

**Recommendation for Committee Decision (WG-D#16-B)**

**Prepared by:** Working Group D

**Date of Submission:** 10 November 2016 (REVISED 12 November 2012)

**Issue Title:** Information on the works related to the proposed redefinition of UTC (revision of Recommendation 16 (2012), revised as 16-1 in 2013)

**Background/Brief Description of the Issue:**

Considering that:

- the navigation systems have unique timing and geodetic references for operational necessity. Interoperability of the GNSS requires interrelationship of the timing and geodetic references to reduce ambiguities for users with regard to the interpretation of navigation and timing solutions.
- discussion on redefinition of UTC started in 2000 at the ITU-R, SG7 Science Services WP7A Time Signals and Frequency Standard Emissions,
- during 2000-2010 WP7A studied the issue, considered different options, organized an open meeting (Torino, 2003), and worked on a proposal for an amended ITU recommendation,
- in 2010 the Draft Revision of Recommendation ITU-R TF.460-6 (new proposed version) was submitted by ITU-R WP7A to ITU-R SG7; while considering this issue at SG7 no consensus on the Draft Revision of Recommendation ITU-R TF.460-6 was achieved,
- the SG7 sent the Draft Revision of Recommendation ITU-R TF.460-6 to the Radiocommunication Assembly 2012 (RA -12) for « final decision »,
- at RA-12 after several statements of Administrations and Sector members supporting different views the Chairman stated that there are almost even balance between those administrations that are in favour of the draft revision of the Recommendation, those that are opposing it, and a third group of administrations who indicated that as they had not participated actively at SG7 and WP7A meetings, more information is required to enable them to form an opinion,
- as a result RA-12 decided to address this issue in the RA-12 Report for World Radiocommunication Conference 2012 (WRC-12) to develop a new WRC-15 Agenda item.
- WRC-12 started a new study question on WRC-15 Agenda item 1.14 in accordance with Resolution 653 (WRC-12) and put back the Draft Revision of Recommendation ITU-R TF.460-6 to SG7-WP7A for a final decision at WRC-15,

- WRC-12 Resolution 653 on the feasibility of a continuous UTC involves the BIPM, CCTF, CGPM, IAU, IUGG, URSI, ICAO, IMO, WMO, ISO, and invites to consider the feasibility of achieving a continuous reference time-scale, whether by the modification of UTC or some other method, and take appropriate action, taking into account ITU-R studies,
- WRC-15 recognized the roles of the BIPM and ITU concerning time scales definition and maintenance and their dissemination, invited the various organizations to cooperate for developing studies on the present and potential future reference time scales and submit contributions to WRC-23 and decided that until WRC-23 Rec. 460-6 will continue to apply.

**Recommendation of Committee Action:**

*It is recommended that the ICG monitors the ongoing development of the proposed redefinition of UTC and that reports be presented until a decision is made at WRC-23.*

**Recommendation for Committee Decision (WG-D#20-A)**

**Prepared by:** Working Group D

**Date of Submission:** 10 November 2016 (REVISED 12 November 2013)

**Issue Title:** BIPM publication of [UTC – GNSS times] and [UTC – UTC (k)<sub>GNSS</sub>] (revision of Recommendation 20 adopted in 2013)

**Background/Brief Description of the Issue:**

Considering that

- Coordinated Universal Time UTC is the sole international reference time scale,
- That GNSS times are constraint to keep within specified offsets from UTC(k),
- That GNSS broadcast a prediction of UTC(k) namely *UTC (k)<sub>GNSS</sub>*.

Noting that

- the BIPM has been publishing in its monthly *Circular T* for over 25 years daily values of [UTC – GNSS times] and more recently also of [UTC – UTC (k)<sub>GNSS</sub>],
- This information is useful to users of GNSS services, but also to GNSS systems to assess the quality and interoperability of their systems.

**Discussion/Analyses:**

The monitoring of the values of [UTC – GNSS times] and [UTC – UTC (k)<sub>GNSS</sub>] serves to a better coordination of the various GNSS and to provide a better time service to users.

The procedure for calculation of these values is provided in the explanatory supplement of *BIPM Circular T*.

**Recommendation of Committee Action:**

*The ICG WG-D recommends that the BIPM continues the regular provision of the values of [UTC – GNSS times] and [UTC – UTC (k)<sub>GNSS</sub>] and extends them to other GNSS, in particular Galileo and BeiDou.*

**Recommendation for Committee Decision (#21-A)**

**Prepared by:** Working Group D

**Date of Submission:** 10 November 2016 (REVISED 13 November 2013)

**Issue Title:** On the monitoring of offsets between GNSS times (revision of Recommendation 21 adopted in 2013)

**Background/Brief Description of the Issue:**

Offsets between GNSS times are important information for GNSS users. Monitoring of the offsets between GNSS times and provision of consistent broadcast information are essential to improve interoperability and combined navigation using multiple GNSS.

**Discussion/Analyses:**

Information of the differences between the GNSS times is the basis of interoperability and combined application of the various GNSS systems. Every GNSS system has its own time system and they are different. The time offsets between different GNSS could be measured continuously by GNSS timing receivers, could be obtained by direct time comparison link or computed from a common reference. The monitoring and broadcast of GNSS time offsets are technically possible and will benefit GNSS providers and users.

The time offset between GPS and Galileo (GGTO) is currently being monitored and is planned to be broadcast in their navigation messages. The time offset parameters of BDT relative to the other three GNSS times have been designed in BeiDou navigation messages and the relevant experiments of monitoring and prediction have been implemented.

In order to improve the monitoring of offsets between GNSS times, the different GNSS should work for reaching consistency in the procedures for monitoring and broadcasting the GNSS time offsets.

**Recommendation of Committee Action:**

- 1. GNSS Providers should consider monitoring of offsets between GNSS times and implement the broadcast of this information in the navigation messages.*
- 2. GNSS Providers are encouraged to undertake studies on possible approaches for giving information on the offsets between GNSS times.*
- 3. In order to improve consistency of offsets between GNSS times broadcast by the various systems, GNSS Providers should discuss on the adoption of the same or similar models.*
- 4. In order to promote GNSS compatibility and interoperability, GNSS time relevant organizations actively develop methods to monitor the offsets between GNSS times and share the monitoring data and relevant research results.*