

Liaison with the Consultative Committee for Time and Frequency

Quadriennial report 2019-2023

Claude Boucher, Felix Perosanz
IUGG representatives to the CCTF

The Consultative Committee for Time and Frequency (CCTF) is one of the consultative committees of the International Committee for Weights and Measurements (CIPM). Its domain includes all aspects related to time and frequency.

In addition to national delegates, CCTF members include representatives of some international organizations. This is the case of IUGG, as well as the International Astronomical Union (IAU) and the International Union for Radio-Sciences (URSI).

Presently the IUGG representatives to CCTF are Claude Boucher (France) and Felix Perosanz (France), both acting as IUGG liaisons.

Meetings

The following meetings were held during the 2019-2023 period:

24rd meeting of the Consultative Committee for Units (CCU), 8-9 October 2019

Claude Boucher attended this meeting devoted to general issues related to units, to which CCTF among other consultative committees reported.

22th meeting of CCTF, 28-29 October 2020, 11-12 and 18-19 March 2021

The meeting was organized using videoconference into three parts. The agenda is given in annex 1.

Among outputs of these meetings, a wide survey of the community, and especially international organizations in liaison with CCTF, was implemented on the following matters:

- Redefinition of the second
- Leap seconds in UTC
- Mutual benefits between UTC and GNSS

23th meeting of CCTF, 29 June-1st July 2022

Agenda in annex 2.

A report was required for each international liaison. The report for IUGG is also given in annex 3.

Major topics of interest for IUGG

UTC

This is a long term topic of discussion within the International Union of Telecommunications. The redefinition of UTC is in progress towards a solution which will abandon leap seconds.

ITRS

The **General Conference for Weights and Measures** (Conférence Générale des Poids et Mesures, **CGPM**) in 2011, considering the significant and increasing number of Global Navigation Satellite Systems (GNSS), that the proliferation of time and geodesy reference systems in use in these navigation systems creates ambiguities for users, rendering their interoperability more difficult; and considering that the adoption of a common reference system is beneficial for users, adopted a resolution recommending that “the ITRS, as defined by the International Union of Geodesy and Geophysics (IUGG) and realized by the International Earth Rotation and Reference Systems Service (IERS), be adopted as the unique international reference system for terrestrial reference frames for all metrological applications”. (Resolution 9, 24th CGPM, 2011)

Following this view, the involvement of the metrology community was rediscussed during the 20th CCTF meeting at point 10.2. Since that, no new action was decided by BIPM about this issue.

Relativistic geodesy

During the previous period, a Joint Working Group between BIPM and IAG was established, JWG 2.3 ‘Relativistic geodesy: First steps towards a new geodetic technique’, chaired by Jakob Flury (Germany) and co-chaired by Gerard Petit (BIPM); This group was modified for this period as a working group (Q3) of the IAG Project QuGe on Quantum Geodesy. Major topic of interest in liaison with CCTF is the proper relativistic modeling of clocks, in particular the optical ones. Claude Boucher is member of this working group, now co-chaired by Jacob Flury and Pacome Delva (France).

Redefinition of the second

This redefinition using an optical frequency in place of the cesium is in progress. For users, such as IUGG members, this implies a potential gain of two orders of magnitude in the accuracy of measurements based on time and frequency.

Annex 1 Agenda of CCTF 22



22nd Meeting of the Consultative Committee for Time and Frequency Session II, BIPM, March 11-12 and 18-19, 2021 by videoconference

Agenda

First day 2-hour session on March 11,

UTC h 12.00 -14.00

12.00 – 12.30	Welcome, tour de table, introduction, ad memoriam	(N.Dimarco, CIPM)
12.30 – 12.45	Report of the BIPM Time Department	(P.Tavella, BIPM)
12.45 – 13.25	Task Force on Updating the Roadmap for the redefinition of second: <i>SG C - TF Dissemination and time scales</i>	(D Calonico INRIM, T. Ido NICT)
	Q&A	
13.25 – 13.45	Report from CCTF WG TWSTFT (V. Zhang NIST) and WG ATFT (D. Calonico, INRIM)	
13.45 – 14.00	Q&A, virtual Photo - end of first day	

Second day 2-hour session on March 12,

UTC h 12.00 -14.00

12.00 – 12.10	Introduction	(N.Dimarco, CIPM)
12.10 – 13.30	Task Force on Updating the Roadmap for the redefinition of second: <i>SG A - Request from user communities, NMIs, and Liaisons</i>	(M. Gertsolf NRC, G. Miletì Uni Neuchâtel)
	Q&A	
	<i>SG B - Atomic frequency standards, and possible redefinition approaches</i>	(S. Bize SYRTE, E. Peik PTB, C. Oates NIST)
	Q&A	
13.30 – 13.45	<i>Criteria for the redefinition</i>	(N.Dimarco, CIPM)
13.45 – 14.00	Q&A - end of second day	

Third day 2-hour session on March 18,

UTC h 12.00 -14.00

12.00 - 12.10	Introduction	(N.Dimarco, CIPM)
12.10 - 12.50	Leap seconds in UTC and building a consensus for a continuous timescale (J. Levine NIST, P. Tavella BIPM)	
	Q&A	
12.50 - 13.30	Promoting the mutual benefit of UTC and GNSS (P. Defraigne ORB, A. Bauch PTB)	
	Q&A	
13.30 - 13.50	Report from WG GNSS (P. Defraigne, ORB) and WG MRA (C. Matthee, NMISA)	
13.50 - 14.00	Q&A - end of third day	

Fourth day 2-hour session on March 19,

UTC h 12.00 -14.00

12.00 - 12.10	Introduction	(N.Dimarco, CIPM)
12.10 - 12.40	Capacity building activities to ensure the best performance of the global network of NMIs in producing UTC (M. Gertsvolf NRC, Y. Hanado, NICT)	
	Q&A	
12.40 - 13.20	Report from WG TAI (M. Gertsvolf NRC), WG Algorithms (Y. Hanado NICT), Joint CCL-CCTF FS (S. Bize SYRTE), WG PSFS (S. Weyers PTB)	
	Q&A	
13.20 - 14.00	Discussion and final CCTF recommendations Conclusion way forward, plans for 2022	

Annex 2 Agenda for CCTF 23



23rd Meeting of the Consultative Committee for Time and Frequency 29 June - 1 July, 2022 online

Draft agenda (June 14, 2022)

First day 2-hour session on June 29, videoconference

*UTC*h 12.00 -14.00

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| 12.00 – 12.15 | Opening of the meeting, tour de table, appointment of a rapporteur (N.Dimarco, CIPM) |
| 12.15 – 12.30 | CCTF activity and achievements , (N.Dimarco, CIPM) |
| 12.30 – 13.30 | Task Force on Updating the Roadmap for the redefinition of second and Introduction (N.Dimarco, CIPM), criteria, fulfilment level <ol style="list-style-type: none"><i>Request from user communities, NMIs, and Liaisons</i> (M. Gertsolf, NRC; G. Mileti, Uni Neuchatel)<i>Atomic frequency standards, and possible redefinition approaches</i> (S. Bize, SYRTE; E. Peik, PTB; C. Oates, NIST)<i>TF Dissemination and time scales</i> (D Calonico, INRIM; T. Ido NICT) Q&A |
| 13.30 – 13.50 | Report from Joint CCL-CCTF FS (S. Bize SYRTE), WG PSFS (S. Weyers PTB) |
| 13.50 – 14.00 | Virtual Photo - end of first day |

Second day 2-hour session on June 30, videoconference

*UTC*h 12.00 -14.00

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| 12.00 – 12.05 | Opening of the meeting |
| 12.05 – 12.30 | Leap seconds in UTC and building a consensus for a continuous timescale CGPM draft resolution D (J. Levine, NIST, P. Tavella, BIPM),
Q&A |
| 12.30 – 12.40 | Sharing resources to improve international timekeeping (M. Gertsolf NRC, Y. Hanado, NICT),
Q&A |
| 12.40 – 13.25 | Report from WG TAI (M. Gertsolf NRC), WG Algorithms (Y. Hanado NICT), WG TWSTFT (C. Rieck, RISE, M. Fujeda, NICT), WG ATFT (D. Calonico, INRIM) |
| 13.25 – 13.50 | Report of the BIPM Time Department I (P.Tavella, BIPM) |
| 13.50 – 14.00 | actions for the final day |

Third day 2-hour session on July 1, videoconference

UTC h 12.00 -14.00

12.00 - 12.05	Opening of the meeting
12.05 - 12.30	Promoting the mutual benefit of UTC and GNSS (P. Defraigne, ORB; A. Bauch, PTB), Q&A
12.30 - 12.55	Report from WG GNSS (P. Defraigne, ORB) and WG MRA (C. Matthee, NMISA)
12.55 - 13.10	Report of the BIPM Time Department II (P. Tavella, BIPM)
13.10 - 13.25	Discussion and final CCTF recommendations
13.25 - 13.55	Guidelines for the CCTF strategy doc update , plan for the next years, WG organization (N. Dimarcq, CIPM)
13.50 - 14.00	Conclusion way forward, plans for next CCTF 2024/ 2025

Annex 3 Report to CCTF 23



23rd CCTF March 2022

June 29 2022

International Union of Geodesy and Geophysics (IUGG) REPORT of ACTIVITY

1 Report on the main recent activities related to CCTF domain

1.1 Brief description of the Liaison

The liaison to CCTF is ensured as one of the various liaisons that IUGG has established with multiple international organizations, intergovernmental or not. The liaison is presently ensured by two IUGG representatives, Claude Boucher (France) and Felix Perosanz (France)

1.2 Liaison and its Stakeholder needs, interests, and activities in TF

IUGG is a complex organization including commissions, services and 8 thematic associations. All stakeholders have common interest for the following issues relevant to CCTF:

- Use of time scales either for time tagging measurements or observations, or for time parameter in models
- Use of most precise definition of the second regarding the quality of quantum sensors

Three stakeholders currently have a specific relation with TF activities:

- The “Novel sensors and quantum technology for geodesy (QuGe)” Project of the International association of geodesy (IAG)
- The International Earth and Reference systems Service (IERS)
- The International GNSS Service (IGS)

IGS has presently a direct liaison with CCTF.

Major topics of interest of IUGG stakeholders related to CCTF activities:

- ITRS

The adoption of ITRS as recommended terrestrial system by the metrological community was highly appreciated

- UTC

Previous reports of IUGG already recommended the abandon of the leap second in order to give full continuity to the UTC time scale

- New definition of the second

IUGG is in favour of the principle of this adoption which will significantly improve both precision and accuracy of any kind of measurement, thanks to the newly adopted SI system of units

1.3 Future liaison activities or projects related to TF

The increased contribution of the IAG QuGe project members is stimulated, specifically regarding the redefinition of the second.

2 Feedback on the CCTF roadmaps and the hot topics

2.1 Specific needs of the Liaison from the CCTF and TF community related to the practical implementation of CGPM Draft Resolution E (future re-definition of the second)

Approuval of the general roadmap

2.2 Specific needs of the Liaison from the CCTF and TF community related to the practical implementation of the CGPM Draft Resolution D (Use and future development of UTC)

Support of the CCTF proposals

3 Suggestions from the Liaison to the CCTF and BIPM

4 References