International Telecommunication Union – Radiocommunication Sector (ITU-R)

24th Meeting of the CCU
Redefinition of the Second
9 October 2019

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Chairman, ITU-R Working Party 7A
ITU-R Radiocommunications Study Groups

- To determine a ITU-R position on Possible Redefinition of the Second
  the technical aspects and impacts need to be studied and considered
  by the Participating Member States

- The ITU-R Study Groups develop the technical basis for decisions taken
  at World Radiocommunication Conferences and develop global
  standards (Recommendations), Reports and Handbooks on
  radiocommunication matters.

- There are seven Study Groups and the Responsible Group is Study
  Group 7, Science Services

- Within Study Group7, Working Party 7A deals with Broadcast
  Frequency and Time Signals Services
ITU-R Study Group 7 Science Services

Working Party 7A, Frequency and Time Signals Services

Responsible for Standard Frequency and Time Signal (STFS) services, both terrestrial and satellite.

Scope includes the dissemination, reception and exchange of STFS services and coordination of these services, including satellite techniques, on a worldwide basis.

Goals are to develop and maintain ITU-R Recommendations in the TF Series and Handbooks relevant to SFTS activities, covering the fundamentals of the SFTS generation, measurements and data processing. These ITU-R Recommendations are of paramount importance to telecommunication administrations and industry, to which they are first directed. They also have important consequences for other fields, such as radio navigation, electric power generation, space technology, scientific and metrological activities and cover the following topics:

- Terrestrial SFTS transmissions, including HF, VHF, UHF broadcasts; television broadcasts; microwave link; coaxial and optical cables;
- Space-based SFTS transmissions, including navigation satellites; communication satellites; meteorological satellites;
- Time and frequency technology, including frequency standards and clocks; measurement systems; performance characterization; timing interface standards; time scales; time codes
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Establish Basis for Reports, Recommendations and Handbooks
The Consultative Committee for Time and Frequency (CCTF) has concerns to raise since the ITU-R is responsible for the Definition of UTC.

Issues were raised in the CCTF concerning discontinuities in UTC creating problems in coordinating telecommunications systems.

Time as used in navigation satellite and telecommunications systems could possibly lead to multiple independent timekeeping systems (e.g. GPS Time) vice UTC.

Difficulties in computer systems and networks to adjust for time steps or leap seconds.

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 between UTC and UT1?
   - $|\text{UT1} - \text{UTC}|$ 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
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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

**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
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Current WP 7A Activities


Preparing a report summarizing technical studies and analyses related to Time-Scale determination and distribution applications to provide supporting technical information in depth to support proposals to be submitted to WRC-23.

This Technical Report will discuss technical aspects of time-scale realization and applications to support proposals for future systems, and provide detailed information for WRC decisions.
Content and structure of time signals to be disseminated by radiocommunication systems and various aspects of current and potential future reference time scales, including their impacts and applications in radiocommunication

1 Introduction
2 Background
   2.1 The origins of UTC
   2.2 Organizations responsible for UTC
   2.3 Other organizations associated with time scales and related standards
3 Description of current and potential future reference time-scales
4 Synchronization and dissemination of time signals via radiocommunication systems
5 Use of UTC in radiocommunication services and other applications
6 Impact of using UTC on radiocommunication services and other applications
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   6.7 Impact on the maritime mobile service, including global maritime distress and safety service (GMDSS), aeronautical mobile service and radiodetermination service
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   6.9 Impact on other applications
7 Summary of results
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