Final draft ETSI EN 302 500-1 V1.2.1 (2008-04)

European Standard (Telecommunications series)

Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD) using Ultra WideBand (UWB) technology; Location Tracking equipment operating in the frequency range from 6 GHz to 8,5 GHz; Part 1: Technical characteristics and test methods

Reference
REN/ERM-TG31C-257-1

Keywords
radio, regulation, SRD, testing, UWB

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:
http://www.etsi.org

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at
http://portal.etsi.org/tb/status/status.asp

If you find errors in the present document, please send your comment to one of the following services:
http://portal.etsi.org/chaircor/ETSI_support.asp

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This 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.

For non EU countries the present document may be used for regulatory (Type Approval) purposes.

The present document is part 1 of a multi-part deliverable covering Short Range Devices (SRD) using Ultra WideBand (UWB) technology; Location Tracking equipment operating in the frequency range from 6 GHz to 8,5 GHz, as identified below:

Part 1: "Technical characteristics and test methods";

Part 2: "Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive".

Clauses 1 and 3 provide a general description on the types of equipment covered by the present document and the definitions and abbreviations used.

Clause 4 provides a guide as to the number of samples required in order that type tests may be carried out, and any markings on the equipment which the provider shall provide.

Clauses 5 and 6 give guidance on the test and general conditions for testing of the device.

Clause 7 gives the interpretation of results and maximum measurement uncertainty values.

Clause 8 specifies the transmitter spectrum utilization parameters which are required to be measured. The clauses provide details on how the equipment should be tested and the conditions which should be applied.

Clause 9 specifies the receiver spectrum utilization parameters which are required to be measured. The clauses provide details on how the equipment should be tested and the conditions which should be applied.

Annex A (normative) provides specifications concerning radiated measurements.

Annex B (normative) provides information on the spectrum analyser specification.

Annex C (normative) provides information on additional design requirements for equipment covered by the present document.

Annex D (informative) provides information on measurement antenna and preamplifier specifications.

Annex E (informative) provides information on peak measurements within a 3 MHz measurement bandwidth.

Annex F (informative) covers other supplementary information.

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):	6 months after doa

1 Scope

The present document specifies the requirements for ultra-wideband location tracking equipment operating in all or part of the frequency range from 6 GHz to 8,5 GHz.

The present document applies for indoor as well as portable or mobile outdoor applications.

It covers ultra-wideband location tracking tags which are attached to people or objects and tags are tracked using a fixed receiver infrastructure to only receive the UWB emission emitted by the tags. Equipment covered by the present document is fitted with an integral or dedicated antenna.

The present document contains the technical characteristics and test methods for location tracking equipment and it does not necessarily include all the characteristics which may be required by a user, nor does it necessarily represent the optimum performance achievable.

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 (V1.4.1) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

[2] CISPR 16-1-1 (2006): "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus".

[3] ANSI C63.5 (2006): "American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electro Magnetic Interference".

2.2 Informative references

The following referenced documents are not essential to the use of the present document 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.

[4] CENELEC EN 55022:2006: "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement".

[5] ITU-R Recommendation SM.1754: "Measurement techniques of ultra-wideband transmissions".

[6] ETSI EN 300 220 (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW".

[7] ETSI EN 300 440 (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range".

[8] 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".

[9] ETSI TR 102 273 (V1.2.1) (all parts): "Electromagnetic compatibility and Radio Spectrum Matters (ERM): Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties".

[10] CEPT/ERC/REC 70-03: "Relating to the use of Short Range Devices (SRD)".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

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

fixed-mounted station: station which is fixed mounted and which is not intended to be operated while in motion; however, it behaves otherwise in the system like a mobile station

impulsive UWB signal: radiated, short transient ultra-wideband signal whose occupied bandwidth is defined by its time duration rather than by frequency-hopping or other techniques

integral antenna: antenna designed to be connected to the equipment without the use of a standard connector and considered to be part of the equipment

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

Mobile Station (MS): station intended to be used while in motion or during halts at unspecified points

portable station: mobile station that is portable but cannot comfortably be carried around by a person due to weight and/or size or having relatively high power consumption

provider: manufacturer or his authorized representative or the person responsible for placing on the market

pulse: radiated short transient UWB signal whose time duration is nominally the reciprocal of its -10 dB bandwidth

NOTE: See ITU-R Recommendation SM.1754 [5].

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

Ultra WideBand (UWB): equipment incorporating, as an integral part or as an accessory, technology for short-range radiocommunication, involving the intentional generation and transmission of radio-frequency energy that spreads over a frequency range wider than 50 MHz, which may overlap several frequency bands allocated to radiocommunication services

3.2 Symbols

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

dB	decibel
R	distance
λ	wavelength

3.3 Abbreviations

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

e.i.r.p.	equivalent isotropically radiated power
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
LNA	Low Noise Amplifier
MS	Mobile Station
PRF	Pulse Repetition Frequency
R&TTE	Radio and Telecommunications Terminal Equipment
RBW	Resolution BandWidth
RF	Radio Frequency
rms	root mean square
SNR	Signal to Noise Ratio
SRD	Short Range Device
TX	Transmitter
UWB	Ultra WideBand
VBW	Video BandWidth
VSWR	Voltage Standing Wave Ratio

4 Technical requirement specifications

4.1 General requirements

Equipment supplied for testing against the present document shall be fitted with either an integral antenna or a dedicated antenna.

4.2 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.

To simplify and harmonize the testing procedures between the different testing laboratories, measurements shall be performed, according to the present document, on samples of equipment defined in clause 4.2.1.

These clauses are intended to give confidence that the requirements set out in the present document have been met without the necessity of performing measurements on all frequencies.

4.2.1 Choice of model for testing

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

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

4.2.1.1 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.

4.2.1.2 Declarations by the provider

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

4.3 Mechanical and electrical design

4.3.1 General

The equipment submitted by the provider or his representative, shall be designed, constructed and manufactured in accordance with good engineering practice, and with the aim of minimizing harmful interference to other equipment and services.

4.3.2 Controls

Those controls, which, if maladjusted, may increase the interfering potential of the equipment, shall not be easily accessible to the user.

4.3.3 Transmitter shut-off facility

If the equipment is equipped with an automatic transmitter shut-off facility, it shall be possible to disable this feature for the purposes of testing. See clause 8.

4.3.4 Marking

The equipment shall be marked in a visible place. This marking shall be legible and durable. In cases where the equipment is too small to carry the marking, it is sufficient to provide the relevant information in the users' manual.

4.3.4.1 Equipment identification

The marking shall include as a minimum:

- The name of the manufacturer or his trademark.
- The type designation. This is the manufacturer's numeric or alphanumeric code or name that is specific to a particular equipment.

4.3.4.2 Additional information for the user

The following additional information shall be included in the users' manual:

- statements that the UWB transmitter equipment conforming to the present document shall not be:
  - installed at a fixed outdoor location;
  - installed or used in flying models, aircraft and other forms of aviation;
  - installed or used in a road or rail vehicle.

4.4 Other device emissions

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.

For example, a UWB device which may be connected to an office IT network should meet at least the requirements of the present document (for the elements of the device concerned with radio communications), and the requirements of a standard for EMC compatibility of IT equipment, such as EN 55022 [4] (for the elements of the device which are not concerned with radio communications but are considered to be IT equipment).

NOTE: For further information on this topic see TR 102 070-2 [8].

5 Test conditions, power sources and ambient temperatures

5.1 Normal and extreme test conditions

Testing shall be performed under normal test conditions.

The test conditions and procedures shall be as specified in clauses 5.2 and 5.3.

5.2 Test power source

The equipment shall be tested using the appropriate test power source as specified in clauses 5.2.1 or 5.2.2. Where equipment can be powered using either external or internal power sources, then equipment shall be tested using the external test power source as specified in clause 5.2.1 then repeated using the internal power source as specified in clause 5.2.2.

The test power source used shall be recorded and stated.

5.2.1 External test power source

During tests, the power source of the equipment shall be replaced by an external test power source capable of producing normal test voltages as specified in clause 5.3.2. The internal impedance of the external test power source shall be low enough for its effect on the test results to be negligible. For the purpose of the tests, the voltage of the external test power source shall be measured at the input terminals of the equipment. The external test power source shall be suitably de-coupled and applied as close to the equipment battery terminals as practicable. For radiated measurements any external power, leads shall be so arranged so as not to affect the measurements.

During tests, the external test power source voltages shall be within a tolerance < ±1 % relative to the voltage at the beginning of each test.

5.2.2 Internal test power source

For radiated measurements on portable equipment with integral antenna, fully charged internal batteries shall be used. The batteries used shall be as supplied or recommended by the provider. If internal batteries are used, at the end of each test the voltage shall be within a tolerance of < ±5 % relative to the voltage at the beginning of each test.

If appropriate, the external test power source may replace the supplied or recommended internal batteries at the required voltage, this shall be recorded and stated. In this case, the battery remains present, electrically isolated from the rest of the equipment, possibly by putting tape over its contacts.