

Final draft **ETSI EN 302 571** V1.1.1 (2008-07)

Harmonized European Standard (Telecommunications series)

**Intelligent Transport Systems (ITS);
Radiocommunications equipment operating
in the 5 855 MHz to 5 925 MHz frequency band;
Harmonized EN covering the essential requirements
of article 3.2 of the R&TTE Directive**

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Reference

DEN/ERM-TG37-007

Keywords

CALM, ITS, radio, regulation, transport

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Sous-Préfecture de Grasse (06) N° 7803/88

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Foreword

This Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the Vote phase of the ETSI standards Two-step Approval Procedure.

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC (as amended) [i.1] laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("the R&TTE Directive") [i.2].

Technical specifications relevant to Directive 1999/5/EC [i.2] are given in annex A.

Equipment compliant with the present document can be intended for fitment into road vehicles, therefore it is subject to automotive EMC type approval and Directive 95/54/EC [i.3]. For use on vehicles outside the scope of Directive 95/54/EC [i.3], compliance with an EMC directive/standard appropriate for that use is required.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

Introduction

The present document is part of a set of standards developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the R&TTE Directive. The modular structure is shown in EG 201 399 [i.4].

1 Scope

The present document applies to communications using radio transmitters and receivers for Intelligent Transport Systems (ITS). ITS communications may comprise vehicle-to-vehicle, vehicle-to-roadside and roadside-to-vehicle.

Table 1: Radiocommunications service frequency bands

Radiocommunications service frequency bands	
Transmit	5 855 MHz to 5 925 MHz
Receive	5 855 MHz to 5 925 MHz

The equipment is comprised of a transmitter and associated encoder and modulator and/or a receiver and associated demodulator and decoder. The types of equipment covered by the present document are as follows:

- OnBoard Equipment (OBE equipment fitted with an integral or dedicated antenna(s), intended for use in vehicles);
- Road Side Equipment (RSE equipment fitted with an antenna socket, integral or dedicated antenna(s), normally used as a fixed station).

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
 - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
 - for informative references.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

For online referenced documents, information sufficient to identify and locate the source shall be provided. Preferably, the primary source of the referenced document should be cited, in order to ensure traceability. Furthermore, the reference should, as far as possible, remain valid for the expected life of the document. The reference shall include the method of access to the referenced document and the full network address, with the same punctuation and use of upper case and lower case letters.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] ETSI TR 100 028 (2001-12) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [2] CISPR 16, (parts 1-1 (2007), 1-4 (2008) and 1-5 (2003)): "Specifications for radio disturbance and immunity measuring apparatus and methods; Part 1: Radio disturbance and immunity measuring apparatus".

2.2 Informative references

The following referenced documents are not essential to the use of the ETSI deliverable but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

- [i.1] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.
- [i.2] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).
- [i.3] Commission Directive 95/54/EC of 31 October 1995 adapting to technical progress Council Directive 72/245/EEC on the approximation of the laws of the Member States relating to the suppression of radio interference produced by spark-ignition engines fitted to motor vehicles and amending Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers.
- [i.4] ETSI EG 201 399 (V2.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of candidate Harmonized Standards for application under the R&TTE Directive".
- [i.5] ETSI TR 102 070-2 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Guide to the application of harmonized standards to multi-radio and combined radio and non-radio equipment; Part 2: Effective use of the radio frequency spectrum".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

available channel: channel identified as available for use as an *Operating Channel* having performed a "listen before talk check" first

channel: amount of spectrum used by a single ITS device operating on one of the carrier frequencies listed in table 2 of the present document

dedicated antenna: removable antenna supplied and tested with the radio equipment, designed as an indispensable part of the equipment

NOTE: The dedicated antenna has been designed or developed for one or more specific types of equipment. It is the combination of dedicated antenna and radio equipment that is expected to be compliant with the regulations.

integral antenna: antenna designed as a fixed part of the equipment, without the use of an external connector and as such which can not be disconnected from the equipment by the user

NOTE: An integral antenna may be fitted internally or externally.

Listen Before Talk (LBT): monitoring method in which the RF channel is checked for activity before transmitting

radiated measurements: measurements which involve the absolute measurement of a radiated field

Transmit Power Control (TPC): technique in which the transmitter output power is controlled resulting in reduced interference to other users

Transmit Power Control range: power range over which the TPC is able to control the transmitter output power

3.2 Symbols

For the purposes of the present document, the following symbols apply:

dB	decibel
dBi	antenna gain relative to isotropic radiator in decibel
dBc	decibel relative to carrier power
E	electrical field strength
f	frequency
f_c	nominal centre frequency
G	antenna gain
PH	highest power level
R	distance
T_{max}	maximum temperature
T_{min}	minimum temperature
Tx on	effective transmitter on-time
Tx off	effective transmitter off-time
V_{max}	maximum voltage
V_{min}	minimum voltage
Ω	ohm
μs	microsecond

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CW	Continuous Wave
DC	Direct Current
e.r.p.	effective radiated power
e.i.r.p.	equivalent isotropically radiated power
EC	European Commission
EMC	Electro Magnetic Compatibility
HS	Harmonized Standard
ITS	Intelligent Transport Systems
LBT	Listen Before Talk
OBE	On Board Equipment
ppm	parts per million = 10^{-6}
PSD	Power Spectral Density
RF	Radio Frequency
RSE	Road Side Equipment
RSU	Road Side Unit
TPC	Transmit Power Control
UUT	Unit Under Test

4 General

4.1 Presentation of equipment for testing purposes

Each equipment submitted for testing shall fulfil the requirements of the present document on all frequencies over which it is intended to operate.

The provider shall declare the frequency ranges, the range of operating conditions and power requirements as applicable, to establish the appropriate test conditions.

Additionally, technical documentation and operating manuals, sufficient to make the test, shall be supplied.

4.1.1 Choice of model for testing

The provider shall provide one or more samples of the equipment, as appropriate for testing.

Stand-alone equipment shall be offered by the provider complete with any ancillary equipment needed for testing.

If an equipment has several optional features considered not to affect the RF parameters, then the tests need only to be performed on the equipment configured with the combination of features considered to be the most complex, as proposed by the provider and agreed by the test laboratory.

If channel bundling as identified in clause 6.2.1 is implemented, then tests need to be performed on the equipment using higher channel bandwidth than 10 MHz. Where practicable, equipment offered for testing shall provide a 50 Ω connector for conducted RF power level measurements.

In the case of a dedicated integral antenna equipment, if the equipment does not have an internal permanent 50 Ω connector, then it is permissible to supply a second sample of the equipment with a temporary antenna connector fitted to facilitate testing.

The performance of the equipment submitted for testing shall be representative of the performance of the corresponding production model.

The equipment may contain digital circuit elements, radio circuit elements and other elements whose performance is not covered by the present document. These elements of the equipment shall meet the appropriate performance requirements for those components, as specified in other standards.

An ITS device which is combined with other system(s) should meet at least the requirements of the present document (for the elements of the device concerned with radio communications), and the requirements of any relevant standard for EMC compatibility of the other equipment for the elements of the device which are not concerned with radio communications.

EXAMPLE: An ITS communications device combined with a navigation system.

NOTE: For further information on this topic see TR 102 070-2 [i.5].

4.1.1.1 Auxiliary test equipment

All necessary test signal sources, setting up instructions and other product information shall accompany the equipment when it is submitted for testing.

4.1.1.2 Declarations by the provider

The provider shall declare the necessary information of the equipment with respect to all technical requirements set by the present document.

4.2 Mechanical and electrical design

4.2.1 General

The equipment shall be designed, constructed and manufactured with the aim of minimizing harmful interference to other equipment and services.

4.2.2 Controls

Those controls, which if maladjusted, might increase the interfering potentialities of the equipment shall not be accessible for adjustment by the user.

4.3 Testing using bit streams or messages

The manufacturer may elect to have the equipment tested using bit streams or data packets.

4.4 Measuring continuous mode equipment

In the case of measurements performed on equipment designed to operate only in continuous mode, requirements such as "equipment shall be set in continuous mode" shall be interpreted as "equipment shall be used in its normal transmission mode (in this case, the continuous mode)".

4.5 Measuring discontinuous mode equipment

When it is specified that the transmission shall be continuous for the duration of the measurement(s), the transmitter under test shall be set to operate in continuous mode. If this is not possible, the measurements shall be carried out in a period shorter than the duration of the transmitted burst. It may be necessary to extend the duration of the burst.

When measurements are made in discontinuous mode, the reported values can be average values. This averaging shall be made using a set of measurements, each of these measurements being made during a burst or a part of it.

5 Test conditions, power sources and ambient temperatures

5.1 Normal and extreme test conditions

Testing shall be made under normal test conditions, and also, where stated, under extreme test conditions.

The test conditions and procedures shall be as specified in clauses 5.2 to 5.5.

5.2 Test power source

During testing the power source of the equipment shall be replaced by a test power source capable of producing normal and extreme test voltages as specified in clauses 5.3.2 and 5.4.2. The internal impedance of the test power source shall be low enough for its effect on the test results to be negligible. For the purpose of tests, the voltage of the power source shall be measured at the input terminals of the equipment.

For battery operated equipment the battery shall be removed and the test power source shall be applied as close to the battery terminals as practicable.

During tests of DC powered equipment the power source voltages shall be maintained within a tolerance of $< \pm 1$ % relative to the voltage at the beginning of each test. The value of this tolerance is critical for power measurements, using a smaller tolerance will provide better measurement uncertainty values.

5.3 Normal test conditions

5.3.1 Normal temperature and humidity

The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:

- temperature: +15 °C to +35 °C;
- relative humidity: 20 % to 75 %.

When it is impracticable to carry out the tests under these conditions, a note to this effect, stating the ambient temperature and relative humidity during the tests, shall be added to the test report.

5.3.2 Normal test power source

5.3.2.1 Mains voltage

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage or any of the declared voltages for which the equipment was designed.

The frequency of the test power source corresponding to the ac mains shall be between 49 Hz and 51 Hz.

5.3.2.2 Regulated lead-acid battery power sources used on vehicles

When the radio equipment is intended for operation from the usual types of regulated lead-acid battery power source used on vehicles the normal test voltage shall be 1,1 times the nominal voltage of the battery (e.g. for nominal voltages of 6 V and 12 V, these are 6,6 V and 13,2 V respectively).

5.3.2.3 Other power sources

For operation from other power sources or types of battery (primary or secondary), the normal test voltage shall be that declared by the equipment manufacturer.

5.4 Extreme test conditions

5.4.1 Extreme temperatures

For tests at extreme temperatures, measurements shall be made in accordance with the procedures specified in clause 5.5, at the upper and lower temperatures:

- temperature: -30 °C to +70 °C;

The manufacturer can also declare which extreme conditions the equipment is intended to be installed in. In this case the upper temperature can be above +70 °C and the lower temperature can be below -30 °C as declared by the manufacturer.

5.4.2 Extreme test source voltages

5.4.2.1 Mains voltage

The extreme test voltage for equipment to be connected to an ac mains source shall be the nominal mains voltage $\pm 10\%$.