Krypton spectral lamp ($\lambda \approx 606$ nm)

$^{86}$Kr spectral lamp radiation, $5d_5 - 2p_{10}$ transition

1. CIPM recommended value

The value $\lambda = 605 780 210.3$ fm with a relative expanded uncertainty $U = 3.9 \times 10^{-9}$, where $U = ku_c$ ($k = 3$), $u_c$ being the combined standard uncertainty, applies to the radiation emitted by a discharge lamp. The radiation of $^{86}$Kr is obtained by means of a hot-cathode discharge lamp containing $^{86}$Kr, of a purity not less than 99 %, in sufficient quantity to assure the presence of solid krypton at a temperature of 64 K, this lamp having a capillary with an inner diameter from 2 mm to 4 mm and a wall thickness of about 1 mm.

It is estimated that the wavelength of the radiation emitted by the positive column is equal, to within 1 part in $10^8$, to the wavelength corresponding to the transition between the unperturbed levels, when the following conditions are satisfied:

- the capillary is observed end-on from the side closest to the anode;
- the lower part of the lamp, including the capillary, is immersed in a cold bath maintained at a temperature within one degree of the triple point of nitrogen;
- the current density in the capillary is $(0.3 \pm 0.1)$ A cm$^{-2}$.

2. Source data

<table>
<thead>
<tr>
<th>Adopted value</th>
<th>$f = 494 886 516.4$ (6) MHz</th>
<th>$u_c/y = 1.3 \times 10^{-9}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>for which:</td>
<td>$\lambda = 605 780 210.3$ (.8) fm</td>
</tr>
<tr>
<td>$f$ / kHz</td>
<td>$u_c/y$</td>
<td>source data</td>
</tr>
<tr>
<td>494 886 516 422 kHz</td>
<td>$1.3 \times 10^{-9}$</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Source data

2.1 The CCDM 1982 [1, 2] gives

$\frac{f_{\text{Kr}}}{f_i} = 1.044 919 242 05$ \hspace{1cm} $u_c/y = 1.3 \times 10^{-9}$, using the recommended operation conditions [3].

Using the recommended value of the absorbing molecule $^{127}$I$_2$, a$_{16}$ or $f$ component, R(127) 11-5 transition (see iodine at $\lambda \approx 633$ nm and frequency differences listed in corresponding Table 1) one obtains

$f_i = 473 612 214 712$ kHz \hspace{1cm} $u_c/y = 2.2 \times 10^{-11}$,

which leads to

$f_{\text{Kr}} = 494 886 516 422$ kHz \hspace{1cm} $u_c/y = 1.3 \times 10^{-9}$.
3. References

