

Approved by the CCTF in September 2025, active on March 27, 2026

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

**LUTETIUM 176 ION ( $f \approx 353.6$  THz)**

$^{176}\text{Lu}^+$ , the mean of the 3 unperturbed optical transitions  $6s^2\ ^1\text{S}_0$  (F=7) –  $5d6s\ ^3\text{D}_1$  (F=6),  $6s^2\ ^1\text{S}_0$  (F=7) –  $5d6s\ ^3\text{D}_1$  (F=7) and  $6s^2\ ^1\text{S}_0$  (F=7) –  $5d6s\ ^3\text{D}_1$  (F=8)

**1. Recommended value [1] of the frequency in the CIPM List of Frequencies**

$$f(^{176}\text{Lu}^+) = 353\ 638\ 794\ 073\ 800.35\ \text{Hz}$$

with a relative standard uncertainty of  $2.8 \times 10^{-15}$ .

If we denote the 3 different transitions  $\nu_1, \nu_2$  and  $\nu_3$  respectively,  $f(^{176}\text{Lu}^+) = (\nu_1 + \nu_2 + \nu_3)/3$ .

**2. Source data**

The adopted value for the recommended frequency is based on the measured frequency of 353 638 794 073 800.35(33) Hz reported in [2]. With this value, determined by a single laboratory, the CCTF considered it prudent to attribute a standard uncertainty increased by a factor of three.

**3. References**

- [1] Consultative Committee for Time and Frequency (CCTF), 24th meeting (session II): Recommendation 24-2 (<https://www.bipm.org/en/committees/cc/cctf/24-2-2025>)
- [2] Z. Zhang, Q. Zhao, Q. Qichen, N. Jayjong, M. D. K. Lee, K. J. Arnold, M. D. Barrett: Absolute frequency measurement of a Lu+ (3D1) optical frequency standard via link to international atomic time; Metrologia 62, 035008 (2025)