

Recommendation 14 for Committee Decision

Prepared by: Working Group D

Date of Submission: 08 November 2012

Issue Title: Interrelationship of the GNSS geodetic references through the International Terrestrial Reference System (ITRS)

Background/Brief Description of the Issue:

Considering

- that several global navigation satellite systems (GNSS) exist and that each is continuously expanding and improving,
- these navigation systems have unique timing and geodetic references for operational necessity. Interoperability of the GNSS requires interrelationship of the timing and geodetic references to reduce ambiguities for users with regard to the interpretation of navigation and timing solutions.
- the existence of the International Terrestrial Reference System (ITRS),
- the adoption of the ITRS by the International Union of Geodesy and Geophysics (IUGG) and by the General Conference on Weights and Measures (CGPM) for geosciences and metrological applications,
- that the adoption of a theoretical reference system would lead to benefits for users regarding interrelationship of navigation and timing solutions and systems interoperability.

It is essential for multi-GNSS positioning users to be able to position precisely their locations in a unique terrestrial reference frame. Given the fact that each GNSS system has its own reference frame, e.g. WGS84 for GPS, PZ-90 for GLONASS, CGCS2000 for COMPASS, GTRF for Galileo, etc., it is desirable, from the user point of view, to relate or align these different frames to the International Terrestrial Reference Frame (ITRF), as a realization of the ITRS

Discussion/Analyses:

The individual GNSS reference frames are materialized through the provision/computation of the coordinates using data collected at the ground control stations.

All the current individual GNSS reference frames are aligned to the ITRF.

Recommendation of Committee Action:

The ICG WG-D recommends that the ITRS, as defined by the International Union of Geodesy and Geophysics (IUGG), adopted by the General Conference on Weights and Measures (CGPM) and realized by the International Earth Rotation and Reference Systems Service (IERS), be adopted by the ICG as the theoretical reference system for the alignment of GNSS terrestrial reference frames to the ITRF.

Recommendation 15 for Committee Decision

Prepared by: Working Group D

Date of Submission: 08 November 2012

Issue Title: Improving the GNSS contribution to the ITRF defining parameters

Background/Brief Description of the Issue:

Considering

- several global navigation satellite systems (GNSS) exist and that each is continuously expanding and improving,
- the existence of thousands of continuously observing GNSS stations,
- the importance of improving the ITRF defining parameters for earth science and positioning applications
- the importance of the GNSS contribution to the ITRF from the IGS,
- the nearly unique role of GNSS in accessing and densifying the ITRF,

But considering also

- that weaknesses affect the GNSS reference frame in origin and scale

Discussion/Analyses:

The GNSS reference frame exhibits weaknesses in origin and scale determination because of high correlations between (1) the reference frame Z-axis and satellite solar radiation pressure parameters and (2) the scale of the reference frame and the satellite antenna phase center offset.

Recommendation of Committee Action:

The ICG WG-D recommends that the GNSS Providers consider (1) calibrating satellite antenna phase center and variations before launch, (2) adding retro-reflectors to GNSS satellites and (3) studying the possibility and utility of adding an accelerometer to new satellites.

Recommendation 16 for Committee Decision

Prepared by: Working Group D

Date of Submission: 08 November 2012

Issue Title: Information on the works related to the proposed redefinition of UTC

Background/Brief Description of the Issue:

Considering that:

- the navigation systems have unique timing and geodetic references for operational necessity. Interoperability of the GNSS requires interrelationship of the timing and geodetic references to reduce ambiguities for users with regard to the interpretation of navigation and timing solutions.
- discussion on redefinition of UTC started in 2000 at the ITU-R, SG7 Science Services WP7A Time Signals and Frequency Standard Emissions,
- during 2000-2010 WP7A studied the issue, considered different options, organized an open meeting (Torino, 2003), and worked on a proposal for an amended ITU recommendation,
- in 2010 the Draft Recommendation ITU-R TF.460-6 (new proposed version) was submitted by WP7A to SG7; discussion came to a « dead-end » with a 10-year opposition from one administration, plus two more administrations joining this position,
- the SG7 sent the Draft Recommendation to the Radiocommunication Assembly 2012 (January) for « final decision »,
- WRC 2012 put back the recommendation to SG7-WP7A for a final decision at WRC 2015;
- WRC 2012 Resolution 653 on the feasibility of a continuous UTC involves the BIPM, CCTF, CGPM, IAU, IUGG, URSI, ICAO, IMO, WMO, ISO, and invites to consider the feasibility of achieving a continuous reference time-scale, whether by the modification of UTC or some other method, and take appropriate action, taking into account ITU-R studies,

Recommendation of Committee Action:

to inform the Providers and all ICG participants that the redefinition of UTC was not resolved at the WRC-2012 and the decision is deferred until WRC-2015. It is recommended that the ICG monitors the ongoing development of this issue.

Recommendation 17 for Committee Decision

Prepared by: Working Group D

Date of Submission: 08 November 2012

Issue Title: Declaration on the computation of Rapid UTC (UTCr)

Background/Brief Description of the Issue:

Considering:

- that 10 to 40 days delay as publication of UTC in BIPM Circular T is not adequate for some applications,
- that short term assessment of UTC(k) steering to UTC, is impacting contributing laboratories, and in particular GNSS times steering to UTC(k),
- better determination of GNSS times offsets is essential for interoperability of navigation systems,
- discussions at the ICG in 2010 and 2011,
- discussions with experts in commissions for developing strategies for GNSS times,
- need of a « rapid » product, to give access on a shorter delay to an approximation to UTC, before final validation by Circular T, similar to IERS, IGS rapid products,
- that UTC contributing laboratories have been invited to participate on a voluntary basis to a pilot experiment (daily submission of daily data),
- positive responses of national time laboratories with adequate equipment,
- pilot experiment started on January 2012 computing every Wednesday rapid UTC and publishing it on BIPM website,
- report to the Consultative Committee for Time and Frequency in September 2012,
- pilot experiment will continue until final validation (few months)
- routine production of UTCr should start in 2013,
- UTC as calculated and published today will not be affected, however, it will benefit from UTCr,

Recommendation of Committee Action:

to recognize UTCr as an important service benefiting interoperability of navigation systems, and to thank the BIPM and contributing time laboratories for their efforts and commitment. It further recommends that GNSS providers consider studying the possibility of using UTCr as a common time reference for interrelationship between GNSSs.