

A: UNIVERSAL TIME SCALE (UTC)

Question: What does UTC stand for and what does it mean?

Coordinated Universal Time (UTC) is the primary time standard or international time scale by which the world regulates clocks and time.

The international time scale used by distributed services throughout the world known as **Coordinated Universal Time (UTC)** is a stepped atomic time scale, as defined by the [ITU](#) and determined by the International Bureau of Weights and Measures ([BIPM](#)) in cooperation with the International Earth reference and Rotation Service ([IERS](#))

Question: What is the Vocabulary of terms for UTC?

This Vocabulary is defined in **Recommendation [ITU-R TF.460-6](#)** : Standard-frequency and time-signal emissions. This version of the Recommendation has regulatory status as it is incorporated by reference in the [Radio Regulations](#).

Universal time (UT) is the general designation of time scales based on the rotation of the Earth.

In applications in which an imprecision of a few hundredths of a second cannot be tolerated, it is necessary to specify the form of UT which should be used:

- UT0 is the mean solar time of the prime meridian obtained from direct astronomical observation;
- UT1 is UT0 corrected for the effects of small movements of the Earth relative to the axis of rotation (polar variation); it corresponds directly with the angular position of the Earth around its axis of diurnal rotation.
- UT2 is UT1 corrected for the effects of a small seasonal fluctuation in the rate of rotation of the Earth;

International atomic time (TAI)

The international reference scale of atomic time (TAI), based on the second (SI), as realized on the rotating geoid, is formed by the [BIPM](#) on the basis of clock data supplied by cooperating establishments. It is in the form of a continuous scale, e.g. in days, hours, minutes and seconds from the origin 1 January 1958 (adopted by the CGPM 1971).



ITU-R FAQ on UNIVERSAL TIME SCALE (UTC) – LEAP SECOND

Coordinated universal time (UTC)

UTC is the time-scale maintained by the [BIPM](#), with assistance from the [IERS](#), which forms the basis of a coordinated dissemination of standard frequencies and time signals. It corresponds exactly in rate with TAI but differs from it by an integer number of seconds.

The UTC scale is adjusted by the insertion or deletion of seconds (positive or negative leap-seconds) to ensure approximate agreement with UT1.

ITU-R Recommendations on 'Time signals and frequency standards emissions' can be found [here](#).

B: THE LEAP SECOND

Question: What does the 'Leap Second' stand for and what does it mean?

Adjustments made in one second steps, known as 'leap seconds', have been implemented since 1972 to compensate for variations in the speed of the earth's rotation within the framework of Coordinated Universal Time (UTC).

UTC is defined by [ITU](#) and is maintained by the International Bureau of Weights and Measures ([BIPM](#)) in cooperation with the International Earth Rotation and Reference Systems Service ([IERS](#)). Measurements from timing centres around the world are used in the determination of UTC, which is adjusted to within 0.9 seconds of Earth rotation time (UT1) by IERS-determined values of the Earth's rotation.

The suppression of the leap second would make a continuous time scale available for all modern electronic navigation and computerized systems to operate with and eliminate the need for specialized ad hoc time systems.

For more information on the 'Leap Second' please see the following interviews by [Vincent MEENS](#), Chairman, [ITU-R Study Group 7](#):

['ITU Notification of 30 June 2015 Leap Second'](#) and ['ITU Newslog on 'The Leap Second'](#) - <http://newslog.itu.int/archives/988>

ITU INTERVIEWS @ RA-12: ['The Leap Second'](#) - http://www.youtube.com/watch?v=RtxIVoo_5I0&list=PLE917DC934F8E41DD&index=12

['Future of the International Time Scale'](#) - <http://www.youtube.com/watch?v=PEU3XhXHG2I>



What are some of the different points of view of ITU member administrations for and against abolition of the Leap Second?

Over 500 participants from 102 countries attended the [ITU Radiocommunication Assembly \(RA-12\)](#) from 16 to 20 January 2012 in Geneva, Switzerland to deliberate on the issue of the Leap Second (amongst others) and decided to conduct further studies related to the development of a continuous time standard in order to address the concerns of countries that use the current system of the leap second in Coordinated Universal Time (UTC).

For more information regarding different points of view for and against abolition of the Leap Second, you may view the following ITU videos and articles:

The RA-12 Plenary Session discussions: ITU Video - RA-12 Plenary - 19th January 2012 – ‘The Leap Second’ - <http://www.youtube.com/watch?v=C-2UqYW9SEs&list=PLE917DC934F8E41DD&index=8>

and,

ITU INTERVIEWS @ RA-12: The Leap Second" by Mr. Vincent MEENS, Chairman, ITU-R Study Group 7-
http://www.youtube.com/watch?v=RtxlVoo_5I0&list=PLE917DC934F8E41DD&index=12

[ITU News Magazine](#) No. 7, September 2013 ‘The future of time – To abolish or not to abolish the leap second’.

Why did the ITU decide to postpone the decision on the ‘Leap Second’?

Source: ITU [Press Release](#) of 19 January 2012 - ‘ITU Radiocommunication Assembly defers decision to eliminate the leap second’.

The suppression of the leap second would make a continuous time scale available for all modern electronic navigation and computerized systems to operate with and eliminate the need for specialized ad hoc time systems.

This however may have social and legal consequences when the accumulated difference between UT1 – Earth rotation time – would reach a perceivable level (2 to 3 minutes in 2100 and about 30 minutes in 2700).

The [ITU Radiocommunication Assembly 2012 \(RA-12\)](#) reached an important decision to defer the development of a continuous time standard in order to address the concerns of countries that use the current system of the leap second in Coordinated Universal Time (UTC). This decision was reached to ensure that all the technical options have been fully addressed in further studies related to the issue. It



ITU-R FAQ on UNIVERSAL TIME SCALE (UTC) – LEAP SECOND

was necessary because the decision was not only of a technical nature but had some regulatory and legal consequences.

These studies will continue to involve further discussions within the ITU membership and with other organizations that have an interest in this matter.

C: ITU'S ROLE WITH UNIVERSAL TIME SCALE (UTC)

Question: Where are the studies on the Leap Second and UTC conducted in ITU?

The studies are conducted in [ITU-R Study Group 7 \(Science services\)](#) and its [Working Party 7A](#) (Time signals and frequency standard emissions).

Topics studied are provided in [Question \(SG07.236/7\)](#) 'The Future of the UTC Timescale' and the results of the studies are included in Recommendation [ITU-R TF.460-6](#) 'Standard-frequency and time-signal emissions'.

The framework for the consideration requested by the [World Radiocommunication Conference 2012 \(WRC-12\)](#) is provided in [Resolution 653](#) 'Future of the Coordinated Universal Time time-scale'.

The decision is expected to be taken at the World Radiocommunication Conference 2015 ([WRC-15](#)) in November 2015. The ITU Member States will formulate their proposals to [WRC-15](#) on the basis of the conclusions of the Studies undertaken by ITU-R.

Question: What Specifications for UTC are available in ITU-R Recommendations?

The procedures for maintaining the Coordinated Universal Time (UTC) time scale are described in [Recommendation ITU-R TF.460-6](#) on 'Standard-frequency and time-signal emissions'. Please note that this version of the Recommendation is given regulatory status by the fact that it is incorporated by reference in the Radio Regulations.

Since 2000, an [ITU-R Study Group 7 \(Science services\)](#) Question ([236/7](#)) on '[The Future of the UTC Timescale](#)', was established in the ITU Radiocommunication Sector. With a change to the definition of the UTC timescale there could be a major improvement in synchronization of communications networks, navigation systems and time distribution performance.



ITU-R FAQ on UNIVERSAL TIME SCALE (UTC) – LEAP SECOND

A proposed revision of [Recommendation ITU-R TF.460-6](#) that proposed changing from UTC to a continuous time scale did not result in consensus among the [ITU membership](#) in the last years. Finally, it was decided to send the text for consideration by the [ITU Radiocommunication Assembly 2012 \(RA-12\)](#). RA-12 decided to postpone a decision on this proposal and requested ITU-R to conduct further studies.

Question: When will a decision on the Leap Second, be addressed?

The conclusions of the above-mentioned studies within the ITU-R have been included in the ‘Draft CPM Report to WRC-15’ for consideration by Members States in their proposals to the [World Radiocommunication Conference 2015](#) (Geneva, 2 to 27 November 2015) WRC-15 [Agenda](#) item 1.14. [WRC-15](#) is expected to take a decision on the future of UTC.

The results of these studies will also be considered at the next Radiocommunication Assembly 2015 ([RA-15](#)), (Geneva, 26-30 October 2015) but no decision will be taken there.

Question: What is the future of the International Time Scale?

Please see the interview: ‘[Future of the International Time Scale](#)’ by Vincent Meens Chairman, [ITU-R Study Group 7](#) as he talks about the leap second and the proposed changes in discussion at the moment at the ITU - <http://www.youtube.com/watch?v=PEU3XhXHG2I>

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