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# **Naming of scientific concepts**

## **Requirements from international terminology standards**

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“Terminology and other Language and Content Resources”

# Agenda

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- Complementary role of standards bodies in various disciplines
- Consensus on importance of standards
- Standardization of terminology – a prerequisite for all standardization activities
- ISO requirement - Univocity – clarity of terms and their meaning
- ISO TC37 – a horizontal committee
- ITU terminology
- New or changed concept = new term
- ITU – recognize what you have already been doing and move forward

# Standards organizations working in tandem

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- The International Organization for Standardization develops international standards in all scientific, technical, and economic sectors
- Complementary to ISO
  - BIPM develops measurement standards
  - ITU develops ICT standards
  - IERS provides Earth orientation parameters
- Time measurement is one of the earliest activities subject to standardization

# BIPM and ISO

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- ISO participates in the Consultative Committee for Units (CCU), the Joint Committee for Guides in Metrology (JCGM), and the Joint Committee on Coordination of Assistance to Developing Countries in Metrology, Accreditation and Standardization (JCDCMAS).
- The BIPM has Liaison A status with the following ISO Committees:
  - **TC 12 (Quantities, units, symbols, conversion factors)**
  - TC 146 (Air quality), TC 146/SC 3 (Ambient atmospheres)
  - TC 212 (Clinical laboratory testing and in vitro diagnostic test systems)
  - TC 229 (Nanotechnologies)
  - CASCO (Committee on conformity assessment)
  - REMCO (Committee on reference materials).
- **ISO TC37 also has a Liaison A status with TC12 and with the ITU**

# Joint BIPM, OIML, ILAC and ISO Declaration on Metrological Traceability

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- International consistency and comparability of measurements are required
- Measurement comparability is an essential characteristic of an international measurement system within which measurement results can be universally accepted
- This international consistency and comparability can only be guaranteed if measurement results are traceable to internationally recognized references

# Prerequisites supporting the Joint Declaration

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- Scientific and technical concepts need to be absolutely clear in order to serve their purpose
- This property of clarity is called “univocity”
- Terms that denote scientific and technical concepts therefore must be “univocal”
- A term is “univocal” if it has *one and only one meaning*

# ISO/IEC Directives – Rules for the structure and drafting of international standards

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- The objective of standards is to define clear and unambiguous provisions in order to facilitate international trade and communication
- To achieve this objective, “uniformity of terminology shall be maintained”
- “The standardization of terms and definitions is fundamental to all standardization activities.”
- By definition, ALL standards bodies share this objective
- Requirements for documenting terminology in standards are stipulated in ISO 10241-1 - *Terminological entries in standards*
- 10241-1 is a normative reference in the ISO Directives

# ISO TC37

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- Scope: Standardization of principles, methods and applications relating to terminology
- TC37 is one of only 7 “horizontal committees” among ISO’s 285 TCs
  - [http://isostore.libnor.org/libnor/iso\\_committees\\_on\\_horizontal\\_subjects.pdf](http://isostore.libnor.org/libnor/iso_committees_on_horizontal_subjects.pdf)
  - ISO TC12 is also a horizontal committee
- “Consultation with these committees is advisable if you face difficulties in any of the relevant subject areas”
- In ISO, the application of ISO/TC 37’s rules is compulsory when dealing with terminology



# ISO 10241-1

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- A mandatory standard for all ISO standardization committees
- Stipulates normative provisions for standardization of terms and definitions, as specified in ISO 704
- Key requirement : Univocity
  - One designation corresponds to one concept (a term shall have only one meaning)
  - One concept corresponds to one designation (a concept shall be named by only one term)

# ITU has an established record of terminology standardization

- ITU maintains a terminology database
- It contains 123,417 terms in six languages
- Its purpose is to standardize terms and concepts
- ITU has therefore already demonstrated an awareness about the importance of terminology standards
- The terminology around time measurement is very complex and therefore requires special standardization effort

ITU-R	<a href="#">coordinated Universal Time</a> Recommended	<a href="#">توقيت عالمي منسق</a> Recommended	<a href="#">协调世界时</a> Recommended	<a href="#">tiempo universal coordinado</a> Recommended	<a href="#">temps universel coordonné</a> Recommended	<a href="#">всемирное координированное время</a> Recommended
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## Definition

English - [عربي](#) - [中文](#) - [Español](#) - [Français](#) - [Русский](#)

**Sector :** Radiocommunication (ITU-R) - Recommended

**Abbreviation :** UTC

**Term :** *coordinated Universal Time*

**Definition :** Rec. ITU-R V.573- 4 - The time scale, maintained by the BIPM and the International Earth Rotation Service (IERS), which forms the basis of a coordinated dissemination of standard frequencies and time signals. UTC corresponds exactly in rate with TAI, but differs from it by an integral number of seconds. RR - The UTC scale is adjusted by the insertion or deletion of seconds (positive or negative leap seconds) to ensure approximate agreement with UT1. Time scale, based on the second (SI), as defined in ITU-R Recommendation ITU-R TF.460-5. Rec. ITU-R TF. 460-5 - 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.

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**Source :** RR 1.14; RR 2004

**Publications :**

[Recommendation ITU-R M.493-12](#) (2007) - An. 1, § 8.1.3;

[Recommendation ITU-R TF.460-6](#) (2002) - cons. g);

[Recommendation ITU-R TF.686-2](#) (2002) - An. 1;

[Recommendation ITU-R V.573-4](#) (2000) - An. 1 (J06);

# Key meetings where naming the concept has been discussed

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- 2003. ITU-R international colloquium in Torino, Italy
  - <http://www.ucolick.org/~sla/leapsecs/torino/index.html>
- 2011. Colloquium Exploring Implications of Redefining UTC in Astrodynamics, Astronomy, Geodesy, Navigation, Remote Sensing and Related Fields, Exton, PA
  - <http://www.cacr.caltech.edu/futureofutc/2011/>
- 2012. Statement from ISO to ITU-R
- 2013. Colloquium - Requirements for UTC and Civil Timekeeping on Earth, Charlottesville, VA
  - <http://www.cacr.caltech.edu/futureofutc/index.html>

# ITU-R Colloquium in Torino, 2003

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A recommendation to change UTC was not reached. However, there was broad agreement that:

- If a broadcast time scale without leap seconds is to be adopted
  - The change should not take place until 2022
  - The new concept be given a new name
- “Temps International (TI)” was put forward as a possible new name (by E.F. Arias)

# UTC without leap seconds = new concept

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- “TI should be a continuous atomic time scale, without Leap Seconds, that is *synchronized with UTC* at the time of transition.”
- UTC without leap seconds is therefore a new concept that co-exists with “UTC” as is universally understood today
- When one term experiences a *shift in meaning*, it denotes two concepts simultaneously: the former and the latter. This is *polysemy*.

# “UTC” must avoid polysemy

- Polysemy undermines comprehension and is always a problem when precision of meaning is important, but it is even more problematic in highly-restricted and specialized domains *such as time measurement*.
- If UTC is redefined to remove leap seconds, the term is no longer univocal, but becomes **polysemic**
  1. “old UTC” = atomic time adjusted to UT1 to align with solar (earth rotation) time
  2. “new UTC” = ...

# UTC without leap seconds should not be called UTC

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- The name is no longer “transparent” because the concept is no longer connected to “universal time”, which is a measure of earth rotation.
- Unless explicitly stated, the precise meaning in a given context will be un-determinable
- All existing time measurement terms containing “UT” are based on astronomical time, (UT0, UT1, etc.), i.e. rotation of the earth
- A civil standard not tied to Earth rotation would be fundamentally different from existing and historical practice, and shall therefore omit any reference to “Universal Time” by title.



# The link between UTC and the notion of “universal time”

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By various resolutions of the ITU, CGPM, ISO, and IAU:

- The "Universal Day" is a mean solar day.
- "Universal Time" as a subdivision of the Universal Day.
- "Universal Time" is time based on rotation of the earth
- UTC without leap seconds would not be Universal Time.
- UTC provides mean solar time.
- The designation Universal Time (Coordinated), UTC, may be abbreviated to Universal Time, UT, thus indicating the expectation that UTC closely matches UT.
- UTC provides Universal Time, or mean solar time
- UTC is a form of Universal Time (UT)

Source: <http://www.ucolick.org/~sla/leapsecs/epochtime.html>

**ISO/TC 37 Terminology and other language and content resources**



# Legal, geopolitical considerations

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- UTC is the basis for legal time in many jurisdictions
- One cannot change the meaning of legal terms
- International agreements require leap seconds in UTC
- International agreements do not require leap seconds in the broadcast time scale recommended by the ITU-R, if that is given a different name

# Concluding remarks

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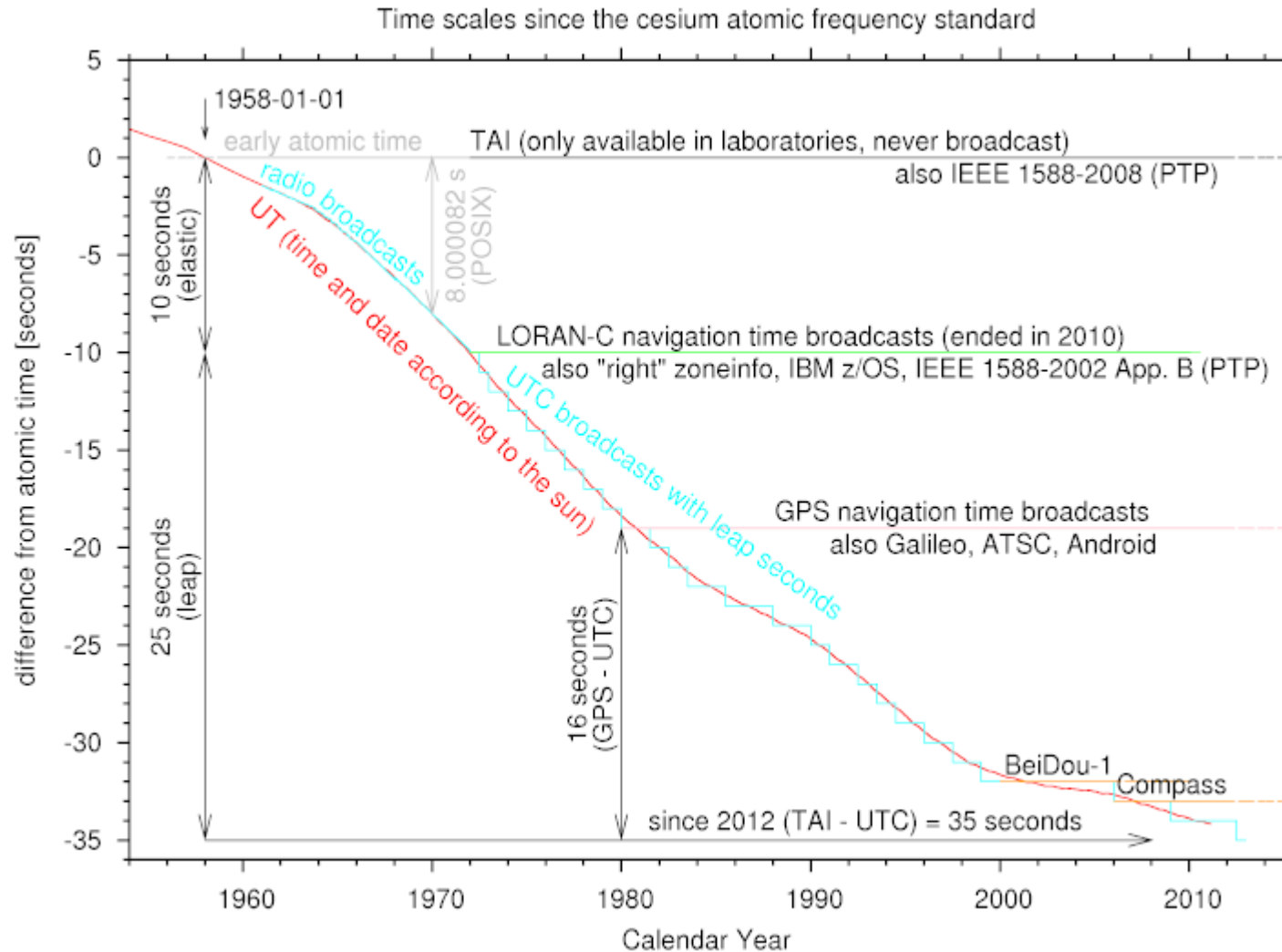
- A new concept or a change in concept requires a new name.
- This requirement has been applied by standards bodies world-wide for decades.
- ISO applauds the ITU for taking initiatives to manage its own terminology.
- ISO encourages the ITU to continue in this vein and to apply even more rigorously the terminology standards of ISO TC37 to support its important activities.

# Backup slides

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**ISO/TC 37 Terminology and other language and content resources**



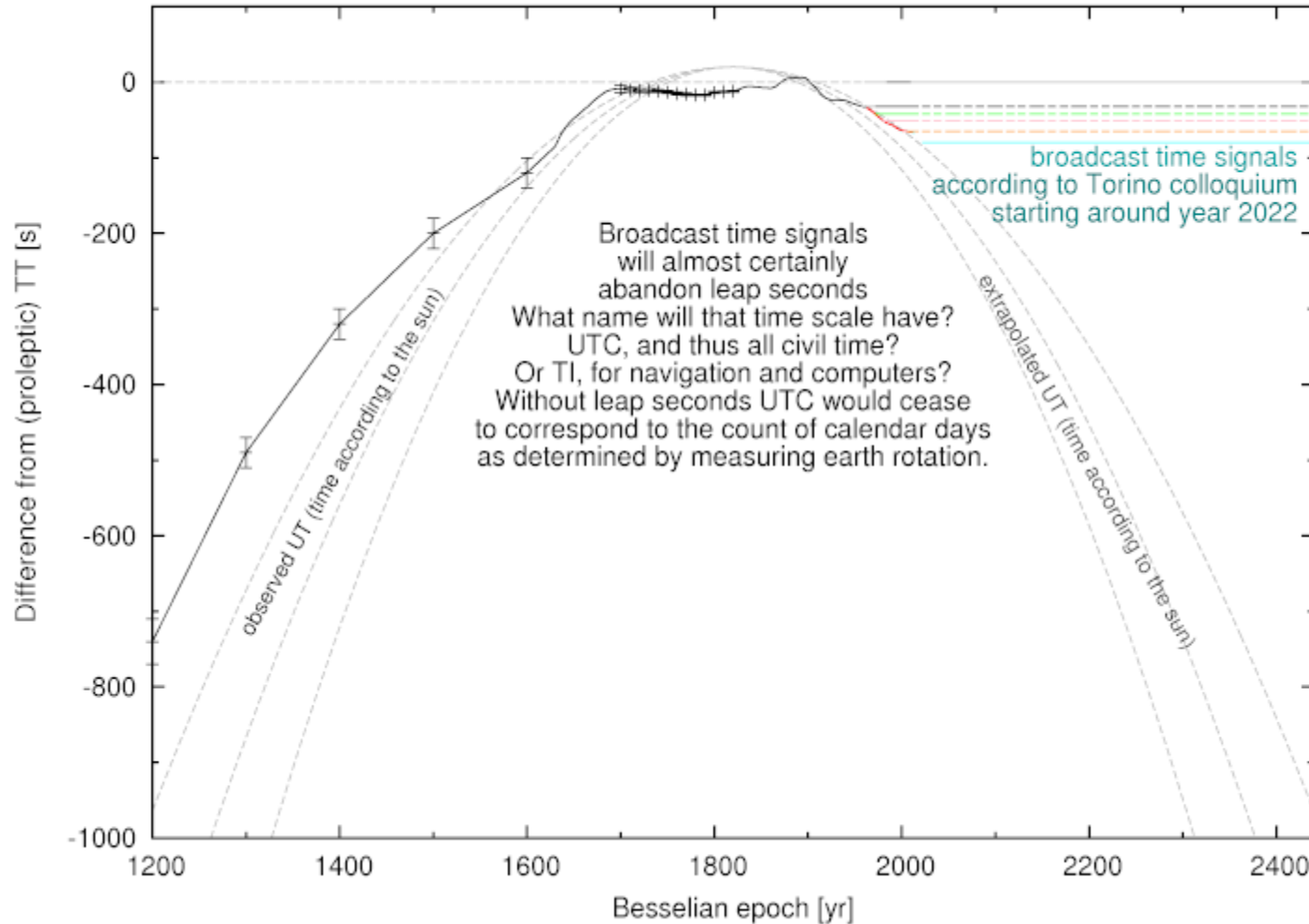


Source: <http://www.ucolick.org/~sla/leapsecs/deltat.html>

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### Future Time Scales -- The ITU-R Decision



Source: <http://www.ucolick.org/~sla/leapsecs/deltat.html>