

RECOMMENDATION CCTF PSFS 1 (2020)

Recommendations for operating, comparing and reporting frequency standards to improve TAI and to prepare for a redefinition of the second by optical transitions

The Consultative Committee for Time and Frequency (CCTF), at its 22nd session in 2020 and 2021, **considering that**

- More calibration of TAI with primary and secondary frequency standards can improve the frequency stability, accuracy and robustness of TAI,
- Demonstrating a permanent, continuous and sustainable calibrations of TAI with optical frequency standards is required for a future redefinition of the second using optical frequency standards,
- Numerous and diverse measurements of frequency ratios between primary frequency standards, secondary frequency standards and other optical frequency standards with excellent uncertainties are important to maintain and improve the CIPM list of recommended frequencies including secondary representation of the second, to monitor the status of these standards and to prepare for redefinition of the second by optical transitions,
- Accounting for possible correlations between these measurements is of growing importance, including correlations with measurements involving TAI and frequency standards providing calibrations of the TAI scale interval,

noting

- The 2017 CCTF recommendation CCTF-1(2017)
 - o on steps to be taken by the institutes regarding their developments of frequency standards in the view of a redefinition of the second by optical transitions,
- Resolution 2 of the 26th CGPM on the definition of time scales
 - o which states that in the transformation from the proper time of a clock to TAI, the relativistic rate shift is computed with respect to a conventionally adopted equipotential of the Earth's gravity potential,

recommends that

- the institutes performing such frequency and frequency ratio measurements
 - o identify in their publications contributions of individual standards based on
 - a perennial labelling of these standards,
 - separately reporting the type A and type B uncertainty contributions for each involved standard,
 - reporting the periods of measurements using modified Julian dates (MJD),
 - reporting supplementary data analysis breaking down long data sets into bins according to the 5 day TAI grid, even for measurements that are not reported to the BIPM to calibrate TAI,
 - o provide in their publications other information relevant to the identification of correlations with other measurements.
 - o when reporting measurements to the BIPM, also conform to the recommendations of CCTF (particularly CCTF-PSFS-3(2020), CCTF-1(2017), CCTF-3(2006), CCTF-2(2004)), and consult with the BIPM Time department and with the CCTF working group in charge of primary and secondary frequency standards
- the institutes improve their determination of the geopotential at the location of their facility and of their individual frequency standards, and take into account time variations of the geopotential due to tides as required in certain frequency measurements.