

### 2019 Report of TAI Measurements with NIST-Yb1

During the period from November 2017 to June 2018, an ytterbium optical lattice frequency standard at NIST (NIST-Yb1) was measured with respect to TAI and PSFS. In December 2018, reports of these measurements were submitted to the BIPM Time Department, to be considered for a first-time calibration of TAI. In February 2019, the Working Group on PSFS approved the NIST-Yb1 data for TAI steering, which was subsequently included in Circular T 374.

Over the course of these measurements, the type B uncertainty of NIST-Yb1 was  $u_B=1.4 \times 10^{-18}$ , as reported in [1]. As of the writing of this report, this uncertainty evaluation remains up-to-date. The type A uncertainty of NIST-Yb1 was  $u_A < 1 \times 10^{-17}$ , whereas  $u_{\text{lab}}$  varied within the range of  $2.2 \times 10^{-16}$  to  $4.83 \times 10^{-16}$ , for each month reported.

[1] W. McGrew, et al., "Atomic clock performance enabling geodesy below the centimetre level," *Nature* **564** 87–90 (2018).