



## Development of roadmaps of the Consultative Committee for Time and Frequency for a redefinition of the second and for a continuous timescale UTC

E. Peik

PTB, 38116 Braunschweig, Germany

Email: ekkehard.peik@ptb.de

on behalf of the CCTF Strategic Working Group extended to the Co-Chairs of the additional ad hoc CCTF groups

### Abstract

The current activities of the Consultative Committee on Time and Frequency that may have an impact on Radio Science are reported.

### 1. Introduction

In the last two years the Consultative Committee for Time and Frequency (CCTF) is concentrating the activity on four topics that are considered important for the development of time and frequency metrology and for different applications including Radio Sciences.

These are:

1. Updating the Roadmap for the redefinition of the second
2. Leap seconds in UTC - building a consensus for a continuous timescale
3. Promoting the mutual benefit of UTC and GNSS
4. Capacity building by sharing resources to improve international timekeeping

The main activity of the CCTF together with the way forward identified on each topic will be reported to allow the URSI community to be informed and take part in the discussion.

### 2. Work in progress

The CCTF has created ad hoc task forces and task groups to deal with each hot topic. More than 60 people from national metrology institutes (NMI) and time laboratories are collaborating to progress on these topics.

The 22nd CCTF (1st session) was held online in October 2020. The topics were illustrated [1], followed by a survey carried out online that collected more than 200 responses. The 22nd CCTF (2nd session) was held online in March 2021 to examine the received feedback and discuss future roadmaps.

On the first two topics dedicated roadmaps have been agreed and they will be presented to the next Conference General des Poids et Mesures (CGPM) in November 2022.

The roadmap for the redefinition of the second has been updated after the first version of 2016. The CCTF has envisaged three possible scenarios for the redefinition of the second, illustrated in Fig. 1. The CCTF will propose to the CGPM 2022 to concentrate on scenario 2 leading to a new definition of the SI second in 2030 if the mandatory criteria are fulfilled. The mandatory criteria and the current status of fulfillment will be illustrated.

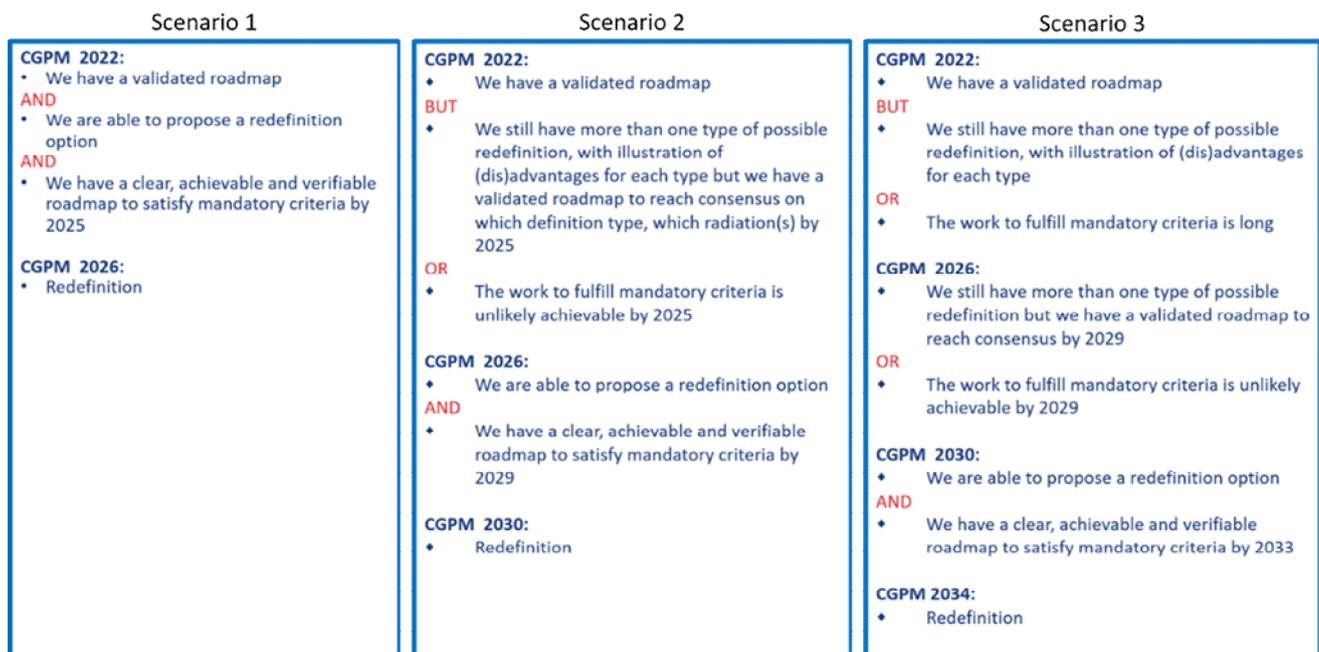
The need for a continuous UTC in many different applications from navigation satellite systems to the modern digital networks has been deeply examined leading to the conclusion that the tolerance with respect to the Earth rotational angle should be expanded, ensuring UTC is continuous at least for the next century. This topic is also under evaluation by the International Telecommunication Union – Radiocommunication in close cooperation with the BIPM. A roadmap based on different options was discussed at the CCTF and will be illustrated.

The third topic aims to improve the collaboration with the providers and users of GNSS highlighting the mutual benefits for navigation and time metrology in applications such as time transfer, interoperability, and traceability to UTC through the GNSS broadcast information.

The fourth topic aims to help the UTC community to grow taking advantage of the capacity already developed in some laboratories that could be shared for the improvement of all the local UTC(k) realizations, realizing that a better UTC(k) results in higher quality contributions to the BIPM and, therefore, a better UTC.

### 3. Conclusion

The CCTF ad hoc working groups are working towards progress in four areas related to the time and frequency metrology that could have an impact on Radio Science. The identified way forward and the current status of the accomplishment will be reported.



**Figure 1.** Three possible scenarios for the options and timeline towards a new definition of the SI second.

## Acknowledgements

The CCTF Strategic WG extended to the Co-Chairs of the additional ad hoc CCTF groups is formed by:

Noël Dimarcq, Andreas Bauch, Sebastien Bize, Davide Calonico, Pascale Defraigne, Miho Fujeda, Marina Gertsvolf, Yuko Hanado, Tetsuya Ido, Judah Levine, Chris Mathee, Gaetano Mileti, Chris Oates, Ekkehard Peik, Carsten Rieck, Stefan Weyers, Frédéric Meynadier, Gianna Panfilo, Gerard Petit, and Patrizia Tavella. The contributions of all the colleagues and the great support to this work is kindly acknowledged.

## References

- [1] <https://www.bipm.org/en/committees/cc/cctf/22-1-2020> and [https://www.youtube.com/playlist?list=PL-vj-3\\_a7wTBb7CKy-ckmZM8L6K3hipR5](https://www.youtube.com/playlist?list=PL-vj-3_a7wTBb7CKy-ckmZM8L6K3hipR5)