EURADOS IC2012n

Irradiations at NPL

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Outline

• NPL Irradiation Facility
• Dosimeter Storage
• Irradiation Details
• Exposure Validation
• Summary of Uncertainties
Dosimeter Storage

Dosimeters bagged as unpacked and placed in storage units
## Irradiation Details

Source emission rates measured in NPL Manganese Bath
Source anisotropy measured in same facility as exposures

<table>
<thead>
<tr>
<th>Dose (mSv)</th>
<th>Angle</th>
<th>Source Type</th>
<th>Source ID</th>
<th>Emission rate* (s⁻¹)</th>
<th>% of $^{250}$Cf</th>
<th>Exposure time (hh:mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3</td>
<td>$0^0$</td>
<td>$^{252}$Cf (bare)</td>
<td>5000NC</td>
<td>$3.4 \times 10^7$</td>
<td>13%</td>
<td>00:26</td>
</tr>
<tr>
<td>3</td>
<td>$0^0$</td>
<td>$^{252}$Cf (bare)</td>
<td>1254NU</td>
<td>$2.9 \times 10^8$</td>
<td>negligible</td>
<td>00:30</td>
</tr>
<tr>
<td>15</td>
<td>$0^0$</td>
<td>$^{252}$Cf (bare)</td>
<td>1254NU</td>
<td>&quot;</td>
<td>&quot;</td>
<td>02:27</td>
</tr>
<tr>
<td>2</td>
<td>$45^0$</td>
<td>$^{252}$Cf (bare)</td>
<td>1254NU</td>
<td>&quot;</td>
<td>&quot;</td>
<td>00:20</td>
</tr>
<tr>
<td>3</td>
<td>$0^0$</td>
<td>$^{252}$Cf (moderated)</td>
<td>1254NU</td>
<td>&quot;</td>
<td>&quot;</td>
<td>02:06</td>
</tr>
</tbody>
</table>

*On 31/10/2012
Reference EPD-N2s mounted on top of phantoms during exposures
Table 2: Percentage standard uncertainties associated with the determination of the personal dose equivalent at the reference distance.

<table>
<thead>
<tr>
<th>Uncertainty component</th>
<th>Irradiation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$^{252}$Cf</td>
</tr>
<tr>
<td></td>
<td>0.3 mSv</td>
</tr>
</tbody>
</table>

Type B (non-random)

- Reference irradiation distance* ± 0.53% ± 0.53% ± 0.53% ± 0.53% ± 0.53%
- Source emission rate ($MnSO_4$ bath) (includes component for half-life) ± 0.60% ± 0.40% ± 0.40% ± 0.40% ± 0.40%
- Source anisotropy correction ± 0.50% ± 0.50% ± 0.50% ± 0.0% ± 0.50%
- Timing ± 0.26% ± 0.22% ± 0.04% ± 0.05% ± 0.33%
- Scatter ± 1.0% ± 1.0% ± 1.0% ± 1.0% ± 1.0%
- $H_p(10,0)$ conversion coefficient ± 1.0% ± 1.0% ± 1.0% ± 4.0% ± 1.0%

Total Standard Uncertainty Components added in quadrature ± 1.7% ± 1.7% ± 1.6% ± 4.2% ± 1.7%

Expanded uncertainty * ± 3.4% ± 3.4% ± 3.2% ± 8.4% ± 3.4%

* The figures quoted for the uncertainty in the reference irradiation distance includes a sensitivity factor of 2, taking into account the inverse square dependence of the neutron fluence rate on the distance between the source centre to reference point.

** Obtained by multiplying the total standard uncertainty by a coverage factor $k=2$. (This provides an uncertainty estimate at a confidence level of approximately 95%.)