.9933 | (24) | % |
| $\beta^-$ | : | 0.0067 | (24) | % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,4}$ | 6037 (3) | 0.002 |
| $\alpha_{0,3}$ | 6322.0 (16) | 0.0049 (4) |
| $\alpha_{0,2}$ | 6484.7 (16) | 0.0167 (8) |
| $\alpha_{0,1}$ | 6813.8 (16) | 0.0384 (15) |
| $\alpha_{0,0}$ | 7066.9 (16) | 99.932 (3) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Bi) | 5.3 - 16.4 | | 0.0077 (4) |
| $e_{AK}$ | (Bi) | | | 0.00044 (3) |
| | KLL | 57.491 - 63.419 | } | |
| | KLX | 70.025 - 77.105 | } | |
| | KXY | 82.53 - 90.52 | } | |
| $ec_{1,0\ K}$ | (Bi) | 167.35 (4) | | 0.0125 (6) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Bi) | 9.421 — 15.708 | | 0.00497 (23) | |
| $XK\alpha_2$ | (Bi) | 74.8157 | | 0.00351 (20) | } $K\alpha$ |
| $XK\alpha_1$ | (Bi) | 77.1088 | | 0.0059 (4) | } |
| $XK\beta_3$ | (Bi) | 86.835 | } | | |
| $XK\beta_1$ | (Bi) | 87.344 | } | 0.00201 (11) | $K\beta_1^{'}$ |
| $XK\beta_5^{''}$ | (Bi) | 87.862 | } | | |
| $XK\beta_2$ | (Bi) | 89.732 | } | | |
| $XK\beta_4$ | (Bi) | 90.074 | } | 0.00062 (4) | $K\beta_2^{'}$ |
| $XKO_{2,3}$ | (Bi) | 90.421 | } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Bi) | 257.88 (4) | 0.0446 (13) | M1+29%E2 | 0.555 (26) | 0.0287 (7) |
| $\gamma_{2,1}$(Bi) | 335.33 (10) | 0.0062 (3) | | | 0.0062 (3) |
| $\gamma_{4,2}$(Bi) | 455 | 0.002 | | | 0.002 |
| $\gamma_{2,0}$(Bi) | 593.1 (1) | 0.0115 (5) | | | 0.0115 (5) |
| $\gamma_{3,0}$(Bi) | 758.9 (1) | 0.0049 (4) | | | 0.0049 (4) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 1.4 | (2) | s |
| $Q_\alpha$ | : | 6874 | (3) | keV |
| $Q_{\beta^-}$ | : | 2881 | (12) | keV |
| $\alpha$ | : | 99.9 | (1) | % |
| $\beta^-$ | : | 0.1 | (1) | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,0}$ | 2881 (12) | 0.1 (1) | | |

## 3 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,2}$ | 6653 (5) | 6.4 (1) |
| $\alpha_{0,1}$ | 6694 (3) | 90.0 (1) |
| $\alpha_{0,0}$ | 6756 (5) | 3.6 (1) |

## 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|
| $\beta^-_{0,0}$ | max: | 2881 (12) | 0.1 (1) | avg: | 1095 (12) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 56 | (4) | s |
| $Q_\alpha$ | : | 6324 | (15) | keV |
| $Q_{\beta^-}$ | : | 1566 | (3) | keV |
| $\alpha$ | : | ~97 | | % |
| $\beta^-$ | : | ~3 | | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,0}$ | 1566 (3) | ~3 | 1st forbidden non-unique | 6.2 |

## 3 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,0}$ | 6208 (15) | ~97 |

## 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|
| $\beta^-_{0,0}$ | max: | 1566 (3) | ~3 | avg: | 547 (2) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 0.54 | (5) | $\times 10^{-3}$ s |
| $Q_\alpha$ | : | 7887 | (3) | keV |
| $\alpha$ | : | 100 | | % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,0}$ | 7742 (3) | 100 |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 36.0 | (19) | $\times 10^{-3}$ s |
| $Q_\alpha$ | : | 7262.5 | (19) | keV |
| $\alpha$ | : | 100 | | % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,1}$ | 6531.1 (19) | 0.127 (7) |
| $\alpha_{0,0}$ | 7129.2 (19) | 99.873 (7) |

# 3 Photon Emissions

## 3.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. | |
|---|---|---|---|---|
| XL | (Po) | 9.66 — 16.21 | 0.00080 (3) | |
| $XK\alpha_2$ | (Po) | 76.864 | 0.00052 (4) | } $K\alpha$ |
| $XK\alpha_1$ | (Po) | 79.293 | 0.00086 (6) | } |
| $XK\beta_3$ | (Po) | 89.256 } | | |
| $XK\beta_1$ | (Po) | 89.807 } | 0.000296 (21) | $K\beta_1'$ |
| $XK\beta_5''$ | (Po) | 90.363 } | | |
| $XK\beta_2$ | (Po) | 92.263 } | | |
| $XK\beta_4$ | (Po) | 92.618 } | 0.000092 (7) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Po) | 92.983 } | | |

## 3.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Po) | 609.31 (6) | 0.127 (7) | E2 | 0.0204 (3) | 0.124 (7) |

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(Q)

## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 3.98 | (3) | s |
| $Q_\alpha$ | : | 6946.1 | (3) | keV |
| $\alpha$ | : | 100 | | % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,14}$ | 5745 (1) | 0.00009 (5) |
| $\alpha_{0,13}$ | 5765.1 (5) | 0.00094 (19) |
| $\alpha_{0,12}$ | 5906.2 (10) | 0.00009 (5) |
| $\alpha_{0,11}$ | 5944.4 (4) | 0.0021 (3) |
| $\alpha_{0,10}$ | 5958.1 (7) | 0.0003 (1) |
| $\alpha_{0,9}$ | 5999.2 (4) | 0.0032 (5) |
| $\alpha_{0,8}$ | 6099.9 (5) | 0.00123 (12) |
| $\alpha_{0,7}$ | 6124.1 (6) | 0.00064 (12) |
| $\alpha_{0,6}$ | 6154.9 (3) | 0.0184 (22) |
| $\alpha_{0,5}$ | 6222.0 (3) | 0.0043 (10) |
| $\alpha_{0,4}$ | 6311.1 (3) | 0.048 (3) |
| $\alpha_{0,3}$ | 6424.8 (3) | 7.85 (24) |
| $\alpha_{0,2}$ | 6531.0 (3) | 0.098 (5) |
| $\alpha_{0,1}$ | 6553.0 (3) | 12.6 (3) |
| $\alpha_{0,0}$ | 6819.2 (3) | 79.4 (10) |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $e_{AL}$ | (Po) | 5.434 - 10.934 | 1.50 (5) |
| $e_{AK}$ | (Po) | | 0.067 (9) |
| | KLL | 58.978 - 65.205 | } |
| | KLX | 71.902 - 79.289 | } |
| | KXY | 84.8 - 93.1 | } |
| $ec_{1,0\ K}$ | (Po) | 178.13 (1) | 1.23 (2) |
| $ec_{1,0\ L}$ | (Po) | 254.30 - 257.43 | 0.74 (2) |
| $ec_{1,0\ M}$ | (Po) | 267.08 - 268.55 | 0.19 (1) |
| $ec_{3,0\ K}$ | (Po) | 308.71 (1) | 0.234 (8) |
| $ec_{3,0\ L}$ | (Po) | 384.88 - 388.00 | 0.102 (3) |
| $ec_{3,0\ M}$ | (Po) | 397.66 - 399.13 | 0.026 (1) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Po) | 9.658 — 16.213 | | 1.01 (5) | |
| $XK\alpha_2$ | (Po) | 76.864 | | 0.540 (24) | } $K\alpha$ |
| $XK\alpha_1$ | (Po) | 79.293 | | 0.90 (4) | } |
| $XK\beta_3$ | (Po) | 89.256 | } | | |
| $XK\beta_1$ | (Po) | 89.807 | } | 0.309 (15) | $K\beta_1'$ |
| $XK\beta_5''$ | (Po) | 90.363 | } | | |
| $XK\beta_2$ | (Po) | 92.263 | } | | |
| $XK\beta_4$ | (Po) | 92.618 | } | 0.096 (5) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Po) | 92.983 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{3,1}$(Po) | 130.58 (1) | 0.72 (6) | M1+26.5%E2 | 4.44 (13) | 0.133 (11) |
| $\gamma_{4,2}$(Po) | 224.04 (7) | 0.0019 (3) | (E2) | 0.319 (5) | 0.0014 (2) |
| $\gamma_{1,0}$(Po) | 271.228 (10) | 13.30 (26) | M1+94%E2 | 0.201 (7) | 11.07 (22) |
| $\gamma_{2,0}$(Po) | 293.56 (4) | 0.101 (4) | M1+50%E2 | 0.34 (5) | 0.075 (3) |
| $\gamma_{12,5}$(Po) | 322 (1) | 0.00009 (5) | | | 0.00009 (5) |
| $\gamma_{8,3}$(Po) | 330.9 (4) | 0.00100 (11) | | | 0.00100 (11) |
| $\gamma_{11,4}$(Po) | 373.5 (3) | 0.00025 (3) | | | 0.00025 (3) |
| $\gamma_{6,2}$(Po) | 383.1 (1) | 0.00044 (7) | | | 0.00044 (7) |
| $\gamma_{3,0}$(Po) | 401.81 (1) | 7.12 (23) | E2 | 0.0555 (8) | 6.75 (22) |
| $\gamma_{6,1}$(Po) | 405.4 (1) | 0.00025 (4) | | | 0.00025 (4) |
| $\gamma_{7,1}$(Po) | 436.9 (5) | 0.00031 (6) | | | 0.00031 (6) |
| $\gamma_{8,1}$(Po) | 461.5 (4) | 0.00017 (3) | | | 0.00017 (3) |
| $\gamma_{11,3}$(Po) | 489.3 (3) | 0.00064 (9) | | | 0.00064 (9) |
| $\gamma_{4,0}$(Po) | 517.60 (6) | 0.046 (4) | M1+50%E2 | 0.073 (10) | 0.043 (3) |
| $\gamma_{13,4}$(Po) | 556.1 (4) | 0.00006 (4) | M1+50%E2 | 0.061 (8) | 0.00006 (4) |
| $\gamma_{9,1}$(Po) | 564.1 (2) | 0.0015 (3) | | | 0.0015 (3) |
| $\gamma_{14,4}$(Po) | 576.6 (10) | 0.00009 (5) | | | 0.00009 (5) |
| $\gamma_{5,0}$(Po) | 608.30 (7) | 0.0044 (10) | (M1+E2) | | 0.0044 (10) |
| $\gamma_{11,1}$(Po) | 619.9 (3) | 0.00033 (11) | | | 0.00033 (11) |
| $\gamma_{-1,1}$(Po) | 665.5 (10) | 0.00009 (5) | | | 0.00009 (5) |
| $\gamma_{13,3}$(Po) | 671.9 (4) | 0.00022 (11) | M1+E2 | | 0.00022 (11) |
| $\gamma_{6,0}$(Po) | 676.66 (7) | 0.018 (2) | | | 0.018 (2) |
| $\gamma_{7,0}$(Po) | 708.1 (5) | 0.00033 (11) | | | 0.00033 (11) |
| $\gamma_{8,0}$(Po) | 732.7 (4) | 0.00007 (4) | | | 0.00007 (4) |
| $\gamma_{13,1}$(Po) | 802.5 (4) | 0.00033 (11) | M1+E2 | | 0.00033 (11) |
| $\gamma_{9,0}$(Po) | 835.32 (22) | 0.0017 (3) | | | 0.0017 (3) |
| $\gamma_{10,0}$(Po) | 877.2 (6) | 0.00033 (11) | | | 0.00033 (11) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{11,0}$(Po) | 891.1 (3) | 0.0009 (2) | | | 0.0009 (2) |
| $\gamma_{13,0}$(Po) | 1073.7 (4) | 0.00033 (11) | E2 | 0.00641 (9) | 0.00033 (11) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 55.8 | (3) | s |
| $Q_\alpha$ | : | 6404.67 | (10) | keV |
| $\alpha$ | : | 100 | | % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,1}$ | 5748.46 (11) | 0.118 (15) |
| $\alpha_{0,0}$ | 6288.22 (10) | 99.882 (15) |

## 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Po) | 5.434 - 10.934 | | 0.00140 (11) |
| $e_{AK}$ | (Po) | | | 0.000074 (13) |
| | KLL | 58.978 - 65.205 | } | |
| | KLX | 71.902 - 79.289 | } | |
| | KXY | 84.8 - 93.1 | } | |

## 4 Photon Emissions

### 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Po) | 9.658 — 16.213 | | 0.00094 (8) | |
| XK$\alpha_2$ | (Po) | 76.864 | | 0.00059 (8) | } K$\alpha$ |
| XK$\alpha_1$ | (Po) | 79.293 | | 0.00099 (13) | } |
| XK$\beta_3$ | (Po) | 89.256 | } | | |
| XK$\beta_1$ | (Po) | 89.807 | } | 0.00034 (5) | K$\beta_1'$ |
| XK$\beta_5''$ | (Po) | 90.363 | } | | |
| XK$\beta_2$ | (Po) | 92.263 | } | | |
| XK$\beta_4$ | (Po) | 92.618 | } | 0.000106 (15) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Po) | 92.983 | } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Po) | 549.76 (4) | 0.118 (15) | E2 | 0.0257 (4) | 0.115 (15) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 3.8232 | (8) | d |
| $Q_\alpha$ | : | 5590.3 | (3) | keV |
| $\alpha$ | : | 100 | | % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,2}$ | 4827 (4) | ≈0.0005 |
| $\alpha_{0,1}$ | 4987 (1) | 0.078 |
| $\alpha_{0,0}$ | 5489.48 (30) | 99.92 (1) |

# 3 Photon Emissions

## 3.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Po) | 9.66 — 16.21 | | 0.000766 (15) | |
| $XK\alpha_2$ | (Po) | 76.864 | | 0.000469 (10) | } $K\alpha$ |
| $XK\alpha_1$ | (Po) | 79.293 | | 0.000781 (16) | } |
| $XK\beta_3$ | (Po) | 89.256 | } | | |
| $XK\beta_1$ | (Po) | 89.807 | } | 0.000269 (7) | $K\beta_1'$ |
| $XK\beta_5''$ | (Po) | 90.363 | } | | |
| $XK\beta_2$ | (Po) | 92.263 | } | | |
| $XK\beta_4$ | (Po) | 92.618 | } | 0.0000837 (25) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Po) | 92.983 | } | | |

## 3.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Po) | 510 (2) | 0.078 | [E2] | 0.0306 (6) | 0.076 |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 4.79 | (2) | min |
| $Q_\alpha$ | : | 6457.8 | (14) | keV |
| $Q_{\beta^-}$ | : | 314 | (6) | keV |
| $\alpha$ | : | 99.9952 | (15) | % |
| $\beta^-$ | : | 0.0048 | (15) | % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,14}$ | 5500 (40) | 0.000038 (10) |
| $\alpha_{0,13}$ | 5530 (25) | 0.00010 (2) |
| $\alpha_{0,12}$ | 5689 (3) | 0.0025 (5) |
| $\alpha_{0,11}$ | 5697 (4) | 0.0003 |
| $\alpha_{0,10}$ | 5776 (3) | 0.064 (4) |
| $\alpha_{0,9}$ | 5783 (4) | 0.0031 (6) |
| $\alpha_{0,8}$ | 5813 (3) | 0.006 (1) |
| $\alpha_{0,7}$ | 5925 (3) | 0.0285 (24) |
| $\alpha_{0,6}$ | 5938.9 (20) | 0.128 (3) |
| $\alpha_{0,5}$ | 5965.9 (25) | 0.064 (16) |
| $\alpha_{0,4}$ | 5979.9 (20) | 0.39 (7) |
| $\alpha_{0,3}$ | 6075.9 (20) | 0.15 (3) |
| $\alpha_{0,2}$ | 6126.3 (15) | 15.1 (2) |
| $\alpha_{0,1}$ | 6243 (2) | 1.34 (7) |
| $\alpha_{0,0}$ | 6341.0 (13) | 82.8 (2) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (At) | 5.6 - 17.4 | | 3.05 (10) |
| $e_{AK}$ | (At) | | | 0.114 (6) |
| | KLL | 60.489 - 67.031 | } | |
| | KLX | 73.811 - 81.516 | } | |
| | KXY | 87.10 - 95.72 | } | |
| $ec_{1,0\ K}$ | (At) | 4.53 (2) | | 1.51 (13) |
| $ec_{2,1\ K}$ | (At) | 22.10 (3) | | 0.13 (10) |
| $ec_{3,2\ L}$ | (At) | 36.33 - 39.60 | | 0.156 (27) |
| $ec_{3,2\ M}$ | (At) | 49.50 - 51.03 | | 0.037 (6) |
| $ec_{4,2\ K}$ | (At) | 54.49 (3) | | 0.138 (8) |
| $ec_{3,1\ K}$ | (At) | 76.11 (3) | | 0.0156 (21) |
| $ec_{4,3\ L}$ | (At) | 78.8 - 82.1 | | 0.029 (18) |
| $ec_{1,0\ L}$ | (At) | 82.77 - 86.04 | | 0.274 (23) |
| $ec_{1,0\ M}$ | (At) | 95.94 - 97.47 | | 0.065 (5) |
| $ec_{2,1\ L}$ | (At) | 100.34 - 103.61 | | 0.024 (18) |

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $ec_{2,0\ K}$ | (At) | 122.40 (2) | 1.570 (31) |
| $ec_{4,2\ L}$ | (At) | 132.73 - 136.00 | 0.0247 (14) |
| $ec_{3,1\ L}$ | (At) | 154.35 - 157.62 | 0.0325 (43) |
| $ec_{2,0\ L}$ | (At) | 200.64 - 203.91 | 1.943 (37) |
| $ec_{2,0\ M}$ | (At) | 213.81 - 215.34 | 0.515 (10) |
| $ec_{10,2\ K}$ | (At) | 264.14 (4) | 0.01047 (44) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (At) | 9.8964 — 16.7291 | | 2.18 (7) | |
| $XK\alpha_2$ | (At) | 78.94 | | 0.96 (5) | } $K\alpha$ |
| $XK\alpha_1$ | (At) | 81.51 | | 1.59 (9) | } |
| $XK\beta_3$ | (At) | 91.73 | } | | |
| $XK\beta_1$ | (At) | 92.315 | } | 0.55 (6) | $K\beta_1'$ |
| $XK\beta_5''$ | (At) | 92.883 | } | | |
| $XK\beta_2$ | (At) | 94.846 | } | | |
| $XK\beta_4$ | (At) | 95.211 | } | 0.18 (2) | $K\beta_2'$ |
| $XKO_{2,3}$ | (At) | 95.595 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{3,2}$(At) | 53.81 (3) | 0.220 (38) | M1 | 14.17 (20) | 0.0145 (25) |
| $\gamma_{4,3}$(At) | 96.3 (3) | 0.046 (26) | M1+E2 | 5.6 (24) | 0.007 (3) |
| $\gamma_{1,0}$(At) | 100.25 (2) | 2.02 (17) | M1 | 11.97 (17) | 0.156 (13) |
| $\gamma_{2,1}$(At) | 117.82 (3) | 0.19 (14) | M1 | 7.58 (11) | 0.022 (16) |
| $\gamma_{4,2}$(At) | 150.21 (3) | 0.216 (12) | M1 | 3.80 (5) | 0.0449 (25) |
| $\gamma_{3,1}$(At) | 171.83 (3) | 0.129 (17) | E2 | 0.863 (12) | 0.069 (9) |
| $\gamma_{10,4}$(At) | 208.3 (6) | 0.0073 (14) | [E2] | 0.430 (8) | 0.0051 (10) |
| $\gamma_{2,0}$(At) | 218.12 (2) | 15.61 (21) | E2 | 0.367 (5) | 11.42 (15) |
| $\gamma_{5,1}$(At) | 282.12 (9) | 0.0097 (20) | [M1,E2] | 0.41 (25) | 0.0069 (7) |
| $\gamma_{7,1}$(At) | 324.10 (6) | 0.0252 (17) | M1 | 0.446 (6) | 0.0174 (12) |
| $\gamma_{10,2}$(At) | 359.86 (4) | 0.0514 (20) | M1 | 0.335 (5) | 0.0385 (15) |
| $\gamma_{5,0}$(At) | 382.34 (4) | 0.0437 (18) | M1 | 0.284 (4) | 0.0340 (14) |
| $\gamma_{6,0}$(At) | 410.64 (5) | 0.1270 (26) | E2 | 0.0548 (8) | 0.1204 (25) |
| $\gamma_{8,1}$(At) | 437.00 (5) | 0.0010 (1) | | | 0.0010 (1) |
| $\gamma_{12,2}$(At) | 446.30 (8) | 0.0017 (4) | E1+M2 | | 0.0017 (4) |
| $\gamma_{9,1}$(At) | 468.3 (7) | 0.0018 (3) | | | 0.0018 (3) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{8,0}$(At) | 537.8 (8) | 0.0045 (8) | | | 0.0045 (8) |
| $\gamma_{12,1}$(At) | 562.3 (12) | 0.005 (5) | | | 0.005 (5) |
| $\gamma_{9,0}$(At) | 568.5 (3) | 0.0012 (4) | | | 0.0012 (4) |
| $\gamma_{10,0}$(At) | 576.9 (4) | 0.0033 (7) | [M1] | 0.0948 (13) | 0.0030 (6) |
| $\gamma_{11,0}$(At) | 652 (2) | 0.0004 (4) | | | 0.0004 (4) |
| $\gamma_{12,0}$(At) | 665 (2) | 0.0009 (9) | | | 0.0009 (9) |
| $\gamma_{13,0}$(At) | 809.3 (2) | 0.00010 (2) | | | 0.00010 (2) |
| $\gamma_{14,0}$(At) | 891.9 (3) | 0.000038 (10) | | | 0.000038 (10) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 22.00 | (7) | min |
| $Q_{\beta^-}$ | : | 1149.2 | (9) | keV |
| $Q_\alpha$ | : | 5562 | (3) | keV |
| $\beta^-$ | : | 99.980 | (4) | % |
| $\alpha$ | : | 0.020 | (4) | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,32}$ | 120.3 (10) | 0.0012 (3) | Super-allowed or allowed | 7.3 |
| $\beta^-_{0,31}$ | 124.6 (10) | 0.0004 (1) | 1st forbidden | 7.82 |
| $\beta^-_{0,30}$ | 129.9 (10) | 0.00046 (12) | 1st forbidden | 7.82 |
| $\beta^-_{0,29}$ | 191.5 (9) | 0.020 (4) | nth forbidden unique | 6.7 |
| $\beta^-_{0,28}$ | 205.9 (9) | 0.0082 (18) | nth forbidden unique | 7.19 |
| $\beta^-_{0,27}$ | 208.4 (9) | 0.0051 (12) | | 7.41 |
| $\beta^-_{0,26}$ | 222.6 (9) | 0.106 (22) | nth forbidden unique | 6.18 |
| $\beta^-_{0,25}$ | 243.3 (10) | 0.0011 (4) | 1st forbidden | 8.29 |
| $\beta^-_{0,24}$ | 281.9 (9) | 0.025 (5) | nth forbidden unique | 7.14 |
| $\beta^-_{0,23}$ | 302.8 (9) | 0.088 (18) | 1st forbidden | 6.69 |
| $\beta^-_{0,22}$ | 306.9 (9) | 0.035 (7) | nth forbidden unique | 7.11 |
| $\beta^-_{0,21}$ | 323.3 (9) | 0.54 (10) | | 5.99 |
| $\beta^-_{0,20}$ | 326.0 (9) | 0.014 (3) | nth forbidden unique | 7.59 |
| $\beta^-_{0,19}$ | 343.8 (9) | 0.0040 (8) | nth forbidden unique | 8.21 |
| $\beta^-_{0,18}$ | 345.4 (9) | 0.14 (3) | nth forbidden unique | 6.67 |
| $\beta^-_{0,17}$ | 362.1 (9) | 0.019 (4) | 1st forbidden | 7.6 |
| $\beta^-_{0,16}$ | 366.7 (10) | 0.00111 (22) | nth forbidden unique | 8.85 |
| $\beta^-_{0,15}$ | 555.3 (9) | 0.013 (3) | 1st forbidden | 8.38 |
| $\beta^-_{0,14}$ | 773.1 (10) | 0.0046 (12) | | 9.31 |
| $\beta^-_{0,13}$ | 779.9 (9) | 1.8 (4) | | 6.73 |
| $\beta^-_{0,11}$ | 806.7 (9) | 0.037 (8) | 1st forbidden | 8.47 |
| $\beta^-_{0,10}$ | 814.9 (9) | 0.042 (9) | 1st forbidden | 8.43 |
| $\beta^-_{0,9}$ | 819.4 (9) | 0.049 (10) | Super-allowed or allowed | 8.37 |
| $\beta^-_{0,8}$ | 863.1 (9) | 0.032 (9) | 1st forbidden | 8.64 |
| $\beta^-_{0,7}$ | 869.0 (9) | 0.004 (4) | | 9.5 |
| $\beta^-_{0,6}$ | 914.5 (9) | 9.1 (17) | | 6.27 |
| $\beta^-_{0,5}$ | 1025.5 (9) | 0.24 (6) | | 8.02 |
| $\beta^-_{0,4}$ | 1069.6 (9) | 15 (3) | | 6.29 |
| $\beta^-_{0,3}$ | 1087.8 (9) | 0.27 (19) | | 8.1 |
| $\beta^-_{0,2}$ | 1099.1 (9) | 67 (13) | Super-allowed or allowed | 5.68 |
| $\beta^-_{0,1}$ | 1119.3 (9) | 6 (6) | | 6.8 |
| $\beta^-_{0,0}$ | 1149.2 (9) | 1 | 1st forbidden | 7.6 |

## 3 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,4}$ | 5172 (5) | 0.0009 (5) |
| $\alpha_{0,3}$ | 5291 (4) | 0.0060 (26) |
| $\alpha_{0,2}$ | 5314 (4) | 0.0053 (23) |
| $\alpha_{0,1}$ | 5403 (3) | 0.0044 (20) |
| $\alpha_{0,0}$ | 5462 (3) | 0.0033 (15) |

## 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Ra) | 5.71 - 12.04 | 29 (4) | |
| $e_{AK}$ | (Ra) | | 0.159 (21) | |
| | KLL | 65.149 - 72.729 | } | |
| | KLX | 79.721 - 88.466 | } | |
| | KXY | 94.27 - 103.91 | } | |
| $e_{AL}$ | (At) | 5.6 - 17.4 | 0.0076 (18) | |
| $e_{AK}$ | (At) | | 0.000065 (20) | |
| | KLL | 60.489 - 67.031 | } | |
| | KLX | 73.811 - 81.516 | } | |
| | KXY | 87.10 - 95.72 | } | |
| $ec_{2,1\ L}$ | (Ra) | 1.04 - 4.83 | 8.1 (17) | |
| $ec_{1,0\ L}$ | (Ra) | 10.55 - 14.34 | 20 (6) | |
| $ec_{3,1\ L}$ | (Ra) | 12.46 - 16.25 | 0.26 (8) | |
| $ec_{2,1\ M}$ | (Ra) | 15.45 - 17.16 | 2.10 (45) | |
| $ec_{5,4\ L}$ | (Ra) | 24.768 - 28.556 | 0.131 (12) | |
| $ec_{1,0\ M}$ | (Ra) | 24.96 - 26.68 | 5.0 (14) | |
| $ec_{3,1\ M}$ | (Ra) | 26.87 - 28.58 | 0.068 (20) | |
| $ec_{4,1\ L}$ | (Ra) | 30.6 - 34.4 | 1.34 (32) | |
| $ec_{13,6\ K}$ | (Ra) | 30.68 (2) | 0.092 (18) | |
| $ec_{2,0\ L}$ | (Ra) | 30.9 - 34.7 | 17.4 (37) | |
| $ec_{5,4\ M}$ | (Ra) | 39.178 - 40.895 | 0.0344 (32) | |
| $ec_{3,0\ L}$ | (Ra) | 42.20 - 45.99 | 0.25 (5) | |
| $ec_{4,1\ M}$ | (Ra) | 45.0 - 46.7 | 0.33 (8) | |
| $ec_{2,0\ M}$ | (Ra) | 45.3 - 47.0 | 4.3 (9) | |
| $ec_{5,2\ L}$ | (Ra) | 54.3 - 58.1 | 0.039 (27) | |
| $ec_{3,0\ M}$ | (Ra) | 56.61 - 58.32 | 0.068 (14) | |
| $ec_{4,0\ L}$ | (Ra) | 60.42 - 64.21 | 1.38 (28) | |
| $ec_{5,2\ M}$ | (Ra) | 68.7 - 70.4 | 0.011 (7) | |
| $ec_{6,3\ K}$ | (Ra) | 69.43 (5) | 0.16 (14) | |
| $ec_{4,0\ M}$ | (Ra) | 74.83 - 76.54 | 0.33 (7) | |
| $ec_{6,2\ K}$ | (Ra) | 80.74 (5) | 0.0191 (43) | |
| $ec_{6,1\ K}$ | (Ra) | 100.93 (5) | 1.47 (28) | |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $ec_{7,3\ K}$ | (Ra) | 114.88 | (5) | 0.0118 (23) | | |
| $ec_{13,6\ L}$ | (Ra) | 115.4 - 119.2 | | 0.0192 (38) | | |
| $ec_{6,0\ K}$ | (Ra) | 130.78 | (5) | 3.0 (6) | | |
| $ec_{7,1\ K}$ | (Ra) | 146.33 | (5) | 0.01506 (22) | | |
| $ec_{6,3\ L}$ | (Ra) | 154.12 - 157.91 | | 0.061 (13) | | |
| $ec_{6,3\ M}$ | (Ra) | 168.53 - 170.24 | | 0.0156 (38) | | |
| $ec_{6,1\ L}$ | (Ra) | 185.62 - 189.41 | | 0.28 (5) | | |
| $ec_{6,1\ M}$ | (Ra) | 200.03 - 201.74 | | 0.066 (12) | | |
| $ec_{13,2\ K}$ | (Ra) | 215.33 | (5) | 0.215 (42) | | |
| $ec_{6,0\ L}$ | (Ra) | 215.5 - 219.3 | | 0.56 (10) | | |
| $ec_{6,0\ M}$ | (Ra) | 229.9 - 231.6 | | 0.134 (25) | | |
| $ec_{13,2\ L}$ | (Ra) | 300.02 - 303.81 | | 0.040 (8) | | |
| $\beta^-_{0,32}$ | max: | 120.3 | (10) | 0.0012 (3) | avg: | 31.5 (3) |
| $\beta^-_{0,31}$ | max: | 124.6 | (10) | 0.0004 (1) | avg: | 32.7 (3) |
| $\beta^-_{0,30}$ | max: | 129.9 | (10) | 0.00046 (12) | avg: | 34.1 (3) |
| $\beta^-_{0,29}$ | max: | 191.5 | (9) | 0.020 (4) | avg: | 51.5 (3) |
| $\beta^-_{0,28}$ | max: | 205.9 | (9) | 0.0082 (18) | avg: | 55.6 (3) |
| $\beta^-_{0,27}$ | max: | 208.4 | (9) | 0.0051 (12) | avg: | 56.3 (3) |
| $\beta^-_{0,26}$ | max: | 222.6 | (9) | 0.106 (22) | avg: | 60.5 (3) |
| $\beta^-_{0,25}$ | max: | 243.3 | (10) | 0.0011 (4) | avg: | 66.6 (3) |
| $\beta^-_{0,24}$ | max: | 281.9 | (9) | 0.025 (5) | avg: | 78.1 (3) |
| $\beta^-_{0,23}$ | max: | 302.8 | (9) | 0.088 (18) | avg: | 84.4 (3) |
| $\beta^-_{0,22}$ | max: | 306.9 | (9) | 0.035 (7) | avg: | 85.7 (3) |
| $\beta^-_{0,21}$ | max: | 323.3 | (9) | 0.54 (10) | avg: | 90.7 (3) |
| $\beta^-_{0,20}$ | max: | 326.0 | (9) | 0.014 (3) | avg: | 91.5 (3) |
| $\beta^-_{0,19}$ | max: | 343.8 | (9) | 0.0040 (8) | avg: | 97.0 (3) |
| $\beta^-_{0,18}$ | max: | 345.4 | (9) | 0.14 (3) | avg: | 97.5 (3) |
| $\beta^-_{0,17}$ | max: | 362.1 | (9) | 0.019 (4) | avg: | 102.7 (3) |
| $\beta^-_{0,16}$ | max: | 366.7 | (10) | 0.00111 (22) | avg: | 104.1 (3) |
| $\beta^-_{0,15}$ | max: | 555.3 | (9) | 0.013 (3) | avg: | 165.6 (4) |
| $\beta^-_{0,14}$ | max: | 773.1 | (10) | 0.0046 (12) | avg: | 241.3 (4) |
| $\beta^-_{0,13}$ | max: | 779.9 | (9) | 1.8 (4) | avg: | 243.7 (4) |
| $\beta^-_{0,11}$ | max: | 806.7 | (9) | 0.037 (8) | avg: | 253.3 (4) |
| $\beta^-_{0,10}$ | max: | 814.9 | (9) | 0.042 (9) | avg: | 256.3 (4) |
| $\beta^-_{0,9}$ | max: | 819.4 | (9) | 0.049 (10) | avg: | 257.9 (4) |
| $\beta^-_{0,8}$ | max: | 863.1 | (9) | 0.032 (9) | avg: | 273.8 (4) |
| $\beta^-_{0,7}$ | max: | 869.0 | (9) | 0.004 (4) | avg: | 275.9 (4) |
| $\beta^-_{0,6}$ | max: | 914.5 | (9) | 9.1 (17) | avg: | 292.6 (4) |
| $\beta^-_{0,5}$ | max: | 1025.5 | (9) | 0.24 (6) | avg: | 333.9 (4) |
| $\beta^-_{0,4}$ | max: | 1069.6 | (9) | 15 (3) | avg: | 350.5 (4) |
| $\beta^-_{0,3}$ | max: | 1087.8 | (9) | 0.27 (19) | avg: | 357.4 (4) |
| $\beta^-_{0,2}$ | max: | 1099.1 | (9) | 67 (13) | avg: | 361.7 (4) |
| $\beta^-_{0,1}$ | max: | 1119.3 | (9) | 6 (6) | avg: | 369.4 (4) |
| $\beta^-_{0,0}$ | max: | 1149.2 | (9) | 1 | avg: | 380.8 (4) |

## 5 Photon Emissions

### 5.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Ra) | 10.6241 — 18.3539 | | 24 (3) | |
| $XK\alpha_2$ | (Ra) | 85.43 | | 1.44 (19) | } $K\alpha$ |
| $XK\alpha_1$ | (Ra) | 88.47 | | 2.3 (3) | } |
| $XK\beta_3$ | (Ra) | 99.432 | } | | |
| $XK\beta_1$ | (Ra) | 100.13 | } | 0.83 (11) | $K\beta_1'$ |
| $XK\beta_5''$ | (Ra) | 100.738 | } | | |
| $XK\beta_2$ | (Ra) | 102.89 | } | | |
| $XK\beta_4$ | (Ra) | 103.295 | } | 0.27 (4) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Ra) | 103.74 | } | | |
| XL | (At) | 9.8964 — 16.7291 | | 0.0054 (13) | |
| $XK\alpha_2$ | (At) | 78.94 | | 0.00056 (15) | } $K\alpha$ |
| $XK\alpha_1$ | (At) | 81.51 | | 0.00092 (25) | } |
| $XK\beta_3$ | (At) | 91.73 | } | | |
| $XK\beta_1$ | (At) | 92.315 | } | 0.00031 (11) | $K\beta_1'$ |
| $XK\beta_5''$ | (At) | 92.883 | } | | |
| $XK\beta_2$ | (At) | 94.846 | } | | |
| $XK\beta_4$ | (At) | 95.211 | } | 0.00011 (6) | $K\beta_2'$ |
| $XKO_{2,3}$ | (At) | 95.595 | } | | |

### 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{2,1}$(Ra) | 20.27 (5) | 12.3 (26) | [E1] | 7.76 (22) | 1.4 (3) |
| $\gamma_{1,0}$(Ra) | 29.78 (4) | 26 (7) | M1+8.26%E2 | 370 (50) | 0.070 (17) |
| $\gamma_{3,1}$(Ra) | 31.69 (5) | 0.35 | M1+7.27%E2 | 260 (80) | 0.00135 |
| $\gamma_{9,8}$(Ra) | 43.5 (2) | 0.0044 | E1 | 1.015 (19) | 0.0022 |
| $\gamma_{5,4}$(Ra) | 44.0 (1) | 0.178 | M1+21.3%E2 | 131 (12) | 0.00135 |
| $\gamma_{4,1}$(Ra) | 49.80 (5) | 4.3 (10) | E1 | 0.708 (10) | 2.5 (6) |
| $\gamma_{2,0}$(Ra) | 50.10 (2) | 56 (12) | E1 | 0.696 (10) | 33 (7) |
| $\gamma_{1,0}$(At) | 58.9 (2) | 0.0095 (36) | M1 | 10.87 (19) | 0.0008 (3) |
| $\gamma_{3,0}$(Ra) | 61.43 (5) | 0.34 (7) | E2 | 96.5 (14) | 0.0035 (7) |
| $\gamma_{5,3}$(Ra) | 62.31 (6) | 0.022 (10) | E1 | 0.389 (6) | 0.016 (7) |
| $\gamma_{5,2}$(Ra) | 73.5 (1) | 0.054 (38) | E2 | 40.8 (6) | 0.0013 (9) |
| $\gamma_{4,0}$(Ra) | 79.65 (2) | 10.8 (22) | E1 | 0.202 (3) | 9.0 (18) |
| $\gamma_{13,7}$(Ra) | 89.08 (10) | 0.054 (11) | | | 0.054 (11) |
| $\gamma_{5,1}$(Ra) | 93.88 (5) | 0.067 (16) | E1 | 0.1305 (18) | 0.059 (14) |
| $\gamma_{6,5}$(Ra) | 111.05 (3) | 0.0049 (14) | | | 0.0049 (14) |
| $\gamma_{13,6}$(Ra) | 134.60 (2) | 0.62 (12) | [E1] | 0.234 (3) | 0.5 (1) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{4,2}$(At) | 145.3 (3) | 0.00078 (47) | M1+(E2) | 2.9 (13) | 0.0002 (1) |
| $\gamma_{2,0}$(At) | 150.9 (2) | 0.0135 (12) | E2 | 1.417 (21) | 0.0056 (5) |
| $\gamma_{6,4}$(Ra) | 155.5 (5) | 0.0027 | | | 0.0027 |
| $\gamma_{6,3}$(Ra) | 173.35 (5) | 0.36 (15) | M1,E2 | 2.1 (12) | 0.115 (22) |
| $\gamma_{6,2}$(Ra) | 184.65 (5) | 0.24 (6) | E1 | 0.1092 (15) | 0.22 (5) |
| $\gamma_{7,4}$(Ra) | 200.7 (2) | 0.0027 (10) | | | 0.0027 (10) |
| $\gamma_{6,1}$(Ra) | 204.85 (5) | 2.8 (5) | M1+1.42%E2 | 2.02 (5) | 0.92 (18) |
| $\gamma_{9,5}$(Ra) | 205.6 (2) | 0.0090 (17) | E2 | 0.530 (8) | 0.0059 (11) |
| $\gamma_{10,5}$(Ra) | 210.60 (5) | 0.0105 (21) | E1 | 0.0798 (11) | 0.0097 (19) |
| $\gamma_{7,3}$(Ra) | 218.80 (5) | 0.0232 (46) | M1 | 1.701 (24) | 0.0086 (17) |
| $\gamma_{6,0}$(Ra) | 234.70 (5) | 6.5 (12) | M1(+0.5%E2) | 1.393 (16) | 2.7 (5) |
| $\gamma_{8,2}$(Ra) | 236.05 (5) | 0.029 (8) | E1 | 0.0610 (9) | 0.027 (8) |
| $\gamma_{13,5}$(Ra) | 245.60 (5) | 0.019 (4) | | | 0.019 (4) |
| $\gamma_{9,4}$(Ra) | 250.25 (5) | 0.0043 | M1+81.5%E2 | 0.44 (7) | 0.003 |
| $\gamma_{7,1}$(Ra) | 250.25 (5) | 0.035 | M1 | 1.170 (16) | 0.016 |
| $\gamma_{10,4}$(Ra) | 254.6 (2) | 0.0060 (13) | E1 | 0.0512 (7) | 0.0057 (12) |
| $\gamma_{8,1}$(Ra) | 256.18 (5) | 0.025 (5) | E2 | 0.250 (4) | 0.020 (4) |
| $\gamma_{11,4}$(Ra) | 262.9 (2) | 0.0037 (12) | E1 | 0.0475 (7) | 0.0035 (11) |
| $\gamma_{10,3}$(Ra) | 272.8 (2) | 0.0064 (23) | M1+E2 | 0.6 (4) | 0.004 (1) |
| $\gamma_{7,0}$(Ra) | 280.7 (5) | 0.0003 | | | 0.0003 |
| $\gamma_{11,3}$(Ra) | 280.7 (5) | 0.0003 | | | 0.0003 |
| $\gamma_{8,0}$(Ra) | 286.0 (2) | 0.0069 (24) | M1+E2 | 0.5 (4) | 0.0046 (10) |
| $\gamma_{13,4}$(Ra) | 289.67 (5) | 0.21 | | | 0.21 |
| $\gamma_{14,4}$(Ra) | 296.5 (2) | 0.0022 (7) | M1+1.66%E2 | 0.723 (9) | 0.0013 (4) |
| $\gamma_{9,1}$(Ra) | 299.95 (5) | 0.0207 (41) | E1 | 0.0352 (5) | 0.020 (4) |
| $\gamma_{10,1}$(Ra) | 304.40 (5) | 0.0142 (28) | M1+6.3%E2(+E0) | 0.647 (14) | 0.0086 (17) |
| $\gamma_{15,8}$(Ra) | 307.93 (5) | 0.012 (3) | | | 0.012 (3) |
| $\gamma_{13,3}$(Ra) | 307.93 (5) | 0.0013 (13) | | | 0.0013 (13) |
| $\gamma_{11,1}$(Ra) | 312.65 (5) | 0.026 (6) | M1+2.5%E2 | 0.621 (10) | 0.016 (4) |
| $\gamma_{14,3}$(Ra) | 314.6 (2) | 0.0023 (7) | E1 | 0.0316 (5) | 0.0022 (7) |
| $\gamma_{13,2}$(Ra) | 319.25 (5) | 0.73 (14) | M1+3.14%E2 | 0.583 (10) | 0.46 (9) |
| $\gamma_{9,0}$(Ra) | 329.80 (5) | 0.025 (5) | (E1) | 0.0285 (4) | 0.024 (5) |
| $\gamma_{10,0}$(Ra) | 334.30 (6) | 0.0119 (24) | M1+27.12%E2 | 0.414 (13) | 0.0084 (17) |
| $\gamma_{13,1}$(Ra) | 339.50 (5) | 0.062 (13) | | | 0.062 (13) |
| $\gamma_{11,0}$(Ra) | 342.50 (7) | 0.0145 (30) | M1+62.5%E2 | 0.250 (5) | 0.0116 (24) |
| $\gamma_{12,0}$(Ra) | 350.5 (2) | 0.0028 (15) | E1 | 0.0249 (4) | 0.0027 (15) |
| $\gamma_{13,0}$(Ra) | 369.32 (5) | 0.089 (18) | | | 0.089 (18) |
| $\gamma_{18,13}$(Ra) | 434.4 (1) | 0.0022 (7) | | | 0.0022 (7) |
| $\gamma_{16,11}$(Ra) | 439.6 (3) | 0.00030 (8) | | | 0.00030 (8) |
| $\gamma_{17,11}$(Ra) | 444.5 (3) | 0.0011 (4) | | | 0.0011 (4) |
| $\gamma_{16,9}$(Ra) | 452.9 (2) | 0.0008 | | | 0.0008 |
| $\gamma_{17,10}$(Ra) | 452.9 (2) | 0.0008 | | | 0.0008 |
| $\gamma_{17,9}$(Ra) | 457.5 (2) | 0.0008 | | | 0.0008 |
| $\gamma_{18,10}$(Ra) | 469.3 (2) | 0.001 | | | 0.001 |
| $\gamma_{15,5}$(Ra) | 469.3 (2) | 0.001 | | | 0.001 |
| $\gamma_{19,9}$(Ra) | 475.4 (1) | 0.0027 | | | 0.0027 |
| $\gamma_{21,12}$(Ra) | 475.4 (1) | 0.003 | | | 0.003 |
| $\gamma_{20,11}$(Ra) | 480.9 (3) | 0.0013 (4) | | | 0.0013 (4) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{20,9}$(Ra) | 493.4 (2) | 0.0024 (7) | | | 0.0024 (7) |
| $\gamma_{17,7}$(Ra) | 506.9 (2) | 0.0022 (7) | | | 0.0022 (7) |
| $\gamma_{23,9}$(Ra) | 516.7 (2) | 0.0032 (8) | | | 0.0032 (8) |
| $\gamma_{24,11}$(Ra) | 524.8 (2) | 0.0043 (12) | | | 0.0043 (12) |
| $\gamma_{24,10}$(Ra) | 533.1 (3) | 0.0019 (7) | | | 0.0019 (7) |
| $\gamma_{20,8}$(Ra) | 537.2 (2) | 0.0032 | | | 0.0032 |
| $\gamma_{24,9}$(Ra) | 537.2 (2) | 0.0019 | | | 0.0019 |
| $\gamma_{21,8}$(Ra) | 539.8 (2) | 0.0059 (18) | | | 0.0059 (18) |
| $\gamma_{21,7}$(Ra) | 545.4 (4) | 0.00030 (8) | | | 0.00030 (8) |
| $\gamma_{17,6}$(Ra) | 552.3 (2) | 0.0027 (8) | | | 0.0027 (8) |
| $\gamma_{22,8}$(Ra) | 556.3 (3) | 0.0011 (4) | | | 0.0011 (4) |
| $\gamma_{18,6}$(Ra) | 569.03 (8) | 0.049 (11) | | | 0.049 (11) |
| $\gamma_{25,9}$(Ra) | 576.1 (4) | 0.0011 (4) | | | 0.0011 (4) |
| $\gamma_{24,8}$(Ra) | 581.3 (4) | 0.0013 (4) | | | 0.0013 (4) |
| $\gamma_{26,10}$(Ra) | 592.3 (2) | 0.0032 (10) | | | 0.0032 (10) |
| $\gamma_{26,9}$(Ra) | 596.9 (4) | 0.0008 (3) | | | 0.0008 (3) |
| $\gamma_{28,11}$(Ra) | 600.7 (4) | 0.00054 (14) | | | 0.00054 (14) |
| $\gamma_{22,6}$(Ra) | 607.6 (3) | 0.0022 (7) | | | 0.0022 (7) |
| $\gamma_{28,9}$(Ra) | 613.6 (4) | 0.0011 (4) | | | 0.0011 (4) |
| $\gamma_{24,6}$(Ra) | 632.7 (3) | 0.0022 (7) | | | 0.0022 (7) |
| $\gamma_{17,5}$(Ra) | 663.7 (3) | 0.0011 (4) | | | 0.0011 (4) |
| $\gamma_{29,8}$(Ra) | 671.9 (4) | 0.00054 (14) | | | 0.00054 (14) |
| $\gamma_{17,4}$(Ra) | 708.3 (3) | 0.0013 (4) | | | 0.0013 (4) |
| $\gamma_{23,5}$(Ra) | 722.65 (5) | 0.038 (9) | | | 0.038 (9) |
| $\gamma_{18,4}$(Ra) | 724.15 (5) | 0.014 (4) | | | 0.014 (4) |
| $\gamma_{17,2}$(Ra) | 737.4 (3) | 0.0009 (3) | | | 0.0009 (3) |
| $\gamma_{18,3}$(Ra) | 742.4 (3) | 0.0011 (4) | | | 0.0011 (4) |
| $\gamma_{21,4}$(Ra) | 746.30 (5) | 0.020 (5) | | | 0.020 (5) |
| $\gamma_{18,2}$(Ra) | 753.65 (5) | 0.0094 (22) | | | 0.0094 (22) |
| $\gamma_{17,1}$(Ra) | 757.20 (5) | 0.0076 (20) | | | 0.0076 (20) |
| $\gamma_{22,4}$(Ra) | 762.6 (2) | 0.0024 (7) | | | 0.0024 (7) |
| $\gamma_{23,4}$(Ra) | 766.64 (5) | 0.022 (5) | | | 0.022 (5) |
| $\gamma_{21,2}$(Ra) | 775.83 (5) | 0.45 (9) | | | 0.45 (9) |
| $\gamma_{22,3}$(Ra) | 780.8 (1) | 0.003 (1) | | | 0.003 (1) |
| $\gamma_{23,3}$(Ra) | 784.93 (5) | 0.0086 (21) | | | 0.0086 (21) |
| $\gamma_{24,4}$(Ra) | 787.6 (2) | 0.0024 (7) | | | 0.0024 (7) |
| $\gamma_{17,0}$(Ra) | 787.6 (2) | 0.0003 (3) | | | 0.0003 (3) |
| $\gamma_{22,2}$(Ra) | 792.2 (3) | 0.00054 (14) | | | 0.00054 (14) |
| $\gamma_{23,2}$(Ra) | 796.22 (5) | 0.0108 (25) | | | 0.0108 (25) |
| $\gamma_{18,0}$(Ra) | 803.77 (5) | 0.059 (14) | | | 0.059 (14) |
| $\gamma_{19,0}$(Ra) | 806.0 (2) | 0.0013 (4) | | | 0.0013 (4) |
| $\gamma_{22,1}$(Ra) | 812.40 (6) | 0.021 (5) | | | 0.021 (5) |
| $\gamma_{27,5}$(Ra) | 816.5 (2) | 0.0013 (4) | | | 0.0013 (4) |
| $\gamma_{20,0}$(Ra) | 823.20 (7) | 0.0070 (16) | | | 0.0070 (16) |
| $\gamma_{21,0}$(Ra) | 825.95 (7) | 0.054 (13) | | | 0.054 (13) |
| $\gamma_{29,5}$(Ra) | 833.9 (2) | 0.0013 (4) | | | 0.0013 (4) |
| $\gamma_{24,1}$(Ra) | 837.5 (1) | 0.0097 (21) | | | 0.0097 (21) |
| $\gamma_{22,0}$(Ra) | 842.2 (1) | 0.0049 (11) | | | 0.0049 (11) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{26,4}$(Ra) | 846.85 (10) | 0.049 (13) | | | 0.049 (13) |
| $\gamma_{23,0}$(Ra) | 846.85 (10) | 0.005 (3) | | | 0.005 (3) |
| $\gamma_{28,4}$(Ra) | 863.6 (1) | 0.0038 (9) | | | 0.0038 (9) |
| $\gamma_{24,0}$(Ra) | 867.4 (1) | 0.0016 (4) | | | 0.0016 (4) |
| $\gamma_{26,2}$(Ra) | 876.5 (1) | 0.038 (9) | | | 0.038 (9) |
| $\gamma_{29,4}$(Ra) | 878.1 (2) | 0.0032 (8) | | | 0.0032 (8) |
| $\gamma_{28,2}$(Ra) | 893.1 (2) | 0.0024 (7) | | | 0.0024 (7) |
| $\gamma_{26,1}$(Ra) | 896.7 (2) | 0.013 (3) | | | 0.013 (3) |
| $\gamma_{29,2}$(Ra) | 907.6 (2) | 0.014 (3) | | | 0.014 (3) |
| $\gamma_{27,1}$(Ra) | 911.3 (3) | 0.0008 (3) | | | 0.0008 (3) |
| $\gamma_{28,1}$(Ra) | 913.6 (3) | 0.00041 (14) | | | 0.00041 (14) |
| $\gamma_{26,0}$(Ra) | 926.5 (3) | 0.0016 (4) | | | 0.0016 (4) |
| $\gamma_{27,0}$(Ra) | 941.2 (3) | 0.0030 (8) | | | 0.0030 (8) |
| $\gamma_{32,4}$(Ra) | 949.3 (4) | 0.00032 (8) | | | 0.00032 (8) |
| $\gamma_{29,0}$(Ra) | 958.0 (7) | 0.00035 (8) | | | 0.00035 (8) |
| $\gamma_{30,2}$(Ra) | 969.2 (4) | 0.00032 (8) | | | 0.00032 (8) |
| $\gamma_{31,2}$(Ra) | 975.2 (5) | 0.00016 (5) | | | 0.00016 (5) |
| $\gamma_{32,2}$(Ra) | 978.7 (4) | 0.00067 (12) | | | 0.00067 (12) |
| $\gamma_{30,1}$(Ra) | 989.4 (5) | 0.00014 (3) | | | 0.00014 (3) |
| $\gamma_{31,1}$(Ra) | 994.3 (3) | 0.00011 (3) | | | 0.00011 (3) |
| $\gamma_{32,1}$(Ra) | 999.3 (5) | 0.00019 (4) | | | 0.00019 (4) |
| $\gamma_{31,0}$(Ra) | 1025.1 (5) | 0.00014 (3) | | | 0.00014 (3) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 11.43 | (3) | d |
| $Q_\alpha$ | : | 5978.99 | (21) | keV |
| $\alpha$ | : | 100 | | % |
| $^{14}C$ | : | 6.4 | (1) | $\times 10^{-8}$ % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,30}$ | 5014.3 | ~0.00044 |
| $\alpha_{0,29}$ | 5026.1 | ~0.00063 |
| $\alpha_{0,28}$ | 5035.9 | ~0.0004 |
| $\alpha_{0,27}$ | 5056.5 | ~0.0002 |
| $\alpha_{0,26}$ | 5086 | ~0.0003 |
| $\alpha_{0,25}$ | 5112.5 | ~0.0006 |
| $\alpha_{0,24}$ | 5137.1 | ~0.0017 |
| $\alpha_{0,23}$ | 5151.98 (23) | 0.021 |
| $\alpha_{0,22}$ | 5173.10 (23) | 0.026 |
| $\alpha_{0,21}$ | 5211.1 (5) | 0.0053 |
| $\alpha_{0,20}$ | 5237.12 (23) | 0.041 |
| $\alpha_{0,19}$ | 5259.14 (21) | 0.042 |
| $\alpha_{0,18}$ | 5283.65 (21) | 0.093 |
| $\alpha_{0,17}$ | 5288.19 (23) | 0.16 (4) |
| $\alpha_{0,16}$ | 5339.37 (21) | 0.13 |
| $\alpha_{0,14}$ | 5366.37 (23) | 0.13 |
| $\alpha_{0,12}$ | 5432.83 (21) | 0.50 (8) |
| $\alpha_{0,11}$ | 5434.60 (21) | 1.60 (24) |
| $\alpha_{0,10}$ | 5481.7 (5) | 0.008 |
| $\alpha_{0,8}$ | 5502.12 (21) | 0.74 (25) |
| $\alpha_{0,6}$ | 5539.43 (21) | 10.6 (10) |
| $\alpha_{0,5}$ | 5606.99 (21) | 25.8 (11) |
| $\alpha_{0,4}$ | 5715.84 (21) | 49.6 (12) |
| $\alpha_{0,3}$ | 5747.14 (21) | 10.0 (3) |
| $\alpha_{0,2}$ | 5857.52 (21) | 0.32 (4) |
| $\alpha_{0,0}$ | 5871.63 (21) | 1.0 (2) |

## 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Rn) | 5.66 - 17.95 | | 30.1 (4) |
| $e_{AK}$ | (Rn) | | | 1.73 (21) |
| | KLL | 62.017 - 68.885 | } | |
| | KLX | 75.744 - 83.785 | } | |
| | KXY | 89.45 - 98.39 | } | |
| $ec_{17,13\ K}$ | (Rn) | 4.8 (2) | | 0.03 (3) |

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $ec_{2,1\ M}$ | (Rn) | 5.4 - 7.0 | 11.8 (16) |
| $ec_{12,7\ K}$ | (Rn) | 5.64 (4) | 0.1 (1) |
| $ec_{11,6\ K}$ | (Rn) | 8.38 (3) | 0.204 (13) |
| $ec_{2,1\ N}$ | (Rn) | 8.8 - 9.7 | 3.05 (41) |
| $ec_{2,0\ M}$ | (Rn) | 9.90 - 11.49 | 7.6 (6) |
| $ec_{5,4\ K}$ | (Rn) | 12.46 (1) | 0.0211 (15) |
| $ec_{2,0\ N}$ | (Rn) | 13.28 - 14.15 | 1.96 (15) |
| $ec_{4,3\ L}$ | (Rn) | 13.82 - 17.26 | 0.156 (31) |
| $ec_{3,1\ K}$ | (Rn) | 23.92 (1) | 7.28 (16) |
| $ec_{4,3\ M}$ | (Rn) | 27.40 - 28.99 | 0.042 (8) |
| $ec_{4,3\ N}$ | (Rn) | 30.78 - 31.65 | 0.0108 (22) |
| $ec_{4,2\ K}$ | (Rn) | 45.87 (2) | 12.40 (36) |
| $ec_{12,9\ L}$ | (Rn) | 51.5 - 54.9 | 0.039 (17) |
| $ec_{4,1\ K}$ | (Rn) | 55.81 (1) | 18.0 (5) |
| $ec_{4,0\ K}$ | (Rn) | 60.24 (1) | 1.98 (10) |
| $ec_{6,4\ K}$ | (Rn) | 81.14 (6) | 0.249 (25) |
| $ec_{17,13\ L}$ | (Rn) | 85.2 - 88.6 | 0.021 (15) |
| $ec_{12,7\ L}$ | (Rn) | 85.99 - 89.43 | 0.064 (32) |
| $ec_{11,6\ L}$ | (Rn) | 88.73 - 92.17 | 0.0375 (23) |
| $ec_{5,4\ L}$ | (Rn) | 92.808 - 96.250 | 0.214 (15) |
| $ec_{12,7\ M}$ | (Rn) | 99.57 - 101.16 | 0.017 (10) |
| $ec_{3,1\ L}$ | (Rn) | 104.271 - 107.710 | 1.373 (30) |
| $ec_{5,4\ M}$ | (Rn) | 106.383 - 107.972 | 0.0577 (41) |
| $ec_{5,4\ N}$ | (Rn) | 109.770 - 110.634 | 0.0150 (11) |
| $ec_{3,1\ M}$ | (Rn) | 117.846 - 119.435 | 0.328 (7) |
| $ec_{3,1\ N}$ | (Rn) | 121.230 - 122.097 | 0.0854 (19) |
| $ec_{4,2\ L}$ | (Rn) | 126.22 - 129.66 | 2.30 (6) |
| $ec_{4,1\ L}$ | (Rn) | 136.16 - 139.60 | 3.27 (9) |
| $ec_{4,2\ M}$ | (Rn) | 139.80 - 141.39 | 0.547 (15) |
| $ec_{4,0\ L}$ | (Rn) | 140.587 - 144.020 | 0.373 (12) |
| $ec_{4,2\ N}$ | (Rn) | 143.18 - 144.05 | 0.143 (4) |
| $ec_{4,1\ M}$ | (Rn) | 149.735 - 151.324 | 0.777 (21) |
| $ec_{8,3\ K}$ | (Rn) | 151.09 (3) | 0.019 (16) |
| $ec_{4,1\ N}$ | (Rn) | 153.120 - 153.986 | 0.203 (5) |
| $ec_{17,7\ K}$ | (Rn) | 153.2 (3) | 0.022 (22) |
| $ec_{4,0\ M}$ | (Rn) | 154.162 - 155.751 | 0.0891 (35) |
| $ec_{4,0\ N}$ | (Rn) | 157.540 - 158.413 | 0.0232 (9) |
| $ec_{6,4\ L}$ | (Rn) | 161.49 - 164.93 | 0.058 (5) |
| $ec_{5,0\ K}$ | (Rn) | 171.07 (1) | 9.06 (27) |
| $ec_{6,4\ M}$ | (Rn) | 175.07 - 176.66 | 0.0142 (13) |
| $ec_{6,2\ K}$ | (Rn) | 225.47 (1) | 1.55 (7) |
| $ec_{6,0\ K}$ | (Rn) | 239.88 (1) | 0.992 (25) |
| $ec_{5,0\ L}$ | (Rn) | 251.415 - 254.850 | 1.65 (4) |
| $ec_{5,0\ M}$ | (Rn) | 264.990 - 266.579 | 0.391 (10) |
| $ec_{5,0\ N}$ | (Rn) | 268.370 - 269.241 | 0.1019 (28) |
| $ec_{8,1\ K}$ | (Rn) | 273.279 (15) | 0.135 (4) |
| $ec_{6,2\ L}$ | (Rn) | 305.823 - 309.260 | 0.281 (9) |
| $ec_{6,2\ M}$ | (Rn) | 319.398 - 320.987 | 0.0666 (21) |

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $ec_{6,0\ L}$ | (Rn) | 320.234 - 323.670 | 0.177 (5) |
| $ec_{6,2\ N}$ | (Rn) | 322.780 - 323.649 | 0.0174 (5) |
| $ec_{6,0\ M}$ | (Rn) | 333.809 - 335.398 | 0.0420 (11) |
| $ec_{6,0\ N}$ | (Rn) | 337.19 - 338.06 | 0.0109 (3) |
| $ec_{11,0\ K}$ | (Rn) | 346.636 (12) | 0.213 (7) |
| $ec_{8,1\ L}$ | (Rn) | 353.628 - 357.070 | 0.0240 (6) |
| $ec_{11,0\ L}$ | (Rn) | 426.985 - 430.420 | 0.0378 (13) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Rn) | 10.1372 — 17.2578 | | 22.1 (4) | |
| $XK\alpha_2$ | (Rn) | 81.07 | | 14.86 (23) | } $K\alpha$ |
| $XK\alpha_1$ | (Rn) | 83.78 | | 24.5 (4) | } |
| $XK\beta_3$ | (Rn) | 94.247 | } | | |
| $XK\beta_1$ | (Rn) | 94.868 | } | 8.50 (18) | $K\beta_1'$ |
| $XK\beta_5''$ | (Rn) | 95.449 | } | | |
| $XK\beta_2$ | (Rn) | 97.48 | } | | |
| $XK\beta_4$ | (Rn) | 97.853 | } | 2.72 (7) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Rn) | 98.357 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Rn) | 4.47 (1) | 54.9 (23) | E2 | 860000 | 0.0000064 |
| $\gamma_{2,1}$(Rn) | 9.90 (2) | 15.7 (21) | M1+E2 | 990 (40) | 0.0158 (20) |
| $\gamma_{2,0}$(Rn) | 14.37 (1) | 10.0 (8) | M1+E2 | 539 (15) | 0.0185 (13) |
| $\gamma_{4,3}$(Rn) | 31.87 (2) | 0.21 (4) | (E2) | 2010 (30) | 0.000105 (21) |
| $\gamma_{12,9}$(Rn) | 69.5 (1) | 0.059 (25) | M1 | 7.36 (11) | 0.007 (3) |
| $\gamma_{15,12}$(Rn) | 70.9 (2) | 0.0036 (11) | | | 0.0036 (11) |
| $\gamma_{11,7}$(Rn) | 102.2 (2) | 0.0008 (4) | | | 0.0008 (4) |
| $\gamma_{17,13}$(Rn) | 103.2 (2) | 0.064 (35) | M1+E2 | 9.6 (24) | 0.006 (3) |
| $\gamma_{12,7}$(Rn) | 104.04 (4) | 0.20 (5) | M1+E2 | 9.4 (24) | 0.0194 (21) |
| $\gamma_{11,6}$(Rn) | 106.78 (3) | 0.277 (17) | (M1) | 10.89 (16) | 0.0233 (14) |
| $\gamma_{12,6}$(Rn) | 108.5 (2) | 0.006 (3) | | | 0.006 (3) |
| $\gamma_{5,4}$(Rn) | 110.856 (10) | 0.369 (26) | E2 | 5.36 (8) | 0.058 (4) |
| $\gamma_{13,8}$(Rn) | 114.7 (2) | 0.010 (4) | | | 0.010 (4) |
| $\gamma_{3,1}$(Rn) | 122.319 (10) | 10.32 (21) | M1+E2 | 7.34 (11) | 1.238 (19) |
| $\gamma_{20,14}$(Rn) | 131.6 (2) | 0.006 (3) | | | 0.006 (3) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{14,8}$(Rn) | 138.3 (3) | 0.0017 (7) | | | 0.0017 (7) |
| $\gamma_{4,2}$(Rn) | 144.27 (2) | 18.8 (5) | M1+E2 | 4.59 (7) | 3.36 (8) |
| $\gamma_{17,12}$(Rn) | 147.2 (3) | 0.006 (3) | | | 0.006 (3) |
| $\gamma_{4,1}$(Rn) | 154.208 (10) | 28.2 (7) | M1 | 3.83 (6) | 5.84 (13) |
| $\gamma_{4,0}$(Rn) | 158.635 (10) | 3.18 (11) | M1+E2 | 3.46 (12) | 0.713 (16) |
| $\gamma_{16,8}$(Rn) | 165.8 (2) | 0.0054 (28) | | | 0.0054 (28) |
| $\gamma_{11,5}$(Rn) | 175.65 (15) | 0.017 (4) | | | 0.017 (4) |
| $\gamma_{12,5}$(Rn) | 177.3 (1) | 0.047 (4) | | | 0.047 (4) |
| $\gamma_{6,4}$(Rn) | 179.54 (6) | 0.480 (45) | M1+E2 | 2.12 (7) | 0.154 (14) |
| $\gamma_{20,12}$(Rn) | 199.3 (3) | 0.0030 (14) | | | 0.0030 (14) |
| $\gamma_{18,9}$(Rn) | 221.32 (24) | 0.038 (6) | E1 | 0.0675 (10) | 0.036 (6) |
| $\gamma_{19,8}$(Rn) | 247.2 (5) | 0.0097 (28) | | | 0.0097 (28) |
| $\gamma_{8,3}$(Rn) | 249.49 (3) | 0.061 (22) | M1+E2 | 0.6 (4) | 0.038 (10) |
| $\gamma_{17,7}$(Rn) | 251.6 (3) | 0.088 (27) | M1+E2 | 0.6 (4) | 0.055 (10) |
| $\gamma_{5,2}$(Rn) | 255.2 (2) | 0.048 (7) | | | 0.048 (7) |
| $\gamma_{17,6}$(Rn) | 255.7 (3) | 0.0055 (28) | | | 0.0055 (28) |
| $\gamma_{18,6}$(Rn) | 260.4 (3) | 0.0067 (28) | | | 0.0067 (28) |
| $\gamma_{5,0}$(Rn) | 269.463 (10) | 25.5 (6) | M1+E2 | 0.789 (14) | 14.23 (32) |
| $\gamma_{10,3}$(Rn) | 270.3 (4) | 0.0007 (4) | | | 0.0007 (4) |
| $\gamma_{23,12}$(Rn) | 286.0 (4) | 0.0011 (6) | | | 0.0011 (6) |
| $\gamma_{12,4}$(Rn) | 288.18 (3) | 0.167 (5) | E1 | 0.0364 (6) | 0.161 (5) |
| $\gamma_{6,2}$(Rn) | 323.871 (10) | 5.98 (14) | M1+E2 | 0.473 (17) | 4.06 (8) |
| $\gamma_{7,2}$(Rn) | 328.38 (3) | 0.209 (10) | (E1) | 0.0271 (4) | 0.203 (10) |
| $\gamma_{6,1}$(Rn) | 334.01 (6) | 0.110 (7) | (E2) | 0.1007 (15) | 0.100 (6) |
| $\gamma_{6,0}$(Rn) | 338.282 (10) | 4.08 (9) | M1 | 0.430 (6) | 2.85 (6) |
| $\gamma_{7,0}$(Rn) | 342.78 (2) | 0.232 (13) | E1 | 0.0246 (4) | 0.226 (13) |
| $\gamma_{23,9}$(Rn) | 355.5 (2) | 0.0043 (14) | | | 0.0043 (14) |
| $\gamma_{14,4}$(Rn) | 355.7 (2) | 0.0028 (14) | | | 0.0028 (14) |
| $\gamma_{8,2}$(Rn) | 361.89 (2) | 0.028 (7) | | | 0.028 (7) |
| $\gamma_{9,2}$(Rn) | 362.9 (2) | 0.016 (7) | | | 0.016 (7) |
| $\gamma_{22,7}$(Rn) | 368.56 (12) | 0.009 (4) | | | 0.009 (4) |
| $\gamma_{8,1}$(Rn) | 371.676 (15) | 0.665 (15) | M1 | 0.333 (5) | 0.499 (11) |
| $\gamma_{9,1}$(Rn) | 372.86 (6) | 0.052 | E1 | 0.0205 (3) | 0.051 |
| $\gamma_{8,0}$(Rn) | 376.26 (2) | 0.013 (4) | | | 0.013 (4) |
| $\gamma_{16,4}$(Rn) | 383.35 (2) | 0.007 (4) | | | 0.007 (4) |
| $\gamma_{14,3}$(Rn) | 387.7 (2) | 0.016 (6) | | | 0.016 (6) |
| $\gamma_{23,7}$(Rn) | 390.1 (2) | 0.0046 (21) | | | 0.0046 (21) |
| $\gamma_{11,2}$(Rn) | 430.6 (3) | 0.020 (6) | | | 0.020 (6) |
| $\gamma_{12,2}$(Rn) | 432.45 (3) | 0.0356 (29) | | | 0.0356 (29) |
| $\gamma_{11,0}$(Rn) | 445.033 (12) | 1.542 (48) | M1 | 0.205 (3) | 1.28 (4) |
| $\gamma_{20,4}$(Rn) | 487.5 (2) | 0.011 (2) | | | 0.011 (2) |
| $\gamma_{-1,1}$(Rn) | 490.8 (3) | 0.0017 (7) | | | 0.0017 (7) |
| $\gamma_{14,2}$(Rn) | 500.0 (4) | 0.0014 (6) | | | 0.0014 (6) |
| $\gamma_{14,1}$(Rn) | 510.0 (4) | 0.0004 (3) | | | 0.0004 (3) |
| $\gamma_{-1,2}$(Rn) | 523.2 (4) | 0.0014 (6) | | | 0.0014 (6) |
| $\gamma_{16,2}$(Rn) | 527.611 (13) | 0.073 (4) | | | 0.073 (4) |
| $\gamma_{-1,3}$(Rn) | 532.9 (4) | 0.0014 (6) | | | 0.0014 (6) |
| $\gamma_{16,1}$(Rn) | 537.6 (1) | 0.0021 (7) | | | 0.0021 (7) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{16,0}$(Rn) | 541.99 (2) | 0.0014 (6) | | | 0.0014 (6) |
| $\gamma_{21,3}$(Rn) | 545.8 (5) | 0.0011 (6) | | | 0.0011 (6) |
| $\gamma_{23,4}$(Rn) | 574.1 (7) | 0.0011 (6) | | | 0.0011 (6) |
| $\gamma_{17,2}$(Rn) | 579.6 (3) | 0.0014 (6) | | | 0.0014 (6) |
| $\gamma_{18,2}$(Rn) | 584.3 (3) | 0.0014 (6) | | | 0.0014 (6) |
| $\gamma_{17,0}$(Rn) | 594.0 (3) | 0.0014 (6) | | | 0.0014 (6) |
| $\gamma_{18,0}$(Rn) | 598.721 (24) | 0.092 (4) | | | 0.092 (4) |
| $\gamma_{19,2}$(Rn) | 609.31 (4) | 0.057 (3) | | | 0.057 (3) |
| $\gamma_{19,1}$(Rn) | 619.1 (4) | 0.0036 (11) | | | 0.0036 (11) |
| $\gamma_{19,0}$(Rn) | 623.68 (4) | 0.009 (4) | | | 0.009 (4) |
| $\gamma_{20,2}$(Rn) | 631.7 (7) | 0.0004 (3) | | | 0.0004 (3) |
| $\gamma_{20,1}$(Rn) | 641.7 (4) | 0.0017 (7) | | | 0.0017 (7) |
| $\gamma_{20,0}$(Rn) | 646.1 (5) | 0.0004 (4) | | | 0.0004 (4) |
| $\gamma_{22,2}$(Rn) | 696.9 (7) | 0.0007 (3) | | | 0.0007 (3) |
| $\gamma_{22,0}$(Rn) | 711.3 (2) | 0.0037 (10) | | | 0.0037 (10) |
| $\gamma_{23,2}$(Rn) | 718.4 (4) | 0.0014 (6) | | | 0.0014 (6) |
| $\gamma_{23,1}$(Rn) | 728.4 (8) | 0.00028 (14) | | | 0.00028 (14) |
| $\gamma_{23,0}$(Rn) | 732.8 (6) | 0.0006 (3) | | | 0.0006 (3) |
| $\gamma_{-1,25}$(Rn) | 737.2 (8) | 0.00028 (14) | | | 0.00028 (14) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 3.631 | (2) | d |
| $Q_\alpha$ | : | 5788.85 | (15) | keV |
| $\alpha$ | : | 100 | | % |
| $^{14}C$ | : | 5 | (1) | $\times 10^{-9}$ % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,4}$ | 5034.29 (18) | 0.0030 (5) |
| $\alpha_{0,3}$ | 5051.56 (17) | 0.0076 (10) |
| $\alpha_{0,2}$ | 5161.32 (18) | 0.0072 (8) |
| $\alpha_{0,1}$ | 5448.80 (15) | 5.25 (5) |
| $\alpha_{0,0}$ | 5685.48 (15) | 94.73 (5) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Rn) | 5.58 - 11.48 | | 0.498 (16) |
| $e_{AK}$ | (Rn) | | | 0.0151 (19) |
| | KLL | 62.017 - 68.885 | } | |
| | KLX | 75.744 - 83.785 | } | |
| | KXY | 89.45 - 98.39 | } | |
| $ec_{1,0\ K}$ | (Rn) | 142.590 (6) | | 0.46 (2) |
| $ec_{1,0\ L}$ | (Rn) | 222.938 - 226.376 | | 0.50 (3) |
| $ec_{1,0\ M}$ | (Rn) | 236.513 - 238.102 | | 0.134 (3) |
| $ec_{1,0\ N}$ | (Rn) | 239.900 - 240.764 | | 0.0347 (6) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Rn) | 10.137 — 17.28 | | 0.373 (16) | |
| XK$\alpha_2$ | (Rn) | 81.07 | | 0.130 (3) | } K$\alpha$ |
| XK$\alpha_1$ | (Rn) | 83.78 | | 0.214 (4) | } |
| XK$\beta_3$ | (Rn) | 94.247 | } | | |
| XK$\beta_1$ | (Rn) | 94.868 | } | 0.0743 (18) | K$\beta_1'$ |
| XK$\beta_5''$ | (Rn) | 95.449 | } | | |
| XK$\beta_2$ | (Rn) | 97.48 | } | | |
| XK$\beta_4$ | (Rn) | 97.853 | } | 0.0238 (7) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Rn) | 98.357 | } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Rn) | 240.986 (6) | 5.26 (5) | E2 | 0.276 (4) | 4.12 (4) |
| $\gamma_{2,1}$(Rn) | 292.7 (1) | 0.0072 (8) | E2 | 0.1487 (21) | 0.0063 (7) |
| $\gamma_{3,1}$(Rn) | 404.45 (9) | 0.0022 (5) | E1 | 0.01717 (24) | 0.0022 (5) |
| $\gamma_{4,1}$(Rn) | 422.04 (10) | 0.0030 (5) | [E1] | 0.01567 (22) | 0.0030 (5) |
| $\gamma_{3,0}$(Rn) | 645.44 (9) | 0.0054 (9) | E1 | 0.00663 (10) | 0.0054 (9) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 14.82 | (19) | d |
| $Q_{\beta^-}$ | : | 356 | (5) | keV |
| $\beta^-$ | : | 100 | | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,3}$ | 200 (5) | <0.01 | 2nd forbidden | >10.1 |
| $\beta^-_{0,2}$ | 235 (5) | <0.01 | 1st forbidden unique | >9.9 |
| $\beta^-_{0,1}$ | 316 (5) | 68.8 (20) | Allowed | 6.87 |
| $\beta^-_{0,0}$ | 356 (5) | 31.2 (20) | 1st forbidden | 7.38 |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|
| $e_{AL}$ | (Ac) | 5.87 - 19.69 | 15.7 (7) | | |
| $ec_{1,0\ L}$ | (Ac) | 20.24 - 24.22 | 29.2 (8) | | |
| $ec_{1,0\ M}$ | (Ac) | 35.09 - 36.87 | 7.2 (12) | | |
| $ec_{1,0\ N}$ | (Ac) | 38.82 - 39.78 | 1.86 (27) | | |
| $\beta^-_{0,3}$ | max: | 200 (5) | <0.01 | avg: | 54.0 (15) |
| $\beta^-_{0,2}$ | max: | 235 (5) | <0.01 | avg: | 70.5 (16) |
| $\beta^-_{0,1}$ | max: | 316 (5) | 68.8 (20) | avg: | 88.3 (16) |
| $\beta^-_{0,0}$ | max: | 356 (5) | 31.2 (20) | avg: | 100.7 (16) |

## 4 Photon Emissions

### 4.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. |
|---|---|---|---|
| XL | (Ac) | 10.8701 — 18.9228 | 13.6 (6) |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Ac) | 40.09 (5) | 68.8 (17) | E1 | 1.293 (19) | 30.0 (7) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 1600 | (7) | y |
| $Q_\alpha$ | : | 4870.62 | (25) | keV |
| $\alpha$ | : | 100 | | % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,4}$ | 4160 (2) | 0.0002 |
| $\alpha_{0,3}$ | 4191 (2) | 0.0008 |
| $\alpha_{0,2}$ | 4340 (1) | 0.0066 (22) |
| $\alpha_{0,1}$ | 4601 (1) | 5.95 (4) |
| $\alpha_{0,0}$ | 4784.34 (25) | 94.038 (40) |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $ec_{1,0\ K}$ | (Rn) | 87.814 (13) | 0.675 (11) |
| $ec_{1,0\ L}$ | (Rn) | 168.163 - 171.600 | 1.280 (18) |
| $ec_{1,0\ M}$ | (Rn) | 181.738 - 183.327 | 0.342 (5) |
| $ec_{1,0\ N}$ | (Rn) | 185.120 - 185.989 | 0.0892 (14) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. | |
|---|---|---|---|---|
| XL | (Rn) | 10.14 — 17.26 | 0.807 (14) | |
| $XK\alpha_2$ | (Rn) | 81.07 | 0.192 (4) | } $K\alpha$ |
| $XK\alpha_1$ | (Rn) | 83.78 | 0.317 (6) | } |
| $XK\beta_3$ | (Rn) | 94.247 } | | |
| $XK\beta_1$ | (Rn) | 94.868 } | 0.1098 (25) | $K\beta_1'$ |
| $XK\beta_5''$ | (Rn) | 95.449 } | | |
| $XK\beta_2$ | (Rn) | 97.48 } | | |
| $XK\beta_4$ | (Rn) | 97.853 } | 0.0351 (10) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Rn) | 98.357 } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Rn) | 186.211 (13) | 5.962 (48) | E2 | 0.677 (10) | 3.555 (19) |
| $\gamma_{2,1}$(Rn) | 262.27 (5) | 0.0066 (22) | [E2] | 0.209 (4) | 0.0055 (18) |
| $\gamma_{3,1}$(Rn) | 414.60 (5) | 0.0003 | [E1] | 0.01628 (23) | 0.0003 |
| $\gamma_{4,1}$(Rn) | 449.37 (10) | 0.0002 | [E1] | 0.01373 (20) | 0.0002 |
| $\gamma_{3,0}$(Rn) | 600.66 (5) | 0.0005 | [E1] | 0.00762 (11) | 0.0005 |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 5.75 | (4) | y |
| $Q_{\beta^-}$ | : | 45.8 | (7) | keV |
| $\beta^-$ | : | 100 | | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,4}$ | 12.7 (7) | 30 (10) | Allowed | 5.11 |
| $\beta^-_{0,3}$ | 25.6 (7) | 8.7 (9) | 1st forbidden | 6.2 |
| $\beta^-_{0,2}$ | 39.1 (7) | 49 (10) | Allowed | 6.45 |
| $\beta^-_{0,1}$ | 39.5 (7) | 12 (10) | 1st forbidden | 7.07 |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Ac) | 5.87 - 19.67 | 12 (5) | |
| $ec_{1,0\ M}$ | (Ac) | 1.28 - 3.06 | 9 (7) | |
| $ec_{1,0\ N}$ | (Ac) | 5.01 - 5.97 | 2.5 (21) | |
| $ec_{2,0\ M}$ | (Ac) | 1.67 - 3.45 | 67 (11) | |
| $ec_{2,0\ N}$ | (Ac) | 5.40 - 6.36 | 17.8 (28) | |
| $ec_{3,2\ M}$ | (Ac) | 8.52 - 10.30 | 7.17 (46) | |
| $ec_{3,2\ N}$ | (Ac) | 12.25 - 13.21 | 1.82 (12) | |
| $ec_{4,2\ L}$ | (Ac) | 6.6 - 10.5 | 21 (8) | |
| $ec_{4,2\ M}$ | (Ac) | 21.4 - 23.2 | 5.2 (19) | |
| $ec_{4,2\ N}$ | (Ac) | 25.1 - 26.1 | 1.38 (49) | |
| $ec_{4,3\ M}$ | (Ac) | 7.88 - 9.66 | 1.53 (31) | |
| $ec_{4,3\ N}$ | (Ac) | 11.61 - 12.57 | 0.39 (8) | |
| $\beta^-_{0,4}$ | max: | 12.7 (7) | 30 (10) | avg: 3.2 (2) |
| $\beta^-_{0,3}$ | max: | 25.6 (7) | 8.7 (9) | avg: 6.5 (2) |
| $\beta^-_{0,2}$ | max: | 39.1 (7) | 49 (10) | avg: 9.9 (2) |
| $\beta^-_{0,1}$ | max: | 39.5 (7) | 12 (10) | avg: 10.0 (2) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. |
|---|---|---|---|
| XL | (Ac) | 10.8701 — 18.9228 | 9.6 (19) |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Ac) | 6.28 (3) | 12 (10) | M2 | 6680000 (190000) | 0.0000018 (15) |
| $\gamma_{2,0}$(Ac) | 6.67 (2) | 89 (14) | E2 | 1560000 (40000) | 0.000057 (9) |
| $\gamma_{4,3}$(Ac) | 12.88 (11) | 2.30 (46) | E1 | 6.67 (18) | 0.30 (6) |
| $\gamma_{3,2}$(Ac) | 13.520 (36) | 11.0 (7) | E1 | 5.86 (10) | 1.6 (1) |
| $\gamma_{4,2}$(Ac) | 26.40 (11) | 28 (10) | M1+E2 | 201 (4) | 0.14 (5) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 10.0 | (1) | d |
| $Q_\alpha$ | : | 5935.1 | (14) | keV |
| $\alpha$ | : | 100 | | % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,48}$ | 4903.6 (14) | 0.0011 (4) |
| $\alpha_{0,47}$ | 4992.7 (14) | 0.0013 (3) |
| $\alpha_{0,46}$ | 5019.3 (14) | 0.00015 (5) |
| $\alpha_{0,45}$ | 5025.5 (14) | 0.00083 (21) |
| $\alpha_{0,44}$ | 5035.5 (14) | 0.0021 (3) |
| $\alpha_{0,43}$ | 5064.1 (14) | 0.00114 (18) |
| $\alpha_{0,42}$ | 5076.8 (14) | 0.0038 (19) |
| $\alpha_{0,41}$ | 5094.1 (14) | 0.015 (7) |
| $\alpha_{0,40}$ | 5129.0 (14) | 0.0058 (8) |
| $\alpha_{0,39}$ | 5162.1 (14) | 0.00066 (12) |
| $\alpha_{0,38}$ | 5195.1 (14) | 0.00015 (5) |
| $\alpha_{0,37}$ | 5203.3 (14) | 0.0101 (10) |
| $\alpha_{0,36}$ | 5210.2 (14) | 0.022 (1) |
| $\alpha_{0,35}$ | 5239.3 (14) | 0.0026 (5) |
| $\alpha_{0,34}$ | 5269.1 (14) | 0.048 (19) |
| $\alpha_{0,33}$ | 5287.6 (14) | 0.214 (10) |
| $\alpha_{0,32}$ | 5321.2 (14) | 0.007 (7) |
| $\alpha_{0,31}$ | 5341.9 (14) | 0.0027 (8) |
| $\alpha_{0,30}$ | 5356.2 (14) | 0.000097 (2) |
| $\alpha_{0,29}$ | 5379.0 (14) | 0.0020 (5) |
| $\alpha_{0,28}$ | 5391.2 (14) | 0.0006 (4) |
| $\alpha_{0,27}$ | 5414.5 (14) | 0.0030 (4) |
| $\alpha_{0,26}$ | 5428.3 (14) | 0.0023 (3) |
| $\alpha_{0,25}$ | 5430.1 (14) | 0.0028 (8) |
| $\alpha_{0,24}$ | 5435.8 (14) | 0.0083 (6) |
| $\alpha_{0,23}$ | 5443.3 (14) | 0.098 (19) |
| $\alpha_{0,22}$ | 5468.4 (14) | 0.00052 (18) |
| $\alpha_{0,21}$ | 5487.4 (14) | 0.0020 (3) |
| $\alpha_{0,20}$ | 5497.4 (14) | 0.0022 (7) |
| $\alpha_{0,19}$ | 5515.2 (14) | 0.0052 (19) |
| $\alpha_{0,18}$ | 5523.7 (14) | 0.013 (6) |
| $\alpha_{0,17}$ | 5540.1 (14) | 0.0072 (8) |
| $\alpha_{0,16}$ | 5546.5 (14) | 0.055 (12) |
| $\alpha_{0,15}$ | 5555.3 (14) | 0.084 (10) |
| $\alpha_{0,14}$ | 5563.3 (14) | 0.017 (7) |
| $\alpha_{0,13}$ | 5580.5 (14) | 0.95 (4) |
| $\alpha_{0,12}$ | 5599.3 (14) | 0.114 (7) |
| $\alpha_{0,11}$ | 5609.0 (14) | 1.09 (5) |
| $\alpha_{0,10}$ | 5637.3 (14) | 4.16 (23) |
| $\alpha_{0,9}$ | 5682.2 (14) | 1.31 (4) |
| $\alpha_{0,8}$ | 5686.4 (14) | 0.021 (14) |

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,7}$ | 5723.1 (14) | 2.03 (23) |
| $\alpha_{0,6}$ | 5730.5 (14) | 1.6 (3) |
| $\alpha_{0,5}$ | 5731.6 (14) | 1.24 (10) |
| $\alpha_{0,4}$ | 5731.9 (17) | 9.0 (5) |
| $\alpha_{0,3}$ | 5791.7 (14) | 6.2 (9) |
| $\alpha_{0,2}$ | 5793.1 (21) | 18.9 (20) |
| $\alpha_{0,1}$ | 5804.2 (14) | 0.3 |
| $\alpha_{0,0}$ | 5829.6 (14) | 52.4 (24) |

## 3 Electron Emissions

| | | Energy keV | | | Electrons per 100 disint. |
|---|---|---|---|---|---|
| $e_{AL}$ | (Fr) | 5.73 | - | 18.52 | 23.8 (12) |
| $e_{AK}$ | (Fr) | | | | 0.115 (9) |
| | KLL | 63.576 | - | 70.787 | } |
| | KLX | 77.720 | - | 86.101 | } |
| | KXY | 91.84 | - | 101.12 | } |
| $ec_{13,9\ K}$ | (Fr) | 2.4 | | (1) | 0.015 (7) |
| $ec_{7,0\ K}$ | (Fr) | 7.27 | | (3) | 1.84 (15) |
| $ec_{1,0\ L}$ | (Fr) | 7.39 | - | 11.00 | 7.0 (9) |
| $ec_{9,3\ K}$ | (Fr) | 10.40 | | (3) | 0.088 (6) |
| $ec_{2,0\ L}$ | (Fr) | 18.06 | - | 21.66 | 14.6 (12) |
| $ec_{8,1\ K}$ | (Fr) | 18.72 | | (3) | 0.0191 (12) |
| $ec_{3,0\ L}$ | (Fr) | 19.95 | - | 23.56 | 6.7 (6) |
| $ec_{1,0\ M}$ | (Fr) | 21.38 | - | 23.03 | 1.88 (25) |
| $ec_{11,6\ K}$ | (Fr) | 22.62 | | (4) | 0.0192 (14) |
| $ec_{11,5\ K}$ | (Fr) | 23.68 | | (3) | 0.113 (7) |
| $ec_{1,0\ N}$ | (Fr) | 24.87 | - | 25.77 | 0.49 (7) |
| $ec_{9,5\ L}$ | (Fr) | 31.6 | - | 35.2 | 0.1080 (16) |
| $ec_{2,0\ M}$ | (Fr) | 32.05 | - | 33.70 | 3.93 (33) |
| $ec_{3,0\ M}$ | (Fr) | 33.94 | - | 35.59 | 1.81 (17) |
| $ec_{2,0\ N}$ | (Fr) | 35.54 | - | 36.44 | 1.02 (9) |
| $ec_{3,0\ N}$ | (Fr) | 37.43 | - | 38.33 | 0.474 (45) |
| $ec_{6,3\ L}$ | (Fr) | 44.0 | - | 47.6 | 0.32 (7) |
| $ec_{13,7\ K}$ | (Fr) | 44.04 | | (3) | 0.0221 (14) |
| $ec_{4,2\ L}$ | (Fr) | 44.32 | - | 47.92 | 4.04 (25) |
| $ec_{9,5\ M}$ | (Fr) | 45.6 | - | 47.2 | 0.02914 (43) |
| $ec_{6,2\ L}$ | (Fr) | 45.637 | - | 49.246 | 0.80 (16) |
| $ec_{9,0\ K}$ | (Fr) | 48.93 | | (2) | 0.0968 (22) |
| $ec_{7,3\ L}$ | (Fr) | 51.22 | - | 54.82 | 0.166 (42) |
| $ec_{13,4\ K}$ | (Fr) | 52.80 | | (3) | 0.0270 (18) |
| $ec_{7,2\ L}$ | (Fr) | 53.10 | - | 56.71 | 0.411 (41) |
| $ec_{4,1\ L}$ | (Fr) | 54.91 | - | 58.52 | 0.52 (14) |
| $ec_{5,1\ L}$ | (Fr) | 55.23 | - | 58.84 | 0.0562 (43) |

| | | Energy keV | | | Electrons per 100 disint. |
|---|---|---|---|---|---|
| $ec_{10,3\ K}$ | (Fr) | 56.12 | | (3) | 1.12 (17) |
| $ec_{6,1\ L}$ | (Fr) | 56.2 | - | 59.8 | 0.136 (27) |
| $ec_{6,3\ M}$ | (Fr) | 58.0 | - | 59.6 | 0.086 (20) |
| $ec_{4,2\ M}$ | (Fr) | 58.31 | - | 59.96 | 0.96 (6) |
| $ec_{6,2\ M}$ | (Fr) | 59.627 | - | 61.277 | 0.207 (42) |
| $ec_{11,8\ L}$ | (Fr) | 60.2 | - | 63.8 | 0.053 (8) |
| $ec_{7,3\ M}$ | (Fr) | 65.21 | - | 66.86 | 0.045 (11) |
| $ec_{7,2\ M}$ | (Fr) | 67.09 | - | 68.74 | 0.111 (11) |
| $ec_{23,11\ K}$ | (Fr) | 68.05 | | (4) | 0.017 (16) |
| $ec_{7,3\ N}$ | (Fr) | 68.7 | - | 69.6 | 0.0118 (30) |
| $ec_{10,7\ L}$ | (Fr) | 68.78 | - | 72.38 | 0.86 (6) |
| $ec_{4,1\ M}$ | (Fr) | 68.90 | - | 70.55 | 0.142 (37) |
| $ec_{5,1\ M}$ | (Fr) | 69.22 | - | 70.87 | 0.0136 (10) |
| $ec_{6,1\ M}$ | (Fr) | 70.19 | - | 71.84 | 0.035 (7) |
| $ec_{7,2\ N}$ | (Fr) | 70.58 | - | 71.48 | 0.0292 (29) |
| $ec_{11,8\ M}$ | (Fr) | 74.2 | - | 75.8 | 0.0125 (19) |
| $ec_{10,6\ L}$ | (Fr) | 76.3 | - | 79.9 | 0.261 (25) |
| $ec_{10,5\ L}$ | (Fr) | 77.53 | - | 81.13 | 0.149 (46) |
| $ec_{16,7\ K}$ | (Fr) | 78.65 | | (4) | 0.013 (11) |
| $ec_{4,0\ L}$ | (Fr) | 81.02 | - | 84.62 | 1.76 (13) |
| $ec_{5,0\ L}$ | (Fr) | 81.28 | - | 84.88 | 0.088 (7) |
| $ec_{6,0\ L}$ | (Fr) | 82.3 | - | 85.9 | 0.33 (14) |
| $ec_{10,7\ M}$ | (Fr) | 82.77 | - | 84.42 | 0.204 (15) |
| $ec_{13,9\ L}$ | (Fr) | 84.85 | - | 88.46 | 0.011 (6) |
| $ec_{11,2\ K}$ | (Fr) | 86.84 | | (3) | 0.0432 (25) |
| $ec_{7,0\ L}$ | (Fr) | 89.8 | - | 93.4 | 0.586 (48) |
| $ec_{10,6\ M}$ | (Fr) | 90.3 | - | 91.9 | 0.062 (6) |
| $ec_{10,5\ M}$ | (Fr) | 91.52 | - | 93.17 | 0.040 (13) |
| $ec_{9,3\ L}$ | (Fr) | 92.9 | - | 96.5 | 0.0191 (13) |
| $ec_{10,0\ K}$ | (Fr) | 94.62 | | (3) | 0.16 (9) |
| $ec_{4,0\ M}$ | (Fr) | 95.01 | - | 96.66 | 0.426 (32) |
| $ec_{5,0\ M}$ | (Fr) | 95.27 | - | 96.92 | 0.0212 (16) |
| $ec_{6,0\ M}$ | (Fr) | 96.3 | - | 97.9 | 0.086 (39) |
| $ec_{7,0\ M}$ | (Fr) | 103.8 | - | 105.4 | 0.148 (14) |
| $ec_{11,5\ L}$ | (Fr) | 106.18 | - | 109.78 | 0.0465 (29) |
| $ec_{7,0\ N}$ | (Fr) | 107.3 | - | 108.2 | 0.0388 (33) |
| $ec_{13,2\ K}$ | (Fr) | 115.77 | | (3) | 0.0186 (12) |
| $ec_{11,5\ M}$ | (Fr) | 120.17 | - | 121.82 | 0.0119 (7) |
| $ec_{9,0\ L}$ | (Fr) | 131.43 | - | 135.04 | 0.01940 (44) |
| $ec_{10,3\ L}$ | (Fr) | 138.619 | - | 142.228 | 0.212 (21) |
| $ec_{10,3\ M}$ | (Fr) | 152.609 | - | 154.259 | 0.051 (5) |
| $ec_{10,0\ L}$ | (Fr) | 177.12 | - | 180.72 | 0.0465 (29) |
| $ec_{10,0\ M}$ | (Fr) | 191.11 | - | 192.76 | 0.0117 (9) |
| $ec_{33,4\ K}$ | (Fr) | 351.11 | | (3) | 0.0185 (14) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Fr) | 10.38 — 17.799 | | 18.7 (9) | |
| $XK\alpha_2$ | (Fr) | 83.23 | | 1.00 (8) | } $K\alpha$ |
| $XK\alpha_1$ | (Fr) | 86.1 | | 1.64 (12) | } |
| $XK\beta_3$ | (Fr) | 96.815 | } | | |
| $XK\beta_1$ | (Fr) | 97.474 | } | 0.57 (5) | $K\beta_1'$ |
| $XK\beta_5''$ | (Fr) | 98.069 | } | | |
| $XK\beta_2$ | (Fr) | 100.16 | } | | |
| $XK\beta_4$ | (Fr) | 100.548 | } | 0.19 (2) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Fr) | 100.972 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{2,1}$(Fr) | 10.6 | 7.7 (10) | M1 | 510 (7) | 0.015 (2) |
| $\gamma_{1,0}$(Fr) | 26.0 (1) | 9.4 (13) | E2 | 5940 (150) | 0.00159 (21) |
| $\gamma_{2,0}$(Fr) | 36.69 (3) | 19.8 (17) | E2 | 1092 (16) | 0.0181 (15) |
| $\gamma_{3,0}$(Fr) | 38.58 (4) | 9.1 (9) | E2 | 854 (13) | 0.0107 (10) |
| $\gamma_{8,4}$(Fr) | 46.24 (5) | 0.0090 (13) | [E1] | 0.841 (12) | 0.0049 (7) |
| $\gamma_{9,6}$(Fr) | 49.12 (4) | 0.0137 (14) | [E1] | 0.715 (11) | 0.0080 (8) |
| $\gamma_{9,5}$(Fr) | 50.2 | 0.15 | [E2] | 236.0 (34) | 0.00062 |
| $\gamma_{34,32}$(Fr) | 53.4 (4) | 0.074 | [M1] | 17.6 (5) | 0.004 |
| $\gamma_{13,10}$(Fr) | 57.71 (4) | 0.0075 (12) | (E1) | 0.465 (7) | 0.0051 (8) |
| $\gamma_{6,3}$(Fr) | 62.6 (3) | 0.44 (10) | [E2] | 81.2 (23) | 0.0053 (12) |
| $\gamma_{4,2}$(Fr) | 62.94 (3) | 5.81 (36) | M1 | 10.85 (15) | 0.49 (3) |
| $\gamma_{5,2}$(Fr) | 63.5 (3) | 0.0286 (41) | [E1] | 0.360 (7) | 0.021 (3) |
| $\gamma_{6,2}$(Fr) | 64.27 (3) | 1.13 (21) | M1+E2 | 23 (4) | 0.047 (4) |
| $\gamma_{7,3}$(Fr) | 69.86 (5) | 0.23 (6) | E2 | 47.9 (7) | 0.0047 (12) |
| $\gamma_{7,2}$(Fr) | 71.71 (4) | 0.57 (6) | E2 | 42.3 (6) | 0.0132 (13) |
| $\gamma_{4,1}$(Fr) | 73.55 (9) | 0.73 (19) | E2 | 37.5 (6) | 0.019 (5) |
| $\gamma_{5,1}$(Fr) | 73.85 (3) | 0.383 (29) | E1 | 0.240 (3) | 0.309 (23) |
| $\gamma_{6,1}$(Fr) | 74.82 (5) | 0.197 (39) | (M1+E2) | 12.15 (18) | 0.015 (3) |
| $\gamma_{11,8}$(Fr) | 78.8 | 0.082 (13) | M1 | 5.63 (8) | 0.0123 (19) |
| $\gamma_{10,7}$(Fr) | 87.41 (3) | 1.4 (1) | M1 | 4.16 (6) | 0.271 (19) |
| $\gamma_{10,6}$(Fr) | 94.90 (2) | 0.449 (43) | M1 | 3.28 (5) | 0.105 (10) |
| $\gamma_{10,5}$(Fr) | 96.16 (5) | 0.23 (7) | M1+E2 | 6.0 (14) | 0.033 (7) |
| $\gamma_{4,0}$(Fr) | 99.67 (5) | 3.09 (22) | M1+E2 | 3.06 (11) | 0.76 (5) |
| $\gamma_{5,0}$(Fr) | 99.89 (6) | 1.20 (9) | E1 | 0.1073 (15) | 1.08 (8) |
| $\gamma_{6,0}$(Fr) | 100.86 (4) | 0.54 (19) | M1+E2 | 4.6 (19) | 0.096 (8) |
| $\gamma_{13,9}$(Fr) | 103.48 (10) | 0.033 (12) | [M1,E2] | 10 (3) | 0.0030 (7) |
| $\gamma_{7,0}$(Fr) | 108.38 (3) | 2.87 (19) | M1+E2 | 10.27 (25) | 0.255 (16) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{9,3}$(Fr) | 111.52 (3) | 0.427 (29) | (E1) | 0.363 (5) | 0.313 (21) |
| $\gamma_{24,16}$(Fr) | 112.80 (2) | 0.00284 (41) | [E1] | 0.353 (5) | 0.0021 (3) |
| $\gamma_{23,15}$(Fr) | 114 | 0.0094 (14) | M1 | 9.86 (14) | 0.00087 (13) |
| $\gamma_{8,1}$(Fr) | 119.85 (3) | 0.104 (7) | [E1] | 0.305 (4) | 0.080 (5) |
| $\gamma_{14,9}$(Fr) | 121.06 (7) | 0.022 (6) | (E1) | 0.298 (4) | 0.017 (5) |
| $\gamma_{11,6}$(Fr) | 123.75 (4) | 0.112 (8) | [E1] | 0.282 (4) | 0.087 (6) |
| $\gamma_{11,5}$(Fr) | 124.81 (3) | 0.205 (13) | M1+E2 | 6.01 | 0.0292 (18) |
| $\gamma_{12,7}$(Fr) | 126.10 (5) | 0.0100 (9) | (E1) | 0.270 (4) | 0.0079 (7) |
| $\gamma_{15,9}$(Fr) | 129.22 (7) | 0.016 (9) | [M1,E2] | 5 (2) | 0.0027 (5) |
| $\gamma_{12,6}$(Fr) | 133.60 (3) | 0.0242 (20) | (E1) | 0.234 (3) | 0.0196 (16) |
| $\gamma_{12,4}$(Fr) | 134.85 (3) | 0.0393 (37) | (E1) | 0.229 (3) | 0.032 (3) |
| $\gamma_{26,14}$(Fr) | 137.4 (1) | 0.0023 (3) | | | 0.0023 (3) |
| $\gamma_{23,13}$(Fr) | 139.6 | 0.0068 (26) | M1+E2 | 3.9 (17) | 0.00139 (21) |
| $\gamma_{17,9}$(Fr) | 144.7 (2) | 0.0022 (6) | (M1+E2) | 3.79 | 0.00046 (12) |
| $\gamma_{13,7}$(Fr) | 145.15 (3) | 0.174 (11) | (E1) | 0.191 (3) | 0.146 (9) |
| $\gamma_{9,0}$(Fr) | 150.05 (3) | 0.815 (14) | E1 | 0.1766 (25) | 0.693 (12) |
| $\gamma_{13,6}$(Fr) | 152.64 (3) | 0.0230 (15) | [E1] | 0.1694 (24) | 0.0197 (13) |
| $\gamma_{13,4}$(Fr) | 153.92 (3) | 0.239 (15) | E1 | 0.1660 (23) | 0.205 (13) |
| $\gamma_{10,3}$(Fr) | 157.25 (3) | 1.73 (18) | M1+E2 | 3.8 (3) | 0.36 (3) |
| $\gamma_{18,9}$(Fr) | 161.35 (7) | 0.013 (6) | [M1,E2] | 2.5 (13) | 0.0036 (9) |
| $\gamma_{23,11}$(Fr) | 169.18 (4) | 0.037 (20) | [M1,E2] | 2.1 (11) | 0.012 (5) |
| $\gamma_{10,1}$(Fr) | 169.9 | 0.0139 (14) | | | 0.0139 (14) |
| $\gamma_{15,7}$(Fr) | 170.77 (5) | 0.015 (8) | (E1) | 0.1290 (18) | 0.013 (7) |
| $\gamma_{15,6}$(Fr) | 178.29 (3) | 0.0180 (13) | E1 | 0.1162 (16) | 0.0161 (12) |
| $\gamma_{16,7}$(Fr) | 179.78 (4) | 0.030 (11) | (M1,E2) | 1.8 (10) | 0.0108 (8) |
| $\gamma_{11,3}$(Fr) | 186.1 | 0.0127 (14) | | | 0.0127 (14) |
| $\gamma_{17,7}$(Fr) | 186.29 (3) | 0.0046 (6) | E1 | 0.1045 (15) | 0.0042 (5) |
| $\gamma_{16,6}$(Fr) | 187.2 | 0.0103 (7) | | | 0.0103 (7) |
| $\gamma_{11,2}$(Fr) | 187.96 (3) | 0.584 (33) | E1 | 0.1023 (14) | 0.53 (3) |
| $\gamma_{10,0}$(Fr) | 195.74 (3) | 0.37 (9) | M1+E2 | 1.5 (6) | 0.148 (9) |
| $\gamma_{23,10}$(Fr) | 197.50 (3) | 0.0284 (33) | E1 | 0.0908 (13) | 0.026 (3) |
| $\gamma_{12,2}$(Fr) | 197.7 (1) | 0.041 (5) | [E1] | 0.0906 (13) | 0.038 (5) |
| $\gamma_{11,1}$(Fr) | 198.47 (23) | 0.0205 (14) | [E1] | 0.0898 (13) | 0.0188 (13) |
| $\gamma_{29,13}$(Fr) | 205.07 (11) | 0.0015 (5) | | | 0.0015 (5) |
| $\gamma_{13,2}$(Fr) | 216.89 (3) | 0.343 (21) | (E1) | 0.0726 (10) | 0.32 (2) |
| $\gamma_{19,4}$(Fr) | 220.43 (8) | 0.0060 (18) | | | 0.0060 (18) |
| $\gamma_{11,0}$(Fr) | 224.59 (3) | 0.119 (9) | [E1] | 0.0669 (9) | 0.112 (8) |
| $\gamma_{13,1}$(Fr) | 228.2 (4) | 0.0046 (12) | | | 0.0046 (12) |
| $\gamma_{41,32}$(Fr) | 231.16 (7) | 0.012 (7) | (M1) | 1.338 (19) | 0.005 (3) |
| $\gamma_{14,2}$(Fr) | 236.0 (6) | 0.0017 (3) | | | 0.0017 (3) |
| $\gamma_{20,4}$(Fr) | 238.64 (8) | 0.0022 (7) | (M1) | 1.225 (17) | 0.0010 (3) |
| $\gamma_{15,3}$(Fr) | 240.68 (3) | 0.0124 (11) | [E1] | 0.0568 (8) | 0.0117 (10) |
| $\gamma_{23,9}$(Fr) | 243.12 (5) | 0.0067 (9) | [M1] | 1.163 (16) | 0.0031 (4) |
| $\gamma_{16,3}$(Fr) | 249.60 (3) | 0.0170 (13) | (E2) | 0.258 (4) | 0.0135 (10) |
| $\gamma_{13,0}$(Fr) | 253.46 (3) | 0.139 (8) | [E1] | 0.0504 (7) | 0.132 (8) |
| $\gamma_{17,3}$(Fr) | 256.0 (2) | 0.00039 (7) | [E1] | 0.0492 (7) | 0.00037 (7) |
| $\gamma_{15,0}$(Fr) | 279.18 (3) | 0.0317 (23) | E1 | 0.0403 (6) | 0.0305 (22) |
| $\gamma_{36,21}$(Fr) | 282.1 (2) | 0.00097 (9) | [M1] | 0.771 (11) | 0.00055 (5) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{23,7}$(Fr) | 284.75 (3) | 0.0077 (6) | [E1] | 0.0385 (5) | 0.0074 (6) |
| $\gamma_{25,7}$(Fr) | 298.33 (5) | 0.0028 (7) | (M1,E2) | 0.4 (3) | 0.0020 (3) |
| $\gamma_{34,13}$(Fr) | 317.23 (18) | 0.00065 (33) | M1 | 0.558 (8) | 0.00042 (21) |
| $\gamma_{27,6}$(Fr) | 321.77 (4) | 0.00340 (41) | [E1] | 0.0292 (4) | 0.0033 (4) |
| $\gamma_{21,0}$(Fr) | 348.33 (5) | 0.0030 (3) | | | 0.0030 (3) |
| $\gamma_{23,3}$(Fr) | 354.56 (6) | 0.0020 (7) | [E1] | 0.0236 (3) | 0.0020 (7) |
| $\gamma_{33,10}$(Fr) | 356.6 | 0.00026 (11) | | | 0.00026 (11) |
| $\gamma_{24,3}$(Fr) | 362.38 (3) | 0.0055 (5) | (E1) | 0.0225 (3) | 0.0054 (5) |
| $\gamma_{22,0}$(Fr) | 367.74 (12) | 0.00052 (18) | | | 0.00052 (18) |
| $\gamma_{34,10}$(Fr) | 374.98 (5) | 0.0019 (5) | [E1] | 0.0209 (3) | 0.0019 (5) |
| $\gamma_{31,7}$(Fr) | 388.07 (7) | 0.00125 (21) | | | 0.00125 (21) |
| $\gamma_{37,12}$(Fr) | 403.13 (10) | 0.00019 (16) | | | 0.00019 (16) |
| $\gamma_{33,8}$(Fr) | 405.95 (3) | 0.0079 (5) | [E1] | 0.01759 (25) | 0.0078 (5) |
| $\gamma_{32,5}$(Fr) | 417.90 (2) | 0.0056 (5) | | | 0.0056 (5) |
| $\gamma_{47,27}$(Fr) | 429.80 (18) | 0.00038 (19) | | | 0.00038 (19) |
| $\gamma_{36,10}$(Fr) | 434.82 (5) | 0.0029 (3) | | | 0.0029 (3) |
| $\gamma_{40,14}$(Fr) | 442.16 (8) | 0.0045 (7) | | | 0.0045 (7) |
| $\gamma_{30,3}$(Fr) | 443.43 (10) | 0.0001 | | | 0.0001 |
| $\gamma_{33,7}$(Fr) | 443.43 (10) | 0.0015 (5) | [E2] | 0.0494 (7) | 0.0014 (5) |
| $\gamma_{28,0}$(Fr) | 446.31 (10) | 0.0006 (4) | | | 0.0006 (4) |
| $\gamma_{33,6}$(Fr) | 451.04 (5) | 0.0036 (6) | [M1] | 0.215 (3) | 0.0030 (5) |
| $\gamma_{33,4}$(Fr) | 452.23 (3) | 0.13 (1) | [M1] | 0.213 (3) | 0.107 (8) |
| $\gamma_{29,0}$(Fr) | 458.79 (8) | 0.00053 (13) | | | 0.00053 (13) |
| $\gamma_{34,7}$(Fr) | 462.43 (13) | 0.00045 (11) | [E1] | 0.01338 (19) | 0.00044 (11) |
| $\gamma_{34,6}$(Fr) | 469.48 (5) | 0.0028 (4) | | | 0.0028 (4) |
| $\gamma_{32,2}$(Fr) | 480.85 (11) | 0.0340 (22) | | | 0.0340 (22) |
| $\gamma_{32,1}$(Fr) | 491.45 (10) | 0.00035 (14) | | | 0.00035 (14) |
| $\gamma_{31,0}$(Fr) | 496.9 (3) | 0.0015 (7) | | | 0.0015 (7) |
| $\gamma_{45,19}$(Fr) | 498.6 (6) | 0.00083 (21) | | | 0.00083 (21) |
| $\gamma_{33,3}$(Fr) | 512.5 (7) | 0.00055 (21) | | | 0.00055 (21) |
| $\gamma_{33,2}$(Fr) | 515.13 (3) | 0.0246 (15) | [M1] | 0.1506 (21) | 0.0214 (13) |
| $\gamma_{32,0}$(Fr) | 517.51 (3) | 0.0159 (10) | | | 0.0159 (10) |
| $\gamma_{36,7}$(Fr) | 522.14 (4) | 0.00208 (15) | | | 0.00208 (15) |
| $\gamma_{33,1}$(Fr) | 525.94 (17) | 0.0403 (25) | [M1] | 0.1425 (20) | 0.0353 (22) |
| $\gamma_{36,6}$(Fr) | 529.59 (3) | 0.0076 (7) | | | 0.0076 (7) |
| $\gamma_{36,4}$(Fr) | 530.87 (4) | 0.0047 (5) | | | 0.0047 (5) |
| $\gamma_{34,3}$(Fr) | 532.11 (9) | 0.00077 (21) | [E1] | 0.01005 (14) | 0.00076 (21) |
| $\gamma_{37,4}$(Fr) | 538.1 (1) | 0.0038 (10) | | | 0.0038 (10) |
| $\gamma_{43,12}$(Fr) | 545.8 (6) | 0.00053 (14) | | | 0.00053 (14) |
| $\gamma_{33,0}$(Fr) | 551.79 (3) | 0.0059 (16) | [M1] | 0.1254 (17) | 0.0052 (14) |
| $\gamma_{35,2}$(Fr) | 564.34 (11) | 0.00022 (9) | | | 0.00022 (9) |
| $\gamma_{40,8}$(Fr) | 567.48 (5) | 0.0012 (4) | | | 0.0012 (4) |
| $\gamma_{34,0}$(Fr) | 570.69 (3) | 0.0040 (5) | [E1] | 0.00874 (12) | 0.0040 (5) |
| $\gamma_{36,3}$(Fr) | 590.42 (5) | 0.00083 (14) | | | 0.00083 (14) |
| $\gamma_{36,2}$(Fr) | 593.87 (4) | 0.0029 (3) | | | 0.0029 (3) |
| $\gamma_{35,0}$(Fr) | 600.92 (3) | 0.0024 (5) | | | 0.0024 (5) |
| $\gamma_{37,2}$(Fr) | 600.92 (3) | 0.006 | | | 0.006 |
| $\gamma_{41,8}$(Fr) | 603.09 (4) | 0.00173 (21) | | | 0.00173 (21) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{43,9}$(Fr) | 628.95 (10) | 0.00032 (7) | | | 0.00032 (7) |
| $\gamma_{37,0}$(Fr) | 637.1 (7) | 0.00012 | | | 0.00012 |
| $\gamma_{38,0}$(Fr) | 645.94 (12) | 0.00015 (5) | | | 0.00015 (5) |
| $\gamma_{41,5}$(Fr) | 649.03 (4) | 0.0017 (5) | | | 0.0017 (5) |
| $\gamma_{47,10}$(Fr) | 656.18 (11) | 0.00049 (21) | | | 0.00049 (21) |
| $\gamma_{42,7}$(Fr) | 657.88 (5) | 0.0014 (3) | | | 0.0014 (3) |
| $\gamma_{42,4}$(Fr) | 667.14 (8) | 0.0021 (18) | | | 0.0021 (18) |
| $\gamma_{46,9}$(Fr) | 674.9 (3) | 0.00010 (5) | | | 0.00010 (5) |
| $\gamma_{39,0}$(Fr) | 679.36 (6) | 0.00066 (12) | | | 0.00066 (12) |
| $\gamma_{47,9}$(Fr) | 702.00 (14) | 0.00016 (7) | | | 0.00016 (7) |
| $\gamma_{48,10}$(Fr) | 747.0 (1) | 0.0011 (4) | | | 0.0011 (4) |
| $\gamma_{47,4}$(Fr) | 752.46 (12) | 0.00026 (7) | | | 0.00026 (7) |
| $\gamma_{43,1}$(Fr) | 754.04 (13) | 0.00023 (7) | | | 0.00023 (7) |
| $\gamma_{42,0}$(Fr) | 767.9 (3) | 0.00030 (6) | | | 0.00030 (6) |
| $\gamma_{43,0}$(Fr) | 780.6 (6) | 0.000055 (14) | | | 0.000055 (14) |
| $\gamma_{44,0}$(Fr) | 808.48 (10) | 0.0021 (3) | | | 0.0021 (3) |
| $\gamma_{46,0}$(Fr) | 824.2 (7) | 0.000049 | | | 0.000049 |

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(Q)

# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 21.772 | (3) | y |
| $Q_{\beta^-}$ | : | 44.8 | (8) | keV |
| $Q_\alpha$ | : | 5042.19 | (14) | keV |
| $\beta^-$ | : | 98.620 | (4) | % |
| $\alpha$ | : | 1.380 | (4) | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,3}$ | 6.9 (8) | 0.3 | Allowed | 6.9 |
| $\beta^-_{0,2}$ | 20.5 (8) | 10 | 1st forbidden | 6.8 |
| $\beta^-_{0,1}$ | 35.5 (8) | 35 | 1st forbidden | 7 |
| $\beta^-_{0,0}$ | 44.8 (8) | 53 | 1st forbidden | 7.1 |

# 3 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,24}$ | 4362.83 (15) | 0.00004 |
| $\alpha_{0,23}$ | 4422.03 (28) | 0.00008 |
| $\alpha_{0,22}$ | 4447.12 (26) | 0.0007 |
| $\alpha_{0,21}$ | 4459 (7) | 0.00007 |
| $\alpha_{0,20}$ | 4512 (5) | 0.00004 |
| $\alpha_{0,19}$ | 4581 (7) | 0.00004 |
| $\alpha_{0,18}$ | 4594.21 (17) | 0.0003 |
| $\alpha_{0,16}$ | 4712.89 (20) | |
| $\alpha_{0,15}$ | 4713.68 (19) | |
| $\alpha_{0,14}$ | 4714.88 (15) | 0.006 (3) |
| $\alpha_{0,13}$ | 4734.41 (17) | |
| $\alpha_{0,12}$ | 4737.50 (16) | 0.0012 |
| $\alpha_{0,11}$ | 4767.47 (15) | |
| $\alpha_{0,10}$ | 4769.35 (17) | 0.025 (7) |
| $\alpha_{0,9}$ | 4784.19 (15) | 0.0011 |
| $\alpha_{0,8}$ | 4795.58 (15) | 0.014 (7) |
| $\alpha_{0,6}$ | 4821.09 (15) | 0.001 |
| $\alpha_{0,5}$ | 4854.01 (15) | |
| $\alpha_{0,4}$ | 4855.36 (15) | 0.08 (1) |
| $\alpha_{0,3}$ | 4872.55 (15) | 0.087 (7) |
| $\alpha_{0,2}$ | 4899.23 (15) | 0.0015 |
| $\alpha_{0,1}$ | 4940.57 (15) | 0.546 (17) |
| $\alpha_{0,0}$ | 4953.23 (14) | 0.658 (14) |

## 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Th) | 5.8 - 20.3 | 3.9 | |
| $e_{AL}$ | (Fr) | 5.73 - 18.52 | 0.097 (10) | |
| $e_{AK}$ | (Fr) | | 0.00050 (15) | |
| | KLL | 63.576 - 70.787 } | | |
| | KLX | 77.720 - 86.101 } | | |
| | KXY | 91.84 - 101.12 } | | |
| $ec_{2,0\ L}$ | (Th) | 3.9 - 8.0 | 7.1 | |
| $ec_{1,0\ M}$ | (Th) | 4.1 - 6.0 | 27 | |
| $ec_{3,1\ L}$ | (Th) | 8.1 - 12.3 | 0.1016 (21) | |
| $ec_{2,1\ M}$ | (Th) | 10.0 - 11.9 | 0.11 | |
| $ec_{3,0\ L}$ | (Th) | 17.4 - 21.6 | 0.0568 (15) | |
| $ec_{2,0\ M}$ | (Th) | 19.2 - 21.0 | 1.8 | |
| $ec_{3,1\ M}$ | (Th) | 23.39 - 25.24 | 0.0259 (5) | |
| $ec_{3,0\ M}$ | (Th) | 32.7 - 34.6 | 0.01411 (29) | |
| $ec_{1,0\ M}$ | (Fr) | 8.3 - 9.9 | 0.528 (11) | |
| $ec_{4,2\ L}$ | (Fr) | 26.1 - 29.7 | 0.018 (17) | |
| $ec_{3,1\ L}$ | (Fr) | 50.65 - 54.26 | 0.053 (10) | |
| $ec_{3,0\ L}$ | (Fr) | 63.6 - 67.2 | 0.0135 (16) | |
| $ec_{3,1\ M}$ | (Fr) | 64.64 - 66.29 | 0.0140 (27) | |
| $ec_{4,1\ L}$ | (Fr) | 68.1 - 71.7 | 0.022 (14) | |
| $ec_{4,0\ L}$ | (Fr) | 81.0 - 84.6 | 0.022 (12) | |
| $\beta^-_{0,3}$ | max: | 6.9 (8) | 0.3 | avg: 1.7 (3) |
| $\beta^-_{0,2}$ | max: | 20.5 (8) | 10 | avg: 5.1 (3) |
| $\beta^-_{0,1}$ | max: | 35.5 (8) | 35 | avg: 9.0 (3) |
| $\beta^-_{0,0}$ | max: | 44.8 (8) | 53 | avg: 11.4 (3) |

## 5 Photon Emissions

### 5.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. | |
|---|---|---|---|---|
| XL | (Th) | 11.118 — 19.599 | 2.64 | |
| XL | (Fr) | 10.381 — 17.839 | 0.074 (8) | |
| $XK\alpha_2$ | (Fr) | 83.23 | 0.0043 (12) | } $K\alpha$ |
| $XK\alpha_1$ | (Fr) | 86.1 | 0.0070 (19) | } |
| $XK\beta_3$ | (Fr) | 96.815 } | | |
| $XK\beta_1$ | (Fr) | 97.474 } | 0.0024 (7) | $K\beta_1'$ |
| $XK\beta_5''$ | (Fr) | 98.069 } | | |

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| $XK\beta_2$ | (Fr) | 100.16 | } | | |
| $XK\beta_4$ | (Fr) | 100.548 | } | 0.00079 (22) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Fr) | 100.972 | } | | |

## 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Th) | 9.3 | 36 | E2 | 326000 | 0.00011 |
| $\gamma_{1,0}$(Fr) | 12.9 (1) | 0.698 | (E2) | 49860 (1000) | 0.000014 |
| $\gamma_{2,1}$(Th) | 15.2 (1) | 0.15 | M1 | 238 (5) | 0.00063 |
| $\gamma_{2,0}$(Th) | 24.33 (5) | 9.5 | M1+E2 | 340 (11) | 0.028 |
| $\gamma_{8,6}$(Fr) | 25.95 | 0.00000055 | | | 0.00000055 |
| $\gamma_{3,1}$(Th) | 28.57 (5) | 0.18 | E1 | 3.24 (7) | 0.042 |
| $\gamma_{6,5}$(Fr) | 33.5 (1) | 0.00033 (9) | [E1] | 1.99 (4) | 0.00011 (3) |
| $\gamma_{6,4}$(Fr) | 35.0 (2) | 0.000078 (28) | [E1] | 1.77 (4) | 0.000028 (10) |
| $\gamma_{3,0}$(Th) | 37.90 (3) | 0.12 | E1 | 1.54 (3) | 0.049 |
| $\gamma_{4,2}$(Fr) | 44.7 (1) | 0.025 (23) | [M1+E2] | 223 (200) | 0.00011 (3) |
| $\gamma_{13,9}$(Fr) | 51.06 | 0.00000028 | | | 0.00000028 |
| $\gamma_{10,6}$(Fr) | 52.32 | 0.0000014 | | | 0.0000014 |
| $\gamma_{14,11}$(Fr) | 53.7 (2) | 0.000064 (16) | [E1] | 0.563 (11) | 0.000041 (10) |
| $\gamma_{2,0}$(Fr) | 55.0 (1) | 0.0077 (14) | M1+E2 | 16.4 (8) | 0.00044 (8) |
| $\gamma_{16,11}$(Fr) | 55.80 (5) | 0.0000039 | | | 0.0000039 |
| $\gamma_{16,10}$(Fr) | 57.56 (5) | 0.0000032 | | | 0.0000032 |
| $\gamma_{8,5}$(Fr) | 59.4 (2) | 0.000059 (14) | [E1] | 0.430 (9) | 0.000041 (10) |
| $\gamma_{8,4}$(Fr) | 60.6 (3) | 0.000058 (14) | [E1] | 0.408 (9) | 0.000041 (10) |
| $\gamma_{3,1}$(Fr) | 69.28 (8) | 0.076 (14) | M1+E2 | 18.4 (19) | 0.0039 (6) |
| $\gamma_{14,10}$(Fr) | 70.6 (2) | 0.0023 (18) | [M1+E2] | 27 (19) | 0.000083 (30) |
| $\gamma_{16,9}$(Fr) | 72.5 (2) | 0.000086 (38) | [E1] | 0.252 (5) | 0.000069 (30) |
| $\gamma_{9,4}$(Fr) | 72.5 (2) | 0.000086 (38) | [E1] | 0.252 (5) | 0.000069 (30) |
| $\gamma_{6,2}$(Fr) | 79.54 (8) | 0.00132 (12) | E1 | 0.197 (4) | 0.0011 (1) |
| $\gamma_{3,0}$(Fr) | 82.2 (1) | 0.0192 (23) | E2 | 22.1 (5) | 0.00083 (10) |
| $\gamma_{15,8}$(Fr) | 83.0 (1) | 0.0000014 | | | 0.0000014 |
| $\gamma_{12,6}$(Fr) | 85.0 (5) | 0.000011 | | | 0.000011 |
| $\gamma_{10,5}$(Fr) | 86.1 (1) | 0.00047 | | | 0.00047 |
| $\gamma_{4,1}$(Fr) | 86.7 (2) | 0.034 (20) | [M1+E2] | 11 (7) | 0.0028 (4) |
| $\gamma_{5,1}$(Fr) | 88.1 (1) | 0.0076 (43) | [M1+E2] | 10 (6) | 0.00069 (10) |
| $\gamma_{11,5}$(Fr) | 88.1 (1) | 0.0076 (43) | [M1+E2] | 10 (6) | 0.00069 (10) |
| $\gamma_{13,6}$(Fr) | 88.5 (6) | 0.00000097 | | | 0.00000097 |
| $\gamma_{9,3}$(Fr) | 90.0 (1) | 0.00021 (8) | [E1] | 0.142 (3) | 0.00018 (7) |
| $\gamma_{4,0}$(Fr) | 99.6 (1) | 0.036 (16) | M1+E2 | 6 (3) | 0.0051 (7) |
| $\gamma_{5,0}$(Fr) | 101.0 (1) | 0.0048 (29) | [M1+E2] | 6 (3) | 0.00069 (30) |
| $\gamma_{10,3}$(Fr) | 105.0 (2) | 0.0046 (16) | M1 | 12.4 (25) | 0.00034 (10) |
| $\gamma_{11,3}$(Fr) | 106.85 (10) | 0.0110 (34) | M(+E2) | 9 (3) | 0.0011 (1) |
| $\gamma_{14,6}$(Fr) | 108.0 (3) | 0.00041 (16) | [M1+E2] | 9 (3) | 0.000041 (10) |
| $\gamma_{12,5}$(Fr) | 118.7 (4) | 0.000054 (13) | [E1] | 0.312 (6) | 0.000041 (10) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{18,15}$(Fr) | 121.6 (1) | 0.00155 (39) | [E1] | 0.295 (6) | 0.0012 (3) |
| $\gamma_{6,1}$(Fr) | 121.6 (1) | 0.00155 (39) | [E1] | 0.295 (6) | 0.0012 (3) |
| $\gamma_{6,0}$(Fr) | 134.5 (1) | 0.00068 (12) | E1 | 0.230 (5) | 0.00055 (10) |
| $\gamma_{12,3}$(Fr) | 137.4 (1) | 0.00050 (12) | [E1] | 0.220 (5) | 0.00041 (10) |
| $\gamma_{13,3}$(Fr) | 140.9 (1) | 0.00025 (7) | [E1] | 0.206 (4) | 0.00021 (6) |
| $\gamma_{14,4}$(Fr) | 143.0 (1) | 0.00034 (7) | [E1] | 0.198 (4) | 0.00028 (6) |
| $\gamma_{18,13}$(Fr) | 143.0 (1) | 0.0013 (6) | [M1+E2] | 3.6 (18) | 0.00028 (6) |
| $\gamma_{16,5}$(Fr) | 143.65 (5) | 0.00015886 | M1 | 5.11 (11) | 0.000026 |
| $\gamma_{18,12}$(Fr) | 146.0 (2) | 0.0000088 | | | 0.0000088 |
| $\gamma_{8,1}$(Fr) | 147.61 (8) | 0.00296 (36) | E1 | 0.184 (4) | 0.0025 (3) |
| $\gamma_{7,0}$(Fr) | 149.3 (3) | 0.000014 | | | 0.000014 |
| $\gamma_{9,1}$(Fr) | 159.2 (1) | 0.00063 (12) | [E1] | 0.153 (3) | 0.00055 (10) |
| $\gamma_{8,0}$(Fr) | 160.49 (10) | 0.00506 (46) | E1 | 0.150 (3) | 0.0044 (4) |
| $\gamma_{15,3}$(Fr) | 161.4 (4) | 0.00049 (23) | [M1+E2] | 2.5 (13) | 0.00014 (4) |
| $\gamma_{16,3}$(Fr) | 162.6 (2) | 0.00019 (12) | M1,E2 | 2.4 (13) | 0.000055 (30) |
| $\gamma_{9,0}$(Fr) | 172.0 (1) | 0.00109 (11) | E1 | 0.127 (3) | 0.00097 (10) |
| $\gamma_{10,1}$(Fr) | 174.3 (1) | 0.00081 (35) | [M1+E2] | 1.9 (11) | 0.00028 (6) |
| $\gamma_{18,11}$(Fr) | 176.1 (1) | 0.000370 (45) | [E1] | 0.120 (3) | 0.00033 (4) |
| $\gamma_{11,1}$(Fr) | 176.1 (1) | 0.00096 (40) | M1,E2 | 1.9 (11) | 0.00033 (6) |
| $\gamma_{12,1}$(Fr) | 206.8 (1) | 0.00105 (11) | E1 | 0.0814 (17) | 0.00097 (10) |
| $\gamma_{17,1}$(Fr) | 216.6 (3) | 0.00011 (7) | [M1+E2] | 1.0 (7) | 0.000055 (30) |
| $\gamma_{-1,1}$(Fr) | 219.2 (4) | 0.0000140 (4) | | | 0.0000140 (4) |
| $\gamma_{14,1}$(Fr) | 229.7 (1) | 0.00044 (7) | [E1] | 0.0634 (13) | 0.00041 (7) |
| $\gamma_{15,1}$(Fr) | 230.9 (5) | 0.0000252 | [M1+E2] | 0.8 (5) | 0.000014 |
| $\gamma_{16,1}$(Fr) | 231.79 (5) | 0.0000072 | | | 0.0000072 |
| $\gamma_{14,0}$(Fr) | 242.6 (2) | 0.00030 (7) | [E1] | 0.0558 (12) | 0.00028 (7) |
| $\gamma_{15,0}$(Fr) | 243.9 (4) | 0.0000358 (10) | [E2] | 0.279 (6) | 0.0000280 (8) |
| $\gamma_{18,3}$(Fr) | 283.4 (3) | 0.000057 (31) | [E1] | 0.0389 (8) | 0.000055 (30) |
| $\gamma_{23,11}$(Fr) | 351.7 (3) | 0.000056 (31) | [E1] | 0.0240 (5) | 0.000055 (30) |
| $\gamma_{22,4}$(Fr) | 415.6 (3) | 0.00024 (7) | | 0.16 (11) | 0.00021 (6) |
| $\gamma_{23,5}$(Fr) | 439.60 (5) | 0.000034 (1) | | | 0.000034 (1) |
| $\gamma_{23,4}$(Fr) | 441.0 (4) | 0.000056 (30) | [E1] | 0.0148 (3) | 0.000055 (30) |
| $\gamma_{22,2}$(Fr) | 460.2 (3) | 0.00024 (7) | M1+E2 | 0.12 (9) | 0.00021 (6) |
| $\gamma_{23,1}$(Fr) | 527.6 (1) | 0.000029 | | | 0.000029 |
| $\gamma_{23,0}$(Fr) | 540.40 (5) | 0.00007 | | | 0.00007 |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 6.15 | (3) | h |
| $Q_{\beta^-}$ | : | 2123.8 | (27) | keV |
| $Q_{\alpha}$ | : | 4814 | (50) | keV |
| $\beta^-$ | : | 100 | | % |
| $\alpha$ | : | 5.5 | (22) | $\times 10^{-8}$ % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,60}$ | 0.7 (27) | 0.0047 (11) | Allowed | 3.3 |
| $\beta^-_{0,59}$ | 86.8 (27) | 0.0069 (11) | Allowed | 7.38 |
| $\beta^-_{0,58}$ | 94.0 (27) | 0.026 (4) | Allowed | 6.91 |
| $\beta^-_{0,57}$ | 101.0 (27) | 0.061 (6) | Allowed or 1st forbidden | 6.64 |
| $\beta^-_{0,56}$ | 110.2 (27) | 0.0032 (10) | Allowed | 8.03 |
| $\beta^-_{0,55}$ | 113.7 (27) | 0.238 (15) | Allowed | 6.2 |
| $\beta^-_{0,54}$ | 136.3 (27) | 0.07 (4) | Allowed | 7 |
| $\beta^-_{0,53}$ | 158.8 (27) | 0.0132 (14) | Allowed | 7.91 |
| $\beta^-_{0,52}$ | 165.1 (27) | 0.0038 (8) | Allowed | 8.5 |
| $\beta^-_{0,51}$ | 178.9 (27) | 0.307 (22) | Allowed | 6.7 |
| $\beta^-_{0,50}$ | 186.6 (27) | 0.053 (6) | Allowed | 7.52 |
| $\beta^-_{0,49}$ | 195.2 (27) | 0.061 (8) | Allowed | 7.52 |
| $\beta^-_{0,48}$ | 217.2 (27) | 0.025 (5) | Allowed | 8.05 |
| $\beta^-_{0,47}$ | 223.9 (27) | 0.069 (8) | Allowed | 7.65 |
| $\beta^-_{0,46}$ | 230.8 (27) | 0.109 (8) | Allowed | 7.5 |
| $\beta^-_{0,45}$ | 326.2 (27) | 0.051 (8) | Allowed | 8.3 |
| $\beta^-_{0,44}$ | 327.9 (27) | 0.035 (6) | Allowed | 8.48 |
| $\beta^-_{0,43}$ | 363.6 (27) | 0.139 (12) | Allowed | 8.02 |
| $\beta^-_{0,42}$ | 365.6 (27) | 0.060 (8) | Allowed | 8.39 |
| $\beta^-_{0,41}$ | 379.9 (27) | 0.378 (16) | Allowed | 7.65 |
| $\beta^-_{0,40}$ | 388.4 (27) | 0.149 (11) | Allowed | 8.08 |
| $\beta^-_{0,39}$ | 399.5 (27) | 1.93 (8) | Allowed | 7.01 |
| $\beta^-_{0,38}$ | 435.4 (27) | 2.50 (16) | Allowed | 7.02 |
| $\beta^-_{0,37}$ | 440.0 (27) | 0.20 (3) | 1st forbidden | 8.13 |
| $\beta^-_{0,36}$ | 441.0 (27) | 1.21 (4) | Allowed | 7.35 |
| $\beta^-_{0,35}$ | 477.8 (27) | 4.12 (20) | Allowed | 6.94 |
| $\beta^-_{0,34}$ | 480.7 (27) | 0.82 (3) | 1st forbidden | 7.64 |
| $\beta^-_{0,33}$ | 485.5 (27) | 1.23 (6) | Allowed | 7.48 |
| $\beta^-_{0,32}$ | 506.0 (27) | 0.071 (10) | Allowed | 8.78 |
| $\beta^-_{0,31}$ | 535.5 (27) | 8.8 (23) | 1st forbidden | 6.77 |
| $\beta^-_{0,30}$ | 584.6 (27) | 0.030 (6) | Allowed | 9.36 |
| $\beta^-_{0,27}$ | 691.8 (27) | 1.6 (5) | Allowed | 7.88 |
| $\beta^-_{0,26}$ | 707.7 (27) | 0.060 (8) | Allowed or 1st forbidden | 9.34 |
| $\beta^-_{0,25}$ | 779.7 (27) | 0.208 (18) | 1st forbidden | 8.94 |
| $\beta^-_{0,24}$ | 826.4 (27) | 1.46 (11) | 1st forbidden unique | 8.18 |
| $\beta^-_{0,23}$ | 897.2 (27) | 0.67 (8) | 1st forbidden | 8.65 |
| $\beta^-_{0,22}$ | 948.4 (27) | 0.166 (19) | Allowed | 9.34 |

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,20}$ | 955.4 (27) | 3.39 (13) | 1st forbidden | 8.04 |
| $\beta^-_{0,19}$ | 970.3 (27) | 6 (3) | Allowed | 7.8 |
| $\beta^-_{0,18}$ | 1000.8 (27) | 6.67 (18) | 1st forbidden | 7.81 |
| $\beta^-_{0,16}$ | 1063.9 (27) | 0.099 (11) | 1st forbidden | 9.74 |
| $\beta^-_{0,15}$ | 1101.3 (27) | 3.0 (4) | Allowed | 8.31 |
| $\beta^-_{0,14}$ | 1107.4 (27) | 0.39 (6) | Allowed or 1st forbidden | 9.2 |
| $\beta^-_{0,13}$ | 1144.3 (27) | 0.238 (20) | Allowed | 9.47 |
| $\beta^-_{0,12}$ | 1154.8 (27) | 31 (4) | Allowed | 7.37 |
| $\beta^-_{0,11}$ | 1155.4 (27) | 0.18 (3) | 1st forbidden | 9.6 |
| $\beta^-_{0,10}$ | 1179.6 (27) | 0.087 (16) | Allowed or 1st forbidden | 9.95 |
| $\beta^-_{0,8}$ | 1249.3 (27) | 0.17 (10) | Allowed | 9.7 |
| $\beta^-_{0,5}$ | 1727.7 (27) | 12.4 (5) | 1st forbidden | 8.4 |
| $\beta^-_{0,4}$ | 1745.6 (27) | 0.147 (21) | 2nd forbidden unique | 12.29 |
| $\beta^-_{0,3}$ | 1795.8 (27) | 0.72 (23) | 1st forbidden unique | 10.65 |
| $\beta^-_{0,2}$ | 1937.0 (27) | 0.6 (5) | Allowed | 10 |
| $\beta^-_{0,1}$ | 2066.0 (27) | 6 (4) | Allowed | 9 |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Th) | 5.8 - 20.3 | 39.9 (21) | |
| $e_{AK}$ | (Th) | | 0.27 (8) | |
| | KLL | 68.406 - 76.745 } | | |
| | KLX | 83.857 - 93.345 } | | |
| | KXY | 99.29 - 109.64 } | | |
| $ec_{35,29\ K}$ | (Th) | 4.830 (13) | 0.05 (5) | |
| $ec_{28,27\ M}$ | (Th) | 13.233 - 15.083 | 0.038 (8) | |
| $ec_{2,1\ K}$ | (Th) | 19.414 (6) | 0.660 (21) | |
| $ec_{38,35\ L}$ | (Th) | 21.97 - 26.10 | 0.32 (11) | |
| $ec_{31,28\ K}$ | (Th) | 28.291 (17) | 0.168 (24) | |
| $ec_{20,15\ K}$ | (Th) | 36.198 (8) | 0.0264 (10) | |
| $ec_{31,29\ L}$ | (Th) | 36.389 - 40.600 | 5.2 (35) | |
| $ec_{38,35\ M}$ | (Th) | 37.26 - 39.11 | 0.076 (25) | |
| $ec_{1,0\ L}$ | (Th) | 37.287 - 41.500 | 52.7 (21) | |
| $ec_{38,35\ N}$ | (Th) | 41.11 - 42.10 | 0.020 (7) | |
| $ec_{18,12\ K}$ | (Th) | 44.333 (8) | 0.1037 (35) | |
| $ec_{31,29\ M}$ | (Th) | 51.679 - 53.529 | 1.4 (11) | |
| $ec_{1,0\ M}$ | (Th) | 52.577 - 54.427 | 14.4 (6) | |
| $ec_{31,29\ N}$ | (Th) | 55.530 - 56.526 | 0.40 (26) | |
| $ec_{1,0\ N}$ | (Th) | 56.430 - 57.424 | 3.87 (15) | |
| $ec_{19,12\ K}$ | (Th) | 74.849 (11) | 4.3 (22) | |
| $ec_{29,27\ L}$ | (Th) | 79.023 - 83.200 | 3.65 (13) | |
| $ec_{18,15\ L}$ | (Th) | 79.952 - 84.100 | 0.259 (14) | |
| $ec_{4,2\ K}$ | (Th) | 81.706 (11) | 0.0227 (14) | |

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $ec_{20,12\ K}$ | (Th) | 89.757 (7) | 0.0225 (18) | |
| $ec_{35,29\ L}$ | (Th) | 94.01 - 98.20 | 0.033 (15) | |
| $ec_{29,27\ M}$ | (Th) | 94.313 - 96.163 | 0.881 (31) | |
| $ec_{24,15\ K}$ | (Th) | 94.388 (9) | 0.83 (6) | |
| $ec_{18,15\ M}$ | (Th) | 95.242 - 97.092 | 0.0701 (38) | |
| $ec_{29,27\ N}$ | (Th) | 98.16 - 99.16 | 0.234 (8) | |
| $ec_{18,15\ N}$ | (Th) | 99.090 - 100.089 | 0.0191 (10) | |
| $ec_{5,2\ K}$ | (Th) | 99.605 (6) | 0.267 (10) | |
| $ec_{2,1\ L}$ | (Th) | 108.592 - 112.800 | 6.35 (20) | |
| $ec_{28,23\ K}$ | (Th) | 114.179 (12) | 0.086 (9) | |
| $ec_{31,28\ L}$ | (Th) | 117.469 - 121.600 | 0.0321 (46) | |
| $ec_{2,1\ M}$ | (Th) | 123.882 - 125.732 | 1.74 (5) | |
| $ec_{2,1\ N}$ | (Th) | 127.730 - 128.729 | 0.468 (15) | |
| $ec_{18,12\ L}$ | (Th) | 133.511 - 137.700 | 0.0218 (7) | |
| $ec_{27,21\ K}$ | (Th) | 147.821 (19) | 0.0294 (20) | |
| $ec_{3,1\ K}$ | (Th) | 160.594 (6) | 0.1335 (43) | |
| $ec_{19,8\ K}$ | (Th) | 169.344 (21) | 0.10 (8) | |
| $ec_{4,2\ L}$ | (Th) | 170.884 - 175.100 | 0.0589 (37) | |
| $ec_{28,20\ K}$ | (Th) | 172.369 (11) | 0.036 (38) | |
| $ec_{24,15\ L}$ | (Th) | 183.566 - 187.700 | 0.286 (21) | |
| $ec_{4,2\ M}$ | (Th) | 186.174 - 188.024 | 0.0161 (10) | |
| $ec_{5,2\ L}$ | (Th) | 188.783 - 193.000 | 0.0529 (19) | |
| $ec_{24,15\ M}$ | (Th) | 198.856 - 200.706 | 0.074 (5) | |
| $ec_{24,15\ N}$ | (Th) | 202.710 - 203.703 | 0.0202 (14) | |
| $ec_{28,23\ L}$ | (Th) | 203.357 - 207.500 | 0.0166 (17) | |
| $ec_{5,2\ M}$ | (Th) | 204.073 - 205.923 | 0.01274 (46) | |
| $ec_{19,7\ K}$ | (Th) | 211.994 (14) | 0.0147 (9) | |
| $ec_{3,0\ K}$ | (Th) | 218.353 (4) | 0.0745 (30) | |
| $ec_{5,1\ K}$ | (Th) | 228.669 (6) | 0.261 (10) | |
| $ec_{27,17\ K}$ | (Th) | 231.31 (1) | 0.029 (8) | |
| $ec_{51,31\ K}$ | (Th) | 246.910 (18) | 0.011 (11) | |
| $ec_{3,1\ L}$ | (Th) | 249.772 - 253.900 | 0.0254 (8) | |
| $ec_{19,8\ L}$ | (Th) | 258.522 - 262.700 | 0.024 (7) | |
| $ec_{28,20\ L}$ | (Th) | 261.547 - 265.700 | 0.0108 (45) | |
| $ec_{27,15\ K}$ | (Th) | 299.802 (8) | 0.32 (26) | |
| $ec_{19,7\ L}$ | (Th) | 301.172 - 305.300 | 0.0125 (8) | |
| $ec_{3,0\ L}$ | (Th) | 307.531 - 311.700 | 0.0138 (5) | |
| $ec_{5,1\ L}$ | (Th) | 317.847 - 322.000 | 0.0483 (18) | |
| $ec_{27,17\ L}$ | (Th) | 320.49 - 324.70 | 0.0183 (12) | |
| $ec_{29,17\ K}$ | (Th) | 330.81 (1) | 0.0303 (24) | |
| $ec_{5,1\ M}$ | (Th) | 333.137 - 334.987 | 0.01156 (44) | |
| $ec_{27,12\ K}$ | (Th) | 353.361 (8) | 0.139 (8) | |
| $ec_{27,15\ L}$ | (Th) | 388.98 - 393.20 | 0.077 (32) | |
| $ec_{29,15\ K}$ | (Th) | 399.297 (8) | 0.0444 (35) | |
| $ec_{27,15\ M}$ | (Th) | 404.27 - 406.12 | 0.018 (8) | |
| $ec_{27,12\ L}$ | (Th) | 442.539 - 446.700 | 0.0665 (37) | |
| $ec_{29,12\ K}$ | (Th) | 452.856 (8) | 0.062 (45) | |
| $ec_{27,12\ M}$ | (Th) | 457.829 - 459.679 | 0.0174 (10) | |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $ec_{39,19\ K}$ | (Th) | 461.166 | (12) | 0.022 (6) | | |
| $ec_{11,5\ K}$ | (Th) | 462.641 | (21) | 0.011 (8) | | |
| $ec_{29,15\ L}$ | (Th) | 488.475 | - 492.600 | 0.0100 (8) | | |
| $ec_{29,12\ L}$ | (Th) | 542.034 | - 546.200 | 0.013 (7) | | |
| $ec_{39,15\ K}$ | (Th) | 592.106 | (8) | 0.0124 (10) | | |
| $ec_{39,12\ K}$ | (Th) | 645.665 | (8) | 0.0580 (24) | | |
| $ec_{20,5\ K}$ | (Th) | 662.647 | (7) | 0.0283 (20) | | |
| $ec_{18,3\ K}$ | (Th) | 685.298 | (7) | 0.057 (5) | | |
| $ec_{15,2\ K}$ | (Th) | 726.054 | (7) | 0.0178 (8) | | |
| $ec_{20,3\ K}$ | (Th) | 730.722 | (6) | 0.01008 (44) | | |
| $ec_{39,12\ L}$ | (Th) | 734.843 | - 739.000 | 0.01067 (44) | | |
| $ec_{18,3\ L}$ | (Th) | 774.476 | - 778.600 | 0.0147 (9) | | |
| $ec_{12,1\ K}$ | (Th) | 801.559 | (6) | 0.236 (8) | | |
| $ec_{15,1\ K}$ | (Th) | 855.118 | (7) | 0.0426 (17) | | |
| $ec_{12,0\ K}$ | (Th) | 859.318 | (5) | 0.1282 (45) | | |
| $ec_{12,1\ L}$ | (Th) | 890.737 | - 894.900 | 0.0579 (19) | | |
| $ec_{12,1\ M}$ | (Th) | 906.027 | - 907.877 | 0.01438 (49) | | |
| $ec_{12,0\ L}$ | (Th) | 948.496 | - 952.700 | 0.0304 (11) | | |
| $ec_{35,1\ K}$ | (Th) | 1478.545 | (13) | 0.017 (7) | | |
| $\beta^-_{0,60}$ | max: | 0.7 | (27) | 0.0047 (11) | avg: | 0.18 (68) |
| $\beta^-_{0,59}$ | max: | 86.8 | (27) | 0.0069 (11) | avg: | 22.4 (8) |
| $\beta^-_{0,58}$ | max: | 94.0 | (27) | 0.026 (4) | avg: | 24.3 (7) |
| $\beta^-_{0,57}$ | max: | 101.0 | (27) | 0.061 (6) | avg: | 26.2 (7) |
| $\beta^-_{0,56}$ | max: | 110.2 | (27) | 0.0032 (10) | avg: | 28.7 (7) |
| $\beta^-_{0,55}$ | max: | 113.7 | (27) | 0.238 (15) | avg: | 29.7 (8) |
| $\beta^-_{0,54}$ | max: | 136.3 | (27) | 0.07 (4) | avg: | 35.9 (8) |
| $\beta^-_{0,53}$ | max: | 158.8 | (27) | 0.0132 (14) | avg: | 42.2 (8) |
| $\beta^-_{0,52}$ | max: | 165.1 | (27) | 0.0038 (8) | avg: | 43.9 (8) |
| $\beta^-_{0,51}$ | max: | 178.9 | (27) | 0.307 (22) | avg: | 47.8 (8) |
| $\beta^-_{0,50}$ | max: | 186.6 | (27) | 0.053 (6) | avg: | 50.0 (8) |
| $\beta^-_{0,49}$ | max: | 195.2 | (27) | 0.061 (8) | avg: | 52.5 (8) |
| $\beta^-_{0,48}$ | max: | 217.2 | (27) | 0.025 (5) | avg: | 58.8 (8) |
| $\beta^-_{0,47}$ | max: | 223.9 | (27) | 0.069 (8) | avg: | 60.8 (8) |
| $\beta^-_{0,46}$ | max: | 230.8 | (27) | 0.109 (8) | avg: | 62.8 (8) |
| $\beta^-_{0,45}$ | max: | 326.2 | (27) | 0.051 (8) | avg: | 91.4 (8) |
| $\beta^-_{0,44}$ | max: | 327.9 | (27) | 0.035 (6) | avg: | 91.9 (8) |
| $\beta^-_{0,43}$ | max: | 363.6 | (27) | 0.139 (12) | avg: | 103.0 (9) |
| $\beta^-_{0,42}$ | max: | 365.6 | (27) | 0.060 (8) | avg: | 103.6 (9) |
| $\beta^-_{0,41}$ | max: | 379.9 | (27) | 0.378 (16) | avg: | 108.1 (9) |
| $\beta^-_{0,40}$ | max: | 388.4 | (27) | 0.149 (11) | avg: | 110.7 (9) |
| $\beta^-_{0,39}$ | max: | 399.5 | (27) | 1.93 (8) | avg: | 114.3 (9) |
| $\beta^-_{0,38}$ | max: | 435.4 | (27) | 2.50 (16) | avg: | 125.7 (9) |
| $\beta^-_{0,37}$ | max: | 440.0 | (27) | 0.20 (3) | avg: | 127.2 (9) |
| $\beta^-_{0,36}$ | max: | 441.0 | (27) | 1.21 (4) | avg: | 127.5 (9) |
| $\beta^-_{0,35}$ | max: | 477.8 | (27) | 4.12 (20) | avg: | 139.5 (9) |
| $\beta^-_{0,34}$ | max: | 480.7 | (27) | 0.82 (3) | avg: | 140.4 (9) |
| $\beta^-_{0,33}$ | max: | 485.5 | (27) | 1.23 (6) | avg: | 142.0 (9) |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $\beta^-_{0,32}$ | max: | 506.0 | (27) | 0.071 (10) | avg: | 148.7 (9) |
| $\beta^-_{0,31}$ | max: | 535.5 | (27) | 8.8 (23) | avg: | 158.5 (9) |
| $\beta^-_{0,30}$ | max: | 584.6 | (27) | 0.030 (6) | avg: | 175.0 (9) |
| $\beta^-_{0,27}$ | max: | 691.8 | (27) | 1.6 (5) | avg: | 211.8 (10) |
| $\beta^-_{0,26}$ | max: | 707.7 | (27) | 0.060 (8) | avg: | 217.3 (10) |
| $\beta^-_{0,25}$ | max: | 779.7 | (27) | 0.208 (18) | avg: | 242.7 (10) |
| $\beta^-_{0,24}$ | max: | 826.4 | (27) | 1.46 (11) | avg: | 259.4 (10) |
| $\beta^-_{0,23}$ | max: | 897.2 | (27) | 0.67 (8) | avg: | 285.1 (10) |
| $\beta^-_{0,22}$ | max: | 948.4 | (27) | 0.166 (19) | avg: | 303.9 (10) |
| $\beta^-_{0,20}$ | max: | 955.4 | (27) | 3.39 (13) | avg: | 306.4 (10) |
| $\beta^-_{0,19}$ | max: | 970.3 | (27) | 6 (3) | avg: | 311.9 (10) |
| $\beta^-_{0,18}$ | max: | 1000.8 | (27) | 6.67 (18) | avg: | 323.2 (10) |
| $\beta^-_{0,16}$ | max: | 1063.9 | (27) | 0.099 (11) | avg: | 346.7 (11) |
| $\beta^-_{0,15}$ | max: | 1101.3 | (27) | 3.0 (4) | avg: | 360.8 (11) |
| $\beta^-_{0,14}$ | max: | 1107.4 | (27) | 0.39 (6) | avg: | 363.1 (11) |
| $\beta^-_{0,13}$ | max: | 1144.3 | (27) | 0.238 (20) | avg: | 377.1 (11) |
| $\beta^-_{0,12}$ | max: | 1154.8 | (27) | 31 (4) | avg: | 381.1 (11) |
| $\beta^-_{0,11}$ | max: | 1155.4 | (27) | 0.18 (3) | avg: | 381.4 (11) |
| $\beta^-_{0,10}$ | max: | 1179.6 | (27) | 0.087 (16) | avg: | 390.6 (11) |
| $\beta^-_{0,8}$ | max: | 1249.3 | (27) | 0.17 (10) | avg: | 417.2 (11) |
| $\beta^-_{0,5}$ | max: | 1727.7 | (27) | 12.4 (5) | avg: | 605.7 (11) |
| $\beta^-_{0,4}$ | max: | 1745.6 | (27) | 0.147 (21) | avg: | 587.3 (11) |
| $\beta^-_{0,3}$ | max: | 1795.8 | (27) | 0.72 (23) | avg: | 605.4 (11) |
| $\beta^-_{0,2}$ | max: | 1937.0 | (27) | 0.6 (5) | avg: | 690.2 (11) |
| $\beta^-_{0,1}$ | max: | 2066.0 | (27) | 6 (4) | avg: | 742.8 (11) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Th) | 11.1177 — 19.5043 | | 37 (4) | |
| XK$\alpha_2$ | (Th) | 89.954 | | 2.5 (7) | } K$\alpha$ |
| XK$\alpha_1$ | (Th) | 93.351 | | 4.1 (11) | } |
| XK$\beta_3$ | (Th) | 104.819 | } | | |
| XK$\beta_1$ | (Th) | 105.604 | } | 1.5 (4) | K$\beta'_1$ |
| XK$\beta''_5$ | (Th) | 106.239 | } | | |
| XK$\beta_2$ | (Th) | 108.509 | } | | |
| XK$\beta_4$ | (Th) | 108.955 | } | 0.49 (13) | K$\beta'_2$ |
| XKO$_{2,3}$ | (Th) | 109.442 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{28,27}$(Th) | 18.415 (12) | 0.142 (30) | E1 | 6.46 (10) | 0.019 (4) |
| $\gamma_{38,35}$(Th) | 42.46 (5) | 0.43 (14) | M1 | 46.3 (7) | 0.009 (3) |
| $\gamma_{31,29}$(Th) | 56.88 (5) | 8 (8) | E1+[M2] | 360 (220) | 0.020 (5) |
| $\gamma_{1,0}$(Th) | 57.752 (13) | 72.5 (28) | E2 | 153.2 (22) | 0.470 (17) |
| $\gamma_{20,17}$(Th) | 77.34 (3) | 0.027 (6) | E1 | 0.232 (4) | 0.027 (6) |
| $\gamma_{29,27}$(Th) | 99.505 (12) | 6.10 (21) | M1 | 3.84 (6) | 1.26 (4) |
| $\gamma_{18,15}$(Th) | 100.41 (3) | 0.114 (6) | E1+M2 | 3.10 (5) | 0.114 (6) |
| $\gamma_{35,29}$(Th) | 114.56 (7) | 0.102 (46) | M1+E2 | 9 (4) | 0.0102 (22) |
| $\gamma_{2,1}$(Th) | 129.065 (3) | 11.85 (36) | E2 | 3.74 (6) | 2.50 (7) |
| $\gamma_{23,17}$(Th) | 135.507 (22) | 0.024 (6) | E1 | 0.238 (4) | 0.024 (6) |
| $\gamma_{31,28}$(Th) | 137.936 (22) | 0.239 (34) | M1 | 7.52 (11) | 0.028 (4) |
| $\gamma_{6,4}$(Th) | 140.999 (20) | 0.055 (11) | E1 | 0.217 (3) | 0.045 (9) |
| $\gamma_{20,15}$(Th) | 145.842 (20) | 0.169 (6) | E1 | 0.200 (3) | 0.169 (6) |
| $\gamma_{18,12}$(Th) | 153.967 (11) | 0.754 (23) | E1 | 0.1757 (25) | 0.754 (23) |
| $\gamma_{25,22}$(Th) | 168.53 (12) | 0.0127 (31) | M1+E2 | 2.7 (15) | 0.0111 (27) |
| $\gamma_{49,43}$(Th) | 168.53 (12) | 0.0093 (46) | M1+E2 | 2.7 (15) | 0.0025 (7) |
| $\gamma_{19,13}$(Th) | 173.96 (3) | 0.036 (5) | M1+E2 | 2.5 (14) | 0.036 (5) |
| $\gamma_{19,12}$(Th) | 184.547 (19) | 5.5 (29) | E0+M1 | 100 (40) | 0.054 (19) |
| $\gamma_{4,2}$(Th) | 191.351 (17) | 0.236 (14) | E2 | 0.776 (11) | 0.133 (8) |
| $\gamma_{20,12}$(Th) | 199.402 (15) | 0.299 (23) | E1 | 0.0950 (14) | 0.299 (23) |
| $\gamma_{24,15}$(Th) | 204.029 (11) | 0.114 (8) | M2 | 10.65 (15) | 0.114 (8) |
| $\gamma_{5,2}$(Th) | 209.248 (7) | 4.31 (14) | E1 | 0.0848 (12) | 3.97 (13) |
| $\gamma_{19,9}$(Th) | 214.89 (10) | 0.047 (8) | E2 | 0.514 (8) | 0.031 (5) |
| $\gamma_{28,23}$(Th) | 223.793 (21) | 0.058 (6) | M1+E2 | 1.85 (4) | 0.058 (6) |
| $\gamma_{22,10}$(Th) | 231.42 (10) | 0.026 (4) | E2 | 0.392 (6) | 0.026 (4) |
| $\gamma_{27,21}$(Th) | 257.482 (21) | 0.0286 (19) | M1 | 1.285 (18) | 0.0286 (19) |
| $\gamma_{27,20}$(Th) | 263.58 (10) | 0.0451 (31) | E1 | 0.0498 (7) | 0.043 (3) |
| $\gamma_{3,1}$(Th) | 270.245 (7) | 3.72 (10) | E1 | 0.0470 (7) | 3.55 (10) |
| $\gamma_{19,8}$(Th) | 278.80 (15) | 0.33 (9) | M1+E2 | 0.6 (4) | 0.204 (28) |
| $\gamma_{27,19}$(Th) | 278.80 (15) | 0.038 (6) | E2 | 0.212 (3) | 0.031 (5) |
| $\gamma_{28,20}$(Th) | 282.02 (4) | 0.14 (6) | M1+E2 | 0.6 (4) | 0.09 (3) |
| $\gamma_{19,7}$(Th) | 321.646 (8) | 0.232 (14) | E2 | 0.1369 (20) | 0.232 (14) |
| $\gamma_{42,27}$(Th) | 326.04 (20) | 0.035 (6) | E2 | 0.1315 (19) | 0.035 (6) |
| $\gamma_{3,0}$(Th) | 328.004 (7) | 3.13 (11) | E1 | 0.0305 (5) | 3.04 (11) |
| $\gamma_{6,2}$(Th) | 332.371 (6) | 0.38 (6) | E1 | 0.0297 (5) | 0.37 (6) |
| $\gamma_{5,1}$(Th) | 338.320 (5) | 11.72 (41) | E1 | 0.0285 (4) | 11.4 (4) |
| $\gamma_{27,17}$(Th) | 340.969 (21) | 0.405 (20) | E2+M1 | 0.133 (21) | 0.405 (20) |
| $\gamma_{51,31}$(Th) | 356.7 (3) | 0.032 (15) | E1+M2 | 0.8 (8) | 0.0178 (21) |
| $\gamma_{55,33}$(Th) | 372.59 (3) | 0.0070 (17) | E2 | 0.0902 (13) | 0.0070 (17) |
| $\gamma_{29,19}$(Th) | 377.99 (10) | 0.033 (6) | M1+E2 | 0.27 (18) | 0.026 (3) |
| $\gamma_{57,33}$(Th) | 384.47 (9) | 0.0070 (17) | E2 | 0.0828 (12) | 0.0070 (17) |
| $\gamma_{49,30}$(Th) | 389.32 (13) | 0.0108 (17) | M1+E2 | 0.25 (17) | 0.0108 (17) |
| $\gamma_{50,30}$(Th) | 397.95 (10) | 0.029 (3) | | | 0.029 (3) |
| $\gamma_{41,25}$(Th) | 399.83 (14) | 0.0316 (41) | E1 | 0.0200 (3) | 0.031 (4) |
| $\gamma_{27,15}$(Th) | 409.460 (13) | 2.02 (6) | E2+M1 | 0.21 (15) | 2.02 (6) |
| $\gamma_{30,18}$(Th) | 415.96 (14) | 0.0138 (23) | E1 | 0.0184 (3) | 0.0138 (23) |
| $\gamma_{35,23}$(Th) | 419.38 (7) | 0.0224 (31) | E1 | 0.0181 (3) | 0.022 (3) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{29,17}$(Th) | 440.450 (24) | 0.166 (13) | M1 | 0.295 (5) | 0.128 (10) |
| $\gamma_{11,6}$(Th) | 449.11 (6) | 0.053 (6) | E2 | 0.0554 (8) | 0.050 (6) |
| $\gamma_{27,13}$(Th) | 452.50 (6) | 0.0199 (19) | E2 | 0.0544 (8) | 0.0199 (19) |
| $\gamma_{37,23}$(Th) | 457.18 (15) | 0.0186 (39) | M1+E2 | 0.16 (11) | 0.016 (3) |
| $\gamma_{27,12}$(Th) | 463.002 (6) | 4.45 (24) | E2 | 0.0514 (8) | 4.45 (24) |
| $\gamma_{33,20}$(Th) | 470.21 (20) | 0.0142 (30) | E1 | 0.01428 (20) | 0.014 (3) |
| $\gamma_{26,10}$(Th) | 471.77 (15) | 0.0357 (42) | E2 | 0.0491 (7) | 0.034 (4) |
| $\gamma_{34,20}$(Th) | 474.79 (10) | 0.026 (5) | M1+E2 | 0.14 (10) | 0.023 (4) |
| $\gamma_{8,5}$(Th) | 478.40 (5) | 0.227 (19) | E1 | 0.01379 (20) | 0.224 (19) |
| $\gamma_{48,26}$(Th) | 490.33 (15) | 0.0116 (25) | E2 | 0.0447 (7) | 0.0116 (25) |
| $\gamma_{35,19}$(Th) | 492.29 (8) | 0.0282 (41) | M1+E2 | 0.13 (9) | 0.025 (3) |
| $\gamma_{39,23}$(Th) | 497.64 (10) | 0.0062 (19) | M2 | 0.581 (9) | 0.0062 (19) |
| $\gamma_{7,3}$(Th) | 503.819 (23) | 0.173 (19) | E1 | 0.01243 (18) | 0.171 (19) |
| $\gamma_{29,15}$(Th) | 508.955 (13) | 0.568 (45) | E2+M1 | 0.1130 (16) | 0.51 (4) |
| $\gamma_{33,18}$(Th) | 515.12 (7) | 0.051 (6) | E1 | 0.01189 (17) | 0.051 (6) |
| $\gamma_{34,18}$(Th) | 520.16 (3) | 0.070 (7) | M1+E2 | 0.11 (8) | 0.070 (7) |
| $\gamma_{35,18}$(Th) | 523.129 (22) | 0.129 (10) | E1 | 0.01153 (17) | 0.129 (10) |
| $\gamma_{16,6}$(Th) | 540.67 (5) | 0.0297 (38) | M1+E2 | 0.10 (7) | 0.027 (3) |
| $\gamma_{8,3}$(Th) | 546.445 (21) | 0.201 (16) | E1 | 0.01058 (15) | 0.199 (16) |
| $\gamma_{39,22}$(Th) | 548.73 (11) | 0.0264 (47) | M1+E2 | 0.10 (7) | 0.024 (4) |
| $\gamma_{35,17}$(Th) | 555.07 (16) | 0.048 (6) | M1+E2 | | 0.048 (6) |
| $\gamma_{29,12}$(Th) | 562.496 (7) | 0.97 (7) | E2+M1 | 0.09 (6) | 0.89 (4) |
| $\gamma_{39,19}$(Th) | 570.88 (4) | 0.22 (6) | M1 | 0.1472 (21) | 0.19 (5) |
| $\gamma_{11,5}$(Th) | 572.10 (5) | 0.170 (22) | M1+E2 | 0.09 (6) | 0.156 (18) |
| $\gamma_{13,5}$(Th) | 583.391 (10) | 0.120 (11) | E1 | 0.00932 (13) | 0.120 (11) |
| $\gamma_{9,3}$(Th) | 610.65 (10) | 0.024 (5) | E1 | 0.00853 (12) | 0.024 (5) |
| $\gamma_{10,3}$(Th) | 616.21 (3) | 0.085 (7) | E1 | 0.00838 (12) | 0.084 (7) |
| $\gamma_{14,5}$(Th) | 620.32 (7) | 0.084 (7) | | | 0.084 (7) |
| $\gamma_{35,15}$(Th) | 623.48 (22) | 0.0128 (33) | M1+E2 | 0.07 (5) | 0.012 (3) |
| $\gamma_{34,14}$(Th) | 626.80 (22) | 0.015 (3) | | | 0.015 (3) |
| $\gamma_{35,14}$(Th) | 629.41 (5) | 0.047 (5) | E2 | 0.0254 (4) | 0.047 (5) |
| $\gamma_{11,3}$(Th) | 640.32 (4) | 0.058 (6) | E2 | 0.0245 (4) | 0.057 (6) |
| $\gamma_{20,6}$(Th) | 649.02 (12) | 0.043 (11) | E2 | 0.0238 (4) | 0.0332 (36) |
| $\gamma_{32,12}$(Th) | 649.02 (12) | 0.0086 (9) | | | 0.0086 (9) |
| $\gamma_{13,3}$(Th) | 651.53 (3) | 0.094 (10) | E1 | 0.00754 (11) | 0.094 (10) |
| $\gamma_{36,15}$(Th) | 660.1 (3) | 0.00572 (38) | M1+E2 | 0.06 (4) | 0.0054 (3) |
| $\gamma_{16,5}$(Th) | 663.88 (8) | 0.029 (6) | M1+E2 | 0.06 (4) | 0.029 (6) |
| $\gamma_{46,23}$(Th) | 666.45 (5) | 0.0068 (7) | E1 | 0.00722 (11) | 0.0068 (7) |
| $\gamma_{35,13}$(Th) | 666.45 (5) | 0.061 (7) | M1+E2 | 0.06 (4) | 0.058 (6) |
| $\gamma_{38,14}$(Th) | 671.95 (8) | 0.027 (8) | | | 0.027 (8) |
| $\gamma_{34,12}$(Th) | 674.63 (4) | 0.105 (10) | M1+E2 | 0.06 (4) | 0.105 (10) |
| $\gamma_{35,12}$(Th) | 677.08 (10) | 0.065 (6) | M1+E2 | 0.06 (4) | 0.065 (6) |
| $\gamma_{14,3}$(Th) | 688.12 (4) | 0.070 (7) | | | 0.070 (7) |
| $\gamma_{34,10}$(Th) | 698.99 (10) | 0.038 (6) | E2 | 0.0203 (3) | 0.038 (6) |
| $\gamma_{39,15}$(Th) | 701.742 (15) | 0.181 (15) | M1 | 0.0850 (12) | 0.181 (15) |
| $\gamma_{23,6}$(Th) | 707.42 (5) | 0.162 (18) | E2 | 0.0198 (3) | 0.162 (18) |
| $\gamma_{51,23}$(Th) | 718.30 (3) | 0.0191 (40) | E1 | 0.00628 (9) | 0.019 (4) |
| $\gamma_{18,5}$(Th) | 726.88 (10) | 0.68 (8) | E2 | 0.0187 (3) | 0.68 (8) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{43,15}$(Th) | 737.74 (5) | 0.039 (5) | M1+E2 | 0.05 (3) | 0.039 (5) |
| $\gamma_{39,12}$(Th) | 755.313 (9) | 1.102 (43) | M1 | 0.070 (1) | 1.03 (4) |
| $\gamma_{20,5}$(Th) | 772.291 (7) | 1.52 (6) | M1+E2 | 0.0244 (14) | 1.52 (6) |
| $\gamma_{7,1}$(Th) | 774.07 (10) | 0.0630 (41) | E2 | 0.01649 (23) | 0.062 (4) |
| $\gamma_{51,20}$(Th) | 776.51 (3) | 0.020 (6) | | | 0.020 (6) |
| $\gamma_{12,2}$(Th) | 782.140 (6) | 0.508 (41) | E2 | 0.01615 (23) | 0.50 (4) |
| $\gamma_{51,19}$(Th) | 791.43 (9) | 0.0149 (42) | M1 | 0.0618 (9) | 0.014 (4) |
| $\gamma_{43,12}$(Th) | 791.43 (9) | 0.0104 (31) | M1+E2 | 0.039 (23) | 0.010 (3) |
| $\gamma_{13,2}$(Th) | 792.69 (10) | 0.082 (5) | E2 | 0.01572 (22) | 0.081 (5) |
| $\gamma_{18,3}$(Th) | 794.942 (14) | 4.31 (14) | E2+M1 | 0.0179 (14) | 4.31 (14) |
| $\gamma_{38,8}$(Th) | 813.88 (10) | 0.0073 (17) | M1+E2 | 0.036 (22) | 0.0073 (17) |
| $\gamma_{8,1}$(Th) | 816.82 (10) | 0.0321 (42) | M1+E2 | 0.036 (21) | 0.031 (4) |
| $\gamma_{25,6}$(Th) | 824.931 (25) | 0.054 (6) | E2 | 0.01452 (21) | 0.053 (6) |
| $\gamma_{23,5}$(Th) | 830.481 (8) | 0.61 (6) | E2+M1 | 0.0150 (3) | 0.61 (6) |
| $\gamma_{15,2}$(Th) | 835.704 (8) | 1.70 (7) | E2 | 0.01415 (20) | 1.70 (7) |
| $\gamma_{20,3}$(Th) | 840.372 (9) | 0.984 (41) | E2 | 0.0140 (2) | 0.97 (4) |
| $\gamma_{51,17}$(Th) | 853.96 (8) | 0.0128 (21) | M1+E2 | 0.032 (19) | 0.0124 (20) |
| $\gamma_{46,15}$(Th) | 870.47 (7) | 0.046 (5) | M1 | 0.0481 (7) | 0.046 (5) |
| $\gamma_{16,2}$(Th) | 873.10 (15) | 0.032 (7) | E1 | 0.00440 (7) | 0.032 (7) |
| $\gamma_{8,0}$(Th) | 874.45 (8) | 0.051 (11) | E2 | 0.01294 (19) | 0.050 (11) |
| $\gamma_{47,15}$(Th) | 877.38 (7) | 0.0144 (31) | M1+E2 | 0.030 (18) | 0.014 (3) |
| $\gamma_{9,1}$(Th) | 880.76 (10) | 0.0066 (19) | E2 | 0.01276 (18) | 0.0065 (19) |
| $\gamma_{55,18}$(Th) | 887.26 (10) | 0.029 (3) | M1+E2 | 0.029 (17) | 0.029 (3) |
| $\gamma_{24,5}$(Th) | 901.38 (3) | 0.0172 (40) | E2 | 0.01220 (17) | 0.017 (4) |
| $\gamma_{17,2}$(Th) | 904.20 (5) | 0.78 (4) | E2 | 0.01212 (17) | 0.78 (4) |
| $\gamma_{12,1}$(Th) | 911.196 (6) | 26.5 (8) | E2 | 0.01194 (17) | 26.2 (8) |
| $\gamma_{55,17}$(Th) | 919.03 (12) | 0.028 (3) | | | 0.028 (3) |
| $\gamma_{13,1}$(Th) | 921.87 (12) | 0.0158 (24) | M1+E2 | 0.027 (15) | 0.0154 (23) |
| $\gamma_{28,6}$(Th) | 930.99 (7) | 0.0026 (24) | M1+E2 | 0.026 (15) | 0.0025 (23) |
| $\gamma_{47,12}$(Th) | 930.99 (7) | 0.004 (1) | | | 0.004 (1) |
| $\gamma_{58,17}$(Th) | 939.89 (15) | 0.009 (3) | | | 0.009 (3) |
| $\gamma_{10,0}$(Th) | 944.19 (3) | 0.102 (10) | E1+M2 | 0.025 (14) | 0.10 (1) |
| $\gamma_{25,5}$(Th) | 947.976 (24) | 0.111 (10) | M1+E2 | 0.025 (14) | 0.111 (10) |
| $\gamma_{14,1}$(Th) | 958.59 (4) | 0.29 (5) | | | 0.29 (5) |
| $\gamma_{15,1}$(Th) | 964.786 (8) | 4.99 (17) | E2+M1 | 0.01119 (23) | 4.99 (17) |
| $\gamma_{12,0}$(Th) | 968.960 (9) | 16.1 (5) | E2 | 0.01061 (15) | 15.9 (5) |
| $\gamma_{51,12}$(Th) | 975.98 (5) | 0.052 (6) | M1 | 0.0356 (5) | 0.052 (6) |
| $\gamma_{13,0}$(Th) | 979.49 (10) | 0.0283 (30) | E2 | 0.01039 (15) | 0.028 (3) |
| $\gamma_{21,2}$(Th) | 987.87 (10) | 0.14 (6) | M1+E2 | 0.022 (13) | 0.14 (6) |
| $\gamma_{22,2}$(Th) | 988.65 (20) | 0.081 (14) | E2 | 0.01021 (15) | 0.081 (14) |
| $\gamma_{51,10}$(Th) | 1000.68 (10) | 0.0054 (3) | | | 0.0054 (3) |
| $\gamma_{58,14}$(Th) | 1013.55 (13) | 0.0097 (16) | | | 0.0097 (16) |
| $\gamma_{14,0}$(Th) | 1016.44 (10) | 0.0194 (31) | M1+E2 | 0.021 (12) | 0.019 (3) |
| $\gamma_{54,12}$(Th) | 1017.94 (20) | 0.032 (32) | E2+M3 | 0.07 (7) | 0.03 (3) |
| $\gamma_{26,5}$(Th) | 1019.88 (10) | 0.022 (5) | | | 0.022 (5) |
| $\gamma_{17,1}$(Th) | 1033.244 (23) | 0.204 (12) | E2 | 0.00938 (14) | 0.204 (12) |
| $\gamma_{23,2}$(Th) | 1039.83 (7) | 0.056 (18) | | | 0.056 (18) |
| $\gamma_{55,12}$(Th) | 1040.94 (15) | 0.047 (10) | E2+M3 | 0.07 (6) | 0.047 (10) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{57,12}$(Th) | 1053.11 (20) | 0.0143 (41) | M1+E2 | 0.019 (10) | 0.014 (4) |
| $\gamma_{28,5}$(Th) | 1054.13 (20) | 0.019 (6) | M1+E2 | 0.019 (10) | 0.019 (6) |
| $\gamma_{50,8}$(Th) | 1062.57 (15) | 0.011 (4) | | | 0.011 (4) |
| $\gamma_{18,1}$(Th) | 1065.168 (15) | 0.135 (8) | | | 0.135 (8) |
| $\gamma_{48,7}$(Th) | 1074.73 (15) | 0.011 (4) | | | 0.011 (4) |
| $\gamma_{26,3}$(Th) | 1088.20 (15) | 0.0062 (14) | | | 0.0062 (14) |
| $\gamma_{19,1}$(Th) | 1095.671 (23) | 0.126 (10) | M1+E2 | 0.017 (9) | 0.126 (10) |
| $\gamma_{27,3}$(Th) | 1103.43 (10) | 0.0102 (11) | E3 | 0.0195 (3) | 0.0102 (11) |
| $\gamma_{20,1}$(Th) | 1110.604 (9) | 0.285 (22) | E1 | 0.00288 (4) | 0.284 (22) |
| $\gamma_{24,2}$(Th) | 1110.604 (9) | 0.0273 (21) | E1 | 0.00288 (4) | 0.0272 (21) |
| $\gamma_{22,1}$(Th) | 1117.65 (10) | 0.061 (7) | | | 0.061 (7) |
| $\gamma_{29,5}$(Th) | 1135.26 (15) | 0.0102 (17) | | | 0.0102 (17) |
| $\gamma_{30,5}$(Th) | 1142.87 (15) | 0.0108 (22) | | | 0.0108 (22) |
| $\gamma_{57,8}$(Th) | 1148.17 (14) | 0.0062 (14) | M1+E2 | 0.015 (8) | 0.0062 (14) |
| $\gamma_{19,0}$(Th) | 1153.27 (4) | 0.148 (13) | E1+M2 | 0.03 (3) | 0.148 (13) |
| $\gamma_{25,2}$(Th) | 1157.16 (15) | 0.0073 (14) | E1+M2 | 0.03 (3) | 0.0073 (14) |
| $\gamma_{37,6}$(Th) | 1164.55 (7) | 0.067 (7) | M1+E2 | 0.015 (8) | 0.067 (7) |
| $\gamma_{22,0}$(Th) | 1175.33 (10) | 0.0257 (42) | E1+M2 | 0.027 (24) | 0.025 (4) |
| $\gamma_{57,7}$(Th) | 1190.83 (20) | 0.0065 (17) | M1+E2 | 0.014 (7) | 0.0065 (17) |
| $\gamma_{40,6}$(Th) | 1217.03 (10) | 0.022 (4) | | | 0.022 (4) |
| $\gamma_{26,2}$(Th) | 1229.42 (15) | 0.0078 (25) | | | 0.0078 (25) |
| $\gamma_{27,2}$(Th) | 1245.15 (6) | 0.110 (8) | M1+E2 | 0.013 (6) | 0.110 (8) |
| $\gamma_{34,5}$(Th) | 1247.10 (5) | 0.524 (24) | M1 | 0.0187 (3) | 0.524 (24) |
| $\gamma_{35,5}$(Th) | 1250.06 (5) | 0.065 (6) | | | 0.065 (6) |
| $\gamma_{44,6}$(Th) | 1276.72 (10) | 0.015 (3) | | | 0.015 (3) |
| $\gamma_{25,1}$(Th) | 1286.29 (20) | 0.052 (11) | E1+M2 | | 0.052 (11) |
| $\gamma_{37,5}$(Th) | 1287.77 (8) | 0.109 (25) | M1+E2 | 0.012 (6) | 0.109 (25) |
| $\gamma_{33,3}$(Th) | 1309.76 (20) | 0.020 (7) | E1+M2 | 0.020 (18) | 0.020 (7) |
| $\gamma_{34,3}$(Th) | 1315.33 (10) | 0.0152 (30) | M1+E2 | 0.011 (6) | 0.015 (3) |
| $\gamma_{29,2}$(Th) | 1344.62 (15) | 0.0094 (20) | M1+E2 | 0.011 (5) | 0.0094 (20) |
| $\gamma_{41,5}$(Th) | 1347.50 (15) | 0.0163 (41) | E1+M2 | 0.019 (17) | 0.016 (4) |
| $\gamma_{40,4}$(Th) | 1357.81 (15) | 0.021 (5) | | | 0.021 (5) |
| $\gamma_{41,4}$(Th) | 1365.71 (12) | 0.0144 (31) | E2+M3 | 0.03 (3) | 0.014 (3) |
| $\gamma_{27,1}$(Th) | 1374.24 (7) | 0.0196 (14) | E2+M3 | 0.03 (3) | 0.0196 (14) |
| $\gamma_{45,5}$(Th) | 1401.52 (10) | 0.0132 (31) | E1+M2 | 0.017 (15) | 0.013 (3) |
| $\gamma_{41,3}$(Th) | 1415.55 (14) | 0.022 (5) | E3 | 0.01141 (16) | 0.022 (5) |
| $\gamma_{32,2}$(Th) | 1430.99 (10) | 0.037 (8) | | | 0.037 (8) |
| $\gamma_{28,0}$(Th) | 1451.43 (15) | 0.0111 (22) | M1+E2 | 0.009 (4) | 0.0111 (22) |
| $\gamma_{35,2}$(Th) | 1459.131 (22) | 0.89 (6) | E2 | 0.00498 (7) | 0.87 (5) |
| $\gamma_{45,3}$(Th) | 1469.74 (15) | 0.021 (5) | E1+M2 | 0.015 (14) | 0.021 (5) |
| $\gamma_{36,2}$(Th) | 1495.904 (16) | 0.924 (30) | E2 | 0.00477 (7) | 0.92 (3) |
| $\gamma_{38,2}$(Th) | 1501.59 (5) | 0.513 (17) | | | 0.513 (17) |
| $\gamma_{39,2}$(Th) | 1537.89 (10) | 0.049 (6) | E2+M3 | 0.023 (19) | 0.049 (6) |
| $\gamma_{40,2}$(Th) | 1548.65 (6) | 0.040 (5) | | | 0.040 (5) |
| $\gamma_{41,2}$(Th) | 1557.13 (7) | 0.173 (9) | E2+M1 | 0.0070 (6) | 0.173 (9) |
| $\gamma_{32,1}$(Th) | 1560.02 (7) | 0.021 (5) | | | 0.021 (5) |
| $\gamma_{42,2}$(Th) | 1571.55 (20) | 0.0059 (17) | | | 0.0059 (17) |
| $\gamma_{43,2}$(Th) | 1573.389 (24) | 0.0341 (40) | E2 | 0.00438 (7) | 0.034 (4) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{33,1}$(Th) | 1580.531 (25) | 0.624 (40) | M1+E2 | 0.007 (3) | 0.62 (4) |
| $\gamma_{35,1}$(Th) | 1588.200 (25) | 3.06 (12) | E2 | 0.007 (3) | 3.06 (12) |
| $\gamma_{54,4}$(Th) | 1609.44 (15) | 0.0081 (17) | E2 | 0.00422 (6) | 0.0081 (17) |
| $\gamma_{36,1}$(Th) | 1625.09 (4) | 0.270 (23) | E2+M3 | 0.020 (17) | 0.270 (23) |
| $\gamma_{38,1}$(Th) | 1630.618 (20) | 1.52 (6) | M1+E2 | 0.007 (3) | 1.52 (6) |
| $\gamma_{33,0}$(Th) | 1638.272 (23) | 0.462 (30) | E2 | 0.00410 (6) | 0.46 (3) |
| $\gamma_{39,1}$(Th) | 1666.514 (13) | 0.173 (9) | M1 | 0.00895 (13) | 0.173 (9) |
| $\gamma_{40,1}$(Th) | 1677.66 (6) | 0.057 (6) | | | 0.057 (6) |
| $\gamma_{41,1}$(Th) | 1686.22 (11) | 0.094 (7) | E2 | 0.00391 (6) | 0.094 (7) |
| $\gamma_{42,1}$(Th) | 1700.62 (20) | 0.0105 (25) | | | 0.0105 (25) |
| $\gamma_{43,1}$(Th) | 1702.40 (8) | 0.055 (7) | E2+M3 | 0.018 (15) | 0.055 (7) |
| $\gamma_{46,2}$(Th) | 1706.17 (7) | 0.0089 (12) | M1+E2 | 0.0078 (12) | 0.0089 (12) |
| $\gamma_{47,2}$(Th) | 1713.49 (20) | 0.0057 (11) | E2+M3 | 0.018 (14) | 0.0057 (11) |
| $\gamma_{39,0}$(Th) | 1724.19 (5) | 0.030 (4) | E1+M2 | | 0.030 (4) |
| $\gamma_{44,1}$(Th) | 1738.46 (5) | 0.018 (4) | | | 0.018 (4) |
| $\gamma_{45,1}$(Th) | 1740.5 (3) | 0.011 (4) | | | 0.011 (4) |
| $\gamma_{49,2}$(Th) | 1742.1 (3) | 0.0084 (25) | M1+E2 | | 0.0084 (25) |
| $\gamma_{50,2}$(Th) | 1750.58 (20) | 0.0084 (9) | | | 0.0084 (9) |
| $\gamma_{51,2}$(Th) | 1758.11 (5) | 0.0361 (40) | E2+M1 | 0.00371 (6) | 0.036 (4) |
| $\gamma_{52,2}$(Th) | 1772.2 (3) | 0.0019 (5) | E2+M3 | 0.016 (13) | 0.0019 (5) |
| $\gamma_{60,3}$(Th) | 1795.13 (6) | 0.0022 (8) | | | 0.0022 (8) |
| $\gamma_{45,0}$(Th) | 1797.5 (5) | 0.0022 (8) | E1+M2 | 0.009 (8) | 0.0022 (8) |
| $\gamma_{54,2}$(Th) | 1800.9 (2) | 0.0046 (8) | | | 0.0046 (8) |
| $\gamma_{55,2}$(Th) | 1823.22 (10) | 0.046 (5) | | | 0.046 (5) |
| $\gamma_{56,2}$(Th) | 1826.8 (3) | 0.0022 (8) | | | 0.0022 (8) |
| $\gamma_{46,1}$(Th) | 1835.29 (10) | 0.0381 (40) | E2+M1 | 0.00382 (10) | 0.038 (4) |
| $\gamma_{47,1}$(Th) | 1842.15 (8) | 0.037 (6) | M1+E2 | 0.0055 (4) | 0.037 (6) |
| $\gamma_{59,2}$(Th) | 1850.17 (20) | 0.0046 (8) | | | 0.0046 (8) |
| $\gamma_{49,1}$(Th) | 1870.82 (9) | 0.0257 (24) | M1+E2 | 0.0051 (18) | 0.0257 (24) |
| $\gamma_{50,1}$(Th) | 1879.6 (3) | 0.0013 (5) | | | 0.0013 (5) |
| $\gamma_{51,1}$(Th) | 1887.13 (5) | 0.094 (7) | E2+M1 | 0.0050 (17) | 0.094 (7) |
| $\gamma_{47,0}$(Th) | 1900.16 (20) | 0.0030 (6) | E1+M2 | 0.008 (7) | 0.0030 (6) |
| $\gamma_{53,1}$(Th) | 1907.14 (11) | 0.0124 (13) | | | 0.0124 (13) |
| $\gamma_{54,1}$(Th) | 1929.78 (20) | 0.0208 (14) | E2+M3 | 0.013 (10) | 0.0208 (14) |
| $\gamma_{60,2}$(Th) | 1936.3 (3) | 0.0022 (6) | | | 0.0022 (6) |
| $\gamma_{55,1}$(Th) | 1952.37 (10) | 0.062 (5) | E2+M3 | 0.013 (10) | 0.062 (5) |
| $\gamma_{56,1}$(Th) | 1955.9 (5) | 0.0008 (3) | | | 0.0008 (3) |
| $\gamma_{52,0}$(Th) | 1958.4 (3) | 0.0016 (5) | E1+M2 | | 0.0016 (5) |
| $\gamma_{57,1}$(Th) | 1965.22 (12) | 0.0223 (22) | M1+E2 | 0.0046 (15) | 0.0223 (22) |
| $\gamma_{58,1}$(Th) | 1972.0 (3) | 0.0038 (8) | | | 0.0038 (8) |
| $\gamma_{59,1}$(Th) | 1979.3 (3) | 0.0019 (5) | | | 0.0019 (5) |
| $\gamma_{58,0}$(Th) | 2029.4 (5) | 0.0019 (5) | E1+M2 | 0.007 (6) | 0.0019 (5) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 698.55 | (32) | d |
| $Q_\alpha$ | : | 5520.08 | (22) | keV |
| $\alpha$ | : | 100 | | % |
| $^{20}O$ | : | 1.13 | (22) | $\times 10^{-11}$ % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,8}$ | 4448.00 (23) | 0.0000045 (7) |
| $\alpha_{0,7}$ | 4522.97 (23) | 0.000017 (3) |
| $\alpha_{0,6}$ | 4952.5 (3) | 0.000024 (5) |
| $\alpha_{0,5}$ | 4997.76 (24) | 0.000010 (2) |
| $\alpha_{0,4}$ | 5137.97 (22) | 0.036 (6) |
| $\alpha_{0,3}$ | 5176.86 (22) | 0.218 (4) |
| $\alpha_{0,2}$ | 5211.05 (22) | 0.408 (7) |
| $\alpha_{0,1}$ | 5340.35 (22) | 26.0 (5) |
| $\alpha_{0,0}$ | 5423.24 (22) | 73.4 (5) |

## 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Ra) | 5.71 - 12.04 | | 10.4 (4) |
| $e_{AK}$ | (Ra) | | | 0.0020 (3) |
| | KLL | 65.149 - 72.729 | } | |
| | KLX | 79.721 - 88.466 | } | |
| | KXY | 94.27 - 103.91 | } | |
| $ec_{1,0\ L}$ | (Ra) | 65.14 - 68.93 | | 18.5 (5) |
| $ec_{1,0\ M}$ | (Ra) | 79.55 - 81.27 | | 5.0 (2) |
| $ec_{1,0\ N+}$ | (Ra) | 83.17 - 84.36 | | 1.65 (5) |
| $ec_{2,0\ K}$ | (Ra) | 112.072 (4) | | 0.015 (6) |
| $ec_{3,1\ K}$ | (Ra) | 62.497 (4) | | 0.023 (1) |
| $ec_{3,1\ L}$ | (Ra) | 147.17 - 150.97 | | 0.069 (2) |
| $ec_{3,1\ M+}$ | (Ra) | 161.59 - 166.40 | | 0.025 (1) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Ra) | 10.622 — 18.412 | | 8.6 (4) | |
| $XK\alpha_2$ | (Ra) | 85.43 | | 0.0180 (3) | } $K\alpha$ |
| $XK\alpha_1$ | (Ra) | 88.47 | | 0.0295 (5) | } |
| $XK\beta_3$ | (Ra) | 99.432 | } | | |
| $XK\beta_1$ | (Ra) | 100.13 | } | 0.01034 (21) | $K\beta_1'$ |
| $XK\beta_5''$ | (Ra) | 100.738 | } | | |
| $XK\beta_2$ | (Ra) | 102.89 | } | | |
| $XK\beta_4$ | (Ra) | 103.295 | } | 0.00339 (9) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Ra) | 103.74 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{4,2}$(Ra) | 74.38 (4) | 0.015 (5) | [E2] | 38.6 (6) | 0.00039 (14) |
| $\gamma_{1,0}$(Ra) | 84.373 (3) | 26.4 (7) | E2 | 21.2 (3) | 1.19 (3) |
| $\gamma_{2,1}$(Ra) | 131.612 (5) | 0.158 (3) | E1 | 0.247 (4) | 0.127 (2) |
| $\gamma_{5,4}$(Ra) | 142.71 (11) | 0.0000041 (13) | [E2] | 2.14 (3) | 0.0000013 (4) |
| $\gamma_{3,1}$(Ra) | 166.410 (4) | 0.217 (4) | E2 | 1.164 (17) | 0.1004 (14) |
| $\gamma_{5,3}$(Ra) | 182.29 (10) | 0.0000057 (20) | [E1] | 0.1126 (16) | 0.0000051 (18) |
| $\gamma_{4,1}$(Ra) | 205.99 (4) | 0.0204 (5) | [E1] | 0.0841 (12) | 0.0188 (5) |
| $\gamma_{2,0}$(Ra) | 215.985 (4) | 0.265 (4) | E1 | 0.0752 (11) | 0.246 (4) |
| $\gamma_{6,3}$(Ra) | 228.42 (18) | 0.000025 (6) | [E2] | 0.366 (6) | 0.000018 (4) |
| $\gamma_{7,2}$(Ra) | 700.36 (7) | 0.000003 (1) | E1 | 0.00611 (9) | 0.000003 (1) |
| $\gamma_{8,3}$(Ra) | 741.87 (6) | 0.0000014 (4) | [E2] | 0.01625 (23) | 0.0000014 (4) |
| $\gamma_{7,1}$(Ra) | 831.97 (7) | 0.000014 (2) | E2 | 0.01289 (18) | 0.000014 (2) |
| $\gamma_{8,1}$(Ra) | 908.28 (6) | 0.0000017 (5) | [M1+50%E2] | 0.024 (3) | 0.0000017 (5) |
| $\gamma_{8,0}$(Ra) | 992.65 (6) | 0.0000014 (4) | [E2] | 0.00913 (13) | 0.0000014 (4) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 7.88 | (12) | $\times 10^3$ y |
| $Q_\alpha$ | : | 5167.6 | (10) | keV |
| $\alpha$ | : | 100 | | % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,44}$ | 4478 (3) | 0.005 |
| $\alpha_{0,43}$ | 4484 (2) | 0.03 (2) |
| $\alpha_{0,40}$ | 4599 (3) | 0.02 (1) |
| $\alpha_{0,38}$ | 4608 (2) | 0.050 (8) |
| $\alpha_{0,36}$ | 4667 | 0.001 |
| $\alpha_{0,33}$ | 4690 (2) | 0.23 (8) |
| $\alpha_{0,30}$ | 4694 (2) | 0.12 (2) |
| $\alpha_{0,29}$ | 4737 | 0.01 |
| $\alpha_{0,28}$ | 4748 | 0.005 |
| $\alpha_{0,27}$ | 4754 | 0.05 |
| $\alpha_{0,26}$ | 4761 (2) | 1.0 (4) |
| $\alpha_{0,24}$ | 4797.8 (12) | 1.5 (2) |
| $\alpha_{0,23}$ | 4809 | 0.22 |
| $\alpha_{0,22}$ | 4814.6 (12) | 9.30 (8) |
| $\alpha_{0,20}$ | 4833 | 0.29 |
| $\alpha_{0,19}$ | 4838 (2) | 5.0 (2) |
| $\alpha_{0,18}$ | 4845.3 (12) | 56.2 (2) |
| $\alpha_{0,17}$ | 4852 | 0.03 |
| $\alpha_{0,15}$ | 4861 (2) | 0.28 (10) |
| $\alpha_{0,14}$ | 4865 | 0.03 |
| $\alpha_{0,13}$ | 4878 | 0.03 |
| $\alpha_{0,12}$ | 4901.0 (12) | 10.20 (8) |
| $\alpha_{0,10}$ | 4930 (2) | 0.16 (5) |
| $\alpha_{0,8}$ | 4967.5 (12) | 5.97 (6) |
| $\alpha_{0,6}$ | 4978.5 (12) | 3.17 (4) |
| $\alpha_{0,5}$ | 5009 (2) | 0.09 (1) |
| $\alpha_{0,4}$ | 5023 (2) | 0.009 (3) |
| $\alpha_{0,3}$ | 5036 (2) | 0.24 (2) |
| $\alpha_{0,2}$ | 5047 (2) | 0.2 |
| $\alpha_{0,1}$ | 5053 (2) | 6.6 (1) |
| $\alpha_{0,0}$ | 5078 (2) | 0.05 (1) |

## 3 Electron Emissions

| | | Energy keV | | | Electrons per 100 disint. |
|---|---|---|---|---|---|
| $e_{AL}$ | (Ra) | 5.71 | - | 12.04 | 132 (7) |
| $e_{AK}$ | (Ra) | | | | 1.60 (21) |
| | KLL | 65.149 | - | 72.729 | } |
| | KLX | 79.721 | - | 88.466 | } |
| | KXY | 94.27 | - | 103.91 | } |
| $ec_{3,1\ L}$ | (Ra) | 1.92 | - | 1.92 | 0.52 (26) |
| $ec_{10,3\ K}$ | (Ra) | 3.193 | | (8) | 7.6 (16) |
| $ec_{4,2\ L}$ | (Ra) | 4.4 | - | 8.2 | 0.218 (21) |
| $ec_{15,8\ K}$ | (Ra) | 5.285 | | (8) | 0.45 (11) |
| $ec_{1,0\ L}$ | (Ra) | 6.16 | - | 9.95 | 43 (21) |
| $ec_{12,5\ K}$ | (Ra) | 6.417 | | (10) | 0.037 (4) |
| $ec_{12,10\ L}$ | (Ra) | 10.7 | - | 14.5 | 18.4 (33) |
| $ec_{6,5\ L}$ | (Ra) | 11.9 | - | 15.7 | 1.56 (15) |
| $ec_{2,0\ L}$ | (Ra) | 12.3 | - | 16.1 | 2.14 (8) |
| $ec_{22,18\ L}$ | (Ra) | 12.34 | - | 16.13 | 4.7 (7) |
| $ec_{3,1\ M}$ | (Ra) | 12.54 | - | 14.26 | 18 (9) |
| $ec_{15,6\ K}$ | (Ra) | 16.065 | | (8) | 0.402 (3) |
| $ec_{3,1\ N}$ | (Ra) | 16.15 | - | 17.08 | 4.6 (23) |
| $ec_{5,2\ L}$ | (Ra) | 18.6 | - | 22.4 | 2.4 (12) |
| $ec_{4,2\ M}$ | (Ra) | 18.8 | - | 20.5 | 0.053 (5) |
| $ec_{19,9\ K}$ | (Ra) | 19.278 | | (11) | 0.035 (5) |
| $ec_{1,0\ M}$ | (Ra) | 20.57 | - | 22.28 | 11 (6) |
| $ec_{10,1\ K}$ | (Ra) | 20.63 | | (5) | 4.63 (41) |
| $ec_{18,8\ K}$ | (Ra) | 20.74 | | (5) | 4.95 (41) |
| $ec_{17,6\ K}$ | (Ra) | 22.5650 | | (17) | 0.05 (1) |
| $ec_{33,22\ K}$ | (Ra) | 22.565 | | (17) | 0.032 (3) |
| $ec_{8,5\ L}$ | (Ra) | 23.1 | - | 26.9 | 0.068 (7) |
| $ec_{3,0\ L}$ | (Ra) | 23.59 | - | 27.38 | 9.0 (23) |
| $ec_{1,0\ N}$ | (Ra) | 24.18 | - | 25.11 | 3.0 (15) |
| $ec_{5,1\ L}$ | (Ra) | 24.76 | - | 28.55 | 0.491 (23) |
| $ec_{12,10\ M}$ | (Ra) | 25.1 | - | 26.8 | 4.6 (8) |
| $ec_{6,5\ M}$ | (Ra) | 26.3 | - | 28.0 | 0.391 (38) |
| $ec_{2,0\ M}$ | (Ra) | 26.7 | - | 28.4 | 0.536 (20) |
| $ec_{22,18\ M}$ | (Ra) | 26.75 | - | 28.46 | 1.12 (17) |
| $ec_{19,8\ K}$ | (Ra) | 28.011 | | (5) | 1.91 (7) |
| $ec_{6,5\ N}$ | (Ra) | 29.9 | - | 30.8 | 0.10 (1) |
| $ec_{24,10\ K}$ | (Ra) | 30.275 | | (20) | 0.0165 (7) |
| $ec_{2,0\ N}$ | (Ra) | 30.3 | - | 31.2 | 0.137 (5) |
| $ec_{13,5\ K}$ | (Ra) | 30.3 | | (1) | 0.051 (8) |
| $ec_{22,18\ N}$ | (Ra) | 30.36 | - | 31.29 | 0.297 (44) |
| $ec_{26,23\ L}$ | (Ra) | 30.518 | - | 34.306 | 0.42 (6) |
| $ec_{9,5\ L}$ | (Ra) | 31.76 | - | 35.55 | 0.29 (7) |
| $ec_{5,2\ M}$ | (Ra) | 33.0 | - | 34.7 | 0.65 (33) |
| $ec_{12,3\ K}$ | (Ra) | 33.075 | | (4) | 6.04 (18) |
| $ec_{26,22\ L}$ | (Ra) | 34.52 | - | 38.31 | 0.158 (43) |

| | | Energy keV | | | Electrons per 100 disint. |
|---|---|---|---|---|---|
| $ec_{5,2\ N}$ | (Ra) | 36.6 | - | 37.5 | 0.17 (9) |
| $ec_{18,12\ L}$ | (Ra) | 37.286 | - | 41.074 | 4.1 (12) |
| $ec_{8,5\ M}$ | (Ra) | 37.5 | - | 39.2 | 0.0166 (17) |
| $ec_{3,0\ M}$ | (Ra) | 38.00 | - | 39.72 | 2.2 (7) |
| $ec_{19,6\ K}$ | (Ra) | 39.047 | | (5) | 1.83 (6) |
| $ec_{5,1\ M}$ | (Ra) | 39.17 | - | 40.89 | 0.121 (6) |
| $ec_{3,0\ N}$ | (Ra) | 41.61 | - | 42.54 | 0.61 (16) |
| $ec_{5,1\ N}$ | (Ra) | 42.78 | - | 43.71 | 0.0311 (15) |
| $ec_{22,9\ K}$ | (Ra) | 43.725 | | (30) | 0.031 (2) |
| $ec_{12,2\ K}$ | (Ra) | 44.24 | | (4) | 0.129 (9) |
| $ec_{26,23\ M}$ | (Ra) | 44.928 | - | 46.645 | 0.10 (2) |
| $ec_{10,0\ K}$ | (Ra) | 46.12 | | (3) | 0.20 (6) |
| $ec_{9,5\ M}$ | (Ra) | 46.17 | - | 47.89 | 0.068 (16) |
| $ec_{33,19\ K}$ | (Ra) | 47.7 | | (3) | 0.0960 (15) |
| $ec_{26,23\ N}$ | (Ra) | 48.542 | - | 49.471 | 0.034 (5) |
| $ec_{12,8\ L}$ | (Ra) | 48.86 | - | 52.65 | 0.76 (30) |
| $ec_{26,22\ M}$ | (Ra) | 48.93 | - | 50.64 | 0.038 (10) |
| $ec_{8,3\ L}$ | (Ra) | 49.60 | - | 53.39 | 5.6 (5) |
| $ec_{9,5\ N}$ | (Ra) | 49.78 | - | 50.71 | 0.0180 (43) |
| $ec_{12,1\ K}$ | (Ra) | 50.42 | | (1) | 2.5 (7) |
| $ec_{18,12\ M}$ | (Ra) | 51.696 | - | 53.413 | 0.96 (27) |
| $ec_{22,8\ K}$ | (Ra) | 52.494 | | (9) | 4.19 (12) |
| $ec_{26,22\ N}$ | (Ra) | 52.54 | - | 53.47 | 0.0100 (27) |
| $ec_{33,18\ K}$ | (Ra) | 54.50 | | (12) | 0.17 (7) |
| $ec_{18,12\ N}$ | (Ra) | 55.310 | - | 56.239 | 0.25 (7) |
| $ec_{6,1\ L}$ | (Ra) | 55.9 | - | 59.7 | 16.5 (35) |
| $ec_{26,19\ L}$ | (Ra) | 59.068 | - | 62.856 | 0.041 (7) |
| $ec_{30,17\ K}$ | (Ra) | 59.425 | | (40) | 0.069 (7) |
| $ec_{18,5\ K}$ | (Ra) | 63.061 | | (50) | 0.023 (2) |
| $ec_{12,8\ M}$ | (Ra) | 63.27 | - | 64.98 | 0.19 (7) |
| $ec_{22,6\ K}$ | (Ra) | 63.53 | | (8) | 0.145 (29) |
| $ec_{8,3\ M}$ | (Ra) | 64.01 | - | 65.72 | 1.52 (15) |
| $ec_{12,8\ N}$ | (Ra) | 66.88 | - | 67.81 | 0.048 (22) |
| $ec_{8,1\ L}$ | (Ra) | 67.02 | - | 70.81 | 5.6 (8) |
| $ec_{18,10\ L}$ | (Ra) | 67.2 | - | 71.0 | 93.6 (13) |
| $ec_{8,3\ N}$ | (Ra) | 67.62 | - | 68.55 | 0.401 (39) |
| $ec_{24,8\ K}$ | (Ra) | 69.011 | | (18) | 0.292 (27) |
| $ec_{6,1\ M}$ | (Ra) | 70.3 | - | 72.0 | 4.5 (10) |
| $ec_{6,1\ N}$ | (Ra) | 73.9 | - | 74.8 | 1.18 (25) |
| $ec_{10,4\ L}$ | (Ra) | 75.498 | - | 79.286 | 0.026 (3) |
| $ec_{12,0\ K}$ | (Ra) | 75.842 | | (60) | 0.039 (5) |
| $ec_{24,6\ K}$ | (Ra) | 80.013 | | (8) | 0.324 (16) |
| $ec_{8,1\ M}$ | (Ra) | 81.43 | - | 83.14 | 1.39 (21) |
| $ec_{18,10\ M}$ | (Ra) | 81.6 | - | 83.3 | 22.39 (35) |
| $ec_{8,1\ N}$ | (Ra) | 85.04 | - | 85.97 | 0.36 (6) |
| $ec_{18,10\ N}$ | (Ra) | 85.2 | - | 86.1 | 5.90 (11) |
| $ec_{10,3\ L}$ | (Ra) | 87.876 | - | 91.664 | 1.78 (49) |
| $ec_{18,3\ K}$ | (Ra) | 89.60 | | (5) | 8.9 |

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $ec_{15,8\ L}$ | (Ra) | 89.968 - 93.756 | 0.085 (22) |
| $ec_{15,1\ K}$ | (Ra) | 90.385 (70) | 0.034 (5) |
| $ec_{19,3\ K}$ | (Ra) | 96.892 (80) | 0.011 (2) |
| $ec_{22,10\ L}$ | (Ra) | 98.868 - 102.656 | 0.043 (5) |
| $ec_{15,6\ L}$ | (Ra) | 100.748 - 104.536 | 0.075 (5) |
| $ec_{18,2\ K}$ | (Ra) | 100.775 (80) | 0.041 (6) |
| $ec_{10,3\ M}$ | (Ra) | 102.286 - 104.003 | 0.44 (14) |
| $ec_{15,8\ M}$ | (Ra) | 104.378 - 106.095 | 0.023 (5) |
| $ec_{10,1\ L}$ | (Ra) | 105.32 - 109.11 | 0.86 (8) |
| $ec_{18,8\ L}$ | (Ra) | 105.42 - 109.21 | 0.92 (8) |
| $ec_{10,3\ N}$ | (Ra) | 105.900 - 106.829 | 0.113 (41) |
| $ec_{26,8\ K}$ | (Ra) | 106.24 (8) | 0.29 (6) |
| $ec_{18,1\ K}$ | (Ra) | 106.938 (3) | 4.25 (46) |
| $ec_{33,22\ L}$ | (Ra) | 107.248 - 111.036 | 0.016 (2) |
| $ec_{17,6\ L}$ | (Ra) | 107.248 - 111.036 | 0.025 (3) |
| $ec_{19,8\ L}$ | (Ra) | 112.694 - 116.482 | 0.355 (14) |
| $ec_{22,10\ M}$ | (Ra) | 113.278 - 114.995 | 0.0116 (23) |
| $ec_{19,1\ K}$ | (Ra) | 114.239 (17) | 0.248 (28) |
| $ec_{24,10\ L}$ | (Ra) | 114.958 - 118.746 | 0.0109 (6) |
| $ec_{15,6\ M}$ | (Ra) | 115.158 - 116.875 | 0.018 (2) |
| $ec_{26,6\ K}$ | (Ra) | 117.305 (100) | 0.032 (5) |
| $ec_{12,3\ L}$ | (Ra) | 117.76 - 121.55 | 1.125 (33) |
| $ec_{10,1\ M}$ | (Ra) | 119.73 - 121.44 | 0.206 (18) |
| $ec_{18,8\ M}$ | (Ra) | 119.83 - 121.54 | 0.221 (18) |
| $ec_{26,12\ L}$ | (Ra) | 122.768 - 126.556 | 0.016 (3) |
| $ec_{10,1\ N}$ | (Ra) | 123.34 - 124.27 | 0.0544 (48) |
| $ec_{18,8\ N}$ | (Ra) | 123.44 - 124.37 | 0.0583 (48) |
| $ec_{19,6\ L}$ | (Ra) | 123.730 - 127.518 | 0.341 (11) |
| $ec_{19,8\ M}$ | (Ra) | 127.104 - 128.821 | 0.0851 (33) |
| $ec_{12,2\ L}$ | (Ra) | 128.92 - 132.71 | 0.0263 (18) |
| $ec_{19,8\ N}$ | (Ra) | 130.718 - 131.647 | 0.0224 (9) |
| $ec_{10,0\ L}$ | (Ra) | 130.81 - 134.60 | 0.047 (6) |
| $ec_{12,3\ M}$ | (Ra) | 132.17 - 133.89 | 0.269 (8) |
| $ec_{18,0\ K}$ | (Ra) | 132.334 (100) | 0.021 (3) |
| $ec_{33,19\ L}$ | (Ra) | 132.4 - 136.2 | 0.01782 (28) |
| $ec_{12,1\ L}$ | (Ra) | 135.104 - 138.892 | 0.55 (6) |
| $ec_{12,3\ N}$ | (Ra) | 135.78 - 136.71 | 0.0709 (21) |
| $ec_{22,8\ L}$ | (Ra) | 137.177 - 140.965 | 0.777 (23) |
| $ec_{19,6\ M}$ | (Ra) | 138.140 - 139.857 | 0.0816 (27) |
| $ec_{22,1\ K}$ | (Ra) | 138.685 (110) | 0.09 (1) |
| $ec_{33,18\ L}$ | (Ra) | 139.19 - 142.98 | 0.032 (6) |
| $ec_{19,6\ N}$ | (Ra) | 141.754 - 142.683 | 0.0215 (7) |
| $ec_{30,17\ L}$ | (Ra) | 144.108 - 147.896 | 0.013 (2) |
| $ec_{10,0\ M}$ | (Ra) | 145.22 - 146.94 | 0.0114 (18) |
| $ec_{18,5\ L}$ | (Ra) | 147.744 - 151.532 | 0.046 (5) |
| $ec_{22,6\ L}$ | (Ra) | 148.22 - 152.01 | 0.027 (5) |
| $ec_{12,1\ M}$ | (Ra) | 149.514 - 151.231 | 0.139 (23) |
| $ec_{22,8\ M}$ | (Ra) | 151.587 - 153.304 | 0.186 (5) |

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $ec_{12,1\ N}$ | (Ra) | 153.128 - 154.057 | 0.035 (5) |
| $ec_{24,8\ L}$ | (Ra) | 153.694 - 157.482 | 0.054 (5) |
| $ec_{24,1\ K}$ | (Ra) | 155.165 (130) | 0.031 (4) |
| $ec_{22,8\ N}$ | (Ra) | 155.201 - 156.130 | 0.0489 (14) |
| $ec_{12,0\ L}$ | (Ra) | 160.525 - 164.313 | 0.099 (16) |
| $ec_{24,6\ L}$ | (Ra) | 164.696 - 168.484 | 0.060 (3) |
| $ec_{24,8\ M}$ | (Ra) | 168.104 - 169.821 | 0.0129 (12) |
| $ec_{18,3\ L}$ | (Ra) | 174.29 - 178.08 | 1.6 |
| $ec_{12,0\ M}$ | (Ra) | 174.935 - 176.652 | 0.027 (6) |
| $ec_{15,1\ L}$ | (Ra) | 175.068 - 178.856 | 0.011 (2) |
| $ec_{24,6\ M}$ | (Ra) | 179.106 - 180.823 | 0.0144 (7) |
| $ec_{19,3\ L}$ | (Ra) | 181.575 - 185.363 | 0.022 (3) |
| $ec_{18,3\ M}$ | (Ra) | 188.70 - 190.42 | 0.4 |
| $ec_{26,8\ L}$ | (Ra) | 190.92 - 194.71 | 0.054 (11) |
| $ec_{18,1\ L}$ | (Ra) | 191.621 - 195.409 | 0.78 (8) |
| $ec_{18,3\ N}$ | (Ra) | 192.31 - 193.24 | 0.14 |
| $ec_{19,1\ L}$ | (Ra) | 198.922 - 202.710 | 0.046 (5) |
| $ec_{26,8\ M}$ | (Ra) | 205.33 - 207.04 | 0.0128 (27) |
| $ec_{22,3\ L}$ | (Ra) | 206.028 - 209.816 | 0.012 (2) |
| $ec_{18,1\ M}$ | (Ra) | 206.031 - 207.748 | 0.187 (20) |
| $ec_{18,1\ N}$ | (Ra) | 209.645 - 210.574 | 0.049 (5) |
| $ec_{19,1\ M}$ | (Ra) | 213.332 - 215.049 | 0.0109 (12) |
| $ec_{18,0\ L}$ | (Ra) | 217.017 - 220.805 | 0.028 (3) |
| $ec_{22,1\ L}$ | (Ra) | 223.368 - 227.156 | 0.017 (2) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Ra) | 10.62 — 18.41 | | 106 (7) | |
| $XK\alpha_2$ | (Ra) | 85.43 | | 14.3 (6) | } $K\alpha$ |
| $XK\alpha_1$ | (Ra) | 88.47 | | 23.4 (9) | } |
| $XK\beta_3$ | (Ra) | 99.432 | } | | |
| $XK\beta_1$ | (Ra) | 100.13 | } | 8.2 (4) | $K\beta_1^{'}$ |
| $XK\beta_5^{''}$ | (Ra) | 100.738 | } | | |
| $XK\beta_2$ | (Ra) | 102.89 | } | | |
| $XK\beta_4$ | (Ra) | 103.295 | } | 2.69 (12) | $K\beta_2^{'}$ |
| $XKO_{2,3}$ | (Ra) | 103.74 | } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{8,6}$(Ra) | 11.10 (8) | 12.0 (18) | (M1+E2) | 60000 (6) | 0.00020 (3) |
| $\gamma_{43,42}$(Ra) | 11.79 (20) | 0.0005 | | | 0.0005 |
| $\gamma_{3,1}$(Ra) | 17.360 (36) | 24 (12) | (M1) | 133.2 (21) | 0.18 (9) |
| $\gamma_{4,2}$(Ra) | 23.6 | 0.291 (24) | (M1+E2) | 241.33 | 0.0012 (1) |
| $\gamma_{1,0}$(Ra) | 25.39 (2) | 58 (29) | (E2) | 7240 (110) | 0.008 (4) |
| $\gamma_{23,19}$(Ra) | 28.68 (10) | 0.10 (3) | | | 0.10 (3) |
| $\gamma_{12,10}$(Ra) | 29.9 (1) | 24.6 (45) | (M1+E2) | 223 | 0.11 (2) |
| $\gamma_{10,9}$(Ra) | 29.9 (1) | 0.002 | | | 0.002 |
| $\gamma_{6,5}$(Ra) | 31.10 (5) | 2.92 (28) | (E1) | 2.48 (4) | 0.84 (8) |
| $\gamma_{2,0}$(Ra) | 31.50 (5) | 4.03 (14) | E1 | 2.39 (4) | 1.19 (4) |
| $\gamma_{22,18}$(Ra) | 31.57 (9) | 6.3 (9) | (M1) | 91.1 (15) | 0.068 (10) |
| $\gamma_{25,21}$(Ra) | 33.04 (20) | 0.01 | | | 0.01 |
| $\gamma_{5,2}$(Ra) | 37.8 (1) | 3.3 (16) | (E2) | 1023 (20) | 0.0032 (16) |
| $\gamma_{8,5}$(Ra) | 42.3 (1) | 0.172 (17) | (E1) | 1.094 (17) | 0.082 (8) |
| $\gamma_{3,0}$(Ra) | 42.82 (5) | 12.2 (31) | (M1+E2) | 75 (19) | 0.16 (1) |
| $\gamma_{5,1}$(Ra) | 43.99 (1) | 1.31 (6) | E1 | 0.985 (14) | 0.66 (3) |
| $\gamma_{22,15}$(Ra) | 46.52 (4) | 0.021 (2) | | | 0.021 (2) |
| $\gamma_{26,23}$(Ra) | 49.75 (8) | 0.58 (5) | (M1) | 25.2 | 0.022 (2) |
| $\gamma_{9,5}$(Ra) | 50.99 (4) | 0.39 (9) | (M1) | 22.2 (4) | 0.017 (4) |
| $\gamma_{26,22}$(Ra) | 53.75 (20) | 0.22 (6) | (M1) | 19.0 (4) | 0.011 (3) |
| $\gamma_{4,0}$(Ra) | 55.11 (3) | 0.0042 (6) | (E1) | 0.540 (8) | 0.0027 (4) |
| $\gamma_{18,12}$(Ra) | 56.518 (5) | 5.5 (15) | M1(+E2) | 18 (5) | 0.29 (2) |
| $\gamma_{12,9}$(Ra) | 59.33 (10) | 0.012 (2) | | | 0.012 (2) |
| $\gamma_{24,15}$(Ra) | 63.7 (2) | 0.005 (2) | | | 0.005 (2) |
| $\gamma_{9,4}$(Ra) | 64.96 (10) | 0.087 (11) | | | 0.087 (11) |
| $\gamma_{25,17}$(Ra) | 65.91 (10) | 0.161 (17) | | | 0.161 (17) |
| $\gamma_{12,8}$(Ra) | 68.09 (4) | 1.04 (38) | M1+E2 | 14 (5) | 0.069 (10) |
| $\gamma_{15,11}$(Ra) | 68.8 (1) | 0.04 | | | 0.04 |
| $\gamma_{20,12}$(Ra) | 68.8 (10) | 0.09 | | | 0.09 |
| $\gamma_{8,3}$(Ra) | 68.83 (3) | 7.7 (7) | E2 | 55.9 (8) | 0.136 (13) |
| $\gamma_{33,26}$(Ra) | 72.739 (10) | 0.14 (2) | | | 0.14 (2) |
| $\gamma_{6,1}$(Ra) | 75.1 (1) | 23.1 (49) | E2 | 36.9 (6) | 0.61 (13) |
| $\gamma_{16,10}$(Ra) | 75.19 (10) | 0.002 (1) | | | 0.002 (1) |
| $\gamma_{9,3}$(Ra) | 77.63 (5) | 0.055 (7) | (E1) | 0.216 (3) | 0.045 (6) |
| $\gamma_{26,19}$(Ra) | 78.3 (2) | 0.059 (15) | (M1) | 6.33 (10) | 0.008 (2) |
| $\gamma_{8,1}$(Ra) | 86.25 (4) | 8.7 (11) | M1+E2 | 5.7 (7) | 1.3 (1) |
| $\gamma_{18,10}$(Ra) | 86.40 (5) | 100.0 (19) | M1 | 4.75 (7) | 26.0 (1) |
| $\gamma_{29,21}$(Ra) | 89.09 (20) | 0.01 | | | 0.01 |
| $\gamma_{36,27}$(Ra) | 89.09 (20) | 0.005 | | | 0.005 |
| $\gamma_{9,2}$(Ra) | 89.09 (20) | 0.14 | | | 0.14 |
| $\gamma_{26,17}$(Ra) | 94.7 (1) | 0.028 (10) | | | 0.028 (10) |
| $\gamma_{10,4}$(Ra) | 94.73 (8) | 0.304 (23) | (E1) | 0.1274 (18) | 0.27 (2) |
| $\gamma_{9,1}$(Ra) | 94.92 (8) | 0.0146 (34) | (E1) | 0.1268 (18) | 0.013 (3) |
| $\gamma_{40,30}$(Ra) | 97.01 (12) | 0.011 (3) | | | 0.011 (3) |
| $\gamma_{20,10}$(Ra) | 98.86 (10) | 0.120 (15) | | | 0.120 (15) |
| $\gamma_{26,15}$(Ra) | 101.1 (2) | 0.018 (3) | | | 0.018 (3) |
| $\gamma_{7,0}$(Ra) | 101.58 (10) | 0.049 (7) | | | 0.049 (7) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{33,25}$(Ra) | 101.58 (10) | 0.049 (7) | | | 0.049 (7) |
| $\gamma_{27,16}$(Ra) | 102.54 (2) | 0.160 (19) | | | 0.160 (19) |
| $\gamma_{24,12}$(Ra) | 104.6 (2) | 0.058 (30) | (M1+E2) | 5.4 (25) | 0.009 (3) |
| $\gamma_{10,3}$(Ra) | 107.108 (8) | 10.8 (10) | M1(+E2) | 12.3 (11) | 0.81 (4) |
| $\gamma_{15,8}$(Ra) | 109.1 (1) | 0.58 (11) | (M1) | 12.15 (18) | 0.044 (8) |
| $\gamma_{21,10}$(Ra) | 110.3 (5) | 0.009 (2) | | | 0.009 (2) |
| $\gamma_{12,5}$(Ra) | 110.332 (8) | 0.171 (17) | (E1) | 0.377 (6) | 0.124 (12) |
| $\gamma_{42,38}$(Ra) | 114.75 (10) | 0.0151 (22) | | | 0.0151 (22) |
| $\gamma_{14,6}$(Ra) | 115.85 (10) | 0.01 | | | 0.01 |
| $\gamma_{18,9}$(Ra) | 115.85 (10) | 0.014 | (E1) | 0.336 (5) | 0.01 |
| $\gamma_{10,2}$(Ra) | 118.1 (1) | 0.007 (3) | | | 0.007 (3) |
| $\gamma_{22,10}$(Ra) | 118.1 (1) | 0.074 (23) | (E2) | 4.72 (7) | 0.013 (4) |
| $\gamma_{15,6}$(Ra) | 119.98 (2) | 0.52 (21) | (M1) | 9.30 (13) | 0.05 (2) |
| $\gamma_{19,9}$(Ra) | 123.193 (13) | 0.195 (9) | (E1) | 0.290 (4) | 0.151 (7) |
| $\gamma_{10,1}$(Ra) | 124.55 (5) | 6.5 (6) | (M1) | 8.36 (12) | 0.69 (6) |
| $\gamma_{18,8}$(Ra) | 124.65 (5) | 6.9 (6) | (M1) | 8.34 (12) | 0.74 (6) |
| $\gamma_{33,22}$(Ra) | 126.48 (10) | 0.061 (34) | (M1,E2) | 5.8 (23) | 0.009 (4) |
| $\gamma_{17,6}$(Ra) | 126.48 (10) | 0.095 (42) | (M1,E2) | 5.8 (23) | 0.014 (4) |
| $\gamma_{19,8}$(Ra) | 131.926 (5) | 2.71 (10) | M1 | 7.1 (1) | 0.335 (12) |
| $\gamma_{13,5}$(Ra) | 134.19 (10) | 0.073 (12) | (M1) | 6.76 (10) | 0.0094 (15) |
| $\gamma_{24,10}$(Ra) | 134.19 (10) | 0.022 (11) | (E2) | 2.75 (4) | 0.006 (3) |
| $\gamma_{33,21}$(Ra) | 134.19 (10) | 0.0014 (7) | | | 0.0014 (7) |
| $\gamma_{12,3}$(Ra) | 136.990 (4) | 8.71 (25) | M1 | 6.38 (9) | 1.18 (3) |
| $\gamma_{20,8}$(Ra) | 137.0 (1) | 0.04 (1) | | | 0.04 (1) |
| $\gamma_{21,9}$(Ra) | 139.8 (1) | 0.0045 (10) | | | 0.0045 (10) |
| $\gamma_{26,12}$(Ra) | 142.0 (1) | 0.035 (10) | (E2) | 2.18 (4) | 0.011 (3) |
| $\gamma_{19,6}$(Ra) | 142.962 (5) | 2.69 (9) | M1 | 5.65 (8) | 0.404 (12) |
| $\gamma_{22,9}$(Ra) | 147.64 (5) | 0.237 (24) | E1 | 0.187 (3) | 0.20 (2) |
| $\gamma_{12,2}$(Ra) | 148.15 (4) | 1.04 (7) | E1 | 0.186 (3) | 0.88 (6) |
| $\gamma_{10,0}$(Ra) | 150.04 (3) | 0.33 | (M1+E2) | 4.5 (8) | 0.06 |
| $\gamma_{11,0}$(Ra) | 151.6 (3) | 0.025 | | | 0.025 |
| $\gamma_{33,19}$(Ra) | 151.6 (3) | 0.15 | (M1) | 4.78 (8) | 0.025 |
| $\gamma_{12,1}$(Ra) | 154.336 (10) | 3.9 (6) | M1+E2 | 4.1 (8) | 0.77 (2) |
| $\gamma_{22,8}$(Ra) | 156.409 (9) | 6.40 (18) | M1 | 4.38 (7) | 1.19 (3) |
| $\gamma_{33,18}$(Ra) | 158.42 (12) | 0.26 (7) | M1(+E2) | 4.5 (14) | 0.048 (5) |
| $\gamma_{30,17}$(Ra) | 163.34 (17) | 0.097 (34) | (M1) | 3.87 (6) | 0.020 (7) |
| $\gamma_{18,5}$(Ra) | 166.976 (7) | 0.234 (11) | (E1) | 0.1391 (20) | 0.205 (10) |
| $\gamma_{22,6}$(Ra) | 167.45 (5) | 0.230 (46) | (M1) | 3.61 (5) | 0.05 (1) |
| $\gamma_{31,16}$(Ra) | 169.2 (3) | 0.0029 (14) | | | 0.0029 (14) |
| $\gamma_{16,4}$(Ra) | 169.2 (3) | 0.0010 (5) | | | 0.0010 (5) |
| $\gamma_{30,15}$(Ra) | 169.2 (3) | 0.0039 (14) | | | 0.0039 (14) |
| $\gamma_{23,6}$(Ra) | 171.76 (5) | 0.040 (4) | | | 0.040 (4) |
| $\gamma_{24,8}$(Ra) | 172.926 (18) | 0.472 (43) | M1 | 3.29 (5) | 0.11 (1) |
| $\gamma_{19,5}$(Ra) | 174.05 (7) | 0.0023 | | 0.1258 (18) | 0.002 |
| $\gamma_{30,14}$(Ra) | 174.05 (11) | 0.0071 (18) | | | 0.0071 (18) |
| $\gamma_{33,15}$(Ra) | 174.05 (11) | 0.0067 (18) | | | 0.0067 (18) |
| $\gamma_{37,23}$(Ra) | 174.7 (2) | 0.030 (3) | | | 0.030 (3) |
| $\gamma_{12,0}$(Ra) | 179.757 (7) | 0.368 (28) | E2 | 0.867 (13) | 0.197 (15) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{16,3}$(Ra) | 182.12 (10) | 0.0054 (11) | | | 0.0054 (11) |
| $\gamma_{35,15}$(Ra) | 183.0 (1) | 0.0071 (12) | | | 0.0071 (12) |
| $\gamma_{24,6}$(Ra) | 183.928 (8) | 0.541 (27) | M1(+E2) | 2.92 | 0.138 (7) |
| $\gamma_{38,25}$(Ra) | 185.6 (1) | 0.002 | | | 0.002 |
| $\gamma_{28,10}$(Ra) | 185.6 (1) | 0.002 | | | 0.002 |
| $\gamma_{37,21}$(Ra) | 186.1 (1) | 0.013 (5) | | | 0.013 (5) |
| $\gamma_{42,35}$(Ra) | 189.25 (6) | 0.0104 (21) | | | 0.0104 (21) |
| $\gamma_{21,5}$(Ra) | 190.63 (20) | 0.0101 (20) | | | 0.0101 (20) |
| $\gamma_{16,2}$(Ra) | 193.52 (5) | 0.0007 (3) | | | 0.0007 (3) |
| $\gamma_{18,3}$(Ra) | 193.52 (5) | 15.53 | M1 | 2.53 | 4.4 |
| $\gamma_{15,1}$(Ra) | 194.3 (3) | 0.08 (6) | (M1,E2) | 1.5 (9) | 0.03 (2) |
| $\gamma_{19,3}$(Ra) | 200.807 (16) | 0.1088 (48) | (E2) | 0.577 (8) | 0.069 (3) |
| $\gamma_{18,2}$(Ra) | 204.690 (5) | 0.640 (33) | (E1) | 0.0854 (12) | 0.59 (3) |
| $\gamma_{26,8}$(Ra) | 210.15 (8) | 0.55 (12) | (M1) | 1.90 (3) | 0.19 (4) |
| $\gamma_{18,1}$(Ra) | 210.853 (3) | 8.1 (9) | M1 | 1.89 (3) | 2.8 (3) |
| $\gamma_{41,26}$(Ra) | 213.48 (5) | 0.0087 (16) | | | 0.0087 (16) |
| $\gamma_{24,5}$(Ra) | 215.10 (1) | 0.147 (11) | (E1) | 0.0759 (11) | 0.137 (10) |
| $\gamma_{27,8}$(Ra) | 216.0 (1) | 0.053 (6) | | | 0.053 (6) |
| $\gamma_{21,3}$(Ra) | 217.41 (10) | 0.0065 (11) | | | 0.0065 (11) |
| $\gamma_{19,1}$(Ra) | 218.154 (17) | 0.49 (5) | M1 | 1.715 (24) | 0.18 (2) |
| $\gamma_{34,12}$(Ra) | 219.8 (1) | 0.0033 (8) | | | 0.0033 (8) |
| $\gamma_{37,17}$(Ra) | 219.8 (1) | 0.0008 | | | 0.0008 |
| $\gamma_{26,6}$(Ra) | 221.22 (5) | 0.058 (16) | (M1) | 1.650 (24) | 0.022 (6) |
| $\gamma_{16,0}$(Ra) | 225.26 (10) | 0.003 (1) | | | 0.003 (1) |
| $\gamma_{22,3}$(Ra) | 225.26 (10) | 0.086 (8) | (E2) | 0.384 (6) | 0.062 (6) |
| $\gamma_{21,2}$(Ra) | 228.6 (1) | 0.0006 (2) | | | 0.0006 (2) |
| $\gamma_{21,1}$(Ra) | 234.8 (1) | 0.0008 (2) | | | 0.0008 (2) |
| $\gamma_{38,19}$(Ra) | 234.8 (1) | 0.0008 | | | 0.00084 |
| $\gamma_{18,0}$(Ra) | 236.249 (20) | 0.231 (12) | E2 | 0.327 (5) | 0.174 (9) |
| $\gamma_{22,1}$(Ra) | 242.6 (2) | 0.189 (18) | M1 | 1.275 (18) | 0.083 (8) |
| $\gamma_{31,10}$(Ra) | 244.4 (1) | 0.0013 (3) | | | 0.0013 (3) |
| $\gamma_{25,3}$(Ra) | 250.1 (1) | 0.00034 (16) | | | 0.00034 (16) |
| $\gamma_{26,5}$(Ra) | 252.43 (3) | 0.100 (13) | (E1) | 0.0522 (8) | 0.095 (12) |
| $\gamma_{24,1}$(Ra) | 259.08 (4) | 0.07 (1) | (M1) | 1.063 (15) | 0.034 (5) |
| $\gamma_{25,1}$(Ra) | 267.4 (1) | 0.0008 (3) | | | 0.0008 (3) |
| $\gamma_{33,9}$(Ra) | 274.1 (1) | 0.0007 (2) | | | 0.0007 (2) |
| $\gamma_{43,27}$(Ra) | 276.85 (10) | 0.0042 (10) | | | 0.0042 (10) |
| $\gamma_{30,8}$(Ra) | 278.65 (5) | 0.0068 (8) | | | 0.0068 (8) |
| $\gamma_{44,27}$(Ra) | 281.27 (10) | 0.007 (1) | | | 0.007 (1) |
| $\gamma_{33,8}$(Ra) | 282.6 (1) | 0.0038 (7) | | | 0.0038 (7) |
| $\gamma_{30,6}$(Ra) | 289.62 (5) | 0.0150 (17) | | | 0.0150 (17) |
| $\gamma_{33,6}$(Ra) | 293.78 (10) | 0.0065 (8) | | | 0.0065 (8) |
| $\gamma_{26,1}$(Ra) | 296.21 (10) | 0.0191 (20) | (E2) | 0.1581 (23) | 0.0165 (17) |
| $\gamma_{38,12}$(Ra) | 298.72 (12) | 0.0070 (8) | | | 0.0070 (8) |
| $\gamma_{28,2}$(Ra) | 303.75 (10) | 0.0017 (30) | | | 0.0017 (30) |
| $\gamma_{39,12}$(Ra) | 307.3 (1) | 0.006 (3) | | | 0.006 (3) |
| $\gamma_{28,1}$(Ra) | 310.1 (1) | 0.0020 (3) | | | 0.0020 (3) |
| $\gamma_{45,29}$(Ra) | 313.3 (1) | 0.0037 (11) | | | 0.0037 (11) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{29,2}$(Ra) | 317.8 (1) | 0.00055 (14) | | | 0.00055 (14) |
| $\gamma_{42,23}$(Ra) | 320.8 (1) | 0.00016 (7) | | | 0.00016 (7) |
| $\gamma_{31,5}$(Ra) | 324.6 (1) | 0.00043 (13) | | | 0.00043 (13) |
| $\gamma_{45,28}$(Ra) | 327.9 (1) | 0.003 | | | 0.003 |
| $\gamma_{27,0}$(Ra) | 327.9 (1) | 0.016 (3) | | | 0.016 (3) |
| $\gamma_{38,10}$(Ra) | 328.2 (1) | 0.0020 (8) | | | 0.0020 (8) |
| $\gamma_{34,5}$(Ra) | 329.9 (2) | 0.0006 (2) | | | 0.0006 (2) |
| $\gamma_{37,8}$(Ra) | 334.74 (10) | 0.00043 (11) | | | 0.00043 (11) |
| $\gamma_{43,22}$(Ra) | 336.7 (1) | 0.0082 (1) | | | 0.0082 (1) |
| $\gamma_{39,10}$(Ra) | 336.7 (1) | 0.0001 | | | 0.0001 |
| $\gamma_{45,26}$(Ra) | 341.1 (1) | 0.0008 (2) | | | 0.0008 (2) |
| $\gamma_{34,4}$(Ra) | 344.3 (1) | 0.0001 | | | 0.0001 |
| $\gamma_{36,5}$(Ra) | 347.4 (1) | 0.0006 (1) | | | 0.0006 (1) |
| $\gamma_{42,19}$(Ra) | 349.4 (1) | 0.0001 | | | 0.0001 |
| $\gamma_{29,0}$(Ra) | 349.4 (1) | 0.0004 (1) | | | 0.0004 (1) |
| $\gamma_{32,3}$(Ra) | 351.7 (1) | 0.0005 (1) | | | 0.0005 (1) |
| $\gamma_{38,9}$(Ra) | 358.0 (1) | 0.006 (1) | | | 0.006 (1) |
| $\gamma_{43,19}$(Ra) | 361.0 (1) | 0.0006 (1) | | | 0.0006 (1) |
| $\gamma_{38,8}$(Ra) | 366.5 (1) | 0.0004 (1) | | | 0.0004 (1) |
| $\gamma_{39,9}$(Ra) | 366.5 (1) | 0.0001 | | | 0.0001 |
| $\gamma_{43,18}$(Ra) | 368.1 (1) | 0.0019 (3) | | | 0.0019 (3) |
| $\gamma_{31,1}$(Ra) | 368.9 (1) | 0.0019 (3) | | | 0.0019 (3) |
| $\gamma_{39,8}$(Ra) | 375.1 (1) | 0.0003 (1) | | | 0.0003 (1) |
| $\gamma_{38,6}$(Ra) | 377.4 (1) | 0.0029 (3) | | | 0.0029 (3) |
| $\gamma_{43,16}$(Ra) | 379.4 (1) | 0.0013 (2) | | | 0.0013 (2) |
| $\gamma_{39,6}$(Ra) | 386.4 (1) | 0.0008 (2) | | | 0.0008 (2) |
| $\gamma_{32,0}$(Ra) | 395.3 (2) | 0.0008 (1) | | | 0.0008 (1) |
| $\gamma_{34,0}$(Ra) | 399.9 (2) | 0.00014 (6) | | | 0.00014 (6) |
| $\gamma_{35,0}$(Ra) | 403.3 (1) | 0.0018 (2) | | | 0.0018 (2) |
| $\gamma_{38,5}$(Ra) | 408.5 (1) | 0.0010 (1) | | | 0.0010 (1) |
| $\gamma_{41,9}$(Ra) | 414.61 (10) | 0.0003 (1) | | | 0.0003 (1) |
| $\gamma_{39,5}$(Ra) | 417.4 (1) | 0.0014 (2) | | | 0.0014 (2) |
| $\gamma_{45,19}$(Ra) | 419.9 (2) | 0.0006 (1) | | | 0.0006 (1) |
| $\gamma_{43,12}$(Ra) | 424.8 (1) | 0.0032 (3) | | | 0.0032 (3) |
| $\gamma_{38,3}$(Ra) | 435.3 (1) | 0.0031 (4) | | | 0.0031 (4) |
| $\gamma_{39,3}$(Ra) | 444.1 (1) | 0.0005 (1) | | | 0.0005 (1) |
| $\gamma_{38,1}$(Ra) | 452.6 (1) | 0.0017 (2) | | | 0.0017 (2) |
| $\gamma_{43,10}$(Ra) | 454.76 (10) | 0.0105 (11) | | | 0.0105 (11) |
| $\gamma_{44,10}$(Ra) | 459.1 (3) | 0.001 | | | 0.001 |
| $\gamma_{41,5}$(Ra) | 465 (1) | 0.0001 | | | 0.0001 |
| $\gamma_{38,0}$(Ra) | 478.0 (1) | 0.0037 (4) | | | 0.0037 (4) |
| $\gamma_{45,12}$(Ra) | 483.7 (1) | 0.0018 (2) | | | 0.0018 (2) |
| $\gamma_{39,0}$(Ra) | 487.3 (2) | 0.0004 (1) | | | 0.0004 (1) |
| $\gamma_{43,8}$(Ra) | 492.9 (1) | 0.00152 (16) | | | 0.00152 (16) |
| $\gamma_{43,6}$(Ra) | 503.6 (1) | 0.00005 | | | 0.00005 |
| $\gamma_{41,2}$(Ra) | 503.6 (1) | 0.00012 (5) | | | 0.00012 (5) |
| $\gamma_{45,10}$(Ra) | 513.5 (2) | 0.0007 (2) | | | 0.0007 (2) |
| $\gamma_{42,5}$(Ra) | 523.5 (1) | 0.0005 (1) | | | 0.0005 (1) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{41,0}$(Ra) | 535.1 (1) | 0.0013 (2) | | | 0.0013 (2) |
| $\gamma_{43,5}$(Ra) | 535.1 (1) | 0.0002 | | | 0.0002 |
| $\gamma_{45,9}$(Ra) | 543.0 (3) | 0.0001 | | | 0.0001 |
| $\gamma_{42,3}$(Ra) | 549.8 (5) | 0.0001 | | | 0.0001 |
| $\gamma_{45,8}$(Ra) | 551.7 (2) | 0.00011 (4) | | | 0.00011 (4) |
| $\gamma_{43,3}$(Ra) | 561.8 (1) | 0.0019 (2) | | | 0.0019 (2) |
| $\gamma_{44,3}$(Ra) | 565.7 (3) | 0.0009 (1) | | | 0.0009 (1) |
| $\gamma_{43,2}$(Ra) | 573.0 (1) | 0.0028 (3) | | | 0.0028 (3) |
| $\gamma_{43,1}$(Ra) | 579.2 (2) | 0.0006 (1) | | | 0.0006 (1) |
| $\gamma_{42,0}$(Ra) | 592.5 (1) | 0.0003 (1) | | | 0.0003 (1) |
| $\gamma_{45,5}$(Ra) | 594.4 (3) | 0.0001 | | | 0.0001 |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 25.52 | (1) | h |
| $Q_{\beta^-}$ | : | 391.6 | (15) | keV |
| $\beta^-$ | : | 100 | | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,14}$ | 39.8 (15) | 0.0032 (2) | | 7.33 |
| $\beta^-_{0,13}$ | 71.4 (15) | 0.066 (2) | 1st forbidden | 6.79 |
| $\beta^-_{0,12}$ | 73.6 (15) | 0.00078 (5) | | 8.76 |
| $\beta^-_{0,11}$ | 144.3 (15) | 2.7 (4) | Allowed | 6.11 |
| $\beta^-_{0,10}$ | 173.4 (15) | 0.31 (23) | | 7.3 |
| $\beta^-_{0,9}$ | 208.1 (15) | 12.2 (15) | Allowed | 5.95 |
| $\beta^-_{0,8}$ | 217.4 (15) | 1.36 (24) | | 6.96 |
| $\beta^-_{0,6}$ | 289.3 (15) | 13 (8) | Allowed | 6.4 |
| $\beta^-_{0,5}$ | 290.2 (15) | 41 (16) | Allowed | 5.88 |
| $\beta^-_{0,4}$ | 307.4 (15) | 29 (18) | Allowed | 6.1 |
| $\beta^-_{0,3}$ | 313.9 (15) | 0.43 (2) | 1st forbidden | 7.97 |
| $\beta^-_{0,2}$ | 333.0 (15) | 0.17 (17) | 1st forbidden | 8.2 |
| $\beta^-_{0,0}$ | 391.6 (15) | 0.022 (7) | 1st forbidden | 9.57 |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Pa) | 5.9 - 21.0 | 68 (3) | |
| $e_{AK}$ | (Pa) | | 0.038 (5) | |
| | KLL | 70.081 - 78.822 | } | |
| | KLX | 85.989 - 95.858 | } | |
| | KXY | 101.87 - 112.59 | } | |
| $ec_{4,2\ L}$ | (Pa) | 4.540 - 8.912 | 45.3 (24) | |
| $ec_{5,4\ M}$ | (Pa) | 11.8 - 13.8 | 31 (11) | |
| $ec_{9,2\ K}$ | (Pa) | 12.320 (19) | 0.01333 (41) | |
| $ec_{6,4\ M}$ | (Pa) | 12.71 - 14.63 | 8.2 (36) | |
| $ec_{4,2\ M}$ | (Pa) | 20.284 - 22.203 | 11.7 (6) | |
| $ec_{5,2\ L}$ | (Pa) | 21.78 - 26.16 | 0.0507 (14) | |
| $ec_{10,8\ L}$ | (Pa) | 22.98 - 27.35 | 0.16 (16) | |
| $ec_{11,7\ K}$ | (Pa) | 23.071 (11) | 0.49 (11) | |
| $ec_{11,5\ K}$ | (Pa) | 33.34 (2) | 0.110 (33) | |
| $ec_{2,0\ L}$ | (Pa) | 37.467 - 41.839 | 54.5 (20) | |
| $ec_{5,2\ M}$ | (Pa) | 37.53 - 39.45 | 0.0125 (7) | |
| $ec_{10,8\ M}$ | (Pa) | 38.72 - 40.64 | 0.041 (40) | |
| $ec_{11,9\ L}$ | (Pa) | 42.76 - 47.13 | 0.59 (26) | |
| $ec_{3,1\ L}$ | (Pa) | 47.4 - 51.8 | 0.316 (9) | |

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $ec_{11,4\ K}$ | (Pa) | 50.509 (4) | 0.61 (7) | |
| $ec_{8,5\ L}$ | (Pa) | 51.647 - 56.019 | 0.0549 (37) | |
| $ec_{2,0\ M}$ | (Pa) | 53.211 - 55.130 | 15.0 (5) | |
| $ec_{11,9\ M}$ | (Pa) | 58.50 - 60.42 | 0.16 (7) | |
| $ec_{9,6\ L}$ | (Pa) | 60.123 - 64.495 | 5.5 (9) | |
| $ec_{9,5\ L}$ | (Pa) | 60.982 - 65.354 | 2.47 (38) | |
| $ec_{8,0\ K}$ | (Pa) | 61.56 (2) | 0.032 (29) | |
| $ec_{3,1\ M}$ | (Pa) | 63.1 - 65.1 | 0.0873 (28) | |
| $ec_{4,0\ L}$ | (Pa) | 63.110 - 67.482 | 11.86 (18) | |
| $ec_{8,5\ M}$ | (Pa) | 67.391 - 69.310 | 0.0134 (9) | |
| $ec_{8,4\ L}$ | (Pa) | 68.84 - 73.22 | 0.1222 (42) | |
| $ec_{9,6\ M}$ | (Pa) | 75.867 - 77.786 | 1.36 (27) | |
| $ec_{9,5\ M}$ | (Pa) | 76.726 - 78.645 | 0.63 (13) | |
| $ec_{9,4\ L}$ | (Pa) | 78.176 - 82.548 | 0.607 (42) | |
| $ec_{4,0\ M}$ | (Pa) | 78.854 - 80.773 | 3.8 (7) | |
| $ec_{6,0\ L}$ | (Pa) | 81.16 - 85.54 | 0.0379 (10) | |
| $ec_{8,4\ M}$ | (Pa) | 84.59 - 86.51 | 0.0297 (10) | |
| $ec_{9,4\ M}$ | (Pa) | 93.920 - 95.839 | 0.155 (12) | |
| $ec_{11,7\ L}$ | (Pa) | 114.562 - 118.934 | 0.112 (15) | |
| $ec_{11,5\ L}$ | (Pa) | 124.836 - 129.208 | 0.0411 (36) | |
| $ec_{11,7\ M}$ | (Pa) | 130.306 - 132.225 | 0.0279 (48) | |
| $ec_{11,5\ M}$ | (Pa) | 140.580 - 142.499 | 0.0107 (14) | |
| $ec_{11,4\ L}$ | (Pa) | 142.000 - 146.372 | 0.122 (5) | |
| $ec_{8,0\ L}$ | (Pa) | 153.06 - 157.43 | 0.0122 (10) | |
| $ec_{11,4\ M}$ | (Pa) | 157.744 - 159.663 | 0.0296 (17) | |
| $\beta^-_{0,14}$ | max: | 39.8 (15) | 0.0032 (2) | avg: 10.1 (5) |
| $\beta^-_{0,13}$ | max: | 71.4 (15) | 0.066 (2) | avg: 18.3 (4) |
| $\beta^-_{0,12}$ | max: | 73.6 (15) | 0.00078 (5) | avg: 18.9 (4) |
| $\beta^-_{0,11}$ | max: | 144.3 (15) | 2.7 (4) | avg: 38.1 (5) |
| $\beta^-_{0,10}$ | max: | 173.4 (15) | 0.31 (23) | avg: 46.2 (5) |
| $\beta^-_{0,9}$ | max: | 208.1 (15) | 12.2 (15) | avg: 56.2 (5) |
| $\beta^-_{0,8}$ | max: | 217.4 (15) | 1.36 (24) | avg: 58.9 (5) |
| $\beta^-_{0,6}$ | max: | 289.3 (15) | 13 (8) | avg: 80.1 (5) |
| $\beta^-_{0,5}$ | max: | 290.2 (15) | 41 (16) | avg: 80.4 (5) |
| $\beta^-_{0,4}$ | max: | 307.4 (15) | 29 (18) | avg: 85.6 (5) |
| $\beta^-_{0,3}$ | max: | 313.9 (15) | 0.43 (2) | avg: 87.6 (5) |
| $\beta^-_{0,2}$ | max: | 333.0 (15) | 0.17 (17) | avg: 93.4 (5) |
| $\beta^-_{0,0}$ | max: | 391.6 (15) | 0.022 (7) | avg: 111.6 (5) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pa) | 11.3676 — 20.1126 | | 65 (3) | |
| $XK\alpha_2$ | (Pa) | 92.288 | | 0.37 (4) | } $K\alpha$ |
| $XK\alpha_1$ | (Pa) | 95.869 | | 0.59 (7) | } |
| $XK\beta_3$ | (Pa) | 107.595 | } | | |
| $XK\beta_1$ | (Pa) | 108.422 | } | 0.21 (2) | $K\beta_1'$ |
| $XK\beta_5''$ | (Pa) | 109.072 | } | | |
| $XK\beta_2$ | (Pa) | 111.405 | } | | |
| $XK\beta_4$ | (Pa) | 111.87 | } | 0.071 (8) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Pa) | 112.38 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{4,2}$(Pa) | 25.64 (2) | 74.6 (39) | E1 | 4.37 (7) | 13.9 (7) |
| $\gamma_{5,2}$(Pa) | 42.86 (7) | 0.1275 (34) | [E1] | 1.14 (2) | 0.0596 (15) |
| $\gamma_{10,8}$(Pa) | 44.08 (17) | 0.22 (23) | [M1+E2] | 300 (300) | 0.00074 (21) |
| $\gamma_{2,0}$(Pa) | 58.5700 (24) | 75.1 (27) | E2 | 155.5 (22) | 0.480 (16) |
| $\gamma_{11,9}$(Pa) | 63.86 (3) | 0.82 (36) | M1+E2 | 34 (15) | 0.0235 (21) |
| $\gamma_{3,1}$(Pa) | 68.5 (1) | 0.438 (13) | E2 | 73.3 (12) | 0.00590 (15) |
| $\gamma_{8,5}$(Pa) | 72.7510 (25) | 0.333 (22) | [E1] | 0.280 (4) | 0.260 (17) |
| $\gamma_{3,0}$(Pa) | 77.69 | 0.0042 (7) | | | 0.0042 (7) |
| $\gamma_{9,6}$(Pa) | 81.2280 (14) | 8.2 (13) | M1(+E2) | 8.1 (14) | 0.905 (23) |
| $\gamma_{9,5}$(Pa) | 82.0870 (13) | 3.7 (6) | M1(+E2) | 7.9 (13) | 0.418 (13) |
| $\gamma_{4,0}$(Pa) | 84.2140 (13) | 23.4 (17) | E1 | 2.50 (25) | 6.70 (7) |
| $\gamma_{8,4}$(Pa) | 89.95 (2) | 1.171 (35) | E1 | 0.1598 (22) | 1.01 (3) |
| $\gamma_{6,1}$(Pa) | 93.02 (4) | 0.0459 (34) | [E1] | 0.1463 (21) | 0.040 (3) |
| $\gamma_{9,4}$(Pa) | 99.278 (3) | 0.96 (7) | M1+E2 | 6.0 (4) | 0.137 (6) |
| $\gamma_{6,0}$(Pa) | 102.2700 (13) | 0.491 (12) | E1 | 0.1141 (16) | 0.441 (11) |
| $\gamma_{9,3}$(Pa) | 105.81 (3) | 0.0087 (6) | [E1] | 0.1043 (15) | 0.0079 (5) |
| $\gamma_{10,7}$(Pa) | 106.61 (3) | 0.0197 (8) | [E1] | 0.1023 (14) | 0.0179 (7) |
| $\gamma_{8,2}$(Pa) | 115.63 (3) | 0.0121 (47) | [M1+E2] | 10 (4) | 0.00110 (16) |
| $\gamma_{10,5}$(Pa) | 116.82 (2) | 0.0302 (12) | E1 | 0.342 (5) | 0.0225 (9) |
| $\gamma_{9,2}$(Pa) | 124.914 (17) | 0.0763 (20) | E1 | 0.294 (4) | 0.0590 (15) |
| $\gamma_{10,4}$(Pa) | 134.03 (2) | 0.0318 (10) | E1 | 0.249 (4) | 0.0255 (8) |
| $\gamma_{11,7}$(Pa) | 135.664 (11) | 0.72 (9) | M1(+E2) | 8.0 (11) | 0.0797 (22) |
| $\gamma_{13,9}$(Pa) | 136.75 (7) | 0.00547 (19) | [E1] | 0.237 (3) | 0.00442 (15) |
| $\gamma_{10,3}$(Pa) | 140.54 (4) | 0.0047 (19) | [M1+E2] | 5.3 (25) | 0.00074 (7) |
| $\gamma_{11,6}$(Pa) | 145.06 (4) | 0.0201 (11) | [E2] | 2.46 (3) | 0.0058 (3) |
| $\gamma_{11,5}$(Pa) | 145.94 (2) | 0.198 (27) | M1+E2 | 5.1 (8) | 0.0324 (12) |
| $\gamma_{11,4}$(Pa) | 163.101 (4) | 0.92 (7) | M1(+E2) | 4.9 (4) | 0.156 (5) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{8,1}$(Pa) | 165.00 (5) | 0.00857 (35) | [E2] | 1.464 (2) | 0.00348 (14) |
| $\gamma_{11,3}$(Pa) | 169.66 (3) | 0.00161 (8) | [E1] | 0.1421 (20) | 0.00141 (7) |
| $\gamma_{8,0}$(Pa) | 174.15 (2) | 0.067 (27) | [M1+E2] | 2.7 (15) | 0.0180 (6) |
| $\gamma_{9,0}$(Pa) | 183.480 (25) | 0.0375 (9) | E1 | 0.1181 (17) | 0.0335 (8) |
| $\gamma_{11,2}$(Pa) | 188.76 (2) | 0.00378 (33) | [E1] | 0.1105 (15) | 0.0034 (3) |
| $\gamma_{13,6}$(Pa) | 217.94 (3) | 0.0434 (9) | E1 | 0.0789 (11) | 0.0402 (8) |
| $\gamma_{13,4}$(Pa) | 236.01 (3) | 0.01002 (32) | [E1] | 0.0657 (9) | 0.0094 (3) |
| $\gamma_{12,3}$(Pa) | 240.27 (5) | 0.000308 (43) | [E1] | 0.0630 (9) | 0.00029 (4) |
| $\gamma_{13,3}$(Pa) | 242.50 (4) | 0.0016 (6) | [M1+E2] | 1.0 (7) | 0.00082 (5) |
| $\gamma_{14,6}$(Pa) | 249.60 (7) | 0.00085 (7) | [E1] | 0.0578 (8) | 0.00080 (7) |
| $\gamma_{14,5}$(Pa) | 250.45 (7) | 0.00071 (7) | [E1] | 0.0573 (8) | 0.00067 (7) |
| $\gamma_{14,4}$(Pa) | 267.62 (8) | 0.00148 (15) | [E1] | 0.0493 (7) | 0.00141 (14) |
| $\gamma_{14,3}$(Pa) | 274.1 (1) | 0.000058 (27) | [M1+E2] | 0.7 (5) | 0.000034 (12) |
| $\gamma_{12,1}$(Pa) | 308.78 (7) | 0.0003748 (19) | [E1] | 0.0358 (5) | 0.0003618 (18) |
| $\gamma_{13,1}$(Pa) | 311.00 (5) | 0.005 (1) | M1+E2 | 0.6 (3) | 0.00315 (14) |
| $\gamma_{12,0}$(Pa) | 317.87 (8) | 0.0001039 (5) | [E1] | 0.0336 (5) | 0.0001005 (5) |
| $\gamma_{13,0}$(Pa) | 320.15 (8) | 0.00022 (7) | [M1+E2] | 0.5 (4) | 0.00015 (3) |
| $\gamma_{14,0}$(Pa) | 351.8 (1) | 0.000090 (24) | [M1+E2] | 0.35 (25) | 0.000067 (13) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 14.02 | (6) | $\times 10^{9}$ y |
| $Q_{\alpha}$ | : | 4081.6 | (14) | keV |
| $\alpha$ | : | 100 | | % |
| $^{24-26}Ne$ | : | 1.15 | | $\times 10^{-9}$ % |
| $SF$ | : | <2.78 | | $\times 10^{-10}$ % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,2}$ | 3810.0 (14) | 0.068 (20) |
| $\alpha_{0,1}$ | 3948.5 (14) | 21.0 (13) |
| $\alpha_{0,0}$ | 4011.2 (14) | 78.9 (13) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Ra) | 5.71 - 19.09 | | 8.18 (29) |
| $e_{AK}$ | (Ra) | | | 0.00019 (6) |
| | KLL | 65.149 - 72.729 | } | |
| | KLX | 79.721 - 88.466 | } | |
| | KXY | 94.27 - 103.91 | } | |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Ra) | 10.624 — 18.354 | | 7.2 (3) | |
| XK$\alpha_2$ | (Ra) | 85.43 | | 0.0017 (5) | } K$\alpha$ |
| XK$\alpha_1$ | (Ra) | 88.47 | | 0.0028 (8) | } |
| XK$\beta_3$ | (Ra) | 99.432 | } | | |
| XK$\beta_1$ | (Ra) | 100.13 | } | 0.00097 (28) | K$\beta_1'$ |
| XK$\beta_5''$ | (Ra) | 100.738 | } | | |
| XK$\beta_2$ | (Ra) | 102.89 | } | | |
| XK$\beta_4$ | (Ra) | 103.295 | } | 0.00032 (10) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Ra) | 103.74 | } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Ra) | 63.811 (10) | 21.1 (13) | E2 | 80.4 (12) | 0.259 (15) |
| $\gamma_{2,1}$(Ra) | 140.88 (1) | 0.068 (20) | E2 | 2.26 (4) | 0.021 (6) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 22.15 | (8) | min |
| $Q_{\beta^-}$ | : | 1243.1 | (14) | keV |
| $\beta^-$ | : | 100 | | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,20}$ | 224.4 (14) | 0.0434 (9) | | 6.7 |
| $\beta^-_{0,19}$ | 258.3 (14) | 0.205 (2) | Allowed | 6.2 |
| $\beta^-_{0,18}$ | 431.5 (14) | 0.385 (4) | Allowed | 6.6 |
| $\beta^-_{0,17}$ | 478.5 (14) | 1.19 (3) | Allowed | 6.3 |
| $\beta^-_{0,16}$ | 573.2 (14) | 0.0174 (22) | 1st forbidden | 8.4 |
| $\beta^-_{0,15}$ | 657.6 (14) | 0.15 (3) | Allowed | 7.6 |
| $\beta^-_{0,14}$ | 689.2 (14) | 1.23 (3) | Allowed | 6.8 |
| $\beta^-_{0,13}$ | 788.7 (14) | 0.217 (13) | Allowed | 7.7 |
| $\beta^-_{0,12}$ | 795.3 (14) | 0.821 (14) | 1st forbidden | 7.2 |
| $\beta^-_{0,11}$ | 985.8 (14) | 0.60 (3) | 1st forbidden unique | 8.1 |
| $\beta^-_{0,8}$ | 1041.4 (14) | 0.074 (8) | Allowed | 8.6 |
| $\beta^-_{0,7}$ | 1073.9 (14) | 0.692 (12) | Allowed | 7.7 |
| $\beta^-_{0,5}$ | 1148.4 (14) | 10.4 (4) | Allowed | 6.6 |
| $\beta^-_{0,1}$ | 1236.4 (14) | 50 (6) | 1st forbidden | 6.1 |
| $\beta^-_{0,0}$ | 1243.1 (14) | 34 (6) | 1st forbidden | 6.2 |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Pa) | 5.9 - 21.6 | 8.6 (10) | |
| $e_{AK}$ | (Pa) | | 0.041 (5) | |
| | KLL | 70.081 - 78.822 } | | |
| | KLX | 88.03 - 95.56 } | | |
| | KXY | 101.78 - 112.40 } | | |
| $ec_{1,0\ M}$ | (Pa) | 1.29 - 3.21 | 34.2 (9) | |
| $ec_{8,4\ K}$ | (Pa) | 2.54 (5) | 0.013 | |
| $ec_{9,5\ K}$ | (Pa) | 5.10 (2) | 0.0270 (31) | |
| $ec_{1,0\ N}$ | (Pa) | 5.27 - 6.30 | 9.27 (26) | |
| $ec_{4,2\ L}$ | (Pa) | 8.268 - 12.640 | 4.97 (19) | |
| $ec_{8,3\ K}$ | (Pa) | 18.5 (1) | 0.013 | |
| $ec_{10,6\ K}$ | (Pa) | 21.689 (20) | 0.015 | |
| $ec_{4,2\ M}$ | (Pa) | 24.012 - 25.931 | 1.272 (49) | |
| $ec_{4,2\ N}$ | (Pa) | 27.990 - 29.018 | 0.332 (12) | |
| $ec_{10,5\ K}$ | (Pa) | 30.63 (2) | 0.057 (16) | |
| $ec_{2,0\ L}$ | (Pa) | 36.0 - 40.4 | 6.39 (23) | |
| $ec_{10,4\ K}$ | (Pa) | 38.9 (2) | 0.034 | |

| | | Energy keV | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|
| $ec_{3,1\ L}$ | (Pa) | 42.82 - 47.19 | 0.052 (22) | | |
| $ec_{3,0\ L}$ | (Pa) | 49.38 - 53.76 | 0.020 (17) | | |
| $ec_{7,1\ K}$ | (Pa) | 49.908 (12) | 0.0206 (6) | | |
| $ec_{11,5\ K}$ | (Pa) | 50 | 0.01968 (29) | | |
| $ec_{2,0\ M}$ | (Pa) | 51.7 - 53.7 | 1.76 (6) | | |
| $ec_{7,5\ L}$ | (Pa) | 53.40 - 57.78 | 0.299 (14) | | |
| $ec_{2,0\ N}$ | (Pa) | 55.7 - 56.7 | 0.475 (16) | | |
| $ec_{7,0\ K}$ | (Pa) | 56.57 (1) | 0.0281 (7) | | |
| $ec_{11,4\ K}$ | (Pa) | 58.00 (6) | 0.0557 (14) | | |
| $ec_{3,1\ M}$ | (Pa) | 58.56 - 60.48 | 0.014 (6) | | |
| $ec_{4,0\ L}$ | (Pa) | 65.372 - 69.744 | 2.08 (8) | | |
| $ec_{17,15\ K}$ | (Pa) | 66.45 (8) | 0.075 (22) | | |
| $ec_{5,1\ L}$ | (Pa) | 66.88 - 71.26 | 0.0217 (6) | | |
| $ec_{7,5\ M}$ | (Pa) | 69.15 - 71.07 | 0.0720 (34) | | |
| $ec_{7,5\ N}$ | (Pa) | 73.13 - 74.16 | 0.0193 (9) | | |
| $ec_{5,0\ L}$ | (Pa) | 73.54 - 77.91 | 0.0814 (18) | | |
| $ec_{11,3\ K}$ | (Pa) | 74.20 (18) | 0.031 (27) | | |
| $ec_{12,11\ K}$ | (Pa) | 77.956 (14) | 0.224 (6) | | |
| $ec_{4,0\ M}$ | (Pa) | 81.116 - 83.035 | 0.41 (7) | | |
| $ec_{5,0\ M}$ | (Pa) | 89.29 - 91.21 | 0.01992 (45) | | |
| $ec_{17,14\ K}$ | (Pa) | 98.07 (8) | 0.020 (16) | | |
| $ec_{13,10\ K}$ | (Pa) | 104 (2) | 0.029 | | |
| $ec_{18,15\ K}$ | (Pa) | 113.5 (2) | 0.0275 (12) | | |
| $ec_{10,5\ L}$ | (Pa) | 122.12 - 126.50 | 0.0138 (20) | | |
| $ec_{10,4\ L}$ | (Pa) | 130.4 - 134.8 | 0.011 | | |
| $ec_{13,8\ K}$ | (Pa) | 140.18 (9) | 0.014 | | |
| $ec_{11,0\ K}$ | (Pa) | 144.70 (15) | 0.031 (31) | | |
| $ec_{11,4\ L}$ | (Pa) | 149.5 - 153.9 | 0.01166 (33) | | |
| $ec_{17,15\ L}$ | (Pa) | 157.95 - 162.32 | 0.0167 (6) | | |
| $ec_{11,3\ L}$ | (Pa) | 165.7 - 170.1 | 0.0111 (5) | | |
| $ec_{12,11\ L}$ | (Pa) | 169.447 - 173.819 | 0.0430 (11) | | |
| $ec_{13,7\ K}$ | (Pa) | 172.64 (7) | 0.017 | | |
| $ec_{12,11\ M}$ | (Pa) | 185.191 - 187.110 | 0.01037 (27) | | |
| $ec_{12,3\ K}$ | (Pa) | 264.67 (11) | 0.015 | | |
| $ec_{12,1\ K}$ | (Pa) | 328.34 (4) | 0.046 (8) | | |
| $ec_{12,0\ K}$ | (Pa) | 335.17 (2) | 0.0240 (42) | | |
| $ec_{14,5\ K}$ | (Pa) | 346.626 (7) | 0.227 (6) | | |
| $ec_{12,3\ L}$ | (Pa) | 356.2 - 360.6 | 0.029 | | |
| $ec_{15,5\ K}$ | (Pa) | 378.2 (6) | 0.035 | | |
| $ec_{15,4\ K}$ | (Pa) | 386.42 (4) | 0.042 | | |
| $ec_{14,5\ L}$ | (Pa) | 438.117 - 442.489 | 0.043 (1) | | |
| $ec_{17,8\ K}$ | (Pa) | 450.33 (8) | 0.01 | | |
| $ec_{14,5\ M}$ | (Pa) | 453.861 - 455.780 | 0.01035 (24) | | |
| $ec_{17,7\ K}$ | (Pa) | 482.79 (6) | 0.02 | | |
| $ec_{17,5\ K}$ | (Pa) | 557.305 (16) | 0.0423 (10) | | |
| $\beta^-_{0,20}$ | max: | 224.4 (14) | 0.0434 (9) | avg: | 60.9 (4) |
| $\beta^-_{0,19}$ | max: | 258.3 (14) | 0.205 (2) | avg: | 70.8 (4) |
| $\beta^-_{0,18}$ | max: | 431.5 (14) | 0.385 (4) | avg: | 124.3 (5) |

| | | Energy keV | | Electrons per 100 disint. | Energy keV | |
|---|---|---|---|---|---|---|
| $\beta^-_{0,17}$ | max: | 478.5 | (14) | 1.19 (3) | avg: | 139.5 (5) |
| $\beta^-_{0,16}$ | max: | 573.2 | (14) | 0.0174 (22) | avg: | 170.8 (5) |
| $\beta^-_{0,15}$ | max: | 657.6 | (14) | 0.15 (3) | avg: | 199.6 (5) |
| $\beta^-_{0,14}$ | max: | 689.2 | (14) | 1.23 (3) | avg: | 210.5 (5) |
| $\beta^-_{0,13}$ | max: | 788.7 | (14) | 0.217 (13) | avg: | 245.5 (5) |
| $\beta^-_{0,12}$ | max: | 795.3 | (14) | 0.821 (14) | avg: | 247.8 (5) |
| $\beta^-_{0,11}$ | max: | 985.8 | (14) | 0.60 (3) | avg: | 317.0 (6) |
| $\beta^-_{0,8}$ | max: | 1041.4 | (14) | 0.074 (8) | avg: | 337.6 (6) |
| $\beta^-_{0,7}$ | max: | 1073.9 | (14) | 0.692 (12) | avg: | 349.7 (6) |
| $\beta^-_{0,5}$ | max: | 1148.4 | (14) | 10.4 (4) | avg: | 377.8 (6) |
| $\beta^-_{0,1}$ | max: | 1236.4 | (14) | 50 (6) | avg: | 411.2 (6) |
| $\beta^-_{0,0}$ | max: | 1243.1 | (14) | 34 (6) | avg: | 413.8 (6) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pa) | 11.366 — 21.6 | | 8.2 (9) | |
| XK$\alpha_2$ | (Pa) | 92.288 | | 0.39 (1) | } K$\alpha$ |
| XK$\alpha_1$ | (Pa) | 95.869 | | 0.615 (13) | } |
| XK$\beta_3$ | (Pa) | 107.595 | } | | |
| XK$\beta_1$ | (Pa) | 108.422 | } | 0.235 (6) | K$\beta'_1$ |
| XK$\beta''_5$ | (Pa) | 109.072 | } | | |
| XK$\beta_2$ | (Pa) | 111.405 | } | | |
| XK$\beta_4$ | (Pa) | 111.87 | } | 0.079 (3) | K$\beta'_2$ |
| XKO$_{2,3}$ | (Pa) | 112.38 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pa) | 6.65 (5) | 51 (6) | (M1) | 3080 (60) | 0.0165 (18) |
| $\gamma_{4,2}$(Pa) | 29.373 (10) | 8.83 (31) | E1 | 3.07 (6) | 2.17 (7) |
| $\gamma_{2,0}$(Pa) | 57.10 (2) | 8.81 (33) | E2 | 176 (4) | 0.0498 (15) |
| $\gamma_{3,1}$(Pa) | 63.92 (6) | 0.072 (31) | (E2) | 102.1 (21) | 0.0007 (3) |
| $\gamma_{3,0}$(Pa) | 70.49 (10) | 0.029 (27) | [M1+E2] | 40 (30) | 0.0007 (4) |
| $\gamma_{7,5}$(Pa) | 74.51 (5) | 0.436 (20) | [M1] | 9.85 (20) | 0.0402 (17) |
| $\gamma_{4,0}$(Pa) | 86.477 (10) | 4.48 (16) | E1 | 1.43 (8) | 1.843 (22) |
| $\gamma_{5,1}$(Pa) | 87.99 (3) | 0.1985 (24) | [E1] | 0.169 (3) | 0.1698 (20) |
| $\gamma_{5,0}$(Pa) | 94.65 (5) | 0.884 (11) | E1 | 0.140 (3) | 0.775 (9) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{-1,2}$(Pa) | 105.2 (1) | 0.041 | | | 0.041 |
| $\gamma_{9,6}$(Pa) | 108.5 (1) | 0.0027 | M1+E2 | 3.5 (6) | 0.0006 |
| $\gamma_{8,4}$(Pa) | 115.14 (5) | 0.03 (8) | [M1+E2] | 10 (4) | 0.003 (7) |
| $\gamma_{9,5}$(Pa) | 117.692 (20) | 0.038 (4) | M1+E2 | 12.2 (4) | 0.0029 (3) |
| $\gamma_{8,3}$(Pa) | 131.101 (25) | 0.0641 (17) | E1 | 0.262 (5) | 0.0508 (13) |
| $\gamma_{10,6}$(Pa) | 134.285 (20) | 0.016 (5) | [M1+E2] | 8.0 (14) | 0.0018 (5) |
| $\gamma_{10,5}$(Pa) | 143.23 (2) | 0.088 (15) | M1+E2 | 6.7 (12) | 0.0114 (7) |
| $\gamma_{-1,3}$(Pa) | 147.5 | 0.0018 (6) | | | 0.0018 (6) |
| $\gamma_{10,4}$(Pa) | 151.409 (20) | 0.040 (4) | [M1+E2] | 4.9 (6) | 0.0067 (3) |
| $\gamma_{11,6}$(Pa) | 153.49 (18) | 0.0480 (8) | [E1] | 0.180 (4) | 0.0407 (7) |
| $\gamma_{9,2}$(Pa) | 155.239 (20) | 0.000270 (35) | E1 | 0.176 (4) | 0.00023 (3) |
| $\gamma_{11,5}$(Pa) | 162.504 | 0.185 | [E1] | 0.157 (3) | 0.16 |
| $\gamma_{7,1}$(Pa) | 162.504 (12) | 0.194 (3) | [E1] | 0.157 (3) | 0.1674 (26) |
| $\gamma_{7,0}$(Pa) | 169.162 (10) | 0.287 (5) | [E1] | 0.1431 (29) | 0.251 (4) |
| $\gamma_{11,4}$(Pa) | 170.60 (6) | 0.578 (10) | [E1] | 0.1403 (28) | 0.507 (9) |
| $\gamma_{17,15}$(Pa) | 179.05 (8) | 0.125 (25) | (M1+E2) | 3.5 (8) | 0.0278 (7) |
| $\gamma_{10,2}$(Pa) | 180.76 (3) | 0.000123 (3) | [E1] | 0.1223 (24) | 0.00011 (3) |
| $\gamma_{11,3}$(Pa) | 186.80 (18) | 0.067 (27) | [M1+E2] | 2.2 (13) | 0.0209 (9) |
| $\gamma_{12,11}$(Pa) | 190.552 (14) | 0.367 (8) | M1 | 3.26 (6) | 0.0861 (15) |
| $\gamma_{8,1}$(Pa) | 194.97 (7) | 0.1183 (19) | E1 | 0.1024 (20) | 0.1073 (17) |
| $\gamma_{8,0}$(Pa) | 201.62 (5) | 0.0242 (9) | E1 | 0.0946 (19) | 0.0221 (8) |
| $\gamma_{17,14}$(Pa) | 210.67 (8) | 0.044 (18) | [M1+E2] | 1.5 (10) | 0.0178 (11) |
| $\gamma_{-1,4}$(Pa) | 211.3 (2) | 0.0202 (9) | | | 0.0202 (9) |
| $\gamma_{9,0}$(Pa) | 212.34 (5) | 0.0070 (7) | E1 | 0.0839 (17) | 0.0065 (6) |
| $\gamma_{13,10}$(Pa) | 216.54 (8) | 0.031 (12) | (M1+E2) | 1.4 (9) | 0.0130 (7) |
| $\gamma_{18,15}$(Pa) | 226.1 (2) | 0.0516 (22) | M1+(E2) | 2.02 (4) | 0.0171 (7) |
| $\gamma_{10,0}$(Pa) | 237.86 (6) | 0.00202 (43) | [E1] | 0.0645 (13) | 0.0019 (4) |
| $\gamma_{-1,5}$(Pa) | 242.3 | 0.0029 (6) | | | 0.0029 (6) |
| $\gamma_{12,8}$(Pa) | 246.14 (6) | 0.0043 (6) | [E1] | 0.0596 (12) | 0.0041 (6) |
| $\gamma_{11,1}$(Pa) | 250.65 (16) | 0.0062 (4) | [E2] | 0.317 (6) | 0.0047 (3) |
| $\gamma_{13,8}$(Pa) | 252.78 (9) | 0.0152 (21) | [M1+E2] | 1.3 (3) | 0.0066 (3) |
| $\gamma_{11,0}$(Pa) | 257.30 (15) | 0.09 (3) | [M1+E2] | 0.8 (6) | 0.0524 (12) |
| $\gamma_{12,7}$(Pa) | 278.7 (4) | 0.0047 (6) | | | 0.0047 (6) |
| $\gamma_{13,7}$(Pa) | 285.24 (7) | 0.030 (4) | [M1+E2] | 0.94 (22) | 0.0154 (9) |
| $\gamma_{-1,6}$(Pa) | 309.9 | 0.0032 (3) | | | 0.0032 (3) |
| $\gamma_{14,10}$(Pa) | 316.1 | 0.00383 (41) | E1 | 0.0340 (7) | 0.0037 (4) |
| $\gamma_{15,10}$(Pa) | 347.64 (6) | 0.0234 (13) | [M1] | 0.613 (12) | 0.0145 (8) |
| $\gamma_{13,5}$(Pa) | 359.74 (4) | 0.1355 (21) | M1 | 0.559 (11) | 0.0869 (12) |
| $\gamma_{12,4}$(Pa) | 361.285 (22) | 0.0224 (6) | [E1] | 0.0255 (5) | 0.0218 (6) |
| $\gamma_{13,4}$(Pa) | 367.92 (7) | 0.0056 (11) | [M1] | 0.525 (10) | 0.0037 (7) |
| $\gamma_{12,3}$(Pa) | 377.27 (11) | 0.040 (3) | [M1+E2] | 0.46 (8) | 0.0275 (9) |
| $\gamma_{-1,7}$(Pa) | 383.5 | 0.0019 (6) | | | 0.0019 (6) |
| $\gamma_{19,15}$(Pa) | 398.8 (5) | 0.0158 (10) | [M1] | 0.422 (8) | 0.0111 (7) |
| $\gamma_{-1,8}$(Pa) | 408.8 (5) | 0.0005 (4) | | | 0.0005 (4) |
| $\gamma_{16,11}$(Pa) | 412.5 (5) | 0.0115 (10) | [M1] | 0.385 (8) | 0.0083 (7) |
| $\gamma_{-1,9}$(Pa) | 418.4 (5) | 0.0091 (7) | | | 0.0091 (7) |
| $\gamma_{19,14}$(Pa) | 430.9 (4) | 0.0239 (5) | (M1) | 0.342 (6) | 0.0178 (4) |
| $\gamma_{20,15}$(Pa) | 433.2 (4) | 0.0117 (4) | | | 0.0117 (4) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{12,1}$(Pa) | 440.94 (4) | 0.249 (10) | (M1+E2) | 0.30 (5) | 0.1912 (23) |
| $\gamma_{12,0}$(Pa) | 447.762 (20) | 0.134 (5) | [M1+E2] | 0.29 (4) | 0.1043 (14) |
| $\gamma_{-1,10}$(Pa) | 454.2 (5) | 0.04 | | | 0.04 |
| $\gamma_{14,5}$(Pa) | 459.222 (7) | 1.274 (17) | M1 | 0.288 (6) | 0.989 (12) |
| $\gamma_{-1,11}$(Pa) | 464.8 | 0.0026 (3) | | | 0.0026 (3) |
| $\gamma_{14,4}$(Pa) | 467.40 (6) | 0.0167 (17) | [M1,E2] | 0.16 (11) | 0.0144 (4) |
| $\gamma_{-1,12}$(Pa) | 473.9 (5) | 0.0033 (7) | | | 0.0033 (7) |
| $\gamma_{15,5}$(Pa) | 490.80 (6) | 0.1338 (21) | M1 | 0.241 (5) | 0.1078 (16) |
| $\gamma_{-1,13}$(Pa) | 497.1 (4) | 0.0128 (4) | | | 0.0128 (4) |
| $\gamma_{15,4}$(Pa) | 499.02 (4) | 0.1938 (27) | M1 | 0.230 (5) | 0.1576 (21) |
| $\gamma_{-1,14}$(Pa) | 505.5 (6) | 0.0055 (3) | | | 0.0055 (3) |
| $\gamma_{-1,15}$(Pa) | 513.4 (4) | 0.0133 (4) | | | 0.0133 (4) |
| $\gamma_{-1,16}$(Pa) | 517.0 (4) | 0.0046 (3) | | | 0.0046 (3) |
| $\gamma_{17,10}$(Pa) | 526.69 (6) | 0.052 (4) | [M1,E2] | 0.12 (8) | 0.0463 (11) |
| $\gamma_{-1,17}$(Pa) | 531.8 (4) | 0.0070 (7) | | | 0.0070 (7) |
| $\gamma_{17,9}$(Pa) | 552.21 (8) | 0.0194 (6) | (M1) | 0.1754 (35) | 0.0165 (5) |
| $\gamma_{-1,18}$(Pa) | 553.7 | 0.0030 (3) | | | 0.0030 (3) |
| $\gamma_{-1,19}$(Pa) | 554.9 | 0.0031 (3) | | | 0.0031 (3) |
| $\gamma_{17,8}$(Pa) | 562.93 (8) | 0.0636 (8) | [M1] | 0.167 (3) | 0.0545 (7) |
| $\gamma_{18,10}$(Pa) | 573.7 (4) | 0.0384 (12) | [M1] | 0.158 (3) | 0.0332 (10) |
| $\gamma_{-1,20}$(Pa) | 578.7 | 0.0017 (5) | | | 0.0017 (5) |
| $\gamma_{-1,21}$(Pa) | 583.2 | 0.0016 (5) | | | 0.0016 (5) |
| $\gamma_{17,7}$(Pa) | 595.39 (6) | 0.1346 (19) | (M1) | 0.143 (3) | 0.1178 (16) |
| $\gamma_{18,9}$(Pa) | 599.3 (2) | 0.0335 (6) | [M1] | 0.141 (3) | 0.0294 (5) |
| $\gamma_{18,8}$(Pa) | 610.0 (3) | 0.0643 (14) | [M1] | 0.134 (3) | 0.0567 (12) |
| $\gamma_{18,7}$(Pa) | 642.4 (2) | 0.0226 (6) | [M1] | 0.1171 (23) | 0.0202 (5) |
| $\gamma_{16,1}$(Pa) | 663.3 (5) | 0.0041 (6) | [M1] | 0.1075 (22) | 0.0037 (5) |
| $\gamma_{16,0}$(Pa) | 669.9 (5) | 0.0018 | | | 0.0018 |
| $\gamma_{17,5}$(Pa) | 669.901 (16) | 0.557 (7) | [M1] | 0.1047 (21) | 0.504 (6) |
| $\gamma_{17,4}$(Pa) | 678.04 (10) | 0.0686 (28) | [M1,E2] | 0.06 (4) | 0.0647 (9) |
| $\gamma_{-1,22}$(Pa) | 681.2 (6) | 0.0143 (4) | | | 0.0143 (4) |
| $\gamma_{-1,23}$(Pa) | 690 | 0.0021 (5) | | | 0.0021 (5) |
| $\gamma_{-1,24}$(Pa) | 698.5 (6) | 0.0106 (5) | | | 0.0106 (5) |
| $\gamma_{-1,25}$(Pa) | 703.7 (6) | 0.0091 (5) | | | 0.0091 (5) |
| $\gamma_{18,6}$(Pa) | 707.8 (3) | 0.0093 (5) | [E2] | 0.0209 (4) | 0.0091 (5) |
| $\gamma_{18,5}$(Pa) | 717.0 (2) | 0.0458 (10) | (M1) | 0.0874 (17) | 0.0421 (9) |
| $\gamma_{18,4}$(Pa) | 725.1 (2) | 0.0687 (11) | (M1) | 0.0848 (17) | 0.0633 (10) |
| $\gamma_{-1,26}$(Pa) | 727.8 | 0.0029 (2) | | | 0.0029 (2) |
| $\gamma_{18,3}$(Pa) | 741.1 (2) | 0.0237 (5) | [E1] | 0.00615 (12) | 0.0236 (5) |
| $\gamma_{-1,27}$(Pa) | 744.9 (5) | 0.0053 (2) | | | 0.0053 (2) |
| $\gamma_{-1,28}$(Pa) | 751.6 (6) | 0.0023 (4) | | | 0.0023 (4) |
| $\gamma_{17,1}$(Pa) | 757.90 (7) | 0.0324 (7) | | | 0.0324 (7) |
| $\gamma_{17,0}$(Pa) | 764.55 (6) | 0.0891 (13) | | | 0.0891 (13) |
| $\gamma_{-1,29}$(Pa) | 767.5 | 0.0032 (2) | | | 0.0032 (2) |
| $\gamma_{-1,30}$(Pa) | 774.0 (4) | 0.0108 (5) | | | 0.0108 (5) |
| $\gamma_{19,8}$(Pa) | 783.2 (5) | 0.00600 (32) | [M1] | 0.0692 (14) | 0.0056 (3) |
| $\gamma_{-1,31}$(Pa) | 784.2 (5) | 0.0022 (2) | | | 0.0022 (2) |
| $\gamma_{18,1}$(Pa) | 805.0 (2) | 0.0215 (6) | [E1] | 0.00529 (11) | 0.0214 (6) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{20,9}$(Pa) | 806.4 (5) | 0.0123 (5) | | | 0.0123 (5) |
| $\gamma_{18,0}$(Pa) | 811.6 (2) | 0.0060 (2) | [E1] | 0.00521 (10) | 0.0060 (2) |
| $\gamma_{19,7}$(Pa) | 815.9 (4) | 0.0207 (6) | [M1] | 0.0621 (12) | 0.0195 (6) |
| $\gamma_{20,8}$(Pa) | 817.0 (6) | 0.0095 (5) | | | 0.0095 (5) |
| $\gamma_{-1,32}$(Pa) | 832.0 (3) | 0.0075 | | | 0.0075 |
| $\gamma_{-1,33}$(Pa) | 846.8 (7) | 0.0013 | | | 0.0013 |
| $\gamma_{20,7}$(Pa) | 849.5 (5) | 0.0039 (3) | | | 0.0039 (3) |
| $\gamma_{-1,34}$(Pa) | 870.7 (7) | 0.0031 (2) | | | 0.0031 (2) |
| $\gamma_{-1,35}$(Pa) | 874.0 (5) | 0.00120 (4) | | | 0.00120 (4) |
| $\gamma_{19,6}$(Pa) | 880.9 (5) | 0.0098 (4) | E2 | 0.0135 (3) | 0.0097 (4) |
| $\gamma_{19,5}$(Pa) | 890.1 (5) | 0.1104 (15) | [M1] | 0.0493 (10) | 0.1052 (14) |
| $\gamma_{19,4}$(Pa) | 898.3 (5) | 0.0023 (4) | [M1] | 0.0481 (10) | 0.0022 (4) |
| $\gamma_{-1,36}$(Pa) | 918.9 (5) | 0.006 | | | 0.006 |
| $\gamma_{-1,37}$(Pa) | 935.2 (7) | 0.0369 (7) | | | 0.0369 (7) |
| $\gamma_{-1,38}$(Pa) | 941.9 (8) | 0.0048 (3) | | | 0.0048 (3) |
| $\gamma_{-1,39}$(Pa) | 942.8 | 0.0019 (3) | | | 0.0019 (3) |
| $\gamma_{20,3}$(Pa) | 948.3 (5) | 0.0060 (3) | | | 0.0060 (3) |
| $\gamma_{-1,40}$(Pa) | 955 (1) | 0.0002 (3) | | | 0.0002 (3) |
| $\gamma_{-1,41}$(Pa) | 960.8 (8) | 0.0041 (2) | | | 0.0041 (2) |
| $\gamma_{-1,42}$(Pa) | 962.8 (9) | 0.0015 (2) | | | 0.0015 (2) |
| $\gamma_{-1,43}$(Pa) | 968.2 (9) | 0.0083 (3) | | | 0.0083 (3) |
| $\gamma_{19,1}$(Pa) | 978.2 (5) | 0.00582 (30) | [E1] | 0.00374 (7) | 0.0058 (3) |
| $\gamma_{19,0}$(Pa) | 984.8 (5) | 0.01024 (30) | [E1] | 0.00369 (7) | 0.0102 (3) |
| $\gamma_{-1,44}$(Pa) | 994 (1) | 0.0006 (1) | | | 0.0006 (1) |
| $\gamma_{-1,45}$(Pa) | 1001 (1) | 0.0008 (2) | | | 0.0008 (2) |
| $\gamma_{-1,46}$(Pa) | 1007 (1) | 0.0014 (2) | | | 0.0014 (2) |
| $\gamma_{-1,47}$(Pa) | 1011 (1) | 0.0019 (2) | | | 0.0019 (2) |
| $\gamma_{-1,48}$(Pa) | 1026.5 (10) | 0.0075 | | | 0.0075 |
| $\gamma_{-1,49}$(Pa) | 1092.5 (10) | 0.006 | | | 0.006 |
| $\gamma_{-1,50}$(Pa) | 1132.1 | 0.0006 (2) | | | 0.0006 (2) |
| $\gamma_{-1,51}$(Pa) | 1139.1 | 0.0004 (1) | | | 0.0004 (1) |
| $\gamma_{-1,52}$(Pa) | 1144 (1) | 0.0027 | | | 0.0027 |
| $\gamma_{-1,53}$(Pa) | 1201 (1) | 0.006 | | | 0.006 |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 24.10 | (3) | d |
| $Q_{\beta^-}$ | : | 272 | (10) | keV |
| $\beta^-$ | : | 100 | | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,7}$ | 85 (10) | 1.6 (6) | Allowed | 7 |
| $\beta^-_{0,6}$ | 95 (10) | 0.016 (5) | 1st forbidden | 9.1 |
| $\beta^-_{0,5}$ | 105 (10) | 6.5 (7) | Allowed | 6.7 |
| $\beta^-_{0,4}$ | 106 (10) | 14.1 (12) | 1st forbidden | 6.3 |
| $\beta^-_{0,2}$ | 198 (10) | 77.8 (15) | 1st forbidden | 6.4 |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Pa) | 5.9 - 21.6 | 7.7 (6) | |
| $e_{AK}$ | (Pa) | | 0.0014 (9) | |
| | KLL | 70.081 - 78.822 | } | |
| | KLX | 85.989 - 95.858 | } | |
| | KXY | 101.87 - 112.59 | } | |
| $ec_{3,2\ L}$ | (Pa) | 8.4 - 12.8 | 3.95 (45) | |
| $ec_{7,5\ M}$ | (Pa) | 14.65 - 16.57 | 0.63 (28) | |
| $ec_{7,5\ N}$ | (Pa) | 18.63 - 19.65 | 0.17 (8) | |
| $ec_{3,2\ M}$ | (Pa) | 24.1 - 26.1 | 1.08 (12) | |
| $ec_{3,2\ N}$ | (Pa) | 28.1 - 29.1 | 0.292 (34) | |
| $ec_{4,3\ L}$ | (Pa) | 41.78 - 46.15 | 0.31 (8) | |
| $ec_{5,3\ L}$ | (Pa) | 42.2 - 46.6 | 1.144 (31) | |
| $ec_{1,0\ L}$ | (Pa) | 52.82 - 57.19 | 0.106 (12) | |
| $ec_{4,3\ M}$ | (Pa) | 57.52 - 59.44 | 0.079 (20) | |
| $ec_{5,3\ M}$ | (Pa) | 57.9 - 59.9 | 0.281 (7) | |
| $ec_{4,3\ N}$ | (Pa) | 61.50 - 62.53 | 0.021 (5) | |
| $ec_{5,3\ N}$ | (Pa) | 61.9 - 62.9 | 0.0739 (19) | |
| $ec_{1,0\ M}$ | (Pa) | 68.56 - 70.48 | 0.0258 (29) | |
| $ec_{4,2\ L}$ | (Pa) | 71.27 - 75.65 | 8.7 (8) | |
| $ec_{5,2\ L}$ | (Pa) | 71.7 - 76.1 | 0.239 (21) | |
| $ec_{4,2\ M}$ | (Pa) | 87.02 - 88.94 | 2.09 (18) | |
| $ec_{5,2\ M}$ | (Pa) | 87.4 - 89.4 | 0.058 (5) | |
| $ec_{4,2\ N}$ | (Pa) | 91.00 - 92.02 | 0.56 (5) | |
| $ec_{5,2\ N}$ | (Pa) | 91.4 - 92.4 | 0.0154 (14) | |
| $ec_{7,2\ L}$ | (Pa) | 91.70 - 96.08 | 0.0143 (15) | |
| $\beta^-_{0,7}$ | max: | 85 (10) | 1.6 (6) | avg: 22 (3) |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $\beta^-_{0,6}$ | max: | 95 | (10) | 0.016 (5) | avg: | 25 (3) |
| $\beta^-_{0,5}$ | max: | 105 | (10) | 6.5 (7) | avg: | 27 (3) |
| $\beta^-_{0,4}$ | max: | 106 | (10) | 14.1 (12) | avg: | 28 (3) |
| $\beta^-_{0,2}$ | max: | 198 | (10) | 77.8 (15) | avg: | 53 (3) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pa) | 11.3676 — 20.1126 | | 7.1 (3) | |
| XK$\alpha_2$ | (Pa) | 92.288 | | 0.013 (9) | } K$\alpha$ |
| XK$\alpha_1$ | (Pa) | 95.869 | | 0.021 (13) | } |
| XK$\beta_3$ | (Pa) | 107.595 | } | | |
| XK$\beta_1$ | (Pa) | 108.422 | } | 0.007 (5) | K$\beta_1'$ |
| XK$\beta_5''$ | (Pa) | 109.072 | } | | |
| XK$\beta_2$ | (Pa) | 111.405 | } | | |
| XK$\beta_4$ | (Pa) | 111.87 | } | 0.0025 (16) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Pa) | 112.38 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{7,5}$(Pa) | 20.01 (2) | 1.2 (6) | M1+E2 | 240 (70) | 0.0051 (21) |
| $\gamma_{3,2}$(Pa) | 29.50 (2) | 5.4 (6) | E2 | 4390 (70) | 0.00123 (14) |
| $\gamma_{4,3}$(Pa) | 62.88 (2) | 0.43 (11) | M1+E2 | 25 (5) | 0.0164 (28) |
| $\gamma_{5,3}$(Pa) | 63.30 (2) | 5.27 (11) | E1 | 0.405 (6) | 3.75 (8) |
| $\gamma_{1,0}$(Pa) | 73.92 (2) | 0.154 (17) | M1+E2 | 10.6 (4) | 0.0133 (14) |
| $\gamma_{7,3}$(Pa) | 83.31 (5) | 0.073 (6) | E1 | 0.196 (3) | 0.061 (5) |
| $\gamma_{4,2}$(Pa) | 92.38 (1) | 13.7 (12) | M1 | 5.27 (8) | 2.18 (19) |
| $\gamma_{5,2}$(Pa) | 92.80 (2) | 2.47 (22) | E1 | 0.1472 (21) | 2.15 (19) |
| $\gamma_{6,2}$(Pa) | 103.35 (10) | 0.0154 (48) | M1 | 3.81 (6) | 0.0032 (10) |
| $\gamma_{7,2}$(Pa) | 112.81 (5) | 0.264 (40) | E1 | 0.23 (14) | 0.215 (22) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 32670 | (260) | y |
| $Q_\alpha$ | : | 5149.9 | (8) | keV |
| $\alpha$ | : | 100 | | % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,25}$ | 4415.6 (9) | 0.0021 (5) |
| $\alpha_{0,24}$ | 4507.6 (8) | 0.0036 (3) |
| $\alpha_{0,23}$ | 4533.0 (8) | 0.00076 (20) |
| $\alpha_{0,22}$ | 4568.1 (9) | 0.008 (4) |
| $\alpha_{0,21}$ | 4599.6 (8) | 0.015 (7) |
| $\alpha_{0,20}$ | 4630.3 (8) | 0.078 (21) |
| $\alpha_{0,19}$ | 4633.0 (8) | 0.0504 (11) |
| $\alpha_{0,18}$ | 4642.5 (8) | 0.080 (6) |
| $\alpha_{0,17}$ | 4680.1 (8) | 1.8 (3) |
| $\alpha_{0,16}$ | 4712.3 (8) | 1.20 (22) |
| $\alpha_{0,15}$ | 4736.3 (8) | 8.4 (4) |
| $\alpha_{0,14}$ | 4761.2 (8) | 0.0032 (9) |
| $\alpha_{0,12}$ | 4794.1 (8) | 0.040 (15) |
| $\alpha_{0,11}$ | 4853.5 (8) | 1.40 (15) |
| $\alpha_{0,8}$ | 4903.4 (22) | 0.002 (1) |
| $\alpha_{0,7}$ | 4936.0 (8) | 2.9 (3) |
| $\alpha_{0,6}$ | 4952.6 (8) | 22.5 (5) |
| $\alpha_{0,5}$ | 4977.6 (8) | 0.4 (1) |
| $\alpha_{0,4}$ | 4987.8 (8) | 1.6 (2) |
| $\alpha_{0,3}$ | 5015.1 (8) | 25.3 (5) |
| $\alpha_{0,2}$ | 5031.2 (8) | 20 (2) |
| $\alpha_{0,1}$ | 5033.8 (8) | 2.8 (3) |
| $\alpha_{0,0}$ | 5060.7 (8) | 11.7 (5) |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $e_{AL}$ | (Ac) | 5.87 - 19.69 | 52.6 (15) |
| $e_{AK}$ | (Ac) | | 0.078 (11) |
| | KLL | 66.769 - 74.715 | } |
| | KLX | 81.775 - 90.882 | } |
| | KXY | 96.76 - 106.75 | } |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Ac) | 10.8701 — 18.9228 | | 44.3 (13) | |
| $XK\alpha_2$ | (Ac) | 87.768 | | 0.715 (23) | } $K\alpha$ |
| $XK\alpha_1$ | (Ac) | 90.885 | | 1.16 (4) | } |
| $XK\beta_3$ | (Ac) | 102.101 | } | | |
| $XK\beta_1$ | (Ac) | 102.841 | } | 0.410 (15) | $K\beta_1'$ |
| $XK\beta_5''$ | (Ac) | 103.462 | } | | |
| $XK\beta_2$ | (Ac) | 105.679 | } | | |
| $XK\beta_4$ | (Ac) | 106.098 | } | 0.136 (6) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Ac) | 106.563 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{3,2}$(Ac) | 16.370 (14) | 2.12 (9) | E1 | 8.58 (12) | 0.221 (9) |
| $\gamma_{3,1}$(Ac) | 18.980 (14) | 42 (4) | M1 | 113.2 (16) | 0.37 (3) |
| $\gamma_{11,9}$(Ac) | 23.46 (6) | 1.16 (15) | M1 | 241 (4) | 0.0048 (6) |
| $\gamma_{16,15}$(Ac) | 24.46 (4) | 1.05 (21) | M1 | 214 (4) | 0.0049 (10) |
| $\gamma_{6,5}$(Ac) | 25.390 (22) | 18.3 (14) | M1 | 191 (3) | 0.095 (7) |
| $\gamma_{1,0}$(Ac) | 27.37 (1) | 59 (7) | E1 | 4.5 (6) | 10.8 (4) |
| $\gamma_{2,0}$(Ac) | 29.98 (1) | 26 (3) | M1+E2 | 270 (30) | 0.097 (4) |
| $\gamma_{6,4}$(Ac) | 35.800 (22) | 0.045 (3) | E1 | 1.746 (25) | 0.0163 (10) |
| $\gamma_{5,3}$(Ac) | 38.200 (14) | 13 (3) | M1+E2 | 89 (19) | 0.144 (6) |
| $\gamma_{4,2}$(Ac) | 44.160 (14) | 2.11 (16) | M1 | 37.4 (6) | 0.055 (4) |
| $\gamma_{3,0}$(Ac) | 46.35 (1) | 0.357 (19) | E1 | 0.879 (13) | 0.19 (1) |
| $\gamma_{20,17}$(Ac) | 50.73 (5) | 0.057 (21) | M1 | 24.9 (4) | 0.0022 (8) |
| $\gamma_{7,4}$(Ac) | 52.720 (22) | 1.77 (10) | M1 | 22.2 (4) | 0.076 (4) |
| $\gamma_{5,2}$(Ac) | 54.570 (14) | 0.110 (6) | E1 | 0.569 (8) | 0.070 (4) |
| $\gamma_{15,13}$(Ac) | 56.90 (3) | 0.18 (4) | M1+E2 | 37 (6) | 0.0047 (7) |
| $\gamma_{5,1}$(Ac) | 57.180 (14) | 4.6 (5) | E2 | 148.1 (21) | 0.031 (3) |
| $\gamma_{17,15}$(Ac) | 57.190 (22) | 0.7 (3) | E2 | 148.0 (21) | 0.0046 (21) |
| $\gamma_{9,7}$(Ac) | 60.46 (4) | 0.0076 (10) | E1 | 0.433 (7) | 0.0053 (7) |
| $\gamma_{6,3}$(Ac) | 63.590 (22) | 3.99 (16) | E2 | 88.8 (13) | 0.0446 (17) |
| $\gamma_{-1,1}$(Ac) | 70.49 (5) | 0.0051 (8) | | | 0.0051 (8) |
| $\gamma_{10,7}$(Ac) | 71.85 (5) | 0.019 (7) | M1 | 8.98 (13) | 0.0019 (7) |
| $\gamma_{12,10}$(Ac) | 72.58 (7) | 0.029 (7) | M1 | 8.71 (13) | 0.0030 (7) |
| $\gamma_{4,0}$(Ac) | 74.14 (1) | 0.97 (4) | E2 | 42.6 (6) | 0.0223 (9) |
| $\gamma_{9,6}$(Ac) | 77.38 (4) | 0.50 (4) | M1 | 7.23 (11) | 0.061 (4) |
| $\gamma_{7,2}$(Ac) | 96.880 (22) | 1.10 (4) | E2 | 12.02 (17) | 0.084 (3) |
| $\gamma_{11,6}$(Ac) | 100.84 (5) | 0.248 (10) | E2 | 9.97 (15) | 0.0226 (9) |
| $\gamma_{9,5}$(Ac) | 102.77 (3) | 0.20 (4) | E2 | 9.12 (13) | 0.019 (4) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{10,4}$(Ac) | 124.57 (4) | 0.0217 (20) | E2 | 4.04 (6) | 0.0043 (4) |
| $\gamma_{12,7}$(Ac) | 144.43 (6) | 0.037 (3) | E2 | 2.18 (3) | 0.0115 (9) |
| $\gamma_{13,4}$(Ac) | 199.00 (3) | 0.0030 (12) | | | 0.0030 (12) |
| $\gamma_{14,4}$(Ac) | 230.59 (5) | 0.0017 (8) | | | 0.0017 (8) |
| $\gamma_{-1,2}$(Ac) | 242.18 (8) | 0.0099 (10) | | | 0.0099 (10) |
| $\gamma_{13,2}$(Ac) | 243.16 (3) | 0.065 (11) | M1+E2 | 0.80 (17) | 0.036 (5) |
| $\gamma_{15,5}$(Ac) | 245.490 (14) | 0.042 (3) | M2 | 5.24 (8) | 0.0067 (5) |
| $\gamma_{13,1}$(Ac) | 245.77 (3) | 0.013 (4) | E1 | 0.0570 (8) | 0.012 (4) |
| $\gamma_{15,4}$(Ac) | 255.900 (14) | 0.134 (3) | E2 | 0.264 (4) | 0.1059 (22) |
| $\gamma_{14,3}$(Ac) | 258.38 (5) | 0.0015 (4) | | | 0.0015 (4) |
| $\gamma_{17,7}$(Ac) | 260.37 (3) | 0.282 (21) | M1+E2 | 0.55 (11) | 0.182 (4) |
| $\gamma_{13,0}$(Ac) | 273.14 (3) | 0.101 (7) | M1+E2 | 0.74 (11) | 0.0579 (12) |
| $\gamma_{17,6}$(Ac) | 277.29 (3) | 0.10 (6) | E1+M2 | 0.5 (9) | 0.0680 (15) |
| $\gamma_{15,3}$(Ac) | 283.690 (14) | 1.72 (3) | E1 | 0.0410 (6) | 1.65 (3) |
| $\gamma_{-1,3}$(Ac) | 286.58 (10) | 0.0104 (5) | | | 0.0104 (5) |
| $\gamma_{15,2}$(Ac) | 300.060 (14) | 4.25 (10) | M1+E2 | 0.764 (17) | 2.41 (5) |
| $\gamma_{15,1}$(Ac) | 302.670 (14) | 2.4 (3) | E1 | 0.0355 (5) | 2.3 (3) |
| $\gamma_{17,5}$(Ac) | 302.680 (22) | 0.22 (10) | E1 | 0.0355 (5) | 0.21 (10) |
| $\gamma_{-1,4}$(Ac) | 310.0 (1) | 0.00092 (20) | | | 0.00092 (20) |
| $\gamma_{17,4}$(Ac) | 313.090 (22) | 0.129 (9) | M1+E2 | 0.31 (9) | 0.0987 (20) |
| $\gamma_{16,1}$(Ac) | 327.13 (4) | 0.0372 (11) | E1 | 0.0298 (5) | 0.0361 (11) |
| $\gamma_{15,0}$(Ac) | 330.04 (1) | 2.09 (5) | M1+E2 | 0.541 (19) | 1.36 (3) |
| $\gamma_{17,3}$(Ac) | 340.880 (22) | 0.196 (7) | E1+M2 | 0.11 (3) | 0.177 (4) |
| $\gamma_{18,4}$(Ac) | 351.45 (3) | 0.0029 (12) | E1 | 0.0255 (4) | 0.0028 (12) |
| $\gamma_{16,0}$(Ac) | 354.50 (4) | 0.1094 (23) | M1+E2 | 0.1375 (20) | 0.0962 (20) |
| $\gamma_{17,2}$(Ac) | 357.250 (22) | 0.240 (18) | M1+E2 | 0.43 (10) | 0.168 (4) |
| $\gamma_{17,1}$(Ac) | 359.860 (22) | 0.0085 (3) | | | 0.0085 (3) |
| $\gamma_{20,4}$(Ac) | 363.82 (4) | 0.0080 (3) | | | 0.0080 (3) |
| $\gamma_{-1,5}$(Ac) | 374.95 (10) | 0.0045 (3) | | | 0.0045 (3) |
| $\gamma_{18,3}$(Ac) | 379.24 (3) | 0.066 (6) | M1+E2 | 0.32 (11) | 0.0498 (11) |
| $\gamma_{21,5}$(Ac) | 384.69 (6) | 0.00365 (22) | | | 0.00365 (22) |
| $\gamma_{17,0}$(Ac) | 387.23 (2) | 0.00032 (11) | E2 | 0.0773 (11) | 0.0003 (1) |
| $\gamma_{20,3}$(Ac) | 391.61 (4) | 0.00687 (22) | E1 | 0.0202 (3) | 0.00673 (22) |
| $\gamma_{18,2}$(Ac) | 395.61 (3) | 0.00230 (22) | E1 | 0.0198 (3) | 0.00226 (22) |
| $\gamma_{18,1}$(Ac) | 398.22 (3) | 0.0095 (3) | | | 0.0095 (3) |
| $\gamma_{19,1}$(Ac) | 407.820 (22) | 0.0475 (11) | M1 | 0.334 (5) | 0.0356 (8) |
| $\gamma_{20,1}$(Ac) | 410.59 (4) | 0.00183 (22) | E1 | 0.0183 (3) | 0.00180 (22) |
| $\gamma_{22,4}$(Ac) | 427.14 (7) | 0.0007 (4) | | | 0.0007 (4) |
| $\gamma_{19,0}$(Ac) | 435.19 (2) | 0.00294 (17) | | | 0.00294 (17) |
| $\gamma_{20,0}$(Ac) | 437.96 (4) | 0.0045 (3) | | | 0.0045 (3) |
| $\gamma_{-1,6}$(Ac) | 438.72 (10) | 0.0013 (4) | | | 0.0013 (4) |
| $\gamma_{24,4}$(Ac) | 488.66 (10) | 0.00165 (17) | | | 0.00165 (17) |
| $\gamma_{23,3}$(Ac) | 490.65 (10) | 0.0004 (1) | | | 0.0004 (1) |
| $\gamma_{22,0}$(Ac) | 501.28 (7) | 0.00076 (18) | | | 0.00076 (18) |
| $\gamma_{23,1}$(Ac) | 509.63 (10) | 0.00036 (17) | | | 0.00036 (17) |
| $\gamma_{24,3}$(Ac) | 516.45 (10) | 0.00137 (15) | | | 0.00137 (15) |
| $\gamma_{24,1}$(Ac) | 535.43 (10) | 0.00061 (12) | | | 0.00061 (12) |
| $\gamma_{25,6}$(Ac) | 546.5 (3) | 0.00083 (13) | | | 0.00083 (13) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{25,5}$(Ac) | 571.9 (3) | 0.00048 (20) | | | 0.00048 (20) |
| $\gamma_{25,4}$(Ac) | 582.3 (3) | 0.00031 (17) | | | 0.00031 (17) |
| $\gamma_{25,3}$(Ac) | 610.1 (3) | 0.0005 (4) | | | 0.0005 (4) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 26.98 | (2) | d |
| $Q_{\beta^-}$ | : | 570.1 | (20) | keV |
| $\beta^-$ | : | 100 | | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,11}$ | 114.1 (20) | 0.0011 (2) | 1st forbidden | 10.6 |
| $\beta^-_{0,10}$ | 154.3 (20) | 25.4 (16) | 1st forbidden | 6.7 |
| $\beta^-_{0,9}$ | 171.5 (20) | 15.4 (8) | 1st forbidden | 7 |
| $\beta^-_{0,8}$ | 189.8 (20) | 0.020 (3) | 1st forbidden unique | 9.4 |
| $\beta^-_{0,7}$ | 229.6 (20) | 25.9 (32) | 1st forbidden | 7.2 |
| $\beta^-_{0,6}$ | 249.4 (20) | 0.020 (5) | 2nd forbidden | 10.4 |
| $\beta^-_{0,5}$ | 258.2 (20) | 26.6 (32) | 1st forbidden | 7.3 |
| $\beta^-_{0,4}$ | 268.1 (20) | 0.010 (2) | Allowed | 11.8 |
| $\beta^-_{0,3}$ | 271.3 (20) | 0.12 (5) | Allowed | 9.8 |
| $\beta^-_{0,1}$ | 529.8 (20) | 0.3 (19) | 1st forbidden unique | 10.2 |
| $\beta^-_{0,0}$ | 570.1 (20) | 6.3 (23) | 1st forbidden | 9.1 |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (U) | 5.9 - 21.6 | 42.2 (13) | |
| $e_{AK}$ | (U) | | 0.95 (13) | |
| | KLL | 71.78 - 80.95 | } | |
| | KLX | 88.15 - 98.34 | } | |
| | KXY | 104.42 - 115.40 | } | |
| $ec_{7,5\ L}$ | (U) | 6.80 - 11.39 | 16.5 (21) | |
| $ec_{10,9\ M}$ | (U) | 11.714 - 13.710 | 1.53 | |
| $ec_{1,0\ L}$ | (U) | 18.59 - 23.18 | 10.3 (15) | |
| $ec_{7,3\ L}$ | (U) | 19.9 - 24.5 | 0.013 (3) | |
| $ec_{7,5\ M}$ | (U) | 23.01 - 25.01 | 4.3 (6) | |
| $ec_{7,5\ N}$ | (U) | 27.118 - 28.180 | 1.14 (15) | |
| $ec_{2,1\ L}$ | (U) | 30.05 - 34.64 | 0.04 | |
| $ec_{1,0\ M}$ | (U) | 34.8 - 36.8 | 2.8 (4) | |
| $ec_{1,0\ N}$ | (U) | 38.908 - 39.970 | 0.77 (12) | |
| $ec_{2,1\ M}$ | (U) | 46.26 - 48.26 | 0.011 | |
| $ec_{10,7\ L}$ | (U) | 53.51 - 58.10 | 11.2 (12) | |
| $ec_{9,5\ L}$ | (U) | 64.84 - 69.43 | 10.6 (6) | |
| $ec_{10,7\ M}$ | (U) | 69.72 - 71.72 | 2.7 (3) | |
| $ec_{2,0\ L}$ | (U) | 70.40 - 74.99 | 0.034 | |
| $ec_{10,7\ N}$ | (U) | 73.828 - 74.890 | 0.74 (9) | |
| $ec_{9,5\ M}$ | (U) | 81.05 - 83.04 | 2.57 (14) | |

| | | Energy keV | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|
| $ec_{10,5\ L}$ | (U) | 82.10 - 86.69 | 2.70 (13) | | |
| $ec_{9,5\ N}$ | (U) | 85.154 - 86.216 | 0.695 (38) | | |
| $ec_{10,5\ M}$ | (U) | 98.31 - 100.31 | 0.66 (4) | | |
| $ec_{10,5\ N}$ | (U) | 102.42 - 103.48 | 0.18 (1) | | |
| $ec_{5,1\ K}$ | (U) | 155.95 (1) | 0.0292 (6) | | |
| $ec_{7,1\ K}$ | (U) | 184.527 (5) | 4.62 (20) | | |
| $ec_{5,0\ K}$ | (U) | 196.302 (5) | 24.5 (8) | | |
| $ec_{7,0\ K}$ | (U) | 224.874 (5) | 2.24 (9) | | |
| $ec_{7,2\ L}$ | (U) | 226.62 - 231.21 | 0.0107 (3) | | |
| $ec_{5,1\ L}$ | (U) | 249.80 - 254.39 | 0.0396 (9) | | |
| $ec_{10,1\ K}$ | (U) | 259.802 (5) | 0.0336 (8) | | |
| $ec_{5,1\ M}$ | (U) | 266.01 - 268.00 | 0.0108 (3) | | |
| $ec_{7,1\ L}$ | (U) | 278.37 - 282.96 | 0.88 (4) | | |
| $ec_{9,0\ K}$ | (U) | 282.890 (5) | 0.0618 (12) | | |
| $ec_{5,0\ L}$ | (U) | 290.15 - 294.74 | 4.83 (17) | | |
| $ec_{7,1\ M}$ | (U) | 294.58 - 296.58 | 0.22 (1) | | |
| $ec_{7,1\ N}$ | (U) | 298.688 - 299.750 | 0.0659 (25) | | |
| $ec_{10,0\ K}$ | (U) | 300.162 (7) | 0.16 (10) | | |
| $ec_{5,0\ M}$ | (U) | 306.36 - 308.35 | 1.19 (4) | | |
| $ec_{5,0\ N}$ | (U) | 310.463 - 311.525 | 0.343 (6) | | |
| $ec_{7,0\ L}$ | (U) | 318.72 - 323.31 | 0.460 (14) | | |
| $ec_{7,0\ M}$ | (U) | 334.93 - 336.93 | 0.098 (5) | | |
| $ec_{7,0\ N}$ | (U) | 339.035 - 340.097 | 0.024 (8) | | |
| $ec_{10,1\ L}$ | (U) | 353.65 - 358.24 | 0.0246 (5) | | |
| $ec_{9,0\ L}$ | (U) | 376.73 - 381.32 | 0.0410 (9) | | |
| $ec_{9,0\ M}$ | (U) | 392.94 - 394.94 | 0.01094 (25) | | |
| $ec_{10,0\ L}$ | (U) | 394.01 - 398.60 | 0.056 (16) | | |
| $ec_{10,0\ M}$ | (U) | 410.22 - 412.21 | 0.014 (3) | | |
| $\beta^-_{0,11}$ | max: | 114.1 (20) | 0.0011 (2) | avg: | 29.8 (5) |
| $\beta^-_{0,10}$ | max: | 154.3 (20) | 25.4 (16) | avg: | 40.9 (5) |
| $\beta^-_{0,9}$ | max: | 171.5 (20) | 15.4 (8) | avg: | 45.7 (5) |
| $\beta^-_{0,8}$ | max: | 189.8 (20) | 0.020 (3) | avg: | 50.9 (6) |
| $\beta^-_{0,7}$ | max: | 229.6 (20) | 25.9 (32) | avg: | 62.4 (6) |
| $\beta^-_{0,6}$ | max: | 249.4 (20) | 0.020 (5) | avg: | 68.2 (6) |
| $\beta^-_{0,5}$ | max: | 258.2 (20) | 26.6 (32) | avg: | 70.8 (6) |
| $\beta^-_{0,4}$ | max: | 268.1 (20) | 0.010 (2) | avg: | 73.7 (6) |
| $\beta^-_{0,3}$ | max: | 271.3 (20) | 0.12 (5) | avg: | 74.6 (6) |
| $\beta^-_{0,1}$ | max: | 529.8 (20) | 0.3 (19) | avg: | 156.1 (6) |
| $\beta^-_{0,0}$ | max: | 570.1 (20) | 6.3 (23) | avg: | 169.6 (6) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (U) | 11.619 — 20.714 | | 40.6 (11) | |
| $XK\alpha_2$ | (U) | 94.666 | | 9.10 (26) | } $K\alpha$ |
| $XK\alpha_1$ | (U) | 98.44 | | 14.6 (4) | } |
| $XK\beta_3$ | (U) | 110.421 | } | | |
| $XK\beta_1$ | (U) | 111.298 | } | 5.25 (18) | $K\beta_1'$ |
| $XK\beta_5''$ | (U) | 111.964 | } | | |
| $XK\beta_2$ | (U) | 114.407 | } | | |
| $XK\beta_4$ | (U) | 115.012 | } | 1.80 (7) | $K\beta_2'$ |
| $XKO_{2,3}$ | (U) | 115.377 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{10,9}$(U) | 17.262 (6) | 2.07 | M1+1.66%E2 | 503 | 0.0041 |
| $\gamma_{7,5}$(U) | 28.559 (10) | 22.3 (28) | M1+2.44%E2 | 313 (18) | 0.071 (8) |
| $\gamma_{1,0}$(U) | 40.349 (5) | 13.9 (19) | M1+54%E2 | 580 (60) | 0.024 (2) |
| $\gamma_{7,3}$(U) | 41.663 (10) | 0.032 (7) | [E1] | 1.253 (25) | 0.014 (3) |
| $\gamma_{2,1}$(U) | 51.81 (4) | 0.055 | [M1+28%E2] | 108 | 0.0005 |
| $\gamma_{10,7}$(U) | 75.269 (10) | 16.1 (16) | M1+2.2%E2 | 11.4 (12) | 1.30 (3) |
| $\gamma_{9,5}$(U) | 86.595 (5) | 16.1 (9) | M1+0.31%E2 | 7.08 (14) | 1.99 (10) |
| $\gamma_{2,0}$(U) | 92.16 (4) | 0.0492 | [E2] | 19.5 | 0.0024 |
| $\gamma_{10,5}$(U) | 103.86 (1) | 4.44 (18) | M1+(1%E2) | 4.21 (21) | 0.853 (6) |
| $\gamma_{6,2}$(U) | 228.57 (5) | 0.0042 (7) | | | 0.0042 (7) |
| $\gamma_{7,2}$(U) | 248.38 (4) | 0.082 (2) | [E2] | 0.346 (7) | 0.0609 (11) |
| $\gamma_{3,1}$(U) | 258.45 (2) | 0.0289 (6) | [E1] | 0.0547 (11) | 0.0274 (6) |
| $\gamma_{5,1}$(U) | 271.555 (10) | 0.406 (4) | E2 | 0.258 (5) | 0.323 (3) |
| $\gamma_{6,1}$(U) | 280.61 (5) | 0.011 (2) | | | 0.011 (2) |
| $\gamma_{8,2}$(U) | 288.42 (10) | 0.016 (3) | | | 0.016 (3) |
| $\gamma_{3,0}$(U) | 298.81 (2) | 0.12 (5) | [E1] | 0.0396 (8) | 0.12 (5) |
| $\gamma_{7,1}$(U) | 300.129 (5) | 12.3 (4) | M1+0.6%E2 | 0.87 (2) | 6.60 (21) |
| $\gamma_{4,0}$(U) | 301.99 (10) | 0.010 (2) | | | 0.010 (2) |
| $\gamma_{5,0}$(U) | 311.904 (5) | 68.9 (12) | M1+1%E2 | 0.80 (2) | 38.3 (5) |
| $\gamma_{6,0}$(U) | 320.73 (10) | 0.0051 (4) | | | 0.0051 (4) |
| $\gamma_{7,0}$(U) | 340.476 (5) | 7.24 (10) | M1+5%E2 | 0.62 (2) | 4.47 (3) |
| $\gamma_{10,1}$(U) | 375.404 (5) | 0.751 (7) | E2 | 0.0981 (20) | 0.684 (7) |
| $\gamma_{8,0}$(U) | 380.28 (10) | 0.0037 (9) | | | 0.0037 (9) |
| $\gamma_{9,0}$(U) | 398.492 (5) | 1.526 (15) | E2 | 0.0835 (17) | 1.408 (14) |
| $\gamma_{10,0}$(U) | 415.764 (5) | 1.97 (12) | M1+83%E2 | 0.13 (8) | 1.747 (7) |
| $\gamma_{11,0}$(U) | 455.96 (10) | 0.0011 (2) | | | 0.0011 (2) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 6.70 | (5) | h |
| $Q_{\beta^-}$ | : | 2195 | (4) | keV |
| $\beta^-$ | : | 100 | | % |

## 2 $\beta^-$ Transitions

| | Energy keV | | Probability × 100 | | Nature | log $ft$ |
|---|---|---|---|---|---|---|
| $\beta^-_{0,77}$ | 51 | (4) | 0.42 | (5) | | 4.98 |
| $\beta^-_{0,76}$ | 79 | (4) | 0.21 | (3) | | 5.87 |
| $\beta^-_{0,75}$ | 94 | (4) | 0.064 | (11) | | 6.6 |
| $\beta^-_{0,74}$ | 126 | (4) | 0.40 | (7) | | 6.21 |
| $\beta^-_{0,73}$ | 129 | (4) | 0.140 | (24) | | 6.69 |
| $\beta^-_{0,72}$ | 158 | (4) | 0.055 | (8) | | 7.37 |
| $\beta^-_{0,71}$ | 161 | (4) | 0.90 | (15) | | 6.19 |
| $\beta^-_{0,70}$ | 175 | (4) | 0.112 | (16) | | 7.2 |
| $\beta^-_{0,69}$ | 195 | (4) | 0.122 | (16) | | 7.31 |
| $\beta^-_{0,68}$ | 214 | (4) | 0.59 | (8) | | 6.75 |
| $\beta^-_{0,67}$ | 226 | (4) | 0.044 | (12) | | 7.95 |
| $\beta^-_{0,66}$ | 236 | (4) | 0.44 | (19) | | 7.01 |
| $\beta^-_{0,65}$ | 254 | (4) | 0.35 | (5) | | 7.22 |
| $\beta^-_{0,64}$ | 267 | (4) | 0.22 | (4) | | 7.49 |
| $\beta^-_{0,63}$ | 279 | (4) | 0.21 | (3) | | 7.56 |
| $\beta^-_{0,62}$ | 313 | (4) | 0.25 | (3) | | 7.65 |
| $\beta^-_{0,61}$ | 332 | (4) | 0.029 | (7) | | 8.66 |
| $\beta^-_{0,60}$ | 351 | (4) | 0.17 | (3) | | 7.97 |
| $\beta^-_{0,59}$ | 383 | (4) | 1.43 | (15) | | 7.17 |
| $\beta^-_{0,58}$ | 402 | (4) | 0.41 | (8) | | 7.78 |
| $\beta^-_{0,57}$ | 411 | (4) | 0.061 | (11) | | 8.64 |
| $\beta^-_{0,56}$ | 412 | (4) | 8 | (3) | | 6.53 |
| $\beta^-_{0,55}$ | 424 | (4) | 0.129 | (17) | | 8.36 |
| $\beta^-_{0,54}$ | 433 | (4) | 2.8 | (4) | | 7.05 |
| $\beta^-_{0,53}$ | 457 | (4) | 0.78 | (19) | | 7.68 |
| $\beta^-_{0,52}$ | 458 | (4) | 1.16 | (14) | | 7.51 |
| $\beta^-_{0,50}$ | 472 | (4) | 8.4 | (9) | 1st forbidden | 6.7 |
| $\beta^-_{0,51}$ | 472 | (4) | 36 | (5) | Allowed | 6.06 |
| $\beta^-_{0,49}$ | 502 | (4) | 6.9 | (8) | 1st forbidden | 6.87 |
| $\beta^-_{0,48}$ | 542 | (4) | 0.95 | (13) | | 7.84 |
| $\beta^-_{0,47}$ | 545 | (4) | 0.18 | (4) | | 8.64 |
| $\beta^-_{0,46}$ | 576 | (4) | 0.035 | (20) | | 9.36 |
| $\beta^-_{0,45}$ | 606 | (4) | <0.7 | | | >8.1 |
| $\beta^-_{0,44}$ | 613 | (4) | 0.05 | (3) | | 9.3 |
| $\beta^-_{0,43}$ | 642 | (4) | 19.6 | (18) | Allowed | 6.77 |
| $\beta^-_{0,42}$ | 647 | (4) | 0.078 | (20) | | 9.18 |
| $\beta^-_{0,41}$ | 651 | (4) | 0.10 | (9) | | 9.1 |
| $\beta^-_{0,40}$ | 658 | (4) | <0.9 | | | >8.1 |
| $\beta^-_{0,39}$ | 662 | (4) | 0.21 | (4) | | 8.79 |

| | Energy keV | Probability × 100 | | Nature | log $ft$ |
|---|---|---|---|---|---|
| $\beta^-_{0,38}$ | 693 (4) | 0.25 | (4) | | 8.78 |
| $\beta^-_{0,37}$ | 699 (4) | <2.7 | | | >7.8 |
| $\beta^-_{0,36}$ | 709 (4) | 0.12 | (3) | | 9.14 |
| $\beta^-_{0,34}$ | 747 (4) | 0.11 | (3) | | 9.25 |
| $\beta^-_{0,31}$ | 883 (4) | 0.109 | (18) | | 9.5 |
| $\beta^-_{0,26}$ | 980 (4) | 0.30 | (12) | | 9.22 |
| $\beta^-_{0,25}$ | 1000 (4) | <1.5 | | | >8.5 |
| $\beta^-_{0,22}$ | 1067 (4) | 1.9 | (10) | | 8.54 |
| $\beta^-_{0,18}$ | 1104 (4) | 0.69 | (20) | | 9.04 |
| $\beta^-_{0,16}$ | 1126 (4) | <8 | | 1st forbidden | >8 |
| $\beta^-_{0,15}$ | 1171 (4) | 1.5 | (13) | | 8.8 |
| $\beta^-_{0,14}$ | 1171 (4) | <5 | | 1st forbidden | >8.3 |
| $\beta^-_{0,13}$ | 1206 (4) | <3.1 | | 1st forbidden unique | >8.5 |
| $\beta^-_{0,12}$ | 1227 (4) | <2.5 | | Allowed | >8.6 |
| $\beta^-_{0,11}$ | 1232 (4) | <0.4 | | | >9.4 |
| $\beta^-_{0,10}$ | 1247 (4) | <0.8 | | Allowed | >9.2 |
| $\beta^-_{0,7}$ | 1346 (4) | <0.8 | | 1st forbidden | >9.3 |
| $\beta^-_{0,2}$ | 2052 (4) | <5 | | Allowed | >9.2 |

## 3 Electron Emissions

| | | Energy keV | | | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|---|---|
| $e_{AL}$ | (U) | 5.9 | - | 21.6 | 77 (10) | |
| $e_{AK}$ | (U) | | | | 1.08 (6) | |
| | KLL | 71.776 | - | 80.954 | } | |
| | KLX | 88.153 | - | 98.429 | } | |
| | KXY | 104.51 | - | 115.59 | } | |
| $ec_{25,16\ K}$ | (U) | 9.86 | | (1) | 0.171 (26) | |
| $ec_{14,13\ L}$ | (U) | 12.5 | - | 17.1 | 6.1 (7) | |
| $ec_{43,33\ K}$ | (U) | 15.70 | | (1) | 3.71 (33) | |
| $ec_{51,45\ K}$ | (U) | 19.01 | | (2) | 0.86 (17) | |
| $ec_{1,0\ L}$ | (U) | 21.73 | - | 26.32 | 62 (16) | |
| $ec_{16,14\ L}$ | (U) | 23.69 | - | 28.28 | 5.1 (32) | |
| $ec_{13,7\ K}$ | (U) | 24.55 | | (2) | 1.5 (11) | |
| $ec_{49,43\ K}$ | (U) | 25.31 | | (3) | 0.054 (9) | |
| $ec_{33,30\ K}$ | (U) | 28.18 | | (2) | 1.04 (16) | |
| $ec_{14,13\ M}$ | (U) | 28.8 | - | 30.7 | 1.69 (18) | |
| $ec_{14,13\ N}$ | (U) | 32.9 | - | 33.9 | 0.46 (5) | |
| $ec_{15,12\ L}$ | (U) | 33.20 | - | 37.79 | 0.8 (8) | |
| $ec_{45,39\ L}$ | (U) | 33.69 | - | 38.28 | 0.012 (4) | |
| $ec_{30,22\ K}$ | (U) | 34.28 | | (3) | 0.0161 (48) | |
| $ec_{22,16\ L}$ | (U) | 36.4 | - | 41.0 | 0.34 (11) | |
| $ec_{3,2\ K}$ | (U) | 37.11 | | (2) | 1.30 (15) | |
| $ec_{56,51\ L}$ | (U) | 37.43 | - | 42.02 | 2.2 (18) | |

| | | Energy keV | | | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|---|---|
| $ec_{1,0\ M}$ | (U) | 37.94 | - | 39.94 | 17.2 (43) | |
| $ec_{16,14\ M}$ | (U) | 39.9 | - | 41.9 | 1.4 (9) | |
| $ec_{13,9\ L}$ | (U) | 40.9 | - | 45.5 | 0.51 (16) | |
| $ec_{1,0\ N}$ | (U) | 42.05 | - | 43.11 | 4.7 (12) | |
| $ec_{33,28\ K}$ | (U) | 43.88 | | (2) | 0.086 (13) | |
| $ec_{16,14\ N}$ | (U) | 44.01 | - | 45.07 | 0.38 (25) | |
| $ec_{25,22\ L}$ | (U) | 45.49 | - | 50.08 | 1.5 (5) | |
| $ec_{25,20\ L}$ | (U) | 47.70 | - | 52.29 | 0.58 (49) | |
| $ec_{22,11\ K}$ | (U) | 49.34 | | (5) | 0.11 (12) | |
| $ec_{15,12\ M}$ | (U) | 49.41 | - | 51.41 | 0.24 (20) | |
| $ec_{22,16\ M}$ | (U) | 52.7 | - | 54.6 | 0.095 (32) | |
| $ec_{15,12\ N}$ | (U) | 53.52 | - | 54.58 | 0.07 (6) | |
| $ec_{56,51\ M}$ | (U) | 53.64 | - | 55.64 | 0.6 (5) | |
| $ec_{51,43\ K}$ | (U) | 55.25 | | (2) | 1.96 (27) | |
| $ec_{22,16\ N}$ | (U) | 56.8 | - | 57.8 | 0.026 (9) | |
| $ec_{13,9\ M}$ | (U) | 57.2 | - | 59.2 | 0.127 (40) | |
| $ec_{56,51\ N}$ | (U) | 57.75 | - | 58.81 | 0.16 (14) | |
| $ec_{16,13\ L}$ | (U) | 58.08 | - | 62.67 | 1.7 (6) | |
| $ec_{14,7\ K}$ | (U) | 58.95 | | (3) | 0.32 (31) | |
| $ec_{13,9\ N}$ | (U) | 61.3 | - | 62.3 | 0.033 (10) | |
| $ec_{25,22\ M}$ | (U) | 61.7 | - | 63.7 | 0.41 (15) | |
| $ec_{25,20\ M}$ | (U) | 63.91 | - | 65.91 | 0.16 (15) | |
| $ec_{51,41\ K}$ | (U) | 64.20 | | (8) | 0.15 (5) | |
| $ec_{25,22\ N}$ | (U) | 65.81 | - | 66.87 | 0.112 (40) | |
| $ec_{25,20\ N}$ | (U) | 68.02 | - | 69.08 | 0.043 (38) | |
| $ec_{51,40\ K}$ | (U) | 70.55 | | (2) | 5.4 (6) | |
| $ec_{16,13\ M}$ | (U) | 74.29 | - | 76.29 | 0.48 (17) | |
| $ec_{14,9\ L}$ | (U) | 75.41 | - | 80.00 | 0.024 (9) | |
| $ec_{2,1\ L}$ | (U) | 78.10 | - | 82.69 | 31 (6) | |
| $ec_{56,45\ K}$ | (U) | 78.13 | | (3) | 0.7 (7) | |
| $ec_{16,13\ N}$ | (U) | 78.40 | - | 79.46 | 0.131 (46) | |
| $ec_{16,12\ L}$ | (U) | 79.13 | - | 83.72 | 0.0115 (22) | |
| $ec_{23,12\ K}$ | (U) | 81.20 | | (5) | 0.1 (1) | |
| $ec_{22,14\ L}$ | (U) | 82.01 | - | 86.60 | 1.96 (33) | |
| $ec_{21,9\ K}$ | (U) | 84.35 | | (5) | 0.1 (1) | |
| $ec_{16,11\ L}$ | (U) | 84.92 | - | 89.51 | 0.104 (32) | |
| $ec_{4,3\ K}$ | (U) | 85.37 | | (3) | 0.138 (20) | |
| $ec_{13,5\ K}$ | (U) | 87.52 | | (3) | 1.0 (5) | |
| $ec_{2,1\ M}$ | (U) | 94.31 | - | 96.31 | 8.7 (16) | |
| $ec_{22,14\ M}$ | (U) | 98.22 | - | 100.22 | 0.54 (9) | |
| $ec_{2,1\ N}$ | (U) | 98.42 | - | 99.48 | 2.36 (44) | |
| $ec_{16,11\ M}$ | (U) | 101.13 | - | 103.13 | 0.025 (8) | |
| $ec_{22,14\ N}$ | (U) | 102.33 | - | 103.39 | 0.148 (25) | |
| $ec_{25,16\ L}$ | (U) | 103.70 | - | 108.29 | 2.69 (41) | |
| $ec_{16,7\ K}$ | (U) | 104.40 | | (8) | 0.276 (47) | |
| $ec_{43,33\ L}$ | (U) | 109.5 | - | 114.1 | 0.84 (8) | |
| $ec_{33,25\ K}$ | (U) | 110.90 | | (3) | 4.4 (16) | |
| $ec_{51,37\ K}$ | (U) | 111.65 | | (3) | 10 (1) | |

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $ec_{51,45\ L}$ | (U) | 112.85 - 117.44 | 0.169 (34) | |
| $ec_{25,11\ K}$ | (U) | 116.61 (3) | 0.16 (15) | |
| $ec_{13,7\ L}$ | (U) | 118.39 - 122.98 | 0.90 (18) | |
| $ec_{49,43\ L}$ | (U) | 119.15 - 123.74 | 0.0120 (19) | |
| $ec_{25,16\ M}$ | (U) | 119.91 - 121.91 | 0.75 (11) | |
| $ec_{33,30\ L}$ | (U) | 122.02 - 126.61 | 0.49 (8) | |
| $ec_{25,16\ N}$ | (U) | 124.02 - 125.08 | 0.203 (31) | |
| $ec_{58,43\ K}$ | (U) | 124.6 (1) | 0.042 (40) | |
| $ec_{43,33\ M}$ | (U) | 125.8 - 127.8 | 0.205 (18) | |
| $ec_{30,22\ L}$ | (U) | 128.12 - 132.71 | 0.111 (34) | |
| $ec_{51,45\ M}$ | (U) | 129.06 - 131.06 | 0.041 (8) | |
| $ec_{56,40\ K}$ | (U) | 129.77 (2) | 1.06 (15) | |
| $ec_{43,33\ N}$ | (U) | 129.9 - 130.9 | 0.0546 (49) | |
| $ec_{3,2\ L}$ | (U) | 130.95 - 135.54 | 8.4 (10) | |
| $ec_{51,45\ N}$ | (U) | 133.17 - 134.23 | 0.0110 (22) | |
| $ec_{33,24\ K}$ | (U) | 133.62 (1) | 0.118 (19) | |
| $ec_{13,7\ M}$ | (U) | 134.6 - 136.6 | 0.24 (6) | |
| $ec_{33,28\ L}$ | (U) | 137.72 - 142.31 | 0.0186 (28) | |
| $ec_{33,30\ M}$ | (U) | 138.23 - 140.23 | 0.129 (20) | |
| $ec_{13,7\ N}$ | (U) | 138.71 - 139.77 | 0.065 (15) | |
| $ec_{68,51\ K}$ | (U) | 141.6 (1) | 0.036 (35) | |
| $ec_{33,30\ N}$ | (U) | 142.34 - 143.40 | 0.035 (5) | |
| $ec_{22,11\ L}$ | (U) | 143.18 - 147.77 | 0.047 (21) | |
| $ec_{30,22\ M}$ | (U) | 144.33 - 146.33 | 0.031 (9) | |
| $ec_{3,2\ M}$ | (U) | 147.16 - 149.16 | 2.33 (27) | |
| $ec_{51,43\ L}$ | (U) | 149.09 - 153.68 | 0.38 (5) | |
| $ec_{3,2\ N}$ | (U) | 151.27 - 152.33 | 0.63 (7) | |
| $ec_{26,10\ K}$ | (U) | 151.52 (5) | 0.11 (9) | |
| $ec_{14,7\ L}$ | (U) | 152.79 - 157.38 | 0.126 (23) | |
| $ec_{49,33\ K}$ | (U) | 156.68 (5) | 0.83 (11) | |
| $ec_{51,41\ L}$ | (U) | 158.0 - 162.6 | 0.029 (10) | |
| $ec_{22,11\ M}$ | (U) | 159.39 - 161.39 | 0.012 (6) | |
| $ec_{21,8\ K}$ | (U) | 159.4 (1) | 0.056 (49) | |
| $ec_{51,40\ L}$ | (U) | 164.39 - 168.98 | 1.04 (11) | |
| $ec_{51,43\ M}$ | (U) | 165.3 - 167.3 | 0.092 (13) | |
| $ec_{14,7\ M}$ | (U) | 169 - 171 | 0.033 (7) | |
| $ec_{51,43\ N}$ | (U) | 169.41 - 170.47 | 0.0249 (34) | |
| $ec_{56,45\ L}$ | (U) | 171.97 - 176.56 | 0.255 (42) | |
| $ec_{23,12\ L}$ | (U) | 175.0 - 179.6 | 0.035 (11) | |
| $ec_{33,22\ K}$ | (U) | 178.19 (5) | 0.84 (29) | |
| $ec_{21,9\ L}$ | (U) | 178.19 - 182.78 | 0.035 (11) | |
| $ec_{4,3\ L}$ | (U) | 179.21 - 183.80 | 0.38 (6) | |
| $ec_{33,20\ K}$ | (U) | 180.31 (8) | 0.07 (6) | |
| $ec_{51,40\ M}$ | (U) | 180.6 - 182.6 | 0.253 (27) | |
| $ec_{13,5\ L}$ | (U) | 181.36 - 185.95 | 0.52 (6) | |
| $ec_{51,40\ N}$ | (U) | 184.71 - 185.77 | 0.068 (7) | |
| $ec_{56,45\ M}$ | (U) | 188.18 - 190.18 | 0.066 (11) | |
| $ec_{56,45\ N}$ | (U) | 192.29 - 193.35 | 0.0178 (30) | |

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $ec_{71,51\ K}$ | (U) | 194.6 (1) | 0.029 (30) | |
| $ec_{4,3\ M}$ | (U) | 195.42 - 197.42 | 0.105 (15) | |
| $ec_{13,5\ M}$ | (U) | 197.57 - 199.57 | 0.138 (17) | |
| $ec_{23,8\ K}$ | (U) | 197.9 (1) | 0.042 (42) | |
| $ec_{16,7\ L}$ | (U) | 198.242 - 202.832 | 0.053 (9) | |
| $ec_{4,3\ N}$ | (U) | 199.53 - 200.59 | 0.0285 (41) | |
| $ec_{37,29\ L}$ | (U) | 200.07 - 204.66 | 0.020 (6) | |
| $ec_{13,5\ N}$ | (U) | 201.68 - 202.74 | 0.0373 (46) | |
| $ec_{33,25\ L}$ | (U) | 204.7 - 209.3 | 1.46 (19) | |
| $ec_{34,22\ K}$ | (U) | 204.8 (1) | 0.021 (16) | |
| $ec_{51,37\ L}$ | (U) | 205.49 - 210.08 | 1.94 (20) | |
| $ec_{25,11\ L}$ | (U) | 210.45 - 215.04 | 0.049 (12) | |
| $ec_{16,7\ M}$ | (U) | 214.452 - 216.450 | 0.0129 (22) | |
| $ec_{33,18\ K}$ | (U) | 214.80 (5) | 0.0198 (23) | |
| $ec_{58,43\ L}$ | (U) | 218.4 - 223.0 | 0.012 (6) | |
| $ec_{33,25\ M}$ | (U) | 221 - 223 | 0.372 (47) | |
| $ec_{51,37\ M}$ | (U) | 221.7 - 223.7 | 0.469 (49) | |
| $ec_{56,40\ L}$ | (U) | 223.61 - 228.20 | 0.205 (30) | |
| $ec_{33,25\ N}$ | (U) | 225.1 - 226.1 | 0.100 (13) | |
| $ec_{51,37\ N}$ | (U) | 225.81 - 226.87 | 0.126 (13) | |
| $ec_{25,11\ M}$ | (U) | 226.66 - 228.66 | 0.0126 (24) | |
| $ec_{33,24\ L}$ | (U) | 227.46 - 232.05 | 0.0234 (38) | |
| $ec_{33,16\ K}$ | (U) | 236.3 (1) | 0.0233 (28) | |
| $ec_{56,40\ M}$ | (U) | 239.82 - 241.82 | 0.050 (7) | |
| $ec_{46,28\ K}$ | (U) | 242.3 (1) | 0.010 (8) | |
| $ec_{56,40\ N}$ | (U) | 243.93 - 244.99 | 0.0134 (19) | |
| $ec_{26,10\ L}$ | (U) | 245.36 - 249.95 | 0.031 (10) | |
| $ec_{49,33\ L}$ | (U) | 250.52 - 255.11 | 0.194 (25) | |
| $ec_{21,8\ L}$ | (U) | 253.28 - 257.87 | 0.015 (5) | |
| $ec_{37,21\ K}$ | (U) | 253.90 (5) | 1.12 (14) | |
| $ec_{40,23\ K}$ | (U) | 256.4 (1) | 0.50 (6) | |
| $ec_{49,33\ M}$ | (U) | 266.73 - 268.73 | 0.048 (6) | |
| $ec_{49,33\ N}$ | (U) | 270.84 - 271.90 | 0.0130 (17) | |
| $ec_{33,22\ L}$ | (U) | 272.03 - 276.62 | 0.33 (5) | |
| $ec_{33,20\ L}$ | (U) | 274.15 - 278.74 | 0.018 (7) | |
| $ec_{33,15\ K}$ | (U) | 282.1 (3) | 0.027 (7) | |
| $ec_{33,22\ M}$ | (U) | 288.24 - 290.24 | 0.085 (13) | |
| $ec_{23,8\ L}$ | (U) | 291.7 - 296.3 | 0.0104 (44) | |
| $ec_{33,22\ N}$ | (U) | 292.35 - 293.41 | 0.0228 (34) | |
| $ec_{33,16\ L}$ | (U) | 330.1 - 334.7 | 0.0191 (23) | |
| $ec_{40,18\ K}$ | (U) | 331.0 (1) | 0.0307 (41) | |
| $ec_{33,11\ K}$ | (U) | 343.08 (5) | 0.125 (47) | |
| $ec_{37,21\ L}$ | (U) | 347.7 - 352.3 | 0.216 (26) | |
| $ec_{40,23\ L}$ | (U) | 350.242 - 354.832 | 0.100 (11) | |
| $ec_{37,15\ K}$ | (U) | 356.7 (1) | 0.083 (9) | |
| $ec_{37,21\ M}$ | (U) | 364 - 366 | 0.052 (6) | |
| $ec_{71,43\ K}$ | (U) | 365.4 (1) | 0.040 (31) | |
| $ec_{40,23\ M}$ | (U) | 366.452 - 368.450 | 0.0242 (28) | |

| | | Energy keV | | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|---|
| $ec_{37,21\ N}$ | (U) | 368.1 - 369.1 | | 0.0141 (17) | |
| $ec_{45,18\ K}$ | (U) | 382.4 | (1) | 0.0125 (24) | |
| $ec_{37,13\ K}$ | (U) | 391.16 | (5) | 0.0138 (15) | |
| $ec_{40,15\ K}$ | (U) | 397.8 | (1) | 0.0703 (11) | |
| $ec_{37,12\ K}$ | (U) | 412.4 | (1) | 0.069 (9) | |
| $ec_{33,11\ L}$ | (U) | 436.92 - 441.51 | | 0.032 (7) | |
| $ec_{45,15\ K}$ | (U) | 449.8 | (1) | 0.149 (16) | |
| $ec_{37,15\ L}$ | (U) | 450.5 - 455.1 | | 0.0159 (18) | |
| $ec_{40,12\ K}$ | (U) | 453.5 | (2) | 0.51 (8) | |
| $ec_{37,9\ K}$ | (U) | 454.1 | (1) | 1.30 (17) | |
| $ec_{59,26\ K}$ | (U) | 481.5 | (1) | 0.0247 (37) | |
| $ec_{40,15\ L}$ | (U) | 491.6 - 496.2 | | 0.01341 (19) | |
| $ec_{53,21\ K}$ | (U) | 496.6 | (1) | 0.044 (6) | |
| $ec_{37,12\ L}$ | (U) | 506.23 - 510.82 | | 0.0131 (17) | |
| $ec_{49,16\ K}$ | (U) | 508.8 | (1) | 0.028 (4) | |
| $ec_{48,15\ K}$ | (U) | 514.0 | (1) | 0.038 (6) | |
| $ec_{54,22\ K}$ | (U) | 518.9 | (2) | 0.0142 (25) | |
| $ec_{50,16\ K}$ | (U) | 538.3 | (1) | 0.046 (8) | |
| $ec_{45,15\ L}$ | (U) | 543.6 - 548.2 | | 0.0283 (30) | |
| $ec_{40,12\ L}$ | (U) | 547.3 - 551.9 | | 0.096 (16) | |
| $ec_{37,9\ L}$ | (U) | 547.9 - 552.5 | | 0.248 (32) | |
| $ec_{40,12\ M}$ | (U) | 563.6 - 565.6 | | 0.0232 (39) | |
| $ec_{37,9\ M}$ | (U) | 564.2 - 566.2 | | 0.060 (8) | |
| $ec_{37,9\ N}$ | (U) | 568.3 - 569.3 | | 0.0161 (21) | |
| $ec_{54,16\ K}$ | (U) | 577.2 | (1) | 0.104 (11) | |
| $ec_{7,2\ K}$ | (U) | 590.6 | (1) | 0.0130 (13) | |
| $ec_{49,11\ K}$ | (U) | 615.6 | (2) | 0.025 (19) | |
| $ec_{50,13\ K}$ | (U) | 617.96 | (5) | 0.50 (6) | |
| $ec_{54,14\ K}$ | (U) | 622.7 | (1) | 0.081 (9) | |
| $ec_{5,1\ K}$ | (U) | 627.482 | (5) | 0.0108 (11) | |
| $ec_{51,12\ K}$ | (U) | 639.7 | (1) | 0.049 (37) | |
| $ec_{56,15\ K}$ | (U) | 643.6 | (1) | 0.010 (8) | |
| $ec_{54,16\ L}$ | (U) | 671.0 - 675.6 | | 0.0197 (21) | |
| $ec_{51,9\ K}$ | (U) | 680.8 | (1) | 0.0325 (38) | |
| $ec_{10,2\ K}$ | (U) | 688.9 | (1) | 0.097 (34) | |
| $ec_{7,1\ K}$ | (U) | 690.60 | (5) | 0.0112 (14) | |
| $ec_{12,2\ K}$ | (U) | 709.9 | (2) | 0.0223 (24) | |
| $ec_{50,13\ L}$ | (U) | 711.80 - 716.39 | | 0.095 (11) | |
| $ec_{22,3\ K}$ | (U) | 716.3 | (1) | 0.0178 (21) | |
| $ec_{54,14\ L}$ | (U) | 716.5 - 721.1 | | 0.0154 (17) | |
| $ec_{50,13\ M}$ | (U) | 728.01 - 730.01 | | 0.0228 (26) | |
| $ec_{51,12\ L}$ | (U) | 733.5 - 738.1 | | 0.010 (6) | |
| $ec_{24,3\ K}$ | (U) | 760.8 | (1) | 0.0269 (25) | |
| $ec_{15,2\ K}$ | (U) | 765.32 | (4) | 0.065 (8) | |
| $ec_{14,2\ K}$ | (U) | 765.32 | (4) | 0.0164 (23) | |
| $ec_{9,1\ K}$ | (U) | 768.06 | (4) | 0.101 (12) | |
| $ec_{10,2\ L}$ | (U) | 782.7 - 787.3 | | 0.069 (24) | |
| $ec_{25,3\ K}$ | (U) | 783.46 | (5) | 0.0122 (15) | |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $ec_{10,2\ M}$ | (U) | 799 | - 801 | 0.064 (23) | | |
| $ec_{12,1\ K}$ | (U) | 809.8 | (1) | 0.076 (9) | | |
| $ec_{9,0\ K}$ | (U) | 811.5 | (1) | 0.070 (12) | | |
| $ec_{13,1\ K}$ | (U) | 830.79 | (3) | 0.045 (5) | | |
| $ec_{18,2\ K}$ | (U) | 832.5 | (2) | 0.0150 (19) | | |
| $ec_{28,3\ K}$ | (U) | 850.6 | (1) | 0.011 (6) | | |
| $ec_{15,2\ L}$ | (U) | 859.16 | - 863.75 | 0.0172 (22) | | |
| $ec_{9,1\ L}$ | (U) | 861.90 | - 866.49 | 0.0268 (31) | | |
| $ec_{15,1\ K}$ | (U) | 865.1 | (1) | 0.01533 (23) | | |
| $ec_{12,1\ L}$ | (U) | 903.6 | - 908.2 | 0.0194 (22) | | |
| $ec_{9,0\ L}$ | (U) | 905.3 | - 909.9 | 0.0179 (30) | | |
| $ec_{21,1\ K}$ | (U) | 968.2 | (1) | 0.0130 (15) | | |
| $ec_{37,2\ K}$ | (U) | 1238.3 | (1) | 0.0164 (17) | | |
| $ec_{40,2\ K}$ | (U) | 1279.3 | (1) | 0.0271 (28) | | |
| $\beta^-_{0,77}$ | max: | 51 | (4) | 0.42 (5) | avg: | 13.0 (11) |
| $\beta^-_{0,76}$ | max: | 79 | (4) | 0.21 (3) | avg: | 20.4 (11) |
| $\beta^-_{0,75}$ | max: | 94 | (4) | 0.064 (11) | avg: | 24.2 (11) |
| $\beta^-_{0,74}$ | max: | 126 | (4) | 0.40 (7) | avg: | 33.1 (11) |
| $\beta^-_{0,73}$ | max: | 129 | (4) | 0.140 (24) | avg: | 33.8 (11) |
| $\beta^-_{0,72}$ | max: | 158 | (4) | 0.055 (8) | avg: | 41.9 (12) |
| $\beta^-_{0,71}$ | max: | 161 | (4) | 0.90 (15) | avg: | 42.9 (12) |
| $\beta^-_{0,70}$ | max: | 175 | (4) | 0.112 (16) | avg: | 46.7 (12) |
| $\beta^-_{0,69}$ | max: | 195 | (4) | 0.122 (16) | avg: | 52.2 (12) |
| $\beta^-_{0,68}$ | max: | 214 | (4) | 0.59 (8) | avg: | 57.8 (12) |
| $\beta^-_{0,67}$ | max: | 226 | (4) | 0.044 (12) | avg: | 61.3 (12) |
| $\beta^-_{0,66}$ | max: | 236 | (4) | 0.44 (19) | avg: | 64.3 (12) |
| $\beta^-_{0,65}$ | max: | 254 | (4) | 0.35 (5) | avg: | 69.7 (12) |
| $\beta^-_{0,64}$ | max: | 267 | (4) | 0.22 (4) | avg: | 73.5 (12) |
| $\beta^-_{0,63}$ | max: | 279 | (4) | 0.21 (3) | avg: | 76.9 (12) |
| $\beta^-_{0,62}$ | max: | 313 | (4) | 0.25 (3) | avg: | 87.3 (13) |
| $\beta^-_{0,61}$ | max: | 332 | (4) | 0.029 (7) | avg: | 93.0 (13) |
| $\beta^-_{0,60}$ | max: | 351 | (4) | 0.17 (3) | avg: | 98.9 (13) |
| $\beta^-_{0,59}$ | max: | 383 | (4) | 1.43 (15) | avg: | 108.9 (13) |
| $\beta^-_{0,58}$ | max: | 402 | (4) | 0.41 (8) | avg: | 114.8 (13) |
| $\beta^-_{0,57}$ | max: | 411 | (4) | 0.061 (11) | avg: | 117.6 (13) |
| $\beta^-_{0,56}$ | max: | 412 | (4) | 8 (3) | avg: | 118.1 (13) |
| $\beta^-_{0,55}$ | max: | 424 | (4) | 0.129 (17) | avg: | 121.8 (13) |
| $\beta^-_{0,54}$ | max: | 433 | (4) | 2.8 (4) | avg: | 124.7 (13) |
| $\beta^-_{0,53}$ | max: | 457 | (4) | 0.78 (19) | avg: | 132.3 (14) |
| $\beta^-_{0,52}$ | max: | 458 | (4) | 1.16 (14) | avg: | 132.5 (14) |
| $\beta^-_{0,50}$ | max: | 472 | (4) | 8.4 (9) | avg: | 137.2 (13) |
| $\beta^-_{0,51}$ | max: | 472 | (4) | 36 (5) | avg: | 137.1 (13) |
| $\beta^-_{0,49}$ | max: | 502 | (4) | 6.9 (8) | avg: | 146.8 (14) |
| $\beta^-_{0,48}$ | max: | 542 | (4) | 0.95 (13) | avg: | 160.1 (14) |
| $\beta^-_{0,47}$ | max: | 545 | (4) | 0.18 (4) | avg: | 164.6 (13) |
| $\beta^-_{0,46}$ | max: | 576 | (4) | 0.035 (20) | avg: | 171.4 (14) |
| $\beta^-_{0,45}$ | max: | 606 | (4) | <0.7 | avg: | 181.7 (14) |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $\beta^-_{0,44}$ | max: | 613 | (4) | 0.05 (3) | avg: | 184.1 (14) |
| $\beta^-_{0,43}$ | max: | 642 | (4) | 19.6 (18) | avg: | 194.0 (14) |
| $\beta^-_{0,42}$ | max: | 647 | (4) | 0.078 (20) | avg: | 195.6 (14) |
| $\beta^-_{0,41}$ | max: | 651 | (4) | 0.10 (9) | avg: | 197.1 (14) |
| $\beta^-_{0,40}$ | max: | 658 | (4) | <0.9 | avg: | 199.3 (14) |
| $\beta^-_{0,39}$ | max: | 662 | (4) | 0.21 (4) | avg: | 200.6 (14) |
| $\beta^-_{0,38}$ | max: | 693 | (4) | 0.25 (4) | avg: | 211.3 (14) |
| $\beta^-_{0,37}$ | max: | 699 | (4) | <2.7 | avg: | 213.5 (14) |
| $\beta^-_{0,36}$ | max: | 709 | (4) | 0.12 (3) | avg: | 216.9 (14) |
| $\beta^-_{0,34}$ | max: | 747 | (4) | 0.11 (3) | avg: | 230.3 (14) |
| $\beta^-_{0,31}$ | max: | 883 | (4) | 0.109 (18) | avg: | 278.7 (15) |
| $\beta^-_{0,26}$ | max: | 980 | (4) | 0.30 (12) | avg: | 314.2 (15) |
| $\beta^-_{0,25}$ | max: | 1000 | (4) | <1.5 | avg: | 312.6 (14) |
| $\beta^-_{0,22}$ | max: | 1067 | (4) | 1.9 (10) | avg: | 346.5 (15) |
| $\beta^-_{0,18}$ | max: | 1104 | (4) | 0.69 (20) | avg: | 360.2 (15) |
| $\beta^-_{0,16}$ | max: | 1126 | (4) | <8 | avg: | 368.3 (15) |
| $\beta^-_{0,15}$ | max: | 1171 | (4) | 1.5 (13) | avg: | 385.4 (16) |
| $\beta^-_{0,14}$ | max: | 1171.2 | (40) | <5 | avg: | 385.4 (16) |
| $\beta^-_{0,13}$ | max: | 1206 | (4) | <3.1 | avg: | 398.5 (16) |
| $\beta^-_{0,12}$ | max: | 1227 | (4) | <2.5 | avg: | 406.4 (16) |
| $\beta^-_{0,11}$ | max: | 1232 | (4) | <0.4 | avg: | 408.7 (16) |
| $\beta^-_{0,10}$ | max: | 1247 | (4) | <0.8 | avg: | 414.4 (16) |
| $\beta^-_{0,7}$ | max: | 1346 | (4) | <0.8 | avg: | 452.1 (16) |
| $\beta^-_{0,2}$ | max: | 2052 | (4) | <5 | avg: | 732.2 (17) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (U) | 11.6185 — 20.7141 | | 77 (10) | |
| $XK\alpha_2$ | (U) | 94.666 | | 10.5 (6) | } $K\alpha$ |
| $XK\alpha_1$ | (U) | 98.44 | | 16.8 (9) | } |
| $XK\beta_3$ | (U) | 110.421 | } | | |
| $XK\beta_1$ | (U) | 111.298 | } | 6.1 (4) | $K\beta'_1$ |
| $XK\beta''_5$ | (U) | 111.964 | } | | |
| $XK\beta_2$ | (U) | 114.407 | } | | |
| $XK\beta_4$ | (U) | 115.012 | } | 2.0 (1) | $K\beta'_2$ |
| $XKO_{2,3}$ | (U) | 115.377 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{14,13}$(U) | 34.30 (4) | 8.4 (9) | (E2) | 2270 (40) | 0.0037 (4) |
| $\gamma_{1,0}$(U) | 43.49 (2) | 86 (23) | E2 | 713 (11) | 0.12 (3) |
| $\gamma_{16,14}$(U) | 45.45 (5) | 6.8 (44) | M1+E2 | 250 (140) | 0.027 (9) |
| $\gamma_{15,12}$(U) | 54.96 (10) | ∼1.23 | [M1+E2] | 130 (110) | ∼0.0094 |
| $\gamma_{14,12}$(U) | 54.96 (10) | ∼0.0094 | [E1] | 0.603 (9) | ∼0.0094 |
| $\gamma_{45,39}$(U) | 55.45 (5) | 0.043 (14) | (E1) | 0.589 (9) | 0.027 (9) |
| $\gamma_{22,16}$(U) | 58.20 (6) | 0.47 (16) | (E2) | 174 (3) | 0.0027 (9) |
| $\gamma_{56,51}$(U) | 59.19 (5) | 2.9 (25) | [M1+E2] | 90 (70) | 0.032 (11) |
| $\gamma_{13,9}$(U) | 62.70 (1) | 2.3 (7) | E1 | 0.426 (6) | 1.6 (5) |
| $\gamma_{25,22}$(U) | 67.25 (10) | 2.1 (8) | M1+E2 | 57 (11) | 0.036 (11) |
| $\gamma_{25,20}$(U) | 69.46 (5) | 0.7 (6) | [E2,M1] | 40 (30) | 0.018 (8) |
| $\gamma_{16,13}$(U) | 79.84 (2) | 2.4 (9) | E2 | 38.4 (6) | 0.062 (22) |
| $\gamma_{14,9}$(U) | 97.17 (10) | 0.27 (10) | [E1] | 0.1343 (20) | 0.24 (9) |
| $\gamma_{2,1}$(U) | 99.86 (2) | 46 (9) | E2 | 13.42 (19) | 3.2 (6) |
| $\gamma_{16,12}$(U) | 100.89 (2) | 0.140 (27) | [E1] | 0.1218 (17) | 0.125 (24) |
| $\gamma_{22,14}$(U) | 103.77 (2) | 2.93 (49) | (E2) | 11.22 (16) | 0.24 (4) |
| $\gamma_{16,11}$(U) | 106.68 (5) | 0.17 (5) | [M1] | 3.83 (6) | 0.036 (11) |
| $\gamma_{25,16}$(U) | 125.46 (1) | 4.7 (7) | E2 | 4.89 (7) | 0.79 (12) |
| $\gamma_{43,33}$(U) | 131.30 (1) | 23 (2) | E1 | 0.265 (4) | 18.2 (16) |
| $\gamma_{51,45}$(U) | 134.61 (2) | 1.20 (24) | M1 | 9.50 (14) | 0.114 (23) |
| $\gamma_{21,13}$(U) | 137.23 (5) | 0.033 (11) | [E1] | 0.239 (4) | 0.027 (9) |
| $\gamma_{13,7}$(U) | 140.15 (2) | 3.2 (10) | M1+E2 | 5.3 (18) | 0.51 (7) |
| $\gamma_{49,43}$(U) | 140.91 (3) | 0.38 (6) | [E1] | 0.224 (4) | 0.31 (5) |
| $\gamma_{33,30}$(U) | 143.78 (2) | 2.02 (32) | (M1+E2) | 5.31 | 0.32 (5) |
| $\gamma_{30,22}$(U) | 149.88 (3) | 0.24 (7) | [E2] | 2.31 (4) | 0.073 (22) |
| $\gamma_{3,2}$(U) | 152.71 (2) | 18.8 (22) | E2 | 2.14 (3) | 6.0 (7) |
| $\gamma_{33,28}$(U) | 159.48 (2) | 0.77 (12) | [E1] | 0.1676 (24) | 0.66 (10) |
| $\gamma_{22,11}$(U) | 164.94 (5) | 0.23 (14) | [E2,M1] | 3.5 (19) | 0.052 (22) |
| $\gamma_{64,54}$(U) | 165.61 (5) | 0.084 (25) | [E1] | 0.1533 (22) | 0.073 (22) |
| $\gamma_{51,43}$(U) | 170.85 (2) | 2.97 (41) | M1 | 4.83 (7) | 0.51 (7) |
| $\gamma_{14,7}$(U) | 174.55 (3) | 0.66 (31) | [M1+E2] | 2.9 (17) | 0.17 (3) |
| $\gamma_{51,41}$(U) | 179.80 (8) | 0.23 (8) | [M1] | 4.19 (6) | 0.045 (16) |
| $\gamma_{51,40}$(U) | 186.15 (2) | 8.5 (9) | M1 | 3.79 (6) | 1.78 (19) |
| $\gamma_{56,45}$(U) | 193.73 (3) | 1.6 (7) | [M1+E2] | 2.1 (13) | 0.50 (8) |
| $\gamma_{23,12}$(U) | 196.80 (5) | 0.22 (12) | E0+E2+M1 | 2.0 (13) | 0.073 (22) |
| $\gamma_{21,9}$(U) | 199.95 (5) | 0.22 (12) | (E0+E2+M1) | 2.0 (13) | 0.073 (22) |
| $\gamma_{4,3}$(U) | 200.97 (3) | 1.56 (23) | E2 | 0.734 (11) | 0.90 (13) |
| $\gamma_{13,5}$(U) | 203.12 (3) | 3.0 (6) | M1+E2 | 1.4 (4) | 1.24 (15) |
| $\gamma_{16,7}$(U) | 220.00 (8) | 0.49 (8) | (M1) | 2.37 (4) | 0.146 (25) |
| $\gamma_{66,53}$(U) | 221.15 (10) | 0.056 (24) | [E1] | 0.0780 (11) | 0.052 (22) |
| $\gamma_{37,29}$(U) | 221.83 (10) | 0.110 (33) | [E2] | 0.513 (8) | 0.073 (22) |
| $\gamma_{33,25}$(U) | 226.50 (3) | 11.3 (20) | M1+E2 | 1.3 (3) | 4.9 (6) |
| $\gamma_{51,37}$(U) | 227.25 (3) | 18.4 (19) | M1 | 2.17 (3) | 5.8 (6) |
| $\gamma_{25,11}$(U) | 232.21 (3) | 0.40 (16) | [E2,M1] | 1.2 (8) | 0.18 (3) |
| $\gamma_{66,51}$(U) | 235.11 (3) | 0.122 (25) | [E1] | 0.0678 (10) | 0.114 (23) |
| $\gamma_{17,7}$(U) | 235.9 (30) | 0.005 (3) | | | 0.005 (3) |
| $\gamma_{58,43}$(U) | 240.2 (1) | 0.11 (6) | [M1,E2] | 1.1 (8) | 0.052 (22) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{56,40}$(U) | 245.37 (2) | 2.09 (30) | M1 | 1.749 (25) | 0.76 (11) |
| $\gamma_{27,13}$(U) | 247.79 (7) | 0.00037 (4) | | | 0.00037 (4) |
| $\gamma_{33,24}$(U) | 249.22 (1) | 2.65 (42) | E1 | 0.0594 (9) | 2.5 (4) |
| $\gamma_{68,51}$(U) | 257.2 (1) | 0.10 (6) | [M1,E2] | 0.9 (7) | 0.052 (22) |
| $\gamma_{26,10}$(U) | 267.12 (5) | 0.32 (12) | [E2,M1] | 0.8 (6) | 0.18 (3) |
| $\gamma_{49,33}$(U) | 272.28 (5) | 2.18 (28) | M1+E2 | 1.004 (14) | 1.09 (14) |
| $\gamma_{21,8}$(U) | 275.04 (10) | 0.17 (7) | [M1,E2] | 0.8 (6) | 0.094 (23) |
| $\gamma_{22,7}$(U) | 278.3 (1) | 0.052 (14) | [E2] | 0.238 (4) | 0.042 (11) |
| $\gamma_{33,22}$(U) | 293.79 (5) | 4.3 (6) | M1+E2 | 0.42 (10) | 3.0 (4) |
| $\gamma_{33,20}$(U) | 295.91 (8) | 0.23 (8) | [M1+E2] | 0.6 (5) | 0.146 (25) |
| $\gamma_{17,5}$(U) | 298.7 (2) | 0.015 (6) | [E1] | 0.0396 (6) | 0.014 (6) |
| $\gamma_{64,46}$(U) | 308.6 (2) | 0.025 (7) | [E2] | 0.1726 (25) | 0.021 (6) |
| $\gamma_{71,51}$(U) | 310.2 (1) | 0.109 (35) | [M1,E2] | 0.5 (4) | 0.073 (13) |
| $\gamma_{27,9}$(U) | 310.52 (10) | 0.000135 (15) | | | 0.000135 (15) |
| $\gamma_{23,8}$(U) | 313.5 (1) | 0.156 (47) | [E2,M1] | 0.5 (4) | 0.104 (14) |
| $\gamma_{21,6}$(U) | 316.7 (1) | 0.121 (16) | [E2] | 0.1597 (23) | 0.104 (14) |
| $\gamma_{34,22}$(U) | 320.4 (1) | 0.078 (24) | [E2,M1] | 0.5 (4) | 0.052 (8) |
| $\gamma_{33,18}$(U) | 330.40 (5) | 0.80 (9) | [E1] | 0.0318 (5) | 0.78 (9) |
| $\gamma_{74,52}$(U) | 331.4 (1) | 0.073 (13) | | | 0.073 (13) |
| $\gamma_{21,5}$(U) | 340.2 (1) | 0.042 (9) | [E1] | 0.0298 (5) | 0.041 (9) |
| $\gamma_{31,12}$(U) | 343.8 (2) | 0.035 (8) | [E1] | 0.0292 (5) | 0.034 (8) |
| $\gamma_{33,16}$(U) | 351.9 (1) | 0.47 (6) | E2 | 0.1175 (17) | 0.42 (5) |
| $\gamma_{46,28}$(U) | 357.9 (1) | 0.050 (19) | [M1,E2] | 0.4 (3) | 0.036 (11) |
| $\gamma_{56,33}$(U) | 360.6 (3) | 0.018 (7) | [E1] | 0.0264 (4) | 0.018 (7) |
| $\gamma_{26,7}$(U) | 365.0 (3) | 0.018 (7) | [E1] | 0.0257 (4) | 0.018 (7) |
| $\gamma_{37,21}$(U) | 369.50 (5) | 3.91 (47) | M1 | 0.565 (8) | 2.5 (3) |
| $\gamma_{40,23}$(U) | 372.0 (1) | 1.87 (21) | M1(+E2) | 0.517 (8) | 1.23 (14) |
| $\gamma_{32,11}$(U) | 379.1 (1) | 0.043 (11) | [E1] | 0.0237 (4) | 0.042 (11) |
| $\gamma_{31,9}$(U) | 385.4 (1) | 0.043 (11) | [E1] | 0.0229 (4) | 0.042 (11) |
| $\gamma_{27,7}$(U) | 387.94 (6) | 0.00072 (6) | | | 0.00072 (6) |
| $\gamma_{45,25}$(U) | 394.1 (1) | 0.096 (14) | [E1] | 0.0219 (3) | 0.094 (14) |
| $\gamma_{33,15}$(U) | 397.7 (3) | 0.063 (16) | [M2] | 1.349 (20) | 0.027 (7) |
| $\gamma_{-1,2}$(U) | 401.8 (2) | | | | 0.036 (11) |
| $\gamma_{40,22}$(U) | 409.8 (1) | 0.35 (5) | [E1] | 0.0202 (3) | 0.34 (5) |
| $\gamma_{49,30}$(U) | 416.1 (1) | 0.039 (12) | [E2] | 0.0746 (11) | 0.036 (11) |
| $\gamma_{-1,3}$(U) | 425.3 (2) | | | | 0.036 (11) |
| $\gamma_{37,16}$(U) | 426.95 (5) | 0.47 (5) | [E1] | 0.0185 (3) | 0.46 (5) |
| $\gamma_{27,6}$(U) | 427.4 (4) | 0.000031 (10) | | | 0.000031 (10) |
| $\gamma_{68,42}$(U) | 433.1 (1) | 0.094 (14) | | | 0.094 (14) |
| $\gamma_{40,18}$(U) | 446.6 (1) | 0.153 (20) | [M1] | 0.338 (5) | 0.114 (15) |
| $\gamma_{27,5}$(U) | 450.93 (4) | 0.0050 (24) | M1+E2 | 0.241 (4) | 0.0040 (19) |
| $\gamma_{42,19}$(U) | 452.4 (3) | 0.027 (9) | | | 0.027 (9) |
| $\gamma_{33,11}$(U) | 458.68 (5) | 1.30 (15) | M1+E2 | 0.14 (5) | 1.14 (12) |
| $\gamma_{45,22}$(U) | 461.5 (1) | 0.045 (14) | [M1] | 0.309 (5) | 0.034 (11) |
| $\gamma_{39,16}$(U) | 464.2 (1) | 0.040 (14) | [M1] | 0.304 (5) | 0.031 (11) |
| $\gamma_{40,16}$(U) | 468.0 (1) | 0.223 (30) | [E1] | 0.01539 (22) | 0.22 (3) |
| $\gamma_{37,15}$(U) | 472.3 (1) | 0.46 (5) | [M1] | 0.290 (4) | 0.36 (4) |
| $\gamma_{41,16}$(U) | 474.2 (2) | 0.037 (11) | [E1] | 0.01499 (21) | 0.036 (11) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{42,16}$(U) | 478.6 (1) | 0.127 (15) | [E1] | 0.01472 (21) | 0.125 (15) |
| $\gamma_{71,43}$(U) | 481.0 (1) | 0.36 (6) | [M1,E2] | 0.16 (12) | 0.31 (4) |
| $\gamma_{45,18}$(U) | 498.0 (1) | 0.078 (15) | [M1] | 0.252 (4) | 0.062 (12) |
| $\gamma_{66,35}$(U) | 502.0 (1) | 0.03 (10) | [E2,M1] | 0.15 (10) | 0.027 (90) |
| $\gamma_{37,13}$(U) | 506.75 (5) | 1.32 (14) | [E1] | 0.01314 (19) | 1.30 (14) |
| $\gamma_{40,15}$(U) | 513.4 (1) | ~0.468 | [M1] | 0.232 (4) | ~0.38 |
| $\gamma_{40,14}$(U) | 513.5 (1) | ~0.77 | [E1] | 0.01280 (18) | ~0.76 |
| $\gamma_{45,16}$(U) | 519.6 (1) | 0.41 (5) | [E1] | 0.01251 (18) | 0.40 (5) |
| $\gamma_{49,24}$(U) | 521.4 (1) | 0.76 (9) | [E1] | 0.01242 (18) | 0.75 (9) |
| $\gamma_{37,12}$(U) | 527.9 (1) | 0.49 (6) | (M1) | 0.215 (3) | 0.40 (5) |
| $\gamma_{43,15}$(U) | 529.1 (3) | 0.102 (46) | [E2,M1] | 0.13 (9) | 0.09 (4) |
| $\gamma_{76,44}$(U) | 534.1 (1) | 0.084 (13) | [E1] | 0.01185 (17) | 0.083 (13) |
| $\gamma_{71,37}$(U) | 537.2 (1) | 0.093 (16) | [M1,E2] | 0.12 (9) | 0.083 (13) |
| $\gamma_{39,13}$(U) | 543.8 (1) | 0.140 (25) | [E2] | 0.0389 (6) | 0.135 (24) |
| $\gamma_{47,19}$(U) | 553.7 (1) | 0.045 (16) | [E1] | 0.01105 (16) | 0.045 (16) |
| $\gamma_{44,14}$(U) | 558.0 (2) | 0.097 (24) | [E2] | 0.0367 (6) | 0.094 (23) |
| $\gamma_{36,9}$(U) | 559.2 (2) | 0.074 (22) | [E1] | 0.01084 (16) | 0.073 (22) |
| $\gamma_{76,43}$(U) | 562.8 (3) | 0.040 (13) | [M1,E2] | 0.11 (8) | 0.036 (11) |
| $\gamma_{45,15}$(U) | 565.2 (1) | 1.23 (13) | (M1) | 0.179 (3) | 1.04 (11) |
| $\gamma_{40,12}$(U) | 568.9 (2) | 4.2 (7) | M1 | 0.1759 (25) | 3.6 (6) |
| $\gamma_{37,9}$(U) | 569.5 (1) | 10.9 (14) | M1 | 0.1754 (25) | 9.3 (12) |
| $\gamma_{41,12}$(U) | 575.5 (1) | 0.03 (1) | [E2,M1] | 0.10 (7) | 0.027 (9) |
| $\gamma_{43,12}$(U) | 584.1 (1) | 0.19 (31) | [E2] | 0.0331 (5) | 0.18 (30) |
| $\gamma_{64,32}$(U) | 586.3 (1) | 0.075 (13) | [E2] | 0.0328 (5) | 0.073 (13) |
| $\gamma_{40,10}$(U) | 590.3 (10) | 0.040 (12) | [E2,M1] | 0.10 (7) | 0.036 (11) |
| $\gamma_{50,22}$(U) | 595.4 (2) | 0.097 (24) | [E2] | 0.0317 (5) | 0.094 (23) |
| $\gamma_{59,26}$(U) | 596.9 (1) | 0.231 (35) | [M1] | 0.1547 (22) | 0.20 (3) |
| $\gamma_{49,18}$(U) | 602.6 (1) | 0.55 (6) | [E1] | 0.00939 (14) | 0.54 (6) |
| $\gamma_{43,10}$(U) | 604.6 (3) | 0.057 (24) | [E2,M1] | 0.09 (6) | 0.052 (22) |
| $\gamma_{53,21}$(U) | 612.0 (1) | 0.43 (6) | (M1) | 0.1447 (21) | 0.38 (5) |
| $\gamma_{41,9}$(U) | 617.0 (2) | 0.054 (23) | [E2] | 0.0294 (5) | 0.052 (22) |
| $\gamma_{44,11}$(U) | 619.0 (2) | 0.039 (12) | [M1+E2] | 0.08 (6) | 0.036 (11) |
| $\gamma_{49,16}$(U) | 624.2 (1) | 0.39 (6) | (M1+E2) | 0.1015 (15) | 0.35 (5) |
| $\gamma_{20,4}$(U) | 628.1 (1) | 0.24 (5) | [E1] | 0.00868 (13) | 0.24 (5) |
| $\gamma_{48,15}$(U) | 629.4 (1) | 0.40 (7) | (M1) | 0.1342 (19) | 0.35 (6) |
| $\gamma_{51,18}$(U) | 632.6 (2) | 0.039 (12) | [E2,M1] | 0.08 (6) | 0.036 (11) |
| $\gamma_{54,22}$(U) | 634.3 (2) | 0.153 (27) | [M1] | 0.1315 (19) | 0.135 (24) |
| $\gamma_{-1,4}$(U) | 643.2 (2) | | | | 0.027 (9) |
| $\gamma_{37,7}$(U) | 646.5 (1) | 0.115 (15) | [E1] | 0.00822 (12) | 0.114 (15) |
| $\gamma_{50,16}$(U) | 653.7 (1) | 0.53 (9) | M1 | 0.1213 (17) | 0.47 (8) |
| $\gamma_{56,22}$(U) | 655.2 (2) | 0.136 (24) | [E1] | 0.00802 (12) | 0.135 (24) |
| $\gamma_{46,11}$(U) | 657.4 (1) | 0.40 (5) | | | 0.40 (5) |
| $\gamma_{-1,5}$(U) | 659.8 (1) | | | | 0.27 (4) |
| $\gamma_{48,13}$(U) | 663.9 (1) | 0.54 (9) | [E1] | 0.00782 (11) | 0.54 (9) |
| $\gamma_{11,3}$(U) | 666.5 (1) | 1.19 (13) | [E1] | 0.00777 (11) | 1.18 (13) |
| $\gamma_{35,5}$(U) | 669.7 (1) | <0.0006 | | | <0.0006 |
| $\gamma_{49,15}$(U) | 669.7 (1) | 1.01 (10) | [E1] | 0.00770 (11) | 1.0 (1) |
| $\gamma_{24,4}$(U) | 675.1 (1) | 0.103 (14) | [E2] | 0.0242 (4) | 0.101 (14) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{59,22}$(U) | 683.9 (2) | 0.161 (40) | [E1] | 0.00740 (11) | 0.16 (4) |
| $\gamma_{40,8}$(U) | 685.1 (2) | 0.15 (4) | | | 0.15 (4) |
| $\gamma_{54,16}$(U) | 692.6 (1) | 1.38 (14) | (M1) | 0.1040 (15) | 1.25 (13) |
| $\gamma_{51,15}$(U) | 699.03 (5) | 3.6 (4) | | | 3.6 (4) |
| $\gamma_{7,2}$(U) | 705.9 (1) | 2.31 (23) | [E1] | 0.00698 (10) | 2.29 (23) |
| $\gamma_{8,2}$(U) | 708.3 (2) | 0.024 (9) | [E2] | 0.0219 (3) | 0.023 (9) |
| $\gamma_{-1,6}$(U) | 711.5 (1) | | | | 0.156 (25) |
| $\gamma_{52,14}$(U) | 713.7 (1) | 0.147 (25) | [E1] | 0.00684 (10) | 0.146 (25) |
| $\gamma_{62,23}$(U) | 716.5 (2) | 0.033 (10) | [M1,E2] | 0.06 (4) | 0.031 (9) |
| $\gamma_{15,3}$(U) | 727.8 (2) | 0.116 (15) | [E2] | 0.0207 (3) | 0.114 (15) |
| $\gamma_{49,11}$(U) | 730.9 (2) | 0.67 (11) | [M1,E2] | 0.06 (4) | 0.63 (10) |
| $\gamma_{50,13}$(U) | 733.39 (5) | 7.6 (9) | M1 | 0.0893 (13) | 7.0 (8) |
| $\gamma_{54,14}$(U) | 738.0 (1) | 1.26 (14) | (M1) | 0.0878 (13) | 1.16 (13) |
| $\gamma_{5,1}$(U) | 742.813 (5) | 2.09 (21) | E1 | 0.00636 (9) | 2.08 (21) |
| $\gamma_{49,10}$(U) | 745.9 (1) | 0.32 (5) | [E1] | 0.00631 (9) | 0.32 (5) |
| $\gamma_{52,13}$(U) | 748.1 (3) | 0.105 (23) | [E1] | 0.00628 (9) | 0.104 (23) |
| $\gamma_{51,12}$(U) | 755.0 (1) | 1.29 (15) | (E2,M1) | 0.05 (4) | 1.23 (13) |
| $\gamma_{56,15}$(U) | 758.9 (1) | 0.262 (33) | [M1,E2] | 0.05 (4) | 0.25 (3) |
| $\gamma_{50,11}$(U) | 761.0 (2) | 0.074 (22) | [E2] | 0.0189 (3) | 0.073 (22) |
| $\gamma_{28,4}$(U) | 764.8 (2) | 0.21 (5) | [M1,E2] | 0.05 (3) | 0.20 (5) |
| $\gamma_{6,1}$(U) | 766.4 (2) | 0.26 (5) | (E2) | 0.0187 (3) | 0.26 (5) |
| $\gamma_{58,15}$(U) | 769.1 (1) | 0.196 (22) | [M1,E2] | 0.05 (3) | 0.187 (20) |
| $\gamma_{54,13}$(U) | 772.4 (2) | 0.074 (22) | [E2] | 0.0184 (3) | 0.073 (22) |
| $\gamma_{-1,7}$(U) | 778.6 (2) | | | | 0.046 (10) |
| $\gamma_{30,4}$(U) | 780.4 (2) | 0.91 (9) | [E1] | 0.00581 (9) | 0.90 (9) |
| $\gamma_{9,2}$(U) | 783.4 (1) | 0.305 (41) | [E2] | 0.0179 (3) | 0.30 (4) |
| $\gamma_{5,0}$(U) | 786.272 (22) | 1.22 (13) | (E1) | 0.00573 (8) | 1.21 (13) |
| $\gamma_{54,12}$(U) | 792.8 (3) | 0.045 (11) | [E1] | 0.00565 (8) | 0.045 (11) |
| $\gamma_{18,3}$(U) | 794.9 (2) | 0.69 (11) | [E2] | 0.01735 (25) | 0.68 (11) |
| $\gamma_{51,9}$(U) | 796.1 (1) | 2.64 (31) | [E2] | 0.01730 (25) | 2.6 (3) |
| $\gamma_{55,12}$(U) | 802.3 (2) | 0.033 (10) | [M1] | 0.0703 (10) | 0.031 (9) |
| $\gamma_{10,2}$(U) | 804.1 (1) | 0.85 (30) | E0+E2 | 0.37 | 0.62 (22) |
| $\gamma_{7,1}$(U) | 805.80 (5) | 2.51 (30) | [E1] | 0.00549 (8) | 2.5 (3) |
| $\gamma_{8,1}$(U) | 808.4 (3) | 0.19 (6) | E0+E2 | 4.2 | 0.036 (11) |
| $\gamma_{53,9}$(U) | 811.5 (1) | 0.130 (16) | [M1,E2] | 0.04 (3) | 0.125 (15) |
| $\gamma_{56,12}$(U) | 814.2 (1) | 0.315 (41) | [E2] | 0.01654 (24) | 0.31 (4) |
| $\gamma_{11,2}$(U) | 819.2 (1) | 1.91 (20) | [E1] | 0.00533 (8) | 1.9 (2) |
| $\gamma_{-1,8}$(U) | 824.2 (2) | | | | 1.25 (15) |
| $\gamma_{12,2}$(U) | 825.1 (2) | 1.93 (20) | [E2] | 0.01611 (23) | 1.9 (2) |
| $\gamma_{20,3}$(U) | 829.3 (2) | 0.36 (11) | [E1] | 0.00521 (8) | 0.36 (11) |
| $\gamma_{22,3}$(U) | 831.5 (1) | 4.2 (5) | [E1] | 0.00518 (8) | 4.2 (5) |
| $\gamma_{75,28}$(U) | 839.5 (1) | 0.031 (8) | | | 0.031 (8) |
| $\gamma_{49,7}$(U) | 844.1 (1) | 0.44 (5) | [E2] | 0.01540 (22) | 0.43 (5) |
| $\gamma_{-1,9}$(U) | 846.1 (2) | | | | 0.052 (12) |
| $\gamma_{59,11}$(U) | 848.9 (2) | 0.027 (8) | [E1] | 0.00500 (7) | 0.027 (8) |
| $\gamma_{8,0}$(U) | 851.8 (1) | 0.074 (22) | [E2] | 0.01513 (22) | 0.073 (22) |
| $\gamma_{57,9}$(U) | 857.7 (2) | 0.037 (8) | [E2] | 0.01493 (21) | 0.036 (8) |
| $\gamma_{59,10}$(U) | 863.2 (2) | 0.076 (23) | [E2,M1] | 0.036 (22) | 0.073 (22) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{77,29}$(U) | 869.7 (1) | 0.20 (3) | | | 0.20 (3) |
| $\gamma_{50,7}$(U) | 874.0 (3) | 0.037 (8) | [E2,M1] | 0.035 (21) | 0.036 (8) |
| $\gamma_{24,3}$(U) | 876.0 (1) | 2.59 (23) | (E2) | 0.01432 (20) | 2.55 (23) |
| $\gamma_{15,2}$(U) | 880.52 (4) | 6.3 (8) | [E2] | 0.01418 (20) | 6.2 (8) |
| $\gamma_{14,2}$(U) | 880.52 (4) | 4.3 (6) | [E1] | 0.00468 (7) | 4.3 (6) |
| $\gamma_{9,1}$(U) | 883.24 (4) | 9.8 (11) | E2 | 0.01409 (20) | 9.7 (11) |
| $\gamma_{66,16}$(U) | 890.1 (4) | 0.027 (8) | | | 0.027 (8) |
| $\gamma_{25,3}$(U) | 898.67 (5) | 3.31 (40) | [E1] | 0.00451 (7) | 3.3 (4) |
| $\gamma_{10,1}$(U) | 904.2 (1) | 0.345 (41) | [E2] | 0.01346 (19) | 0.34 (4) |
| $\gamma_{65,15}$(U) | 916.5 (2) | 0.024 (7) | | | 0.024 (7) |
| $\gamma_{26,3}$(U) | 918.4 (1) | 0.101 (14) | [E2] | 0.01306 (19) | 0.100 (14) |
| $\gamma_{-1,10}$(U) | 920.5 (2) | | | | 0.029 (8) |
| $\gamma_{12,1}$(U) | 925.0 (1) | 8.0 (9) | (E2) | 0.01288 (18) | 7.9 (9) |
| $\gamma_{16,2}$(U) | 926.0 (2) | 1.8 (13) | [E1] | 0.00428 (6) | 1.8 (13) |
| $\gamma_{9,0}$(U) | 926.7 (1) | 7.4 (12) | (E2) | 0.01284 (18) | 7.3 (12) |
| $\gamma_{66,15}$(U) | 935.8 (2) | 0.067 (10) | | | 0.067 (10) |
| $\gamma_{17,2}$(U) | 942.0 (3) | 0.047 (9) | [E2] | 0.01244 (18) | 0.046 (9) |
| $\gamma_{13,1}$(U) | 946.00 (3) | 13.6 (15) | (E1) | 0.00412 (6) | 13.5 (15) |
| $\gamma_{18,2}$(U) | 947.7 (2) | 1.65 (21) | [E2] | 0.01230 (18) | 1.63 (21) |
| $\gamma_{19,2}$(U) | 952.7 (1) | 0.083 (13) | | | 0.083 (13) |
| $\gamma_{59,8}$(U) | 960.0 (1) | 0.074 (13) | [E2] | 0.01199 (17) | 0.073 (13) |
| $\gamma_{28,3}$(U) | 965.8 (1) | 0.49 (6) | [M1,E2] | 0.027 (16) | 0.48 (6) |
| $\gamma_{73,18}$(U) | 975.1 (1) | 0.027 (8) | | | 0.027 (8) |
| $\gamma_{29,3}$(U) | 978.2 (3) | 0.090 (23) | | | 0.090 (23) |
| $\gamma_{14,1}$(U) | 980.3 (1) | ∼2.71 | [E1] | 0.00387 (6) | ∼2.7 |
| $\gamma_{15,1}$(U) | 980.3 (1) | ∼1.79 | [E2] | 0.01152 (17) | ∼1.77 |
| $\gamma_{30,3}$(U) | 981.6 (3) | 0.73 (22) | [E1] | 0.00387 (6) | 0.73 (22) |
| $\gamma_{22,2}$(U) | 984.2 (1) | 1.64 (21) | [E1] | 0.00385 (6) | 1.63 (21) |
| $\gamma_{63,9}$(U) | 989.5 (1) | 0.104 (14) | | | 0.104 (14) |
| $\gamma_{-1,11}$(U) | 992.0 (2) | | | | 0.083 (22) |
| $\gamma_{60,7}$(U) | 994.6 (3) | 0.062 (22) | | | 0.062 (22) |
| $\gamma_{73,16}$(U) | 997.7 (3) | 0.046 (12) | | | 0.046 (12) |
| $\gamma_{71,15}$(U) | 1009.9 (3) | 0.067 (12) | | | 0.067 (12) |
| $\gamma_{76,19}$(U) | 1019.5 (4) | 0.027 (8) | | | 0.027 (8) |
| $\gamma_{23,2}$(U) | 1021.8 (2) | 0.156 (41) | [M1] | 0.0370 (6) | 0.15 (4) |
| $\gamma_{-1,12}$(U) | 1023.6 (2) | | | | 0.062 (22) |
| $\gamma_{-1,13}$(U) | 1025.3 (2) | | | | 0.052 (22) |
| $\gamma_{24,2}$(U) | 1028.7 (1) | 0.58 (6) | [E2] | 0.01051 (15) | 0.57 (6) |
| $\gamma_{75,16}$(U) | 1032.8 (2) | 0.018 (5) | | | 0.018 (5) |
| $\gamma_{-1,14}$(U) | 1035.9 (2) | | | | 0.026 (10) |
| $\gamma_{69,11}$(U) | 1037.9 (2) | 0.018 (7) | | | 0.018 (7) |
| $\gamma_{17,1}$(U) | 1041.1 (2) | 0.033 (11) | [E2,M1] | 0.023 (13) | 0.032 (11) |
| $\gamma_{32,3}$(U) | 1044.4 (2) | 0.031 (3) | | | 0.031 (3) |
| $\gamma_{70,12}$(U) | 1051.4 (2) | 0.062 (12) | | | 0.062 (12) |
| $\gamma_{70,11}$(U) | 1057.8 (3) | 0.0177 (16) | | | 0.0177 (16) |
| $\gamma_{71,12}$(U) | 1065.1 (1) | 0.027 (8) | | | 0.027 (8) |
| $\gamma_{69,9}$(U) | 1073.6 (2) | 0.104 (14) | | | 0.104 (14) |
| $\gamma_{21,1}$(U) | 1083.2 (1) | 0.53 (6) | (M1) | 0.0317 (5) | 0.51 (6) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{17,0}$(U) | 1085.3 (3) | 0.027 (8) | [E2] | 0.00950 (14) | 0.027 (8) |
| $\gamma_{71,9}$(U) | 1106.9 (2) | 0.083 (13) | | | 0.083 (13) |
| $\gamma_{66,7}$(U) | 1110.6 (1) | 0.062 (12) | | | 0.062 (12) |
| $\gamma_{23,1}$(U) | 1121.7 (1) | 0.257 (41) | M1 | 0.0289 (4) | 0.25 (4) |
| $\gamma_{33,3}$(U) | 1125.2 (1) | 0.36 (8) | [E1] | 0.00305 (5) | 0.36 (8) |
| $\gamma_{21,0}$(U) | 1126.8 (1) | 0.303 (40) | [E2] | 0.00885 (13) | 0.30 (4) |
| $\gamma_{34,3}$(U) | 1151.4 (3) | 0.032 (10) | [E1] | 0.00294 (5) | 0.032 (10) |
| $\gamma_{76,11}$(U) | 1153.5 (3) | 0.046 (9) | | | 0.046 (9) |
| $\gamma_{26,1}$(U) | 1171.3 (1) | 0.091 (13) | [E2] | 0.00824 (12) | 0.090 (13) |
| $\gamma_{66,5}$(U) | 1173.1 (1) | 0.046 (9) | | | 0.046 (9) |
| $\gamma_{71,8}$(U) | 1182.1 (2) | ∼0.0094 | | | ∼0.0094 |
| $\gamma_{27,1}$(U) | 1193.77 (2) | 0.021 (6) | E1 | 0.00277 (4) | 0.021 (6) |
| $\gamma_{77,9}$(U) | 1217.3 (1) | 0.22 (3) | | | 0.22 (3) |
| $\gamma_{-1,15}$(U) | 1220.4 (2) | | | | 0.062 (12) |
| $\gamma_{27,0}$(U) | 1237.3 (3) | <0.0094 | E1 | 0.00262 (4) | <0.0094 |
| $\gamma_{40,3}$(U) | 1241.2 (1) | 0.232 (30) | (E2) | 0.00740 (11) | 0.23 (3) |
| $\gamma_{41,3}$(U) | 1247.8 (2) | 0.022 (6) | [E2] | 0.00733 (11) | 0.022 (6) |
| $\gamma_{42,3}$(U) | 1252.6 (2) | 0.018 (8) | | | 0.018 (8) |
| $\gamma_{43,3}$(U) | 1256.5 (1) | 0.060 (8) | [M1,E2] | 0.014 (8) | 0.059 (8) |
| $\gamma_{33,2}$(U) | 1277.7 (2) | 0.047 (9) | [M2] | 0.0473 (7) | 0.045 (9) |
| $\gamma_{45,3}$(U) | 1292.8 (1) | 0.48 (6) | M1 | 0.0199 (3) | 0.47 (6) |
| $\gamma_{-1,16}$(U) | 1296.4 (2) | | | | 0.029 (7) |
| $\gamma_{-1,17}$(U) | 1301.2 (2) | | | | 0.018 (5) |
| $\gamma_{-1,18}$(U) | 1327.0 (2) | | | | 0.018 (5) |
| $\gamma_{36,2}$(U) | 1342.9 (2) | 0.012 (5) | [E1] | 0.00232 (4) | 0.012 (5) |
| $\gamma_{37,2}$(U) | 1352.9 (1) | 1.18 (12) | M1 | 0.01766 (25) | 1.16 (12) |
| $\gamma_{47,3}$(U) | 1354.6 (2) | 0.14 (4) | [E1] | 0.00229 (4) | 0.14 (4) |
| $\gamma_{38,2}$(U) | 1359.0 (1) | 0.156 (25) | | | 0.156 (25) |
| $\gamma_{39,2}$(U) | 1389.6 (2) | 0.073 (22) | [E1] | 0.00222 (4) | 0.073 (22) |
| $\gamma_{40,2}$(U) | 1393.9 (1) | 2.11 (21) | M1 | 0.01634 (23) | 2.08 (21) |
| $\gamma_{49,3}$(U) | 1397.5 (2) | 0.083 (22) | [E1] | 0.00220 (3) | 0.083 (22) |
| $\gamma_{41,2}$(U) | 1400.3 (1) | 0.182 (30) | [E2,M1] | 0.011 (6) | 0.18 (3) |
| $\gamma_{43,2}$(U) | 1409.1 (2) | 0.045 (10) | | | 0.045 (10) |
| $\gamma_{35,1}$(U) | 1414.4 (2) | <0.0028 | | | <0.0028 |
| $\gamma_{51,3}$(U) | 1426.9 (1) | 0.17 (3) | | | 0.17 (3) |
| $\gamma_{36,1}$(U) | 1442.8 (2) | 0.031 (7) | [E1] | 0.00212 (3) | 0.031 (7) |
| $\gamma_{45,2}$(U) | 1445.4 (1) | 0.32 (5) | [M1] | 0.01488 (21) | 0.32 (5) |
| $\gamma_{37,1}$(U) | 1452.7 (1) | 0.82 (9) | [M1] | 0.01468 (21) | 0.81 (9) |
| $\gamma_{38,1}$(U) | 1458.9 (1) | 0.094 (23) | | | 0.094 (23) |
| $\gamma_{46,2}$(U) | 1475.8 (2) | 0.008 (4) | | | 0.008 (4) |
| $\gamma_{56,3}$(U) | 1485.4 (2) | 0.030 (7) | [M1] | 0.01387 (20) | 0.030 (7) |
| $\gamma_{57,3}$(U) | 1488.0 (2) | 0.014 (6) | | | 0.014 (6) |
| $\gamma_{40,1}$(U) | 1493.6 (1) | 0.105 (14) | [E2] | 0.00531 (8) | 0.104 (14) |
| $\gamma_{58,3}$(U) | 1496.0 (2) | 0.036 (9) | | | 0.036 (9) |
| $\gamma_{41,1}$(U) | 1500.0 (2) | 0.0111 (40) | [E2] | 0.00528 (8) | 0.011 (4) |
| $\gamma_{-1,19}$(U) | 1507.3 (2) | | | | 0.020 (5) |
| $\gamma_{48,2}$(U) | 1510.1 (2) | <0.0094 | | | <0.0094 |
| $\gamma_{59,3}$(U) | 1515.6 (2) | 0.073 (13) | | | 0.073 (13) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{-1,20}$(U) | 1520.7 (2) | | | | 0.0094 (9) |
| $\gamma_{-1,21}$(U) | 1538.8 (2) | | | | 0.014 (4) |
| $\gamma_{49,2}$(U) | 1550.1 (1) | 0.073 (13) | [E1] | 0.00196 (3) | 0.073 (13) |
| $\gamma_{61,3}$(U) | 1567.0 (2) | 0.0114 (23) | | | 0.0114 (23) |
| $\gamma_{51,2}$(U) | 1579.9 (1) | 0.073 (22) | | | 0.073 (22) |
| $\gamma_{62,3}$(U) | 1585.9 (1) | 0.146 (17) | | | 0.146 (17) |
| $\gamma_{52,2}$(U) | 1594.0 (1) | 0.312 (40) | M1,E2 | 0.008 (4) | 0.31 (4) |
| $\gamma_{54,2}$(U) | 1618.3 (2) | 0.009 (4) | | | 0.009 (4) |
| $\gamma_{55,2}$(U) | 1627.3 (1) | 0.076 (11) | | | 0.076 (11) |
| $\gamma_{56,2}$(U) | 1638.1 (1) | 0.210 (21) | (M1) | 0.01083 (16) | 0.208 (21) |
| $\gamma_{57,2}$(U) | 1640.5 (3) | 0.010 (4) | | | 0.010 (4) |
| $\gamma_{65,3}$(U) | 1644.9 (2) | 0.010 (4) | | | 0.010 (4) |
| $\gamma_{58,2}$(U) | 1650.2 (2) | <0.006 | | | <0.006 |
| $\gamma_{-1,22}$(U) | 1655.7 (1) | | | | 0.026 (4) |
| $\gamma_{-1,23}$(U) | 1664.8 (3) | | | | 0.018 (7) |
| $\gamma_{59,2}$(U) | 1668.4 (1) | 0.78 (9) | (M1) | 0.01035 (15) | 0.77 (9) |
| $\gamma_{67,3}$(U) | 1672.8 (1) | 0.034 (11) | | | 0.034 (11) |
| $\gamma_{50,1}$(U) | 1679.5 (1) | 0.077 (18) | | | 0.077 (18) |
| $\gamma_{68,3}$(U) | 1685.7 (1) | 0.31 (4) | | | 0.31 (4) |
| $\gamma_{52,1}$(U) | 1693.8 (2) | 0.7 (1) | | | 0.7 (1) |
| $\gamma_{53,1}$(U) | 1695.0 (3) | 0.27 (7) | | | 0.27 (7) |
| $\gamma_{60,2}$(U) | 1700.5 (2) | 0.104 (14) | | | 0.104 (14) |
| $\gamma_{61,2}$(U) | 1719.7 (2) | 0.018 (6) | | | 0.018 (6) |
| $\gamma_{70,3}$(U) | 1723.2 (2) | 0.016 (4) | | | 0.016 (4) |
| $\gamma_{55,1}$(U) | 1727.8 (2) | 0.020 (5) | | | 0.020 (5) |
| $\gamma_{62,2}$(U) | 1737.7 (2) | 0.075 (11) | | | 0.075 (11) |
| $\gamma_{72,3}$(U) | 1741.1 (2) | 0.049 (8) | | | 0.049 (8) |
| $\gamma_{-1,24}$(U) | 1743.2 (2) | | | | 0.033 (8) |
| $\gamma_{58,1}$(U) | 1750.0 (1) | 0.064 (10) | | | 0.064 (10) |
| $\gamma_{-1,25}$(U) | 1757.5 (1) | | | | 0.024 (6) |
| $\gamma_{59,1}$(U) | 1768.0 (3) | 0.020 (5) | | | 0.020 (5) |
| $\gamma_{73,3}$(U) | 1770.8 (2) | 0.068 (17) | | | 0.068 (17) |
| $\gamma_{63,2}$(U) | 1773.0 (2) | 0.068 (17) | | | 0.068 (17) |
| $\gamma_{64,2}$(U) | 1783.7 (2) | 0.025 (7) | | | 0.025 (7) |
| $\gamma_{65,2}$(U) | 1797.1 (1) | 0.24 (3) | | | 0.24 (3) |
| $\gamma_{75,3}$(U) | 1805.8 (3) | 0.0052 (22) | | | 0.0052 (22) |
| $\gamma_{66,2}$(U) | 1815.3 (3) | 0.009 (4) | | | 0.009 (4) |
| $\gamma_{76,3}$(U) | 1819.8 (3) | 0.0042 (11) | | | 0.0042 (11) |
| $\gamma_{67,2}$(U) | 1825.1 (3) | 0.009 (4) | | | 0.009 (4) |
| $\gamma_{-1,26}$(U) | 1830.8 (3) | | | | 0.0042 (11) |
| $\gamma_{68,2}$(U) | 1838.0 (2) | 0.0042 (11) | | | 0.0042 (11) |
| $\gamma_{-1,27}$(U) | 1849.8 (2) | | | | 0.028 (7) |
| $\gamma_{63,1}$(U) | 1872.8 (2) | 0.035 (9) | | | 0.035 (9) |
| $\gamma_{64,1}$(U) | 1884.1 (3) | 0.016 (5) | | | 0.016 (5) |
| $\gamma_{71,2}$(U) | 1890.1 (2) | 0.146 (17) | | | 0.146 (17) |
| $\gamma_{72,2}$(U) | 1893.4 (3) | ~0.0062 | | | ~0.0062 |
| $\gamma_{65,1}$(U) | 1896.7 (2) | 0.104 (23) | | | 0.104 (23) |
| $\gamma_{66,1}$(U) | 1915.5 (3) | 0.020 (5) | | | 0.020 (5) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{74,2}$(U) | 1925.4 (2) | 0.30 (5) | | | 0.30 (5) |
| $\gamma_{-1,28}$(U) | 1927.9 (4) | | | | 0.054 (12) |
| $\gamma_{-1,29}$(U) | 1935.2 (4) | | | | ∼0.0094 |
| $\gamma_{68,1}$(U) | 1937.7 (3) | 0.042 (11) | | | 0.042 (11) |
| $\gamma_{75,2}$(U) | 1958.0 (4) | 0.010 (3) | | | 0.010 (3) |
| $\gamma_{76,2}$(U) | 1971.2 (4) | ∼0.0027 | | | ∼0.0027 |
| $\gamma_{70,1}$(U) | 1977.4 (4) | 0.017 (5) | | | 0.017 (5) |
| $\gamma_{71,1}$(U) | 1989.6 (4) | 0.007 (4) | | | 0.007 (4) |
| $\gamma_{76,1}$(U) | 2072.2 (4) | 0.0042 (22) | | | 0.0042 (22) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 1.159 | (11) | min |
| $Q_{\beta^-}$ | : | 2269 | (4) | keV |
| $Q_{IT}$ | : | 73.92 | (2) | keV |
| $\beta^-$ | : | 99.85 | (1) | % |
| $IT$ | : | 0.15 | (1) | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,30}$ | 299 (4) | 0.00389 (22) | | 6.8 |
| $\beta^-_{0,29}$ | 332 (4) | 0.0108 (3) | | 6.6 |
| $\beta^-_{0,28}$ | 358 (4) | 0.0452 (8) | | 6 |
| $\beta^-_{0,27}$ | 394 (4) | 0.0258 (3) | | 6.4 |
| $\beta^-_{0,26}$ | 406 (4) | 0.00311 (19) | | 7.4 |
| $\beta^-_{0,25}$ | 460 (4) | 0.0146 (7) | | 6.9 |
| $\beta^-_{0,24}$ | 473 (4) | 0.0021 (3) | | 7.7 |
| $\beta^-_{0,23}$ | 488 (4) | 0.0357 (18) | | 6.6 |
| $\beta^-_{0,22}$ | 575 (4) | 0.0024 (3) | | 8 |
| $\beta^-_{0,21}$ | 602 (4) | 0.0061 (3) | | 7.6 |
| $\beta^-_{0,20}$ | 667 (4) | 0.00127 (23) | | 8.5 |
| $\beta^-_{0,19}$ | 677 (4) | 0.0249 (5) | | 7.2 |
| $\beta^-_{0,18}$ | 698 (4) | 0.00231 (19) | | 8.4 |
| $\beta^-_{0,17}$ | 715 (4) | 0.0320 (6) | | 7.2 |
| $\beta^-_{0,16}$ | 768 (4) | 0.0131 (6) | | 7.7 |
| $\beta^-_{0,14}$ | 834 (4) | 0.0092 (11) | | 7.9 |
| $\beta^-_{0,13}$ | 1032 (4) | 0.0121 (11) | | 8.2 |
| $\beta^-_{0,12}$ | 1095 (4) | 0.0046 (3) | | 8.7 |
| $\beta^-_{0,9}$ | 1224 (4) | 1.006 (13) | | 6.5 |
| $\beta^-_{0,4}$ | 1459 (4) | 0.945 (12) | | 6.8 |
| $\beta^-_{0,3}$ | 1483 (4) | 0.049 (3) | | 8 |
| $\beta^-_{0,0}$ | 2269 (4) | 97.599 (24) | Allowed | 5.5 |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (U) | 5.9 - 21.6 | 0.856 (19) | |
| $e_{AK}$ | (U) | | 0.0203 (3) | |
| | KLL | 71.776 - 80.954 | } | |
| | KLX | 88.153 - 98.429 | } | |
| | KXY | 104.51 - 115.59 | } | |
| $e_{AL}$ | (Pa) | 5.9 - 20.9 | 0.048 (4) | |
| $ec_{1,0\ L}$ | (U) | 21.73 - 26.32 | 1.030 (19) | |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $ec_{1,0\ M}$ | (U) | 37.94 - 39.94 | | 0.285 (5) | | |
| $ec_{1,0\ N}$ | (U) | 42.05 - 43.11 | | 0.0770 (14) | | |
| $ec_{1,0\ L}$ | (Pa) | 52.82 - 57.19 | | 0.103 (8) | | |
| $ec_{1,0\ M}$ | (Pa) | 68.56 - 70.48 | | 0.025 (2) | | |
| $\beta^-_{0,30}$ | max: | 299 | (4) | 0.00389 (22) | avg: | 83.0 (13) |
| $\beta^-_{0,29}$ | max: | 332 | (4) | 0.0108 (3) | avg: | 93.0 (13) |
| $\beta^-_{0,28}$ | max: | 358 | (4) | 0.0452 (8) | avg: | 101.0 (13) |
| $\beta^-_{0,27}$ | max: | 394 | (4) | 0.0258 (3) | avg: | 112.3 (13) |
| $\beta^-_{0,26}$ | max: | 406 | (4) | 0.00311 (19) | avg: | 116.0 (13) |
| $\beta^-_{0,25}$ | max: | 460 | (4) | 0.0146 (7) | avg: | 133.3 (13) |
| $\beta^-_{0,24}$ | max: | 473 | (4) | 0.0021 (3) | avg: | 137.4 (14) |
| $\beta^-_{0,23}$ | max: | 488 | (4) | 0.0357 (18) | avg: | 142.3 (14) |
| $\beta^-_{0,22}$ | max: | 575 | (4) | 0.0024 (3) | avg: | 171.2 (14) |
| $\beta^-_{0,21}$ | max: | 602 | (4) | 0.0061 (3) | avg: | 180.1 (14) |
| $\beta^-_{0,20}$ | max: | 667 | (4) | 0.00127 (23) | avg: | 202.5 (14) |
| $\beta^-_{0,19}$ | max: | 677 | (4) | 0.0249 (5) | avg: | 205.8 (14) |
| $\beta^-_{0,18}$ | max: | 698 | (4) | 0.00231 (19) | avg: | 213.3 (14) |
| $\beta^-_{0,17}$ | max: | 715 | (4) | 0.0320 (6) | avg: | 219.2 (14) |
| $\beta^-_{0,16}$ | max: | 768 | (4) | 0.0131 (6) | avg: | 237.6 (15) |
| $\beta^-_{0,14}$ | max: | 834 | (4) | 0.0092 (11) | avg: | 261.1 (15) |
| $\beta^-_{0,13}$ | max: | 1032 | (4) | 0.0121 (11) | avg: | 333.1 (15) |
| $\beta^-_{0,12}$ | max: | 1095 | (4) | 0.0046 (3) | avg: | 356.7 (15) |
| $\beta^-_{0,9}$ | max: | 1224 | (4) | 1.006 (13) | avg: | 405.6 (16) |
| $\beta^-_{0,4}$ | max: | 1459 | (4) | 0.945 (12) | avg: | 496.0 (16) |
| $\beta^-_{0,3}$ | max: | 1483 | (4) | 0.049 (3) | avg: | 505.3 (16) |
| $\beta^-_{0,0}$ | max: | 2269 | (4) | 97.599 (24) | avg: | 820.5 (17) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (U) | 11.6185 — 20.7141 | | 0.856 (19) | |
| $XK\alpha_2$ | (U) | 94.666 | | 0.1973 (25) | } $K\alpha$ |
| $XK\alpha_1$ | (U) | 98.44 | | 0.316 (4) | } |
| $XK\beta_3$ | (U) | 110.421 | } | | |
| $XK\beta_1$ | (U) | 111.298 | } | 0.115 (2) | $K\beta_1'$ |
| $XK\beta_5''$ | (U) | 111.964 | } | | |
| $XK\beta_2$ | (U) | 114.407 | } | | |
| $XK\beta_4$ | (U) | 115.012 | } | 0.0382 (5) | $K\beta_2'$ |
| $XKO_{2,3}$ | (U) | 115.377 | } | | |
| XL | (Pa) | 11.3676 — 20.1126 | | 0.046 (4) | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(U) | 43.49 (2) | 1.414 (26) | E2 | 713 (11) | 0.00198 (2) |
| $\gamma_{8,7}$(U) | 62.70 (1) | 0.0019 (6) | E1 | 0.426 (6) | 0.0013 (4) |
| $\gamma_{1,0}$(Pa) | 73.92 (2) | 0.15 (1) | (M1+E2) | 10.6 (4) | 0.0129 (9) |
| $\gamma_{2,1}$(U) | 99.86 (2) | 0.0082 (7) | E2 | 13.42 (19) | 0.00057 (5) |
| $\gamma_{18,14}$(U) | 135.32 (8) | 0.0000052 (6) | [E1] | 0.247 (4) | 0.0000042 (5) |
| $\gamma_{11,8}$(U) | 137.23 (5) | 0.000059 (21) | [E1] | 0.239 (4) | 0.000048 (17) |
| $\gamma_{8,5}$(U) | 140.1 (10) | <0.008 | M1+E2 | 5.3 (18) | <0.00127 |
| $\gamma_{20,14}$(U) | 166.5 (1) | 0.000000273 (6) | [E1] | 0.1514 (22) | 0.000000237 (5) |
| $\gamma_{12,8}$(U) | 185.0 (4) | 0.00172 (15) | | | 0.00172 (15) |
| $\gamma_{9,6}$(U) | 193.4 (8) | 0.00133 (28) | [E2] | 0.847 (18) | 0.00072 (15) |
| $\gamma_{14,13}$(U) | 197.91 (15) | 0.000081 (39) | [M1,E2] | 2.0 (12) | 0.000027 (7) |
| $\gamma_{11,7}$(U) | 199.9 (10) | 0.0017 (8) | (E0+E2+M1) | 1.9 (12) | 0.00058 (12) |
| $\gamma_{8,3}$(U) | 203.3 (8) | 0.0029 (5) | M1+E2 | 1.4 (4) | 0.00119 (9) |
| $\gamma_{23,18}$(U) | 209.9 (4) | 0.00132 (15) | | | 0.00132 (15) |
| $\gamma_{10,5}$(U) | 235.9 (3) | 0.000096 (43) | [E1] | 0.0673 (10) | 0.00009 (4) |
| $\gamma_{-1,1}$(U) | 243.5 (8) | | | | 0.00050 (9) |
| $\gamma_{13,8}$(U) | 247.7 (8) | 0.0019 (8) | [M1,E2] | 1.0 (7) | 0.00097 (22) |
| $\gamma_{9,3}$(U) | 258.227 (3) | 0.0778 (8) | (E1) | 0.0548 (8) | 0.0738 (8) |
| $\gamma_{11,6}$(U) | 275.5 (8) | 0.00056 (22) | [M1,E2] | 0.8 (6) | 0.00031 (6) |
| $\gamma_{10,3}$(U) | 299 (1) | 0.00067 (14) | [E1] | 0.0395 (7) | 0.00064 (13) |
| $\gamma_{13,7}$(U) | 311 (1) | 0.00054 (11) | [E1] | 0.0363 (6) | 0.00052 (11) |
| $\gamma_{11,4}$(U) | 316.7 (1) | 0.00022 (6) | [E2] | 0.1597 (23) | 0.00019 (5) |
| $\gamma_{24,15}$(U) | 338.1 (8) | 0.00113 (23) | | | 0.00113 (23) |
| $\gamma_{11,3}$(U) | 340.2 (1) | 0.000074 (22) | [E1] | 0.0298 (5) | 0.000072 (21) |
| $\gamma_{28,17}$(U) | 357.5 (10) | 0.00080 (17) | | | 0.00080 (17) |
| $\gamma_{24,14}$(U) | 362.8 (10) | 0.00069 (15) | | | 0.00069 (15) |
| $\gamma_{13,5}$(U) | 387.6 (8) | 0.000512 (44) | [E2] | 0.0899 (14) | 0.00047 (4) |
| $\gamma_{12,3}$(U) | 387.6 (8) | 0.00097 (15) | | | 0.00097 (15) |
| $\gamma_{13,4}$(U) | 427.4 (2) | 0.000020 (5) | [E1] | 0.0185 (3) | 0.000020 (5) |
| $\gamma_{14,8}$(U) | 445.91 (10) | 0.000037 (9) | [M1,E2] | 0.20 (14) | 0.000031 (7) |
| $\gamma_{13,3}$(U) | 450.98 (10) | 0.00385 (16) | M1+E2 | 0.241 (4) | 0.00310 (13) |
| $\gamma_{28,15}$(U) | 453.58 (10) | 0.00282 (16) | [M1] | 0.324 (5) | 0.00213 (12) |
| $\gamma_{22,13}$(U) | 456.7 (10) | 0.00095 (20) | [M1] | 0.318 (5) | 0.00072 (15) |
| $\gamma_{17,10}$(U) | 468.43 (10) | 0.00206 (12) | | | 0.00206 (12) |
| $\gamma_{28,14}$(U) | 475.74 (10) | 0.00305 (17) | [M1] | 0.285 (4) | 0.00237 (13) |
| $\gamma_{18,10}$(U) | 485.44 (7) | 0.0000217 (28) | [M1,E2] | 0.16 (11) | 0.0000187 (17) |
| $\gamma_{19,10}$(U) | 507.5 (10) | 0.00158 (15) | | | 0.00158 (15) |
| $\gamma_{17,9}$(U) | 509.2 (8) | 0.0022 (3) | | | 0.0022 (3) |
| $\gamma_{20,10}$(U) | 516.60 (6) | 0.000015 (2) | (M1) | 0.228 (4) | 0.0000122 (16) |
| $\gamma_{18,9}$(U) | 526.02 (10) | 0.0000110 (12) | [M1] | 0.217 (3) | 0.000009 (1) |
| $\gamma_{23,13}$(U) | 543.98 (10) | 0.00349 (15) | | | 0.00349 (15) |
| $\gamma_{20,9}$(U) | 557.24 (6) | 0.0000098 (13) | (M1) | 0.186 (3) | 0.0000083 (11) |
| $\gamma_{-1,2}$(U) | 557.3 (10) | | | | 0.00072 (17) |
| $\gamma_{25,13}$(U) | 572 (1) | 0.00102 (20) | [M1] | 0.173 (3) | 0.00087 (17) |
| $\gamma_{18,8}$(U) | 581.19 (10) | 0.000081 (9) | [E1] | 0.01006 (14) | 0.000080 (9) |
| $\gamma_{14,4}$(U) | 624.6 (10) | 0.000117 (12) | [E1] | 0.00877 (13) | 0.000116 (12) |
| $\gamma_{-1,3}$(U) | 647.7 (8) | | | | 0.00158 (15) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{14,3}$(U) | 649 (1) | 0.000064 (9) | [M1,E2] | 0.08 (5) | 0.000059 (8) |
| $\gamma_{16,6}$(U) | 649 (1) | 0.0010 (3) | | | 0.0010 (3) |
| $\gamma_{23,11}$(U) | 655.3 (10) | 0.00139 (15) | | | 0.00139 (15) |
| $\gamma_{15,3}$(U) | 670.8 (10) | 0.0004 (1) | [M1,E2] | 0.07 (5) | 0.00037 (9) |
| $\gamma_{28,13}$(U) | 673.9 (10) | 0.00071 (14) | [M1] | 0.1118 (17) | 0.00064 (13) |
| $\gamma_{25,11}$(U) | 683.4 (10) | 0.00058 (12) | [E1] | 0.00741 (11) | 0.00058 (12) |
| $\gamma_{16,4}$(U) | 691.0 (3) | 0.00898 (19) | | | 0.00898 (19) |
| $\gamma_{23,10}$(U) | 695.5 (10) | 0.00164 (14) | | | 0.00164 (14) |
| $\gamma_{29,13}$(U) | 699.02 (10) | 0.0058 (3) | | | 0.0058 (3) |
| $\gamma_{17,6}$(U) | 702.0 (1) | 0.00721 (16) | | | 0.00721 (16) |
| $\gamma_{5,2}$(U) | 705.94 (12) | 0.0052 (6) | [E1] | 0.00698 (10) | 0.0052 (6) |
| $\gamma_{6,2}$(U) | 708.2 (10) | <0.00072 | [E2] | 0.0219 (4) | <0.0007 |
| $\gamma_{18,6}$(U) | 719.01 (7) | 0.0000271 (24) | [M1+E2] | 0.06 (4) | 0.0000256 (20) |
| $\gamma_{30,13}$(U) | 732.5 (10) | 0.00130 (15) | | | 0.00130 (15) |
| $\gamma_{19,6}$(U) | 740.10 (8) | 0.0118 (3) | | | 0.0118 (3) |
| $\gamma_{3,1}$(U) | 742.813 (5) | 0.0946 (30) | E1 | 0.00636 (9) | 0.094 (3) |
| $\gamma_{20,6}$(U) | 750.12 (6) | 0.0000184 (22) | (M1) | 0.0841 (12) | 0.000017 (2) |
| $\gamma_{-1,4}$(U) | 760.3 (10) | | | | 0.00158 (15) |
| $\gamma_{18,4}$(U) | 760.53 (15) | 0.0000046 (10) | [M1] | 0.0811 (12) | 0.0000043 (9) |
| $\gamma_{4,1}$(U) | 766.361 (20) | 0.3290 (41) | (E2) | 0.0187 (3) | 0.323 (4) |
| $\gamma_{19,4}$(U) | 781.75 (10) | 0.00782 (18) | | | 0.00782 (18) |
| $\gamma_{7,2}$(U) | 783.4 (1) | 0.000040 (7) | [E2] | 0.0179 (3) | 0.000039 (7) |
| $\gamma_{3,0}$(U) | 786.272 (22) | 0.0539 (7) | E1+M2 | 0.00573 (8) | 0.0536 (7) |
| $\gamma_{20,4}$(U) | 791.94 (5) | 0.0000106 (14) | [M1] | 0.0728 (11) | 0.0000099 (13) |
| $\gamma_{5,1}$(U) | 805.75 (10) | 0.0062 (8) | [E1] | 0.00549 (8) | 0.0062 (8) |
| $\gamma_{6,1}$(U) | 808.2 (1) | 0.00281 (17) | | | 0.00281 (17) |
| $\gamma_{21,5}$(U) | 818.2 (5) | 0.0010 (3) | | | 0.0010 (3) |
| $\gamma_{28,10}$(U) | 825.5 (2) | 0.0014 (4) | | | 0.0014 (4) |
| $\gamma_{22,5}$(U) | 844.1 (8) | 0.00109 (23) | | | 0.00109 (23) |
| $\gamma_{6,0}$(U) | 851.6 (1) | 0.00707 (15) | [E2] | 0.01514 (22) | 0.00696 (15) |
| $\gamma_{28,9}$(U) | 866.8 (10) | 0.00116 (16) | | | 0.00116 (16) |
| $\gamma_{21,3}$(U) | 880.52 (4) | 0.00392 (5) | | | 0.00392 (5) |
| $\gamma_{7,1}$(U) | 883.24 (3) | 0.00386 (5) | E2 | 0.01409 (20) | 0.00381 (5) |
| $\gamma_{-1,5}$(U) | 887.29 (100) | | | | 0.00708 (14) |
| $\gamma_{28,8}$(U) | 921.72 (10) | 0.01275 (20) | | | 0.01275 (20) |
| $\gamma_{7,0}$(U) | 926.61 (10) | 0.00127 (13) | (E2) | 0.01284 (18) | 0.00125 (13) |
| $\gamma_{26,7}$(U) | 936.3 (10) | 0.00102 (17) | | | 0.00102 (17) |
| $\gamma_{10,2}$(U) | 941.96 (10) | 0.00253 (9) | [E2] | 0.01244 (18) | 0.00250 (9) |
| $\gamma_{8,1}$(U) | 945.961 (16) | 0.01064 (14) | (E1) | 0.00412 (6) | 0.01060 (14) |
| $\gamma_{25,5}$(U) | 960 (1) | 0.0009 (3) | | | 0.0009 (3) |
| $\gamma_{23,3}$(U) | 996.1 (20) | 0.0059 (17) | | | 0.0059 (17) |
| $\gamma_{9,1}$(U) | 1001.026 (18) | 0.856 (8) | E2 | 0.01107 (16) | 0.847 (8) |
| $\gamma_{10,1}$(U) | 1041.7 (1) | 0.00122 (8) | [E2,M1] | 0.023 (13) | 0.00119 (8) |
| $\gamma_{28,6}$(U) | 1059.4 (8) | 0.00111 (22) | | | 0.00111 (22) |
| $\gamma_{28,5}$(U) | 1061.86 (10) | 0.00224 (9) | | | 0.00224 (9) |
| $\gamma_{11,1}$(U) | 1081.9 (10) | 0.00094 (20) | (M1) | 0.0318 (5) | 0.00091 (19) |
| $\gamma_{10,0}$(U) | 1084.25 (10) | 0.00081 (40) | [E2] | 0.00952 (14) | 0.0008 (4) |
| $\gamma_{30,5}$(U) | 1120.6 (8) | 0.00173 (15) | | | 0.00173 (15) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{28,3}$(U) | 1124.93 (10) | 0.00347 (9) | | | 0.00347 (9) |
| $\gamma_{11,0}$(U) | 1124.93 (10) | 0.00039 (9) | [E2] | 0.00888 (13) | 0.00039 (9) |
| $\gamma_{12,0}$(U) | 1174.2 (10) | 0.00192 (19) | | | 0.00192 (19) |
| $\gamma_{13,1}$(U) | 1193.77 (3) | 0.01363 (18) | E1 | 0.00277 (4) | 0.01359 (18) |
| $\gamma_{-1,6}$(U) | 1220.37 (10) | | | | 0.00091 (9) |
| $\gamma_{13,0}$(U) | 1237.28 (10) | 0.00529 (11) | E1 | 0.00262 (4) | 0.00528 (11) |
| $\gamma_{-1,7}$(U) | 1353.0 (15) | | | | 0.0015 (5) |
| $\gamma_{14,1}$(U) | 1392.6 (9) | 0.0029 (11) | E1 | 0.00221 (4) | 0.0029 (11) |
| $\gamma_{15,1}$(U) | 1413.89 (10) | 0.00229 (8) | [E1] | 0.00217 (3) | 0.00229 (8) |
| $\gamma_{14,0}$(U) | 1434.16 (10) | 0.00975 (16) | E1 | 0.00213 (3) | 0.00973 (16) |
| $\gamma_{16,1}$(U) | 1458.5 (15) | 0.0019 (5) | | | 0.0019 (5) |
| $\gamma_{16,0}$(U) | 1501 (2) | 0.0013 | | | 0.0013 |
| $\gamma_{17,1}$(U) | 1510.22 (10) | 0.01308 (19) | | | 0.01308 (19) |
| $\gamma_{18,1}$(U) | 1527.28 (10) | 0.00237 (8) | M1+E2 | 0.009 (4) | 0.00235 (8) |
| $\gamma_{19,1}$(U) | 1550.1 (10) | 0.00137 (15) | | | 0.00137 (15) |
| $\gamma_{17,0}$(U) | 1553.77 (10) | 0.00826 (14) | | | 0.00826 (14) |
| $\gamma_{20,1}$(U) | 1558.4 (10) | 0.00074 (9) | M1 | 0.01228 (18) | 0.00073 (9) |
| $\gamma_{18,0}$(U) | 1570.67 (10) | 0.00111 (8) | M1 | 0.01204 (17) | 0.00110 (8) |
| $\gamma_{19,0}$(U) | 1593.5 (6) | 0.00235 (12) | | | 0.00235 (12) |
| $\gamma_{20,0}$(U) | 1601.8 (15) | 0.00048 (22) | (M1) | 0.01146 (17) | 0.00047 (22) |
| $\gamma_{21,0}$(U) | 1667.6 (10) | 0.00118 (6) | | | 0.00118 (6) |
| $\gamma_{22,0}$(U) | 1694.1 (10) | 0.00038 (2) | | | 0.00038 (2) |
| $\gamma_{-1,8}$(U) | 1720.5 (15) | | | | 0.00033 (15) |
| $\gamma_{-1,9}$(U) | 1732.2 (15) | | | | 0.0019 (3) |
| $\gamma_{23,1}$(U) | 1737.77 (10) | 0.0214 (3) | | | 0.0214 (3) |
| $\gamma_{-1,10}$(U) | 1759.81 (10) | | | | 0.00146 (5) |
| $\gamma_{25,1}$(U) | 1765.44 (10) | 0.0084 (6) | | | 0.0084 (6) |
| $\gamma_{24,0}$(U) | 1796.3 (9) | 0.00031 (5) | | | 0.00031 (5) |
| $\gamma_{25,0}$(U) | 1809.05 (10) | 0.00376 (7) | | | 0.00376 (7) |
| $\gamma_{26,1}$(U) | 1819.69 (10) | 0.00089 (5) | | | 0.00089 (5) |
| $\gamma_{27,1}$(U) | 1831.37 (10) | 0.01759 (23) | | | 0.01759 (23) |
| $\gamma_{26,0}$(U) | 1863.09 (10) | 0.00120 (5) | | | 0.00120 (5) |
| $\gamma_{28,1}$(U) | 1867.7 (1) | 0.00932 (12) | | | 0.00932 (12) |
| $\gamma_{27,0}$(U) | 1874.9 (1) | 0.00819 (14) | | | 0.00819 (14) |
| $\gamma_{29,1}$(U) | 1893.51 (11) | 0.00218 (6) | | | 0.00218 (6) |
| $\gamma_{28,0}$(U) | 1911.20 (11) | 0.00628 (9) | | | 0.00628 (9) |
| $\gamma_{30,1}$(U) | 1926.5 (10) | 0.00045 (4) | | | 0.00045 (4) |
| $\gamma_{29,0}$(U) | 1937.01 (13) | 0.00285 (5) | | | 0.00285 (5) |
| $\gamma_{30,0}$(U) | 1970.3 (8) | 0.00041 (4) | | | 0.00041 (4) |
| $\gamma_{-1,11}$(U) | 2022.24 (12) | | | | 0.000186 (3) |
| $\gamma_{-1,12}$(U) | 2041.23 (13) | | | | 0.00011 (1) |
| $\gamma_{-1,13}$(U) | 2065.80 (13) | | | | 0.00007 |
| $\gamma_{-1,14}$(U) | 2093.19 (38) | | | | 0.00002 |
| $\gamma_{-1,15}$(U) | 2102.14 (15) | | | | 0.00006 |
| $\gamma_{-1,16}$(U) | 2136.69 (14) | | | | 0.00007 |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 70.6 | (11) | y |
| $Q_\alpha$ | : | 5413.63 | (9) | keV |
| $\alpha$ | : | 100 | | % |
| $^{24}Ne$ | : | 5 | (3) | $\times 10^{-10}$ % |
| $SF$ | : | 2.8 | (6) | $\times 10^{-12}$ % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,8}$ | 4460.86 (9) | 0.0000033 (9) |
| $\alpha_{0,7}$ | 4502.77 (9) | 0.0000214 (16) |
| $\alpha_{0,6}$ | 4810.01 (9) | 0.000054 (4) |
| $\alpha_{0,5}$ | 4931.00 (9) | 0.000048 (4) |
| $\alpha_{0,4}$ | 4948.59 (9) | 0.000051 (6) |
| $\alpha_{0,3}$ | 4997.90 (9) | 0.00622 (9) |
| $\alpha_{0,2}$ | 5136.64 (9) | 0.325 (6) |
| $\alpha_{0,1}$ | 5263.48 (9) | 30.6 (6) |
| $\alpha_{0,0}$ | 5320.24 (9) | 69.1 (6) |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $e_{AL}$ | (Th) | 5.8 - 20.3 | 11.62 (22) |
| $e_{AK}$ | (Th) | | 0.00057 (8) |
| | KLL | 68.406 - 76.745 | } |
| | KLX | 83.857 - 93.345 | } |
| | KXY | 99.29 - 109.64 | } |
| $ec_{2,1\ K}$ | (Th) | 19.414 (6) | 0.01811 (33) |
| $ec_{2,1\ L}$ | (Th) | 108.592 - 112.800 | 0.1742 (33) |
| $ec_{2,1\ M}$ | (Th) | 123.882 - 125.732 | 0.0478 (8) |
| $ec_{2,1\ N}$ | (Th) | 127.730 - 128.729 | 0.01283 (24) |
| $ec_{1,0\ L}$ | (Th) | 37.28 - 41.50 | 22.4 (6) |
| $ec_{1,0\ M}$ | (Th) | 52.57 - 54.42 | 6.14 (16) |
| $ec_{1,0\ N}$ | (Th) | 56.420 - 57.417 | 1.646 (41) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Th) | 11.1177 — 19.5043 | | 11.00 (24) | |
| XK$\alpha_2$ | (Th) | 89.954 | | 0.00524 (11) | } K$\alpha$ |
| XK$\alpha_1$ | (Th) | 93.351 | | 0.00847 (16) | } |
| XK$\beta_3$ | (Th) | 104.819 | } | | |
| XK$\beta_1$ | (Th) | 105.604 | } | 0.00301 (7) | K$\beta_1'$ |
| XK$\beta_5''$ | (Th) | 106.239 | } | | |
| XK$\beta_2$ | (Th) | 108.509 | } | | |
| XK$\beta_4$ | (Th) | 108.955 | } | 0.001016 (29) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Th) | 109.442 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Th) | 57.752 (13) | 30.8 (8) | E2 | 153.2 (22) | 0.200 (4) |
| $\gamma_{2,1}$(Th) | 129.065 (3) | 0.325 (5) | E2 | 3.74 (6) | 0.0686 (7) |
| $\gamma_{6,4}$(Th) | 140.999 (20) | 0.0000038 (16) | E1 | 0.217 (3) | 0.0000031 (13) |
| $\gamma_{4,2}$(Th) | 191.351 (11) | 0.000055 (5) | E2 | 0.776 (11) | 0.000031 (3) |
| $\gamma_{5,2}$(Th) | 209.252 (6) | 0.0000119 (33) | E1 | 0.0848 (12) | 0.000011 (3) |
| $\gamma_{3,1}$(Th) | 270.245 (7) | 0.00332 (7) | E1 | 0.0470 (7) | 0.00317 (7) |
| $\gamma_{3,0}$(Th) | 328.004 (7) | 0.00292 (7) | E1 | 0.0305 (5) | 0.00283 (7) |
| $\gamma_{6,2}$(Th) | 332.371 (6) | 0.0000505 (31) | E1 | 0.0297 (5) | 0.000049 (3) |
| $\gamma_{5,1}$(Th) | 338.320 (5) | 0.0000381 (19) | E1 | 0.0285 (4) | 0.0000370 (18) |
| $\gamma_{8,5}$(Th) | 478.41 (5) | 0.0000014 (6) | E1 | 0.01379 (20) | 0.0000014 (6) |
| $\gamma_{7,3}$(Th) | 503.819 (23) | 0.0000147 (9) | E1 | 0.01243 (18) | 0.0000145 (9) |
| $\gamma_{8,3}$(Th) | 546.454 (21) | 0.0000010 (6) | E1 | 0.01058 (15) | 0.0000010 (6) |
| $\gamma_{7,1}$(Th) | 774.05 (9) | 0.0000048 (8) | E2 | 0.01649 (23) | 0.0000047 (8) |
| $\gamma_{8,1}$(Th) | 816.62 (700) | 0.00000083 (31) | M1+E2 | 0.0359 (5) | 0.0000008 (3) |
| $\gamma_{7,0}$(Th) | 831.823 (10) | 0.000002 (1) | E0 | | |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 159.1 | (2) | $\times 10^{3}$ y |
| $Q_{\alpha}$ | : | 4908.5 | (12) | keV |
| $\alpha$ | : | 100 | | % |
| $^{24}Ne$ | : | 7.2 | (7) | $\times 10^{-11}$ % |
| $SF$ | : | <6 | | $\times 10^{-11}$ % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,52}$ | 4087.3 (12) | 0.0000144 (21) |
| $\alpha_{0,43}$ | 4309 (2) | 0.0009 |
| $\alpha_{0,38}$ | 4404 (2) | 0.0003 |
| $\alpha_{0,37}$ | 4411 (2) | 0.0004 |
| $\alpha_{0,35}$ | 4457 (2) | 0.0028 |
| $\alpha_{0,34}$ | 4465 (2) | 0.003 |
| $\alpha_{0,32}$ | 4483 (2) | 0.0014 |
| $\alpha_{0,31}$ | 4503 (2) | 0.001 |
| $\alpha_{0,30}$ | 4507 (2) | 0.012 |
| $\alpha_{0,29}$ | 4513 (2) | 0.018 |
| $\alpha_{0,26}$ | 4538 (2) | 0.004 |
| $\alpha_{0,24}$ | 4565 (2) | 0.0023 |
| $\alpha_{0,21}$ | 4590 (2) | 0.007 |
| $\alpha_{0,19}$ | 4611 (2) | 0.006 |
| $\alpha_{0,18}$ | 4615 (2) | 0.004 |
| $\alpha_{0,17}$ | 4634 (2) | 0.01 |
| $\alpha_{0,16}$ | 4641 (2) | 0.003 |
| $\alpha_{0,15}$ | 4656 (2) | 0.005 |
| $\alpha_{0,13}$ | 4664 (2) | 0.042 |
| $\alpha_{0,11}$ | 4681 (2) | 0.01 |
| $\alpha_{0,10}$ | 4687 (2) | 0.0028 |
| $\alpha_{0,9}$ | 4701 (2) | 0.06 |
| $\alpha_{0,8}$ | 4729 (2) | 1.61 |
| $\alpha_{0,7}$ | 4751 (2) | 0.01 |
| $\alpha_{0,6}$ | 4754 (2) | 0.163 |
| $\alpha_{0,5}$ | 4758 (2) | 0.016 |
| $\alpha_{0,4}$ | 4783.5 (12) | 13.2 (2) |
| $\alpha_{0,3}$ | 4796 (2) | 0.28 |
| $\alpha_{0,0}$ | 4824.2 (12) | 84.3 (6) |

## 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Th) | 5.8 - 20.3 | | 0.01066 (20) |
| $e_{AK}$ | (Th) | | | 0.00076 (10) |
| | KLL | 68.406 - 76.745 | } | |
| | KLX | 83.857 - 93.345 | } | |
| | KXY | 99.29 - 109.64 | } | |
| $ec_{8,6\ L}$ | (Th) | 4.839 - 9.000 | | 0.339 (20) |
| $ec_{4,3\ M}$ | (Th) | 8.062 - 9.912 | | 0.64 (32) |
| $ec_{3,1\ L}$ | (Th) | 8.713 - 12.900 | | 1.31 (17) |
| $ec_{3,0\ L}$ | (Th) | 8.718 - 12.900 | | 0.29 (5) |
| $ec_{6,4\ L}$ | (Th) | 8.919 - 13.100 | | 0.083 (15) |
| $ec_{4,3\ N}$ | (Th) | 11.910 - 12.909 | | 0.17 (9) |
| $ec_{13,9\ L}$ | (Th) | 17.352 - 21.500 | | 0.0123 (20) |
| $ec_{8,6\ M}$ | (Th) | 20.129 - 21.979 | | 0.0821 (48) |
| $ec_{4,1\ L}$ | (Th) | 21.955 - 26.100 | | 0.090 (25) |
| $ec_{4,0\ L}$ | (Th) | 21.963 - 26.100 | | 19 (17) |
| $ec_{6,3\ L}$ | (Th) | 22.161 - 26.300 | | 0.457 (25) |
| $ec_{3,1\ M}$ | (Th) | 24.003 - 25.853 | | 0.332 (43) |
| $ec_{3,0\ M}$ | (Th) | 24.008 - 25.858 | | 0.069 (13) |
| $ec_{6,4\ M}$ | (Th) | 24.209 - 26.059 | | 0.0200 (35) |
| $ec_{3,0\ N}$ | (Th) | 27.860 - 28.855 | | 0.0184 (34) |
| $ec_{9,6\ L}$ | (Th) | 33.14 - 37.30 | | 0.0612 (33) |
| $ec_{8,4\ L}$ | (Th) | 34.229 - 38.400 | | 1.3 (12) |
| $ec_{4,1\ M}$ | (Th) | 37.245 - 39.095 | | 0.025 (7) |
| $ec_{4,0\ M}$ | (Th) | 37.253 - 39.103 | | 5 (5) |
| $ec_{6,3\ M}$ | (Th) | 37.451 - 39.301 | | 0.110 (6) |
| $ec_{6,3\ N}$ | (Th) | 41.300 - 42.298 | | 0.0293 (16) |
| $ec_{13,8\ L}$ | (Th) | 45.646 - 49.800 | | 0.036 (27) |
| $ec_{8,3\ L}$ | (Th) | 47.474 - 51.600 | | 0.0164 (12) |
| $ec_{9,6\ M}$ | (Th) | 48.43 - 50.28 | | 0.0147 (8) |
| $ec_{8,4\ M}$ | (Th) | 49.519 - 51.369 | | 0.37 (30) |
| $ec_{6,1\ L}$ | (Th) | 51.346 - 55.500 | | 0.071 (6) |
| $ec_{6,0\ L}$ | (Th) | 51.354 - 55.500 | | 0.0109 (11) |
| $ec_{8,4\ N}$ | (Th) | 53.370 - 54.366 | | 0.10 (8) |
| $ec_{13,8\ M}$ | (Th) | 60.936 - 62.786 | | 0.010 (7) |
| $ec_{6,1\ M}$ | (Th) | 66.636 - 68.486 | | 0.0196 (15) |
| $ec_{8,0\ L}$ | (Th) | 76.664 - 80.800 | | 0.192 (10) |
| $ec_{8,0\ M}$ | (Th) | 91.954 - 93.804 | | 0.0526 (27) |
| $ec_{8,0\ N}$ | (Th) | 95.810 - 96.801 | | 0.0141 (7) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Th) | 11.1177 — 19.5043 | | 0.00936 (21) | |
| $XK\alpha_2$ | (Th) | 89.954 | | 0.00700 (18) | } $K\alpha$ |
| $XK\alpha_1$ | (Th) | 93.351 | | 0.01133 (28) | } |
| $XK\beta_3$ | (Th) | 104.819 | } | | |
| $XK\beta_1$ | (Th) | 105.604 | } | 0.00403 (12) | $K\beta_1'$ |
| $XK\beta_5''$ | (Th) | 106.239 | } | | |
| $XK\beta_2$ | (Th) | 108.509 | } | | |
| $XK\beta_4$ | (Th) | 108.955 | } | 0.00136 (5) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Th) | 109.442 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Th) | 0.0076 | 2.1 | | | 2.1 |
| $\gamma_{4,3}$(Th) | 13.244 | 0.86 (25) | (M1) | 358 (5) | 0.0024 (7) |
| $\gamma_{21,18}$(Th) | 25.02 (5) | 0.00056 (22) | (E1) | 4.57 (7) | 0.00010 (4) |
| $\gamma_{8,6}$(Th) | 25.3106 (8) | 0.452 (26) | | 213 (3) | 0.00211 (12) |
| $\gamma_{15,12}$(Th) | 25.3106 (8) | 0.0009 | (M1) | 213 (3) | 0.000004 |
| $\gamma_{15,11}$(Th) | 27.119 | 0.0123 | (E2) | 6130 (90) | 0.000002 |
| $\gamma_{9,8}$(Th) | 28.288 | 0.0056 (14) | (M1) | 153.4 (22) | 0.000036 (9) |
| $\gamma_{3,1}$(Th) | 29.1851 (4) | 1.76 (24) | | 225 (12) | 0.0078 (10) |
| $\gamma_{3,0}$(Th) | 29.19 | 0.38 (7) | M1 | 139.8 (20) | 0.0027 (5) |
| $\gamma_{6,4}$(Th) | 29.3911 (4) | 0.110 (19) | (M1) | 137 (2) | 0.00080 (14) |
| $\gamma_{17,13}$(Th) | 32.453 | 0.00165 (31) | (M1) | 102.3 (15) | 0.000016 (3) |
| $\gamma_{27,23}$(Th) | 32.52 (2) | 0.0018 (6) | (M1) | 101.7 (15) | 0.000018 (6) |
| $\gamma_{30,26}$(Th) | 32.73 (5) | 0.00316 (39) | (E1) | 2.26 (4) | 0.00097 (12) |
| $\gamma_{13,9}$(Th) | 37.80 (3) | 0.0166 (26) | (M1) | 65.2 (10) | 0.00025 (4) |
| $\gamma_{4,1}$(Th) | 42.431 | 0.123 (34) | (E2) | 684 (10) | 0.00018 (5) |
| $\gamma_{4,0}$(Th) | 42.4349 (2) | 9.4 (29) | M1+E2 | 400 (400) | 0.072 (4) |
| $\gamma_{6,3}$(Th) | 42.6333 (2) | 0.618 (33) | (M1) | 45.8 (7) | 0.0132 (7) |
| $\gamma_{23,18}$(Th) | 43.69 (3) | 0.0018 (6) | (M1) | 42.6 (6) | 0.000042 (14) |
| $\gamma_{32,28}$(Th) | 44.80 (2) | 0.00113 (36) | (M1) | 39.5 (6) | 0.000028 (9) |
| $\gamma_{22,17}$(Th) | 45.855 | 0.00034 (6) | (M1) | 36.9 (6) | 0.0000091 (16) |
| $\gamma_{26,21}$(Th) | 51.0 (3) | 0.0045 (42) | (M1+E2) | 150 (130) | 0.00003 (1) |
| $\gamma_{19,14}$(Th) | 52.60 (3) | 0.0026 (8) | (M1) | 24.7 (4) | 0.00010 (3) |
| $\gamma_{9,6}$(Th) | 53.6106 (11) | 0.0843 (44) | (M1) | 23.3 (4) | 0.00347 (18) |
| $\gamma_{8,4}$(Th) | 54.7039 (11) | 0.91 (8) | M1+E2 | 110 (90) | 0.0168 (8) |
| $\gamma_{21,15}$(Th) | 63.79 (6) | 0.00044 (17) | (M1) | 14.02 (20) | 0.000029 (11) |
| $\gamma_{28,21}$(Th) | 65.62 (5) | 0.000068 (14) | (E1) | 0.358 (5) | 0.00005 (1) |
| $\gamma_{13,8}$(Th) | 66.1183 (6) | 0.032 (10) | (M1+E2) | 50 (40) | 0.00106 (6) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{8,3}$(Th) | 67.9460 (5) | 0.0228 (16) | E2 | 70.2 (10) | 0.000320 (23) |
| $\gamma_{19,12}$(Th) | 68.81 (3) | 0.00122 (28) | (M1) | 11.23 (16) | 0.000100 (23) |
| $\gamma_{17,9}$(Th) | 70.2813 (13) | 0.0074 (5) | (M1+E2) | 11.74 (17) | 0.00058 (4) |
| $\gamma_{6,1}$(Th) | 71.812 (8) | 0.099 (8) | E2 | 53.8 (8) | 0.00181 (14) |
| $\gamma_{6,0}$(Th) | 71.8159 (20) | 0.0156 (16) | (M1+E2) | 12.49 (18) | 0.00116 (12) |
| $\gamma_{21,14}$(Th) | 72.825 | 0.0206 (15) | (E2) | 50.4 (7) | 0.00040 (3) |
| $\gamma_{11,6}$(Th) | 74.542 (5) | 0.00187 (10) | (E1) | 0.255 (4) | 0.00149 (8) |
| $\gamma_{12,6}$(Th) | 76.350 (4) | 0.000372 (37) | (E1) | 0.240 (4) | 0.00030 (3) |
| $\gamma_{15,8}$(Th) | 76.350 (4) | 0.000025 | (E1) | 0.240 (4) | 0.00002 |
| $\gamma_{39,33}$(Th) | 77.12 (3) | 0.000530 (49) | (E1) | 0.233 (4) | 0.00043 (4) |
| $\gamma_{22,13}$(Th) | 78.21 (5) | 0.00068 (11) | (M1+E2) | 14.45 (21) | 0.000044 (7) |
| $\gamma_{9,4}$(Th) | 83.0125 (20) | 0.00256 (35) | M1+E2 | 12.20 (17) | 0.000197 (22) |
| $\gamma_{30,20}$(Th) | 85.4221 (9) | 0.000141 (47) | (E1) | 0.1779 (25) | 0.00012 (4) |
| $\gamma_{31,22}$(Th) | 86.3 (3) | 0.000362 (29) | (M1+E2) | 8.52 (17) | 0.000038 (3) |
| $\gamma_{35,27}$(Th) | 86.3 (3) | 0.0023 (7) | (E2) | 22.5 (5) | 0.000099 (23) |
| $\gamma_{18,9}$(Th) | 87.25 (4) | 0.00197 (49) | (E2) | 21.4 (3) | 0.000088 (22) |
| $\gamma_{21,12}$(Th) | 89.39 (7) | 0.00162 (19) | (M1) | 5.24 (8) | 0.00026 (3) |
| $\gamma_{20,11}$(Th) | 89.9568 (24) | 0.00146 (15) | (M1) | 5.36 (9) | 0.000229 (23) |
| $\gamma_{21,11}$(Th) | 90.99 (1) | 0.00185 (24) | (M1) | 4.98 (7) | 0.00031 (4) |
| $\gamma_{13,6}$(Th) | 91.433 | 0.00074 (13) | (E2) | 17.14 (24) | 0.000041 (7) |
| $\gamma_{32,23}$(Th) | 92.23 (12) | 0.00019 (7) | (M1) | 4.79 (7) | 0.000033 (12) |
| $\gamma_{16,8}$(Th) | 92.85 (3) | 0.00026 (3) | | | 0.00026 (3) |
| $\gamma_{9,3}$(Th) | 96.22 (3) | 0.0246 (13) | E(2) | 13.49 (19) | 0.00170 (9) |
| $\gamma_{8,0}$(Th) | 97.1346 (3) | 0.282 (14) | E2 | 12.91 (18) | 0.0203 (10) |
| $\gamma_{24,14}$(Th) | 97.37 (4) | 0.0023 (7) | (E1) | 0.1259 (18) | 0.0020 (6) |
| $\gamma_{17,8}$(Th) | 98.565 | 0.00053 (9) | (M1+E2) | 4.50 (7) | 0.000097 (16) |
| $\gamma_{29,19}$(Th) | 99.95 (15) | 0.000021 (7) | (E1) | 0.1176 (18) | 0.000019 (6) |
| $\gamma_{15,6}$(Th) | 101.70 (5) | 0.000077 (17) | (E1) | 0.1123 (16) | 0.000069 (15) |
| $\gamma_{30,19}$(Th) | 103.73 (10) | 0.000070 (21) | (E1) | 0.1066 (16) | 0.000063 (19) |
| $\gamma_{21,9}$(Th) | 111.93 (1) | 0.000549 (41) | (E1) | 0.372 (6) | 0.00040 (3) |
| $\gamma_{26,15}$(Th) | 114.2 (2) | 0.00250 (31) | (M1) | 12.68 (19) | 0.000183 (23) |
| $\gamma_{39,30}$(Th) | 116.3 (2) | 0.000162 (31) | (E1) | 0.342 (5) | 0.000121 (23) |
| $\gamma_{22,9}$(Th) | 116.3 (2) | 0.000032 (6) | (E2) | 5.84 (10) | 0.0000047 (9) |
| $\gamma_{11,3}$(Th) | 117.162 (2) | 0.00383 (19) | E1 | 0.336 (5) | 0.00287 (14) |
| $\gamma_{12,3}$(Th) | 118.968 (5) | 0.00481 (24) | (E1) | 0.325 (5) | 0.00363 (18) |
| $\gamma_{13,4}$(Th) | 120.819 (2) | 0.0168 (9) | E2 | 4.95 (7) | 0.00282 (15) |
| $\gamma_{17,6}$(Th) | 123.886 (7) | 0.00392 (27) | (E2) | 4.45 (7) | 0.00072 (5) |
| $\gamma_{38,28}$(Th) | 125.04 (23) | 0.000108 (32) | (M1) | 9.83 (15) | 0.000010 (3) |
| $\gamma_{9,0}$(Th) | 125.43 (4) | 0.00027 (5) | E2 | 4.22 (6) | 0.000051 (10) |
| $\gamma_{28,15}$(Th) | 129.514 | 0.00007596 | (E1) | 0.266 (4) | 0.00006 |
| $\gamma_{15,4}$(Th) | 131.22 (8) | 0.0000219 (28) | (E1) | 0.257 (4) | 0.0000174 (22) |
| $\gamma_{31,17}$(Th) | 132.1 | 0.0000154 (31) | (E2) | 3.39 (6) | 0.0000035 (7) |
| $\gamma_{14,3}$(Th) | 135.3390 (5) | 0.00244 (12) | E1 | 0.239 (4) | 0.00197 (10) |
| $\gamma_{38,27}$(Th) | 139.3 (3) | 0.000170 (19) | (M1) | 7.24 (11) | 0.0000206 (23) |
| $\gamma_{35,20}$(Th) | 139.3 (3) | 0.000014676 | (E1) | 0.223 (4) | 0.000012 |
| $\gamma_{26,12}$(Th) | 139.722 (3) | 0.00074 (15) | (M1) | 7.17 (10) | 0.000090 (18) |
| $\gamma_{27,11}$(Th) | 141.95 (10) | 0.0000109 (18) | (E1) | 0.213 (3) | 0.0000090 (15) |
| $\gamma_{33,19}$(Th) | 142.69 (1) | 0.000041 (6) | (E1) | 0.211 (3) | 0.000034 (5) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{22,8}$(Th) | 144.42 (2) | 0.0010 (1) | E2 | 2.34 (4) | 0.00030 (3) |
| $\gamma_{19,6}$(Th) | 145.35 (2) | 0.00208 (8) | (E1) | 0.202 (3) | 0.00173 (7) |
| $\gamma_{11,1}$(Th) | 146.3462 (6) | 0.00779 (36) | (E1) | 0.198 (3) | 0.0065 (3) |
| $\gamma_{25,9}$(Th) | 146.9 (5) | 0.000116 (10) | | | 0.000116 (10) |
| $\gamma_{12,0}$(Th) | 148.20 (2) | 0.000474 (24) | (E1) | 0.193 (3) | 0.000397 (20) |
| $\gamma_{29,14}$(Th) | 152.62 (10) | 0.0000130 (35) | (E1) | 0.179 (3) | 0.000011 (3) |
| $\gamma_{17,4}$(Th) | 153.17 (4) | 0.000105 (9) | (E2) | 1.84 (3) | 0.000037 (3) |
| $\gamma_{28,12}$(Th) | 154.90 (3) | 0.000168 (9) | (E1) | 0.1732 (25) | 0.000143 (8) |
| $\gamma_{30,14}$(Th) | 156.19 (5) | 0.0000421 (35) | (E1) | 0.1698 (24) | 0.000036 (3) |
| $\gamma_{26,9}$(Th) | 162.45 (4) | 0.000062 (6) | (E1) | 0.1546 (22) | 0.000054 (5) |
| $\gamma_{31,13}$(Th) | 164.5 | 0.000622 (12) | (E2) | 1.385 (22) | 0.000261 (5) |
| $\gamma_{14,1}$(Th) | 164.5240 (5) | 0.00690 (34) | (E1) | 0.1500 (21) | 0.0060 (3) |
| $\gamma_{21,6}$(Th) | 165.61 (3) | 0.000467 (26) | (E1) | 0.1476 (21) | 0.000407 (23) |
| $\gamma_{43,33}$(Th) | 167.10 (7) | 0.0000165 (14) | | | 0.0000165 (14) |
| $\gamma_{29,12}$(Th) | 169.002 (5) | 0.000047 (7) | (E1) | 0.1407 (20) | 0.000041 (6) |
| $\gamma_{29,11}$(Th) | 170.809 (24) | 0.000114 (7) | (E1) | 0.1371 (20) | 0.000100 (6) |
| $\gamma_{30,12}$(Th) | 172.39 (10) | 0.0000259 (25) | (E1) | 0.1342 (19) | 0.0000228 (22) |
| $\gamma_{30,11}$(Th) | 174.192 (2) | 0.000192 (10) | (E1) | 0.1309 (19) | 0.000170 (9) |
| $\gamma_{28,9}$(Th) | 177.91 (16) | 0.000030 (6) | (M1) | 3.62 (6) | 0.0000066 (13) |
| $\gamma_{37,22}$(Th) | 184.1 (3) | 0.000042 (9) | (E2) | 0.897 (14) | 0.000022 (5) |
| $\gamma_{33,15}$(Th) | 185.76 (9) | 0.0000087 (23) | (E1) | 0.1124 (16) | 0.0000078 (21) |
| $\gamma_{19,3}$(Th) | 187.9670 (3) | 0.00207 (10) | (E1) | 0.1093 (16) | 0.00187 (9) |
| $\gamma_{37,21}$(Th) | 188.65 (6) | 0.0000277 (44) | (E1) | 0.1083 (16) | 0.000025 (4) |
| $\gamma_{34,15}$(Th) | 192.26 (4) | 0.0000397 (44) | (E1) | 0.1036 (15) | 0.000036 (4) |
| $\gamma_{28,8}$(Th) | 205.75 (6) | 0.000078 (8) | (M1) | 2.40 (4) | 0.0000228 (24) |
| $\gamma_{21,3}$(Th) | 208.179 (7) | 0.00249 (12) | (E1) | 0.0859 (12) | 0.00229 (11) |
| $\gamma_{36,15}$(Th) | 209.08 (8) | 0.000019 (3) | | | 0.000019 (3) |
| $\gamma_{38,19}$(Th) | 210.90 (8) | 0.0000148 (26) | (E1) | 0.0833 (12) | 0.0000137 (24) |
| $\gamma_{18,0}$(Th) | 212.36 (3) | 0.000416 (22) | (M1) | 2.20 (3) | 0.000130 (7) |
| $\gamma_{26,6}$(Th) | 216.07 (1) | 0.000669 (32) | (E1) | 0.0787 (11) | 0.00062 (3) |
| $\gamma_{19,1}$(Th) | 217.151 (4) | 0.00354 (17) | (E1) | 0.0778 (11) | 0.00328 (16) |
| $\gamma_{34,12}$(Th) | 217.8 (2) | 0.000003 | (E1) | 0.0773 (11) | 0.000003 |
| $\gamma_{34,11}$(Th) | 219.43 (2) | 0.000127 (6) | (E1) | 0.0759 (11) | 0.000118 (6) |
| $\gamma_{30,8}$(Th) | 223.37 (3) | 0.0000346 (43) | (E2) | 0.443 (7) | 0.000024 (3) |
| $\gamma_{39,18}$(Th) | 224.33 (19) | 0.00000139 (43) | (E1) | 0.0721 (11) | 0.0000013 (4) |
| $\gamma_{23,3}$(Th) | 226.2 (2) | 0.00020 (7) | (M1) | 1.84 (3) | 0.000070 (23) |
| $\gamma_{37,17}$(Th) | 230.17 (2) | 0.00015 (5) | (M1+E2) | 1.1 (7) | 0.000071 (5) |
| $\gamma_{34,9}$(Th) | 240.373 (3) | 0.00086 (5) | M1+E2 | 1.09 (6) | 0.000413 (22) |
| $\gamma_{29,6}$(Th) | 245.350 (1) | 0.00732 (40) | M1+E2 | 1.05 (4) | 0.00357 (18) |
| $\gamma_{30,6}$(Th) | 248.724 (1) | 0.00338 (17) | (M1) | 1.415 (20) | 0.00140 (7) |
| $\gamma_{23,0}$(Th) | 255.91 (2) | 0.000091 (6) | (M1) | 1.307 (19) | 0.0000393 (25) |
| $\gamma_{27,3}$(Th) | 259.31 (2) | 0.000350 (18) | (M1) | 1.260 (18) | 0.000155 (8) |
| $\gamma_{28,4}$(Th) | 260.53 (2) | 0.000229 (13) | (M1) | 1.244 (18) | 0.000102 (6) |
| $\gamma_{24,1}$(Th) | 261.957 (4) | 0.000495 (27) | M1+E2 | 0.78 (4) | 0.000278 (14) |
| $\gamma_{34,8}$(Th) | 268.675 (2) | 0.000448 (25) | M1+E2 | 0.82 (5) | 0.000246 (12) |
| $\gamma_{39,14}$(Th) | 272.39 (2) | 0.0000872 (49) | (E2) | 0.228 (4) | 0.000071 (4) |
| $\gamma_{28,3}$(Th) | 273.74 (5) | 0.0000323 (35) | (M1) | 1.085 (16) | 0.0000155 (17) |
| $\gamma_{29,4}$(Th) | 274.735 (1) | 0.000680 (41) | M1+E2 | 0.62 (5) | 0.000420 (22) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{30,4}$(Th) | 278.108 (2) | 0.00177 (10) | M1+E2 | 0.57 (4) | 0.00113 (6) |
| $\gamma_{33,7}$(Th) | 284.29 (11) | 0.0000093 (17) | (E1) | 0.0419 (6) | 0.0000089 (16) |
| $\gamma_{29,3}$(Th) | 288.0290 (9) | 0.00146 (37) | (M1+E2) | 0.6 (4) | 0.00091 (5) |
| $\gamma_{27,1}$(Th) | 288.50 (3) | 0.000227 (27) | (M1) | 0.938 (14) | 0.000117 (14) |
| $\gamma_{43,20}$(Th) | 291.355 (9) | 0.00062 (25) | | | 0.00062 (25) |
| $\gamma_{30,3}$(Th) | 291.355 (9) | 0.00755 (43) | M1+E2 | 0.63 (3) | 0.00463 (25) |
| $\gamma_{40,15}$(Th) | 291.93 (4) | 0.000102 (15) | | | 0.000102 (15) |
| $\gamma_{34,6}$(Th) | 293.996 (9) | 0.000231 (13) | M1 | 0.890 (13) | 0.000122 (7) |
| $\gamma_{28,0}$(Th) | 302.989 (4) | 0.000142 (7) | (M1) | 0.820 (12) | 0.000078 (4) |
| $\gamma_{45,24}$(Th) | 307.45 (19) | 0.0000075 (29) | (M1,E2) | 0.5 (4) | 0.0000050 (14) |
| $\gamma_{43,19}$(Th) | 309.49 (3) | 0.000083 (5) | | | 0.000083 (5) |
| $\gamma_{36,6}$(Th) | 310.71 (5) | 0.000038 (3) | | | 0.000038 (3) |
| $\gamma_{39,9}$(Th) | 311.76 (3) | 0.0000651 (41) | (E1) | 0.0341 (5) | 0.000063 (4) |
| $\gamma_{45,23}$(Th) | 313.45 (18) | 0.0000056 (11) | | | 0.0000056 (11) |
| $\gamma_{41,13}$(Th) | 315.39 (13) | 0.0000173 (26) | (M1) | 0.734 (11) | 0.0000100 (15) |
| $\gamma_{29,0}$(Th) | 317.169 (2) | 0.0097 (6) | M1+E2 | 0.371 (22) | 0.0071 (4) |
| $\gamma_{33,4}$(Th) | 317.169 (2) | 0.00047 (19) | (M1) | 0.723 (11) | 0.00027 (11) |
| $\gamma_{30,0}$(Th) | 320.547 (1) | 0.00371 (20) | M1+E2 | 0.334 (25) | 0.00278 (14) |
| $\gamma_{34,4}$(Th) | 323.381 (14) | 0.00099 (5) | M1+E2 | 0.280 (17) | 0.00077 (4) |
| $\gamma_{37,8}$(Th) | 328.758 (19) | 0.000112 (25) | (M1+E2) | 0.4 (3) | 0.000080 (4) |
| $\gamma_{34,3}$(Th) | 336.63 (1) | 0.000731 (44) | M1+E2 | 0.26 (4) | 0.00058 (3) |
| $\gamma_{39,8}$(Th) | 340.19 (8) | 0.0000026 (16) | (E1) | 0.0284 (4) | 0.0000025 (16) |
| $\gamma_{37,6}$(Th) | 354.04 (2) | 0.000079 (14) | (M1+E2) | 0.32 (22) | 0.000060 (4) |
| $\gamma_{33,0}$(Th) | 359.38 (4) | 0.0000074 (23) | (M1) | 0.513 (8) | 0.0000049 (15) |
| $\gamma_{47,22}$(Th) | 364.01 (12) | 0.0000064 (16) | | | 0.0000064 (16) |
| $\gamma_{34,0}$(Th) | 365.820 (3) | 0.00115 (6) | (M1) | 0.489 (7) | 0.00077 (4) |
| $\gamma_{44,14}$(Th) | 371.34 (9) | 0.0000021 (10) | (M1) | 0.469 (7) | 0.0000014 (7) |
| $\gamma_{35,0}$(Th) | 374.71 (20) | 0.0000055 (29) | (M1) | 0.458 (7) | 0.0000038 (20) |
| $\gamma_{41,8}$(Th) | 381.35 (8) | 0.0000056 (19) | (M1) | 0.437 (7) | 0.0000039 (13) |
| $\gamma_{37,4}$(Th) | 383.43 (3) | 0.000123 (18) | (M1+E2) | 0.26 (18) | 0.000096 (5) |
| $\gamma_{42,9}$(Th) | 387.86 (12) | 0.0000012 (3) | | | 0.0000012 (3) |
| $\gamma_{40,6}$(Th) | 393.60 (1) | 0.0000130 (12) | | | 0.0000130 (12) |
| $\gamma_{37,3}$(Th) | 396.62 (3) | 0.0000047 (11) | (E2) | 0.0762 (11) | 0.0000044 (10) |
| $\gamma_{49,20}$(Th) | 402.22 (2) | 0.0000072 (14) | | | 0.0000072 (14) |
| $\gamma_{45,14}$(Th) | 404.39 (5) | 0.00000133 (41) | (E1) | 0.0195 (3) | 0.0000013 (4) |
| $\gamma_{41,6}$(Th) | 406.58 (5) | 0.0000021 (5) | (M1) | 0.367 (6) | 0.0000015 (4) |
| $\gamma_{42,8}$(Th) | 416.31 (3) | 0.000012 (1) | | | 0.000012 (1) |
| $\gamma_{40,4}$(Th) | 423.09 (14) | 0.00000052 (14) | | | 0.00000052 (14) |
| $\gamma_{49,18}$(Th) | 425.46 (10) | 0.00000080 (14) | | | 0.00000080 (14) |
| $\gamma_{40,3}$(Th) | 436.23 (2) | 0.0000035 (9) | | | 0.0000035 (9) |
| $\gamma_{42,6}$(Th) | 441.53 (17) | 0.00000073 (22) | | | 0.00000073 (22) |
| $\gamma_{41,3}$(Th) | 449.520 (2) | 0.0000082 (10) | (M1) | 0.280 (4) | 0.0000064 (8) |
| $\gamma_{43,6}$(Th) | 455.48 (25) | 0.00000117 (21) | | | 0.00000117 (21) |
| $\gamma_{47,12}$(Th) | 456.87 (16) | 0.00000044 (21) | | | 0.00000044 (21) |
| $\gamma_{46,9}$(Th) | 459.81 (1) | 0.0000076 (11) | | | 0.0000076 (11) |
| $\gamma_{40,0}$(Th) | 465.37 (12) | 0.00000047 (23) | | | 0.00000047 (23) |
| $\gamma_{42,4}$(Th) | 471.06 (1) | 0.0000185 (18) | | | 0.0000185 (18) |
| $\gamma_{48,11}$(Th) | 474.41 (8) | 0.00000077 (11) | | | 0.00000077 (11) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{41,0}$(Th) | 478.64 (1) | 0.00001829 (16) | (M1) | 0.236 (4) | 0.00001480 (12) |
| $\gamma_{43,4}$(Th) | 484.34 (3) | 0.0000028 (12) | [M1] | 0.228 (4) | 0.0000023 (10) |
| $\gamma_{51,14}$(Th) | 500.40 (9) | 0.00000070 (23) | | | 0.00000070 (23) |
| $\gamma_{42,0}$(Th) | 513.20 (5) | 0.0000165 (21) | | | 0.0000165 (21) |
| $\gamma_{52,20}$(Th) | 514.81 (11) | 0.0000112 (18) | | | 0.0000112 (18) |
| $\gamma_{48,8}$(Th) | 523.68 (6) | 0.00000094 (24) | | | 0.00000094 (24) |
| $\gamma_{50,9}$(Th) | 531.54 (8) | 0.00000070 (23) | | | 0.00000070 (23) |
| $\gamma_{47,6}$(Th) | 533.53 (5) | 0.00000128 (25) | M1+E2 | 0.098 (14) | 0.00000117 (23) |
| $\gamma_{44,1}$(Th) | 536.44 (12) | 0.00000048 (23) | (E1) | 0.01098 (16) | 0.00000047 (23) |
| $\gamma_{49,8}$(Th) | 540.52 (6) | 0.00000164 (23) | | | 0.00000164 (23) |
| $\gamma_{46,4}$(Th) | 542.41 (13) | 0.00000047 (23) | | | 0.00000047 (23) |
| $\gamma_{50,8}$(Th) | 559.87 (18) | 0.00000023 | | | 0.00000023 |
| $\gamma_{47,4}$(Th) | 562.61 (6) | 0.0000015 (8) | M1+E2 | 0.075 (8) | 0.0000014 (7) |
| $\gamma_{45,0}$(Th) | 569.19 (2) | 0.0000041 (16) | M1+E2 | 0.063 (4) | 0.0000039 (15) |
| $\gamma_{47,3}$(Th) | 576.00 (7) | 0.00000096 (43) | M1+E2 | 0.064 (8) | 0.0000009 (4) |
| $\gamma_{48,4}$(Th) | 578.42 (2) | 0.0000034 (11) | | | 0.0000034 (11) |
| $\gamma_{46,0}$(Th) | 584.94 (16) | 0.00000023 | | | 0.00000023 |
| $\gamma_{48,3}$(Th) | 591.64 (7) | 0.00000070 (23) | | | 0.00000070 (23) |
| $\gamma_{47,0}$(Th) | 605.16 (1) | 0.0000051 (10) | M1+E2 | 0.072 (7) | 0.0000048 (9) |
| $\gamma_{49,3}$(Th) | 608.15 (5) | 0.00000047 (23) | | | 0.00000047 (23) |
| $\gamma_{50,4}$(Th) | 614.45 (7) | 0.00000070 (23) | | | 0.00000070 (23) |
| $\gamma_{48,0}$(Th) | 620.81 (3) | 0.0000015 (6) | | | 0.0000015 (6) |
| $\gamma_{50,3}$(Th) | 627.70 (8) | 0.00000047 (23) | | | 0.00000047 (23) |
| $\gamma_{49,0}$(Th) | 637.25 (10) | 0.00000023 | | | 0.00000023 |
| $\gamma_{52,8}$(Th) | 652.79 (19) | 0.00000023 | | | 0.00000023 |
| $\gamma_{50,0}$(Th) | 656.89 (5) | 0.000004 (1) | | | 0.000004 (1) |
| $\gamma_{51,0}$(Th) | 665.03 (10) | 0.00000023 | M1+E2 | 0.06 (4) | 0.00000023 |
| $\gamma_{52,4}$(Th) | 707.41 (2) | 0.0000020 (9) | | | 0.0000020 (9) |
| $\gamma_{52,3}$(Th) | 720.62 (11) | 0.00000047 (23) | | | 0.00000047 (23) |
| $\gamma_{52,0}$(Th) | 749.8 (9) | 0.00000047 (23) | | | 0.00000047 (23) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 2.455 | (6) | $\times 10^5$ y |
| $Q_\alpha$ | : | 4857.7 | (7) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | 1.6 | (2) | $\times 10^{-9}$ % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,5}$ | 4108.6 (7) | 0.000007 |
| $\alpha_{0,4}$ | 4150.6 (7) | 0.000026 |
| $\alpha_{0,3}$ | 4275.2 (7) | 0.00004 (1) |
| $\alpha_{0,2}$ | 4603.5 (7) | 0.210 (2) |
| $\alpha_{0,1}$ | 4722.4 (7) | 28.42 (2) |
| $\alpha_{0,0}$ | 4774.6 (7) | 71.37 (2) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Th) | 5.8 - 20.3 | | 10.8 (4) |
| $e_{AK}$ | (Th) | | | 0.00029 (5) |
| | KLL | 68.406 - 76.745 | } | |
| | KLX | 83.857 - 93.345 | } | |
| | KXY | 99.29 - 109.64 | } | |
| $ec_{1,0\ L}$ | (Th) | 32.7 - 36.9 | | 20.9 (12) |
| $ec_{1,0\ M}$ | (Th) | 48.0 - 49.9 | | 5.70 (32) |
| $ec_{1,0\ N}$ | (Th) | 51.9 - 52.9 | | 1.53 (9) |
| $ec_{2,1\ L}$ | (Th) | 100.4 - 104.6 | | 0.132 (12) |
| $ec_{2,1\ M}$ | (Th) | 115.7 - 117.6 | | 0.0363 (34) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Th) | 11.118 — 19.504 | | 10.2 (4) | |
| $XK\alpha_2$ | (Th) | 89.954 | | 0.00269 (25) | } $K\alpha$ |
| $XK\alpha_1$ | (Th) | 93.351 | | 0.0044 (4) | } |
| $XK\beta_3$ | (Th) | 104.819 | } | | |
| $XK\beta_1$ | (Th) | 105.604 | } | 0.00155 (15) | $K\beta_1'$ |
| $XK\beta_5''$ | (Th) | 106.239 | } | | |

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| $XK\beta_2$ | (Th) | 108.509 | } | | |
| $XK\beta_4$ | (Th) | 108.955 | } | 0.00052 (5) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Th) | 109.442 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Th) | 53.20 (2) | 28.7 (13) | E2+M3 | 228 (7) | 0.1253 (40) |
| $\gamma_{2,1}$(Th) | 120.90 (4) | 0.228 (48) | E2 | 4.92 (15) | 0.0386 (32) |
| $\gamma_{3,1}$(Th) | 454.96 (5) | 0.000025 (6) | E1 | 0.01526 (46) | 0.000025 (6) |
| $\gamma_{5,2}$(Th) | 503.5 (1) | 0.00000095 | [E2] | 0.0418 (13) | 0.00000095 |
| $\gamma_{3,0}$(Th) | 508.16 (5) | 0.0000152 (39) | E1 | 0.01221 (37) | 0.0000150 (39) |
| $\gamma_{4,1}$(Th) | 581.7 (1) | 0.000012 (5) | E2 | 0.0300 (9) | 0.000012 (5) |
| $\gamma_{5,1}$(Th) | 624.4 (1) | 0.00005 | E0+E2+M1 | 5.1 (20) | 0.00000082 |
| $\gamma_{4,0}$(Th) | 634.9 (1) | 0.000014 (7) | E0 | | |
| $\gamma_{5,0}$(Th) | 677.6 (1) | 0.000001 | [E2] | 0.0216 (6) | 0.000001 |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 704 | (1) | $\times 10^6$ y |
| $Q_\alpha$ | : | 4678.3 | (7) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | 7 | (2) | $\times 10^{-9}$ % |
| $Ne/Mg$ | : | ~1 | | $\times 10^{-13}$ % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,22}$ | 3976 (5) | ≈0.0011 |
| $\alpha_{0,21}$ | 4013.2 (8) | 0.0396 (10) |
| $\alpha_{0,20}$ | 4077.5 (7) | 0.016 (12) |
| $\alpha_{0,19}$ | 4152 (5) | 0.294 (13) |
| $\alpha_{0,18}$ | 4214.7 (19) | 5.95 (12) |
| $\alpha_{0,17}$ | 4219.5 (7) | 0.01732 (12) |
| $\alpha_{0,16}$ | 4227.6 (7) | 0.122 (6) |
| $\alpha_{0,15}$ | 4248 (5) | 0.069 (10) |
| $\alpha_{0,14}$ | 4266 (5) | 0.22 (3) |
| $\alpha_{0,13}$ | 4279.3 (7) | 0.0329 (5) |
| $\alpha_{0,12}$ | 4286.9 (7) | 0.065 (13) |
| $\alpha_{0,11}$ | 4302.1 (7) | 0.00959 (13) |
| $\alpha_{0,10}$ | 4322 (4) | 3.33 (6) |
| $\alpha_{0,9}$ | 4327.9 (7) | 0.405 (13) |
| $\alpha_{0,8}$ | 4361.9 (7) | 0.206 (21) |
| $\alpha_{0,7}$ | 4366.1 (20) | 18.80 (13) |
| $\alpha_{0,6}$ | 4381.1 (7) | 0.106 (16) |
| $\alpha_{0,5}$ | 4397.8 (13) | 57.19 (20) |
| $\alpha_{0,4}$ | 4414.9 (5) | 3.01 (16) |
| $\alpha_{0,3}$ | 4437.9 (40) | 0.236 (25) |
| $\alpha_{0,2}$ | 4502.4 (7) | 1.28 (5) |
| $\alpha_{0,1}$ | 4556.0 (4) | 3.79 (6) |
| $\alpha_{0,0}$ | 4596.4 (13) | 4.74 (6) |

## 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Th) | 5.8 - 20.3 | | 24 (3) |
| $e_{AK}$ | (Th) | | | 0.381 (9) |
| | KLL | 68.406 - 76.745 | } | |
| | KLX | 83.857 - 93.345 | } | |
| | KXY | 99.29 - 109.64 | } | |
| $ec_{7,5\ L}$ | (Th) | 11.117 - 15.300 | | 8.3 (29) |
| $ec_{10,7\ L}$ | (Th) | 20.6 - 24.8 | | 1.09 (42) |

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $ec_{1,0\ L}$ | (Th) | 21.484 - 25.700 | 18.2 (32) |
| $ec_{7,5\ M}$ | (Th) | 26.407 - 28.257 | 2.2 (8) |
| $ec_{7,5\ N}$ | (Th) | 30.260 - 31.254 | 0.60 (23) |
| $ec_{7,4\ L}$ | (Th) | 30.709 - 34.900 | 6.8 (14) |
| $ec_{9,6\ L}$ | (Th) | 33.602 - 37.800 | 0.1771 (34) |
| $ec_{10,7\ M}$ | (Th) | 35.9 - 37.8 | 0.26 (10) |
| $ec_{1,0\ M}$ | (Th) | 36.774 - 38.624 | 4.9 (9) |
| $ec_{10,7\ N}$ | (Th) | 39.8 - 40.8 | 0.070 (27) |
| $ec_{1,0\ N}$ | (Th) | 40.630 - 41.621 | 1.32 (23) |
| $ec_{19,18\ L}$ | (Th) | 43.87 - 48.00 | 0.1850 (27) |
| $ec_{7,4\ M}$ | (Th) | 45.999 - 47.849 | 1.87 (39) |
| $ec_{9,6\ M}$ | (Th) | 48.892 - 50.742 | 0.0484 (8) |
| $ec_{7,4\ N}$ | (Th) | 49.850 - 50.846 | 0.5 (1) |
| $ec_{9,6\ N}$ | (Th) | 52.740 - 53.739 | 0.01296 (22) |
| $ec_{19,18\ M}$ | (Th) | 59.16 - 61.01 | 0.0445 (7) |
| $ec_{19,18\ N}$ | (Th) | 63.01 - 64.01 | 0.01188 (18) |
| $ec_{2,0\ L}$ | (Th) | 75.66 - 79.80 | 0.90 (11) |
| $ec_{4,0\ K}$ | (Th) | 76.072 (4) | 5.06 (8) |
| $ec_{2,0\ M}$ | (Th) | 90.95 - 92.80 | 0.248 (30) |
| $ec_{2,0\ N}$ | (Th) | 94.8 - 95.8 | 0.067 (8) |
| $ec_{4,0\ L}$ | (Th) | 165.25 - 169.40 | 1.020 (18) |
| $ec_{4,0\ M}$ | (Th) | 180.54 - 182.39 | 0.2468 (37) |
| $ec_{4,0\ N}$ | (Th) | 184.390 - 185.387 | 0.0651 (10) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. | |
|---|---|---|---|---|
| XL | (Th) | 11.1177 — 19.5043 | 22 (3) | |
| $XK\alpha_2$ | (Th) | 89.954 | 3.56 (9) | } $K\alpha$ |
| $XK\alpha_1$ | (Th) | 93.351 | 5.76 (14) | } |
| $XK\beta_3$ | (Th) | 104.819 } | | |
| $XK\beta_1$ | (Th) | 105.604 } | 2.06 (5) | $K\beta_1'$ |
| $XK\beta_5''$ | (Th) | 106.239 } | | |
| $XK\beta_2$ | (Th) | 108.509 } | | |
| $XK\beta_4$ | (Th) | 108.955 } | 0.685 (18) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Th) | 109.442 } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{7,5}$(Th) | 31.60 (5) | 11.4 (40) | M1+E2 | 667 | 0.017 (6) |
| $\gamma_{10,7}$(Th) | 41.4 (3) | 1.5 (6) | [M1] | 49.9 (13) | 0.029 (11) |
| $\gamma_{1,0}$(Th) | 42.01 (6) | 24.7 (43) | M1+E2 | 440 (30) | 0.056 (9) |
| $\gamma_{7,4}$(Th) | 51.21 (4) | 9.4 (19) | [E2] | 274 (4) | 0.034 (7) |
| $\gamma_{9,6}$(Th) | 54.1 (1) | 0.24 | [E2] | 210 (4) | 0.00115 |
| $\gamma_{2,1}$(Th) | 54.25 (5) | 2.1 | [M1+E2] | 71 (3) | 0.0285 |
| $\gamma_{19,18}$(Th) | 64.45 (5) | 0.26 | [M1] | 13.6 (2) | 0.018 |
| $\gamma_{10,5}$(Th) | 72.7 (2) | 1.86 | M1+E2 | 15 (3) | 0.116 |
| $\gamma_{7,3}$(Th) | 74.94 (3) | 0.064 (8) | [E1] | 0.252 (4) | 0.051 (6) |
| $\gamma_{2,0}$(Th) | 96.09 (2) | 1.33 (16) | [E2] | 13.58 (19) | 0.091 (11) |
| $\gamma_{14,7}$(Th) | 97 (4) | 0.22 (7) | [E2] | 13 (3) | 0.016 (4) |
| $\gamma_{5,2}$(Th) | 109.19 (7) | 1.81 (14) | [E1] | 0.0932 (14) | 1.66 (13) |
| $\gamma_{10,3}$(Th) | 115.45 (5) | 0.040 (13) | [E1] | 0.348 (5) | 0.03 (1) |
| $\gamma_{3,1}$(Th) | 120.35 (5) | 0.31 | [M1] | 10.95 (16) | 0.026 |
| $\gamma_{16,8}$(Th) | 136.55 (5) | 0.103 | [M1] | 7.66 (11) | 0.012 |
| $\gamma_{7,2}$(Th) | 140.76 (2) | 0.244 (12) | [E1] | 0.218 (3) | 0.20 (1) |
| $\gamma_{20,18}$(Th) | 142.40 (5) | 0.018 | [E2] | 2.48 (4) | 0.0051 |
| $\gamma_{4,1}$(Th) | 143.767 (3) | 13.20 (8) | E1 | 0.207 (3) | 10.94 (6) |
| $\gamma_{18,7}$(Th) | 150.936 (15) | 0.61 (20) | [M1] | 5.76 (8) | 0.09 (3) |
| $\gamma_{5,1}$(Th) | 163.356 (3) | 5.855 (36) | (E1) | 0.1526 (22) | 5.08 (3) |
| $\gamma_{16,5}$(Th) | 173 (1) | 0.007 (6) | [E1] | 0.133 (3) | 0.006 (5) |
| $\gamma_{18,5}$(Th) | 182.62 (5) | 1.70 (22) | [M1] | 3.36 (5) | 0.39 (5) |
| $\gamma_{4,0}$(Th) | 185.720 (4) | 63.41 (35) | E1 | 0.1124 (16) | 57.0 (3) |
| $\gamma_{7,1}$(Th) | 194.940 (6) | 0.693 (11) | [E1] | 0.1002 (14) | 0.63 (1) |
| $\gamma_{8,1}$(Th) | 198.894 (14) | 0.131 (7) | M1 | 2.64 (4) | 0.036 (2) |
| $\gamma_{18,4}$(Th) | 202.12 (1) | 3.81 (8) | [M1] | 2.53 (4) | 1.08 (2) |
| $\gamma_{5,0}$(Th) | 205.316 (4) | 5.465 (33) | (E1) | 0.0887 (13) | 5.02 (3) |
| $\gamma_{19,7}$(Th) | 215.28 (4) | 0.090 (9) | [M1] | 2.12 (3) | 0.029 (3) |
| $\gamma_{6,0}$(Th) | 221.386 (14) | 0.349 (15) | M1 | 1.96 (3) | 0.118 (5) |
| $\gamma_{13,2}$(Th) | 228.76 (5) | 0.021 | M1 | 1.79 (3) | 0.0074 |
| $\gamma_{9,1}$(Th) | 233.50 (2) | 0.102 (11) | M1 | 1.687 (24) | 0.038 (4) |
| $\gamma_{8,0}$(Th) | 240.88 (4) | 0.181 (19) | M1(+E2) | 1.45 (22) | 0.074 (4) |
| $\gamma_{19,5}$(Th) | 246.83 (2) | 0.134 (7) | [M1] | 1.445 (21) | 0.055 (3) |
| $\gamma_{15,2}$(Th) | 255.365 (10) | 0.017 | M1 | 1.315 (19) | 0.0074 |
| $\gamma_{19,4}$(Th) | 266.47 (4) | 0.0097 (7) | [E2] | 0.245 (4) | 0.0078 (6) |
| $\gamma_{12,1}$(Th) | 275.35 (15) | 0.094 (11) | M1+E2 | 0.84 (6) | 0.051 (6) |
| $\gamma_{9,0}$(Th) | 275.49 (6) | 0.065 | M1(+E2) | 1.02 (12) | 0.032 |
| $\gamma_{16,2}$(Th) | 281.42 (5) | 0.013 | M1 | 1.005 (14) | 0.0063 |
| $\gamma_{13,1}$(Th) | 282.94 (5) | 0.013 | [M1] | 0.990 (14) | 0.0063 |
| $\gamma_{17,2}$(Th) | 289.56 (4) | 0.0142 | [M1] | 0.929 (13) | 0.0074 |
| $\gamma_{18,2}$(Th) | 291.65 (3) | 0.042 (6) | [E1] | 0.0396 (6) | 0.040 (6) |
| $\gamma_{11,0}$(Th) | 301.7 (1) | 0.01 | M1 | 0.829 (12) | 0.0053 |
| $\gamma_{15,1}$(Th) | 310.69 (6) | 0.011 | (E2) | 0.1517 (22) | 0.0094 |
| $\gamma_{12,0}$(Th) | 317.10 (8) | 0.0019 | M1 | 0.723 (11) | 0.0011 |
| $\gamma_{17,1}$(Th) | 343.5 (2) | 0.0032 | | | 0.0032 |
| $\gamma_{18,1}$(Th) | 345.92 (3) | 0.041 (6) | [E1] | 0.0272 (4) | 0.040 (6) |
| $\gamma_{15,0}$(Th) | 350 (5) | 0.009 | M1 | 0.552 (24) | 0.006 |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{19,2}$(Th) | 356.03 (5) | 0.0054 | [E1] | 0.0255 (4) | 0.0053 |
| $\gamma_{18,0}$(Th) | 387.84 (3) | 0.041 (6) | [E1] | 0.0213 (3) | 0.040 (6) |
| $\gamma_{21,5}$(Th) | 390.27 (20) | 0.040 (1) | | | 0.040 (1) |
| $\gamma_{19,1}$(Th) | 410.29 (4) | 0.0033 | [E1] | 0.0189 (3) | 0.0032 |
| $\gamma_{22,4}$(Th) | 448.40 (6) | 0.0011 | | | 0.0011 |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 23.43 | (6) | $\times 10^6$ y |
| $Q_\alpha$ | : | 4573.1 | (9) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | ~9 | | $\times 10^{-8}$ % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,3}$ | 4168 | 0.00014 (5) |
| $\alpha_{0,2}$ | 4332 (8) | 0.149 (22) |
| $\alpha_{0,1}$ | 4445 (5) | 26.1 (40) |
| $\alpha_{0,0}$ | 4494 (3) | 73.8 (40) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Th) | 5.8 - 20.3 | | 10.1 (12) |
| $e_{AK}$ | (Th) | | | 0.000139 (30) |
| | KLL | 68.406 - 76.745 | } | |
| | KLX | 83.857 - 93.345 | } | |
| | KXY | 99.29 - 109.64 | } | |
| $ec_{1,0\ L}$ | (Th) | 28.99 - 33.20 | | 19.2 (29) |
| $ec_{1,0\ M}$ | (Th) | 44.28 - 46.13 | | 5.3 (8) |
| $ec_{1,0\ N}$ | (Th) | 48.13 - 49.12 | | 1.41 (21) |
| $ec_{2,1\ L}$ | (Th) | 92.32 - 96.50 | | 0.092 (15) |
| $ec_{2,1\ M}$ | (Th) | 107.61 - 109.46 | | 0.0253 (41) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Th) | 11.118 — 19.599 | | 9.4 (10) | |
| XK$\alpha_2$ | (Th) | 89.954 | | 0.00128 (22) | } K$\alpha$ |
| XK$\alpha_1$ | (Th) | 93.351 | | 0.0021 (4) | } |
| XK$\beta_3$ | (Th) | 104.819 | } | | |
| XK$\beta_1$ | (Th) | 105.604 | } | 0.00074 (13) | K$\beta_1'$ |
| XK$\beta_5''$ | (Th) | 106.239 | } | | |

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| $XK\beta_2$ | (Th) | 108.509 | } | | |
| $XK\beta_4$ | (Th) | 108.955 | } | 0.00025 (5) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Th) | 109.442 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Th) | 49.46 (10) | 26.3 (40) | E2 | 324 (10) | 0.081 (12) |
| $\gamma_{2,1}$(Th) | 112.79 (10) | 0.150 (24) | E2 | 6.67 (20) | 0.0195 (31) |
| $\gamma_{3,2}$(Th) | 171.15 (20) | 0.000142 (48) | E2 | 1.186 (36) | 0.000065 (22) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 6.749 | (16) | d |
| $Q_{\beta^-}$ | : | 518.6 | (6) | keV |
| $\beta^-$ | : | 100 | | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,9}$ | 147.7 (6) | 1.3 (9) | Allowed | 7.32 |
| $\beta^-_{0,7}$ | 186.2 (6) | 2.9 (9) | Super-allowed | 7.28 |
| $\beta^-_{0,6}$ | 237.2 (6) | 48.2 (25) | 1st forbidden | 6.39 |
| $\beta^-_{0,5}$ | 251.1 (6) | 40.9 (31) | 1st forbidden | 6.54 |
| $\beta^-_{0,2}$ | 459.1 (6) | 7 (4) | 1st forbidden unique | 8.1 |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Np) | 5.04 - 13.52 | 58.5 (21) | |
| $e_{AK}$ | (Np) | | 1.49 (21) | |
| | KLL | 73.50 - 83.13 | } | |
| | KLX | 90.36 - 97.28 | } | |
| | KXY | 107.10 - 114.58 | } | |
| $ec_{2,1\ L}$ | (Np) | 3.918 - 8.731 | 14.6 (50) | |
| $ec_{6,5\ M}$ | (Np) | 8.07 - 10.15 | 36.0 (19) | |
| $ec_{1,0\ L}$ | (Np) | 10.769 - 15.586 | 17.0 (23) | |
| $ec_{6,5\ N}$ | (Np) | 12.31 - 13.41 | 9.79 (43) | |
| $ec_{9,7\ L}$ | (Np) | 16.11 - 20.93 | 0.7 (7) | |
| $ec_{3,1\ L}$ | (Np) | 20.277 - 25.094 | 0.47 | |
| $ec_{2,1\ M}$ | (Np) | 20.606 - 22.681 | 3.9 (5) | |
| $ec_{4,2\ L}$ | (Np) | 20.996 - 25.813 | 3.2 (5) | |
| $ec_{1,0\ M}$ | (Np) | 27.457 - 29.532 | 4.3 (7) | |
| $ec_{7,6\ L}$ | (Np) | 28.58 - 33.40 | 0.19 (8) | |
| $ec_{1,0\ N}$ | (Np) | 31.695 - 32.793 | 1.16 (17) | |
| $ec_{9,7\ M}$ | (Np) | 32.80 - 34.88 | 0.2 (2) | |
| $ec_{3,1\ M}$ | (Np) | 36.965 - 39.040 | 0.12 | |
| $ec_{9,7\ N}$ | (Np) | 37.04 - 38.14 | 0.05 (5) | |
| $ec_{2,0\ L}$ | (Np) | 37.114 - 41.931 | 28.6 (22) | |
| $ec_{4,2\ M}$ | (Np) | 37.684 - 39.759 | 0.84 (14) | |
| $ec_{3,1\ N}$ | (Np) | 41.203 - 42.301 | 0.032 | |
| $ec_{4,2\ N}$ | (Np) | 41.92 - 43.02 | 0.233 (37) | |
| $ec_{7,5\ L}$ | (Np) | 42.40 - 47.22 | 0.387 (9) | |
| $ec_{7,6\ M}$ | (Np) | 45.27 - 47.35 | 0.0479 (21) | |
| $ec_{5,4\ K}$ | (Np) | 45.94 (2) | 0.363 (9) | |
| $ec_{7,6\ N}$ | (Np) | 49.51 - 50.61 | 0.0127 (6) | |

| | | Energy keV | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|
| $ec_{3,0\ L}$ | (Np) | 53.4 - 58.2 | 0.0354 (7) | | |
| $ec_{2,0\ M}$ | (Np) | 53.802 - 55.877 | 7.7 (3) | | |
| $ec_{2,0\ N}$ | (Np) | 58.040 - 59.138 | 0.846 (24) | | |
| $ec_{7,5\ M}$ | (Np) | 59.09 - 61.17 | 0.096 (2) | | |
| $ec_{7,5\ N}$ | (Np) | 63.33 - 64.43 | 0.0255 (5) | | |
| $ec_{5,2\ K}$ | (Np) | 89.331 (10) | 50.1 (13) | | |
| $ec_{5,1\ K}$ | (Np) | 115.73 (4) | 0.114 (5) | | |
| $ec_{5,4\ L}$ | (Np) | 142.18 - 147.00 | 2.04 (5) | | |
| $ec_{5,0\ K}$ | (Np) | 148.87 (4) | 0.53 (3) | | |
| $ec_{5,4\ M}$ | (Np) | 158.87 - 160.95 | 0.565 (14) | | |
| $ec_{5,4\ N}$ | (Np) | 163.11 - 164.21 | 0.1546 (33) | | |
| $ec_{5,2\ L}$ | (Np) | 185.573 - 190.390 | 10.1 (3) | | |
| $ec_{5,2\ M}$ | (Np) | 202.261 - 204.336 | 2.45 (7) | | |
| $ec_{5,2\ N}$ | (Np) | 206.499 - 207.597 | 0.662 (14) | | |
| $ec_{5,1\ L}$ | (Np) | 211.97 - 216.79 | 0.040 (2) | | |
| $ec_{7,0\ K}$ | (Np) | 213.69 (4) | 0.0757 (18) | | |
| $ec_{8,1\ K}$ | (Np) | 216.71 (4) | 0.052 (7) | | |
| $ec_{5,1\ M}$ | (Np) | 228.66 - 230.74 | 0.0105 (5) | | |
| $ec_{5,0\ L}$ | (Np) | 245.11 - 249.93 | 0.172 (9) | | |
| $ec_{8,0\ K}$ | (Np) | 249.92 (4) | 0.0206 (9) | | |
| $ec_{9,0\ K}$ | (Np) | 252.259 (23) | 0.046 (7) | | |
| $ec_{5,0\ M}$ | (Np) | 261.80 - 263.88 | 0.045 (3) | | |
| $ec_{5,0\ N}$ | (Np) | 266.055 - 267.153 | 0.0123 (7) | | |
| $ec_{7,0\ L}$ | (Np) | 309.93 - 314.75 | 0.0733 (17) | | |
| $ec_{8,1\ L}$ | (Np) | 312.95 - 317.77 | 0.0108 (3) | | |
| $ec_{7,0\ M}$ | (Np) | 326.62 - 328.70 | 0.0197 (5) | | |
| $\beta^-_{0,9}$ | max: | 147.7 (6) | 1.3 (9) | avg: | 39.0 (2) |
| $\beta^-_{0,7}$ | max: | 186.2 (6) | 2.9 (9) | avg: | 49.8 (2) |
| $\beta^-_{0,6}$ | max: | 237.2 (6) | 48.2 (25) | avg: | 64.5 (2) |
| $\beta^-_{0,5}$ | max: | 251.1 (6) | 40.9 (31) | avg: | 68.6 (2) |
| $\beta^-_{0,2}$ | max: | 459.1 (6) | 7 (4) | avg: | 137.6 (2) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Np) | 11.89 — 22.2 | | 59.0 (21) | |
| $XK\alpha_2$ | (Np) | 97.069 | | 14.8 (4) | } $K\alpha$ |
| $XK\alpha_1$ | (Np) | 101.059 | | 23.5 (6) | } |
| $XK\beta_3$ | (Np) | 113.303 | } | | |
| $XK\beta_1$ | (Np) | 114.234 | } | 8.57 (27) | $K\beta_1'$ |
| $XK\beta_5''$ | (Np) | 114.912 | } | | |

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XK$\beta_2$ | (Np) | 117.476 | } | | |
| XK$\beta_4$ | (Np) | 117.876 | } | 2.95 (10) | K$\beta_2^{'}$ |
| XKO$_{2,3}$ | (Np) | 118.429 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{6,5}$(Np) | 13.81 (2) | 48.8 (25) | M1+0.1%E2 | 492 (16) | 0.099 (4) |
| $\gamma_{2,1}$(Np) | 26.34463 (24) | 22 (5) | E1 | 8 (2) | 2.43 (6) |
| $\gamma_{1,0}$(Np) | 33.19629 (22) | 23 (3) | M1+1.66%E2 | 175 (24) | 0.130 (5) |
| $\gamma_{9,7}$(Np) | 38.54 (3) | 0.9 (9) | M1+15%E2 | 280 (210) | 0.0033 (20) |
| $\gamma_{3,1}$(Np) | 42.704 (5) | 0.65 | M1+1.66%E2 | 75 (9) | 0.0085 |
| $\gamma_{4,2}$(Np) | 43.420 (3) | 4.3 (7) | M1+16.8%E2 | 180 (23) | 0.024 (2) |
| $\gamma_{7,6}$(Np) | 51.01 (3) | 0.596 (25) | E1 | 0.753 (15) | 0.340 (14) |
| $\gamma_{2,0}$(Np) | 59.54091 (10) | 73.7 (31) | E1 | 1.16 (7) | 34.1 (9) |
| $\gamma_{7,5}$(Np) | 64.83 (2) | 1.800 (26) | E1 | 0.400 (8) | 1.286 (17) |
| $\gamma_{4,1}$(Np) | 69.76 (3) | 0.0013 (3) | (E1) | 0.330 (7) | 0.00095 (19) |
| $\gamma_{3,0}$(Np) | 75.899 (5) | 0.05 | (E2) | 53.4 (11) | 0.00091 |
| $\gamma_{4,0}$(Np) | 102.959 (3) | 0.0072 (10) | E1 | 0.119 (3) | 0.0064 (9) |
| $\gamma_{5,4}$(Np) | 164.61 (2) | 5.02 (11) | E2 | 1.70 (4) | 1.86 (3) |
| $\gamma_{5,2}$(Np) | 208.00 (1) | 84.8 (19) | M1+2.4%E2 | 2.98 (7) | 21.3 (3) |
| $\gamma_{6,2}$(Np) | 221.80 (4) | 0.0316 (13) | E2 | 0.547 (11) | 0.0204 (8) |
| $\gamma_{5,1}$(Np) | 234.40 (4) | 0.189 (8) | M2 | 8.24 (16) | 0.0205 (8) |
| $\gamma_{5,0}$(Np) | 267.556 (12) | 1.5 (4) | E1+19.4%M2 | 1.06 (6) | 0.721 (10) |
| $\gamma_{8,3}$(Np) | 292.77 (6) | 0.0030 (9) | (E2) | 0.215 (4) | 0.0025 (7) |
| $\gamma_{8,2}$(Np) | 309.1 (3) | 0.00028 | (E1) | 0.0377 (8) | 0.00027 |
| $\gamma_{7,0}$(Np) | 332.376 (16) | 1.374 (19) | E2 | 0.146 (3) | 1.199 (16) |
| $\gamma_{8,1}$(Np) | 335.38 (4) | 0.162 (9) | M1+17.5%E2 | 0.69 (8) | 0.0958 (22) |
| $\gamma_{9,1}$(Np) | 337.7 (2) | 0.0101 (6) | (E2) | 0.139 (3) | 0.0089 (5) |
| $\gamma_{-1,2}$(Np) | 340.45 | 0.0016 (3) | | | 0.0016 (3) |
| $\gamma_{8,0}$(Np) | 368.602 (20) | 0.0675 (28) | M1(+E2) | 0.622 (13) | 0.0416 (17) |
| $\gamma_{9,0}$(Np) | 370.928 (23) | 0.167 (8) | M1+15.6%E2 | 0.53 (7) | 0.109 (2) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 4.468 | (5) | $\times 10^{9}$ y |
| $Q_{\alpha}$ | : | 4269.7 | (29) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | 5.45 | (4) | $\times 10^{-5}$ % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,2}$ | 4038 (5) | 0.13 (3) |
| $\alpha_{0,1}$ | 4151 (5) | 22.33 (50) |
| $\alpha_{0,0}$ | 4198 (3) | 77.54 (50) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Th) | 5.8 - 20.3 | | 8.43 (25) |
| $e_{AK}$ | (Th) | | | 0.00012 (4) |
| | KLL | 68.406 - 76.745 | } | |
| | KLX | 83.857 - 93.345 | } | |
| | KXY | 99.29 - 109.64 | } | |
| $ec_{1,0\ L}$ | (Th) | 29.08 - 33.20 | | 16.3 (8) |
| $ec_{1,0\ M}$ | (Th) | 44.37 - 46.22 | | 4.46 (21) |
| $ec_{1,0\ N}$ | (Th) | 48.22 - 49.22 | | 1.19 (6) |
| $ec_{2,1\ L}$ | (Th) | 93.0 - 97.2 | | 0.080 (22) |
| $ec_{2,1\ M}$ | (Th) | 108.3 - 110.2 | | 0.022 (6) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Th) | 11.118 — 19.504 | | 7.94 (28) | |
| XK$\alpha_2$ | (Th) | 89.954 | | 0.00109 (30) | } K$\alpha$ |
| XK$\alpha_1$ | (Th) | 93.351 | | 0.0018 (5) | } |
| XK$\beta_3$ | (Th) | 104.819 | } | | |
| XK$\beta_1$ | (Th) | 105.604 | } | 0.00063 (17) | K$\beta_1'$ |
| XK$\beta_5''$ | (Th) | 106.239 | } | | |
| XK$\beta_2$ | (Th) | 108.509 | } | | |
| XK$\beta_4$ | (Th) | 108.955 | } | 0.00021 (6) | K$\beta_2'$ |
| XKO$_{2,3}$ | (Th) | 109.442 | } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Th) | 49.55 (6) | 22.5 (5) | E2 | 321 (10) | 0.0697 (26) |
| $\gamma_{2,1}$(Th) | 113.5 (1) | 0.13 (3) | [E2] | 6.47 (19) | 0.0174 (47) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 23.46 | (5) | min |
| $Q_{\beta^-}$ | : | 1261.5 | (16) | keV |
| $\beta^-$ | : | 100 | | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,32}$ | 164.5 (16) | 0.0060 (5) | | |
| $\beta^-_{0,31}$ | 212.3 (16) | 0.0059 (4) | | |
| $\beta^-_{0,30}$ | 221.1 (16) | 0.0077 (4) | | |
| $\beta^-_{0,29}$ | 247.9 (16) | 0.0074 (4) | | |
| $\beta^-_{0,28}$ | 269.3 (16) | 0.0262 (9) | | |
| $\beta^-_{0,27}$ | 295.0 (16) | 0.0008 (2) | | |
| $\beta^-_{0,26}$ | 297.3 (16) | 0.211 (3) | | |
| $\beta^-_{0,25}$ | 302.3 (16) | 0.0284 (7) | 1st forbidden | |
| $\beta^-_{0,24}$ | 398.1 (16) | 0.0005 (2) | | |
| $\beta^-_{0,23}$ | 412.0 (16) | 0.0264 (4) | 1st forbidden | |
| $\beta^-_{0,22}$ | 417.4 (16) | 0.215 (3) | | |
| $\beta^-_{0,21}$ | 442.2 (16) | 0.228 (3) | | |
| $\beta^-_{0,18}$ | 566.3 (16) | 0.0118 (11) | | |
| $\beta^-_{0,17}$ | 599.2 (16) | 0.261 (6) | 1st forbidden | 7.35 |
| $\beta^-_{0,15}$ | 697.6 (16) | 0.0247 (7) | | |
| $\beta^-_{0,14}$ | 731.2 (16) | 0.0029 (4) | | |
| $\beta^-_{0,13}$ | 743.5 (16) | 0.063 (2) | | |
| $\beta^-_{0,12}$ | 787.1 (16) | 0.0033 (4) | | |
| $\beta^-_{0,4}$ | 1143.9 (16) | 2.2 (4) | 1st forbidden | 7.4 |
| $\beta^-_{0,3}$ | 1186.5 (16) | 72.8 (19) | 1st forbidden | 5.91 |
| $\beta^-_{0,1}$ | 1230.4 (16) | 9.4 (15) | Allowed | 6.83 |
| $\beta^-_{0,0}$ | 1261.5 (16) | 14.4 (22) | Allowed | 6.7 |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Np) | 6.04 - 13.12 | 14.7 (7) | |
| $e_{AK}$ | (Np) | | 0.0091 (13) | |
| | KLL | 73.501 - 83.134 | } | |
| | KLX | 90.358 - 101.054 | } | |
| | KXY | 107.19 - 118.66 | } | |
| $ec_{1,0\ L}$ | (Np) | 8.704 - 13.520 | 14.0 (11) | |
| $ec_{4,3\ L}$ | (Np) | 20.7 - 25.5 | 1.48 (28) | |
| $ec_{3,1\ L}$ | (Np) | 21.106 - 25.920 | 3.72 (25) | |
| $ec_{1,0\ M}$ | (Np) | 25.392 - 27.467 | 3.6 (3) | |

| | | Energy keV | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|
| $ec_{1,0\ N}$ | (Np) | 29.630 - 30.728 | 0.99 (8) | | |
| $ec_{4,3\ M}$ | (Np) | 37.4 - 39.4 | 0.39 (8) | | |
| $ec_{3,1\ M}$ | (Np) | 37.794 - 39.869 | 0.94 (6) | | |
| $ec_{4,3\ N}$ | (Np) | 41.6 - 42.7 | 0.10 (13) | | |
| $ec_{3,1\ N}$ | (Np) | 42.032 - 43.130 | 0.248 (16) | | |
| $ec_{2,0\ L}$ | (Np) | 48.78 - 53.60 | 0.115 (21) | | |
| $ec_{3,0\ L}$ | (Np) | 52.237 - 57.050 | 10.7 (3) | | |
| $ec_{2,0\ M}$ | (Np) | 65.47 - 67.55 | 0.032 (3) | | |
| $ec_{8,3\ K}$ | (Np) | 67.48 (4) | 0.049 (46) | | |
| $ec_{10,8\ K}$ | (Np) | 68.61 (8) | 0.010 (9) | | |
| $ec_{3,0\ M}$ | (Np) | 68.925 - 71.000 | 2.64 (8) | | |
| $ec_{3,0\ N}$ | (Np) | 73.163 - 74.261 | 0.704 (21) | | |
| $ec_{8,3\ L}$ | (Np) | 163.72 - 168.54 | 0.0186 (6) | | |
| $\beta^-_{0,32}$ | max: | 164.5 (16) | 0.0060 (5) | avg: | 43.7 (5) |
| $\beta^-_{0,31}$ | max: | 212.3 (16) | 0.0059 (4) | avg: | 57.3 (5) |
| $\beta^-_{0,30}$ | max: | 221.1 (16) | 0.0077 (4) | avg: | 59.9 (5) |
| $\beta^-_{0,29}$ | max: | 247.9 (16) | 0.0074 (4) | avg: | 67.6 (5) |
| $\beta^-_{0,28}$ | max: | 269.3 (16) | 0.0262 (9) | avg: | 74.0 (5) |
| $\beta^-_{0,27}$ | max: | 295.0 (16) | 0.0008 (2) | avg: | 81.7 (5) |
| $\beta^-_{0,26}$ | max: | 297.3 (16) | 0.211 (3) | avg: | 82.4 (5) |
| $\beta^-_{0,25}$ | max: | 302.3 (16) | 0.0284 (7) | avg: | 83.9 (5) |
| $\beta^-_{0,24}$ | max: | 398.1 (16) | 0.0005 (2) | avg: | 113.4 (5) |
| $\beta^-_{0,23}$ | max: | 412.0 (16) | 0.0264 (4) | avg: | 117.8 (5) |
| $\beta^-_{0,22}$ | max: | 417.4 (16) | 0.215 (3) | avg: | 119.6 (5) |
| $\beta^-_{0,21}$ | max: | 442.2 (16) | 0.228 (3) | avg: | 127.4 (5) |
| $\beta^-_{0,18}$ | max: | 566.3 (16) | 0.0118 (11) | avg: | 168.0 (5) |
| $\beta^-_{0,17}$ | max: | 599.2 (16) | 0.261 (6) | avg: | 179.0 (5) |
| $\beta^-_{0,15}$ | max: | 697.6 (16) | 0.0247 (7) | avg: | 212.6 (5) |
| $\beta^-_{0,14}$ | max: | 731.2 (16) | 0.0029 (4) | avg: | 224.3 (5) |
| $\beta^-_{0,13}$ | max: | 743.5 (16) | 0.063 (2) | avg: | 228.6 (5) |
| $\beta^-_{0,12}$ | max: | 787.1 (16) | 0.0033 (4) | avg: | 244.0 (5) |
| $\beta^-_{0,4}$ | max: | 1143.9 (16) | 2.2 (4) | avg: | 374.0 (5) |
| $\beta^-_{0,3}$ | max: | 1186.5 (16) | 72.8 (19) | avg: | 390.4 (5) |
| $\beta^-_{0,1}$ | max: | 1230.4 (16) | 9.4 (15) | avg: | 406.8 (5) |
| $\beta^-_{0,0}$ | max: | 1261.5 (16) | 14.4 (22) | avg: | 418.6 (5) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. | |
|---|---|---|---|---|
| XL | (Np) | 11.871 — 21.491 | 16.1 (5) | |
| $XK\alpha_2$ | (Np) | 97.069 | 0.091 (3) | } $K\alpha$ |
| $XK\alpha_1$ | (Np) | 101.059 | 0.144 (5) | } |

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| $XK\beta_3$ | (Np) | 113.303 | } | | |
| $XK\beta_1$ | (Np) | 114.234 | } | 0.052 (2) | $K\beta_1'$ |
| $XK\beta_5''$ | (Np) | 114.912 | } | | |
| $XK\beta_2$ | (Np) | 117.463 | } | | |
| $XK\beta_4$ | (Np) | 117.876 | } | 0.018 (1) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Np) | 118.429 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Np) | 31.1310 (12) | 19.0 (14) | M1+E2 | 263 (13) | 0.072 (4) |
| $\gamma_{4,3}$(Np) | 43.06 (2) | 2.0 (4) | M1+E2 | 154 (18) | 0.013 (2) |
| $\gamma_{3,1}$(Np) | 43.533 (1) | 9.3 (6) | E1 | 1.14 (3) | 4.35 (28) |
| $\gamma_{-1,1}$(Np) | 46.6 | 0.009 (4) | | | 0.009 (4) |
| $\gamma_{6,4}$(Np) | 55.37 (5) | 0.0076 (25) | M1+E2 | 90 (30) | 0.0000836 (20) |
| $\gamma_{2,0}$(Np) | 71.210 (2) | 0.141 (4) | E2 | 71.9 (14) | 0.00193 (4) |
| $\gamma_{3,0}$(Np) | 74.664 (1) | 65.8 (17) | E1 | 0.276 (6) | 51.6 (13) |
| $\gamma_{4,1}$(Np) | 86.72 (7) | 0.065 (6) | E1 | 0.186 (4) | 0.055 (5) |
| $\gamma_{15,11}$(Np) | 111.0 (2) | 0.0202 (5) | | | 0.0202 (5) |
| $\gamma_{4,0}$(Np) | 117.727 (20) | 0.123 (10) | E1 | 0.0841 (17) | 0.113 (9) |
| $\gamma_{-1,2}$(Np) | 134.71 (13) | 0.0019 (3) | | | 0.0019 (3) |
| $\gamma_{-1,3}$(Np) | 142.5 (1) | 0.0045 (6) | | | 0.0045 (6) |
| $\gamma_{7,2}$(Np) | 170.15 (5) | 0.031 (1) | | | 0.031 (1) |
| $\gamma_{-1,4}$(Np) | 174.07 (6) | 0.0097 (3) | | | 0.0097 (3) |
| $\gamma_{8,3}$(Np) | 186.15 (4) | 0.10 (5) | [M1+E2] | 2.6 (16) | 0.0288 (7) |
| $\gamma_{10,8}$(Np) | 187.28 (8) | 0.020 (9) | [M1+E2] | 2.6 (16) | 0.0056 (3) |
| $\gamma_{9,7}$(Np) | 197.28 (12) | 0.0024 (3) | | | 0.0024 (3) |
| $\gamma_{24,17}$(Np) | 201.18 (6) | 0.0005 (2) | | | 0.0005 (2) |
| $\gamma_{-1,5}$(Np) | 220.52 (4) | 0.0282 (7) | | | 0.0282 (7) |
| $\gamma_{-1,6}$(Np) | 236.28 (14) | 0.00092 (18) | | | 0.00092 (18) |
| $\gamma_{21,16}$(Np) | 239.86 (5) | 0.00087 (23) | | | 0.00087 (23) |
| $\gamma_{21,15}$(Np) | 255.37 (5) | 0.0011 (2) | | | 0.0011 (2) |
| $\gamma_{30,19}$(Np) | 258.44 (6) | 0.00073 (18) | | | 0.00073 (18) |
| $\gamma_{8,0}$(Np) | 260.80 (2) | 0.00310 (21) | [E1] | 0.0549 (11) | 0.0031 (2) |
| $\gamma_{-1,7}$(Np) | 262.89 (19) | 0.0008 (3) | | | 0.0008 (3) |
| $\gamma_{-1,8}$(Np) | 265.44 (17) | 0.0009 (3) | | | 0.0009 (3) |
| $\gamma_{28,18}$(Np) | 296.93 (13) | 0.0024 (8) | [M1+E2] | 0.7 (5) | 0.0014 (2) |
| $\gamma_{26,17}$(Np) | 301.95 (3) | 0.0018 (7) | [M1+E2] | 0.6 (5) | 0.0011 (3) |
| $\gamma_{32,20}$(Np) | 312.05 (3) | 0.0006 | | | 0.0006 |
| $\gamma_{22,13}$(Np) | 326.21 (7) | 0.0044 (2) | | | 0.0044 (2) |
| $\gamma_{-1,9}$(Np) | 330.14 (14) | 0.00069 (13) | | | 0.00069 (13) |
| $\gamma_{-1,10}$(Np) | 332.06 (14) | 0.0012 (2) | | | 0.0012 (2) |
| $\gamma_{30,18}$(Np) | 345.13 (8) | 0.0039 (2) | | | 0.0039 (2) |
| $\gamma_{-1,11}$(Np) | 348.23 (18) | 0.0007 (3) | | | 0.0007 (3) |
| $\gamma_{-1,12}$(Np) | 351.33 (15) | 0.0007 (2) | | | 0.0007 (2) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{-1,13}$(Np) | 361.83 (8) | 0.0044 (3) | | | 0.0044 (3) |
| $\gamma_{10,3}$(Np) | 373.51 (4) | 0.034 (10) | [M1+E2] | 0.35 (22) | 0.025 (6) |
| $\gamma_{11,3}$(Np) | 378.06 (6) | 0.0101 (4) | | | 0.0101 (4) |
| $\gamma_{11,2}$(Np) | 381.27 (16) | 0.0006 (2) | | | 0.0006 (2) |
| $\gamma_{-1,14}$(Np) | 393.01 (18) | 0.0006 (2) | | | 0.0006 (2) |
| $\gamma_{25,15}$(Np) | 395.19 (11) | 0.0021 (2) | | | 0.0021 (2) |
| $\gamma_{12,3}$(Np) | 399.13 (13) | 0.0016 (3) | | | 0.0016 (3) |
| $\gamma_{-1,15}$(Np) | 400.55 (15) | 0.0009 (2) | | | 0.0009 (2) |
| $\gamma_{-1,16}$(Np) | 404.84 (18) | 0.0009 (3) | | | 0.0009 (3) |
| $\gamma_{32,17}$(Np) | 434.71 (4) | 0.00122 (20) | (E1) | 0.0184 (4) | 0.0012 (2) |
| $\gamma_{-1,17}$(Np) | 445.81 (12) | 0.0011 (2) | | | 0.0011 (2) |
| $\gamma_{10,0}$(Np) | 448.18 (2) | 0.00920 (31) | [E1] | 0.0173 (4) | 0.0090 (3) |
| $\gamma_{-1,18}$(Np) | 452.17 (12) | 0.0016 (2) | | | 0.0016 (2) |
| $\gamma_{14,3}$(Np) | 455.63 (6) | 0.0008 (3) | | | 0.0008 (3) |
| $\gamma_{12,0}$(Np) | 474.36 (6) | 0.0017 (2) | | | 0.0017 (2) |
| $\gamma_{-1,19}$(Np) | 478.13 (19) | 0.00055 (23) | | | 0.00055 (23) |
| $\gamma_{-1,20}$(Np) | 479.55 (14) | 0.0010 (2) | | | 0.0010 (2) |
| $\gamma_{13,1}$(Np) | 486.87 (3) | 0.0627 (14) | [E1] | 0.0147 (4) | 0.0618 (14) |
| $\gamma_{-1,21}$(Np) | 490.33 (13) | 0.0007 (1) | | | 0.0007 (1) |
| $\gamma_{15,2}$(Np) | 492.76 (7) | 0.0050 (2) | | | 0.0050 (2) |
| $\gamma_{14,1}$(Np) | 499.1 (1) | 0.0021 (2) | | | 0.0021 (2) |
| $\gamma_{-1,22}$(Np) | 502.12 (17) | 0.0006 (2) | | | 0.0006 (2) |
| $\gamma_{16,3}$(Np) | 504.76 (8) | 0.00545 (31) | [E2] | 0.0488 (10) | 0.0052 (3) |
| $\gamma_{-1,23}$(Np) | 506.80 (14) | 0.0010 (2) | | | 0.0010 (2) |
| $\gamma_{13,0}$(Np) | 518.00 (2) | 0.00456 (30) | [E1] | 0.01300 (19) | 0.0045 (3) |
| $\gamma_{18,6}$(Np) | 522.12 (10) | 0.00274 (33) | [M1+E2] | 0.14 (10) | 0.0024 (2) |
| $\gamma_{15,1}$(Np) | 532.86 (10) | 0.0023 (2) | | | 0.0023 (2) |
| $\gamma_{-1,24}$(Np) | 541.32 (10) | 0.0029 (3) | | | 0.0029 (3) |
| $\gamma_{17,4}$(Np) | 544.48 (9) | 0.0041 (5) | [M1+E2] | 0.13 (9) | 0.0036 (3) |
| $\gamma_{16,1}$(Np) | 547.99 (12) | 0.00202 (30) | [E1] | 0.01170 (24) | 0.0020 (3) |
| $\gamma_{-1,25}$(Np) | 558.46 (17) | 0.0006 (2) | | | 0.0006 (2) |
| $\gamma_{29,11}$(Np) | 560.63 (7) | 0.0058 (3) | | | 0.0058 (3) |
| $\gamma_{15,0}$(Np) | 563.89 (4) | 0.0004 (2) | | | 0.0004 (2) |
| $\gamma_{-1,26}$(Np) | 567.88 (18) | 0.0004 (1) | | | 0.0004 (1) |
| $\gamma_{-1,27}$(Np) | 575.27 (5) | 0.0131 (4) | | | 0.0131 (4) |
| $\gamma_{-1,28}$(Np) | 577.15 (14) | 0.0014 (3) | | | 0.0014 (3) |
| $\gamma_{-1,29}$(Np) | 585.49 (14) | 0.0012 (2) | | | 0.0012 (2) |
| $\gamma_{17,3}$(Np) | 587.62 (2) | 0.0214 (15) | [M1+E2] | 0.11 (7) | 0.0193 (5) |
| $\gamma_{23,8}$(Np) | 588.70 (8) | 0.0055 (3) | | | 0.0055 (3) |
| $\gamma_{-1,30}$(Np) | 591.82 (19) | 0.0009 (4) | | | 0.0009 (4) |
| $\gamma_{-1,31}$(Np) | 599.13 (15) | 0.0007 (2) | | | 0.0007 (2) |
| $\gamma_{-1,32}$(Np) | 602.79 (8) | 0.0048 (3) | | | 0.0048 (3) |
| $\gamma_{-1,33}$(Np) | 604.85 (6) | 0.00096 (27) | | | 0.00096 (27) |
| $\gamma_{23,7}$(Np) | 607.96 (15) | 0.0013 (3) | | | 0.0013 (3) |
| $\gamma_{-1,34}$(Np) | 614.53 (17) | 0.0006 (2) | | | 0.0006 (2) |
| $\gamma_{-1,35}$(Np) | 618.03 (16) | 0.0007 (2) | | | 0.0007 (2) |
| $\gamma_{18,2}$(Np) | 624.11 (7) | 0.00626 (30) | [E1] | 0.0091 (2) | 0.0062 (3) |
| $\gamma_{-1,36}$(Np) | 629.00 (11) | 0.0027 (3) | | | 0.0027 (3) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{17,1}$(Np) | 631.10 (3) | 0.0676 (20) | [E1] | 0.00892 (17) | 0.067 (2) |
| $\gamma_{32,11}$(Np) | 644.253 (30) | 0.0019 (4) | | | 0.0019 (4) |
| $\gamma_{21,6}$(Np) | 646.26 (10) | 0.0029 (3) | | | 0.0029 (3) |
| $\gamma_{-1,37}$(Np) | 649.79 (19) | 0.0009 (4) | | | 0.0009 (4) |
| $\gamma_{17,0}$(Np) | 662.28 (2) | 0.171 (5) | [E1] | 0.00815 (16) | 0.170 (5) |
| $\gamma_{18,1}$(Np) | 664.17 (9) | 0.00544 (40) | [E1] | 0.00811 (16) | 0.0054 (4) |
| $\gamma_{-1,38}$(Np) | 668.76 (18) | 0.00055 (18) | | | 0.00055 (18) |
| $\gamma_{-1,39}$(Np) | 670.88 (20) | 0.0006 (3) | | | 0.0006 (3) |
| $\gamma_{-1,40}$(Np) | 691.01 (6) | 0.0074 (3) | | | 0.0074 (3) |
| $\gamma_{-1,41}$(Np) | 692.61 (13) | 0.0016 (3) | | | 0.0016 (3) |
| $\gamma_{18,0}$(Np) | 695.23 (2) | 0.00363 (30) | [E1] | 0.00745 (15) | 0.0036 (3) |
| $\gamma_{-1,42}$(Np) | 701.21 (10) | 0.0024 (2) | | | 0.0024 (2) |
| $\gamma_{26,8}$(Np) | 703.63 (10) | 0.00235 (20) | [E2] | 0.0234 (5) | 0.0023 (2) |
| $\gamma_{19,3}$(Np) | 707.38 (9) | 0.0022 (2) | | | 0.0022 (2) |
| $\gamma_{20,3}$(Np) | 710.35 (15) | 0.003 | | | 0.003 |
| $\gamma_{-1,43}$(Np) | 714.22 (9) | 0.0030 (3) | | | 0.0030 (3) |
| $\gamma_{26,7}$(Np) | 722.85 (4) | 0.0276 (7) | [E2] | 0.0222 (4) | 0.0270 (7) |
| $\gamma_{23,5}$(Np) | 727.52 (10) | 0.0026 (3) | | | 0.0026 (3) |
| $\gamma_{-1,44}$(Np) | 730.95 (6) | 0.0090 (3) | | | 0.0090 (3) |
| $\gamma_{-1,45}$(Np) | 746.06 (11) | 0.0043 (5) | | | 0.0043 (5) |
| $\gamma_{21,2}$(Np) | 748.09 (3) | 0.0890 (4) | | | 0.0890 (4) |
| $\gamma_{29,8}$(Np) | 752.84 (8) | 0.0013 (3) | | | 0.0013 (3) |
| $\gamma_{-1,46}$(Np) | 764.04 (11) | 0.0026 (3) | | | 0.0026 (3) |
| $\gamma_{-1,47}$(Np) | 768.15 (11) | 0.0020 (2) | | | 0.0020 (2) |
| $\gamma_{-1,48}$(Np) | 769.52 (17) | 0.0004 (1) | | | 0.0004 (1) |
| $\gamma_{22,2}$(Np) | 772.94 (9) | 0.0029 (2) | | | 0.0029 (2) |
| $\gamma_{23,3}$(Np) | 774.77 (4) | 0.015 (4) | | | 0.015 (4) |
| $\gamma_{30,8}$(Np) | 779.57 (14) | 0.0006 (1) | | | 0.0006 (1) |
| $\gamma_{21,1}$(Np) | 788.19 (7) | 0.0049 (2) | | | 0.0049 (2) |
| $\gamma_{26,6}$(Np) | 791.13 (5) | 0.0075 (2) | | | 0.0075 (2) |
| $\gamma_{-1,49}$(Np) | 795.13 (15) | 0.0008 (2) | | | 0.0008 (2) |
| $\gamma_{22,1}$(Np) | 812.89 (3) | 0.0685 (3) | | | 0.0685 (3) |
| $\gamma_{21,0}$(Np) | 819.26 (3) | 0.129 (3) | | | 0.129 (3) |
| $\gamma_{-1,50}$(Np) | 829.59 (17) | 0.00046 (13) | | | 0.00046 (13) |
| $\gamma_{-1,51}$(Np) | 831.89 (9) | 0.0021 (2) | | | 0.0021 (2) |
| $\gamma_{25,4}$(Np) | 841.45 (4) | 0.0025 (4) | | | 0.0025 (4) |
| $\gamma_{22,0}$(Np) | 844.10 (3) | 0.139 (3) | | | 0.139 (3) |
| $\gamma_{26,4}$(Np) | 846.39 (4) | 0.0324 (13) | [M1+E2] | 0.04 (3) | 0.0312 (8) |
| $\gamma_{23,0}$(Np) | 849.44 (9) | 0.0020 (2) | | | 0.0020 (2) |
| $\gamma_{-1,52}$(Np) | 862.56 (18) | 0.0004 (1) | | | 0.0004 (1) |
| $\gamma_{30,6}$(Np) | 867.11 (11) | 0.00076 (8) | | | 0.00076 (8) |
| $\gamma_{28,5}$(Np) | 869.57 (9) | 0.0016 (1) | | | 0.0016 (1) |
| $\gamma_{28,4}$(Np) | 874.43 (3) | 0.00343 (22) | [M1+E2] | 0.038 (23) | 0.0033 (2) |
| $\gamma_{25,3}$(Np) | 884.45 (5) | 0.0086 (2) | | | 0.0086 (2) |
| $\gamma_{25,2}$(Np) | 887.97 (3) | 0.0023 (2) | | | 0.0023 (2) |
| $\gamma_{26,3}$(Np) | 889.49 (4) | 0.0217 (7) | [M1+E2] | 0.036 (22) | 0.0209 (5) |
| $\gamma_{27,2}$(Np) | 895.15 (15) | 0.0008 (2) | | | 0.0008 (2) |
| $\gamma_{-1,53}$(Np) | 913.68 (9) | 0.0019 (1) | | | 0.0019 (1) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{28,3}$(Np) | 917.40 (8) | 0.00279 (12) | [M1+E2] | 0.034 (22) | 0.0027 (1) |
| $\gamma_{28,2}$(Np) | 920.95 (8) | 0.00261 (10) | [E1] | 0.00450 (9) | 0.0026 (1) |
| $\gamma_{30,4}$(Np) | 922.83 (13) | 0.0006 (1) | | | 0.0006 (1) |
| $\gamma_{25,1}$(Np) | 928.05 (3) | 0.0051 (2) | | | 0.0051 (2) |
| $\gamma_{31,4}$(Np) | 931.51 (5) | 0.00547 (33) | [M1+E2] | 0.032 (19) | 0.0053 (3) |
| $\gamma_{26,1}$(Np) | 933.09 (3) | 0.0263 (6) | [E1] | 0.00439 (9) | 0.0262 (6) |
| $\gamma_{29,3}$(Np) | 938.98 (8) | 0.00031 (8) | | | 0.00031 (8) |
| $\gamma_{-1,54}$(Np) | 948.88 (19) | 0.00024 (10) | | | 0.00024 (10) |
| $\gamma_{25,0}$(Np) | 959.18 (3) | 0.0078 (3) | | | 0.0078 (3) |
| $\gamma_{28,1}$(Np) | 960.99 (5) | 0.01054 (30) | [E1] | 0.00417 (9) | 0.0105 (3) |
| $\gamma_{26,0}$(Np) | 964.23 (2) | 0.0909 (20) | [E1] | 0.00415 (8) | 0.0905 (20) |
| $\gamma_{-1,55}$(Np) | 970.07 (14) | 0.0009 (2) | | | 0.0009 (2) |
| $\gamma_{31,3}$(Np) | 974.58 (4) | 0.00040 (8) | [E2] | 0.0123 (5) | 0.00040 (8) |
| $\gamma_{-1,56}$(Np) | 988.51 (14) | 0.00044 (9) | | | 0.00044 (9) |
| $\gamma_{28,0}$(Np) | 992.16 (2) | 0.00281 (10) | [E1] | 0.00395 (8) | 0.0028 (1) |
| $\gamma_{-1,57}$(Np) | 1002.40 (13) | 0.00049 (9) | | | 0.00049 (9) |
| $\gamma_{-1,58}$(Np) | 1005.27 (13) | 0.0006 (1) | | | 0.0006 (1) |
| $\gamma_{-1,59}$(Np) | 1009.38 (18) | 0.0003 (1) | | | 0.0003 (1) |
| $\gamma_{30,0}$(Np) | 1040.37 (4) | 0.0011 (1) | | | 0.0011 (1) |
| $\gamma_{32,1}$(Np) | 1065.76 (12) | 0.00060 (8) | [M1+E2] | 0.023 (13) | 0.00059 (8) |
| $\gamma_{32,0}$(Np) | 1096.99 (3) | 0.00164 (10) | [M1+E2] | 0.022 (13) | 0.0016 (1) |
| $\gamma_{-1,60}$(Np) | 1101.99 (16) | 0.00031 (1) | | | 0.00031 (1) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 1.55 | (8) | $\times 10^5$ y |
| $Q_{EC}$ | : | 930 | (50) | keV |
| $Q_{\beta^-}$ | : | 480 | (50) | keV |
| $Q_\alpha$ | : | 5010 | (50) | keV |
| $EC$ | : | 87.8 | (6) | % |
| $\beta^-$ | : | 12.0 | (6) | % |
| $\alpha$ | : | 0.2 | (6) | % |

## 2 Electron Capture Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ | $P_K$ | $P_L$ | $P_{M+}$ |
|---|---|---|---|---|---|---|---|
| $\epsilon_{0,6}$ | 82 (50) | ~0.096 | allowed | 14.6 | | 0.6 | 0.4 |
| $\epsilon_{0,3}$ | 620 (50) | 87.8 (43) | 1st forbidden | 14.1 | 0.726 (8) | 0.201 (5) | 0.073 (2) |
| $\epsilon_{0,2}$ | 781 (50) | <4.4 | 1st forbidden unique | >15.9 | 0.74 | 0.19 | 0.07 |

## 3 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,3}$ | 174 (50) | 11.8 (12) | 1st forbidden | 14.5 |
| $\beta^-_{0,2}$ | 333 (50) | <1.6 | 1st forbidden unique | >16 |

## 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (U) | 6.07 - 21.68 | 128.8 (19) | |
| $e_{AK}$ | (U) | | 2.1 (3) | |
| | KLL | 71.78 - 80.95 | } | |
| | KLX | 88.15 - 98.43 | } | |
| | KXY | 104.51 - 115.59 | } | |
| $e_{AL}$ | (Pu) | 6.19 - 23.10 | 10.7 (3) | |
| $e_{AK}$ | (Pu) | | 0.021 (4) | |
| | KLL | 75.26 - 85.36 | } | |
| | KLX | 92.61 - 103.73 | } | |
| | KXY | 109.93 - 121.78 | } | |
| $ec_{1,0\ L}$ | (Pu) | 21.53 - 26.57 | 8.7 (5) | |
| $ec_{1,0\ M}$ | (Pu) | 38.70 - 40.86 | 2.42 (14) | |
| $ec_{2,1\ L}$ | (Pu) | 79.72 - 84.76 | 8.1 (6) | |
| $ec_{2,1\ M}$ | (Pu) | 96.89 - 99.04 | 2.28 (18) | |
| $ec_{3,2\ K}$ | (Pu) | 36.56 (2) | 0.73 (8) | |

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $ec_{3,2\ L}$ | (Pu) | 135.25 - 140.29 | 5.4 (6) | |
| $ec_{3,2\ M}$ | (Pu) | 152.42 - 154.57 | 1.50 (16) | |
| $ec_{1,0\ L}$ | (U) | 23.486 - 28.076 | 63.9 (19) | |
| $ec_{1,0\ M}$ | (U) | 39.696 - 41.690 | 17.7 (5) | |
| $ec_{2,1\ L}$ | (U) | 82.475 - 87.065 | 58.6 (16) | |
| $ec_{2,1\ M}$ | (U) | 98.685 - 100.680 | 16.25 (47) | |
| $ec_{3,2\ K}$ | (U) | 44.706 (3) | 6.6 (3) | |
| $ec_{3,2\ L}$ | (U) | 138.55 - 143.14 | 36.0 (18) | |
| $ec_{3,2\ M}$ | (U) | 154.76 - 156.76 | 10.0 (5) | |
| $\beta^-_{0,3}$ | max: | 174 (50) | 11.8 (12) | avg: 46 (15) |
| $\beta^-_{0,2}$ | max: | 333 (50) | 1.6 | avg: 92 (16) |

# 5 Photon Emissions

## 5.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (U) | 11.619 — 20.714 | | 117.5 (30) | |
| $XK\alpha_2$ | (U) | 94.666 | | 20.2 (3) | } $K\alpha$ |
| $XK\alpha_1$ | (U) | 98.44 | | 32.4 (5) | } |
| $XK\beta_3$ | (U) | 110.421 | } | | |
| $XK\beta_1$ | (U) | 111.298 | } | 11.69 (25) | $K\beta_1'$ |
| $XK\beta_5''$ | (U) | 111.964 | } | | |
| $XK\beta_2$ | (U) | 114.407 | } | | |
| $XK\beta_4$ | (U) | 115.012 | } | 4.00 (11) | $K\beta_2'$ |
| $XKO_{2,3}$ | (U) | 115.377 | } | | |
| XL | (Pu) | 12.1246 — 21.984 | | 12.1 (4) | |
| $XK\alpha_2$ | (Pu) | 99.525 | | 0.212 (23) | } $K\alpha$ |
| $XK\alpha_1$ | (Pu) | 103.734 | | 0.33 (4) | } |
| $XK\beta_3$ | (Pu) | 116.244 | } | | |
| $XK\beta_1$ | (Pu) | 117.228 | } | 0.123 (14) | $K\beta_1'$ |
| $XK\beta_5''$ | (Pu) | 117.918 | } | | |
| $XK\beta_2$ | (Pu) | 120.54 | } | | |
| $XK\beta_4$ | (Pu) | 120.969 | } | 0.043 (5) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Pu) | 121.543 | } | | |

### 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pu) | 44.63 (10) | 11.9 (7) | E2 | 741 (15) | 0.0161 (9) |
| $\gamma_{1,0}$(U) | 45.244 (2) | 87.8 (6) | E2 | 589 (12) | 0.149 (3) |
| $\gamma_{5,4}$(U) | 56.6 (5) | ~0.08 | (E2) | 199 (10) | ~0.0004 |
| $\gamma_{2,1}$(Pu) | 102.82 (2) | 12.0 (6) | E2 | 13.87 (28) | 0.81 (6) |
| $\gamma_{6,5}$(U) | 104.1 (10) | ~0.096 | E2 | 11.1 (6) | ~0.008 |
| $\gamma_{2,1}$(U) | 104.234 (6) | 87.8 (6) | E2 | 10.99 (22) | 7.32 (13) |
| $\gamma_{3,2}$(Pu) | 158.35 (3) | 11.8 (12) | E2 | 2.14 (4) | 3.8 (4) |
| $\gamma_{3,2}$(U) | 160.307 (3) | 87.8 (43) | E2 | 1.76 (4) | 31.8 (15) |
| $\gamma_{4,2}$(U) | 538.1 (1) | ~0.0008 | E3 | 0.143 (3) | ~0.0007 |
| $\gamma_{5,2}$(U) | 594.5 (3) | ~0.008 | | | ~0.008 |
| $\gamma_{4,1}$(U) | 642.34 (5) | ~0.068 | E1+(M2+E3) | 0.15 (2) | ~0.059 |
| $\gamma_{4,0}$(U) | 687.60 (5) | ~0.021 | E1+(M2+E3) | 0.31 (2) | ~0.016 |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 22.5 | (4) | h |
| $Q_{EC}$ | : | 993 | (13) | keV |
| $Q_{\beta^-}$ | : | 537 | (8) | keV |
| $EC$ | : | 53 | (1) | % |
| $\beta^-$ | : | 47 | (1) | % |

## 2 Electron Capture Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ | $P_K$ | $P_L$ | $P_{M+}$ |
|---|---|---|---|---|---|---|---|
| $\epsilon_{0,4}$ | 306 (13) | 1.64 (9) | 1st forbidden | 7.3 | 0.621 (10) | 0.274 (7) | 0.105 (3) |
| $\epsilon_{0,1}$ | 948 (13) | 8.3 (30) | allowed | 7.8 | 0.751 (1) | 0.184 (1) | 0.0652 (1) |
| $\epsilon_{0,0}$ | 993 (13) | 43.1 (32) | allowed | 7.1 | 0.753 (1) | 0.182 (1) | 0.0646 (1) |

## 3 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,1}$ | 492 (8) | 11 (4) | Allowed | 7.2 |
| $\beta^-_{0,0}$ | 537 (8) | 36 (4) | Allowed | 6.8 |

## 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (U) | 6.4 - 21.6 | 21.7 (15) | |
| $e_{AK}$ | (U) | | 1.03 (17) | |
| | KLL | 71.776 - 80.954 | } | |
| | KLX | 88.153 - 98.429 | } | |
| | KXY | 104.51 - 115.59 | } | |
| $e_{AL}$ | (Pu) | 6.19 - 22.99 | 3.8 (14) | |
| $ec_{1,0\ L}$ | (Pu) | 21.53 - 26.57 | 8 (3) | |
| $ec_{1,0\ M}$ | (Pu) | 38.70 - 40.86 | 2.2 (8) | |
| $ec_{1,0\ L}$ | (U) | 23.484 - 28.074 | 6.9 (22) | |
| $ec_{1,0\ M}$ | (U) | 39.694 - 41.690 | 1.9 (6) | |
| $ec_{4,1\ K}$ | (U) | 526.75 (9) | 0.121 (13) | |
| $ec_{4,1\ L}$ | (U) | 620.59 - 625.18 | 0.034 (4) | |
| $ec_{4,0\ K}$ | (U) | 572.00 (5) | 0.064 (6) | |
| $ec_{4,0\ L}$ | (U) | 665.8 - 670.4 | 0.0199 (23) | |
| $\beta^-_{0,1}$ | max: | 492 (8) | 11 (4) | avg: 143 (3) |
| $\beta^-_{0,0}$ | max: | 537 (8) | 36 (4) | avg: 158 (3) |

# 5 Photon Emissions

## 5.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (U) | 11.618 — 20.714 | | 21.3 (18) | |
| XK$\alpha_2$ | (U) | 94.666 | | 9.9 (10) | } K$\alpha$ |
| XK$\alpha_1$ | (U) | 98.44 | | 15.8 (15) | } |
| XK$\beta_3$ | (U) | 110.421 | } | | |
| XK$\beta_1$ | (U) | 111.298 | } | 5.7 (6) | K$\beta_1'$ |
| XK$\beta_5''$ | (U) | 111.964 | } | | |
| XK$\beta_2$ | (U) | 114.407 | } | | |
| XK$\beta_4$ | (U) | 115.012 | } | 1.95 (15) | K$\beta_2'$ |
| XKO$_{2,3}$ | (U) | 115.377 | } | | |
| XL | (Pu) | 12.124 — 21.984 | | 4.2 (16) | |

## 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pu) | 44.63 (10) | 11.2 (37) | E2 | 743 (15) | 0.015 (5) |
| $\gamma_{1,0}$(U) | 45.242 (3) | 9.6 (30) | E2 | 589 (12) | 0.016 (5) |
| $\gamma_{2,1}$(U) | 104.234 (6) | 0.0143 (17) | E2 | 11.0 (2) | 0.00119 (14) |
| $\gamma_{4,2}$(U) | 538.11 (10) | 0.0143 (17) | E3 | 0.143 (3) | 0.0125 (15) |
| $\gamma_{4,1}$(U) | 642.35 (9) | 1.24 (8) | E1+(M2+E3) | 0.15 (2) | 1.08 (6) |
| $\gamma_{4,0}$(U) | 687.60 (5) | 0.383 (28) | E1 | 0.31 (2) | 0.292 (21) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 2.144 | (7) | $\times 10^6$ y |
| $Q_\alpha$ | : | 4958.3 | (12) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | $\leq$2.14 | | $\times 10^{-9}$ % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,20}$ | 4515.1 (19) | 0.038 (4) |
| $\alpha_{-1,1}$ | 4550.5 (22) | 0.011 (3) |
| $\alpha_{0,18}$ | 4573 (3) | 0.048 (23) |
| $\alpha_{0,17}$ | 4578.6 (14) | 0.393 (23) |
| $\alpha_{0,16}$ | 4599.1 (18) | 0.373 (9) |
| $\alpha_{0,15}$ | 4619.7 (21) | 0.032 (8) |
| $\alpha_{0,14}$ | 4640 (1) | 6.43 (3) |
| $\alpha_{0,13}$ | 4665.0 (9) | 3.46 (3) |
| $\alpha_{0,12}$ | 4676.4 | 0.38 (2) |
| $\alpha_{0,11}$ | 4698.2 (8) | 0.535 (10) |
| $\alpha_{0,10}$ | 4708.3 (20)} | |
| $\alpha_{0,9}$ | 4712.3 (20)} | 1.174 (13) |
| $\alpha_{0,8}$ | 4741.3 (20) | 0.019 |
| $\alpha_{0,7}$ | 4766.5 (8) | 9.5 (3) |
| $\alpha_{0,6}$ | 4771.4 (8) | 23.0 (3) |
| $\alpha_{0,4}$ | 4788.0 (9) | 47.64 (6) |
| $\alpha_{0,3}$ | 4803.5 (10) | 2.02 (2) |
| $\alpha_{0,2}$ | 4816.8 (10) | 2.430 (17) |
| $\alpha_{0,1}$ | 4866.4 (14) | 0.51 (3) |
| $\alpha_{0,0}$ | 4872.7 (14) | 2.41 (3) |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $e_{AL}$ | (Pa) | 5.90 - 21.01 | 47.1 (20) |
| $e_{AK}$ | (Pa) | | 0.167 (24) |
| | KLL | 70.08 - 78.82 } | |
| | KLX | 85.99 - 95.86 } | |
| | KXY | 101.87 - 112.59 } | |
| $ec_{13,5\ K}$ | (Pa) | 5.11 (2) | 1.59 (9) |
| $ec_{4,2\ L}$ | (Pa) | 8.269 - 12.641 | 32.7 (15) |
| $ec_{14,12\ L}$ | (Pa) | 15.22 - 19.59 | 0.37 (11) |
| $ec_{4,2\ M}$ | (Pa) | 24.013 - 25.932 | 8.4 (4) |
| $ec_{6,2\ L}$ | (Pa) | 25.42 - 29.80 | 0.075 (3) |
| $ec_{14,5\ K}$ | (Pa) | 30.65 (2) | 2.26 (22) |

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $ec_{14,12\ M}$ | (Pa) | 30.96 - 32.88 | 0.090 (27) |
| $ec_{2,0\ L}$ | (Pa) | 35.999 - 40.371 | 48.9 (29) |
| $ec_{14,4\ K}$ | (Pa) | 38.82 (2) | 0.80 (12) |
| $ec_{6,2\ M}$ | (Pa) | 41.17 - 43.09 | 0.0186 (11) |
| $ec_{17,14\ L}$ | (Pa) | 41.48 - 45.86 | 0.3 (2) |
| $ec_{3,1\ L}$ | (Pa) | 42.8 - 47.2 | 0.80 (4) |
| $ec_{3,0\ L}$ | (Pa) | 49.38 - 53.76 | 0.3 (2) |
| $ec_{2,0\ M}$ | (Pa) | 51.743 - 53.662 | 13.4 (8) |
| $ec_{17,14\ M}$ | (Pa) | 57.23 - 59.15 | 0.08 (6) |
| $ec_{3,1\ M}$ | (Pa) | 58.5 - 60.5 | 0.220 (9) |
| $ec_{3,0\ M}$ | (Pa) | 65.13 - 67.05 | 0.08 (6) |
| $ec_{4,0\ L}$ | (Pa) | 65.372 - 69.744 | 13.9 (6) |
| $ec_{5,1\ L}$ | (Pa) | 66.88 - 71.26 | 0.0183 (6) |
| $ec_{5,0\ L}$ | (Pa) | 73.54 - 77.91 | 0.070 (7) |
| $ec_{4,0\ M}$ | (Pa) | 81.116 - 83.035 | 2.7 (7) |
| $ec_{5,0\ M}$ | (Pa) | 89.28 - 91.20 | 0.0170 (18) |
| $ec_{13,5\ L}$ | (Pa) | 96.597 - 100.969 | 0.369 (22) |
| $ec_{13,5\ M}$ | (Pa) | 112.341 - 114.260 | 0.091 (7) |
| $ec_{14,5\ L}$ | (Pa) | 122.144 - 126.516 | 0.49 (5) |
| $ec_{14,4\ L}$ | (Pa) | 130.309 - 134.681 | 0.257 (10) |
| $ec_{14,5\ M}$ | (Pa) | 137.888 - 139.807 | 0.121 (12) |
| $ec_{14,4\ M}$ | (Pa) | 146.053 - 147.972 | 0.0654 (34) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pa) | 11.368 — 20.113 | | 59.7 (32) | |
| $XK\alpha_2$ | (Pa) | 92.288 | | 1.813 (20) | } $K\alpha$ |
| $XK\alpha_1$ | (Pa) | 95.869 | | 2.906 (20) | } |
| $XK\beta_3$ | (Pa) | 107.595 | } | | |
| $XK\beta_1$ | (Pa) | 108.422 | } | 1.06 (10) | $K\beta_1'$ |
| $XK\beta_5''$ | (Pa) | 109.072 | } | | |
| $XK\beta_2$ | (Pa) | 111.405 | } | | |
| $XK\beta_4$ | (Pa) | 111.87 | } | 0.380 (9) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Pa) | 112.38 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{7,6}$(Pa) | 5.18 | | | | 0.220 (5) |
| $\gamma_{5,4}$(Pa) | 8.22 (5) | ≈9 | | | ≈0.12 (5) |
| $\gamma_{-1,1}$(Pa) | 21.5 | | | | 0.352 (13) |
| $\gamma_{-1,2}$(Pa) | 27.7 | | | | 0.84 (7) |
| $\gamma_{4,2}$(Pa) | 29.374 (20) | 58.2 (26) | E1 | 3.07 (6) | 14.3 (6) |
| $\gamma_{14,12}$(Pa) | 36.32 (2) | 0.50 (14) | M1+1.20%E2 | 99 (20) | 0.005 (1) |
| $\gamma_{6,2}$(Pa) | 46.53 (6) | 0.209 (8) | [E1] | 0.914 (18) | 0.109 (4) |
| $\gamma_{2,0}$(Pa) | 57.104 (20) | 67.4 (40) | E2 | 176 (4) | 0.381 (21) |
| $\gamma_{17,14}$(Pa) | 62.59 (10) | 0.4 (3) | [M1+50%E2] | 60 (50) | 0.006 (2) |
| $\gamma_{3,1}$(Pa) | 63.9 (1) | 1.10 (5) | (E2) | 102.3 (20) | 0.0107 (4) |
| $\gamma_{3,0}$(Pa) | 70.49 (10) | 0.42 (28) | [M1+50%E2] | 38 (26) | 0.0107 (4) |
| $\gamma_{10,5}$(Pa) | 74.54 (10) | 0.13 (3) | [M1] | 9.84 (20) | 0.012 (3) |
| $\gamma_{4,0}$(Pa) | 86.477 (10) | 29.8 (10) | E1 | 1.43 (8) | 12.26 (12) |
| $\gamma_{5,1}$(Pa) | 87.99 (3) | 0.167 (4) | [E1] | 0.169 (4) | 0.143 (3) |
| $\gamma_{5,0}$(Pa) | 94.64 (5) | 0.75 (8) | E1 | 0.140 (3) | 0.66 (7) |
| $\gamma_{9,2}$(Pa) | 106.15 (25) | 0.523 (31) | [E2] | 9.28 (19) | 0.0509 (29) |
| $\gamma_{13,6}$(Pa) | 108.7 | 0.32 (4) | M1+4.62%E2 | 3.5 (6) | 0.071 (3) |
| $\gamma_{12,4}$(Pa) | 115.40 (35) | 0.0029 (14) | [M1+E2] | 10 (4) | 0.0026 (8) |
| $\gamma_{13,5}$(Pa) | 117.702 (20) | 2.26 (12) | M1+8.26%E2 | 12.2 (6) | 0.171 (4) |
| $\gamma_{12,3}$(Pa) | 131.101 (25) | 0.106 (6) | E1 | 0.262 (5) | 0.084 (5) |
| $\gamma_{14,6}$(Pa) | 134.285 (20) | 0.62 (9) | [M1+E2] | 8.0 (11) | 0.069 (5) |
| $\gamma_{18,9}$(Pa) | 139.9 (1) | 0.00560 (49) | [E1] | 0.225 (5) | 0.0046 (4) |
| $\gamma_{14,5}$(Pa) | 143.249 (20) | 3.3 (3) | M1+7.76%E2 | 6.94 (14) | 0.42 (4) |
| $\gamma_{14,4}$(Pa) | 151.414 (20) | 1.38 (14) | M1+32.89%E2 | 4.9 (6) | 0.234 (2) |
| $\gamma_{20,13}$(Pa) | 153.37 (10) | 0.021 (6) | [E2] | 1.96 (4) | 0.007 (2) |
| $\gamma_{13,2}$(Pa) | 155.239 (20) | 0.103 (9) | E1 | 0.176 (4) | 0.088 (8) |
| $\gamma_{10,1}$(Pa) | 162.41 (8) | 0.0382 (12) | [E1] | 0.158 (3) | 0.033 (1) |
| $\gamma_{10,0}$(Pa) | 169.156 (20) | 0.0768 (4) | [E1] | 0.143 (3) | 0.0672 (3) |
| $\gamma_{16,7}$(Pa) | 170.59 (6) | 0.100 (22) | [M1+13.79%E2] | 4.0 (5) | 0.020 (4) |
| $\gamma_{16,6}$(Pa) | 176.12 (6) | 0.070 (16) | [M1+13.79%E2] | 3.7 (5) | 0.015 (3) |
| $\gamma_{14,2}$(Pa) | 180.81 (10) | 0.0180 (11) | [E1] | 0.1223 (25) | 0.016 (1) |
| $\gamma_{20,11}$(Pa) | 186.86 (35) | 0.003 (3) | [E1] | 0.1131 (23) | 0.003 (3) |
| $\gamma_{17,7}$(Pa) | 191.46 (5) | 0.074 (9) | [M1+13.79%E2] | 2.9 (4) | 0.019 (1) |
| $\gamma_{16,4}$(Pa) | 193.26 (5) | 0.167 (18) | [M1+13.79%E2] | 2.8 (4) | 0.044 (1) |
| $\gamma_{18,7}$(Pa) | 194.67 (20) | | | | 0.033 (1) |
| $\gamma_{12,1}$(Pa) | 194.95 (3) | 0.192 (22) | E1 | 0.1024 (21) | 0.174 (20) |
| $\gamma_{17,6}$(Pa) | 196.86 (5) | 0.078 (6) | [M1+13.79%E2] | 2.7 (3) | 0.0210 (1) |
| $\gamma_{18,6}$(Pa) | 199.95 (6) | 0.020 (3) | [M1] | 2.85 (6) | 0.0053 (8) |
| $\gamma_{12,0}$(Pa) | 201.62 (5) | 0.0429 (10) | E1 | 0.0946 (19) | 0.0392 (9) |
| $\gamma_{20,9}$(Pa) | 202.9 (2) | 0.0052 (21) | [E1] | 0.0932 (19) | 0.0048 (19) |
| $\gamma_{16,3}$(Pa) | 209.19 (5) | 0.0163 (16) | [E1] | 0.0868 (17) | 0.0150 (15) |
| $\gamma_{13,0}$(Pa) | 212.29 (5) | 0.184 (11) | E1 | 0.0839 (17) | 0.17 (1) |
| $\gamma_{17,4}$(Pa) | 214.01 (5) | 0.115 (13) | [M1+13.79%E2] | 2.1 (3) | 0.037 (2) |
| $\gamma_{16,2}$(Pa) | 222.6 (2) | | | | 0.002 (2) |
| $\gamma_{17,3}$(Pa) | 229.94 (5) | 0.015 (3) | [E1] | 0.0697 (14) | 0.014 (3) |
| $\gamma_{14,0}$(Pa) | 237.86 (2) | 0.0610 (6) | [E1] | 0.0645 (13) | 0.0573 (6) |
| $\gamma_{19,2}$(Pa) | 248.95 (10) | 0.012 (3) | [M1+13.79%E2] | 1.37 (16) | 0.005 (1) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{20,7}$(Pa) | 257.09 (20) | 0.048 (24) | [M1] | 1.41 (3) | 0.02 (1) |
| $\gamma_{20,6}$(Pa) | 262.44 (20) | 0.01120 (49) | [M1] | 1.33 (3) | 0.0048 (2) |
| $\gamma_{20,4}$(Pa) | 279.65 (20) | 0.01320 (49) | [E2] | 0.222 (5) | 0.0108 (4) |
| $\gamma_{-1,4}$(Pa) | 288.3 | | | | 0.0162 (5) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 2.102 | (5) | d |
| $Q_{\beta^-}$ | : | 1291.5 | (4) | keV |
| $\beta^-$ | : | 100 | | % |

# 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,15}$ | 89.0 (4) | 0.51 (6) | 1st forbidden | 6.57 |
| $\beta^-_{0,13}$ | 221.6 (4) | 11.50 (7) | Allowed | 6.44 |
| $\beta^-_{0,12}$ | 263.0 (4) | 44.75 (19) | Allowed | 6.09 |
| $\beta^-_{0,11}$ | 306.0 (4) | 0.49 (1) | 1st forbidden | 8.25 |
| $\beta^-_{0,10}$ | 308.4 (4) | 0.27 (3) | Allowed | 8.51 |
| $\beta^-_{0,9}$ | 323.3 (6) | 0.082 (6) | 1st forbidden | 9.11 |
| $\beta^-_{0,8}$ | 328.7 (4) | 1.25 (1) | 1st forbidden | 7.95 |
| $\beta^-_{0,5}$ | 630.1 (4) | 0.036 (3) | 1st forbidden | 10.44 |
| $\beta^-_{0,4}$ | 686.4 (4) | 0.103 (3) | 1st forbidden | 10.08 |
| $\beta^-_{0,1}$ | 1247.4 (4) | 41.0 (25) | Allowed | 8.38 |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Pu) | 6.19 - 22.99 | 29.7 (14) | |
| $e_{AK}$ | (Pu) | | 0.021 (8) | |
| | KLL | 75.26 - 85.36 | } | |
| | KLX | 92.607 - 103.729 | } | |
| | KXY | 109.93 - 121.78 | } | |
| $ec_{1,0\ L}$ | (Pu) | 20.97 - 26.01 | 58.6 (17) | |
| $ec_{1,0\ M}$ | (Pu) | 38.14 - 40.30 | 16.4 (5) | |
| $ec_{2,1\ L}$ | (Pu) | 78.78 - 83.82 | 2.65 (10) | |
| $ec_{14,9\ L}$ | (Pu) | 91.3 - 96.3 | 0.036 (6) | |
| $ec_{2,1\ M}$ | (Pu) | 95.95 - 98.10 | 0.74 (3) | |
| $ec_{15,14\ L}$ | (Pu) | 97.01 - 102.05 | 0.28 (6) | |
| $ec_{14,9\ M}$ | (Pu) | 108.5 - 110.6 | 0.0100 (19) | |
| $ec_{15,14\ M}$ | (Pu) | 114.18 - 116.34 | 0.070 (7) | |
| $ec_{13,2\ K}$ | (Pu) | 802.20 (2) | 0.0258 (11) | |
| $ec_{10,1\ K}$ | (Pu) | 817.1 (1) | 0.114 (16) | |
| $ec_{12,1\ K}$ | (Pu) | 862.66 (2) | 0.242 (8) | |
| $ec_{13,1\ K}$ | (Pu) | 904.08 (2) | 0.080 (4) | |
| $ec_{12,0\ K}$ | (Pu) | 906.75 (2) | 0.160 (3) | |
| $ec_{10,1\ L}$ | (Pu) | 915.84 - 920.88 | 0.022 (3) | |
| $ec_{12,1\ L}$ | (Pu) | 961.35 - 966.39 | 0.055 (3) | |
| $ec_{12,1\ M}$ | (Pu) | 978.52 - 980.68 | 0.015 (3) | |
| $ec_{13,1\ L}$ | (Pu) | 1002.77 - 1007.81 | 0.0184 (9) | |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $ec_{12,0\ L}$ | (Pu) | 1005.44 - 1010.48 | | 0.0405 (10) | | |
| $ec_{12,0\ M}$ | (Pu) | 1022.61 - 1024.76 | | 0.0101 (2) | | |
| $\beta^-_{0,15}$ | max: | 89.0 | (4) | 0.51 (6) | avg: | 23.0 (2) |
| $\beta^-_{0,13}$ | max: | 221.6 | (4) | 11.50 (7) | avg: | 59.9 (2) |
| $\beta^-_{0,12}$ | max: | 263.0 | (4) | 44.75 (19) | avg: | 72.0 (2) |
| $\beta^-_{0,11}$ | max: | 306.0 | (4) | 0.49 (1) | avg: | 84.9 (2) |
| $\beta^-_{0,10}$ | max: | 308.4 | (4) | 0.27 (3) | avg: | 85.6 (2) |
| $\beta^-_{0,9}$ | max: | 323.3 | (6) | 0.082 (6) | avg: | 90.1 (2) |
| $\beta^-_{0,8}$ | max: | 328.7 | (4) | 1.25 (1) | avg: | 91.8 (2) |
| $\beta^-_{0,5}$ | max: | 630.1 | (4) | 0.036 (3) | avg: | 189.2 (2) |
| $\beta^-_{0,4}$ | max: | 686.4 | (4) | 0.103 (3) | avg: | 208.4 (2) |
| $\beta^-_{0,1}$ | max: | 1247.4 | (4) | 41.0 (25) | avg: | 412.2 (2) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pu) | 12.125 — 21.984 | | 32.4 (14) | |
| $XK\alpha_2$ | (Pu) | 99.525 | | 0.210 (8) | } $K\alpha$ |
| $XK\alpha_1$ | (Pu) | 103.734 | | 0.332 (12) | } |
| $XK\beta_3$ | (Pu) | 116.244 | } | | |
| $XK\beta_1$ | (Pu) | 117.228 | } | 0.122 (5) | $K\beta'_1$ |
| $XK\beta''_5$ | (Pu) | 117.918 | } | | |
| $XK\beta_2$ | (Pu) | 120.54 | } | | |
| $XK\beta_4$ | (Pu) | 120.969 | } | 0.042 (2) | $K\beta'_2$ |
| $XKO_{2,3}$ | (Pu) | 121.543 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pu) | 44.07 (2) | 80.7 (23) | E2 | 788 (16) | 0.1024 (21) |
| $\gamma_{2,1}$(Pu) | 101.88 (2) | 3.90 (14) | E2 | 14.5 (3) | 0.252 (8) |
| $\gamma_{-1,1}$(Pu) | 103.74 (2) | 0.312 (3) | | | 0.312 (3) |
| $\gamma_{14,9}$(Pu) | 114.4 (4) | 0.055 (10) | [E2] | 8.47 (17) | 0.0058 (10) |
| $\gamma_{-1,2}$(Pu) | 116.27 (8) | 0.04 | | | 0.04 |
| $\gamma_{-1,3}$(Pu) | 117.27 (8) | 0.074 | | | 0.074 |
| $\gamma_{15,14}$(Pu) | 120.11 (5) | 0.48 (6) | M1(+E2) | 3.8 (6) | 0.101 (5) |
| $\gamma_{-1,4}$(Pu) | 120.5 | 0.02 | | | 0.02 |
| $\gamma_{-1,5}$(Pu) | 121.70 (8) | 0.010 (1) | | | 0.010 (1) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{15,13}$(Pu) | 132.5 (1) | 0.0018 (10) | [E1] | 0.267 (5) | 0.0014 (8) |
| $\gamma_{3,2}$(Pu) | 157.42 (5) | 0.003 | [E2] | 2.19 (4) | 0.001 |
| $\gamma_{15,12}$(Pu) | 174.08 (5) | 0.0261 (9) | [E1] | 0.142 (3) | 0.0229 (8) |
| $\gamma_{-1,6}$(Pu) | 220.87 (11) | 0.037 (9) | (M2) | 11.4 (20) | 0.0030 (5) |
| $\gamma_{8,5}$(Pu) | 301.37 (7) | 0.0128 (12) | E2 | 0.208 (4) | 0.0106 (10) |
| $\gamma_{14,6}$(Pu) | 319.29 (11) | 0.013 (3) | M1+E2 | 0.59 (25) | 0.0083 (10) |
| $\gamma_{10,5}$(Pu) | 321.75 (20) | 0.0013 | | | 0.0013 (8) |
| $\gamma_{11,5}$(Pu) | 324.02 (9) | 0.0184 (14) | M1+E2 | 0.26 (7) | 0.0146 (8) |
| $\gamma_{7,4}$(Pu) | 336.36 (15) | 0.00020 (13) | [E1] | 0.0324 (7) | 0.0002 (1) |
| $\gamma_{8,4}$(Pu) | 357.64 (7) | 0.0612 (17) | M1+E2 | 0.214 (16) | 0.0504 (13) |
| $\gamma_{10,4}$(Pu) | 378.05 (13) | 0.003 | | | 0.0030 (5) |
| $\gamma_{11,4}$(Pu) | 380.31 (10) | 0.0180 (8) | [M1] | 0.623 (9) | 0.0111 (5) |
| $\gamma_{14,5}$(Pu) | 421.1 (1) | 0.0309 (15) | [M1] | 0.472 (7) | 0.021 (1) |
| $\gamma_{6,3}$(Pu) | 459.8 (2) | 0.0023 | | | 0.0023 (15) |
| $\gamma_{5,2}$(Pu) | 515.51 (7) | 0.0386 (11) | E1+M2 | 0.022 (4) | 0.0378 (11) |
| $\gamma_{4,1}$(Pu) | 561.14 (5) | 0.1072 (15) | E1 | 0.0115 (2) | 0.106 (2) |
| $\gamma_{4,0}$(Pu) | 605.16 (5) | 0.078 (2) | E1 | 0.0100 (2) | 0.077 (2) |
| $\gamma_{5,1}$(Pu) | 617.39 (5) | 0.0604 (7) | E1+M2 | 0.0120 (14) | 0.0593 |
| $\gamma_{6,2}$(Pu) | 617.4 | 0.008 (0) | | | 0.008 |
| $\gamma_{10,2}$(Pu) | 836.96 (7) | 0.0210 (8) | [E2] | 0.0174 (4) | 0.0206 (8) |
| $\gamma_{12,2}$(Pu) | 882.63 (3) | 0.816 (9) | (E2) | 0.0157 (3) | 0.803 (9) |
| $\gamma_{-1,7}$(Pu) | 885 | 0.040 (5) | | | 0.040 (5) |
| $\gamma_{7,1}$(Pu) | 897.34 (10) | 0.0074 (10) | (E2) | 0.0152 (3) | 0.0073 (10) |
| $\gamma_{8,1}$(Pu) | 918.70 (4) | 0.531 (6) | E1 | 0.0047 (1) | 0.529 (6) |
| $\gamma_{13,2}$(Pu) | 923.99 (2) | 2.64 (2) | (M1+E2) | 0.014 (1) | 2.604 (20) |
| $\gamma_{9,1}$(Pu) | 924 | 0.065 | | | 0.065 |
| $\gamma_{14,2}$(Pu) | 936.60 (5) | 0.369 (5) | [E1+M2] | 0.0112 (22) | 0.365 (5) |
| $\gamma_{10,1}$(Pu) | 938.94 (10) | 0.18 (2) | E0+E2 | 4.4 (4) | 0.0327 (25) |
| $\gamma_{11,1}$(Pu) | 941.40 (4) | 0.504 | [E1+M2] | | 0.504 (6) |
| $\gamma_{8,0}$(Pu) | 962.76 (2) | 0.648 (8) | E1 | 0.00433 (9) | 0.645 (8) |
| $\gamma_{9,0}$(Pu) | 968.9 (4) | 0.017 (6) | [M2] | 0.116 (3) | 0.015 (8) |
| $\gamma_{10,0}$(Pu) | 983.0 (3) | 0.07 (2) | [E2] | 0.0128 (3) | 0.068 (20) |
| $\gamma_{12,1}$(Pu) | 984.45 (2) | 25.50 (13) | M1+E2 | 0.0125 (5) | 25.18 (13) |
| $\gamma_{13,1}$(Pu) | 1025.87 (2) | 8.86 (7) | M1+E2 | 0.0120 (5) | 8.76 (6) |
| $\gamma_{12,0}$(Pu) | 1028.54 (2) | 18.46 (13) | E2 | 0.0117 (2) | 18.25 (13) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 2.356 | (3) | d |
| $Q_{\beta^-}$ | : | 722.5 | (10) | keV |
| $\beta^-$ | : | 100 | | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,13}$ | 166.3 (5) | 0.0026 | 1st forbidden | 9.7 |
| $\beta^-_{0,12}$ | 210.7 (5) | 1.56 (16) | Allowed | 7.3 |
| $\beta^-_{0,11}$ | 217.3 (5) | 0.0074 | 1st forbidden | 9.7 |
| $\beta^-_{0,10}$ | 230.3 (5) | 0.02 | 1st forbidden | 9.3 |
| $\beta^-_{0,9}$ | 252.7 (5) | 0.0027 | 1st forbidden unique | 9.9 |
| $\beta^-_{0,8}$ | 330.9 (5) | 38.8 (9) | 1st forbidden | 6.3 |
| $\beta^-_{0,7}$ | 335.1 (5) | | 2nd forbidden | |
| $\beta^-_{0,6}$ | 392.4 (5) | 9.4 (14) | Allowed | 7.4 |
| $\beta^-_{0,5}$ | 437.0 (5) | 43.0 (22) | Allowed | 6.9 |
| $\beta^-_{0,4}$ | 558.7 (5) | | 2nd forbidden | |
| $\beta^-_{0,3}$ | 646.8 (5) | | Allowed | |
| $\beta^-_{0,2}$ | 665.2 (5) | 0.4 (72) | Allowed | |
| $\beta^-_{0,1}$ | 714.6 (5) | 6.5 (10) | Allowed | 8.4 |
| $\beta^-_{0,0}$ | 722.5 (5) | | 2nd forbidden unique | |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Pu) | 6.19 - 22.99 | 47.9 (26) | |
| $e_{AK}$ | (Pu) | | 1.36 (19) | |
| | KLL | 75.26 - 85.36 | } | |
| | KLX | 92.61 - 103.73 | } | |
| | KXY | 109.93 - 121.78 | } | |
| $ec_{1,0\ M}$ | (Pu) | 1.928 - 4.086 | 51 (6) | |
| $ec_{12,7\ K}$ | (Pu) | 2.6 | 0.1 | |
| $ec_{6,5\ L}$ | (Pu) | 21.559 - 26.606 | 8.3 (10) | |
| $ec_{2,1\ L}$ | (Pu) | 26.311 - 31.358 | 13.3 (3) | |
| $ec_{2,0\ L}$ | (Pu) | 34.169 - 39.216 | 20.8 (32) | |
| $ec_{8,6\ L}$ | (Pu) | 38.36 - 43.40 | 0.457 (11) | |
| $ec_{6,5\ M}$ | (Pu) | 38.730 - 40.888 | 2.12 (26) | |
| $ec_{2,1\ M}$ | (Pu) | 43.482 - 45.640 | 3.6 (9) | |
| $ec_{6,4\ K}$ | (Pu) | 44.60 (6) | 0.08 (3) | |
| $ec_{3,1\ L}$ | (Pu) | 44.74 - 49.78 | 7.1 (21) | |
| $ec_{2,0\ M}$ | (Pu) | 51.340 - 53.498 | 5.8 (9) | |
| $ec_{8,6\ M}$ | (Pu) | 55.53 - 57.68 | 0.114 (3) | |
| $ec_{12,6\ K}$ | (Pu) | 59.91 (3) | 0.323 (10) | |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $ec_{3,1\ M}$ | (Pu) | 61.91 - 64.07 | | 2.0 (6) | | |
| $ec_{4,3\ L}$ | (Pu) | 64.96 - 70.00 | | 0.054 (30) | | |
| $ec_{7,5\ L}$ | (Pu) | 78.86 - 83.90 | | 0.084 (21) | | |
| $ec_{4,3\ M}$ | (Pu) | 82.13 - 84.28 | | 0.014 (9) | | |
| $ec_{8,5\ L}$ | (Pu) | 83.02 - 88.07 | | 4.9 (8) | | |
| $ec_{4,2\ L}$ | (Pu) | 83.37 - 88.41 | | 0.42 (7) | | |
| $ec_{5,3\ K}$ | (Pu) | 87.962 | (2) | 7.76 (18) | | |
| $ec_{7,5\ M}$ | (Pu) | 96.03 - 98.18 | | 0.023 (6) | | |
| $ec_{8,5\ M}$ | (Pu) | 100.19 - 102.35 | | 1.30 (21) | | |
| $ec_{4,2\ M}$ | (Pu) | 100.54 - 102.69 | | 0.117 (19) | | |
| $ec_{12,7\ L}$ | (Pu) | 101.3 - 106.3 | | 0.024 | | |
| $ec_{12,5\ K}$ | (Pu) | 104.59 | (2) | 0.52 (3) | | |
| $ec_{8,4\ K}$ | (Pu) | 106 | | 0.030 (6) | | |
| $ec_{5,2\ K}$ | (Pu) | 106.392 | (1) | 21.4 (8) | | |
| $ec_{6,3\ K}$ | (Pu) | 132.61 | (3) | 0.161 (6) | | |
| $ec_{6,4\ L}$ | (Pu) | 143.29 - 148.33 | | 0.016 (7) | | |
| $ec_{6,2\ K}$ | (Pu) | 151.05 | (3) | 0.092 (4) | | |
| $ec_{5,1\ K}$ | (Pu) | 155.808 | (1) | 16.1 (7) | | |
| $ec_{12,6\ L}$ | (Pu) | 158.59 - 163.63 | | 0.066 (2) | | |
| $ec_{5,0\ K}$ | (Pu) | 163.669 | (2) | 0.066 (2) | | |
| $ec_{12,6\ M}$ | (Pu) | 175.76 - 177.92 | | 0.0161 (5) | | |
| $ec_{5,3\ L}$ | (Pu) | 186.65 - 191.70 | | 1.71 (4) | | |
| $ec_{8,3\ K}$ | (Pu) | 194.089 | (3) | 0.0469 (10) | | |
| $ec_{12,5\ L}$ | (Pu) | 203.28 - 208.32 | | 0.105 (7) | | |
| $ec_{5,3\ M}$ | (Pu) | 203.82 - 205.98 | | 0.42 (9) | | |
| $ec_{5,2\ L}$ | (Pu) | 205.08 - 210.13 | | 4.48 (16) | | |
| $ec_{8,2\ K}$ | (Pu) | 212.519 | (3) | 0.0532 (11) | | |
| $ec_{12,5\ M}$ | (Pu) | 220.45 - 222.60 | | 0.0255 (18) | | |
| $ec_{5,2\ M}$ | (Pu) | 222.25 - 224.41 | | 1.10 (4) | | |
| $ec_{6,3\ L}$ | (Pu) | 231.3 - 236.3 | | 0.0324 (11) | | |
| $ec_{6,2\ L}$ | (Pu) | 249.74 - 254.78 | | 0.0186 (8) | | |
| $ec_{5,1\ L}$ | (Pu) | 254.50 - 259.54 | | 3.28 (9) | | |
| $ec_{5,0\ L}$ | (Pu) | 262.36 - 267.40 | | 0.093 (3) | | |
| $ec_{5,1\ M}$ | (Pu) | 271.67 - 273.82 | | 0.801 (18) | | |
| $ec_{5,0\ M}$ | (Pu) | 279.53 - 281.68 | | 0.0256 (6) | | |
| $\beta^-_{0,13}$ | max: | 166.3 | (5) | 0.0026 | avg: | 44.2 (2) |
| $\beta^-_{0,12}$ | max: | 210.7 | (5) | 1.56 (16) | avg: | 56.8 (2) |
| $\beta^-_{0,11}$ | max: | 217.3 | (5) | 0.0074 | avg: | 58.7 (2) |
| $\beta^-_{0,10}$ | max: | 230.3 | (5) | 0.02 | avg: | 62.5 (2) |
| $\beta^-_{0,9}$ | max: | 252.7 | (5) | 0.0027 | avg: | 74.7 (2) |
| $\beta^-_{0,8}$ | max: | 330.9 | (5) | 38.8 (9) | avg: | 98.3 (2) |
| $\beta^-_{0,7}$ | max: | 335.1 | (5) | | avg: | |
| $\beta^-_{0,6}$ | max: | 392.4 | (5) | 9.4 (14) | avg: | 111.5 (2) |
| $\beta^-_{0,5}$ | max: | 437.0 | (5) | 43.0 (22) | avg: | 125.6 (2) |
| $\beta^-_{0,4}$ | max: | 558.7 | (5) | | avg: | |
| $\beta^-_{0,3}$ | max: | 646.8 | (5) | | avg: | |
| $\beta^-_{0,2}$ | max: | 665.2 | (5) | 0.4 (72) | avg: | |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $\beta^-_{0,1}$ | max: | 714.6 | (5) | 6.5 (10) | avg: | 218.3 (2) |
| $\beta^-_{0,0}$ | max: | 722.5 | (5) | | avg: | |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pu) | 12.125 — 21.984 | | 51.3 (24) | |
| $XK\alpha_2$ | (Pu) | 99.525 | | 13.5 (4) | } $K\alpha$ |
| $XK\alpha_1$ | (Pu) | 103.734 | | 21.4 (6) | } |
| $XK\beta_3$ | (Pu) | 116.244 | } | | |
| $XK\beta_1$ | (Pu) | 117.228 | } | 7.84 (25) | $K\beta_1'$ |
| $XK\beta_5''$ | (Pu) | 117.918 | } | | |
| $XK\beta_2$ | (Pu) | 120.54 | } | | |
| $XK\beta_4$ | (Pu) | 120.969 | } | 2.72 (10) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Pu) | 121.543 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pu) | 7.861 (2) | 70 (8) | M1+0.3%E2 | 5716 (400) | 0.0122 (12) |
| $\gamma_{3,2}$(Pu) | 18.430 (4) | 5.5 (30) | [M1+E2] | | 0.02 |
| $\gamma_{6,5}$(Pu) | 44.663 (5) | 11.3 (14) | M1+4%E2 | 86 (8) | 0.13 (1) |
| $\gamma_{2,1}$(Pu) | 49.415 (3) | 18 (5) | M1+20%E2 | 126 (8) | 0.145 (35) |
| $\gamma_{2,0}$(Pu) | 57.273 (4) | 27 (7) | E2 | 222 (5) | 0.12 (3) |
| $\gamma_{7,6}$(Pu) | 57.3 | ≈0.012 | M1(+E2) | | ≈0.012 |
| $\gamma_{8,6}$(Pu) | 61.460 (2) | 1.900 (32) | E1 | 0.473 (10) | 1.29 (2) |
| $\gamma_{3,1}$(Pu) | 67.841 (7) | 9.9 (30) | E2 | 98.3 (20) | 0.10 (3) |
| $\gamma_{4,3}$(Pu) | 88.06 (3) | 0.078 (44) | M1+20%E2 | 12 (6) | 0.006 (2) |
| $\gamma_{7,5}$(Pu) | 101.96 (2) | 0.12 (3) | E2 | 14.4 (3) | 0.008 (2) |
| $\gamma_{8,5}$(Pu) | 106.125 (2) | 32.6 (9) | E1(+M2) | 0.26 (3) | 25.9 (3) |
| $\gamma_{4,2}$(Pu) | 106.50 (3) | 0.63 (10) | E2 | 11.8 (3) | 0.049 (8) |
| $\gamma_{12,7}$(Pu) | 124.4 | 0.15 | E2 | 13.6 (3) | 0.01 |
| $\gamma_{6,4}$(Pu) | 166.39 (6) | 0.12 (5) | M1(+20%E2) | 6.23 (13) | 0.016 (7) |
| $\gamma_{12,6}$(Pu) | 181.70 (3) | 0.497 (14) | M1 | 4.78 (10) | 0.086 (2) |
| $\gamma_{5,3}$(Pu) | 209.753 (2) | 13.47 (24) | M1+2%E2 | 2.94 (6) | 3.42 (3) |
| $\gamma_{12,5}$(Pu) | 226.38 (2) | 0.91 (5) | M1+12%E2 | 2.58 (8) | 0.255 (14) |
| $\gamma_{8,4}$(Pu) | 227.83 | 0.54 (11) | M1+1.7%E2 | 0.0762 (15) | 0.5 (1) |
| $\gamma_{5,2}$(Pu) | 228.183 (1) | 38.6 (12) | M1+7.3%E2 | 2.41 (8) | 11.32 (22) |
| $\gamma_{6,3}$(Pu) | 254.40 (3) | 0.314 (10) | M1+2.5%E2 | 1.85 (4) | 0.110 (3) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{6,2}$(Pu) | 272.84 (3) | 0.194 (8) | M1+2.6%E2 | 1.52 (3) | 0.077 (3) |
| $\gamma_{5,1}$(Pu) | 277.599 (1) | 34.8 (9) | M1+5%E2 | 1.42 (6) | 14.4 (1) |
| $\gamma_{5,0}$(Pu) | 285.460 (2) | 0.973 (13) | E2 | 0.248 (5) | 0.78 (1) |
| $\gamma_{7,3}$(Pu) | 311.70 (2) | 0.002 (2) | (M1+E2) | | 0.002 (2) |
| $\gamma_{8,3}$(Pu) | 315.880 (3) | 1.649 (10) | E1(+0.006%M2) | 0.0372 (8) | 1.59 (1) |
| $\gamma_{6,1}$(Pu) | 322.3 (2) | 0.006 | (E2) | 0.170 (4) | 0.0052 |
| $\gamma_{8,2}$(Pu) | 334.310 (3) | 2.107 (21) | E1(+0.004%M2) | 0.0329 (7) | 2.04 (2) |
| $\gamma_{13,4}$(Pu) | 392.4 (5) | 0.0016 | (E1) | | 0.0016 |
| $\gamma_{11,3}$(Pu) | 429.5 (5) | 0.0039 | | | 0.0039 |
| $\gamma_{10,2}$(Pu) | 434.7 (5) | 0.013 | E1(+M2) | | 0.013 |
| $\gamma_{11,2}$(Pu) | 447.6 (5) | 0.00026 | | | 0.00026 |
| $\gamma_{12,2}$(Pu) | 454.2 (5) | 0.00082 | (M1) | | 0.00082 |
| $\gamma_{9,1}$(Pu) | 461.9 (5) | 0.0016 | (E1) | | 0.0016 |
| $\gamma_{9,0}$(Pu) | 469.8 (5) | 0.0011 | (E1) | | 0.0011 |
| $\gamma_{10,1}$(Pu) | 484.3 (5) | 0.001 | (E1) | | 0.001 |
| $\gamma_{10,0}$(Pu) | 492.3 (5) | 0.006 | (E1) | | 0.006 |
| $\gamma_{11,1}$(Pu) | 497.8 (5) | 0.0032 | | | 0.0032 |
| $\gamma_{13,2}$(Pu) | 498.7 | 0.001 | (E1) | | 0.001 |
| $\gamma_{12,1}$(Pu) | 504.2 (5) | 0.00078 | (E2) | | 0.00078 |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 87.74 | (3) | y |
| $Q_\alpha$ | : | 5593.20 | (19) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | 1.85 | (5) | $\times10^{-7}$ % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,14}$ | 4432.1 (2) | ~0.0000012 |
| $\alpha_{0,13}$ | 4472.1 (2) | 0.00000117 (7) |
| $\alpha_{0,12}$ | 4492.5 (2) | ~0.0000002 |
| $\alpha_{0,11}$ | 4526.3 (2) | 0.000000150 (16) |
| $\alpha_{0,10}$ | 4567.4 (2) | 0.00000023 |
| $\alpha_{0,9}$ | 4587.9 (2) | 0.00000130 (5) |
| $\alpha_{0,8}$ | 4661.7 (2) | 0.0000081 |
| $\alpha_{0,7}$ | 4664.1 (2) | 0.000000075 (22) |
| $\alpha_{0,6}$ | 4702.8 (2) | 0.0001 |
| $\alpha_{0,5}$ | 4726.0 (2) | 0.00000821 (16) |
| $\alpha_{0,4}$ | 5010.4 (2) | 0.00000680 (23) |
| $\alpha_{0,3}$ | 5208.0 (2) | 0.00292 (4) |
| $\alpha_{0,2}$ | 5358.1 (2) | 0.104 (3) |
| $\alpha_{0,1}$ | 5456.3 (2) | 28.85 (6) |
| $\alpha_{0,0}$ | 5499.03 (20) | 71.04 (6) |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $e_{AL}$ | (U) | 5.9 - 21.6 | 10.6 (4) |
| $e_{AK}$ | (U) | | 0.0000110 (15) |
| | KLL | 71.78 - 80.95 | } |
| | KLX | 88.15 - 98.43 | } |
| | KXY | 104.51 - 115.59 | } |
| $ec_{1,0\ L}$ | (U) | 21.74 - 26.33 | 20.6 (6) |
| $ec_{1,0\ M}$ | (U) | 37.95 - 39.95 | 5.7 (12) |
| $ec_{1,0\ N}$ | (U) | 42.057 - 43.119 | 1.544 (39) |
| $ec_{2,1\ L}$ | (U) | 78.095 - 82.685 | 0.0718 (17) |
| $ec_{2,1\ M}$ | (U) | 94.305 - 96.300 | 0.01992 (49) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (U) | 11.619 — 20.714 | | 10.63 (8) | |
| XK$\alpha_2$ | (U) | 94.666 | | 0.000106 (3) | } K$\alpha$ |
| XK$\alpha_1$ | (U) | 98.44 | | 0.000169 (5) | } |
| XK$\beta_3$ | (U) | 110.421 | } | | |
| XK$\beta_1$ | (U) | 111.298 | } | 0.0000609 (22) | K$\beta_1'$ |
| XK$\beta_5''$ | (U) | 111.964 | } | | |
| XK$\beta_2$ | (U) | 114.407 | } | | |
| XK$\beta_4$ | (U) | 115.012 | } | 0.0000208 (6) | K$\beta_2'$ |
| XKO$_{2,3}$ | (U) | 115.377 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{8,6}$(U) | 41.82 (11) | 0.0000026 (14) | [E2] | 863 (18) | 0.0000000030 (16) |
| $\gamma_{1,0}$(U) | 43.498 (1) | 28.3 (8) | E2 | 713 (15) | 0.0397 (8) |
| $\gamma_{11,9}$(U) | 62.70 (1) | 0.000000016 (4) | E1 | 0.426 (9) | 0.000000011 (3) |
| $\gamma_{2,1}$(U) | 99.852 (3) | 0.1060 (23) | E2 | 13.42 (27) | 0.00735 (8) |
| $\gamma_{11,7}$(U) | 140.15 (2) | 0.000000021 (7) | M1+63%E2 | 5.1 (15) | 0.0000000035 (7) |
| $\gamma_{3,2}$(U) | 152.719 (2) | 0.00292 (4) | E2 | 2.14 (4) | 0.000930 (7) |
| $\gamma_{13,8}$(U) | 192.91 (7) | 0.0000000012 (4) | [E2] | 0.856 (17) | 0.00000000066 (20) |
| $\gamma_{4,3}$(U) | 200.97 (3) | 0.00000680 (23) | E2 | 0.734 (15) | 0.00000392 (13) |
| $\gamma_{11,5}$(U) | 203.12 (3) | 0.000000021 (5) | M1+66%E2 | 1.5 (3) | 0.0000000085 (15) |
| $\gamma_{14,8}$(U) | 233.6 (2) | 0.00000041 | (E0+E2) | | |
| $\gamma_{13,6}$(U) | 234.6 (2) | 0.0000001 | E0 | | |
| $\gamma_{14,7}$(U) | 235.9 (3) | 0.000000010 (5) | [E1] | 0.0673 (14) | 0.000000009 (5) |
| $\gamma_{13,5}$(U) | 258.227 (3) | 0.000000074 (12) | (E1) | 0.0548 (11) | 0.000000070 (11) |
| $\gamma_{14,5}$(U) | 299.1 (2) | 0.000000046 (3) | [E1] | 0.0395 (8) | 0.000000044 (3) |
| $\gamma_{7,2}$(U) | 705.9 (1) | 0.000000050 (13) | [E1] | 0.00698 (14) | 0.000000050 (13) |
| $\gamma_{8,2}$(U) | 708.3 (2) | 0.00000050 (3) | [E2] | 0.0219 (5) | 0.00000049 (3) |
| $\gamma_{12,3}$(U) | 727.8 (2) | 0.0000000028 (3) | (E2) | 0.0207 (4) | 0.0000000027 (3) |
| $\gamma_{5,1}$(U) | 742.813 (5) | 0.00000513 (13) | E1 | 0.00636 (13) | 0.00000510 (13) |
| $\gamma_{6,1}$(U) | 766.38 (2) | 0.0000223 (5) | E2 | 0.0187 (4) | 0.0000219 (5) |
| $\gamma_{9,2}$(U) | 783.4 (1) | 0.000000022 (3) | [E2] | 0.0179 (4) | 0.000000022 (3) |
| $\gamma_{5,0}$(U) | 786.27 (3) | 0.00000322 (9) | E1 | 0.00573 (12) | 0.00000320 (9) |
| $\gamma_{10,2}$(U) | 804.4 (3) | 0.00000017 | E0+E2 | 0.57 | 0.00000011 (5) |
| $\gamma_{7,1}$(U) | 805.80 (5) | 0.000000056 (15) | [E1] | 0.00549 (11) | 0.000000056 (15) |
| $\gamma_{8,1}$(U) | 808.2 (1) | 0.0000041 | E0+17%E2 | 4.3 | 0.000000767 (25) |
| $\gamma_{6,0}$(U) | 810.0 (5) | 0.000077 | E0 | | |
| $\gamma_{8,0}$(U) | 851.7 (1) | 0.00000129 (4) | [E2] | 0.01513 (30) | 0.00000127 (4) |
| $\gamma_{12,2}$(U) | 880.5 (1) | ≥0.00000015 | (E0+E2) | | ≥0.00000015 (4) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{9,1}$(U) | 883.24 (4) | 0.00000073 (4) | E2 | 0.01409 (28) | 0.00000072 (4) |
| $\gamma_{10,1}$(U) | 904.37 (15) | 0.000000062 (11) | [E2] | 0.01346 (27) | 0.000000061 (11) |
| $\gamma_{9,0}$(U) | 926.72 (1) | 0.000000565 (25) | (E2) | 0.01284 (26) | 0.000000558 (25) |
| $\gamma_{14,2}$(U) | 941.94 (10) | 0.000000472 (23) | [E2] | 0.01244 (25) | 0.000000466 (23) |
| $\gamma_{11,1}$(U) | 946.00 (3) | 0.000000092 (13) | (E1) | 0.00412 (8) | 0.000000092 (13) |
| $\gamma_{12,1}$(U) | 980.3 (1) | 0.000000042 | (E2) | 0.01152 (23) | 0.000000042 |
| $\gamma_{13,1}$(U) | 1001.03 (3) | 0.00000099 (4) | E2 | 0.01107 (22) | 0.00000098 (4) |
| $\gamma_{14,1}$(U) | 1041.7 (2) | 0.0000002 | (E0+E2) | | 0.000000197 (16) |
| $\gamma_{14,0}$(U) | 1085.4 (2) | 0.000000078 (9) | (E2) | 0.00950 (19) | 0.000000077 (9) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 24100 | (11) | y |
| $Q_\alpha$ | : | 5244.51 | (21) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | 3.0 | (8) | $\times 10^{-10}$ % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,53}$ | 4059.1 (3) | 0.000000021 (5) |
| $\alpha_{0,52}$ | 4116.78 (25) | 0.000000093 (9) |
| $\alpha_{0,51}$ | 4180.6 (3) | 0.00000020 (3) |
| $\alpha_{0,50}$ | 4186.53 (27) | 0.000000077 (7) |
| $\alpha_{0,49}$ | 4202.4 (3) | 0.000000041 (4) |
| $\alpha_{0,48}$ | 4204.42 (21) | 0.000000061 (15) |
| $\alpha_{0,47}$ | 4279.70 (26) | 0.000000199 (12) |
| $\alpha_{0,46}$ | 4305.79 (28) | 0.000000098 (13) |
| $\alpha_{0,45}$ | 4325.5 (10) | ~0.000000042 |
| $\alpha_{0,44}$ | 4326.92 (21) | 0.000000228 (12) |
| $\alpha_{0,43}$ | 4349.15 (21) | 0.00000030 (3) |
| $\alpha_{0,42}$ | 4364.42 (22) | 0.000000084 (14) |
| $\alpha_{0,41}$ | 4390.20 (21) | 0.00000101 (11) |
| $\alpha_{0,40}$ | 4392.08 (28) | 0.000000247 (19) |
| $\alpha_{0,39}$ | 4400.0 (4) | 0.0000103 (12) |
| $\alpha_{0,38}$ | 4400.26 (21) | 0.000027 (3) |
| $\alpha_{0,37}$ | 4408.36 (22) | 0.000000103 (17) |
| $\alpha_{0,36}$ | 4419.14 (26) | 0.00000034 (4) |
| $\alpha_{0,35}$ | 4448.46 (21) | 0.00000213 (9) |
| $\alpha_{0,34}$ | 4464.68 (21) | 0.0000114 (3) |
| $\alpha_{0,33}$ | 4467.37 (21) | 0.00000707 (13) |
| $\alpha_{0,32}$ | 4496.90 (21) | <0.000000034 |
| $\alpha_{0,31}$ | 4503.24 (21) | 0.00000631 (11) |
| $\alpha_{0,30}$ | 4508.72 (21) | 0.0000264 (6) |
| $\alpha_{0,29}$ | 4529.52 (22) | 0.00000322 (21) |
| $\alpha_{0,28}$ | 4534.08 (22) | 0.00000284 (7) |
| $\alpha_{0,27}$ | 4558.75 (22) | 0.000012 (4) |
| $\alpha_{0,26}$ | 4632.35 (21) | 0.00086 (3) |
| $\alpha_{0,25}$ | 4655.27 (27) | 0.0000033 (7) |
| $\alpha_{0,24}$ | 4690.29 (21) | 0.00056 (5) |
| $\alpha_{0,23}$ | 4718.39 (21) | 0.0000400 (11) |
| $\alpha_{0,22}$ | 4737.05 (21) | 0.00570 (5) |
| $\alpha_{0,21}$ | 4748.81 (21) | 0.00075 (11) |
| $\alpha_{0,20}$ | 4770.01 (21) | 0.00125 (3) |
| $\alpha_{0,19}$ | 4795.73 (21) | 0.000944 (17) |
| $\alpha_{0,18}$ | 4805.33 (22) | 0.000017 (4) |
| $\alpha_{0,17}$ | 4823.80 (22) | ≈0.000022 |
| $\alpha_{0,16}$ | 4829.38 (21) | 0.00354 (7) |
| $\alpha_{0,15}$ | 4866.91 (21) | 0.0018 (5) |
| $\alpha_{0,14}$ | 4870.38 (21) | 0.0007 (3) |

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,13}$ | 4911.69 (21) | 0.0030 (16) |
| $\alpha_{0,12}$ | 4935.00 (21) | 0.0050 (7) |
| $\alpha_{0,11}$ | 4962.83 (21) | 0.007 (1) |
| $\alpha_{0,10}$ | 4988.13 (21) | 0.0034 (10) |
| $\alpha_{0,8}$ | 5008.70 (21) | 0.0182 (27) |
| $\alpha_{0,7}$ | 5029.51 (21) | 0.013 (4) |
| $\alpha_{0,6}$ | 5055.34 (21) | 0.0375 (12) |
| $\alpha_{0,5}$ | 5076.28 (21) | 0.052 (8) |
| $\alpha_{0,4}$ | 5105.81 (21) | 11.87 (3) |
| $\alpha_{0,3}$ | 5111.21 (21) | <0.02 |
| $\alpha_{0,2}$ | 5143.82 (21) | 17.14 (4) |
| $\alpha_{0,1}$ | 5156.59 (14) | 70.79 (10) |
| $\alpha_{0,0}$ | 5156.65 (21) | ~0.03 |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $e_{AL}$ | (U) | 5.9 - 21.6 | 4.66 (19) |
| $e_{AK}$ | (U) | | 0.00045 (6) |
| | KLL | 71.78 - 80.95 | } |
| | KLX | 88.15 - 98.34 | } |
| | KXY | 104.42 - 115.40 | } |
| $ec_{2,1\ M}$ | (U) | 7.427 - 9.425 | 15.4 (6) |
| $ec_{5,4\ L}$ | (U) | 8.28 - 12.87 | 0.0259 (11) |
| $ec_{4,2\ L}$ | (U) | 16.903 - 21.493 | 2.61 (16) |
| $ec_{3,0\ L}$ | (U) | 24.45 - 29.04 | 0.0286 (16) |
| $ec_{4,1\ L}$ | (U) | 29.866 - 34.456 | 6.09 (15) |
| $ec_{4,2\ M}$ | (U) | 33.113 - 35.111 | 0.70 (4) |
| $ec_{6,3\ L}$ | (U) | 35.07 - 39.66 | 0.0276 (13) |
| $ec_{4,1\ M}$ | (U) | 46.076 - 48.074 | 1.68 (4) |
| $ec_{5,2\ L}$ | (U) | 46.938 - 51.528 | 0.021 (6) |
| $ec_{8,4\ L}$ | (U) | 77.02 - 81.61 | 0.0139 (12) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. | |
|---|---|---|---|---|
| XL | (U) | 11.619 — 20.714 | 4.66 (5) | |
| XK$\alpha_2$ | (U) | 94.666 | 0.00418 (4) | } K$\alpha$ |
| XK$\alpha_1$ | (U) | 98.44 | 0.00661 (9) | } |

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| $XK\beta_3$ | (U) | 110.421 | } | | |
| $XK\beta_1$ | (U) | 111.298 | } | 0.00239 (3) | $K\beta_1'$ |
| $XK\beta_5''$ | (U) | 111.964 | } | | |
| $XK\beta_2$ | (U) | 114.407 | } | | |
| $XK\beta_4$ | (U) | 115.012 | } | 0.00131 (6) | $K\beta_2'$ |
| $XKO_{2,3}$ | (U) | 115.377 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(U) | 0.0765 (4) | 100 | E3 | $1\times10^{10}$ | ~0.00000001 |
| $\gamma_{2,1}$(U) | 12.975 (10) | 20.7 (8) | M1+0.19(2)%E2 | 607 (17) | 0.0341 (9) |
| $\gamma_{-1,1}$(U) | 14.22 (3) | >0.006 | | | >0.0055 (4) |
| $\gamma_{5,4}$(U) | 30.04 (2) | 0.0346 (14) | (M1) | 157 (3) | 0.000219 (8) |
| $\gamma_{4,2}$(U) | 38.661 (2) | 3.56 (21) | M1+22.2(16)%E2 | 339 (19) | 0.01047 (21) |
| $\gamma_{-1,2}$(U) | 40.41 (5) | >0.0002 | | | >0.000163 (16) |
| $\gamma_{10,7}$(U) | 41.93 (5) | 0.0097 (5) | (M1) | 58.6 (12) | 0.000163 (8) |
| $\gamma_{3,0}$(U) | 46.21 (5) | 0.0389 (21) | M1+1.8(5)%E2 | 52.6 (27) | 0.000726 (13) |
| $\gamma_{11,8}$(U) | 46.68 (3) | 0.0044 (13) | M1+9(5)%E2 | 86 (24) | 0.000050 (6) |
| $\gamma_{7,5}$(U) | 47.60 (3) | 0.00259 (11) | (M1) | 40.4 (8) | 0.0000625 (25) |
| $\gamma_{4,1}$(U) | 51.624 (1) | 8.38 (18) | E2 | 310 (6) | 0.02694 (26) |
| $\gamma_{12,10}$(U) | 54.039 (8) | 0.00560 (14) | M1 | 27.8 (6) | 0.0001943 (28) |
| $\gamma_{6,3}$(U) | 56.828 (3) | 0.0382 (18) | M1+5.0(8)%E2 | 32.6 (15) | 0.001136 (15) |
| $\gamma_{14,12}$(U) | 65.708 (30) | 0.00095 (29) | M1+4(6)%E2 | 19 (6) | 0.0000473 (25) |
| $\gamma_{9,6}$(U) | 67.674 (12) | 0.00283 (12) | M1+3.6(11)%E2 | 16.9 (5) | 0.000158 (5) |
| $\gamma_{5,2}$(U) | 68.696 (6) | 0.029 (8) | E2 | 78.6 (16) | 0.00036 (10) |
| $\gamma_{8,5}$(U) | 68.73 (2) | 0.0036 (17) | (M1+20%E2) | 27 | 0.00013 (6) |
| $\gamma_{-1,3}$(U) | 74.96 (10) | >0.00004 | | | >0.000038 (6) |
| $\gamma_{7,4}$(U) | 77.592 (14) | 0.0068 (38) | M1(+20(32)%E2) | 17 (10) | 0.000380 (6) |
| $\gamma_{13,9}$(U) | 78.43 (2) | 0.0026 (15) | M1(+20(32)%E2) | 16 (10) | 0.0001533 (28) |
| $\gamma_{17,13}$(U) | 89.39 (6) | ~0.000015 | [M1] | 6.40 (13) | ~0.000002 |
| $\gamma_{10,5}$(U) | 89.64 (3) | 0.00040 (22) | (M1+E2) | 14 (8) | 0.000027 (2) |
| $\gamma_{12,7}$(U) | 96.14 (3) | 0.00064 (3) | [E2] | 16.0 (3) | 0.0000379 (19) |
| $\gamma_{15,11}$(U) | 97.6 (3) | 0.0007 (5) | M1+20(19)%E2 | 7.0 (19) | 0.00009 (6) |
| $\gamma_{8,4}$(U) | 98.78 (2) | 0.0204 (17) | E2 | 14.1 (3) | 0.00135 (11) |
| $\gamma_{6,0}$(U) | 103.06 (3) | 0.00273 (9) | E2 | 11.58 (23) | 0.000217 (6) |
| $\gamma_{11,5}$(U) | 115.38 (5) | 0.00362 (40) | E2 | 6.87 (14) | 0.00046 (5) |
| $\gamma_{7,2}$(U) | 116.26 (2) | 0.0077 (15) | M1+24(36)%E2 | 12.2 (26) | 0.000581 (19) |
| $\gamma_{10,4}$(U) | 119.70 (3) | 0.00021 (9) | (M1+E2) | 9 (4) | 0.000021 (3) |
| $\gamma_{14,10}$(U) | 119.76 (2) | 0.000063 (14) | [E2] | 5.99 (12) | 0.000009 (2) |
| $\gamma_{12,6}$(U) | 122.35 (12) | 0.00000125 (17) | (E1) | 0.312 (6) | 0.00000095 (13) |
| $\gamma_{37,29}$(U) | 123.228 (5) | 0.000000021 (5) | (M1) | 12.19 (24) | 0.0000000016 (4) |
| $\gamma_{21,14}$(U) | 123.62 (5) | 0.000310 (13) | [M1] | 12.08 (24) | 0.0000237 (9) |
| $\gamma_{9,3}$(U) | 124.51 (3) | 0.000413 (13) | E2 | 5.06 (10) | 0.0000681 (19) |
| $\gamma_{10,3}$(U) | 125.21 (10) | 0.0000730 (21) | [E1] | 0.296 (6) | 0.0000563 (16) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{7,0}$(U) | 129.296 (1) | 0.00805 (6) | E1 | 0.275 (6) | 0.00631 (4) |
| $\gamma_{19,12}$(U) | 141.657 (20) | 0.000296 (11) | [M1] | 8.22 (16) | 0.0000321 (10) |
| $\gamma_{12,5}$(U) | 143.35 (20) | 0.000110 (46) | [M1+E2] | 5.3 (26) | 0.0000174 (8) |
| $\gamma_{15,8}$(U) | 144.201 (3) | 0.00106 (3) | E2 | 2.72 (5) | 0.000285 (7) |
| $\gamma_{13,6}$(U) | 146.094 (6) | 0.000432 (12) | E2 | 2.57 (5) | 0.000121 (3) |
| $\gamma_{10,2}$(U) | 158.1 (3) | 0.0000029 (3) | [E2] | 1.86 (4) | 0.00000101 (10) |
| $\gamma_{18,11}$(U) | 160.19 (5) | 0.0000172 (36) | [E2] | 1.77 (4) | 0.0000062 (13) |
| $\gamma_{16,10}$(U) | 161.450 (15) | 0.000814 (42) | (M1) | 5.67 (11) | 0.000122 (6) |
| $\gamma_{17,9}$(U) | 167.81 (5) | 0.0000074 (20) | [E2] | 1.47 (3) | 0.0000030 (8) |
| $\gamma_{10,0}$(U) | 171.393 (6) | 0.0001255 (34) | [E1] | 0.141 (3) | 0.000110 (3) |
| $\gamma_{42,28}$(U) | 172.560 (8) | ~0.000000017 | M1 | 4.70 (9) | ~0.000000003 |
| $\gamma_{12,4}$(U) | 173.70 (5) | 0.0000071 (18) | [E2] | 1.28 (3) | 0.0000031 (8) |
| $\gamma_{12,3}$(U) | 179.220 (12) | 0.0000739 (22) | [E1] | 0.127 (3) | 0.0000656 (19) |
| $\gamma_{-1,4}$(U) | 184.55 (5) | 0.000010 (3) | [M1] | 3.87 (8) | 0.0000021 (6) |
| $\gamma_{14,6}$(U) | 188.23 (10) | 0.0000123 (12) | [E1] | 0.1140 (23) | 0.0000110 (11) |
| $\gamma_{21,12}$(U) | 189.36 (1) | 0.00027 (11) | [M1+E2] | 2.3 (14) | 0.0000820 (14) |
| $\gamma_{-1,5}$(U) | 193.13 (12) | >0.000009 | | | >0.0000090 (9) |
| $\gamma_{19,10}$(U) | 195.679 (8) | 0.000456 (11) | M1 | 3.30 (7) | 0.000106 (2) |
| $\gamma_{-1,6}$(U) | 196.87 (5) | >0.000004 | | | >0.0000037 (4) |
| $\gamma_{16,7}$(U) | 203.550 (5) | 0.002224 (49) | M1 | 2.95 (6) | 0.000563 (9) |
| $\gamma_{21,11}$(U) | 218.0 (5) | >0.000002 | | | >0.0000012 (10) |
| $\gamma_{12,0}$(U) | 225.42 (4) | 0.0000161 (4) | [E1] | 0.0747 (15) | 0.0000150 (4) |
| $\gamma_{19,7}$(U) | 237.77 (10) | 0.0000422 (18) | [M1] | 1.91 (4) | 0.0000145 (6) |
| $\gamma_{26,14}$(U) | 242.08 (3) | 0.0000209 (14) | [M1] | 1.82 (4) | 0.0000074 (5) |
| $\gamma_{21,10}$(U) | 243.38 (3) | 0.000053 (18) | [M1+E2] | 1.1 (7) | 0.0000254 (7) |
| $\gamma_{14,3}$(U) | 244.92 (5) | 0.0000054 (5) | | 0.0618 (12) | 0.0000051 (5) |
| $\gamma_{24,12}$(U) | 248.95 (5) | 0.0000188 (16) | [M1] | 1.68 (3) | 0.0000070 (6) |
| $\gamma_{22,10}$(U) | 255.384 (15) | 0.000204 (6) | [M1] | 1.57 (3) | 0.0000795 (20) |
| $\gamma_{20,7}$(U) | 263.95 (3) | 0.0000629 (26) | M1 | 1.43 (3) | 0.0000259 (10) |
| $\gamma_{30,20}$(U) | 265.7 (3) | 0.0000017 (4) | [E1] | 0.0514 (10) | 0.0000016 (4) |
| $\gamma_{16,4}$(U) | 281.2 (2) | 0.0000036 (12) | [M1+E2] | 0.7 (5) | 0.0000021 (3) |
| $\gamma_{19,5}$(U) | 285.3 (2) | 0.0000032 (12) | [M1+E2] | 0.7 (5) | 0.0000019 (4) |
| $\gamma_{22,7}$(U) | 297.46 (3) | 0.000100 (3) | [M1] | 1.025 (21) | 0.0000492 (13) |
| $\gamma_{24,10}$(U) | 302.87 (5) | 0.0000097 (8) | [M1] | 0.976 (20) | 0.0000049 (4) |
| $\gamma_{26,12}$(U) | 307.85 (5) | 0.0000101 (8) | [M1] | 0.933 (19) | 0.0000052 (4) |
| $\gamma_{21,6}$(U) | 311.78 (4) | 0.0000266 (8) | [E1] | 0.0361 (7) | 0.0000257 (8) |
| $\gamma_{23,7}$(U) | 316.41 (3) | 0.0000248 (10) | M1 | 0.865 (17) | 0.0000133 (5) |
| $\gamma_{16,2}$(U) | 319.68 (10) | 0.0000073 (19) | [M1+E2] | 0.50 (35) | 0.0000049 (5) |
| $\gamma_{19,3}$(U) | 320.862 (20) | 0.0000558 (12) | [E1] | 0.0337 (7) | 0.0000540 (12) |
| $\gamma_{24,8}$(U) | 323.84 (3) | 0.0000960 (25) | M1 | 0.811 (16) | 0.0000530 (13) |
| $\gamma_{16,0}$(U) | 332.845 (5) | 0.000503 (8) | E1 | 0.0313 (6) | 0.000488 (8) |
| $\gamma_{26,11}$(U) | 336.113 (12) | 0.000192 (5) | M1 | 0.733 (15) | 0.0001111 (26) |
| $\gamma_{20,4}$(U) | 341.506 (10) | 0.0001106 (24) | M1 | 0.701 (14) | 0.0000650 (13) |
| $\gamma_{24,7}$(U) | 345.00 (2) | <0.000084 | (M1) | 0.682 (14) | <0.00005 |
| $\gamma_{22,5}$(U) | 345.013 (4) | 0.000922 (15) | M1 | 0.682 (14) | 0.000548 (8) |
| $\gamma_{-1,7}$(U) | 350.8 (3) | >0.000002 | | | >0.0000018 (4) |
| $\gamma_{19,2}$(U) | 354.0 (5) | 0.00000085 (33) | [E2] | 0.1150 (23) | 0.00000076 (30) |
| $\gamma_{26,10}$(U) | 361.89 (5) | 0.0000187 (11) | [M1] | 0.598 (12) | 0.0000117 (7) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{19,0}$(U) | 367.073 (25) | 0.0000893 (21) | [E1] | 0.0254 (5) | 0.0000871 (20) |
| $\gamma_{21,3}$(U) | 368.554 (20) | 0.0000899 (14) | [E1] | 0.0252 (5) | 0.0000877 (14) |
| $\gamma_{22,4}$(U) | 375.054 (3) | 0.002376 (37) | M1 | 0.543 (11) | 0.001540 (21) |
| $\gamma_{20,2}$(U) | 380.191 (6) | 0.000460 (7) | M1 | 0.523 (10) | 0.000302 (4) |
| $\gamma_{26,8}$(U) | 382.75 (5) | 0.000387 (7) | M1 | 0.513 (10) | 0.000256 (4) |
| $\gamma_{24,5}$(U) | 392.53 (3) | 0.000179 (24) | M1 | 0.479 (10) | 0.000121 (16) |
| $\gamma_{20,1}$(U) | 393.14 (3) | 0.000619 (25) | M1 | 0.477 (10) | 0.000419 (17) |
| $\gamma_{23,3}$(U) | 399.53 (6) | 0.00000625 (27) | [E1] | 0.0213 (4) | 0.00000612 (26) |
| $\gamma_{25,6}$(U) | 406.8 (2) | 0.0000030 (7) | [E1] | 0.0204 (4) | 0.0000029 (7) |
| $\gamma_{27,11}$(U) | 411.2 (3) | 0.000010 (4) | [M1] | 0.422 (8) | 0.0000069 (30) |
| $\gamma_{42,20}$(U) | 412.49 (6) | ~0.000000018 | [E1] | 0.0199 (4) | ~0.000000018 |
| $\gamma_{22,2}$(U) | 413.713 (5) | 0.00207 (3) | M1 | 0.415 (8) | 0.001464 (21) |
| $\gamma_{24,4}$(U) | 422.598 (19) | 0.0001669 (30) | M1 | 0.392 (8) | 0.0001199 (20) |
| $\gamma_{22,1}$(U) | 426.68 (3) | 0.0000256 (6) | [E2] | 0.0699 (14) | 0.0000239 (6) |
| $\gamma_{24,3}$(U) | 428.4 (3) | 0.00000103 (10) | [E1] | 0.0184 (4) | 0.00000101 (10) |
| $\gamma_{26,6}$(U) | 430.08 (10) | 0.00000437 (19) | [E1] | 0.0183 (4) | 0.00000429 (19) |
| $\gamma_{23,0}$(U) | 445.72 (3) | 0.00000892 (26) | E1 | 0.0170 (3) | 0.00000877 (26) |
| $\gamma_{-1,8}$(U) | 446.82 (20) | 0.0000009 (1) | | | 0.00000085 (13) |
| $\gamma_{26,5}$(U) | 451.481 (10) | 0.000223 (25) | M1(+50%E2) | 0.19 (13) | 0.000187 (3) |
| $\gamma_{27,8}$(U) | 457.61 (5) | 0.00000199 (4) | [M1] | 0.316 (6) | 0.00000151 (3) |
| $\gamma_{24,2}$(U) | 461.25 (5) | 0.00000242 (5) | [E2] | 0.0575 (12) | 0.00000229 (5) |
| $\gamma_{25,3}$(U) | 463.9 (3) | 0.000000284 (30) | [E1] | 0.0157 (3) | 0.00000028 (3) |
| $\gamma_{24,0}$(U) | 473.9 (5) | 0.000000061 (30) | [E1] | 0.0150 (3) | 0.00000006 (3) |
| $\gamma_{26,4}$(U) | 481.66 (12) | 0.00000485 (11) | [E2] | 0.0517 (10) | 0.00000461 (10) |
| $\gamma_{26,3}$(U) | 487.06 (10) | 0.000000269 (19) | [E1] | 0.0142 (3) | 0.000000265 (19) |
| $\gamma_{31,10}$(U) | 493.08 (5) | 0.00000089 (3) | [E1] | 0.0139 (3) | 0.00000088 (3) |
| $\gamma_{-1,9}$(U) | 497.0 (5) | 0.000000044 (25) | | | 0.000000044 (25) |
| $\gamma_{27,5}$(U) | 526.4 (4) | 0.000000059 (19) | [E2] | 0.0419 (8) | 0.000000057 (19) |
| $\gamma_{-1,10}$(U) | 538.8 (2) | 0.00000031 (2) | | | 0.000000309 (19) |
| $\gamma_{33,8}$(U) | 550.5 (2) | 0.000000440 (25) | (E1) | 0.01120 (22) | 0.000000435 (25) |
| $\gamma_{-1,11}$(U) | 557.3 (5) | 0.00000004 (2) | | | 0.000000038 (19) |
| $\gamma_{36,10}$(U) | 579.4 (3) | 0.000000091 (20) | [E2] | 0.0337 (7) | 0.000000088 (19) |
| $\gamma_{31,5}$(U) | 582.89 (10) | 0.000000624 (26) | [E1] | 0.0100 (2) | 0.000000618 (26) |
| $\gamma_{29,4}$(U) | 586.3 (3) | 0.000000155 (16) | [E1] | 0.0099 (2) | 0.000000153 (16) |
| $\gamma_{43,12}$(U) | 596.0 (5) | 0.000000040 (12) | [E2] | 0.0317 (6) | 0.000000039 (12) |
| $\gamma_{33,6}$(U) | 597.99 (5) | 0.00000179 (6) | [E2] | 0.0314 (6) | 0.00000174 (6) |
| $\gamma_{36,8}$(U) | 599.6 (2) | 0.000000204 (25) | [E1] | 0.00948 (19) | 0.000000202 (25) |
| $\gamma_{40,10}$(U) | 606.9 (2) | 0.000000136 (15) | M1(+E2) | 0.12 (3) | 0.000000121 (13) |
| $\gamma_{-1,12}$(U) | 608.9 (2) | 0.00000012 (2) | | | 0.000000117 (12) |
| $\gamma_{31,4}$(U) | 612.83 (3) | 0.00000096 (5) | E1 | 0.00910 (18) | 0.00000095 (5) |
| $\gamma_{35,6}$(U) | 617.1 (1) | 0.00000154 (9) | [M1] | 0.142 (3) | 0.00000135 (8) |
| $\gamma_{31,3}$(U) | 618.28 (6) | 0.00000212 (8) | (E2) | 0.0292 (6) | 0.00000206 (8) |
| $\gamma_{33,5}$(U) | 619.21 (6) | 0.00000122 (8) | [E1] | 0.00892 (18) | 0.00000121 (8) |
| $\gamma_{32,3}$(U) | 624.78 (3) | <0.000000025 | (M1) | 0.137 (3) | <0.000000022 |
| $\gamma_{29,2}$(U) | 624.78 (5) | 0.000000464 (19) | [E1] | 0.00877 (18) | 0.000000460 (19) |
| $\gamma_{28,0}$(U) | 633.15 (6) | 0.00000286 (7) | M1(+E2) | 0.122 (11) | 0.00000255 (6) |
| $\gamma_{29,1}$(U) | 637.73 (5) | 0.00000065 (6) | [E1] | 0.00844 (17) | 0.00000064 (6) |
| $\gamma_{29,0}$(U) | 637.80 (5) | 0.00000197 (20) | E2 | 0.0273 (5) | 0.00000192 (19) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{38,7}$(U) | 639.99 (10) | 0.00000869 (21) | [E2] | 0.0271 (5) | 0.00000846 (20) |
| $\gamma_{30,2}$(U) | 645.94 (4) | 0.00001502 (30) | E1 | 0.00824 (16) | 0.0000149 (3) |
| $\gamma_{33,4}$(U) | 649.32 (6) | 0.00000073 (5) | [E1] | 0.00816 (16) | 0.00000072 (5) |
| $\gamma_{-1,13}$(U) | 650.53 (6) | 0.00000027 (4) | | | 0.00000027 (4) |
| $\gamma_{34,4}$(U) | 652.05 (2) | 0.00000668 (20) | E1 | 0.00809 (16) | 0.00000663 (20) |
| $\gamma_{33,3}$(U) | 654.88 (8) | 0.00000233 (5) | (E2) | 0.0258 (5) | 0.00000227 (5) |
| $\gamma_{30,1}$(U) | 658.86 (6) | 0.00000967 (26) | E1 | 0.00794 (16) | 0.00000959 (26) |
| $\gamma_{31,0}$(U) | 664.58 (5) | 0.000001712 (41) | E2 | 0.0251 (5) | 0.00000167 (4) |
| $\gamma_{36,5}$(U) | 668.2 (5) | 0.000000040 (12) | [E1] | 0.00773 (15) | 0.000000040 (12) |
| $\gamma_{43,8}$(U) | 670.8 (5) | ≤0.000000009 (3) | | | ≤0.000000009 (3) |
| $\gamma_{32,0}$(U) | 670.99 (4) | ≤0.000000009 (3) | [M1+E2] | 0.06 (4) | ≤0.000000009 (3) |
| $\gamma_{35,3}$(U) | 674.05 (3) | 0.000000556 (22) | | 0.1120 (22) | 0.00000050 (2) |
| $\gamma_{40,5}$(U) | 674.4 (5) | 0.000000111 (11) | (M1) | 0.1120 (22) | 0.00000010 (1) |
| $\gamma_{-1,14}$(U) | 685.97 (11) | 0.00000127 (6) | E1 | 0.00736 (15) | 0.00000126 (6) |
| $\gamma_{-1,15}$(U) | 688.1 (3) | 0.000000114 (11) | | | 0.000000112 (11) |
| $\gamma_{34,2}$(U) | 690.81 (8) | 0.00000059 (5) | E1 | 0.00727 (15) | 0.00000059 (5) |
| $\gamma_{-1,16}$(U) | 693.2 (5) | 0.000000033 (13) | | | 0.000000032 (13) |
| $\gamma_{46,10}$(U) | 693.81 (1) | 0.000000019 (7) | (E2) | 0.0229 (5) | 0.000000019 (7) |
| $\gamma_{41,5}$(U) | 697.8 (5) | 0.000000076 (15) | | | 0.000000074 (15) |
| $\gamma_{-1,17}$(U) | 699.6 (5) | 0.00000008 (2) | | | 0.000000080 (16) |
| $\gamma_{33,0}$(U) | 701.1 (2) | 0.000000555 (29) | [M1+E2] | 0.06 (4) | 0.000000524 (19) |
| $\gamma_{34,1}$(U) | 703.68 (5) | 0.00000413 (13) | E1 | 0.00702 (14) | 0.00000410 (13) |
| $\gamma_{-1,18}$(U) | 712.96 (5) | 0.000000052 (6) | | | 0.000000052 (6) |
| $\gamma_{44,7}$(U) | 714.71 (14) | 0.000000081 (8) | E2 | 0.0215 (4) | 0.000000079 (8) |
| $\gamma_{39,4}$(U) | 718.0 (5) | 0.00000278 (6) | E1 | 0.00677 (14) | 0.00000276 (6) |
| $\gamma_{35,0}$(U) | 720.3 (5) | 0.000000029 (5) | | | 0.000000029 (5) |
| $\gamma_{47,10}$(U) | 720.55 (3) | 0.000000020 (2) | | | 0.000000020 (2) |
| $\gamma_{41,4}$(U) | 727.9 (2) | 0.000000136 (8) | M1 | 0.0911 (18) | 0.000000125 (7) |
| $\gamma_{46,7}$(U) | 736.5 (5) | 0.000000031 (9) | M1+59(8)%E2 | 0.0481 (10) | 0.000000030 (9) |
| $\gamma_{-1,19}$(U) | 742.7 (5) | 0.000000038 (11) | | | 0.000000038 (11) |
| $\gamma_{37,2}$(U) | 747.4 (5) | 0.000000082 (16) | E1 | 0.00629 (13) | 0.000000081 (16) |
| $\gamma_{38,2}$(U) | 756.23 (6) | 0.0000029 (5) | [M1+E2] | 0.05 (3) | 0.0000028 (5) |
| $\gamma_{39,2}$(U) | 756.4 (4) | 0.00000069 (19) | [E1] | 0.00615 (12) | 0.00000069 (19) |
| $\gamma_{47,7}$(U) | 762.6 (2) | ∼0.00000001 | | | ∼0.00000001 |
| $\gamma_{45,5}$(U) | 763.60 (15) | >0.000000042 | E0(+M1) | 0.9 | >0.000000022 |
| $\gamma_{41,2}$(U) | 766.47 (3) | 0.00000065 (11) | E0+M1 | 4.0 (4) | 0.00000013 (2) |
| $\gamma_{51,12}$(U) | 767.29 (4) | 0.00000014 (3) | | | 0.00000014 (3) |
| $\gamma_{38,1}$(U) | 769.15 (8) | 0.0000153 (32) | M1+E0 | 2.0 (2) | 0.0000051 (10) |
| $\gamma_{39,1}$(U) | 769.4 (5) | 0.0000068 (12) | E1 | 0.00596 (12) | 0.0000068 (12) |
| $\gamma_{43,4}$(U) | 769.54 (4) | 0.00000008 (2) | E0 | | |
| $\gamma_{-1,20}$(U) | 777.1 (3) | 0.000000028 (7) | | | 0.000000028 (7) |
| $\gamma_{41,1}$(U) | 779.43 (3) | 0.000000147 (10) | M1 | 0.0759 (15) | 0.000000137 (9) |
| $\gamma_{-1,21}$(U) | 786.9 (2) | 0.000000089 (9) | E2 | 0.0177 (4) | 0.000000087 (9) |
| $\gamma_{-1,22}$(U) | 788.5 (3) | 0.000000035 (7) | | | 0.000000035 (7) |
| $\gamma_{42,2}$(U) | 792.68 (6) | 0.000000020 (4) | (E1) | 0.00565 (11) | 0.000000020 (4) |
| $\gamma_{-1,23}$(U) | 796.9 (3) | 0.000000015 (3) | | | 0.000000015 (3) |
| $\gamma_{-1,24}$(U) | 803.2 (2) | 0.000000064 (5) | | | 0.000000064 (5) |
| $\gamma_{42,1}$(U) | 805.65 (6) | 0.000000029 (4) | E2 | 0.0169 (3) | 0.000000028 (4) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{43,2}$(U) | 808.21 (4) | 0.000000130 (6) | M1 | 0.0690 (14) | 0.000000122 (6) |
| $\gamma_{46,4}$(U) | 813.7 (2) | 0.000000048 (5) | M1 | 0.0677 (14) | 0.000000045 (5) |
| $\gamma_{50,9}$(U) | 816.0 (2) | 0.000000026 (4) | [M1+E2] | 0.042 (25) | 0.000000025 (4) |
| $\gamma_{43,0}$(U) | 821.25 (4) | 0.000000050 (11) | E1+M2 | | 0.000000050 (11) |
| $\gamma_{51,10}$(U) | 821.3 (2) | ~0.000000006 | | | ~0.000000006 |
| $\gamma_{-1,25}$(U) | 826.8 (3) | 0.000000018 (6) | | | 0.000000018 (6) |
| $\gamma_{-1,26}$(U) | 828.9 (2) | 0.00000014 (1) | | | 0.000000134 (8) |
| $\gamma_{52,12}$(U) | 832.2 (2) | 0.000000030 (4) | | | 0.000000030 (4) |
| $\gamma_{-1,27}$(U) | 837.3 (2) | 0.000000020 (4) | | | 0.000000020 (4) |
| $\gamma_{47,4}$(U) | 840.4 (2) | 0.000000056 (6) | M1(+E0) | 0.14 (2) | 0.000000049 (5) |
| $\gamma_{44,1}$(U) | 843.78 (1) | 0.000000147 (9) | M1(+E0) | 0.09 (1) | 0.000000135 (8) |
| $\gamma_{47,2}$(U) | 879.2 (3) | 0.000000037 (4) | [M1+E2] | 0.035 (20) | 0.000000036 (4) |
| $\gamma_{47,1}$(U) | 891.0 (3) | 0.000000076 (8) | [E2] | 0.0139 (3) | 0.000000075 (8) |
| $\gamma_{-1,28}$(U) | 895.4 (3) | 0.000000008 (3) | | | 0.0000000076 (25) |
| $\gamma_{-1,29}$(U) | 898.1 (3) | 0.000000018 (4) | | | 0.000000018 (4) |
| $\gamma_{-1,30}$(U) | 905.5 (3) | 0.000000008 (3) | | | 0.0000000076 (25) |
| $\gamma_{-1,31}$(U) | 911.7 (3) | 0.000000014 (3) | | | 0.000000014 (3) |
| $\gamma_{49,4}$(U) | 918.7 (3) | 0.000000009 (3) | | | 0.0000000088 (30) |
| $\gamma_{-1,32}$(U) | 931.9 (3) | 0.000000013 (4) | | | 0.000000013 (4) |
| $\gamma_{50,3}$(U) | 940.3 (3) | 0.000000051 (5) | [E2] | 0.01250 (25) | 0.000000050 (5) |
| $\gamma_{48,2}$(U) | 955.41 (2) | 0.0000000321 (31) | M1+27(13)%E2 | 0.036 (4) | 0.000000031 (3) |
| $\gamma_{49,2}$(U) | 957.6 (3) | 0.000000032 (3) | | | 0.000000032 (3) |
| $\gamma_{48,1}$(U) | 968.37 (2) | 0.000000029 (5) | M1+27(20)%E2 | 0.035 (19) | 0.000000028 |
| $\gamma_{51,2}$(U) | 979.7 (3) | 0.000000029 (5) | [M1+E2] | 0.026 (15) | 0.000000028 (5) |
| $\gamma_{-1,33}$(U) | 982.7 (3) | 0.000000011 (3) | | | 0.0000000107 (25) |
| $\gamma_{53,7}$(U) | 986.90 (4) | 0.000000021 (5) | E1 | 0.00383 (8) | 0.000000021 (5) |
| $\gamma_{51,1}$(U) | 992.64 (3) | 0.000000027 (4) | | | 0.000000027 (4) |
| $\gamma_{52,4}$(U) | 1005.7 (3) | 0.000000018 (3) | | | 0.0000000177 (25) |
| $\gamma_{-1,34}$(U) | 1009.4 (3) | 0.000000014 (3) | | | 0.0000000139 (25) |
| $\gamma_{52,0}$(U) | 1057.3 (2) | 0.000000045 (7) | | | 0.000000045 (7) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 6561 | (7) | y |
| $Q_\alpha$ | : | 5255.75 | (15) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | 5.7 | (1) | $\times 10^{-6}$ % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,10}$ | 4217.6 (2) | <0.0000001 |
| $\alpha_{0,9}$ | 4223.8 (4) | <0.00000013 |
| $\alpha_{0,8}$ | 4226.1 (3) | <0.00000017 |
| $\alpha_{0,7}$ | 4264.3 (3) | 0.00000065 (8) |
| $\alpha_{0,6}$ | 4436.4 (2) | 0.000000013 (7) |
| $\alpha_{0,5}$ | 4492.0 (2) | 0.0000193 (4) |
| $\alpha_{0,4}$ | 4654.5 (2) | 0.000047 (5) |
| $\alpha_{0,3}$ | 4863.5 (2) | 0.001082 (18) |
| $\alpha_{0,2}$ | 5021.1 (2) | 0.0863 (18) |
| $\alpha_{0,1}$ | 5123.6 (2) | 27.16 (19) |
| $\alpha_{0,0}$ | 5168.13 (15) | 72.74 (18) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (U) | 5.01 - 21.60 | | 10.3 (8) |
| $e_{AK}$ | (U) | | | 0.0000027 (4) |
| | KLL | 71.78 - 80.95 | } | |
| | KLX | 88.15 - 98.43 | } | |
| | KXY | 104.51 - 115.59 | } | |
| $ec_{1,0\ L}$ | (U) | 23.486 - 28.076 | | 19.8 (6) |
| $ec_{1,0\ M}$ | (U) | 39.696 - 41.690 | | 5.48 (15) |
| $ec_{1,0\ N}$ | (U) | 43.803 - 44.865 | | 1.483 (40) |
| $ec_{2,1\ L}$ | (U) | 82.475 - 87.067 | | 0.0571 (10) |
| $ec_{2,1\ M}$ | (U) | 98.687 - 100.680 | | 0.01585 (33) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (U) | 11.619 — 20.714 | | 10.34 (15) | |
| $XK\alpha_2$ | (U) | 94.666 | | 0.0000260 (6) | } $K\alpha$ |
| $XK\alpha_1$ | (U) | 98.44 | | 0.0000416 (9) | } |
| $XK\beta_3$ | (U) | 110.421 | } | | |
| $XK\beta_1$ | (U) | 111.298 | } | 0.0000150 (4) | $K\beta_1'$ |
| $XK\beta_5''$ | (U) | 111.964 | } | | |
| $XK\beta_2$ | (U) | 114.407 | } | | |
| $XK\beta_4$ | (U) | 115.012 | } | 0.00000513 (16) | $K\beta_2'$ |
| $XKO_{2,3}$ | (U) | 115.377 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(U) | 45.244 (2) | 27.3 (8) | E2 | 589 (12) | 0.0462 (9) |
| $\gamma_{2,1}$(U) | 104.233 (5) | 0.0856 (14) | E2 | 10.99 (22) | 0.00714 (7) |
| $\gamma_{3,2}$(U) | 160.308 (3) | 0.001116 (17) | E2 | 1.76 (4) | 0.0004045 (22) |
| $\gamma_{4,3}$(U) | 212.46 (5) | 0.0000464 (48) | E2 | 0.599 (12) | 0.000029 (3) |
| $\gamma_{5,2}$(U) | 538.1 (1) | 0.000000168 (14) | E3 | 0.143 (3) | 0.000000147 (12) |
| $\gamma_{5,1}$(U) | 642.34 (5) | 0.00001449 (43) | E1+(M2+E3) | 0.15 (2) | 0.0000126 (3) |
| $\gamma_{5,0}$(U) | 687.56 (10) | 0.00000466 (14) | E1 | 0.31 (2) | 0.00000356 (9) |
| $\gamma_{6,1}$(U) | 698.94 | <0.000000025 | | | <0.000000025 |
| $\gamma_{9,2}$(U) | 810.8 | <0.000000043 | | | <0.000000043 |
| $\gamma_{7,1}$(U) | 874.0 (2) | 0.00000059 (6) | (E2) | 0.0144 (3) | 0.00000058 (6) |
| $\gamma_{8,1}$(U) | 912.4 (3) | <0.00000007 | (M1) | 0.050 (1) | <0.00000007 |
| $\gamma_{9,1}$(U) | 915.1 (3) | <0.000000063 | (M1+E0) | | <0.000000063 |
| $\gamma_{7,0}$(U) | 918.9 (3) | 0.00000006 | (E0) | | |
| $\gamma_{10,1}$(U) | 921.2 (2) | <0.000000022 | E1 | 0.00432 (9) | <0.000000022 |
| $\gamma_{8,0}$(U) | 958.0 (2) | <0.0000001 | | | <0.0000001 |
| $\gamma_{9,0}$(U) | 960.3 | <0.00000005 | | | <0.00000005 |
| $\gamma_{10,0}$(U) | 966.9 (2) | <0.0000000502 | E1 | 0.00397 (8) | <0.00000005 |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 14.33 | (4) | y |
| $Q_{\beta^-}$ | : | 20.8 | (2) | keV |
| $Q_\alpha$ | : | 5140.0 | (5) | keV |
| $\beta^-$ | : | 99.99756 | (2) | % |
| $\alpha$ | : | 0.00244 | (2) | % |
| $SF$ | : | >2.4 | | $\times 10^{-14}$ % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,0}$ | 20.8 (2) | 99.99756 (2) | 1st forbidden | 5.8 |

## 3 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,10}$ | 4694 (3) | ≈0.0000007 |
| $\alpha_{0,9}$ | 4733 (3) | ≈0.0000007 |
| $\alpha_{0,8}$ | 4744 (5) | ≈0.0000017 |
| $\alpha_{0,7}$ | 4785.1 (11) | 0.0000005 (2) |
| $\alpha_{0,6}$ | 4798.0 (5) | 0.000029 (3) |
| $\alpha_{0,5}$ | 4853.8 (5) | 0.000295 (8) |
| $\alpha_{0,4}$ | 4897.3 (5) | 0.00203 (4) |
| $\alpha_{0,3}$ | 4973.1 (5) | 0.000032 (3) |
| $\alpha_{0,2}$ | 4999.2 (5) | 0.0000100 (12) |
| $\alpha_{0,1}$ | 5043.4 (5) | 0.000025 (2) |
| $\alpha_{0,0}$ | 5054.6 (5) | 0.0000086 (10) |

## 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (U) | 5.9 - 21.6 | 0.00117 (6) | |
| $e_{AK}$ | (U) | | 0.000031 (5) | |
| | KLL | 71.776 - 80.954 | } | |
| | KLX | 88.153 - 98.429 | } | |
| | KXY | 104.51 - 115.59 | } | |
| $\beta^-_{0,0}$ | max: | 20.8 (2) | 99.99756 (2) | avg: 5.8 (1) |

# 5 Photon Emissions

## 5.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (U) | 11.619 — 20.714 | | 0.001166 (40) | |
| $XK\alpha_2$ | (U) | 94.666 | | 0.000300 (7) | } $K\alpha$ |
| $XK\alpha_1$ | (U) | 98.44 | | 0.000479 (10) | } |
| $XK\beta_3$ | (U) | 110.421 | } | | |
| $XK\beta_1$ | (U) | 111.298 | } | 0.000179 (5) | $K\beta_1^{'}$ |
| $XK\beta_5^{''}$ | (U) | 111.964 | } | | |
| $XK\beta_2$ | (U) | 114.407 | } | | |
| $XK\beta_4$ | (U) | 115.012 | } | 0.000059 (2) | $K\beta_2^{'}$ |
| $XKO_{2,3}$ | (U) | 115.377 | } | | |

## 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{5,4}$(U) | 44.18 (3) | 0.000258 (17) | M1+1.7(5)%E2 | 60.4 (29) | 0.0000042 (2) |
| $\gamma_{2,1}$(U) | 44.86 (10) | 0.000111 (25) | [M1+15(4)%E2] | 131 (25) | 0.00000084 (10) |
| $\gamma_{2,0}$(U) | 56.30 (12) | 0.00051 (4) | (E2) | 204 (4) | 0.0000025 (2) |
| $\gamma_{6,5}$(U) | 56.76 (10) | 0.0000280 (41) | M1+1.1(13)E2 | 27 (3) | 0.0000010 (1) |
| $\gamma_{3,1}$(U) | 71.64 (9) | 0.000189 (14) | (E2) | 64.3 (13) | 0.0000029 (2) |
| $\gamma_{4,3}$(U) | 77.01 (4) | 0.000225 (6) | (M1) | 9.86 (20) | 0.0000207 (4) |
| $\gamma_{6,4}$(U) | 100.94 (11) | 0.00000099 | (E2) | 12.8 (3) | 0.000000072 |
| $\gamma_{4,2}$(U) | 103.680 (5) | 0.000536 (14) | [M1+0.47(1)%E2] | 4.20 (9) | 0.000103 (2) |
| $\gamma_{7,4}$(U) | 114 (1) | 0.0000067 (13) | E1 | 0.0883 (17) | 0.0000062 (12) |
| $\gamma_{5,3}$(U) | 121.22 (5) | 0.0000097 (10) | (M1) | 12.8 (3) | 0.00000070 (7) |
| $\gamma_{4,1}$(U) | 148.567 (10) | 0.001500 (27) | [M1+2.8(1)%E2] | 7.05 (14) | 0.0001863 (8) |
| $\gamma_{4,0}$(U) | 159.96 (2) | 0.0000179 (4) | (E2) | 1.78 (3) | 0.00000645 (9) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 3.73 | (3) | $\times 10^5$ y |
| $Q_\alpha$ | : | 4984.5 | (10) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | 5.5 | (1) | $\times 10^{-4}$ % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,3}$ | 4600.1 (10) | 0.00084 (6) |
| $\alpha_{0,2}$ | 4756.2 (10) | 0.0304 (13) |
| $\alpha_{0,1}$ | 4858.2 (10) | 23.44 (17) |
| $\alpha_{0,0}$ | 4902.3 (10) | 76.53 (17) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (U) | 5.9 - 21.6 | | 8.40 (19) |
| $e_{AK}$ | (U) | | | 0.00000188 (29) |
| | KLL | 71.78 - 80.95 | } | |
| | KLX | 88.15 - 98.43 | } | |
| | KXY | 104.51 - 115.59 | } | |
| $ec_{1,0\ L}$ | (U) | 23.157 - 27.747 | | 17.1 (5) |
| $ec_{1,0\ M}$ | (U) | 39.367 - 41.360 | | 4.72 (14) |
| $ec_{1,0\ N}$ | (U) | 43.474 - 44.536 | | 1.28 (4) |
| $ec_{2,1\ L}$ | (U) | 81.74 - 86.33 | | 0.0209 (11) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (U) | 11.62 — 21.73 | | 8.71 (21) | |
| $XK\alpha_2$ | (U) | 94.666 | | 0.0000180 (13) | } $K\alpha$ |
| $XK\alpha_1$ | (U) | 98.44 | | 0.0000288 (21) | } |
| $XK\beta_3$ | (U) | 110.421 | } | | |
| $XK\beta_1$ | (U) | 111.298 | } | 0.0000104 (8) | $K\beta_1'$ |
| $XK\beta_5''$ | (U) | 111.964 | } | | |
| $XK\beta_2$ | (U) | 114.407 | } | | |
| $XK\beta_4$ | (U) | 115.012 | } | 0.00000355 (27) | $K\beta_2'$ |
| $XKO_{2,3}$ | (U) | 115.377 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(U) | 44.915 (13) | 23.5 (7) | E2 | 610 (12) | 0.0384 (8) |
| $\gamma_{2,1}$(U) | 103.50 (4) | 0.0313 (16) | E2 | 11.36 (23) | 0.00253 (12) |
| $\gamma_{3,2}$(U) | 158.80 (8) | 0.00084 (6) | E2 | 1.83 (4) | 0.000298 (20) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 432.6 | (6) | y |
| $Q_\alpha$ | : | 5637.82 | (12) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | 3.6 | (9) | $\times 10^{-10}$ % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,36}$ | 4757.58 (13) | 0.00004 (3) |
| $\alpha_{0,34}$ | 4800.99 (13) | 0.000086 |
| $\alpha_{0,33}$ | 4834.15 (13) | 0.0007 |
| $\alpha_{0,32}$ | 4888.98 (15) | |
| $\alpha_{0,30}$ | 4956.06 (15) | |
| $\alpha_{0,29}$ | 4961.63 (14) | |
| $\alpha_{0,28}$ | 4963.83 (13) | |
| $\alpha_{0,27}$ | 5007.07 (14) | 0.0001 |
| $\alpha_{0,25}$ | 5055.36 (13) | |
| $\alpha_{0,24}$ | 5065.97 (15) | 0.00011 |
| $\alpha_{0,23}$ | 5092.06 (13) | ~0.0004 |
| $\alpha_{0,22}$ | 5099.08 (13) | ~0.0004 |
| $\alpha_{0,21}$ | 5106.72 (16) | |
| $\alpha_{0,20}$ | 5117.21 (13) | 0.0004 |
| $\alpha_{0,19}$ | 5132.8 (2) | |
| $\alpha_{0,18}$ | 5155.12 (13) | 0.0007 |
| $\alpha_{0,17}$ | 5179.35 (13) | 0.0003 |
| $\alpha_{0,16}$ | 5181.63 (13) | 0.0009 |
| $\alpha_{0,15}$ | 5190.17 (23) | 0.0006 |
| $\alpha_{0,14}$ | 5217.26 (13) | |
| $\alpha_{0,13}$ | 5225.08 (13) | 0.0013 |
| $\alpha_{0,12}$ | 5232.6 (3) | |
| $\alpha_{0,11}$ | 5244.13 (13) | 0.0022 (3) |
| $\alpha_{0,9}$ | 5280.99 (13) | 0.0005 |
| $\alpha_{0,8}$ | 5321.87 (13) | 0.014 (3) |
| $\alpha_{0,6}$ | 5388.25 (13) | 1.66 (3) |
| $\alpha_{0,5}$ | 5416.28 (13) | ~0.01 |
| $\alpha_{0,4}$ | 5442.86 (12) | 13.23 (10) |
| $\alpha_{0,3}$ | 5469.47 (12) | <0.04 |
| $\alpha_{0,2}$ | 5485.56 (12) | 84.45 (10) |
| $\alpha_{0,1}$ | 5511.46 (12) | 0.23 (1) |
| $\alpha_{0,0}$ | 5544.11 (12) | 0.38 (1) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Np) | 6.04 - 13.52 | | 33.4 (17) |
| $e_{AK}$ | (Np) | | | 0.000114 (16) |
| | KLL | 73.50 - 83.13 | } | |
| | KLX | 90.36 - 97.28 | } | |
| | KXY | 107.10 - 114.58 | } | |
| $ec_{2,1\ L}$ | (Np) | 3.92 - 8.73 | | 14 (5) |
| $ec_{1,0\ L}$ | (Np) | 10.769 - 15.590 | | 15.9 (21) |
| $ec_{3,1\ L}$ | (Np) | 20.28 - 25.09 | | 0.31 (7) |
| $ec_{2,1\ M}$ | (Np) | 20.606 - 22.681 | | 3.7 (5) |
| $ec_{4,2\ L}$ | (Np) | 20.99 - 25.81 | | 8.8 (12) |
| $ec_{1,0\ M}$ | (Np) | 27.46 - 29.53 | | 4.0 (6) |
| $ec_{1,0\ N}$ | (Np) | 31.70 - 32.79 | | 1.08 (16) |
| $ec_{6,4\ L}$ | (Np) | 33.13 - 37.95 | | 0.87 (11) |
| $ec_{3,1\ M}$ | (Np) | 36.97 - 39.04 | | 0.076 (17) |
| $ec_{2,0\ L}$ | (Np) | 37.114 - 41.930 | | 30.2 (22) |
| $ec_{4,2\ M}$ | (Np) | 37.68 - 39.76 | | 2.3 (4) |
| $ec_{3,1\ N}$ | (Np) | 41.2 - 42.3 | | 0.021 (5) |
| $ec_{4,2\ N}$ | (Np) | 41.92 - 43.02 | | 0.65 (9) |
| $ec_{6,4\ M}$ | (Np) | 49.82 - 51.90 | | 0.228 (30) |
| $ec_{3,0\ L}$ | (Np) | 53.5 - 58.3 | | 0.0232 (4) |
| $ec_{2,0\ M}$ | (Np) | 53.802 - 55.877 | | 8.12 (25) |
| $ec_{6,4\ N}$ | (Np) | 54.06 - 55.16 | | 0.062 (8) |
| $ec_{6,2\ L}$ | (Np) | 76.54 - 81.36 | | 0.225 (5) |
| $ec_{6,2\ M}$ | (Np) | 93.23 - 95.31 | | 0.0625 (16) |
| $ec_{6,2\ N}$ | (Np) | 97.47 - 98.57 | | 0.0171 (4) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Np) | 11.89 — 22.2 | | 37.66 (17) | |
| $XK\alpha_2$ | (Np) | 97.069 | | 0.001134 (30) | } $K\alpha$ |
| $XK\alpha_1$ | (Np) | 101.059 | | 0.00181 (5) | } |
| $XK\beta_3$ | (Np) | 113.303 | } | | |
| $XK\beta_1$ | (Np) | 114.234 | } | 0.000658 (21) | $K\beta_1^{'}$ |
| $XK\beta_5^{''}$ | (Np) | 114.912 | } | | |
| $XK\beta_2$ | (Np) | 117.463 | } | | |
| $XK\beta_4$ | (Np) | 117.876 | } | 0.000226 (8) | $K\beta_2^{'}$ |
| $XKO_{2,3}$ | (Np) | 118.429 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{2,1}$(Np) | 26.3446 (2) | 21 (5) | E1 anomalous | 8 (2) | 2.31 (8) |
| $\gamma_{-1,1}$(Np) | 32.183 | 0.0174 (4) | | | 0.0174 (4) |
| $\gamma_{1,0}$(Np) | 33.1963 (3) | 21.3 (30) | M1+1.66%E2 | 175 (24) | 0.1215 (28) |
| $\gamma_{3,1}$(Np) | 42.704 (5) | 0.42 (9) | (M1+≈1.7%E2) | ≈75 (7) | 0.0055 (11) |
| $\gamma_{4,2}$(Np) | 43.420 (3) | 12.1 (16) | M1+16.6%E2 | 180 (23) | 0.0669 (29) |
| $\gamma_{14,10}$(Np) | 51.01 (3) | 0.000046 (21) | E1 | 0.753 (11) | 0.000026 (12) |
| $\gamma_{6,4}$(Np) | 55.56 (2) | 1.19 (16) | M1+17.5%E2 | 65 (6) | 0.0181 (18) |
| $\gamma_{-1,2}$(Np) | 57.85 (5) | | | | 0.0052 (15) |
| $\gamma_{2,0}$(Np) | 59.5409 (1) | 77.6 (25) | E1 anomalous | 1.16 (7) | 35.92 (17) |
| $\gamma_{14,9}$(Np) | 64.83 (2) | 0.000196 (28) | E1 | 0.400 (8) | 0.00014 (2) |
| $\gamma_{8,6}$(Np) | 67.50 (2) | 0.013 (4) | (M1+17%E2) | 29 (6) | 0.00042 (10) |
| $\gamma_{4,1}$(Np) | 69.76 (3) | 0.0039 (5) | (E1) | 0.330 (7) | 0.0029 (4) |
| $\gamma_{3,0}$(Np) | 75.90 (1) | 0.032 | (E2) | 53.1 (11) | 0.0006 |
| $\gamma_{5,1}$(Np) | 96.79 (3) | 0.000047 (16) | | | 0.000047 (16) |
| $\gamma_{6,2}$(Np) | 98.97 (2) | 0.329 (10) | E2 | 15.2 (3) | 0.0203 (4) |
| $\gamma_{4,0}$(Np) | 102.98 (2) | 0.0218 (5) | E1 | 0.1189 (24) | 0.0195 (4) |
| $\gamma_{-1,3}$(Np) | 106.42 (5) | | | | 0.000015 |
| $\gamma_{20,13}$(Np) | 109.70 (7) | 0.000051 | [E2] | 9.44 (19) | 0.0000049 |
| $\gamma_{21,13}$(Np) | 120.36 (8) | | | | 0.0000045 |
| $\gamma_{8,4}$(Np) | 123.05 (1) | 0.00675 (30) | E2 | 5.75 (12) | 0.00100 (4) |
| $\gamma_{6,1}$(Np) | 125.30 (2) | 0.00533 (26) | (E1) | 0.299 (6) | 0.0041 (2) |
| $\gamma_{29,22}$(Np) | 139.44 (8) | 0.000023 (5) | [E2] | 3.37 (7) | 0.0000053 (11) |
| $\gamma_{11,6}$(Np) | 146.55 (3) | 0.00172 (5) | E2 | 2.73 (6) | 0.00046 (1) |
| $\gamma_{8,3}$(Np) | 150.04 (3) | 0.000087 (6) | [E1] | 0.197 (4) | 0.000073 (5) |
| $\gamma_{26,15}$(Np) | 154.27 (20) | 0.000004 | [M1] | 7.06 (14) | 0.0000005 |
| $\gamma_{29,20}$(Np) | 159.26 (20) | 0.0000016 (6) | [E1] | 0.171 (4) | 0.0000014 (5) |
| $\gamma_{24,13}$(Np) | 161.54 (10) | 0.000011 | [M1] | 6.20 (12) | 0.0000015 |
| $\gamma_{9,4}$(Np) | 164.61 (2) | 0.000178 (9) | E2 | 1.70 (4) | 0.000066 (3) |
| $\gamma_{13,6}$(Np) | 165.81 (6) | 0.00011 (5) | [M1+E2] | 3.7 (22) | 0.000023 (1) |
| $\gamma_{18,8}$(Np) | 169.56 (3) | 0.000427 (26) | E2 | 1.51 (3) | 0.00017 (1) |
| $\gamma_{11,5}$(Np) | 175.07 (4) | 0.000021 (3) | [E1] | 0.137 (3) | 0.000018 (3) |
| $\gamma_{-1,7}$(Np) | 190.4 | | | | 0.0000022 (5) |
| $\gamma_{25,11}$(Np) | 191.96 (4) | 0.0000415 (20) | [E2] | 0.932 (19) | 0.0000215 (10) |
| $\gamma_{29,18}$(Np) | 196.76 (8) | 0.00000054 | [E1] | 0.1045 (21) | 0.00000049 |
| $\gamma_{-1,8}$(Np) | 201.70 (14) | 0.0000008 | | | 0.0000008 |
| $\gamma_{18,7}$(Np) | 204.06 (6) | 0.00000226 (7) | [E1] | 0.0960 (19) | 0.00000206 (6) |
| $\gamma_{9,2}$(Np) | 208.005 (23) | 0.00313 (6) | M1+2.38%E2 | 2.98 (6) | 0.000786 (9) |
| $\gamma_{13,4}$(Np) | 221.46 (3) | 0.00011 (5) | [M1+E2] | 1.5 (10) | 0.0000434 (8) |
| $\gamma_{26,10}$(Np) | 232.81 (5) | 0.0000155 (4) | [M1] | 2.22 (5) | 0.00000482 (9) |
| $\gamma_{9,1}$(Np) | 234.40 (4) | 0.0000080 (8) | M2 | 8.24 (17) | 0.00000087 (8) |
| $\gamma_{26,9}$(Np) | 246.73 (10) | 0.00000703 (22) | [M1] | 1.88 (4) | 0.00000244 (7) |
| $\gamma_{13,3}$(Np) | 248.52 (3) | 0.00000155 (3) | [E1] | 0.0612 (12) | 0.00000146 (3) |
| $\gamma_{22,7}$(Np) | 261.00 (7) | 0.00000169 (8) | [E2] | 0.312 (6) | 0.00000129 (6) |
| $\gamma_{13,2}$(Np) | 264.88 (3) | 0.000018 (7) | [M1+E2] | 0.9 (7) | 0.00000943 (12) |
| $\gamma_{9,0}$(Np) | 267.54 (4) | 0.000055 (2) | E1+19.4%M2 | 1.06 (6) | 0.0000268 (6) |
| $\gamma_{-1,9}$(Np) | 270.63 (15) | | | | 0.0000005 (2) |
| $\gamma_{-1,10}$(Np) | 271.54 | | | | 0.00000144 (5) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{20,6}$(Np) | 275.77 (8) | 0.000011 (4) | [M1+E2] | 0.8 (6) | 0.00000632 (10) |
| $\gamma_{27,9}$(Np) | 278.04 (15) | 0.00000270 (8) | [M1] | 1.35 (3) | 0.00000115 (3) |
| $\gamma_{13,1}$(Np) | 291.3 (2) | 0.00000318 (8) | [E1] | 0.0430 (9) | 0.00000305 (8) |
| $\gamma_{16,3}$(Np) | 292.77 (6) | 0.0000173 (4) | [E2] | 0.215 (4) | 0.0000142 (3) |
| $\gamma_{20,5}$(Np) | 304.21 (20) | 0.000000966 (21) | [E1] | 0.0391 (8) | 0.00000093 (2) |
| $\gamma_{16,2}$(Np) | 309.1 (3) | 0.00000210 (31) | [E1] | 0.0377 (8) | 0.0000020 (3) |
| $\gamma_{22,5}$(Np) | 322.56 (3) | 0.000257 (7) | (M1+26.5%E2) | 0.702 (12) | 0.000151 (4) |
| $\gamma_{-1,11}$(Np) | 324.69 | 0.0000018 (3) | | | 0.0000018 (3) |
| $\gamma_{-1,12}$(Np) | 329.69 | 0.0000011 (2) | | | 0.0000011 (2) |
| $\gamma_{14,0}$(Np) | 332.35 (3) | 0.000172 (5) | E2 | 0.147 (3) | 0.000150 (4) |
| $\gamma_{16,1}$(Np) | 335.37 (3) | 0.00084 (4) | M1+17.3%E2 | 0.69 (8) | 0.000496 (7) |
| $\gamma_{17,1}$(Np) | 337.7 (2) | 0.00000556 (10) | (E2) | 0.140 (3) | 0.00000488 (9) |
| $\gamma_{-1,13}$(Np) | 350.71 | 0.00000139 (5) | | | 0.00000139 (5) |
| $\gamma_{20,3}$(Np) | 358.25 (20) | 0.00000133 (5) | [E1] | 0.0275 (6) | 0.00000129 (5) |
| $\gamma_{16,0}$(Np) | 368.62 (3) | 0.000347 (9) | (M1) | 0.622 (12) | 0.000214 (5) |
| $\gamma_{17,0}$(Np) | 370.94 (3) | 0.000080 (4) | M1+16%E2 | 0.53 (7) | 0.0000520 (8) |
| $\gamma_{-1,14}$(Np) | 374.83 | 0.00000313 (5) | | | 0.00000313 (6) |
| $\gamma_{22,3}$(Np) | 376.65 (3) | 0.000225 (9) | (M1) | 0.586 (12) | 0.000137 (3) |
| $\gamma_{23,3}$(Np) | 383.81 (3) | 0.000037 (7) | [M1+E2] | 0.33 (23) | 0.0000281 (6) |
| $\gamma_{-1,15}$(Np) | 389.0 (3) | 0.0000005 | | | 0.00000049 |
| $\gamma_{-1,16}$(Np) | 390.61 (5) | 0.00000573 (8) | | | 0.00000573 (10) |
| $\gamma_{29,7}$(Np) | 400.78 (10) | 0.00000018 (5) | [M1+E2] | 0.29 (21) | 0.00000014 (3) |
| $\gamma_{30,7}$(Np) | 406.35 (15) | 0.00000175 (28) | [M1+E2] | 0.28 (20) | 0.00000137 (5) |
| $\gamma_{-1,17}$(Np) | 411.27 | 0.00000018 (4) | | | 0.00000018 (4) |
| $\gamma_{22,1}$(Np) | 419.33 (4) | 0.000036 (5) | [M1+E2] | 0.26 (18) | 0.0000284 (4) |
| $\gamma_{23,1}$(Np) | 426.47 (4) | 0.000039 (9) | [M1+E2] | 0.25 (18) | 0.000031 (6) |
| $\gamma_{-1,18}$(Np) | 429.9 (1) | 0.00000109 (5) | | | 0.00000109 (5) |
| $\gamma_{-1,19}$(Np) | 440.63 | 0.00000056 (3) | | | 0.00000056 (3) |
| $\gamma_{-1,20}$(Np) | 442.81 (7) | 0.00000331 (7) | | | 0.00000331 (8) |
| $\gamma_{35,13}$(Np) | 446.15 (6) | 0.00000011 (2) | | | 0.00000011 (2) |
| $\gamma_{22,0}$(Np) | 452.6 (2) | 0.00000251 (7) | [E2] | 0.0635 (13) | 0.00000236 (7) |
| $\gamma_{26,2}$(Np) | 454.66 (8) | 0.0000129 (2) | [M1] | 0.351 (7) | 0.00000953 (12) |
| $\gamma_{23,0}$(Np) | 459.68 (10) | 0.0000043 (5) | [M1+E2] | 0.20 (14) | 0.00000355 (7) |
| $\gamma_{29,5}$(Np) | 462.34 (8) | 0.0000012 | [M1+E2] | 0.20 (14) | 0.000001 |
| $\gamma_{30,5}$(Np) | 468.12 (15) | 0.0000032 (4) | [M1+E2] | 0.19 (14) | 0.00000269 (6) |
| $\gamma_{-1,21}$(Np) | 486.05 | 0.00000105 (6) | | | 0.00000105 (6) |
| $\gamma_{28,4}$(Np) | 487.13 (4) | 0.00000080 (6) | [M1] | 0.291 (6) | 0.00000062 (5) |
| $\gamma_{-1,22}$(Np) | 494.39 | 0.00000010 (2) | | | 0.00000010 (2) |
| $\gamma_{-1,23}$(Np) | 501.39 | 0.00000014 (2) | | | 0.00000014 (2) |
| $\gamma_{27,1}$(Np) | 512.5 (3) | 0.00000210 (41) | [E1] | 0.0133 (3) | 0.0000021 (4) |
| $\gamma_{26,0}$(Np) | 514.0 (5) | 0.0000039 (2) | [E1] | 0.0132 | 0.0000038 (2) |
| $\gamma_{30,3}$(Np) | 522.06 (15) | 0.00000113 (11) | [M1+E2] | 0.14 (10) | 0.00000099 (5) |
| $\gamma_{-1,24}$(Np) | 525.14 | 0.00000016 (3) | | | 0.00000016 (3) |
| $\gamma_{38,13}$(Np) | 529.17 (20) | 0.00000072 (5) | [E2] | 0.0437 (9) | 0.00000069 (5) |
| $\gamma_{-1,25}$(Np) | 532.44 | 0.00000008 (2) | | | 0.00000008 (2) |
| $\gamma_{27,0}$(Np) | 546.12 (6) | 0.00000025 (3) | [E1] | 0.0117 (2) | 0.00000025 (3) |
| $\gamma_{-1,26}$(Np) | 548.15 | 0.00000005 (2) | | | 0.00000005 (2) |
| $\gamma_{-1,27}$(Np) | 555.25 | 0.00000009 (2) | | | 0.00000009 (2) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{33,6}$(Np) | 563.46 (2) | 0.000000460 (21) | [E2] | 0.0378 (8) | 0.00000044 (2) |
| $\gamma_{36,8}$(Np) | 573.94 (20) | 0.00000142 (12) | [M1+E2] | 0.11 (8) | 0.00000128 (5) |
| $\gamma_{-1,28}$(Np) | 582.89 | 0.00000101 (6) | | | 0.00000101 (6) |
| $\gamma_{31,2}$(Np) | 586.59 (20) | 0.00000128 (5) | [E2] | 0.0346 (7) | 0.00000124 (5) |
| $\gamma_{28,0}$(Np) | 590.09 (4) | 0.00000283 (6) | [E1] | 0.0101 (2) | 0.00000280 (6) |
| $\gamma_{34,6}$(Np) | 597.19 (2) | 0.0000080 (5) | [M1+E2] | 0.10 (7) | 0.00000729 (11) |
| $\gamma_{-1,29}$(Np) | 600.26 | 0.00000022 (3) | | | 0.00000022 (3) |
| $\gamma_{33,4}$(Np) | 619.01 (2) | 0.000065 (5) | [M1+E2] | 0.09 (7) | 0.000060 (2) |
| $\gamma_{38,8}$(Np) | 627.18 (20) | 0.00000056 (4) | [M1+E2] | 0.09 (6) | 0.00000051 (2) |
| $\gamma_{32,1}$(Np) | 632.93 (15) | 0.00000124 (5) | | | 0.00000124 (5) |
| $\gamma_{-1,30}$(Np) | 636.9 | 0.00000021 (3) | | | 0.00000021 (3) |
| $\gamma_{36,6}$(Np) | 641.32 (4) | 0.0000076 (5) | [M1+E2] | 0.08 (6) | 0.00000704 (10) |
| $\gamma_{34,4}$(Np) | 652.73 (2) | 0.0000410 (25) | [M1+E2] | 0.08 (6) | 0.0000376 (9) |
| $\gamma_{33,2}$(Np) | 662.40 (2) | 0.00045 (10) | (E0+M1+E2) | 0.23 (5) | 0.000367 (6) |
| $\gamma_{32,0}$(Np) | 666.2 (2) | 0.00000095 (7) | | | 0.00000095 (7) |
| $\gamma_{36,5}$(Np) | 669.83 (2) | 0.00000051 (7) | [E1] | 0.0080 (2) | 0.00000051 (7) |
| $\gamma_{37,5}$(Np) | 675.78 (13) | 0.00000091 (7) | [E2,M1] | 0.07 (5) | 0.00000085 (5) |
| $\gamma_{34,3}$(Np) | 679.79 (2) | 0.00000334 (8) | [E1] | 0.00776 (16) | 0.00000331 (8) |
| $\gamma_{33,1}$(Np) | 688.72 (4) | 0.0000325 (6) | [E1] | 0.00758 (16) | 0.0000323 (6) |
| $\gamma_{-1,31}$(Np) | 693.46 | 0.00000354 (7) | | | 0.00000354 (8) |
| $\gamma_{34,2}$(Np) | 696.14 (2) | 0.0000055 (3) | [M1+E2] | 0.07 (5) | 0.00000517 (8) |
| $\gamma_{-1,32}$(Np) | 709.42 (5) | 0.00000641 (18) | | | 0.00000641 (19) |
| $\gamma_{-1,33}$(Np) | 712.5 | 0.00000020 (3) | | | 0.00000020 (3) |
| $\gamma_{33,0}$(Np) | 721.96 (2) | 0.000197 (5) | [E1] | 0.0070 (2) | 0.000196 (5) |
| $\gamma_{37,3}$(Np) | 729.72 (15) | 0.00000151 (6) | [M1] | 0.099 (2) | 0.00000137 (5) |
| $\gamma_{-1,34}$(Np) | 731.44 | 0.00000046 (4) | | | 0.00000046 (4) |
| $\gamma_{-1,35}$(Np) | 736.68 | 0.00000128 (5) | | | 0.00000128 (5) |
| $\gamma_{35,1}$(Np) | 737.34 (5) | 0.00000794 (8) | | | 0.00000794 (11) |
| $\gamma_{-1,36}$(Np) | 740.51 | 0.00000019 (3) | | | 0.00000019 (3) |
| $\gamma_{-1,37}$(Np) | 742.9 (3) | 0.00000035 | | | 0.00000035 |
| $\gamma_{-1,38}$(Np) | 745.02 | 0.00000009 (2) | | | 0.00000009 (2) |
| $\gamma_{-1,39}$(Np) | 750.39 | 0.00000006 (2) | | | 0.00000006 (2) |
| $\gamma_{34,0}$(Np) | 755.68 (2) | 0.00000789 (11) | [E1] | 0.0064 (1) | 0.00000784 (11) |
| $\gamma_{-1,40}$(Np) | 759.5 (1) | 0.00000181 (5) | | | 0.00000181 (5) |
| $\gamma_{-1,41}$(Np) | 763.31 | 0.00000023 (2) | | | 0.00000023 (2) |
| $\gamma_{36,1}$(Np) | 766.62 (4) | 0.00000504 (6) | [E1] | 0.00623 (12) | 0.00000501 (6) |
| $\gamma_{35,0}$(Np) | 770.57 (10) | 0.00000481 (5) | | | 0.00000481 (7) |
| $\gamma_{37,1}$(Np) | 772.57 (12) | 0.00000303 (5) | [M1] | 0.0847 (17) | 0.00000279 (4) |
| $\gamma_{-1,42}$(Np) | 774.67 | 0.00000011 (2) | | | 0.00000011 (2) |
| $\gamma_{-1,43}$(Np) | 777.39 | 0.00000015 (2) | | | 0.00000015 (2) |
| $\gamma_{-1,44}$(Np) | 780.53 | 0.00000031 (2) | | | 0.00000031 (2) |
| $\gamma_{-1,45}$(Np) | 782.2 (5) | 0.00000015 | | | 0.00000015 |
| $\gamma_{39,3}$(Np) | 786.00 (15) | 0.00000062 (0) | | | 0.00000062 |
| $\gamma_{-1,46}$(Np) | 789.0 (3) | 0.00000042 (6) | | | 0.00000042 (6) |
| $\gamma_{-1,47}$(Np) | 792.6 | 0.00000003 (1) | | | 0.00000003 (1) |
| $\gamma_{-1,48}$(Np) | 794.92 (20) | 0.00000094 | | | 0.00000094 |
| $\gamma_{39,2}$(Np) | 801.94 (20) | 0.00000123 (7) | | | 0.00000123 (7) |
| $\gamma_{-1,49}$(Np) | 803.19 | 0.00000016 (3) | | | 0.00000016 (3) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{37,0}$(Np) | 805.77 (12) | 0.00000033 | [M1,E2] | 0.05 (3) | 0.00000031 |
| $\gamma_{-1,50}$(Np) | 811.9 (3) | 0.00000063 (6) | | | 0.00000063 (6) |
| $\gamma_{-1,51}$(Np) | 819.33 | 0.00000043 (6) | | | 0.00000043 (6) |
| $\gamma_{-1,52}$(Np) | 822.21 | 0.00000024 (6) | | | 0.00000024 (6) |
| $\gamma_{39,1}$(Np) | 828.60 (12) | 0.00000021 (4) | | | 0.00000021 (4) |
| $\gamma_{-1,53}$(Np) | 835.21 | 0.00000003 (1) | | | 0.00000003 (1) |
| $\gamma_{-1,54}$(Np) | 838.88 | 0.00000004 (1) | | | 0.00000004 (1) |
| $\gamma_{-1,55}$(Np) | 841.14 | 0.00000010 (3) | | | 0.00000010 (3) |
| $\gamma_{-1,56}$(Np) | 843.7 | 0.00000097 (8) | | | 0.00000097 (8) |
| $\gamma_{-1,57}$(Np) | 846.86 | 0.00000016 (3) | | | 0.00000016 (3) |
| $\gamma_{-1,58}$(Np) | 847.4 (5) | 0.0000003 | | | 0.00000027 (3) |
| $\gamma_{-1,59}$(Np) | 851.6 (10) | 0.00000041 (6) | | | 0.00000041 (6) |
| $\gamma_{-1,60}$(Np) | 854.95 | 0.00000023 (4) | | | 0.00000023 (4) |
| $\gamma_{-1,61}$(Np) | 856.26 | 0.00000010 (3) | | | 0.00000010 (3) |
| $\gamma_{40,2}$(Np) | 861.34 (20) | 0.00000008 | | | 0.00000008 (3) |
| $\gamma_{39,0}$(Np) | 861.80 (12) | 0.00000061 (6) | | | 0.00000061 (6) |
| $\gamma_{-1,62}$(Np) | 870.63 | 0.00000150 (3) | | | 0.00000150 (4) |
| $\gamma_{-1,63}$(Np) | 882 | 0.00000004 (1) | | | 0.00000004 (1) |
| $\gamma_{-1,64}$(Np) | 886.53 | 0.00000015 (3) | | | 0.00000015 (3) |
| $\gamma_{40,1}$(Np) | 887.68 (20) | 0.00000033 (6) | | | 0.00000033 (6) |
| $\gamma_{-1,65}$(Np) | 890.38 | 0.00000032 (5) | | | 0.00000032 (5) |
| $\gamma_{-1,66}$(Np) | 894.47 | 0.00000003 (1) | | | 0.00000003 (1) |
| $\gamma_{-1,67}$(Np) | 898.17 | 0.00000006 (2) | | | 0.00000006 (2) |
| $\gamma_{-1,68}$(Np) | 902.61 | 0.00000033 (3) | | | 0.00000033 (3) |
| $\gamma_{-1,69}$(Np) | 909.95 | 0.00000005 (1) | | | 0.00000005 (1) |
| $\gamma_{-1,70}$(Np) | 912.4 | 0.00000028 (3) | | | 0.00000028 (3) |
| $\gamma_{40,0}$(Np) | 920.88 (20) | 0.00000019 (3) | | | 0.00000019 (3) |
| $\gamma_{-1,71}$(Np) | 928.95 | 0.00000009 (2) | | | 0.00000009 (2) |
| $\gamma_{-1,72}$(Np) | 939.2 | 0.00000005 (1) | | | 0.00000005 (1) |
| $\gamma_{41,0}$(Np) | 946.06 | 0.000000010 (3) | | | 0.000000010 (2) |
| $\gamma_{-1,73}$(Np) | 952.72 | 0.00000003 (1) | | | 0.00000003 (1) |
| $\gamma_{-1,74}$(Np) | 955.91 | 0.00000060 (5) | | | 0.00000060 (5) |
| $\gamma_{42,0}$(Np) | 962.19 | 0.00000004 (1) | | | 0.00000004 (1) |
| $\gamma_{-1,75}$(Np) | 969.09 | 0.00000003 (1) | | | 0.00000003 (1) |
| $\gamma_{-1,76}$(Np) | 980.84 | 0.00000003 (1) | | | 0.00000003 (1) |
| $\gamma_{43,0}$(Np) | 1014.33 | 0.0000010 (2) | | | 0.0000010 (2) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 16.01 | (2) | h |
| $Q_{\beta^-}$ | : | 664.5 | (4) | keV |
| $Q_{EC}$ | : | 751.3 | (7) | keV |
| $\beta^-$ | : | 83.1 | (3) | % |
| $EC$ | : | 16.9 | (3) | % |

# 2 Electron Capture Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ | $P_K$ | $P_L$ | $P_{M+}$ |
|---|---|---|---|---|---|---|---|
| $\epsilon_{0,1}$ | 706.8 (7) | 10.6 (5) | 1st forbidden non-unique | 7.26 | 0.7261 (23) | 0.2016 (15) | 0.0532 (10) |
| $\epsilon_{0,0}$ | 751.3 (7) | 6.3 (6) | 1st forbidden non-unique | 7.55 | 0.7303 (22) | 0.1987 (15) | 0.0522 (10) |

# 3 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,1}$ | 622.4 (4) | 45.8 (23) | 1st forbidden non-unique | 6.84 |
| $\beta^-_{0,0}$ | 664.5 (4) | 37.3 (23) | 1st forbidden non-unique | 7.03 |

# 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Pu) | 6.09 - 13.83 | 9.9 (5) | |
| $e_{AK}$ | (Pu) | | 0.36 (4) | |
| | KLL | 75.263 - 85.357 | } | |
| | KLX | 92.607 - 103.729 | } | |
| | KXY | 109.93 - 121.78 | } | |
| $e_{AL}$ | (Cm) | 6.19 - 14.46 | 15.4 (10) | |
| $ec_{1,0\ L}$ | (Cm) | 17.60 - 23.16 | 33.1 (18) | |
| $ec_{1,0\ M+}$ | (Cm) | 35.79 - 42.11 | 12.7 (7) | |
| $ec_{1,0\ T}$ | (Cm) | 17.60 - 42.11 | 45.8 (23) | |
| $ec_{1,0\ L}$ | (Pu) | 21.44 - 26.48 | 7.7 (4) | |
| $ec_{1,0\ M+}$ | (Pu) | 38.61 - 44.53 | 2.9 (2) | |
| $ec_{1,0\ T}$ | (Pu) | 21.44 - 44.53 | 10.6 (5) | |
| $\beta^-_{0,1}$ | max: | 622.4 (4) | 45.8 (23) | avg: 185.92 (14) |
| $\beta^-_{0,0}$ | max: | 664.5 (4) | 37.3 (23) | avg: 200.17 (14) |

# 5 Photon Emissions

## 5.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pu) | 12.124 — 22.153 | | 10.8 (5) | |
| $XK\alpha_2$ | (Pu) | 99.525 | | 3.55 (17) | } $K\alpha$ |
| $XK\alpha_1$ | (Pu) | 103.734 | | 5.6 (3) | } |
| $XK\beta_3$ | (Pu) | 116.244 | } | | |
| $XK\beta_1$ | (Pu) | 117.228 | } | 2.06 (11) | $K\beta_1'$ |
| $XK\beta_5''$ | (Pu) | 117.918 | } | | |
| $XK\beta_2$ | (Pu) | 120.54 | } | | |
| $XK\beta_4$ | (Pu) | 120.969 | } | 0.72 (4) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Pu) | 121.543 | } | | |
| XL | (Cm) | 12.633 — 23.527 | | 18.0 (11) | |

## 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Cm) | 42.13 (5) | 45.8 (23) | E2 | 1155 (17) | 0.040 (2) |
| $\gamma_{1,0}$(Pu) | 44.54 (2) | 10.6 (5) | E2 | 748 (11) | 0.014 (1) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 143 | (2) | y |
| $Q_\alpha$ | : | 5637.10 | (25) | keV |
| $Q_{IT}$ | : | 48.60 | (5) | keV |
| $IT$ | : | 99.54 | (1) | % |
| $\alpha$ | : | 0.46 | (1) | % |
| $SF$ | : | <4.8 | | $\times 10^{-9}$ % |

# 2 α Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,68}$ | 4975 (3) | 0.000009 (5) |
| $\alpha_{0,64}$ | 5027.3 (15) | 0.00009 (5) |
| $\alpha_{0,59}$ | 5068 (3) | 0.0012 (3) |
| $\alpha_{0,57}$ | 5082.6 (12) | 0.00014 (5) |
| $\alpha_{0,56}$ | 5091.9 (7) | 0.0009 (3) |
| $\alpha_{0,48}$ | 5143.07 (26) | 0.0258 (11) |
| $\alpha_{0,47}$ | 5153.2 (15) | 0.00009 (5) |
| $\alpha_{0,42}$ | 5173.45 (26) | 0.00009 (5) |
| $\alpha_{0,41}$ | 5175.4 (10) | 0.00009 (5) |
| $\alpha_{0,36}$ | 5207.15 (25) | 0.409 (9) |
| $\alpha_{0,35}$ | 5215.4 (7) | 0.00014 (5) |
| $\alpha_{0,28}$ | 5248.15 (25) | 0.0018 (5) |
| $\alpha_{0,27}$ | 5248.21 (26) | 0.0018 (5) |
| $\alpha_{0,25}$ | 5249.64 (26) | 0.00009 (5) |
| $\alpha_{0,23}$ | 5251.80 (25) | 0.00009 (5) |
| $\alpha_{0,20}$ | 5272.96 (25) | 0.0046 (5) |
| $\alpha_{0,14}$ | 5314.95 (25) | 0.0028 (5) |
| $\alpha_{0,11}$ | 5331.97 (25) | 0.0007 (5) |
| $\alpha_{0,9}$ | 5367.73 (25) | 0.0051 (9) |
| $\alpha_{0,6}$ | 5410.13 (25) | 0.0046 (9) |
| $\alpha_{0,3}$ | 5458.68 (25) | 0.00064 (18) |
| $\alpha_{0,1}$ | 5517.93 (25) | 0.000014 (14) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Am) | 6.26 - 23.70 | | 22.1 (11) |
| $e_{AL}$ | (Np) | 6.036 - 13.516 | | 0.35 (4) |
| $e_{AK}$ | (Np) | | | 0.0019 (7) |
| | KLL | 73.501 - 83.134 | } | |
| | KLX | 90.358 - 101.054 | } | |
| | KXY | 107.19 - 118.66 | } | |

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $ec_{1,0\ L}$ | (Am) | 24.8 - 30.10 | 47.1 (10) |
| $ec_{1,0\ M}$ | (Am) | 42.47 - 44.78 | 37.6 (9) |
| $ec_{1,0\ N}$ | (Am) | 46.98 - 48.15 | 11.9 (3) |
| $ec_{1,0\ O}$ | (Am) | 48.23 - 48.49 | 2.71 (6) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Am) | 12.377 — 22.836 | | 25.0 (11) | |
| XL | (Np) | 11.871 — 21.491 | | 0.37 (4) | |
| $XK\alpha_2$ | (Np) | 97.069 | | 0.019 (9) | } $K\alpha$ |
| $XK\alpha_1$ | (Np) | 101.059 | | 0.030 (14) | } |
| $XK\beta_3$ | (Np) | 113.303 | } | | |
| $XK\beta_1$ | (Np) | 114.234 | } | 0.011 (5) | $K\beta_1^{'}$ |
| $XK\beta_5^{''}$ | (Np) | 114.912 | } | | |
| $XK\beta_2$ | (Np) | 117.463 | } | | |
| $XK\beta_4$ | (Np) | 117.876 | } | 0.0037 (17) | $K\beta_2^{'}$ |
| $XKO_{2,3}$ | (Np) | 118.429 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{3,2}$(Np) | 24.34 (1) | 0.021 (3) | M1+E2 | 322 (5) | 0.000064 (9) |
| $\gamma_{1,0}$(Np) | 26.427 (2) | <0.24 | M1+E2 | 338 (5) | <0.000708 |
| $\gamma_{11,10}$(Np) | 32.64 (1) | 0.0026 (4) | M1+E2 | 136.4 (20) | 0.000019 (3) |
| $\gamma_{9,6}$(Np) | 43.11 (1) | 0.0040 (9) | M1+E2 | 61.3 (9) | 0.000064 (14) |
| $\gamma_{19,11}$(Np) | 43.33 (1) | 0.00112 (18) | M1+E2 | 126.7 (18) | 0.0000087 (14) |
| $\gamma_{10,6}$(Np) | 46.833 (3) | 0.00037 (7) | M1+E2 | 48.8 (7) | 0.0000074 (14) |
| $\gamma_{1,0}$(Am) | 48.60 (5) | 99.54 (1) | E4 | 704000 (8000) | 0.0001414 (22) |
| $\gamma_{6,3}$(Np) | 49.371 (3) | 0.244 (8) | E1 | 0.821 (12) | 0.134 (4) |
| $\gamma_{14,9}$(Np) | 53.67 (1) | 0.097 (13) | M1+E2 | 46.0 (7) | 0.0021 (3) |
| $\gamma_{30,19}$(Np) | 53.85 (2) | 0.00011 (6) | M1+E2 | 37.2 (6) | 0.0000028 (14) |
| $\gamma_{9,5}$(Np) | 57.51 (1) | 0.0015 (4) | E1 | 0.549 (8) | 0.00097 (23) |
| $\gamma_{3,1}$(Np) | 60.247 (3) | 0.132 (12) | M1+E2 | 23.1 (4) | 0.0055 (5) |
| $\gamma_{36,20}$(Np) | 66.92 (1) | 0.0205 (6) | E1 | 0.368 (6) | 0.0150 (5) |
| $\gamma_{28,14}$(Np) | 67.92 (2) | 0.100 (8) | M1+E2 | 24 (3) | 0.0040 (3) |
| $\gamma_{6,2}$(Np) | 73.72 (1) | 0.0101 (7) | E1 | 0.285 (4) | 0.0079 (6) |
| $\gamma_{19,10}$(Np) | 75.98 (1) | 0.00052 (8) | E2 | 52.8 (8) | 0.0000097 (14) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{11,6}$(Np) | 79.48 (1) | 0.0033 (8) | M1+E2 | 26 (4) | 0.000124 (23) |
| $\gamma_{27,11}$(Np) | 85.16 (7) | 0.020 (7) | M1+E2 | 19 (3) | 0.0010 (3) |
| $\gamma_{3,0}$(Np) | 86.674 (2) | 0.205 (7) | M1+E2 | 7.95 (12) | 0.0229 (7) |
| $\gamma_{-1,1}$(Np) | 89.60 (5) | 0.0013 (3) | | | 0.0013 (3) |
| $\gamma_{9,3}$(Np) | 92.48 (1) | 0.00324 (35) | E1 | 0.1574 (22) | 0.0028 (3) |
| $\gamma_{11,5}$(Np) | 93.88 (1) | 0.0042 (5) | E1 | 0.1513 (22) | 0.0036 (4) |
| $\gamma_{14,6}$(Np) | 96.78 (1) | 0.0059 (10) | E2 | 16.90 (24) | 0.00033 (6) |
| $\gamma_{30,11}$(Np) | 97.18 (2) | 0.00013 (7) | E2 | 16.58 (24) | 0.000007 (4) |
| $\gamma_{36,14}$(Np) | 109.61 (1) | ≤0.14 | M1+E2 | 6.7 (7) | ≤0.0184 |
| $\gamma_{6,1}$(Np) | 109.618 (3) | ≤0.02 | E1 | 0.1010 (15) | ≤0.0184 |
| $\gamma_{14,5}$(Np) | 111.18 (1) | 0.0027 (5) | E1 | 0.0974 (14) | 0.0025 (4) |
| $\gamma_{19,6}$(Np) | 122.81 (1) | 0.00039 (18) | M1+E2 | 9.6 (9) | 0.00004 (2) |
| $\gamma_{36,11}$(Np) | 126.92 (1) | 0.0008 (4) | E2 | 5.03 (7) | 0.00013 (7) |
| $\gamma_{23,8}$(Np) | 131.50 (5) | 0.00034 (8) | E1 | 0.268 (4) | 0.00027 (6) |
| $\gamma_{28,8}$(Np) | 135.21 (2) | 0.0085 (5) | E1 | 0.251 (4) | 0.0068 (4) |
| $\gamma_{6,0}$(Np) | 136.045 (2) | 0.0118 (3) | E1 | 0.247 (4) | 0.0094 (3) |
| $\gamma_{28,7}$(Np) | 139.05 (3) | ≤0.00014 | E1 | 0.235 (4) | ≤0.00011 |
| $\gamma_{8,1}$(Np) | 139.11 (2) | ≤0.00049 | E2 | 3.40 (5) | ≤0.00011 |
| $\gamma_{30,7}$(Np) | 151.01 (3) | 0.000099 (22) | E1 | 0.194 (3) | 0.000083 (18) |
| $\gamma_{19,4}$(Np) | 152.70 (2) | ≤0.00082 | E1 | 0.189 (3) | ≤0.00069 |
| $\gamma_{9,1}$(Np) | 152.73 (1) | ≤0.00082 | E1 | 0.189 (3) | ≤0.00069 |
| $\gamma_{11,2}$(Np) | 153.19 (1) | 0.00037 (4) | E1 | 0.187 (3) | 0.00031 (4) |
| $\gamma_{20,5}$(Np) | 153.87 (1) | 0.0266 (8) | M1+E2 | 7.02 (10) | 0.00332 (10) |
| $\gamma_{10,1}$(Np) | 156.451 (3) | 0.00032 (5) | E1 | 0.1784 (25) | 0.00027 (5) |
| $\gamma_{-1,2}$(Np) | 160.61 (2) | 0.0004 (2) | | | 0.00041 (18) |
| $\gamma_{34,8}$(Np) | 163.1 (5) | ≤0.079 | M1+E2 | 3.9 (5) | ≤0.0161 |
| $\gamma_{36,9}$(Np) | 163.29 (1) | ≤0.079 | M1+E2 | 3.9 (5) | ≤0.0161 |
| $\gamma_{-1,3}$(Np) | 165.97 (15) | 0.000046 (23) | | | 0.000046 (23) |
| $\gamma_{45,13}$(Np) | 170.7 (8) | 0.00280 (22) | M1+E2 | 3.4 (5) | 0.00063 (5) |
| $\gamma_{48,14}$(Np) | 174.76 (6) | 0.00720 (16) | M1+E2 | 3.1 (4) | 0.00017 (4) |
| $\gamma_{30,6}$(Np) | 176.66 (2) | 0.00006 (3) | E2 | 1.285 (18) | 0.000028 (14) |
| $\gamma_{10,0}$(Np) | 182.878 (2) | 0.00103 (4) | E1 | 0.1238 (18) | 0.00092 (3) |
| $\gamma_{11,1}$(Np) | 189.10 (1) | 0.00030 (5) | E1 | 0.1146 (16) | 0.00027 (5) |
| $\gamma_{23,4}$(Np) | 190.88 (5) | 0.00012 (3) | E1 | 0.1121 (16) | 0.000106 (24) |
| $\gamma_{28,4}$(Np) | 194.59 (2) | 0.00157 (5) | E1 | 0.1072 (15) | 0.00142 (5) |
| $\gamma_{19,2}$(Np) | 196.52 (1) | 0.00011 (5) | E1 | 0.1048 (15) | 0.00010 (5) |
| $\gamma_{36,6}$(Np) | 206.39 (1) | 0.0027 (3) | E2 | 0.711 (10) | 0.00156 (18) |
| $\gamma_{20,2}$(Np) | 213.19 (1) | 0.00015 (5) | M1+E2 | 1.73 (25) | 0.000055 (18) |
| $\gamma_{11,0}$(Np) | 215.522 (4) | 0.00064 (10) | E1 | 0.0847 (12) | 0.00059 (10) |
| $\gamma_{19,1}$(Np) | 232.43 (1) | 0.00060 (3) | E1 | 0.0712 (10) | 0.00056 (3) |
| $\gamma_{-1,4}$(Np) | 233.69 (10) | 0.00013 (3) | | | 0.00013 (3) |
| $\gamma_{25,2}$(Np) | 236.90 (6) | 0.00010 (5) | M1+E2 | 1.27 (19) | 0.000046 (23) |
| $\gamma_{27,2}$(Np) | 238.35 (7) | 0.000017 (9) | E1 | 0.0673 (10) | 0.000016 (8) |
| $\gamma_{17,0}$(Np) | 250.33 (3) | ≤0.0012 | (M1+E2) | 1.08 (16) | ≤0.00056 |
| $\gamma_{30,2}$(Np) | 250.37 (2) | ≤0.0006 | E1 | 0.0602 (9) | ≤0.00056 |
| $\gamma_{42,4}$(Np) | 270.55 (7) | 0.000030 (9) | E1 | 0.0506 (7) | 0.000029 (8) |
| $\gamma_{25,1}$(Np) | 272.80 (6) | 0.000069 (15) | M1+E2 | 0.85 (13) | 0.000037 (8) |
| $\gamma_{36,2}$(Np) | 280.11 (1) | 0.000063 (7) | E1 | 0.0468 (7) | 0.000060 (6) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{25,0}$(Np) | 299.23 (6) | 0.000046 (23) | M1+E2 | 0.65 (10) | 0.000028 (14) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 7367 | (23) | y |
| $Q_\alpha$ | : | 5438.8 | (10) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | 3.8 | (7) | $\times 10^{-9}$ % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,16}$ | 4695 (3) | 0.0017 (5) |
| $\alpha_{0,15}$ | 4919 (3) | 0.000085 |
| $\alpha_{0,14}$ | 4930 (3) | 0.00018 |
| $\alpha_{0,13}$ | 4946 (3) | 0.00034 |
| $\alpha_{0,12}$ | 4997 (3) | 0.0009 (4) |
| $\alpha_{0,11}$ | 5008 (3) | 0.0009 (4) |
| $\alpha_{0,10}$ | 5029 (3) | 0.0020 (6) |
| $\alpha_{0,9}$ | 5035 (3) | 0.0020 (6) |
| $\alpha_{0,8}$ | 5088 (5) | 0.0055 (6) |
| $\alpha_{0,7}$ | 5113 (1) | 0.010 (1) |
| $\alpha_{0,6}$ | 5181 (1) | 1.383 (7) |
| $\alpha_{0,4}$ | 5233.3 (10) | 11.46 (5) |
| $\alpha_{0,3}$ | 5275.3 (10) | 86.74 (5) |
| $\alpha_{0,1}$ | 5321 (1) | 0.192 (3) |
| $\alpha_{0,0}$ | 5349.4 (23) | 0.240 (3) |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $e_{AL}$ | (Np) | 6.04 - 13.52 | 18.4 (11) |
| $e_{AK}$ | (Np) | | 0.00058 (9) |
| | KLL | 73.501 - 83.134 | } |
| | KLX | 90.358 - 101.054 | } |
| | KXY | 107.19 - 118.66 | } |
| $ec_{1,0\ L}$ | (Np) | 8.70 - 13.52 | 9.4 (22) |
| $ec_{4,3\ L}$ | (Np) | 20.8 - 25.6 | 7.4 (8) |
| $ec_{3,1\ L}$ | (Np) | 21.10 - 25.92 | 5.04 (11) |
| $ec_{1,0\ M}$ | (Np) | 25.39 - 27.47 | 2.4 (6) |
| $ec_{1,0\ N}$ | (Np) | 29.63 - 30.73 | 0.65 (15) |
| $ec_{6,4\ L}$ | (Np) | 32.753 - 37.570 | 1.10 (33) |
| $ec_{4,3\ M}$ | (Np) | 37.5 - 39.5 | 1.95 (26) |
| $ec_{3,1\ M}$ | (Np) | 37.79 - 39.87 | 1.266 (28) |
| $ec_{4,3\ N}$ | (Np) | 41.7 - 42.8 | 0.53 (6) |
| $ec_{3,1\ N}$ | (Np) | 42.03 - 43.13 | 0.336 (7) |
| $ec_{6,4\ M}$ | (Np) | 49.441 - 51.516 | 0.30 (9) |

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $ec_{3,0\ L}$ | (Np) | 52.23 - 57.05 | 13.91 (32) |
| $ec_{6,4\ N}$ | (Np) | 53.679 - 54.777 | 0.08 (2) |
| $ec_{4,1\ L}$ | (Np) | 64.28 - 69.10 | 0.0485 (14) |
| $ec_{3,0\ M}$ | (Np) | 68.92 - 71.00 | 3.44 (8) |
| $ec_{3,0\ N}$ | (Np) | 73.16 - 74.26 | 0.917 (21) |
| $ec_{6,3\ L}$ | (Np) | 76.073 - 80.890 | 0.17 (2) |
| $ec_{4,1\ M}$ | (Np) | 80.97 - 83.05 | 0.01194 (36) |
| $ec_{6,3\ M}$ | (Np) | 92.761 - 94.836 | 0.05 (1) |
| $ec_{4,0\ L}$ | (Np) | 95.41 - 100.23 | 0.0361 (32) |
| $ec_{6,3\ N}$ | (Np) | 96.999 - 98.097 | 0.010 (2) |

## 4 Photon Emissions

### 4.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. | |
|---|---|---|---|---|
| XL | (Np) | 11.871 — 21.491 | 18.9 (7) | |
| $XK\alpha_2$ | (Np) | 97.069 | 0.0058 (4) | } $K\alpha$ |
| $XK\alpha_1$ | (Np) | 101.059 | 0.0092 (7) | } |
| $XK\beta_3$ | (Np) | 113.303 } | | |
| $XK\beta_1$ | (Np) | 114.234 } | 0.00335 (25) | $K\beta'_1$ |
| $XK\beta''_5$ | (Np) | 114.912 } | | |
| $XK\beta_2$ | (Np) | 117.463 } | | |
| $XK\beta_4$ | (Np) | 117.876 } | 0.00115 (9) | $K\beta'_2$ |
| $XKO_{2,3}$ | (Np) | 118.429 } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Np) | 31.14 (3) | 12.7 (30) | M1+3.08%E2 | 263 (13) | 0.048 (11) |
| $\gamma_{4,3}$(Np) | 43.1 | 10.1 | M1+12.6%E2 | 154 (18) | 0.065 |
| $\gamma_{3,1}$(Np) | 43.53 (2) | 12.62 (23) | E1 | 1.143 (16) | 5.89 (10) |
| $\gamma_{6,5}$(Np) | 50.6 (10) | 0.011 (2) | (E1) | 0.77 (5) | 0.0062 (10) |
| $\gamma_{6,4}$(Np) | 55.18 (5) | 1.81 (26) | M1+26.4%E2 | 107 (14) | 0.0168 (11) |
| $\gamma_{3,0}$(Np) | 74.66 (2) | 85.7 (16) | E1 | 0.276 (4) | 67.2 (12) |
| $\gamma_{4,1}$(Np) | 86.71 (2) | 0.41 (1) | E1 | 0.186 (3) | 0.346 (9) |
| $\gamma_{6,3}$(Np) | 98.5 (2) | 0.25 (4) | (E2) | 15.6 (3) | 0.0151 (21) |
| $\gamma_{4,0}$(Np) | 117.60 (15) | 0.62 (5) | E1 | 0.0842 (13) | 0.57 (5) |
| $\gamma_{6,1}$(Np) | 141.90 (6) | 0.141 (10) | E1 | 0.224 (4) | 0.115 (8) |
| $\gamma_{7,2}$(Np) | 169 | 0.0014 | (E1) | 0.149 (3) | 0.0012 |
| $\gamma_{9,5}$(Np) | 195.0 (18) | 0.001 | (E1) | 0.107 (3) | 0.00085 |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 10.1 | (1) | h |
| $Q_{\beta^-}$ | : | 1427.3 | (10) | keV |
| $\beta^-$ | : | 100 | | % |

## 2 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,9}$ | 387.1 (10) | 100 | 1st forbidden non-unique | 5.63 |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Cm) | 6.19 - 14.46 | 86 (9) | |
| $e_{AK}$ | (Cm) | | 0.213 (27) | |
| | KLL | 78.858 - 89.973 | } | |
| | KLX | 97.226 - 109.267 | } | |
| | KXY | 115.57 - 128.23 | } | |
| $ec_{1,0\ L}$ | (Cm) | 18.439 - 24.000 | 73 (15) | |
| $ec_{3,2\ K}$ | (Cm) | 25.622 (2) | 3.3 (7) | |
| $ec_{1,0\ M}$ | (Cm) | 36.628 - 38.956 | 21 (4) | |
| $ec_{1,0\ N}$ | (Cm) | 41.281 - 42.500 | 5.7 (12) | |
| $ec_{2,1\ L}$ | (Cm) | 74.857 - 80.410 | 70 (15) | |
| $ec_{4,3\ K}$ | (Cm) | 77.334 (4) | 0.049 (11) | |
| $ec_{2,1\ M}$ | (Cm) | 93.046 - 95.374 | 20 (4) | |
| $ec_{2,1\ N}$ | (Cm) | 97.699 - 98.910 | 5.5 (12) | |
| $ec_{3,2\ L}$ | (Cm) | 129.337 - 134.890 | 36 (8) | |
| $ec_{3,2\ M}$ | (Cm) | 147.526 - 149.854 | 10.2 (21) | |
| $ec_{3,2\ N}$ | (Cm) | 152.179 - 153.390 | 2.8 (6) | |
| $ec_{4,3\ L}$ | (Cm) | 181.049 - 186.600 | 0.19 (4) | |
| $ec_{4,3\ M}$ | (Cm) | 199.238 - 201.566 | 0.053 (12) | |
| $ec_{4,3\ N}$ | (Cm) | 203.891 - 205.100 | 0.0147 (34) | |
| $ec_{9,4\ K}$ | (Cm) | 410.161 (16) | 0.019 (6) | |
| $ec_{9,3\ K}$ | (Cm) | 615.736 (5) | 3.9 (5) | |
| $ec_{9,3\ L}$ | (Cm) | 719.451 - 725.010 | 0.86 (11) | |
| $ec_{9,3\ M}$ | (Cm) | 737.640 - 739.968 | 0.21 (3) | |
| $ec_{9,3\ N}$ | (Cm) | 742.293 - 743.510 | 0.058 (8) | |
| $ec_{9,2\ K}$ | (Cm) | 769.599 (7) | 0.34 (10) | |
| $ec_{9,2\ L}$ | (Cm) | 873.31 - 878.87 | 0.10 (3) | |
| $ec_{9,2\ M}$ | (Cm) | 891.50 - 893.83 | 0.026 (7) | |
| $\beta^-_{0,9}$ | max: | 387.1 (10) | 100 | avg: 109.6 (3) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Cm) | 12.633 — 23.527 | | 100 (10) | |
| $XK\alpha_2$ | (Cm) | 104.59 | | 2.2 (3) | } Kα |
| $XK\alpha_1$ | (Cm) | 109.271 | | 3.4 (4) | } |
| $XK\beta_3$ | (Cm) | 122.304 | } | | |
| $XK\beta_1$ | (Cm) | 123.403 | } | 1.29 (16) | $K\beta'_1$ |
| $XK\beta''_5$ | (Cm) | 124.124 | } | | |
| $XK\beta_2$ | (Cm) | 126.889 | } | | |
| $XK\beta_4$ | (Cm) | 127.352 | } | 0.45 (6) | $K\beta'_2$ |
| $XKO_{2,3}$ | (Cm) | 127.97 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Cm) | 42.965 (10) | 100 (21) | E2 | 1050 (15) | 0.096 (20) |
| $\gamma_{2,1}$(Cm) | 99.383 (4) | 100 (22) | E2 | 19.3 (3) | 5.0 (11) |
| $\gamma_{3,2}$(Cm) | 153.863 (2) | 72 (15) | E2 | 2.81 (4) | 19 (4) |
| $\gamma_{4,3}$(Cm) | 205.575 (4) | 0.66 (15) | E2 | 0.887 (13) | 0.35 (8) |
| $\gamma_{9,4}$(Cm) | 538.402 (16) | 0.69 (20) | E2 | 0.0495 (7) | 0.66 (19) |
| $\gamma_{9,3}$(Cm) | 743.977 (5) | 71 (9) | M1+0.46%E2 | 0.077 (5) | 66 (8) |
| $\gamma_{9,2}$(Cm) | 897.840 (7) | 28 (8) | E2 | 0.01697 (24) | 28 (8) |

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(Theoretical ICC)

# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 26 | (3) | min |
| $Q_{\beta^-}$ | : | 1516 | (3) | keV |
| $Q_{EC}$ | : | 164 | (9) | keV |
| $\beta^-$ | : | 99.964 | (1) | % |
| $EC$ | : | 0.036 | (1) | % |

# 2 Electron Capture Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ | $P_K$ | $P_L$ | $P_{M+}$ |
|---|---|---|---|---|---|---|---|
| $\epsilon_{0,0}$ | 164 (9) | 0.036 (1) | allowed | 6.37 | 0.24 (5) | 0.53 (4) | 0.168 (12) |

# 3 $\beta^-$ Transitions

| | Energy keV | Probability × 100 | Nature | log $ft$ |
|---|---|---|---|---|
| $\beta^-_{0,11}$ | 410 (3) | 0.35 (9) | (1st forbidden non-unique) | 6.8 |
| $\beta^-_{0,10}$ | 432 (3) | 0.56 (13) | (allowed) | 6.67 |
| $\beta^-_{0,7}$ | 496 (3) | 0.08 (2) | (allowed) | 7.7 |
| $\beta^-_{0,6}$ | 531.1 (30) | 1.36 (16) | allowed | 6.58 |
| $\beta^-_{0,1}$ | 1473 (3) | 31 (9) | allowed | 6.74 |
| $\beta^-_{0,0}$ | 1516 (3) | 67 (9) | allowed | 6.45 |

# 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. | Energy keV |
|---|---|---|---|---|
| $e_{AL}$ | (Pu) | 6.19 - 22.99 | 0.0124 (11) | |
| $e_{AK}$ | (Pu) | | 0.000253 (45) | |
| | KLL | 75.263 - 85.357 } | | |
| | KLX | 92.607 - 103.729 } | | |
| | KXY | 109.93 - 121.78 } | | |
| $e_{AL}$ | (Cm) | 6.19 - 14.46 | 10.6 (23) | |
| $e_{AK}$ | (Cm) | | 0.00125 (27) | |
| | KLL | 78.858 - 89.973 } | | |
| | KLX | 97.226 - 109.267 } | | |
| | KXY | 115.57 - 128.23 } | | |
| $ec_{1,0\ L}$ | (Cm) | 18.439 - 23.995 | 23 (7) | |
| $ec_{1,0\ M+}$ | (Cm) | 36.628 - 42.965 | 9 (3) | |
| $ec_{6,0\ T}$ | (Cm) | 856.66 - 984.91 | 1.0 (1) | |
| $\beta^-_{0,11}$ | max: | 410 (3) | 0.35 (9) | avg: 116.9 (7) |

| | | Energy keV | | Electrons per 100 disint. | | Energy keV |
|---|---|---|---|---|---|---|
| $\beta^-_{0,10}$ | max: | 432 | (3) | 0.56 (13) | avg: | 123.7 (7) |
| $\beta^-_{0,7}$ | max: | 496 | (3) | 0.08 (2) | avg: | 144.0 (7) |
| $\beta^-_{0,6}$ | max: | 531.1 | (30) | 1.36 (16) | avg: | 155.7 (7) |
| $\beta^-_{0,1}$ | max: | 1473 | (3) | 31 (9) | avg: | 495.8 (9) |
| $\beta^-_{0,0}$ | max: | 1516 | (3) | 67 (9) | avg: | 512.3 (9) |

# 5 Photon Emissions

## 5.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Cm) | 12.633 — 23.527 | | 12.3 (27) | |
| $XK\alpha_2$ | (Cm) | 104.59 | | 0.013 (4) | } $K\alpha$ |
| $XK\alpha_1$ | (Cm) | 109.271 | | 0.020 (6) | } |
| $XK\beta_3$ | (Cm) | 122.304 | } | | |
| $XK\beta_1$ | (Cm) | 123.403 | } | 0.0076 (21) | $K\beta_1'$ |
| $XK\beta_5''$ | (Cm) | 124.124 | } | | |
| $XK\beta_2$ | (Cm) | 126.889 | } | | |
| $XK\beta_4$ | (Cm) | 127.352 | } | 0.0027 (8) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Cm) | 127.97 | } | | |

## 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Cm) | 42.965 (10) | 32 (9) | E2 | 1050 (15) | 0.030 (9) |
| $\gamma_{6,1}$(Cm) | 941.95 (3) | 0.36 (12) | E2 | 0.01547 (22) | 0.35 (12) |
| $\gamma_{7,1}$(Cm) | 977.80 (4) | 0.08 (2) | E0(+M1+E2) | | |
| $\gamma_{6,0}$(Cm) | 984.91 (2) | 1.0 (1) | E0 | | |
| $\gamma_{10,1}$(Cm) | 1041.22 (3) | 0.19 (6) | (M1+E2) | | 0.19 (6) |
| $\gamma_{11,1}$(Cm) | 1062.95 (3) | 0.30 (9) | anomalous E1 | 0.11 (3) | 0.27 (8) |
| $\gamma_{10,0}$(Cm) | 1084.181 (14) | 0.37 (12) | anomalous (E2) | 0.041 (11) | 0.36 (12) |
| $\gamma_{11,0}$(Cm) | 1105.91 (2) | 0.05 (2) | anomalous (E1) | 0.17 (4) | 0.04 (2) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 162.86 | (8) | d |
| $Q_\alpha$ | : | 6215.56 | (8) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | 6.36 | (14) | $\times 10^{-6}$ % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,15}$ | 4869.43 (23) | 0.00000052 (14) |
| $\alpha_{0,14}$ | 4904.44 (23) | 0.00000055 (15) |
| $\alpha_{0,13}$ | 5005.64 (19) | 0.00000031 (10) |
| $\alpha_{0,12}$ | 5101.21 (10) | 0.0000037 (10) |
| $\alpha_{0,11}$ | 5111.1 (3) | ≤0.0000002 |
| $\alpha_{0,10}$ | 5146.07 (12) | 0.0000017 (5) |
| $\alpha_{0,9}$ | 5165.95 (16) | 0.00000113 (21) |
| $\alpha_{0,8}$ | 5186.95 (12) | 0.000035 (7) |
| $\alpha_{0,7}$ | 5366.22 (15) | ≤0.00000022 |
| $\alpha_{0,6}$ | 5462.47 (14) | 0.000013 (3) |
| $\alpha_{0,5}$ | 5517.75 (11) | 0.00025 (5) |
| $\alpha_{0,4}$ | 5607.76 (16) | 0.00002 |
| $\alpha_{0,3}$ | 5816.39 (11) | 0.0046 (5) |
| $\alpha_{0,2}$ | 5969.24 (9) | 0.034 (2) |
| $\alpha_{0,1}$ | 6069.37 (9) | 25.94 (7) |
| $\alpha_{0,0}$ | 6112.72 (8) | 74.06 (7) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Pu) | 6.19 - 22.99 | | 8.99 (21) |
| $e_{AK}$ | (Pu) | | | 0.0000082 (15) |
| | KLL | 75.2 - 85.3 | } | |
| | KLX | 92.6 - 103.6 | } | |
| | KXY | 109.8 - 121.5 | } | |
| $ec_{1,0\ L}$ | (Pu) | 20.98 - 26.02 | | 18.8 (6) |
| $ec_{1,0\ M}$ | (Pu) | 38.15 - 40.31 | | 5.25 (15) |
| $ec_{2,1\ L}$ | (Pu) | 78.82 - 83.86 | | 0.0263 (16) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pu) | 12.12 — 23.07 | | 9.92 (23) | |
| $XK\alpha_2$ | (Pu) | 99.525 | | 0.000082 (9) | } $K\alpha$ |
| $XK\alpha_1$ | (Pu) | 103.734 | | 0.000130 (15) | } |
| $XK\beta_3$ | (Pu) | 116.244 | } | | |
| $XK\beta_1$ | (Pu) | 117.228 | } | 0.000048 (6) | $K\beta_1'$ |
| $XK\beta_5''$ | (Pu) | 117.918 | } | | |
| $XK\beta_2$ | (Pu) | 120.54 | } | | |
| $XK\beta_4$ | (Pu) | 120.969 | } | 0.0000165 (19) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Pu) | 121.543 | } | | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pu) | 44.08 (3) | 26.0 (8) | E2 | 787 (16) | 0.0330 (7) |
| $\gamma_{2,1}$(Pu) | 101.92 (4) | 0.0388 (22) | E2 | 14.45 (21) | 0.00251 (14) |
| $\gamma_{3,2}$(Pu) | 157.42 (9) | 0.0046 (5) | [E2] | 2.19 (4) | 0.00145 (16) |
| $\gamma_{4,3}$(Pu) | 210.20 (14) | 0.00002052 | E2 | 0.710 (14) | 0.000012 |
| $\gamma_{8,5}$(Pu) | 336.36 (15) | 0.00000072 (31) | [E1] | 0.0323 (6) | 0.0000007 (3) |
| $\gamma_{9,5}$(Pu) | 357.64 (7) | 0.000000055 (11) | M1+E2 | 0.214 (15) | 0.000000045 (9) |
| $\gamma_{7,3}$(Pu) | 459.8 (2) | 0.00000006 (3) | | | 0.00000006 (3) |
| $\gamma_{6,2}$(Pu) | 515.25 (19) | 0.0000046 (12) | E1+M2 | 0.022 (3) | 0.0000045 (12) |
| $\gamma_{5,1}$(Pu) | 561.02 (10) | 0.000152 (40) | E1 | 0.01153 (23) | 0.00015 (4) |
| $\gamma_{5,0}$(Pu) | 605.04 (10) | 0.000106 (30) | E1 | 0.00999 (20) | 0.000105 (30) |
| $\gamma_{6,1}$(Pu) | 617.20 (12) | 0.0000080 (21) | E1+M2 | 0.0120 (12) | 0.0000079 (21) |
| $\gamma_{7,2}$(Pu) | 617.22 (13) | 0.00000016 | | | 0.00000016 |
| $\gamma_{10,2}$(Pu) | 837.01 (15) | 0.00000019 (6) | [E2] | 0.0174 (3) | 0.00000019 (6) |
| $\gamma_{12,2}$(Pu) | 882.63 (3) | 0.000000068 (15) | (E2) | 0.0157 (3) | 0.000000067 (15) |
| $\gamma_{8,1}$(Pu) | 897.33 (10) | 0.000022 (6) | (E2) | 0.0152 (3) | 0.000022 (6) |
| $\gamma_{9,1}$(Pu) | 918.7 (2) | 0.00000054 (15) | E1 | 0.00469 (9) | 0.00000054 (15) |
| $\gamma_{10,1}$(Pu) | 938.91 (10) | 0.00000097 (33) | E0+E2 | 4.4 (4) | 0.00000018 (6) |
| $\gamma_{9,0}$(Pu) | 962.8 (2) | 0.00000053 (15) | E1 | 0.00432 (8) | 0.00000053 (15) |
| $\gamma_{11,1}$(Pu) | 974.5 (3) | 0.0000002 | | | 0.0000002 |
| $\gamma_{13,2}$(Pu) | 979.8 (2) | 0.00000026 (8) | | | 0.00000026 (8) |
| $\gamma_{10,0}$(Pu) | 983.0 (3) | 0.00000051 (18) | [E2] | 0.01276 (25) | 0.00000050 (18) |
| $\gamma_{12,1}$(Pu) | 984.5 (1) | 0.0000020 (6) | M1+E2 | 0.01279 (26) | 0.0000020 (6) |
| $\gamma_{12,0}$(Pu) | 1028.5 (2) | 0.0000016 (5) | E2 | 0.01171 (23) | 0.0000016 (5) |
| $\gamma_{13,1}$(Pu) | 1081.7 (3) | 0.00000005 (2) | | | 0.00000005 (2) |
| $\gamma_{15,2}$(Pu) | 1118.3 (3) | 0.00000017 (9) | [E2] | 0.01001 (20) | 0.00000017 (9) |
| $\gamma_{14,1}$(Pu) | 1184.6 (3) | 0.00000050 (15) | E2 | 0.00899 (18) | 0.00000050 (15) |
| $\gamma_{15,1}$(Pu) | 1220.2 (3) | 0.00000035 (11) | E0+E2+(M1) | 0.26 (3) | 0.00000028 (9) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 28.9 | (4) | y |
| $Q_{\alpha}$ | : | 6168.8 | (10) | keV |
| $Q_{EC}$ | : | 7.5 | (17) | keV |
| $\alpha$ | : | 99.71 | (3) | % |
| $EC$ | : | 0.29 | (3) | % |
| $SF$ | : | 5.3 | (9) | $\times 10^{-9}$ % |

# 2 Electron Capture Transitions

| | Energy keV | Probability $\times$ 100 | Nature | log $ft$ | $P_K$ | $P_L$ | $P_{M+}$ |
|---|---|---|---|---|---|---|---|
| $\epsilon_{0,0}$ | 7.5 (17) | 0.29 (3) | 1st forbidden | 7.2 | 0 (0) | 0 (0) | 1.000 (0) |

# 3 $\alpha$ Emissions

| | Energy keV | Probability $\times$ 100 |
|---|---|---|
| $\alpha_{0,27}$ | 5231 (15) | 0.00039 |
| $\alpha_{0,26}$ | 5268 (3) | 0.0015 |
| $\alpha_{0,25}$ | 5317 (3) | 0.001 |
| $\alpha_{0,24}$ | 5324 (3) | 0.003 |
| $\alpha_{0,23}$ | 5333 (3) | 0.003 |
| $\alpha_{0,22}$ | 5520.1 (11) | 0.002 |
| $\alpha_{0,21}$ | 5533 (3) | 0.006 |
| $\alpha_{0,20}$ | 5538 (3) | 0.002 |
| $\alpha_{0,19}$ | 5569.9 (10) | 0.007 |
| $\alpha_{0,18}$ | 5576 (3) | 0.007 |
| $\alpha_{0,17}$ | 5583.2 (10) | 0.009 |
| $\alpha_{0,16}$ | 5588 (3) | 0.02 |
| $\alpha_{0,15}$ | 5594 (3) | 0.01 |
| $\alpha_{0,14}$ | 5605.1 (11) | $\leq$0.01 |
| $\alpha_{0,13}$ | 5613 (3) | 0.03 |
| $\alpha_{0,12}$ | 5624 (5) | 0.06 |
| $\alpha_{0,11}$ | 5640 (3) | 0.14 |
| $\alpha_{0,10}$ | 5647 (3) | 0.03 |
| $\alpha_{0,9}$ | 5682 (1) | 0.2 |
| $\alpha_{0,8}$ | 5686.1 (10) | 1.6 (1) |
| $\alpha_{0,7}$ | 5742.5 (10) | 11.3 (2) |
| $\alpha_{0,6}$ | 5786.4 (10) | 73.4 (4) |
| $\alpha_{0,5}$ | 5877.6 (14) | 0.7 |
| $\alpha_{0,4}$ | 5906.1 (10) | 0.1 |
| $\alpha_{0,3}$ | 5992.7 (10) | 5.7 (2) |
| $\alpha_{0,2}$ | 6010.8 (10) | 1.05 (12) |
| $\alpha_{0,1}$ | 6059.4 (10) | 4.4 (2) |
| $\alpha_{0,0}$ | 6067.2 (10) | 1.3 (2) |

## 4 Electron Emissions

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $e_{AL}$ | (Pu) | 6.19 - 22.99 | 49.3 (15) |
| $e_{AK}$ | (Pu) | | 1.34 (19) |
| | KLL | 75.263 - 85.357 } | |
| | KLX | 92.607 - 103.729 } | |
| | KXY | 109.93 - 121.78 } | |
| $ec_{1,0\ M}$ | (Pu) | 1.93 - 4.09 | 63.0 (45) |
| $ec_{1,0\ N}$ | (Pu) | 6.30 - 7.44 | 17.4 (12) |
| $ec_{3,2\ M}$ | (Pu) | 12.50 - 14.66 | 0.6 (6) |
| $ec_{3,2\ N}$ | (Pu) | 16.87 - 18.01 | 0.16 (16) |
| $ec_{7,6\ L}$ | (Pu) | 21.559 - 26.606 | 9.4 (16) |
| $ec_{2,1\ L}$ | (Pu) | 26.308 - 31.355 | 18.4 (12) |
| $ec_{2,0\ L}$ | (Pu) | 34.169 - 39.216 | 9.67 (14) |
| $ec_{8,7\ L}$ | (Pu) | 34.2 - 39.2 | 1.720 (24) |
| $ec_{7,6\ M}$ | (Pu) | 38.730 - 40.888 | 2.36 (49) |
| $ec_{7,6\ N}$ | (Pu) | 43.104 - 44.239 | 0.66 (12) |
| $ec_{2,1\ M}$ | (Pu) | 43.479 - 45.637 | 4.96 (34) |
| $ec_{7,4\ K}$ | (Pu) | 44.60 (6) | 0.079 (34) |
| $ec_{3,1\ L}$ | (Pu) | 44.737 - 49.784 | 14.3 (36) |
| $ec_{2,1\ N}$ | (Pu) | 47.853 - 48.988 | 1.36 (10) |
| $ec_{2,0\ M}$ | (Pu) | 51.340 - 53.498 | 2.700 (42) |
| $ec_{8,7\ M}$ | (Pu) | 51.4 - 53.5 | 0.419 (6) |
| $ec_{8,7\ N}$ | (Pu) | 55.7 - 56.9 | 0.1142 (16) |
| $ec_{2,0\ N}$ | (Pu) | 55.714 - 56.849 | 0.742 (11) |
| $ec_{3,1\ M}$ | (Pu) | 61.908 - 64.066 | 4 (1) |
| $ec_{4,3\ L}$ | (Pu) | 64.96 - 70.00 | 0.01633 (23) |
| $ec_{3,1\ N}$ | (Pu) | 66.282 - 67.417 | 1.10 (28) |
| $ec_{8,6\ L}$ | (Pu) | 78.86 - 83.90 | 0.0837 (12) |
| $ec_{9,6\ L}$ | (Pu) | 83.021 - 88.068 | 0.056 (10) |
| $ec_{4,2\ L}$ | (Pu) | 83.37 - 88.41 | 0.1284 (18) |
| $ec_{6,3\ K}$ | (Pu) | 87.962 (2) | 8.42 (29) |
| $ec_{5,3\ L}$ | (Pu) | 94 - 99 | 0.442 (19) |
| $ec_{8,6\ M}$ | (Pu) | 96.03 - 98.18 | 0.02344 (40) |
| $ec_{9,6\ M}$ | (Pu) | 100.192 - 102.350 | 0.0148 (27) |
| $ec_{4,2\ M}$ | (Pu) | 100.54 - 102.70 | 0.0360 (6) |
| $ec_{6,2\ K}$ | (Pu) | 106.392 (2) | 21.4 (7) |
| $ec_{5,3\ M}$ | (Pu) | 111.2 - 113.3 | 0.123 (6) |
| $ec_{5,3\ N}$ | (Pu) | 115.5 - 116.7 | 0.0340 (14) |
| $ec_{7,3\ K}$ | (Pu) | 132.61 (3) | 0.160 (15) |
| $ec_{7,4\ L}$ | (Pu) | 143.29 - 148.33 | 0.016 (7) |
| $ec_{7,2\ K}$ | (Pu) | 151.08 (9) | 0.096 (12) |
| $ec_{6,1\ K}$ | (Pu) | 155.808 (2) | 16.0 (5) |
| $ec_{6,0\ K}$ | (Pu) | 163.669 (2) | 0.0615 (19) |
| $ec_{6,3\ L}$ | (Pu) | 186.649 - 191.696 | 1.68 (6) |
| $ec_{8,3\ K}$ | (Pu) | 189.9 (2) | 0.0143 (18) |
| $ec_{6,3\ M}$ | (Pu) | 203.820 - 205.978 | 0.408 (14) |

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $ec_{6,2\ L}$ | (Pu) | 205.079 - 210.126 | 4.27 (14) |
| $ec_{6,3\ N}$ | (Pu) | 208.194 - 209.329 | 0.1112 (38) |
| $ec_{6,2\ M}$ | (Pu) | 222.250 - 224.408 | 1.038 (33) |
| $ec_{6,2\ N}$ | (Pu) | 226.624 - 227.759 | 0.282 (9) |
| $ec_{7,3\ L}$ | (Pu) | 231.3 - 236.3 | 0.0323 (30) |
| $ec_{7,2\ L}$ | (Pu) | 249.77 - 254.81 | 0.0193 (24) |
| $ec_{6,1\ L}$ | (Pu) | 254.495 - 259.542 | 3.22 (11) |
| $ec_{6,0\ L}$ | (Pu) | 262.36 - 267.40 | 0.0869 (27) |
| $ec_{6,1\ M}$ | (Pu) | 271.666 - 273.824 | 0.784 (25) |
| $ec_{6,1\ N}$ | (Pu) | 276.040 - 277.175 | 0.213 (7) |
| $ec_{6,0\ M}$ | (Pu) | 279.53 - 281.68 | 0.0238 (7) |

# 5 Photon Emissions

## 5.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Pu) | 12.1246 — 21.9844 | | 52.1 (16) | |
| $XK\alpha_2$ | (Pu) | 99.525 | | 13.34 (28) | } $K\alpha$ |
| $XK\alpha_1$ | (Pu) | 103.734 | | 21.1 (5) | } |
| $XK\beta_3$ | (Pu) | 116.244 | } | | |
| $XK\beta_1$ | (Pu) | 117.228 | } | 7.75 (21) | $K\beta_1'$ |
| $XK\beta_5''$ | (Pu) | 117.918 | } | | |
| $XK\beta_2$ | (Pu) | 120.54 | } | | |
| $XK\beta_4$ | (Pu) | 120.969 | } | 2.69 (8) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Pu) | 121.543 | } | | |

## 5.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pu) | 7.861 (2) | 85.5 | M1+E2 | 5700 (400) | 0.015 |
| $\gamma_{3,2}$(Pu) | 18.430 (4) | 0.8 | (M1+E2) | 8000 (6200) | 0.0001 |
| $\gamma_{7,6}$(Pu) | 44.663 (5) | 12.7 (23) | M1+E2 | 96 (13) | 0.131 (16) |
| $\gamma_{2,1}$(Pu) | 49.414 (2) | 25.4 | M1+E2 | 126 (8) | 0.2 |
| $\gamma_{2,0}$(Pu) | 57.273 (4) | 13.38 | E2 | 222 (4) | 0.06 |
| $\gamma_{8,7}$(Pu) | 57.30 (2) | 2.368 | [M1] | 28.6 (4) | 0.08 |
| $\gamma_{9,7}$(Pu) | 61.460 (2) | 0.0222 (19) | E1 | 0.473 (7) | 0.0151 (13) |
| $\gamma_{3,1}$(Pu) | 67.841 (7) | 20 (5) | E2 | 98.5 (14) | 0.20 (5) |
| $\gamma_{4,3}$(Pu) | 88.06 (3) | 0.024 | M1+E2 | 12.26 (18) | 0.0018 |
| $\gamma_{8,6}$(Pu) | 101.96 (2) | 0.123 | E2 | 14.42 (21) | 0.008 |
| $\gamma_{9,6}$(Pu) | 106.125 (2) | 0.373 (34) | E1(+M2) | 0.26 (4) | 0.296 (25) |

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{4,2}$(Pu) | 106.47 (4) | 0.192 | E2 | 11.80 (17) | 0.015 |
| $\gamma_{5,3}$(Pu) | 117.1 (10) | 0.7 (0) | [E2] | 7.6 (4) | 0.08 |
| $\gamma_{7,4}$(Pu) | 166.39 (6) | 0.12 (5) | M1 | 6.22 (9) | 0.016 (7) |
| $\gamma_{6,3}$(Pu) | 209.753 (2) | 13.95 (45) | M1+E2 | 3.24 (5) | 3.29 (10) |
| $\gamma_{6,2}$(Pu) | 228.183 (2) | 37.7 (11) | M1+E2 | 2.56 (4) | 10.6 (3) |
| $\gamma_{7,3}$(Pu) | 254.40 (3) | 0.314 (29) | M1+E2 | 1.85 (3) | 0.11 (1) |
| $\gamma_{7,2}$(Pu) | 272.87 (9) | 0.201 (25) | M1+E2 | 1.518 (22) | 0.08 (1) |
| $\gamma_{6,1}$(Pu) | 277.599 (2) | 34.3 (10) | M1+E2 | 1.448 (21) | 14.0 (4) |
| $\gamma_{6,0}$(Pu) | 285.460 (2) | 0.910 (25) | E2 | 0.247 (4) | 0.73 (2) |
| $\gamma_{8,3}$(Pu) | 311.7 (2) | 0.0350 (42) | M1+E2 | 1.06 (3) | 0.017 (2) |
| $\gamma_{9,3}$(Pu) | 315.880 (3) | 0.0187 (21) | E1(+M2) | 0.0372 (9) | 0.018 (2) |
| $\gamma_{7,1}$(Pu) | 322.3 (2) | 0.0082 (12) | [E2] | 0.1699 (24) | 0.007 (1) |
| $\gamma_{9,2}$(Pu) | 334.310 (3) | 0.0248 (21) | E1(+M2) | 0.0329 (6) | 0.024 (2) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 18.11 | (3) | y |
| $Q_\alpha$ | : | 5901.74 | (5) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | 1.36 | (8) | $\times 10^{-4}$ % |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,9}$ | 4882.12 (8) | 0.0000047 (11) |
| $\alpha_{0,8}$ | 4919.24 (7) | 0.000050 (5) |
| $\alpha_{0,7}$ | 4958.20 (9) | 0.000149 (16) |
| $\alpha_{0,6}$ | 5166.58 (7) | 0.0000042 (30) |
| $\alpha_{0,5}$ | 5217.24 (7) | 0.000055 (9) |
| $\alpha_{0,4}$ | 5315.3 | 0.00004 |
| $\alpha_{0,3}$ | 5515.29 (6) | 0.00352 (18) |
| $\alpha_{0,2}$ | 5665.41 (5) | 0.0204 (15) |
| $\alpha_{0,1}$ | 5762.65 (5) | 23.3 (4) |
| $\alpha_{0,0}$ | 5804.77 (5) | 76.7 (4) |

# 3 Electron Emissions

| | | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|---|
| $e_{AL}$ | (Pu) | | 6.19 - 22.99 | | 8.09 (20) |
| $e_{AK}$ | (Pu) | | | | 0.0000061 (9) |
| | | KLL | 75.263 - 85.357 | } | |
| | | KLX | 92.607 - 103.729 | } | |
| | | KXY | 109.93 - 121.78 | } | |
| $ec_{1,0\ L}$ | (Pu) | | 19.720 - 24.767 | | 16.9 (6) |
| $ec_{1,0\ M}$ | (Pu) | | 36.891 - 39.049 | | 4.72 (16) |
| $ec_{2,1\ L}$ | (Pu) | | 75.76 - 80.80 | | 0.0164 (11) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. | |
|---|---|---|---|---|
| XL | (Pu) | 12.125 — 21.984 | 8.92 (23) | |
| $XK\alpha_2$ | (Pu) | 99.525 | 0.000061 (4) | } $K\alpha$ |
| $XK\alpha_1$ | (Pu) | 103.734 | 0.000097 (5) | } |

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| $XK\beta_3$ | (Pu) | 116.244 | } | | |
| $XK\beta_1$ | (Pu) | 117.228 | } | 0.0000354 (20) | $K\beta_1'$ |
| $XK\beta_5''$ | (Pu) | 117.918 | } | | |
| $XK\beta_2$ | (Pu) | 120.54 | } | | |
| $XK\beta_4$ | (Pu) | 120.969 | } | 0.0000123 (7) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Pu) | 121.543 | } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pu) | 42.824 (8) | 23.4 (8) | E2 | 905 (18) | 0.0258 (7) |
| $\gamma_{2,1}$(Pu) | 98.860 (13) | 0.0239 (16) | E2 | 16.6 (3) | 0.00136 (9) |
| $\gamma_{3,2}$(Pu) | 152.63 (2) | 0.00355 (18) | (E2) | 2.48 (5) | 0.00102 (5) |
| $\gamma_{4,3}$(Pu) | 202.4 | 0.00004 | (E2) | 0.817 (16) | 0.000022 |
| $\gamma_{8,6}$(Pu) | 251.47 (6) | 0.0000121 (24) | (E1) | 0.0606 (12) | 0.0000114 (23) |
| $\gamma_{7,5}$(Pu) | 263.37 (8) | 0.000065 (9) | (E1) | 0.0547 (11) | 0.000062 (9) |
| $\gamma_{9,6}$(Pu) | 289.21 (7) | 0.0000048 (48) | E2+M3 | 7 (7) | 0.0000006 (3) |
| $\gamma_{8,5}$(Pu) | 302.98 (6) | 0.0000198 (31) | (E1) | 0.0405 (8) | 0.000019 (3) |
| $\gamma_{9,5}$(Pu) | 340.72 (7) | 0.0000018 (9) | | | 0.0000018 (9) |
| $\gamma_{6,2}$(Pu) | 507.16 (5) | 0.0000088 (28) | (E1) | 0.01401 (29) | 0.0000087 (28) |
| $\gamma_{5,1}$(Pu) | 554.52 (4) | 0.000088 (11) | (E1) | 0.01179 (24) | 0.000087 (11) |
| $\gamma_{5,0}$(Pu) | 597.34 (4) | 0.000054 (7) | (E1) | 0.01024 (21) | 0.000053 (7) |
| $\gamma_{6,1}$(Pu) | 606.03 (4) | 0.0000081 (14) | | | 0.0000081 (14) |
| $\gamma_{8,2}$(Pu) | 758.63 (5) | 0.0000141 (19) | (E2) | 0.0212 (4) | 0.0000138 (19) |
| $\gamma_{7,1}$(Pu) | 817.89 (7) | 0.000069 (9) | (E2) | 0.0182 (4) | 0.000068 (9) |
| $\gamma_{8,1}$(Pu) | 857.50 (4) | 0.0000057 (8) | | | 0.0000057 (8) |
| $\gamma_{7,0}$(Pu) | 860.71 (7) | 0.0000082 (20) | (E0) | | |
| $\gamma_{9,1}$(Pu) | 895.24 (6) | 0.0000019 (7) | E1+M2 | 0.07 (7) | 0.0000018 (6) |
| $\gamma_{8,0}$(Pu) | 900.32 (4) | 0.0000013 (6) | | | 0.0000013 (6) |
| $\gamma_{9,0}$(Pu) | 938.06 (6) | 0.0000004 (4) | | | 0.0000004 (4) |

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## 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 8250 | (70) | y |
| $Q_\alpha$ | : | 5622.3 | (5) | keV |
| $\alpha$ | : | 100 | | % |
| $SF$ | : | 5.9 | (9) | $\times 10^{-7}$ % |

## 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,8}$ | 5152 (3) | ≤0.005 |
| $\alpha_{0,7}$ | 5234.4 (12) | 0.32 |
| $\alpha_{0,6}$ | 5303.6 (12) | 5.0 (1) |
| $\alpha_{0,5}$ | 5361.8 (12) | 93.2 (5) |
| $\alpha_{0,4}$ | 5371.4 (5) | 0.0210 (9) |
| $\alpha_{0,3}$ | 5371.7 (5) | 0.39 (22) |
| $\alpha_{0,2}$ | 5436.1 (5) | 0.04 |
| $\alpha_{0,1}$ | 5488.5 (5) | 0.83 |
| $\alpha_{0,0}$ | 5530.4 (4) | 0.58 |

## 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $e_{AL}$ | (Pu) | 6.19 - 22.99 | 50.1 (13) |
| $e_{AK}$ | (Pu) | | 1.91 (27) |
| | KLL | 75.263 - 85.357 | } |
| | KLX | 92.607 - 103.729 | } |
| | KXY | 109.93 - 121.78 | } |
| $ec_{5,1\ K}$ | (Pu) | 11.290 (2) | 24.7 (7) |
| $ec_{6,2\ K}$ | (Pu) | 14.365 (9) | 0.70 (14) |
| $ec_{7,3\ K}$ | (Pu) | 18.067 (16) | 0.032 (32) |
| $ec_{1,0\ L}$ | (Pu) | 18.868 - 23.915 | 28.1 (16) |
| $ec_{2,1\ L}$ | (Pu) | 30.703 - 35.750 | 2.43 (15) |
| $ec_{6,5\ L}$ | (Pu) | 33.79 - 38.83 | 2.30 (22) |
| $ec_{1,0\ M}$ | (Pu) | 36.039 - 38.197 | 7.16 (42) |
| $ec_{4,0\ K}$ | (Pu) | 39.894 (1) | 0.0135 (6) |
| $ec_{1,0\ N}$ | (Pu) | 40.413 - 41.548 | 1.96 (11) |
| $ec_{3,2\ L}$ | (Pu) | 42.431 - 47.478 | 0.32 (17) |
| $ec_{7,6\ L}$ | (Pu) | 46.133 - 51.180 | 0.15 (9) |
| $ec_{2,1\ M}$ | (Pu) | 47.874 - 50.032 | 0.615 (37) |
| $ec_{6,5\ M}$ | (Pu) | 50.96 - 53.12 | 0.62 (6) |
| $ec_{2,1\ N}$ | (Pu) | 52.248 - 53.383 | 0.168 (10) |
| $ec_{5,0\ K}$ | (Pu) | 53.2613 (14) | 40.0 (11) |
| $ec_{6,5\ N}$ | (Pu) | 55.33 - 56.47 | 0.169 (17) |
| $ec_{5,2\ L}$ | (Pu) | 56.169 - 61.216 | 1.9 (6) |

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $ec_{3,2\ M}$ | (Pu) | 59.602 - 61.760 | 0.081 (44) |
| $ec_{7,6\ M}$ | (Pu) | 63.304 - 65.462 | 0.035 (26) |
| $ec_{3,2\ N}$ | (Pu) | 63.976 - 65.111 | 0.022 (13) |
| $ec_{7,6\ N}$ | (Pu) | 67.678 - 68.813 | 0.010 (7) |
| $ec_{6,1\ K}$ | (Pu) | 68.17 (1) | 0.502 (34) |
| $ec_{2,0\ L}$ | (Pu) | 72.676 - 77.722 | 0.153 (32) |
| $ec_{5,2\ M}$ | (Pu) | 73.340 - 75.498 | 0.52 (15) |
| $ec_{5,2\ N}$ | (Pu) | 77.714 - 78.849 | 0.144 (49) |
| $ec_{7,2\ K}$ | (Pu) | 83.602 (16) | 0.013 (12) |
| $ec_{2,0\ M}$ | (Pu) | 89.846 - 92.004 | 0.043 (9) |
| $ec_{2,0\ N}$ | (Pu) | 94.220 - 95.355 | 0.0118 (25) |
| $ec_{7,5\ L}$ | (Pu) | 102.99 - 108.03 | 0.028 (8) |
| $ec_{5,1\ L}$ | (Pu) | 109.977 - 115.024 | 5.40 (16) |
| $ec_{6,2\ L}$ | (Pu) | 113.052 - 118.099 | 0.231 (19) |
| $ec_{7,3\ L}$ | (Pu) | 116.754 - 121.801 | 0.0160 (45) |
| $ec_{5,1\ M}$ | (Pu) | 127.148 - 129.306 | 1.329 (39) |
| $ec_{6,2\ M}$ | (Pu) | 130.223 - 132.381 | 0.059 (6) |
| $ec_{5,1\ N}$ | (Pu) | 131.522 - 132.657 | 0.362 (10) |
| $ec_{6,2\ N}$ | (Pu) | 134.597 - 135.732 | 0.0162 (17) |
| $ec_{4,0\ L}$ | (Pu) | 138.581 - 143.628 | 0.0915 (41) |
| $ec_{5,0\ L}$ | (Pu) | 151.948 - 156.995 | 8.40 (22) |
| $ec_{4,0\ M}$ | (Pu) | 155.752 - 157.910 | 0.0256 (11) |
| $ec_{6,1\ L}$ | (Pu) | 166.861 - 171.908 | 0.1357 (45) |
| $ec_{5,0\ M}$ | (Pu) | 169.119 - 171.277 | 2.05 (5) |
| $ec_{5,0\ N}$ | (Pu) | 173.493 - 174.628 | 0.560 (15) |
| $ec_{6,1\ M}$ | (Pu) | 184.032 - 186.190 | 0.0343 (11) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. | |
|---|---|---|---|---|
| XL | (Pu) | 12.1246 — 21.9844 | 51.7 (10) | |
| $XK\alpha_2$ | (Pu) | 99.525 | 19.0 (5) | } $K\alpha$ |
| $XK\alpha_1$ | (Pu) | 103.734 | 30.1 (7) | } |
| $XK\beta_3$ | (Pu) | 116.244 | } | |
| $XK\beta_1$ | (Pu) | 117.228 | } 11.06 (30) | $K\beta_1'$ |
| $XK\beta_5''$ | (Pu) | 117.918 | } | |
| $XK\beta_2$ | (Pu) | 120.54 | } | |
| $XK\beta_4$ | (Pu) | 120.969 | } 3.84 (12) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Pu) | 121.543 | } | |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pu) | 41.972 (1) | 38.2 (22) | M1+E2 | 102.4 (20) | 0.369 (20) |
| $\gamma_{2,1}$(Pu) | 53.807 (1) | 3.34 (20) | M1+E2 | 44.7 (11) | 0.073 (4) |
| $\gamma_{6,5}$(Pu) | 56.89 (3) | 3.16 (17) | M1+E2 | 87 (7) | 0.0359 (21) |
| $\gamma_{3,2}$(Pu) | 65.535 (3) | 0.45 (22) | M1+E2 | 24 (12) | 0.018 (2) |
| $\gamma_{7,6}$(Pu) | 69.237 (18) | 0.20 (4) | M1(+E2) | 28 (14) | 0.007 (3) |
| $\gamma_{5,2}$(Pu) | 79.2728 (18) | 2.8 (7) | M1+E2 | 22 (6) | 0.120 (7) |
| $\gamma_{2,0}$(Pu) | 95.7795 (12) | 0.221 (47) | E2 | 19.3 (3) | 0.0109 (23) |
| $\gamma_{7,5}$(Pu) | 126.09 (4) | 0.046 (13) | [E2] | 5.59 (8) | 0.007 (2) |
| $\gamma_{5,1}$(Pu) | 133.081 (2) | 34.7 (10) | M1+E2 | 11.36 (17) | 2.81 (7) |
| $\gamma_{6,2}$(Pu) | 136.156 (9) | 1.13 (12) | M1+E2 | 9 (1) | 0.113 (4) |
| $\gamma_{7,3}$(Pu) | 139.858 (16) | 0.064 (33) | [M1,E2] | 7 (4) | 0.008 (1) |
| $\gamma_{4,0}$(Pu) | 161.685 (1) | 0.210 (9) | E2 | 1.96 (3) | 0.071 (3) |
| $\gamma_{5,0}$(Pu) | 175.0523 (14) | 61.0 (16) | M1+E2 | 5.21 (8) | 9.83 (22) |
| $\gamma_{6,1}$(Pu) | 189.965 (10) | 0.889 (42) | M1+E2 | 3.36 (16) | 0.204 (6) |
| $\gamma_{7,2}$(Pu) | 205.393 (16) | 0.028 (13) | [M1,E2] | 2.1 (14) | 0.009 (1) |
| $\gamma_{6,0}$(Pu) | 231.935 (9) | 0.0175 (27) | [E2] | 0.498 (7) | 0.0117 (18) |
| $\gamma_{-1,1}$(Pu) | 388.16 (5) | 0.019 (1) | | | 0.019 (1) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 4723 | (27) | y |
| $Q_\alpha$ | : | 5476.7 | (9) | keV |
| $\alpha$ | : | 99.97385 | (7) | % |
| $SF$ | : | 0.02615 | (7) | % |
| $\bar{\nu}$ | : | 2.948 | | n/fission |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,2}$ | 5242.5 (10) | 0.020 (2) |
| $\alpha_{0,1}$ | 5343.7 (9) | 20.81 (22) |
| $\alpha_{0,0}$ | 5387.5 (9) | 79.17 (22) |

# 3 Electron Emissions

| | | Energy keV | Electrons per 100 disint. |
|---|---|---|---|
| $e_{AL}$ | (Pu) | 6.19 - 22.99 | 7.20 (21) |
| $ec_{1,0\ L}$ | (Pu) | 21.441 - 26.488 | 15.1 (6) |
| $ec_{1,0\ M}$ | (Pu) | 38.612 - 40.770 | 4.22 (17) |
| $ec_{1,0\ N}$ | (Pu) | 42.986 - 44.121 | 1.161 (47) |
| $ec_{2,1\ L}$ | (Pu) | 79.7 - 84.7 | 0.0135 (15) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | Photons per 100 disint. |
|---|---|---|---|
| XL | (Pu) | 12.125 — 21.984 | 7.95 (24) |

## 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Pu) | 44.545 (9) | 20.82 (22) | E2 | 746 (22) | 0.0279 (8) |
| $\gamma_{2,1}$(Pu) | 102.8 (1) | 0.020 (2) | E2 | 13.86 (42) | 0.00134 (14) |

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# 1 Half-life, Q-value and Decay mode

| | | | | |
|---|---|---|---|---|
| $T_{1/2}$ | : | 2.6470 | (26) | y |
| $Q_\alpha$ | : | 6216.87 | (4) | keV |
| $\alpha$ | : | 96.914 | (3) | % |
| $SF$ | : | 3.086 | (8) | % |
| $\bar{\nu}$ | : | 3.7675 | (40) | n/fission |

# 2 $\alpha$ Emissions

| | Energy keV | Probability × 100 |
|---|---|---|
| $\alpha_{0,3}$ | 5826.3 | 0.0019 |
| $\alpha_{0,2}$ | 5976.6 | 0.23 (4) |
| $\alpha_{0,1}$ | 6075.64 (11) | 15.1 (3) |
| $\alpha_{0,0}$ | 6118.1 (1) | 81.7 (3) |

# 3 Electron Emissions

| | | Energy keV | | Electrons per 100 disint. |
|---|---|---|---|---|
| $e_{AL}$ | (Cm) | 6.3 - 24.5 | | 5.02 (13) |
| $e_{AK}$ | (Cm) | | | 0.0000025 (4) |
| | KLL | 78.858 - 89.973 | } | |
| | KLX | 97.226 - 109.267 | } | |
| | KXY | 115.57 - 128.23 | } | |
| $ec_{1,0\ L}$ | (Cm) | 18.9 - 24.4 | | 10.93 (33) |
| $ec_{1,0\ M}$ | (Cm) | 37.1 - 39.4 | | 3.08 (9) |
| $ec_{1,0\ N}$ | (Cm) | 41.7 - 42.9 | | 0.856 (26) |
| $ec_{2,1\ L}$ | (Cm) | 75.7 - 81.2 | | 0.159 (27) |
| $ec_{2,1\ M}$ | (Cm) | 93.9 - 96.2 | | 0.045 (8) |
| $ec_{2,1\ N}$ | (Cm) | 98.5 - 99.7 | | 0.0125 (21) |

# 4 Photon Emissions

## 4.1 X-Ray Emissions

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| XL | (Cm) | 12.634 — 23.319 | | 6.07 (14) | |
| XK$\alpha_2$ | (Cm) | 104.59 | | 0.0000257 (7) | } K$\alpha$ |
| XK$\alpha_1$ | (Cm) | 109.271 | | 0.0000402 (11) | } |
| XK$\beta_3$ | (Cm) | 122.304 | } | | |
| XK$\beta_1$ | (Cm) | 123.403 | } | 0.0000151 (5) | K$\beta_1'$ |
| XK$\beta_5''$ | (Cm) | 124.124 | } | | |

| | | Energy keV | | Photons per 100 disint. | |
|---|---|---|---|---|---|
| $XK\beta_2$ | (Cm) | 126.889 | } | | |
| $XK\beta_4$ | (Cm) | 127.352 | } | 0.00000530 (19) | $K\beta_2'$ |
| $XKO_{2,3}$ | (Cm) | 127.97 | } | | |

### 4.2 Gamma Transitions and Emissions

| | Energy keV | $P_{\gamma+ce}$ × 100 | Multipolarity | $\alpha_T$ | $P_\gamma$ × 100 |
|---|---|---|---|---|---|
| $\gamma_{1,0}$(Cm) | 43.399 (25) | 15.2 (3) | E2 | 1000 (15) | 0.0152 (4) |
| $\gamma_{2,1}$(Cm) | 100.2 (4) | 0.232 (39) | E2 | 18.5 (5) | 0.0119 (20) |
| $\gamma_{3,2}$(Cm) | 154.5 (6) | 0.00192 | E2 | 2.76 (6) | 0.00051 |

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