THE FUTURE OF THE UTC TIME SCALE

10th Meeting of Laboratories contributing to TAI
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The Future of The UTC Time Scale

Question ITU-R 236/7
(2000)

1. What are the requirements for globally-accepted time scales for use both in navigation and telecommunications systems, and for civil time-keeping?
    - Accuracy, Stability, Based on the SI Second
    - Uniformity, Accessibility
    - Reliability
    - Availability
    - Civil / National Timekeeping

2. What are the present and future requirements for the tolerance limit between UTC and UT1?
    - |UT1 – UTC| Tolerance of 0.9 seconds
    - Could a Greater Tolerance be Accommodated?

3. Does the current leap second procedure satisfy user needs, or should an alternative procedure be developed?
    - Availability of Leap Second Information for Users
    - Alternatives Used (Establishing System Independent Time)
    - Relationship of Telecom & NAVSAT System Internal Time to Time Scales

ITU-R TF.460-6 STANDARD-FREQUENCY AND TIME-SIGNAL EMISSIONS
(1970-1974-1978-1982-1986-1997-2002)

To maintain worldwide coordination of standard frequency and time signals

Disseminate standard frequency and time signals in conformity with the SI second

Continuing need for UT immediate availability to an uncertainty of 0.1 second

All standard-frequency and time-signal emissions conform as closely as possible to UTC

Time signals should not deviate from UTC by more than 1 ms; that the standard frequencies should not deviate by more than 1 part in 10^{10}

TAI - International reference timescale of atomic time based on SI second as realized on a rotating geoid. Continuous scale from origin 1 Jan 1958

UTC - Basis of coordinated dissemination of standard frequency and time signals. Corresponds exactly in rate with TAI but differs by integral number of seconds. UTC scale adjusted by insertion or deletion of seconds to ensure agreement with UT1

DUT1 - Dissemination to include *predicted difference* UT1 – UTC (values given by IERS in integral multiples of 0.1 s)

Leaps Seconds may be introduced as the last second of a UTC month December and June Preferred, March and September second choice

RA and WRC-12 Results

- UTC as defined in ITU-R TF460 is incorporated into the Radio Regulations by reference.
- Proposed Modification to ITU-R TF460-6 discussed at Radiocommunication Assembly and forwarded to World Radiocommunication Conference (WRC-12)
- WRC-12 decision contained in Resolution 653 which invited further study to be reported on the agenda for its next meeting in 2015

Resolution 653 recognized "that a change in the reference time-scale may have operational and therefore economic consequences" and invited ITU-R "to study issues related to the possible implementation of a continuous reference time-scale (including technical and operational factors)"

Agenda item 1.14 : "to consider the feasibility of achieving a continuous reference time-scale, whether by the modification of coordinated universal time (UTC) or some other method, and take appropriate action, in accordance with Resolution 653"

WRC-12 Actions

Resolution 653 calls for notification of other organizations of Agenda item 1.14 (CGPM, CCTF, BIPM, IERS, BIPM and others)

Director of Radiocommunications Bureau to include presentation on the topic in Radiocommunications World Seminars

Topic to be included in regional seminar being held in Ecuador (2012) and other international forums

A Workshop on the Future of the UTC Time Scale co-hosted by the ITU-R and BIPM was help at the ITU in Geneva in 2013 (Presentations available on ITU Website http://www.itu.int/ITU-R/go/itu-bipm-workshop-13

Invited administrations to participate in studies by submitting contributions to ITU-R

WRC-15 Preparation

Conference Preparatory Meetings (CPM) are held to compile final text for WRC agenda items

CPM 15-1 (20-21 February 2012) begin the process

- **Designated ITU-R Working Party 7A as the responsible group to prepare text**

Working Party 7A to conduct further studies into:

- **Feasibility of achieving a continuous reference time-scale for dissemination by radiocommunication systems**
- **Issues related to possible implementation of a continuous reference time-scale including technical and operational factors**

Working Party 7A prepared CPM Text for Agenda Item 1.14

CPM 15-2 (23 March – 2 April 2015) Compiled final report CPM Text for WRC-15

CPM TEXT PREPARATION

Working Party 7A exhausted technical considerations and studies

Surveys requested data from administrations on Leap Second Events

Two requests were made

Response from International groups, IUGG, IAU, IERS, URSI, IEC and ISO was mixed.

Consensus not reached on other than technical grounds

WRC-15 AGENDA ITEM 1.14

Methods to Satisfy the Agenda Item

Method A – Discontinue Leap Seconds Not earlier that 5 years after date of entry of Final Acts of WRC (with and without change of Name)

Method B - Retain UTC as currently defined and introduce a continuous reference atomic time-scale based on TAI with an offset with respect to UTC to be broadcasted on an equal basis.

Method C- No change in definition of UTC as specified in Recommendation ITU-R TF.460-6, which will remain the only time-scale which is broadcast in order to avoid any confusion. Clarification/defintion of method to derive TAI from UTC be established.

Method D -No change to the Radio Regulations as the results of studies are inconclusive.