|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A-3. Gamma-ray energies and emission probabilities for actinides and natural decay products | | | | | |
| **Nuclide** | **Half-life 1 y = 1 year = 365.24219878 days** | **Energy   [keV]** | **Emission probability   [% decay]** | [**Source**](https://www-nds.iaea.org/sgnucdat/a3.htm#ref) | [**Notes**](https://www-nds.iaea.org/sgnucdat/a3.htm#notes) |
| |  | | --- | | **81-Tl-208** | | |  | | --- | | 3.060 ± 0.008 m | | |  | | --- | | 277.37 ± 0.03 | | 583.187 ± 0.002 | | 860.56 ± 0.03 | | 2614.511 ± 0.010 | | |  | | --- | | 6.6 ± 0.3 | | 85.0 ± 0.3 | | 12.5 ± 0.1 | | 99.79 ± 0.01 | | |  | | --- | | BIPM-5 | |  | |  | |  | | |  | | --- | | [1] | |  | |  | |  | |
| |  | | --- | | **82-Pb-210** | | |  | | --- | | 22.20 ± 0.22 y | | |  | | --- | | 46.539 ± 0.001 | | |  | | --- | | 4.25 ± 0.04 | | |  | | --- | | ENSDF | | |  | | --- | |  | |
| |  | | --- | | **82-Pb-211** | | |  | | --- | | 36.1 ± 0.2 m | | |  | | --- | | 404.853 ± 0.010 | | 427.088 ± 0.010 | | 704.64 ± 0.03 | | 766.51 ± 0.03 | | 832.01 ± 0.03 | | |  | | --- | | 3.78 ± 0.06 | | 1.76 ± 0.04 | | 0.46 ± 0.01 | | 0.62 ± 0.02 | | 3.52 ± 0.06 | | |  | | --- | | ENSDF | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |
| |  | | --- | | **82-Pb-212** | | |  | | --- | | 10.64 ± 0.01 h | | |  | | --- | | 115.183 ± 0.005 | | 238.632 ± 0.002 | | 300.09 ± 0.01 | | |  | | --- | | 0.623 ± 0.022 | | 43.6 ± 0.3 | | 3.18 ± 0.13 | | |  | | --- | | BIPM-5 | |  | |  | | |  | | --- | |  | |  | |  | |
| |  | | --- | | **82-Pb-214** | | |  | | --- | | 26.8 ± 0.9 m | | |  | | --- | | 53.2275 ± 0.0021 | | 241.997 ± 0.003 | | 295.224 ± 0.002 | | 351.932 ± 0.002 | | |  | | --- | | 1.066 ± 0.014 | | 7.19 ± 0.06 | | 18.28 ± 0.14 | | 35.34 ± 0.27 | | |  | | --- | | IAEA-CRP-XG | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |
| |  | | --- | | **83-Bi-211** | | |  | | --- | | 2.14 ± 0.02 m | | |  | | --- | | 351.06 ± 0.04 | | |  | | --- | | 12.91 ± 0.11 | | |  | | --- | | ENSDF | | |  | | --- | |  | |
| |  | | --- | | **83-Bi-212** | | |  | | --- | | 60.54 ± 0.06 m | | |  | | --- | | 727.33 ± 0.01 | | 785.37 ± 0.09 | | 1078.63 ± 0.11 | | 1620.74 ± 0.01 | | |  | | --- | | 6.74 ± 0.12 | | 1.11 ± 0.01 | | 0.55 ± 0.02 | | 1.51 ± 0.03 | | |  | | --- | | BIPM-5 | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |
| |  | | --- | | **83-Bi-214** | | |  | | --- | | 19.9 ± 0.4 m | | |  | | --- | | 609.316 ± 0.003 | | 665.453 ± 0.022 | | 768.367 ± 0.011 | | 806.185 ± 0.011 | | 934.061 ± 0.012 | | 1120.287 ± 0.010 | | 1155.19 ± 0.02 | | 1238.110 ± 0.012 | | 1280.96 ± 0.02 | | 1377.669 ± 0.012 | | 1401.516 ± 0.014 | | 1407.993 ± 0.007 | | 1509.217 ± 0.008 | | 1661.316 ± 0.013 | | 1729.640 ± 0.012 | | 1764.539 ± 0.015 | | 1847.420 ± 0.025 | | 2118.536 ± 0.008 | | 2204.071 ± 0.021 | | 2447.673 ± 0.010 | | |  | | --- | | 45.16 ± 0.33 | | 1.521 ± 0.011 | | 4.850 ± 0.038 | | 1.255 ± 0.011 | | 3.074 ± 0.025 | | 14.78 ± 0.11 | | 1.624 ± 0.014 | | 5.785 ± 0.045 | | 1.425 ± 0.012 | | 3.954 ± 0.033 | | 1.324 ± 0.011 | | 2.369 ± 0.019 | | 2.108 ± 0.021 | | 1.037 ± 0.010 | | 2.817 ± 0.023 | | 15.17 ± 0.12 | | 2.000 ± 0.018 | | 1.148 ± 0.011 | | 4.89 ± 0.10 | | 1.536 ± 0.015 | | |  | | --- | | IAEA-CRP-XG | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **86-Rn-219** | | |  | | --- | | 3.96 ± 0.01 s | | |  | | --- | | 271.23 ± 0.01 | | 401.81 ± 0.01 | | |  | | --- | | 10.8 ± 0.6 | | 6.6 ± 0.4 | | |  | | --- | | ENSDF | |  | | |  | | --- | |  | |  | |
| |  | | --- | | **86-Rn-220** | | |  | | --- | | 55.8 ± 0.3 s | | |  | | --- | | 549.76 ± 0.04 | | |  | | --- | | 0.115 ± 0.015 | | |  | | --- | | BIPM-5 | | |  | | --- | |  | |
| |  | | --- | | **88-Ra-223** | | |  | | --- | | 11.43 ± 0.05 d | | |  | | --- | | 122.319 ± 0.010 | | 144.235 ± 0.010 | | 154.208 ± 0.010 | | 269.463 ± 0.010 | | 323.871 ± 0.010 | | 338.282 ± 0.010 | | 445.033 ± 0.012 | | |  | | --- | | 1.21 ± 0.02 | | 3.27 ± 0.08 | | 5.70 ± 0.16 | | 13.9 ± 0.3 | | 3.99 ± 0.09 | | 2.84 ± 0.07 | | 1.29 ± 0.05 | | |  | | --- | | ENSDF | |  | |  | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **88-Ra-224** | | |  | | --- | | 3.627 ± 0.007 d | | |  | | --- | | 240.986 ± 0.006 | | |  | | --- | | 4.12 ± 0.04 | | |  | | --- | | BIPM-5 | | |  | | --- | |  | |
| |  | | --- | | **88-Ra-226** | | |  | | --- | | ( 1.600 ± 0.007 ) x 103 y | | |  | | --- | | 186.211 ± 0.013 | | |  | | --- | | 3.533 ± 0.028 | | |  | | --- | | IAEA-CRP-XG | | |  | | --- | |  | |
| |  | | --- | | **90-Th-227** | | |  | | --- | | 18.718 ± 0.005 d | | |  | | --- | | 50.13 ± 0.01 | | 79.69 ± 0.02 | | 93.88 ± 0.05 | | 210.62 ± 0.05 | | 235.96 ± 0.02 | | 256.23 ± 0.02 | | 286.09 ± 0.02 | | 289.59 ± 0.10 | | 299.98 ± 0.03 | | 304.50 ± 0.02 | | 329.85 ± 0.02 | | 334.37 ± 0.02 | | |  | | --- | | 8.2 ± 0.5\* | | 1.90 ± 0.11 | | 1.48 ± 0.08 | | 1.22 ± 0.11 | | 12.6 ± 0.6 | | 6.8 ± 0.4 | | 1.70 ± 0.17\* | | 1.9 ± 0.4\* | | 2.16 ± 0.12\* | | 1.12 ± 0.14 | | 2.9 ± 0.2 | | 1.11 ± 0.09 | | |  | | --- | | LNHB | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | |  | | --- | | [2] | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **90-Th-228** | | |  | | --- | | 698.60 ± 0.23 d | | |  | | --- | | 84.373 ± 0.003 | | 131.612 ± 0.004 | | 166.410 ± 0.004 | | 215.985 ± 0.004 | | |  | | --- | | 1.17 ± 0.05 | | 0.124 ± 0.006 | | 0.094 ± 0.007 | | 0.226 ± 0.020 | | |  | | --- | | BIPM-5 | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |
| |  | | --- | | **90-Th-229** | | |  | | --- | | ( 7.34 ± 0.16 ) x 103 y | | |  | | --- | | 107.108 ± 0.008 | | 136.99 ± 0.04 | | 148.15 ± 0.04 | | 156.409 ± 0.009 | | 193.509 ± 0.004 | | 210.853 ± 0.003 | | |  | | --- | | 0.81 ± 0.05 | | 1.18 ± 0.04 | | 0.88 ± 0.07 | | 1.19 ± 0.04 | | 4.41 ± 0.07 | | 2.8 ± 0.4 | | |  | | --- | | ENSDF | |  | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **90-Th-230** | | |  | | --- | | ( 7.538 ± 0.030 ) x 104 y | | |  | | --- | | 67.672 ± 0.002 | | 143.872 ± 0.004 | | 253.729 ± 0.010 | | |  | | --- | | 0.38 ± 0.04 | | 0.049 ± 0.004 | | 0.0111 ± 0.0009 | | |  | | --- | | ENSDF | |  | |  | | |  | | --- | |  | |  | |  | |
| |  | | --- | | **90-Th-231** | | |  | | --- | | 25.52 ± 0.01 h | | |  | | --- | | 58.5700 ± 0.0024 | | 81.2280 ± 0.0014 | | 82.0870 ± 0.0014 | | 84.2140 ± 0.0013 | | 89.95 ± 0.02 | | 102.2700 ± 0.0013 | | |  | | --- | | 0.46 ± 0.03 | | 0.90 ± 0.06 | | 0.42 ± 0.03 | | 6.6 ± 0.4 | | 1.00 ± 0.06 | | 0.44 ± 0.03 | | |  | | --- | | ENSDF | |  | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **90-Th-232** | | |  | | --- | | ( 1.405 ± 0.006 ) x 1010 y | | |  | | --- | | 63.81 ± 0.01 | | 140.88 ± 0.01 | | |  | | --- | | 0.263 ± 0.013 | | 0.021 ± 0.004 | | |  | | --- | | ENSDF | |  | | |  | | --- | |  | |  | |
| |  | | --- | | **90-Th-233** | | |  | | --- | | 22.15 ± 0.15 m | | |  | | --- | | 29.373 ± 0.010 | | 86.477 ± 0.010 | | 94.65 ± 0.05 | | 169.159 ± 0.010 | | 459.222 ± 0.007 | | 669.902 ± 0.016 | | |  | | --- | | 2.5 ± 0.4 | | 2.7 ± 0.4 | | 0.8 ± 0.1 | | 0.34 ± 0.05 | | 1.4 ± 0.3 | | 0.68 ± 0.14 | | |  | | --- | | LNHB | |  | |  | |  | |  | |  | | |  | | --- | | [3] | |  | |  | |  | |  | |  | |
| |  | | --- | | **90-Th-234** | | |  | | --- | | 24.10 ± 0.03 d | | |  | | --- | | 63.29 ± 0.02 | | 92.38 ± 0.01 | | 92.80 ± 0.02 | | 112.81 ± 0.05 | | |  | | --- | | 3.70 ± 0.06 | | 2.62 ± 0.06 | | 2.59 ± 0.06 | | 0.244 ± 0.015 | | |  | | --- | | ADS-98 | |  | |  | |  | | |  | | --- | | [4] | |  | |  | |  | |
| |  | | --- | | **91-Pa-231** | | |  | | --- | | ( 3.276 ± 0.011 ) x 104 y | | |  | | --- | | 260.19 ± 0.06 | | 283.69 ± 0.01 | | 300.07 ± 0.01 | | 302.65 ± 0.05 | | 330.06 ± 0.01 | | 340.74 ± 0.05 | | 357.12 ± 0.09 | | |  | | --- | | 0.188 ± 0.012 | | 1.7 ± 0.1 | | 2.5 ± 0.2 | | 2.2 ± 0.4 | | 1.40 ± 0.09 | | 0.181 ± 0.011 | | 0.175 ± 0.013 | | |  | | --- | | ENSDF | |  | |  | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **91-Pa-233** | | |  | | --- | | 26.98 ± 0.02 d | | |  | | --- | | 75.269 ± 0.010 | | 86.595 ± 0.010 | | 103.86 ± 0.01 | | 271.555 ± 0.010 | | 300.129 ± 0.005 | | 311.904 ± 0.005 | | 340.476 ± 0.005 | | 375.404 ± 0.005 | | 398.492 ± 0.005 | | 415.764 ± 0.005 | | |  | | --- | | 1.30 ± 0.03 | | 1.99 ± 0.11 | | 0.853 ± 0.006 | | 0.323 ± 0.003 | | 6.60 ± 0.21 | | 38.25 ± 0.23 | | 4.47 ± 0.03 | | 0.684 ± 0.007 | | 1.408 ± 0.014 | | 1.747 ± 0.007 | | |  | | --- | | LNHB | |  | |  | |  | |  | |  | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **91-Pa-234m** | | |  | | --- | | 1.159 ± 0.016 m | | |  | | --- | | 258.24 ± 0.07 | | 742.814 ± 0.022 | | 766.358 ± 0.020 | | 786.272 ± 0.022 | | 1001.025 ± 0.022 | | |  | | --- | | 0.0726 ± 0.0009 | | 0.096 ± 0.003 | | 0.318 ± 0.005 | | 0.054 ± 0.001 | | 0.832 ± 0.010 | | |  | | --- | | IAEA-CRP-XG | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |
| |  | | --- | | **92-U-232** | | |  | | --- | | 68.9 ± 0.4 y | | |  | | --- | | 57.78 ± 0.05 | | 129.08 ± 0.05 | | 270.2 ± 0.2 | | 327.9 ± 0.2 | | |  | | --- | | 0.200 ± 0.002 | | 0.0682 ± 0.0004 | | 0.00316 ± 0.00005 | | 0.00283 ± 0.00006 | | |  | | --- | | ENSDF | |  | |  | |  | | |  | | --- | | [3] | |  | |  | |  | |
| |  | | --- | | **92-U-233** | | |  | | --- | | ( 1.592 ± 0.002 ) x 105 y | | |  | | --- | | 54.699 ± 0.001 | | 118.968 ± 0.002 | | 120.816 ± 0.001 | | 135.36 ± 0.03 | | 146.345 ± 0.002 | | 164.522 ± 0.002 | | 208.171 ± 0.002 | | 245.345 ± 0.002 | | 291.354 ± 0.004 | | 317.16 ± 0.01 | | 320.541 ± 0.005 | | |  | | --- | | 0.0182 ± 0.0003 | | 0.00406 ± 0.00004 | | 0.00332 ± 0.00003 | | 0.00232 ± 0.00002 | | 0.00657 ± 0.00006 | | 0.00623 ± 0.00005 | | 0.00229 ± 0.00003 | | 0.00362 ± 0.00003 | | 0.00537 ± 0.00005 | | 0.00776 ± 0.00007 | | 0.00290 ± 0.00003 | | |  | | --- | | ENSDF | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | |  | | --- | | [3] | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **92-U-234** | | |  | | --- | | ( 2.455 ± 0.006 ) x 105 y | | |  | | --- | | 53.20 ± 0.02 | | 120.90 ± 0.04 | | |  | | --- | | 0.1253 ± 0.0040 | | 0.0386 ± 0.0032 | | |  | | --- | | LNHB | |  | | |  | | --- | | [3] | |  | |
| |  | | --- | | **92-U-235** | | |  | | --- | | ( 7.038 ± 0.005 ) x 108 y | | |  | | --- | | 109.16 ± 0.02 | | 140.76 ± 0.04 | | 143.76 ± 0.02 | | 163.33 ± 0.02 | | 182.61 ± 0.05 | | 185.715 ± 0.005 | | 194.94 ± 0.01 | | 202.11 ± 0.02 | | 205.311 ± 0.010 | | 221.38 ± 0.02 | | |  | | --- | | 1.54 ± 0.06 | | 0.22 ± 0.03 | | 10.96 ± 0.14 | | 5.08 ± 0.07 | | 0.34 ± 0.03 | | 57.2 ± 0.8 | | 0.63 ± 0.02 | | 1.08 ± 0.03 | | 5.01 ± 0.06 | | 0.12 ± 0.02 | | |  | | --- | | ENSDF | |  | |  | |  | |  | |  | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **92-U-236** | | |  | | --- | | ( 2.342 ± 0.004 ) x 107 y | | |  | | --- | | 49.369 ± 0.009 | | 112.750 ± 0.015 | | |  | | --- | | 0.078 ± 0.012 | | 0.019 ± 0.003 | | |  | | --- | | ENSDF | |  | | |  | | --- | |  | |  | |
| |  | | --- | | **92-U-237** | | |  | | --- | | 6.749 ± 0.016 d | | |  | | --- | | 59.5409 ± 0.0001 | | 64.83 ± 0.02 | | 164.61 ± 0.02 | | 208.00 ± 0.01 | | 332.36 ± 0.04 | | |  | | --- | | 34.1 ± 0.8 | | 1.286 ± 0.017 | | 1.86 ± 0.03 | | 21.3 ± 0.3 | | 1.199 ± 0.016 | | |  | | --- | | LNHB | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |
| |  | | --- | | **92-U-238** | | |  | | --- | | ( 4.468 ± 0.005 ) x 109 y | | |  | | --- | | 49.55 ± 0.06 | | 113.5 ± 0.1 | | |  | | --- | | 0.0697 ± 0.0026 | | 0.0174 ± 0.0047 | | |  | | --- | | LNHB | |  | | |  | | --- | |  | |  | |
| |  | | --- | | **92-U-239** | | |  | | --- | | 23.45 ± 0.02 m | | |  | | --- | | 43.533 ± 0.001 | | 74.664 ± 0.001 | | 662.24 ± 0.03 | | 819.22 ± 0.04 | | 844.10 ± 0.04 | | |  | | --- | | 4.07 ± 0.13 | | 49.2 ± 1.2 | | 0.182 ± 0.005 | | 0.148 ± 0.004 | | 0.162 ± 0.004 | | |  | | --- | | ENSDF | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |
| |  | | --- | | **93-Np-236m** | | |  | | --- | | 22.5 ± 0.4 h | | |  | | --- | | 538.11 ± 0.10 | | 642.35 ± 0.09 | | 687.60 ± 0.05 | | |  | | --- | | 0.0125 ± 0.0015 | | 1.08 ± 0.06 | | 0.292 ± 0.021 | | |  | | --- | | LNHB | |  | |  | | |  | | --- | |  | |  | |  | |
| |  | | --- | | **93-Np-237** | | |  | | --- | | ( 2.144 ± 0.007 ) x 106 y | | |  | | --- | | 57.104 ± 0.020 | | 86.477 ± 0.010 | | 87.99 ± 0.03 | | 117.702 ± 0.020 | | 143.249 ± 0.020 | | 151.414 ± 0.020 | | 194.95 ± 0.03 | | 212.29 ± 0.05 | | |  | | --- | | 0.354 ± 0.008 | | 12.4 ± 0.3 | | 0.167 ± 0.004 | | 0.169 ± 0.004 | | 0.443 ± 0.008 | | 0.23 ± 0.02 | | 0.177 ± 0.005 | | 0.151 ± 0.003 | | |  | | --- | | ENSDF | |  | |  | |  | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **93-Np-238** | | |  | | --- | | 2.117 ± 0.002 d | | |  | | --- | | 101.90 ± 0.03 | | 882.63 ± 0.03 | | 918.69 ± 0.04 | | 923.98 ± 0.02 | | 936.61 ± 0.06 | | 941.38 ± 0.05 | | 962.77 ± 0.03 | | 984.45 ± 0.02 | | 1025.87 ± 0.02 | | 1028.54 ± 0.02 | | |  | | --- | | 0.251 ± 0.007 | | 0.811 ± 0.011 | | 0.532 ± 0.007 | | 2.62 ± 0.04 | | 0.368 ± 0.006 | | 0.514 ± 0.007 | | 0.645 ± 0.008 | | 25.19 ± 0.21 | | 8.72 ± 0.15 | | 18.3 ± 0.3 | | |  | | --- | | ENSDF | |  | |  | |  | |  | |  | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **93-Np-239** | | |  | | --- | | 2.356 ± 0.003 d | | |  | | --- | | 61.460 ± 0.002 | | 106.123 ± 0.002 | | 209.753 ± 0.002 | | 226.38 ± 0.02 | | 228.183 ± 0.001 | | 277.599 ± 0.001 | | 315.880 ± 0.003 | | 334.310 ± 0.002 | | |  | | --- | | 1.30 ± 0.02 | | 26.3 ± 1.0 | | 3.42 ± 0.03 | | 0.259 ± 0.016 | | 11.14 ± 0.11 | | 14.44 ± 0.10 | | 1.60 ± 0.02 | | 2.06 ± 0.02 | | |  | | --- | | ENSDF | |  | |  | |  | |  | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **94-Pu-236** | | |  | | --- | | 2.858 ± 0.008 y | | |  | | --- | | 47.57 ± 0.01 | | 109.00 ± 0.01 | | 165.0 ± 0.5 | | 645. ± 2. | | |  | | --- | | 0.066 ± 0.020 | | 0.012 ± 0.004 | | 0.00066 ± 0.00020 | | 0.00024 ± 0.00008 | | |  | | --- | | ENSDF | |  | |  | |  | | |  | | --- | | [6] | |  | |  | |  | |
| |  | | --- | | **94-Pu-238** | | |  | | --- | | 87.74 ± 0.03 y | | |  | | --- | | 43.498 ± 0.001 | | 99.852 ± 0.003 | | 152.719 ± 0.002 | | |  | | --- | | 0.0397 ± 0.0008 | | 0.00735 ± 0.00008 | | 0.000930 ± 0.000007 | | |  | | --- | | BIPM-5 | |  | |  | | |  | | --- | | [7] | |  | |  | |
| |  | | --- | | **94-Pu-239** | | |  | | --- | | ( 2.411 ± 0.003 ) x 104 y | | |  | | --- | | 51.624 ± 0.001 | | 56.828 ± 0.003 | | 129.296 ± 0.001 | | 144.201 ± 0.003 | | 146.094 ± 0.006 | | 161.450 ± 0.015 | | 171.393 ± 0.006 | | 195.679 ± 0.008 | | 203.550 ± 0.005 | | 332.845 ± 0.005 | | 345.013 ± 0.004 | | 375.054 ± 0.003 | | 380.191 ± 0.006 | | 382.75 ± 0.05 | | 392.53 ± 0.03 | | 413.713 ± 0.005 | | 422.598 ± 0.019 | | 451.481 ± 0.010 | | 645.94 ± 0.04 | | 652.05 ± 0.02 | | 658.86 ± 0.06 | | |  | | --- | | 0.02722 ± 0.00003 | | 0.001152 ± 0.000013 | | 0.00631 ± 0.00004 | | 0.000283 ± 0.000006 | | 0.000119 ± 0.000003 | | 0.000123 ± 0.000002 | | 0.000110 ± 0.000002 | | 0.000107 ± 0.000001 | | 0.000569 ± 0.000003 | | 0.000494 ± 0.000003 | | 0.000556 ± 0.000005 | | 0.001554 ± 0.000009 | | 0.000305 ± 0.000006 | | 0.000259 ± 0.000005 | | 0.000205 ± 0.000020 | | 0.001466 ± 0.000011 | | 0.000122 ± 0.000002 | | 0.0001894 ± 0.0000016 | | 0.0000152 ± 0.0000003 | | 0.0000066 ± 0.0000002 | | 0.0000097 ± 0.0000002 | | |  | | --- | | ENSDF | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | |  | | --- | | [7] | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **94-Pu-240** | | |  | | --- | | ( 6.561 ± 0.007 ) x 103 y | | |  | | --- | | 45.242 ± 0.003 | | 104.234 ± 0.006 | | 160.307 ± 0.003 | | |  | | --- | | 0.0450 ± 0.0009 | | 0.00714 ± 0.00007 | | 0.0004045 ± 0.0000022 | | |  | | --- | | BIPM-5 | |  | |  | | |  | | --- | | [7] | |  | |  | |
| |  | | --- | | **94-Pu-241** | | |  | | --- | | 14.290 ± 0.006 y | | |  | | --- | | 77.10 ± 0.10 | | 103.680 ± 0.005 | | 148.567 ± 0.010 | | |  | | --- | | 0.0000211 ± 0.0000008 | | 0.000102 ± 0.000002 | | 0.000185 ± 0.000003 | | |  | | --- | | ENSDF | |  | |  | | |  | | --- | | [7] | |  | |  | |
| |  | | --- | | **94-Pu-242** | | |  | | --- | | ( 3.73 ± 0.03 ) x 105 y | | |  | | --- | | 44.915 ± 0.013 | | 103.50 ± 0.04 | | 158.80 ± 0.08 | | |  | | --- | | 0.0376 ± 0.0008 | | 0.00251 ± 0.00011 | | 0.000298 ± 0.000020 | | |  | | --- | | BIPM-5 | |  | |  | | |  | | --- | | [7] | |  | |  | |
| |  | | --- | | **95-Am-241** | | |  | | --- | | 432.6 ± 0.6 y | | |  | | --- | | 26.3446 ± 0.0002 | | 33.1963 ± 0.0003 | | 59.5409 ± 0.0001 | | 98.95 ± 0.01 | | 102.97 ± 0.01 | | 123.02 ± 0.02 | | 125.29 ± 0.01 | | 146.57 ± 0.01 | | 169.55 ± 0.02 | | 208.00 ± 0.02 | | 322.53 ± 0.03 | | 335.40 ± 0.03 | | 368.63 ± 0.03 | | 662.41 ± 0.02 | | |  | | --- | | 2.40 ± 0.03 | | 0.121 ± 0.003 | | 35.78 ± 0.09 | | 0.0203 ± 0.0004 | | 0.0195 ± 0.0004 | | 0.00100 ± 0.00004 | | 0.0041 ± 0.0002 | | 0.00046 ± 0.00001 | | 0.00017 ± 0.00001 | | 0.000786 ± 0.000005 | | 0.000151 ± 0.000003 | | 0.000496 ± 0.000005 | | 0.000214 ± 0.000004 | | 0.000367 ± 0.000005 | | |  | | --- | | BIPM-5 | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | |  | | --- | | [8] | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **95-Am-242m** | | |  | | --- | | 141 ± 2 y | | |  | | --- | | 49.35 ± 0.02 | | 60.13 ± 0.06 | | 66.89 ± 0.02 | | 73.66 ± 0.02 | | 86.65 ± 0.02 | | 135.19 ± 0.02 | | 136.03 ± 0.02 | | |  | | --- | | 0.13 ± 0.01 | | 0.005 ± 0.001 | | 0.015 ± 0.001 | | 0.008 ± 0.001 | | 0.023 ± 0.001 | | 0.007 ± 0.001 | | 0.009 ± 0.001 | | |  | | --- | | ENSDF | |  | |  | |  | |  | |  | |  | | |  | | --- | | [9] | |  | |  | |  | |  | |  | |  | |
| |  | | --- | | **95-Am-243** | | |  | | --- | | ( 7.370 ± 0.017 ) x 103 y | | |  | | --- | | 43.53 ± 0.02 | | 74.66 ± 0.02 | | 86.71 ± 0.02 | | 141.90 ± 0.06 | | |  | | --- | | 5.89 ± 0.10 | | 67.2 ± 1.2 | | 0.346 ± 0.009 | | 0.115 ± 0.008 | | |  | | --- | | LNHB | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |
| |  | | --- | | **96-Cm-242** | | |  | | --- | | 162.86 ± 0.08 d | | |  | | --- | | 44.08 ± 0.03 | | 101.92 ± 0.04 | | 157.42 ± 0.09 | | |  | | --- | | 0.0330 ± 0.0007 | | 0.00251 ± 0.00014 | | 0.00145 ± 0.00016 | | |  | | --- | | LNHB | |  | |  | | |  | | --- | | [7] | |  | |  | |
| |  | | --- | | **96-Cm-243** | | |  | | --- | | 29.1 ± 0.1 y | | |  | | --- | | 209.753 ± 0.002 | | 228.183 ± 0.002 | | 277.599 ± 0.002 | | 285.460 ± 0.002 | | |  | | --- | | 3.29 ± 0.1 | | 10.6 ± 0.3 | | 14.0 ± 0.4 | | 0.73 ± 0.02 | | |  | | --- | | ENSDF | |  | |  | |  | | |  | | --- | |  | |  | |  | |  | |
| |  | | --- | | **96-Cm-244** | | |  | | --- | | 18.11 ± 0.03 y | | |  | | --- | | 42.824 ± 0.008 | | 98.860 ± 0.013 | | 152.63 ± 0.02 | | |  | | --- | | 0.0258 ± 0.0007 | | 0.00136 ± 0.00009 | | 0.00102 ± 0.00005 | | |  | | --- | | LNHB | |  | |  | | |  | | --- | | [7] | |  | |  | |
| |  | | --- | | **98-Cf-252** | | |  | | --- | | 2.645 ± 0.008 y | | |  | | --- | | 43.399 ± 0.025 | | 100.2 ± 0.4 | | |  | | --- | | 0.0148 ± 0.0009 | | 0.013 ± 0.006 | | |  | | --- | | ENSDF | |  | | |  | | --- | | [7] | |  | |

|  |  |
| --- | --- |
| References | |
| BIPM-5 | M.-M. Bé, V. Chisté, C. Dulieu, E. Browne, V. Chechev, N. Kuzmenko, R. Helmer, A. Nichols, E. Schönfeld, R. Dersch, Monographie BIPM-5, Table of Radionuclides, Vol. 2 - A = 151 to 242, 2004. |
| ENSDF | Evaluated Nuclear Structure Data File, http://www-nds.iaea.org/ensdf/, 15 November 2006. |
| IAEA-CRP-XG | M.-M. Bé, V. P. Chechev, R. Dersch, O. A. M. Helene, R. G. Helmer, M. Herman, S. Hlavác, A. Marcinkowski, G. L. Molnár, A. L. Nichols, E. Schönfeld, V. R. Vanin, M. J. Woods, IAEA CRP "Update of X Ray and Gamma Ray Decay Data Standards for Detector Calibration and Other Applications", IAEA Scientific and Technical Information report STI/PUB/1287, May 2007, International Atomic Energy Agency, Vienna, Austria, ISBN 92-0-113606-4. |
| LNHB | Laboratoire National Henri Becquerel, Recommended Data, http://www.nucleide.org/DDEP\_WG/DDEPdata.htm,  3 October 2006. |
| ADS-98 | I. Adsley, J.S. Backhouse, A.L. Nichols, J. Toole, U-238 Decay Chain: Resolution of Observed Anomalies in the Measured Secular Equilibrium Between Th-234 and Daughter Pa-234m, Appl. Radiat. Isot. 49 (1998) 1337. |

|  |
| --- |
| Notes |
| [1] 510.7-keV emission probability of 22.6 ± 0.2% has been set aside as too close in energy to any annihilation radiation.  [2] Possible minor interference from other gamma-ray emissions of comparable energy (\*).  [3] Doubly-placed transitions were not considered. Uncertainties of the emission probabilities are adopted from E. Browne,  R. B. Firestone and V. S. Shirley, Table of Radioactive Isotopes, John Wiley & Sons, New York, 1986.  [4] Measurement of the emission probability of the 63.29-keV γ-ray by Abousahl et al., Nucl. Instrum. Meth. Phys. Res. A517 (2004) 211, has been incorporated into an earlier evaluation (Adsley et al., Appl. Radiat. Isot. 49 (1998) 1337) to give a recommended value of (3.70 ± 0.06)%; all other emissions probabilities and uncertainties were adjusted accordingly.  [5] Low intensity emissions.  [6] Energy uncertainties are adopted from E. Browne, R. B. Firestone and V. S. Shirley, Table of Radioactive Isotopes, John Wiley & Sons, New York, 1986.   [7] Low intensity emissions (no alternative).  [8] Low intensity emissions included.   [9] Low intensity emissions included; doubly-placed transitions were not considered. |

|  |  |
| --- | --- |
| |  | | --- | | Read our [Disclaimer](javascript:openpop('disclaimer.html')) [Copyright](javascript:openpop('copyright.html')) International Atomic Energy Agency - Nuclear Data Section P.O. Box 100, Wagramer Strasse 5, A-1400 Vienna, Austria | |