RADIOCOMMUNICATION
STUDY GROUPS

THE FUTURE OF UTC

Working Group of Labs Contributing to TAI

BIPM

12 & 13 September 2006

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Chairman, ITU-R Working Party 7A

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RECENT EVENTS

Events Since Special Rapporteur Group Report To 16th CCTF Concerning Possible Transition of UTC

WP7A In Considering Contributions Submitted On The Definition Of UTC Agreed Additional Information Desirable

Letter From Director, ITU-R Requesting Information On Experiences With Leap Second Of 30 December 2005 Sent To Sector Members , Twelve International Bodies, And Posted On Websites Of Several International Organizations

Responses Complied And Included In SRG Final Report

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ITU-R Working Party 7A

Special Rapporteur Working Group on UTC

- Formed in 2000 to focus studies on definition and uses of UTC
- Addressed relevant issues:
  - Proliferation of Ad Hoc system time as Time Scales (e.g. GPS Time)
  - Use of TAI
  - Interfacing Multiple systems with different time scales
- Special Colloquium on UTC
- Prepared Draft Transition Plan for Consideration
- Compiled Response to request for Leap Second experiences
- Compiled Final Report for publication on ITU-R Web Site
- Purpose Accomplished and Dissolved September 2006

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Request for Leap Second Experiences

Ten Responses Compiled with Additional Materials and Submitted by the SRG

- **Six from Timing Laboratories**
- **Two from Satellite Agencies**
- **Letter from IAU and IVS**

Additional Materials

- **Informal Response**
- **Draft Report from Internet Engineering Task Force**
- **Two Notices Concerning AIS Receivers**

Three Responses Only Indicated Satisfaction With Present UTC System.

Minor Problems Reported On GPS Driven Equipment, NTP Time Servers and Related Networking Equipment

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Leap Second Experience Results

Responses from Timing Centers indicated No (or Few) Problems

Current Systems Use Time Scale in "Real time"

Media Attention Highlights Confusion in General Public on Time Scales in Use and Their Purpose

- **Purpose and Utility of UTC has become unclear**
- **Approximation/Equality with UT1 (Solar Time)**
- **Basis for Legal Time ?**

Lack of Uniformity in Accommodating Leap Seconds

- **Such As, Changing Time Interval Around Leap Second**

Of Note was Absence of Galileo Response or Contribution

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WP7A Considerations

Confirmed Adoption of a Change in the Definition of UTC (Proposed by ITU Member State) Would Need Acceptance at World Radio Conference

Adequate Clarifying Information should be Prepared and Available for WRC Participants

- **Information obtained through the SRG indicates majority of system operators are coping with time irregularities**
- **A change in realizing UTC would definitely ease use in many applications requiring a continuous time reference**

WP7A Decided At the 2006 meeting Further analysis and Dissemination of Information was Required before a Formal Recommendation could be Agreed

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Major Points for Clarification

Systems use of Internal Time Scales due to lack of standard continuous time scale

- **UTC is the only time realized in time laboratories and disseminated with time signals**
- **TAI is the basis for UTC and provides a frequency reference**

Introduction of new timescale could be very disruptive and confusing

- **UTC was intended to be Common Time for Broadcast Coordination**

Civil timekeeping and Realization of UT1 (Solar Time)

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The Way Ahead

Dissemination of Information on Consequences of Modifying UTC

Request Assistance of CCTF

- **Establishing How Leap Seconds are Accommodated**
- **Provide Clarification on Time Scales, Realization and Uses**
- **Clarification of the Dangers of Ad Hoc" System Time Scales?**

Clarify Relationship of UTC and Realization of UT1

- **Change in Definition of UT1 (ERA?)**

Impact of Radio-Communications Transition to Another Time Scale

Review of Standards for Timing Systems and their Use

BACKUP

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Question on
The Future of the UTC Time Scale

1. What are the requirements for globally-accepted time scales for use both in navigation and telecommunications systems, and for civil time-keeping?

2. What are the present and future requirements for the tolerance limit between UTC and UT1?

3. Does the current leap second procedure satisfy user needs, or should an alternative procedure be developed?

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RECOMMENDATION 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 immediately 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