



Approved by the CIPM in June 2013

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

YTTERBIUM 171 ATOM ($f \approx 518$ THz)

^{171}Yb neutral atom, $6s^2\ ^1S_0 - 6s6p\ ^3P_0$ unperturbed optical transition

1. Recommended value [1] of the frequency

$$\nu(^{171}\text{Yb}) = 518\,295\,836\,590\,865.0 \text{ Hz}$$

equivalent to

$$\lambda(^{171}\text{Yb}) = 578\,419\,575.916\,161 \text{ fm,}$$

with a relative uncertainty of 2.7×10^{-15} .

This radiation was endorsed as a secondary representation of the definition of the second.

2. Source data

$$\text{Adopted value } \nu(^{171}\text{Yb}) = 518\,295\,836\,590\,865.0 \text{ Hz} \quad u_c/y = 2.7 \times 10^{-15}$$

calculated from

$\nu(^{171}\text{Yb}) / \text{Hz}$	u / Hz	source data
518 295 836 590 864	28	[2]
518 295 836 590 863.1	2.0	[3]
518 295 836 590 865.2	0.7	[4]

by a weighted mean.

Given the small number of measurements the CCTF considered it prudent to estimate a relative standard uncertainty of 2.7×10^{-15} .

3. References

[1] CIPM Recommendation 1(CI-2013): Updates to the list of standard frequencies.

[2] T. Kohno, M. Yasuda, K. Hosaka, H. Inaba, Y. Nakajima, F. L. Hong: One-Dimensional Optical Lattice Clock with a Fermionic ^{171}Yb Isotope, *Appl. Phys. Express* **2**, 072501 (2009).

- [3] M. Yasuda, H. Inaba, T. Kohno, T. Tanabe, Y. Nakajima, K. Hosaka, D. Akamatsu, A. Onae, T. Suzuyama, M. Amemiya, F.-L. Hong: Improved Absolute Frequency Measurement of the ^{171}Yb Optical Lattice Clock towards a Candidate for the Redefinition of the Second, *Appl. Phys. Express* **5**, 102401 (2012).
- [4] N. D. Lemke, A. D. Ludlow, Z.W. Barber, T. M. Fortier, S.A. Diddams, Y. Jiang, S. R. Jefferts, T. P. Heavner, T. E. Parker, and C.W. Oates: Spin-1/2 Optical Lattice Clock, *Phys. Rev. Lett.* **103**, 063001 (2009).