

RECOMMENDATION CCTF 24-3 (2025)

On the actions to progress on the roadmap for the redefinition of the second

The Consultative Committee for Time and Frequency (CCTF), at its 24th session in 2025,

Recalling

- the 21st CCTF recommendation CCTF-1 (2017) for operating, comparing and reporting frequency standards as secondary representations of the second in preparation for a redefinition of the second by optical transitions,
- the 22nd CCTF recommendations PSFS1 (2020) for operating, comparing and reporting frequency standards to improve TAI and to prepare for a redefinition of the second by optical transitions and PSFS2 (2021) on the updates to the CIPM list of standard frequencies,
- the 23rd CCTF recommendation 1 (2022) for developing awareness on options for the redefinition of the second, on criteria required for enabling such a redefinition and for developing activities to fulfil these criteria
- the Resolution 5 adopted at the 27th CGPM meeting (2022) "On the future redefinition of the second", which encouraged the International Committee for Weights and Measures (CIPM) to bring proposals for the choice of the preferred species, or ensemble of species for a new definition of the second, and for the further steps that must be taken for a new definition to be adopted at the 29th meeting of the CGPM (2030),

Noting

- the updated CCTF Roadmap towards the redefinition of the second, with the objective to bring a proposal to the 29th meeting of the CGPM (2030) for a new definition of the second and a proposal for the date of its implementation,

Considering that

- a consensus has not yet been reached either between the choice of a single species and an ensemble of species for the new definition, nor on the choice of the preferred species themselves, despite active scientific debate,
- it is important to ensure a solid and long-lasting basis for the choice, and the international acceptability of the new definition,
- noticeable inconsistencies in some comparisons of Optical Frequency Standards (OFS) and in the global set of frequency ratio measurements involving OFS,
- some criteria are far from being fulfilled, for instance a comparison uncertainty below 5E-18 between clocks of the same type developed by different laboratories has not yet been achieved, and OFS are not yet contributing regularly to the calibration of TAI with the adequate uncertainty level; however such criteria could realistically be fulfilled by 2030 thanks to international coordinated efforts supported by the CCTF,
- contribution from Caesium fountains will be critical till the redefinition and in a transition period after the redefinition to preserve the quality of TAI,

Recommends that institutes

- pursue their efforts and strengthen their actions to:
 - develop their awareness, knowledge and analysis for the envisaged possibilities for the redefinition,
 - improve the fulfilment of the mandatory criteria for the redefinition, especially:
 - the improvement and the validation of OFS accuracy budgets at the proper level of uncertainty, including the understanding and the removal of the inconsistencies observed in recent comparison campaigns,
 - the improvement of OFS operation periods and the regular provision of OFS data for the calibration of TAI to the BIPM with overall uncertainties (not including uSrep) below the corresponding uncertainties of the current primary frequency standards,
- communicate the timetable for the redefinition to their stakeholders in a timely manner to address any required regulatory changes,
- engage in education, training and outreach to prepare the adoption of the new definition,
- maintain the contribution from Caesium fountains at least till the redefinition and as long as needed to preserve the quality of TAI,

and further recommends that the CCTF Task Force on the redefinition of the second

- pursues and frames its activities and the debate to converge towards a proposal for the new definition of the second to be presented at the 29th meeting of the CGPM (2030),
- promotes and support the coordination of NMIs to engage, to the best effort level, in OFS comparison campaigns and in further OFS contributions to the calibration of TAI with the objective of mitigating current criticalities for the fulfilment of some mandatory criteria,
- valorizes the institutes progress and achievements for the scientific and technological developments underpinning the redefinition,
- pursues its activities on education and communication to help the understanding and the adoption of the new definition.