Bureau International des Poids et Mesures

Approved by the CIPM in October 2015

RECOMMENDED VALUES OF STANDARD FREQUENCIES FOR APPLICATIONS INCLUDING THE PRACTICAL REALIZATION OF THE METRE AND SECONDARY REPRESENTATIONS OF THE DEFINITION OF THE SECOND

IODINE ($\lambda \approx 531$ nm)

Absorbing atom $^{127}I_2$, a_1 component, R(36) 32-0 transition

1. Recommended value [1]

$f\,(^{127}I_2) = 564\,074\,632.42$ MHz

equivalent to

$\lambda = 531\,476\,582.65$ fm

with an estimated relative standard uncertainty of 1×10^{-10} applies to the radiation of a frequency-doubled diode DFB laser, stabilized with an iodine cell external to the laser with the following parameters:

- cold-finger temperature (25 ± 0.5)°C (corresponding to the iodine pressure p = 41 Pa)
- frequency modulation width, peak-to-peak, (12 ± 1) MHz for 3f detection cases;
- saturating beam intensity of 12.7 mW (±10%) at a beam diameter of 1 mm

2. Source data

Adopted value : f = 564 074 632.42 MHz $u_c/y = 1 \times 10^{-10}$

taken from

f / kHz	u_c/y	source data
564 074 632 419(8)	1.4×10^{-11}	[2]

This value was issued from only a single laboratory under conditions where strong linear absorption at Doppler centre occurs, thereby degrading the signal-to-noise level at this high iodine vapour pressure [2]. Thus, the CIPM following a recommendation of the CCL considered it prudent to enlarge the standard uncertainty by a factor of seven, and round to 1×10^{-10}.

3. References

[1] CIPM Recommendation 2 (CI-2015): Updates to the list of standard frequencies
http://www.bipm.org/jsp/en/CIPMRecommendations.jsp

[2] T. Kobayashi, D. Akamatsu, K. Hosaka, H. Inaba, S. Okubo, T. Tanabe, M. Yasuda, A. Onae, F.-L. Hong, Compact iodine-stabilized laser operating at 531 nm with stability at the 10^{-12} level and using a coin-sized laser module, *Optics Express*, **23**, 20749 (2015).