MEP 2003

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 ± 0.1) A · cm^{-2}.

2. Source data

Adopted value	$f = 494\ 886\ 516.4\ (6)$ MHz	$u_c/y = 1.3 \times 10^{-9}$
	for which:	
	$\lambda = 605\ 780\ 210.3\ (.8)$ fm	$u_c/y = 1.3 \times 10^{-9}$

calculated from

f / kHz	u_c/y	source data
494 886 516 422 kHz	1.3×10^{-9}	2.1

Source data

2.1 The CCDM 1982 [1, 2] gives
$f_{Kr} / f_i = 1.044\ 919\ 242\ 05$ $u_c/y = 1.3 \times 10^{-9}$, 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 $u_c/y = 2.2 \times 10^{-11}$,

which leads to
$f_{Kr} = 494\ 886\ 516\ 422$ kHz $u_c/y = 1.3 \times 10^{-9}$.

3. References

[1] Documents Concerning the New Definition of the Metre, *Metrologia*, 1984, **19**, 163-178.

[2] *BIPM, Com. Cons. Déf. Mètre*, 1982, **7**, M58..

[3] *BIPM Proc. Verb. Com. Int. Poids et Mesures*, 1960, **28**, 71-72 and *BIPM Comptes Rendus 11^{e} Conf. Gén. Poids et Mesures*, 1960, 85.