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Space systems — Space based services requirements for centimetre class positioning

Systèmes spatiaux — Exigences de services fondés sur l'espace pour le positionnement de la classe centimètre

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 20, *Aircraft and space vehicle*, Subcommittee SC 14, *Space systems and operations*.

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Introduction

Nowadays, applications such as civil engineering, automatic farming, traffic control, and disaster monitoring system need centimetre class positioning. This centimetre class positioning is deeply concerned with various fields of our daily life.

Especially the positioning system of applications for the construction and civil engineering, surveying and mapping, and water level measuring for river or ocean, requires certifying the reliability of positioning system. Also, the case of automatic vehicle driving, ship control, and snowplow on the road demands the centimetre class positioning capability which is available in real-time and over wide area.

This International Standard intends to standardize the system requirements and verification criteria for centimetre class positioning over a wide area by broadcasting augmentation data through satellites, in order that we can enhance the availability of related applications and improve our daily life.

The services broadcasting augmentation data through satellite or satellite-based augmentation system (SBAS), such as WAAS, EGNOS, and MSAS, are currently in operation for aviation. This SBAS claims the positioning accuracy of meter level and focuses on high integrity. Also, the SBAS is mainly operated by a state agency for the sake of human life and internationality of aviation.

On the other hand, the services in this International Standard such as precise point positioning (PPP) require the positioning accuracy at centimetre level. There are now a number of providers supplying different sets of PPP corrections. At the same time, this PPP covers different markets such as civil engineering, automatic farming, and automatic driving. PPP began to outpace SBAS for some applications requiring higher precision. Therefore, it is inevitably essential to ensure and certify the reliability of the PPP system.

As stated above, from the viewpoint of benefit, it is clear that PPP services continue to evolve and become more and more sophisticated to match the growing complexity of customer applications.[7] On the other hand, in view of rationale, there have been some great strides in overcoming the convergence time challenge and there are currently some successful real-time PPP applications both academic and commercial.[8] The objective of this International Standard is to establish the space based services by broadcasting the augmentation data for centimetre class positioning over wide area. Also, this International Standard defines the requirements for verification and evaluation of the guarantee of quality of the services, and therefore, this International Standard plays a role of the recognition for the certification of these services as well.

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Space systems — Space based services requirements for centimetre class positioning

1 Scope

This International Standard defines the requirements for the wide area centimetre class positioning system by broadcasting augmentation data through satellites as follows.

— Centimetre class positioning

According to the progress of requirements for positioning services such as automatic farming, mapping and others, centimetre class positioning is very useful.

— Wide area positioning

It is quite effective to broadcast augmentation data through satellites for users over wide area such as a square, more than 1,000 km each side, anytime and anywhere. Even if this area is short of data network, additional ground network facilities are not needed. In addition, as ranging signal and augmentation data can be received from satellite broadcasting at the same time, it is unnecessary for user terminals to receive the signal such as transmitted by ground network.

— Real-time property

The user terminals need to resolve the ambiguity in real-time, using augmentation data broadcast from satellites or other means, for the realization of centimetre class positioning. On the other hand, the provider sides have to broadcast augmentation data such that the terminal sides are able to resolve the ambiguity in real-time.

2 Normative references

No normative references cited in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
fixing
determining the integer number of carrier phase waves when calculating the position by use of carrier phase measurement

Note 1 to entry: This should be distinguished from the case of determining the desired value by convergence of continuous quantities when calculating the position by use of pseudorange measurement.

3.2
sustainability
measurement anomaly at some reference point should make no influence on the augmentation data generation

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