

APPENDIX: STATEMENT FROM ISO TECHNICAL COMMITTEE 37 TO THE ITU RADIO ASSEMBLY (JANUARY 7, 2012)

Introduction

The current document was prepared by Hanne Erdman Thomsen and Kara Warburton on behalf of *ISO Technical Committee 37 - Terminology and other language and content resources*, which is responsible for defining international standards for the development and harmonization of scientific terminology. Kara Warburton is the International Chair of ISO TC37 and Ms. Thomsen is a member of the Danish delegation. Both are experienced professional terminologists and recognized experts on terminology standardization and harmonization.

This document makes recommendations designed to assist the ITU Radio Assembly in complying with the standards of the International Organization for Standardization (ISO) that govern the standardization and harmonization of scientific and technical terminology, with respect to its deliberations over the term *Coordinated Universal Time (UTC)*, which will be influenced by the Draft Revision to ITU-R Recommendation TF.460-6.

ISO TC37 respectfully requests the ITU Radio Assembly to carefully consider the following recommendations given the critical importance of the underlying terminology and concepts to stakeholders in many scientific and technical domains.

TC37 standards as requirements

ISO TC37 standards relating to the standardization of terminology are “normative” across the over 260 technical committees in ISO that develop standards in all scientific and technical domains. This means that according to ISO Directives, it is mandatory to adhere to TC37’s fundamental principles and guidelines when selecting and defining terms to convey key concepts in scientific and technical domains.

The concepts in question

Coordinated Universal Time is atomic time synchronized with astronomical time and is currently used as the primary time standard by which the world regulates clocks and time. The ITU proposal is that international time measure should no longer be adjusted to track with astronomical time. As non-experts we will not express our views on this change, only on the terminological issue that arises.

There are three central concepts involved (the definitions are approximate, not taken from standards):

TERM: astronomical time (Universal Time, UT)

CONCEPT: time scale based on astronomical observations

TERM: International Atomic Time (TAI)

CONCEPT: an atomic coordinate time scale based on the notional passage of proper time on Earth’s geoid.

Note: TAI is calculated through observations of the caesium 133 atom.

TERM: Coordinated Universal Time (UTC)

CONCEPT: Currently: a time scale enumerated in standard atomic seconds from the epoch of 1 Jan 1972 00:00:00.00000 and synchronized with astronomical time (Earth rotation) through intercalary corrections.

CONCEPT: Proposed to the ITU: a time scale enumerated in standard atomic seconds from the epoch of 1 Jan 1972 00:00:00.00000, thus synchronized with International Atomic Time.

The recommendation ITU-R TF.460-6 implies that the concept *International Atomic Time (TAI)* might substitute for *UTC* as the primary scientific time standard, but that the term *Coordinated Universal Time (UTC)* would be retained for this new concept in order to keep the term for the civic time standard unchanged. We understand that *UTC* currently signifies a time scale that is synchronized with astronomical time. Thus, henceforth, *UTC* would designate a time measure that is purely atomic and independent of the Earth's rotation, which is a significant deviation from its current universally-recognized meaning.

Statement of the problem

According to ISO terminology standards (see appendix), is it highly discouraged for one concept to assume a designation (term) already used by another concept. Such a practice results in polysemy (one term having multiple meanings), which is highly problematic, *particularly* in the pure sciences. The problem of polysemy is further aggravated when it occurs within one restricted scientific domain or community of practice. The recommendation in the Draft Revision document will result in the term *Coordinated Universal Time (UTC)* becoming polysemic within the extremely restricted domain of time measurement. If the recommendation is accepted, the precise meaning of *UTC* within this domain will be conditional on the time period to which it applies (pre or post leap second adjustments) and the historical, political, legal, social, pedagogic, scientific and technical context in which the term is being used. These conditions will make the future interpretation of the now polysemous term impossible to unambiguously determine in many circumstances.

The principle of “one term for one concept” is fundamental to the entire scientific discipline of terminology management. The Draft Revision to ITU-R Recommendation TF.460-6 violates this principle.

ISO 704:2009 states: “For a standardized terminology, it is desirable that a term be attributed to a single concept.” TC37 wishes to emphasize that, in this particular case, given the technico-scientific importance of the underlying concepts, it is more than “desirable” that all the various concepts of time measurement -- regardless of their scope of use (historical vs. modern, in one application or another, etc.) -- be designated unambiguously by unique (concept-specific) terms.

In this case it appears that the existing *UTC* concept will continue to exist and to be used, and therefore the use of the designation *UTC* for another concept will cause serious misunderstandings and mistakes. Even if an alternative term for the current *UTC* concept were to exist, any attempt to change the term *UTC* to something else (so as to redefine *UTC* without leap-second adjustments) would fail given the widespread use of *UTC* with its current interpretation. Rather than changing the meaning of an existing term, ISO standards governing scientific terminology development recommend that a new concept, or a shift in concept, be designated by a newly-coined term. It is widely recognized that introducing a new term for a new concept is much more effective in achieving user-community comprehension and adoption than assigning a new meaning to an existing term. Furthermore, the latter approach, as stated earlier, results in polysemy which introduces ambiguity that, in a scientific context, can have dangerous consequences.

ISO TC37 is particularly concerned that the proposed use of the term *Coordinated Universal Time (UTC)* corresponds to a meaning that no longer has any relation to Universal Time and is no longer “coordinated” as currently understood (in the sense that many institutions who share a common goal of time scale synchronization with Earth rotation collaborate to achieve the most

precise measurement.) Such a term violates “transparency”— a guiding principle in terminology standardization whereby the meaning of a term shall be self-evident. The lack of transparency of the new meaning is further aggravated in this case given the widespread recognition of the existing meaning of UTC which is fully transparent. This conflict will undoubtedly result in many difficulties.

Adopting the term *Coordinated Universal Time (UTC)* with the proposed new meaning based on atomic time will also have ramifications for the entire set of terms for measurement protocols that use *Universal Time*, such as UT0, UT1, UT1R, UT2, and UT2R, as well as other synonyms (such as *Greenwich Mean Time*), all of which are based on astronomical time measures. Currently the meaning of UTC closely approximates the widespread public usage of GMT as signifying mean solar time in Greenwich. But the history of the term *GMT* itself, which underwent significant shifts in meaning over time, should provide sufficient evidence of terminological chaos that stakeholders should be determined to avoid repeating for the term *UTC*.

The risk is that if UTC is redefined the entire family of terms will become unstable and a long period of public confusion will ensue, necessitating an entire new round of scientific debates over new terminology that will be needed to replace the confusing terms. This period of confusion and debates will be detrimental to scientific and technical practice and innovation that rely on precise terminology for time measurement.

TC37 recommendation

ISO TC37 recommends coining a new term for the instance of the concept *International Atomic Time* that is proposed to be used for the civic time standard. In this respect, we support a new term that does not reference the astronomical term *Universal Time* by title or employ *UT* by abbreviation, such as the term already proposed to the ITU-R at the Special Colloquium on the Future of the UTC Time Scale in Torino, Italy in 2003,^{*} that is, *Temps International (TI)*.

The term *Temps International (TI)* (*International Time* in English) transparently conveys the meaning of an international standard measurement for time. It presents no conflicts with the terms for the various existing time measurement protocols. Being closely aligned in physical appearance to *International Atomic Time (TAI)* makes perfect sense given that the corresponding concepts are identical except for the fact that the intention is to henceforth establish the international status of the protocol as a civic time standard.

ISO TC37 wishes to thank the ITU Radio Assembly for considering our recommendations and would welcome the opportunity to further comment on any terminology proposals being considered.

Appendix [to the Statement from ISO Technical Committee 37]

The following are the main ISO standards for terminology that are relevant to the arguments presented in the current TC37 recommendation.

ISO 704:2009 - Terminology work - Principles and methods

ISO 860:2007 - Terminology work - Harmonization of concepts and terms

^{*} See the first bullet of the Draft Alternate Proposal on the final slide at <http://www.ucolick.org/~sla/leapsecs/torino/closure.pdf>

ISO 10241-1:20011 - Terminological entries in standards - Part 1: General requirements and examples of representation

The following ISO Directive states that TC37 standards are normative:

ISO/IEC Directives, Part 2, Rules for the structure and drafting of International Standards (2011, 6th edition)