This evaluation was completed in August 2003. The literature available by July 2003 was included.

1. DECAY SCHEME

The decay scheme is based on the evaluation of Schmorak (1991Sc08) and taken from 1996Firestone. It can be considered as basically completed though several weak gamma transitions were not observed in $^{240}$Pu alpha decay. They have been taken from data on nuclear reactions and $^{236}$Pa, $^{236}$Np decays (1984Mi02, 1991Sc08).

The alpha transitions to $^{236}$U highly excited levels with energy of 958, 960 and 967 keV were not observed either. They are expected from data on level spins and gamma rays de-excited the above levels.

2. NUCLEAR DATA

$Q(\alpha)$ value is from 1995Au04.

The evaluated half-life of $^{240}$Pu is based on the experimental results given in Table 1. Re-estimated values were used for averaging where necessary.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Author(s)</th>
<th>Original value</th>
<th>Re-estimated value</th>
<th>Measurement method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951In03</td>
<td>Inghram et al.</td>
<td>6580(40)</td>
<td>6500(45)</td>
<td>Mass-Spectrometry</td>
</tr>
<tr>
<td>1951We21</td>
<td>Westrum</td>
<td>6240(120)</td>
<td></td>
<td>$\alpha$-Particle Counting</td>
</tr>
<tr>
<td>1954Fa11</td>
<td>Farwell et al.</td>
<td>6300(600)</td>
<td></td>
<td>$\alpha$-Particle Counting</td>
</tr>
<tr>
<td>1956Bu92</td>
<td>Butler et al.</td>
<td>6600(100)</td>
<td></td>
<td>$\alpha$-Particle Counting</td>
</tr>
<tr>
<td>1959Do64</td>
<td>Dokuchaev</td>
<td>6620(50)</td>
<td>6610(55)</td>
<td>$\alpha$-Particle Counting</td>
</tr>
<tr>
<td>1968Oe02</td>
<td>Oetting</td>
<td>6524(10)</td>
<td>6537(15)</td>
<td>Calorimetry</td>
</tr>
<tr>
<td>1978Ja11</td>
<td>Jaffay et al.</td>
<td>6569(6)</td>
<td>6569(7)</td>
<td>$\alpha$-Particle Counting</td>
</tr>
<tr>
<td>1984Be19</td>
<td>Beckmann et al.</td>
<td>6574(6)</td>
<td>6574(7)</td>
<td>Mass-Spectrometry</td>
</tr>
<tr>
<td>1984St06</td>
<td>Steinkruger et al.</td>
<td>6571(9)</td>
<td></td>
<td>$\alpha$-Particle Counting</td>
</tr>
<tr>
<td>1984Lu04</td>
<td>Lucas and Noyce</td>
<td>6552.2(20)</td>
<td>6552.2(66)</td>
<td>$\alpha$-Particle Counting</td>
</tr>
<tr>
<td>1984Ru04</td>
<td>Rudy et al.</td>
<td>6552.4(17)</td>
<td>6552.4(66)</td>
<td>Calorimetry</td>
</tr>
</tbody>
</table>

* Quoted uncertainties, corresponding to 95% confidence level, have been reduced by a factor 2.
* Re-estimated in 1978Ja11.
* Re-estimated in 1986IAEA. According to the criterion adopted by the members of the CRP, a minimum uncertainty of 0.1% on the half-life of long-lived nuclides should be attributed to all measured values.
* Re-estimated in 1986IAEA. The quoted uncertainty has been increased since no measurements were made to demonstrate the absence of $^{238}$Pu.

With omitting the value of 1951We21 as outlier the weighted mean of the remaining 10 values is 6561 yr with the internal uncertainty 3.1 yr and external uncertainty 4.0 yr.

According to the criterion adopted by the members of the CRP (1986IAEA) a minimum uncertainty of the recommended $^{240}$Pu half-life should be attributed as 7 years.
Therefore, the adopted value of the $^{240}$Pu half-life is 6561(7) years.

The evaluated spontaneous fission half-life of $^{240}$Pu is based on the experimental results given in Table 2.

Table 2. Experimental values of the spontaneous fission $^{240}$Pu half-life (in $10^{11}$ years)

<table>
<thead>
<tr>
<th>Reference</th>
<th>Author(s)</th>
<th>Measurement value</th>
<th>Measurement method</th>
<th>Used for final averaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>1953Ki72</td>
<td>Kinderman</td>
<td>1.314(26)</td>
<td>Low geometry $\alpha$-counting</td>
<td>No</td>
</tr>
<tr>
<td>1954Ba14</td>
<td>Barclay et al.</td>
<td>1.225(30)</td>
<td>Low geometry $\alpha$-counting</td>
<td>No</td>
</tr>
<tr>
<td>1954Ch74</td>
<td>Chamberlain et al.</td>
<td>1.20</td>
<td>Low geometry $\alpha$-counting</td>
<td>No</td>
</tr>
<tr>
<td>1959Mi90</td>
<td>Mikheev et al.</td>
<td>1.20</td>
<td>Low geometry $\alpha$-counting</td>
<td>No</td>
</tr>
<tr>
<td>1962Wa13</td>
<td>Watt et al.</td>
<td>1.340(15)</td>
<td>Low geometry $\alpha$-counting</td>
<td>No</td>
</tr>
<tr>
<td>1963Ma50</td>
<td>Malkin et al.</td>
<td>1.45(2)</td>
<td>Low geometry $\alpha$-counting</td>
<td>No</td>
</tr>
<tr>
<td>1967White</td>
<td>White</td>
<td>1.27(5)</td>
<td>No details available</td>
<td>No</td>
</tr>
<tr>
<td>1967Fi13</td>
<td>Fieldhouse et al.</td>
<td>1.176(25)$^a$</td>
<td>SF neutron emission rates</td>
<td>Yes</td>
</tr>
<tr>
<td>1979BuZC</td>
<td>Budtz-Jorgensen et al.</td>
<td>1.15(3)</td>
<td>Fragment spectra, ionization chamber</td>
<td>Yes</td>
</tr>
<tr>
<td>1984An25</td>
<td>Androsenko et al.</td>
<td>1.15(3)</td>
<td>SF neutron emission rates</td>
<td>Yes</td>
</tr>
<tr>
<td>1988SeZY</td>
<td>Selickij et al.</td>
<td>1.17(3)</td>
<td>Fragment detection in $2\pi$ geometry</td>
<td>Yes</td>
</tr>
<tr>
<td>1989Dy01</td>
<td>Dytlewski et al.</td>
<td>1.12(2)</td>
<td>Neutron coincidences and low geometry $\alpha$-counting</td>
<td>Yes</td>
</tr>
<tr>
<td>1991iv01</td>
<td>Ivanov et al.</td>
<td>1.15(2)</td>
<td>$\lambda_{SF}/\lambda_{\alpha}$ in $^{240}$Pu standards</td>
<td>Yes</td>
</tr>
</tbody>
</table>

$a$ Re-estimated in Holden 2000. Original value is 1.170(25).

Early measurement values have been omitted from averaging according to analysis of Holden and Hoffman (2000Ho27). The weighted mean of 6 selected values is 1.15 with the internal uncertainty 0.010 and external uncertainty 0.0087.

The adopted value of the $^{240}$Pu spontaneous fission is $1.15(2)\cdot10^{11}$ years where the uncertainty is the smallest quoted uncertainty.

2.1 Alpha Transitions

The energies of the alpha transitions have been calculated from the Q value and the level energies given in Table 3 from 1991Sc08, 1996Firestone.

Table 3. $^{236}$U levels populated in the $^{240}$Pu $\alpha$-decay

<table>
<thead>
<tr>
<th>Level number</th>
<th>Energy, keV</th>
<th>Spin and parity</th>
<th>Half-life</th>
<th>Probability of $\alpha$-transition ($\times 10^5$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0</td>
<td>$0^+$</td>
<td>2.342·10$^7$ yr</td>
<td>72.74(11)</td>
</tr>
<tr>
<td>1</td>
<td>45.242(3)</td>
<td>2$^-$</td>
<td>234 ps</td>
<td>27.16(11)</td>
</tr>
<tr>
<td>2</td>
<td>149.476(15)</td>
<td>4$^-$</td>
<td>124 ps</td>
<td>0.0863(18)</td>
</tr>
<tr>
<td>3</td>
<td>309.783(8)</td>
<td>6$^-$</td>
<td>58 ps</td>
<td>0.001082(18)</td>
</tr>
<tr>
<td>4</td>
<td>522.24(5)</td>
<td>8$^+$</td>
<td>24 ps</td>
<td>4.7(5)·10$^{-5}$</td>
</tr>
<tr>
<td>5</td>
<td>687.66(5)</td>
<td>1$^-$</td>
<td>3.8 ns</td>
<td>1.93(4)·10$^{-5}$</td>
</tr>
<tr>
<td>6</td>
<td>744.15(8)</td>
<td>3$^-$</td>
<td>&lt; 0.1 ns</td>
<td>$&lt; 10^{-7}$</td>
</tr>
<tr>
<td>7</td>
<td>919.21(17)</td>
<td>0$^+$</td>
<td>&lt; 1.7·10$^{-7}$</td>
<td>≈ 6.5·10$^{-7}$</td>
</tr>
<tr>
<td>8</td>
<td>957.99(17)</td>
<td>(2$^-$)</td>
<td>&lt; 1.3·10$^{-7}$</td>
<td>&lt; 1·10$^{-7}$</td>
</tr>
<tr>
<td>9</td>
<td>960.3 (3)</td>
<td>(2$^-$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>966.63(9)</td>
<td>1$^-$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The probabilities of the most intensive transitions $\alpha_{0,0}$ and $\alpha_{0,1}$ have been obtained by averaging experimental data (Table 4). The probabilities of all the remaining $\alpha$-transitions have been evaluated from the $P(\gamma^{+}\text{ce})$ balances for corresponding levels of $^{236}\text{U}$.

Table 4. Experimental and evaluated values of $\alpha$-transition probabilities ($\times 100$) in the decay of $^{240}\text{Pu}$

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha_{0,0}$</td>
<td>5168</td>
<td>75.5</td>
<td>75.5</td>
<td>76</td>
<td>73.5 (36)</td>
<td>72.8 (1)</td>
<td>73.0 (5)</td>
<td>72.5 (20)</td>
<td>73.1 (1)</td>
<td>73.1 (11)</td>
<td>74 (2)</td>
<td>72.56 (6)</td>
<td>72.74(11) $^a$</td>
<td>27.16(11) $^a$</td>
</tr>
<tr>
<td>$\alpha_{0,1}$</td>
<td>5124</td>
<td>24.4</td>
<td>24.5</td>
<td>24</td>
<td>26.39 (21)</td>
<td>27.1 (1)</td>
<td>27.0 (5)</td>
<td>27.35 (10)</td>
<td>26.8 (1)</td>
<td>27.5 (11)</td>
<td>26 (2)</td>
<td>27.35 (7)</td>
<td>0.0863(18) $^b$</td>
<td>0.001082(18) $^b$</td>
</tr>
<tr>
<td>$\alpha_{0,2}$</td>
<td>5021</td>
<td>0.091 (6)</td>
<td>0.085 (15)</td>
<td>0.1</td>
<td>0.096 (5)</td>
<td>0.090 (5)</td>
<td>0.10 (2)</td>
<td>2.1(4) $\times 10^{-5}$</td>
<td>0.10 (2)</td>
<td>2.1(4) $\times 10^{-5}$</td>
<td>0.10 (2)</td>
<td>4.7(5) $\times 10^{-5}$ $^b$</td>
<td>1.93(4) $\times 10^{-5}$ $^b$</td>
<td></td>
</tr>
<tr>
<td>$\alpha_{0,3}$</td>
<td>4864</td>
<td>0.0032 (1)</td>
<td>0.0032 (1)</td>
<td>0.1</td>
<td>0.0032 (1)</td>
<td>0.0032 (1)</td>
<td>0.0032 (1)</td>
<td>0.0032 (1)</td>
<td>0.0032 (1)</td>
<td>0.0032 (1)</td>
<td>0.0032 (1)</td>
<td>0.0032 (1)</td>
<td>0.0032 (1)</td>
<td>0.0032 (1)</td>
</tr>
<tr>
<td>$\alpha_{0,4}$</td>
<td>4655</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\alpha_{0,5}$</td>
<td>4492</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$^a$ MBAYS procedure was used for obtaining the final uncertainty as the data set is discrepant (see 2000Ch01)

$^b$ Calculated from ($\gamma^{+}\text{ce}$)-intensity balance for corresponding levels

2.2. Gamma Transitions and Internal Conversion Coefficients

The gamma-ray transition probabilities have been deduced from their gamma-ray emission probabilities and total internal conversion coefficients (ICC). The experimental values of ICC have been adopted for gamma rays $\gamma_{5,1}$ (642.4 keV) and $\gamma_{5,0}$ (687.6 keV). The remaining ICC are theoretical values from 1978Ro22 for the adopted energies and multipolarities. The latter ones have been taken from the analysis of Schmorak (1991Sc08) and 1996Firestone. The relative uncertainties of $\alpha_k$, $\alpha_L$, $\alpha_M$ for pure multipolarities have been adopted as 2%.

3. ATOMIC DATA

3.1. Fluorescence yields

The fluorescence yield data are from 1996Sc06 (Schönfeld and Janßen).

3.2. X Radiations

The energies of U LX-rays have been taken from 1994Le28 and 1994Le37 where the fine structure of LX radiation was measured in the decay of $^{240}\text{Pu}$. Other measurements of U LX-rays can be found in 1983Ah02, 1984Bo41, 1992Ba08 and 1995Jo23.

The U KX-ray energies have been taken from 1999Schönfeld where the calculated values based on X-ray wavelengths from 1967Be65 (Bearden). In Table 5 the adopted values of U KX-ray energies are compared with experimental values.
The relative KX-ray emission probabilities have been taken from 1999 Schönfeld and from data on α-decay of 238Pu.

### Table 5. Experimental and adopted (calculated) values of U KX-ray energies (keV)

<table>
<thead>
<tr>
<th></th>
<th>1976GuZN</th>
<th>1982Ba56</th>
<th>1983Ah02</th>
<th>Adopted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kα₂</td>
<td>94.655(5)</td>
<td>94.656(2)</td>
<td>94.67(2)</td>
<td>94.666</td>
</tr>
<tr>
<td>Kα₁</td>
<td>98.442(5)</td>
<td>98.435(2)</td>
<td>98.45(2)</td>
<td>98.440</td>
</tr>
<tr>
<td>Kβ₃</td>
<td>110.42</td>
<td>110.416(3)</td>
<td>110.42(3)</td>
<td>110.421</td>
</tr>
<tr>
<td>Kβ₁</td>
<td>111.30</td>
<td>111.300(2)</td>
<td>111.31(2)</td>
<td>111.298</td>
</tr>
<tr>
<td>Kβ₅</td>
<td>-</td>
<td>111.868(5)- Kβ₅ '</td>
<td>111.868(5)- Kβ₅ ''</td>
<td>112.01(5)</td>
</tr>
<tr>
<td>Kβ₂₄</td>
<td>114.54</td>
<td>-</td>
<td>114.50(3)</td>
<td>114.46</td>
</tr>
<tr>
<td>KO₂₃</td>
<td>115.40</td>
<td>-</td>
<td>115.40(5)</td>
<td>115.377</td>
</tr>
</tbody>
</table>

### 3.3. Auger Electrons

The energies of Auger electrons are from 1977La19 (Larkins) and 1987Lagoutine.

The ratios P(KLX)/P(KLL), P(KXY)/P(KLL) are taken from 1996Sc06.

### 4. ALPHA EMISSIONS

The energy of the alpha particles corresponding to the alpha transition to a ground state of 236U, E(α₀,₀), has been adopted from the absolute measurement of 1972Go33 taking into account the correction of −0.17 keV recommended by A. Rytz in 1991Ry01.

The energies of all other α-emission energies have been calculated from Eα₀,₀ and the level energies taking into account the recoil energies (see also 1994Ak05).

In Table 6 the calculated (evaluated) values of α-emission energies are compared with the experimental results obtained with using alpha spectrometry.

### Table 6. Experimental and evaluated α-emission energies in the decay of 240Pu, keV

<table>
<thead>
<tr>
<th></th>
<th>Measured</th>
<th>Evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>α₀,₀</td>
<td>5166</td>
<td>5165</td>
</tr>
<tr>
<td>α₀,₁</td>
<td>5122</td>
<td>5121</td>
</tr>
<tr>
<td>α₀,₂</td>
<td>5021(2)</td>
<td>5020</td>
</tr>
<tr>
<td>α₀,₃</td>
<td>4858(5)</td>
<td>4856</td>
</tr>
</tbody>
</table>

* Original values have been adjusted taking into account changes in calibration energies as suggested in 1991Ry01
b Absolute measurement; the value has been adopted as recommended in 1991Ry01 (see text above)

It should be noted that Sibbens and Pomme (2003Sibbens) measured (using a 50 mm² high-resolution planar silicon detector) the energies of 240Pu alpha particles relatively to reference peaks of 238Pu and 239Pu for a 238,239,240Pu mixture. They obtained E(α₀,₀) = 5168.54(1) keV and E(α₀,₁) = 5124.10(2) keV discrepant with published data. However these results can depend on the spectrum de-convolution algorithm used. New experiments for pure 240Pu sources need to be done.
5. ELECTRON EMISSIONS

The energies of the conversion electrons have been calculated from the gamma transition energies given in section 2.2 and the electron binding energies. The emission probabilities of conversion electrons have been deduced from the evaluated $P(\gamma)$ and ICC values. The experimental spectrum of the conversion electrons in the decay of $^{240}$Pu is given in 1958Sa21.

The absolute total emission probability of K Auger electrons have been computed by using the evaluated total emission probability of K–conversion electrons $P(ce_K) = 9.04(18) \times 10^{-5} \%$ and the adopted $\omega_K$ from section 3.

The absolute total emission probability of L Auger electrons have been computed using the adopted total absolute emission probability of U LX–rays and the adopted $\omega_L$ from section 3.

6. PHOTON EMISSIONS

6.1. X-Ray Emissions

6.1.1. LX-Rays

The evaluated absolute emission probabilities of U LX–rays have been obtained as weighted means of measurement values from 1994Le28 and 1994Le37. The uncertainties are the smallest quoted uncertainties.

The total absolute emission probability of U LX–rays $P(XL) = 9.9(5) \%$, calculated using the value $\omega_L = 0.500(19)$ from section 3.1 and the evaluated total absolute emission probability of L conversion electrons $P(ce_L) = 19.8(6) \%$, differs slightly from the value $P(XL) = 10.34(15) \%$ adopted from measurements of 1994Le28, 1994Le37. The measurement result of 1970Swinth (11.5(3) \%) disagrees with the adopted and calculated values.

6.1.2. KX-Rays

The total absolute KX –ray emission probability $P(XK) = 8.77(18) \times 10^{-5} \%$ has been computed using the value $\omega_K = 0.970(4)$ from section 3.1 and the evaluated total emission probability of K–conversion electrons $P(ce_K) = 9.04(18) \times 10^{-5} \%$

6.2. Gamma Ray Emissions

6.2.1. Gamma Ray Energies

The energies of gamma rays accompanying $\alpha$-decay of $^{240}$Pu to levels with energy less than 700 keV have been obtained on the basis of the available experimental data from $^{240}$Pu $\alpha$-decay (Table 7) and data from $^{236}$Pa, $^{236}$Np decays (1984Mi02, 1991Sc08). The adopted gamma ray energies correspond to the decay scheme from 1991Sc08, 1996Firestone. Other much more inaccurate measurements results can be found in 1958Sa21, 1959Tr37 and 1972ClZS.
Table 7. Measured in the decay of $^{240}$Pu and adopted values of gamma ray energies (keV)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$\gamma_{1,0}$</td>
<td>45.235(20)</td>
<td>45.242(6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\gamma_{2,1}$</td>
<td>104.233(10)</td>
<td>104.233(5)</td>
<td>104.15(2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\gamma_{2,2}$</td>
<td>160.35(50)</td>
<td>160.310(8)</td>
<td>160.27(2)</td>
<td>160.312(10)</td>
<td>160.280(15)</td>
<td>160.308(3)</td>
<td>160.307(3)</td>
<td></td>
</tr>
<tr>
<td>$\gamma_{4,3}$</td>
<td></td>
<td>212.4(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\gamma_{5,2}$</td>
<td>538.05(30)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\gamma_{5,1}$</td>
<td>642.43(10)</td>
<td>642.48(15)</td>
<td>642.33(10)</td>
<td>642.48</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\gamma_{5,0}$</td>
<td>687.77(15)</td>
<td>688.01(15)</td>
<td>687.57(10)</td>
<td>687.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\gamma_{7,1}$</td>
<td>873.91(20)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

* Obtained by averaging experimental data with corrections where necessary according to the adopted decay scheme

b Taken from 1981He16
c Taken from 1981He16 with the correction according to 2000He14

6.2.2. Gamma-Ray Emission Probabilities

The experimental and evaluated gamma ray emission probabilities for $\gamma$-rays with energy less than 200 keV are given in Table 8. The evaluated $P(\gamma)$ values have been obtained by averaging several experimental results (except $P(\gamma_{1,0})$ that calculated from intensity balance).

Table 8. Experimental and evaluated emission probabilities of gamma rays in the decay of $^{240}$Pu with energy less than 200 keV (per $10^4 \alpha$-decays)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$\gamma_{1,0}$</td>
<td>45.24(9)</td>
<td>4.50(5)</td>
<td>4.50(5)</td>
<td>4.53(9)</td>
<td>4.61(14)</td>
<td>4.35(9)</td>
<td></td>
<td>4.50(9)</td>
<td></td>
</tr>
<tr>
<td>$\gamma_{2,1}$</td>
<td>104.23(14)</td>
<td>0.70(5)</td>
<td>0.91(5)</td>
<td>0.70(5)</td>
<td>0.698(14)</td>
<td>0.718(7)</td>
<td></td>
<td>0.714(7)</td>
<td></td>
</tr>
<tr>
<td>$\gamma_{5,0}$</td>
<td>160.31(8)</td>
<td>0.0420(12)</td>
<td>0.0409(10)</td>
<td>0.0402(8)</td>
<td>0.0402(4)</td>
<td>0.0402(7)</td>
<td>0.04065(17)</td>
<td>0.04045(22)</td>
<td></td>
</tr>
</tbody>
</table>

* Omitted from averaging as the data of 1971GuZY have been revised in 1976GuZN

b Omitted from averaging as uncertainty is not quoted
c Omitted on statistical considerations
d The uncertainty quoted in 1976GuZN has been recalculated in 1986IAEA to include a 2% detector efficiency uncertainty
e The uncertainty quoted in 1976Um01 has been recalculated in 1986IAEA to include a 2% detector efficiency uncertainty and 1% from the sample isotopic composition
f Calculated from the $P(\alpha)$ values and the adopted total ICC $\alpha_i(\gamma_{1,0}) = 604(12)$; agreed with the weighted mean of 1976GuZN, 1976Um01 and 1981He16: 4.47(10)
g Weighted mean of 1976GuZN and 1981He16; the uncertainty is the smallest quoted uncertainty
h Weighted mean of 5 experimental values; the uncertainty is internal.

The emission probabilities of $\gamma_{4,3}(212$ keV) and $\gamma_{5,1}(538$ keV) have been adopted from absolute measurements of 1975OtZX. The emission probabilities of $\gamma_{5,1}(642$ keV) and $\gamma_{5,0}(687$ keV) have been obtained by averaging experimental data (Table 9).
Table 9. Experimental and evaluated emission probabilities of gamma rays de-exciting the $^{236}$U level with energy of 687.6 keV in the decay of $^{240}$Pu (per $10^8 \alpha$-decays)

<table>
<thead>
<tr>
<th>Energy, keV</th>
<th>1969Le05</th>
<th>1971GuZY</th>
<th>1975OtZX</th>
<th>1975Dr05</th>
<th>1976GuZN</th>
<th>Evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\gamma_{52}$</td>
<td>538.1</td>
<td>$\approx0.23^a$</td>
<td>0.147(12)</td>
<td>13(1)</td>
<td>12.6(3)$^c$</td>
<td>0.147(12)</td>
</tr>
<tr>
<td>$\gamma_{51}$</td>
<td>642.4</td>
<td>14.5$^b$</td>
<td>14.5(5)$^b$</td>
<td>12.6(4)</td>
<td>13(1)</td>
<td>12.6(3)$^c$</td>
</tr>
<tr>
<td>$\gamma_{50}$</td>
<td>687.6</td>
<td>3.77(11)$^b$</td>
<td>3.70(15)$^b$</td>
<td>3.30(13)</td>
<td>3.55(9)</td>
<td>3.56(16)$^d$</td>
</tr>
</tbody>
</table>

$^a$ Omitted from averaging as uncertainty is not quoted  
$^b$ Omitted from averaging as the data of 1971GuZY have been revised in 1976GuZN  
$^c$ Weighted mean of 3 experimental values; the uncertainty is the smallest quoted uncertainty  
$^d$ Weighted mean of 3 experimental values; the uncertainty is external one increased by Student’s coefficient (2000Ch01)

The emission probability of $\gamma_{7,1}$ (874 keV) has been obtained as a weighted average of measurement results from 1969Le05 and 1975OtZX. Weak gamma rays with energy more than 900 keV are reported in 1969Le05 and 1976GuZN. They are expected from the decay scheme but their emission probabilities ($< 10^{-7}$ per 100 decays) have not been determined with a great accuracy.

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(SF half-life)

(Half-life)

(LX-ray energies)

(Half-life)

(Gamma-ray energies)

(Half-life)

(Half-life)

(Gamma-ray emission probabilities)

(Energy of Auger electrons)

(SF half-life)

(SF half-life)

(α-transition probabilities)

(SF half-life)

(α-transition energies)

(Decay scheme, 236U level energies, gamma ray multiplicities)

(X ray energies)

(α-transition probabilities)

(α-transition probabilities)

(LX ray energies and emission probabilities)

(LX ray energies and emission probabilities)

(α-transition probabilities)

(α-transition probabilities)

(Decay energy)

(U LX ray energies and emission probabilities)

(Decay scheme, 236U level energies, gamma ray multiplicities)

(α-transition probabilities)

(KX-ray energies and relative emission probabilities)
Comments on evaluation

