



BSI Standards Publication

**Space – Use of GNSS-based positioning for road
Intelligent Transport Systems (ITS) – Field
tests definition for basic performance**

National foreword

This Published Document is the UK implementation of CEN/TR 17465:2020.

The UK participation in its preparation was entrusted to Technical Committee ACE/68, Space systems and operations.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2020
Published by BSI Standards Limited 2020

ISBN 978 0 539 06546 6

ICS 35.240.60; 03.220.20; 33.060.30

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 April 2020.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

TECHNICAL REPORT

CEN/TR 17465

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

April 2020

ICS 03.220.20; 33.060.30; 35.240.60

English version

Space - Use of GNSS-based positioning for road Intelligent Transport Systems (ITS) - Field tests definition for basic performance

Espace - Utilisation de la localisation basée sur les GNSS pour les systèmes de transport routiers intelligents - Définition des essais terrains pour les performances générales

Definition von Feldtests für Grundleistungen

This Technical Report was approved by CEN on 23 February 2020. It has been drawn up by the Technical Committee CEN/CLC/JTC 5.

CEN and CENELEC members are the national standards bodies and national technical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



CEN-CENELEC Management Centre:
Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword	6
1 Scope	7
2 Normative references	8
3 Terms and definitions	8
4 List of acronyms	8
5 Definition of the general strategy: what kind of tests?	9
5.1 General	9
5.2 GBPT characterization	9
5.2.1 An hybrid and heterogenic system	9
5.2.2 Test combinatory explosion: an issue	10
5.2.3 Proposed approach	11
5.3 Stakeholders and responsibilities	13
5.3.1 Industry value chain	13
5.3.2 Roles and responsibilities	14
5.4 Main criteria for testing strategy	16
5.5 Potential test methods	17
5.5.1 General	17
5.5.2 Simulations	17
5.5.3 Field test	17
5.5.4 Record and Replay	18
5.5.5 Verification methods face off table with regard to main criteria for testing strategy	19
5.6 Metrics coverage	21
5.6.1 Need of refinement of the metrics data sets.....	21
5.6.2 Unique data collection for the accuracy, availability, integrity metrics	21
5.6.3 Same data collection for a flexible list of road applications	22
5.6.4 Particular case of the integrity risk	22
5.6.5 Particular case of the TTFF assessment	24
5.6.6 Fit the test methodology to the metrics purposes	24
5.7 Recommendation for testing strategy	26
5.7.1 General	26
5.7.2 Proposal for a homologation plan (case of complex hybridized GBPT systems considered)	27
6 Definition of the operational scenario: how to configure the tests?	30
6.1 General	30

6.2	Preamble	30
6.3	Status of definition of an operational scenario: discussions	32
6.3.1	General	32
6.3.2	Set-up conditions.....	32
6.3.3	Trajectory/motion	34
6.3.4	Environmental conditions.....	35
6.3.5	Synthesis on the construction of the operational scenario	37
6.4	Descriptions of operational scenarios expected for record and replay testing	38
6.4.1	General	38
6.4.2	Set-up conditions.....	38
6.4.3	Selection of roads	40
6.4.4	Selection of kinds of trips	41
6.4.5	Crossing selected roads and trips: proposed organization of tests	42
6.5	Operational scenarios for TTFF field tests	46
6.5.1	General	46
6.5.2	Set-up conditions.....	47
6.5.3	Trajectories.....	47
6.5.4	Environmental conditions.....	48
6.5.5	Proposed combinations	48
7	Definition of the metrics and related tools: what to measure?	49
7.1	General.....	49
7.2	Accuracy metrics.....	50
7.2.1	General	50
7.2.2	Integrity metrics	60
7.3	Availability metrics	74
7.4	Continuity metrics	75
7.5	Timing metrics	76
7.6	Synthesis on the received outputs to be collected.....	80
7.7	Synthesis of the metrics computation tool functions.....	80
8	Definition of the test facilities: which equipment to use?	81
8.1	General.....	81
8.2	Equipment panorama and characterization	81
8.2.1	Equipment for in-field data collection	81
8.2.2	Laboratory Test-beds.....	86
8.2.3	Log and Replay Solutions	91
8.3	Equipment Justification	95
8.3.1	Equipment for in-field data collection	95
8.3.2	“Log & Replay” Solutions	98
9	Definition of the test procedures: how to proceed to the tests?.....	100

9.1	General.....	100
9.2	Field tests for recording the in-file data of the standardized operational scenario	101
9.2.1	General	101
9.2.2	Test plan.....	101
9.2.3	Good functioning verification	104
9.2.4	Field test conducting.....	105
9.2.5	Data analysis and archiving.....	107
9.3	Characterization of environment.....	108
9.4	Replay step: assessing the DUT performances.....	109
10	Definition of the validation procedures: how to be sure of the results?	110
10.1	General.....	110
10.2	Presentation of a scenario: rush time in Toulouse.....	110
10.3	Quality of the reference trajectory	112
10.4	Availability, regularity of the of the DUT's outputs for the metrics computation.....	113
10.5	Statistic representability of the results.....	114
11	Definition of the synthesis report: how to report the results of the tests?	118
11.1	General.....	118
11.2	Identification of the DUT	118
11.3	Identifications of test	118
11.4	Personal responsible of tests.....	119
11.5	Identification of the tests stimuli	119
11.6	Report of tests conditions	119
11.7	Identification of the files including the test raw data	119
11.8	Identification of tools used in post processing for computing the metrics.....	119
11.9	Results.....	119
11.10	Date of report, responsible and contact, lab address and signatures	120
Annex A (normative)	ETSI test definition for GBLS	121
Annex A	Synthetic reporting of the ETSI specification for the operational environment and tests conditions	121
Annex B (normative)	Detailed criteria for testing strategy.....	133

B.1	First criteria: trust in metrology	133
B.1.1	Reproducible results.....	133
B.1.2	Representative and meaningful results for the road applications.....	135
B.1.3	Reliable procedure for the metric assessment.....	135
B.2	Second criteria: Reasonable cost for manufacturers.....	135
B.2.1	Cost of test benches.....	135
B.2.2	Cost of the test operations.....	136
B.2.3	Additional costs.....	136
B.3	Third criteria: clear responsibility and sharing between.....	137
	Annex C (normative) Size of data collection (GMV contribution).....	139
C.1	Data campaign definition: sample size	139
C.2	Statistical significance.....	140
	Bibliography	144

European foreword

This document (CEN/TR 17465:2020) has been prepared by Technical Committee CEN/TC 5 “Space”, the secretariat of which is held by DIN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

Currently in preview, click buy full version

1 Scope

This document is the output of WP1.2 “Field test definition for basic performances” of the GP-START project.

The GP-START project aims to prepare the draft standards CEN/CENELEC/TC5 16803-2 and 16803-3 for the *Use of GNSS-based positioning for road Intelligent Transport Systems (ITS). Part 2: Assessment of basic performances of GNSS-based positioning terminals* is the specific target of this document.

This document constitutes the part of the Technical Report on *Metrics and Performance levels detailed definition and field test definition for basic performances* regarding the field tests definition.

The purpose of WP1.2 is to define the field tests to be performed in order to evaluate the performances of road applications’ GNSS-based positioning terminal (GBPT). To fully define the tests, this task addresses the test strategy, the facilities to be used, the test scenarios (e.g. environments and characteristics, which should allow the comparison of different tests), and the test procedures. The defined tests and process will be validated by performing various in-field tests. The defined tests focus essentially on accuracy, integrity and availability as required in the statement of work included in the invitation to tender.

This document will serve to:

- the consolidation of EN 16803-1: *Definitions and system engineering procedures for the establishment and assessment of performances*;
- the elaboration of EN 16803-2: *Assessment of basic performances of GNSS-based positioning terminals*;
- the elaboration of EN 16803-3: *Assessment of security performances of GNSS-based positioning terminals*.

The document is structured as follows:

- Clause 1 is the present Scope;
- Clause 5 defines and justifies the global strategy for testing;
- Clause 6 defines and justifies the retained operational scenario;
- Clause 7 defines the metrics and related tools;
- Clause 8 defines the required tests facilities;
- Clause 9 defines the tests procedures;
- Clause 10 defines the validation procedures;
- Clause 11 defines how to report the tests results.