

# ETSI EN 300 113-2 V1.3.1 (2003-12)

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*Candidate Harmonized European Standard (Telecommunications series)*

**Electromagnetic compatibility  
and Radio spectrum Matters (ERM);  
Land mobile service;  
Radio equipment intended for the transmission  
of data (and/or speech) using constant or non-constant  
envelope modulation and having an antenna connector;  
Part 2: Harmonized EN covering essential requirements  
under article 3.2 of the R&TTE Directive**

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Reference

REN/ERM-TG32-046-2

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## Foreword

This Candidate Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

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) 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 [1] 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").

The present document is part 2 of a multi-part deliverable covering the Land mobile service; Radio equipment intended for the transmission of data (and/or speech) using constant or non-constant envelope modulation and having an antenna connector, as identified below:

Part 1: "Technical characteristics and methods of measurement";

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

EN 300 113-2 version 1.2.1 covered both constant envelope angle modulation and non-constant envelope modulation equipment. The present document takes into account more detailed measurement methods covering equipment operating in continuous or discontinuous modes of transmission.

The present version (version 1.3.1) covers equipment designed according to version 1.5.1 of EN 300 113-1 [2].

<b>National transposition dates</b>	
Date of adoption of this EN:	21 November 2003
Date of latest announcement of this EN (doa):	29 February 2004
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 August 2004
Date of withdrawal of any conflicting National Standard (dow):	28 February 2007

## Introduction

The present document (V1.3.1) is part of a set of standards designed to fit in a modular structure to cover all radio and telecommunications terminal equipment under the R&TTE Directive [1]. Each standard is a module in the structure. The modular structure is shown in figure 1.

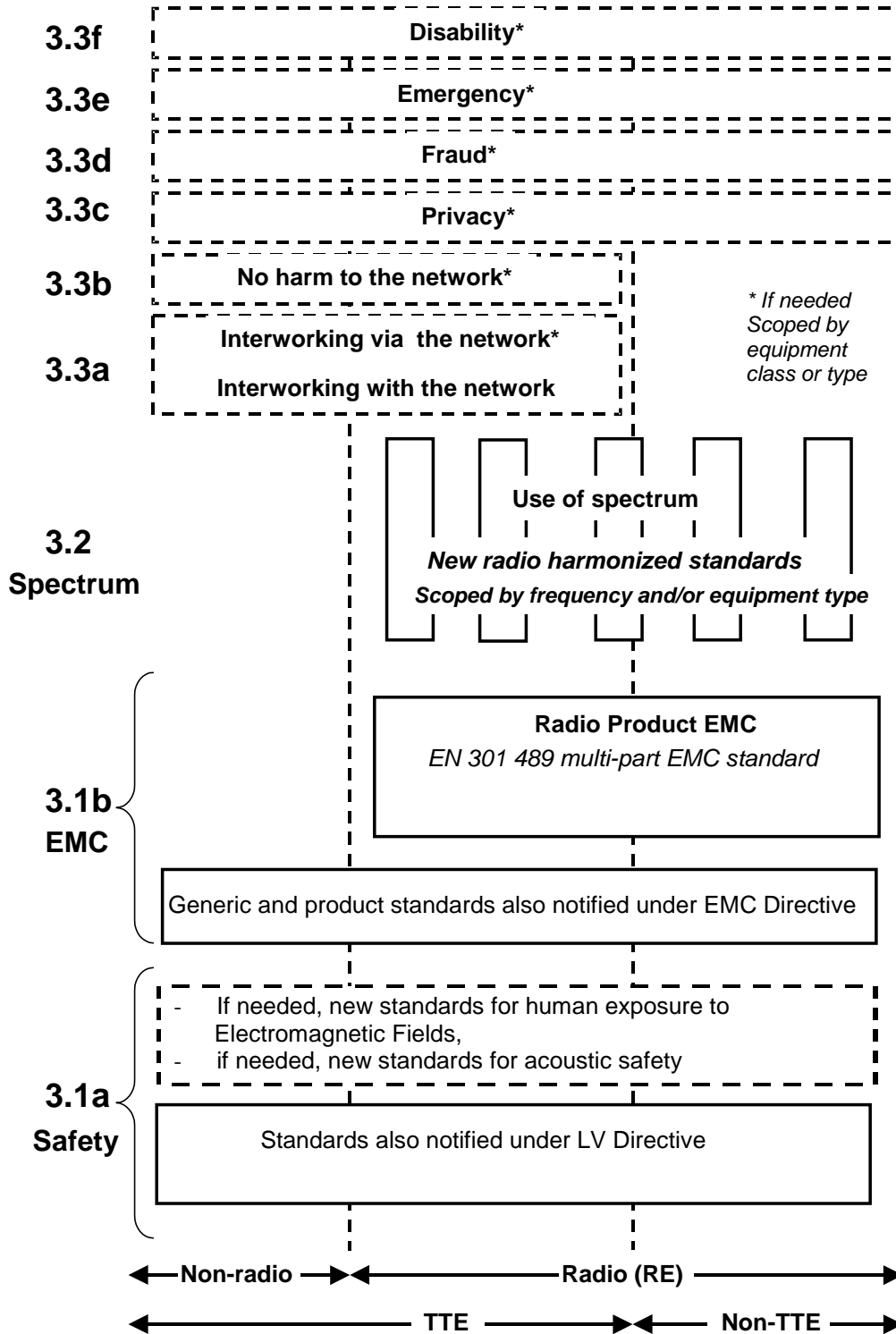


Figure 1: Modular structure for the various standards used under the R&TTE Directive

The left hand edge of the figure 1 shows the different clauses of article 3 of the R&TTE Directive [1].

For article 3.3 various horizontal boxes are shown. Dotted lines indicate that at the time of publication of the present document essential requirements in these areas have to be adopted by the Commission. If such essential requirements are adopted, and as far and as long as they are applicable, they will justify individual standards whose scope is likely to be specified by function or interface type.

The vertical boxes show the standards under article 3.2 for the use of the radio spectrum by radio equipment.

For article 3.1b the diagram shows EN 301 489, the multi-part product EMC standard for radio used under the EMC Directive.

For article 3.1a the diagram shows the existing safety standards currently used under the LV Directive and new standards covering human exposure to electromagnetic fields. New standards covering acoustic safety may also be required.

The bottom of the figure shows the relationship of the standards to radio equipment and telecommunications terminal equipment. A particular equipment may be radio equipment, telecommunications terminal equipment or both. A radio spectrum standard will apply if it is radio equipment. An article 3.3 standard will apply as well only if the relevant essential requirement under the R&TTE Directive [1] is adopted by the Commission and if the equipment in question is covered by the scope of the corresponding standard. Thus, depending on the nature of the equipment, the essential requirements under the R&TTE Directive [1] may be covered in a set of standards.

The modularity principle has been taken because:

- it minimizes the number of standards needed. Because equipment may, in fact, have multiple interfaces and functions it is not practicable to produce a single standard for each possible combination of functions that may occur in an equipment;
- it provides scope for standards to be added:
  - under article 3.2 when new frequency bands are agreed; or
  - under article 3.3 should the Commission take the necessary decisions without requiring alteration of standards that are already published;
- it clarifies, simplifies and promotes the usage of Harmonized Standards as the relevant means of conformity assessment.

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# 1 Scope

The present document applies to either constant envelope angle modulation systems or to non-constant envelope modulation systems for use in the land mobile service, using the available bandwidth, operating on radio frequencies between 30 MHz and 1 GHz, with channel separations of 12,5 kHz, 20 kHz and 25 kHz, intended for data transmissions. It applies to digital and combined analogue and digital radio equipment with an internal or external antenna connector intended for the transmission of data and/or speech. The present document applies both to equipment operating in continuous or in discontinuous mode of transmission.

The types of equipment covered by the present document are as follows:

- base station (equipment fitted with an antenna socket, intended for use in a fixed location);
- mobile station (equipment fitted with an antenna socket, normally used in a vehicle or as a transportable);
- and those hand portable stations:
  - a) fitted with an antenna socket; or
  - b) without an external antenna socket (integral antenna equipment), but fitted with a permanent internal or a temporary internal 50  $\Omega$  RF connector which allows access to the transmitter output and the receiver input.

Hand portable equipment without an external or internal RF connector and without the possibility of having a temporary internal 50  $\Omega$  RF connector is not covered by the present document.

The present document is intended to cover the provisions of article 3.2 of Directive 1999/5/EC [1] (R&TTE Directive), which states that "..... radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference".

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of article 3 of the R&TTE Directive [1] may apply to equipment within the scope of the present document.

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# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- 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.
- For a non-specific reference, the latest version applies.

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

- [1] 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).
- [2] ETSI EN 300 113-1 (V1.5.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Radio equipment intended for the transmission of data (and/or speech) using constant or non-constant envelope modulation and having an antenna connector; Part 1: Technical characteristics and methods of measurement".
- [3] ETSI TR 100 028 (all parts) (V1.3.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".



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## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in the R&TTE Directive [1], EN 300 113-1 [2] and the following apply:

**Mode Listen before transmit:** equipment or systems that operate in a mode "listen before transmit" are defined as transceiver equipment or systems that include receiving modules that implement one or more of the following features:

- squelch;
- CTCSS (Continuous Tone Control Squelch System);
- RSSI (Receiver Signal Strength Indicator);
- algorithms evaluating the quality of the channel; or
- more sophisticated protocols using transmission and reception transactions.

### 3.2 Symbols

For the purposes of the present document, the symbols defined in EN 300 113-1 [2] apply.

### 3.3 Abbreviations

For the purposes of the present document, the abbreviations defined in EN 300 113-1 [2] apply.

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## Technical specifications

### 4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the manufacturer of the equipment. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile.

### 4.2 Transmitter requirements

#### 4.2.1 Frequency error

##### 4.2.1.1 Definition

The frequency error is defined in EN 300 113-1 [2], clause 8.1.1.

##### 4.2.1.2 Limit

The frequency error shall not exceed the limits in EN 300 113-1 [2], table 1.

##### 4.2.1.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 8.1.2 shall be carried out.

## 4.2.2 Carrier power (conducted)

### 4.2.2.1 Definition

The carrier power (conducted) is defined in EN 300 113-1 [2], clause 8.2.1.

### 4.2.2.2 Limit

The carrier power (conducted) shall not exceed the limits in EN 300 113-1 [2], clause 5.1.2.

### 4.2.2.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 8.2.2 shall be carried out.

## 4.2.3 Effective radiated power

### 4.2.3.1 Definition

The effective radiated power is defined in EN 300 113-1 [2], clause 8.3.1.

### 4.2.3.2 Limit

The effective radiated power shall not exceed the limits in EN 300 113-1 [2], clause 5.1.3.

### 4.2.3.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 8.3.2 shall be carried out.

## 4.2.4 Adjacent channel power

### 4.2.4.1 Definition

The adjacent channel power is defined in EN 300 113-1 [2], clause 8.5.1.

### 4.2.4.2 Limit

The adjacent channel power shall not exceed the limits in EN 300 113-1 [2], clause 5.1.4.

### 4.2.4.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 8.5.2 shall be carried out.

## 4.2.5 Spurious emissions

### 4.2.5.1 Definition

The spurious emissions are defined in EN 300 113-1 [2], clause 8.6.1.

### 4.2.5.2 Limit

The spurious emissions shall not exceed the limits in EN 300 113-1 [2], tables 2 and 3.

### 4.2.5.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clauses 8.6.1, 8.6.2 and 8.6.3 shall be carried out.

## 4.2.6 Intermodulation attenuation

### 4.2.6.1 Definition

The intermodulation attenuation is defined in EN 300 113-1 [2], clause 8.7.1.

### 4.2.6.2 Limit

The intermodulation attenuation shall not exceed the limits in EN 300 113-1 [2], clause 5.1.6.

### 4.2.6.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 8.7.2 shall be carried out.

## 4.2.7 Transmitter attack time

### 4.2.7.1 Definition

The transmitter attack time is defined in EN 300 113-1 [2], clause 8.8.1.

### 4.2.7.2 Limit

The transmitter attack time shall not exceed the limits in EN 300 113-1 [2], clause 5.1.7.

### 4.2.7.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 8.8.2 shall be carried out.

## 4.2.8 Transmitter release time

### 4.2.8.1 Definition

The transmitter release time are defined in EN 300 113-1 [2], clause 8.9.1.

### 4.2.8.2 Limit

The transmitter release time shall not exceed the limits in EN 300 113-1 [2], clause 5.1.8.

### 4.2.8.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 8.9.2 shall be carried out.

## 4.2.9 Transient frequency behaviour of the transmitter

### 4.2.9.1 Definition

The transient frequency behaviour of the transmitter is defined in EN 300 113-1 [2], clause 8.10.1.

### 4.2.9.2 Limit

The transient frequency behaviour of the transmitter shall not exceed the limits in EN 300 113-1 [2], clauses 5.1.9.1 and 5.1.9.2.

### 4.2.9.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 8.10.3 shall be carried out.

## 4.3 Receiver requirements

### 4.3.1 Sensitivity (data or messages)

#### 4.3.1.1 Definition

The sensitivity is defined in EN 300 113-1 [2], clause 9.1.1 (conducted) and clause 9.2 (field strength).

#### 4.3.1.2 Limit

The sensitivity shall not exceed the limits in EN 300 113-1 [2], clause 5.2.1 (conducted) and clause 5.2.2 (field strength).

#### 4.3.1.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 9.1.2 (data) or 9.1.3 (messages), and 9.2 (field strength), as appropriate, shall be carried out.

### 4.3.2 Co-channel rejection

#### 4.3.2.1 Definition

The co-channel rejection is defined in EN 300 113-1 [2], clause 9.5.1.

#### 4.3.2.2 Limit

The co-channel rejection shall not exceed the limits in EN 300 113-1 [2], clause 5.2.4.

#### 4.3.2.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 9.5.2 or 9.5.3 shall be carried out.

### 4.3.3 Adjacent channel selectivity

#### 4.3.3.1 Definition

The adjacent channel selectivity is defined in EN 300 113-1 [2], clause 9.6.1.

#### 4.3.3.2 Limit

The adjacent channel selectivity shall not exceed the limits in EN 300 113-1 [2], table 4.

#### 4.3.3.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 9.6.2 or 9.6.3 shall be carried out.

### 4.3.4 Spurious response rejection

#### 4.3.4.1 Definition

The spurious response rejection is defined in EN 300 113-1 [2], clause 9.7.1.

#### 4.3.4.2 Limit

The spurious response rejection shall not exceed the limits in EN 300 113-1 [2], clause 5.2.6.

#### 4.3.4.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 9.7.4 or 9.7.5 shall be carried out.

### 4.3.5 Intermodulation response rejection

#### 4.3.5.1 Definition

The intermodulation response rejection is defined in EN 300 113-1 [2], clause 9.8.1.

#### 4.3.5.2 Limit

The intermodulation response rejection shall not exceed the limits in EN 300 113-1 [2], clause 5.2.7.

#### 4.3.5.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 9.8.2 or 9.8.3 shall be carried out.

### 4.3.6 Blocking or desensitization

#### 4.3.6.1 Definition

The blocking or desensitization is defined in EN 300 113-1 [2], clause 9.9.1.

#### 4.3.6.2 Limit

The blocking or desensitization shall not exceed the limits in EN 300 113-1 [2], clause 5.2.8.

#### 4.3.6.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 9.9.2 or 9.9.3 shall be carried out.

### 4.3.7 Spurious radiations

#### 4.3.7.1 Definition

The spurious radiations are defined in EN 300 113-1 [2], clause 9.10.1.

#### 4.3.7.2 Limit

The spurious radiations shall not exceed the limits in EN 300 113-1 [2], tables 5 and 6.

#### 4.3.7.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clauses 9.10.2 and 9.10.3 shall be carried out.

### 4.3.8 Desensitization and sensitivity (duplex)

#### 4.3.8.1 Definition

The receiver desensitization and sensitivity is defined in EN 300 113-1 [2], clause 10.1.1.

#### 4.3.8.2 Limit

The receiver desensitization and sensitivity shall meet the requirements of EN 300 113-1 [2], clause 5.3.1.

#### 4.3.8.3 Method of measurement

The measurements specified in EN 300 113-1 [2], clause 10.1.2 or 10.1.3 shall be carried out.

#### 4.3.9 Spurious response rejection (duplex)

##### 4.3.9.1 Definition

The spurious response rejection is defined in EN 300 113-1 [2], clause 10.2.1.

##### 4.3.9.2 Limit

The spurious response rejection shall not exceed the limits in EN 300 113-1 [2], clause 5.3.2.

##### 4.3.9.3 Methods of measurement

The measurements specified in EN 300 113-1 [2], clause 10.2.2 shall be carried out.

---

## 5 Testing for compliance with technical requirements

### 5.1 Environmental conditions for testing

#### 5.1.1 Normal and extreme test-conditions

Measurements 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 EN 300 113-1 [2], clauses 6.3, 6.4 and 6.5.

#### 5.1.2 Test power source

The test power source shall meet the requirements of EN 300 113-1 [2], clause 6.2.

#### 5.1.3 Choice of samples for test suites

Measurement shall be performed, according to the present document, on samples of equipment defined in EN 300 113-1 [2], clause 4.1.

### 5.2 Interpretation of the measurement results

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;
- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;
- the value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figures in table 1.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with TR 100 028 [3] and shall correspond to an expansion factor (coverage factor)  $k = 1,96$  or  $k = 2$  (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Table 1 is based on such expansion factors.

The particular expansion factor used for the evaluation of the measurement uncertainty shall be stated.

**Table 1: Absolute measurement uncertainties: maximum values**

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-7}$
RF Power, conducted (up to 160 W)	$\pm 0,75$ dB
Radiated RF power	$\pm 6$ dB
Adjacent channel power	$\pm 5$ dB
Sensitivity	$\pm 3$ dB
Two-signal measurement, valid up to 4 GHz	$\pm 4$ dB
Three-signal measurement	$\pm 3$ dB
Conducted spurious emission of transmitter, valid up to 12,75 GHz	$\pm 4$ dB
Conducted spurious emission of receiver, valid up to 12,75 GHz	$\pm 3$ dB
Radiated emission of the transmitter, valid up to 4 GHz	$\pm 6$ dB
Radiated emission of receiver, valid up to 4 GHz	$\pm 6$ dB
Transmitter transient frequency (frequency difference)	$\pm 250$ Hz
Transmitter transient time	$\pm 20$ %
NOTE: Values valid up to 1 GHz for the RF parameters unless otherwise stated.	

## 5.3 Essential radio test suites

The following radio test suites shall be performed to assess the performance of equipment or systems tested under EN 300 113 standard following article 3.2 of Directive 1999/5/EC [1] (R&TTE Directive).

### 5.3.1 Frequency error

The measurements specified in EN 300 113-1 [2], clause 8.1.2 shall be carried out.

### 5.3.2 Carrier power (conducted)

The measurements specified in EN 300 113-1 [2], clause 8.2.2 shall be carried out.

### 5.3.3 Effective radiated power

The measurements specified in EN 300 113-1 [2], clause 8.3.2 shall be carried out.

### 5.3.4 Adjacent channel power

The measurements specified in EN 300 113-1 [2], clause 8.5.2 shall be carried out.

### 5.3.5 Spurious emissions

The measurements specified in EN 300 113-1 [2], clauses 8.6.1, 8.6.2 and 8.6.3 shall be carried out.

### 5.3.6 Intermodulation attenuation

The measurements specified in EN 300 113-1 [2], clause 8.7.2 shall be carried out.

### 5.3.7 Transmitter attack time

The measurements specified in EN 300 113-1 [2], clause 8.8.2 shall be carried out.

### 5.3.8 Transmitter release time

The measurements specified in EN 300 113-1 [2], clause 8.9.2 shall be carried out.

### 5.3.9 Transient frequency behaviour of the transmitter

The measurements specified in EN 300 113-1 [2], clause 8.10.3 shall be carried out.

### 5.3.10 Receiver Spurious radiations

The measurements specified in EN 300 113-1 [2], clauses 9.10.2 and 9.10.3 shall be carried out.

This test shall not be applied to equipment having only transmitting capabilities.

## 5.4 Other radio test suites

The following radio test suites shall be performed to assess the performance of equipment or systems, that operate in a mode "listen before transmit", tested under EN 300 113 standard following article 3.2 of Directive 1999/5/EC [1] (R&TTE Directive).

### 5.4.1 Sensitivity (data or messages)

The measurements specified in EN 300 113-1 [2], clause 9.1.2 or 9.1.3, and 9.2, as appropriate, shall be carried out.

### 5.4.2 Co-channel rejection

The measurements specified in EN 300 113-1 [2], clause 9.5.2 or 9.5.3 shall be carried out.

### 5.4.3 Adjacent channel selectivity

The measurements specified in EN 300 113-1 [2], clause 9.6.2 or 9.6.3 shall be carried out.

### 5.4.4 Spurious response rejection

The measurements specified in EN 300 113-1 [2], clause 9.7.4 or 9.7.5 shall be carried out.

### 5.4.5 Intermodulation response rejection

The measurements specified in EN 300 113-1 [2], clause 9.8.2 or 9.8.3 shall be carried out.

### 5.4.6 Blocking or desensitization

The measurements specified in EN 300 113-1 [2], clause 9.9.2 or 9.9.3 shall be carried out.

### 5.4.7 Desensitization and sensitivity (duplex)

The measurements specified in EN 300 113-1 [2], clause 10.1.2 or 10.1.3 shall be carried out.

### 5.4.8 Spurious response rejection (duplex)

The measurements specified in EN 300 113-1 [2], clause 10.2.2 shall be carried out.



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## Annex A (informative): Bibliography

- Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive).
- Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (LV Directive).

## Annex B (informative): The EN title in the official languages

Language	EN title
Czech	
Danish	
Dutch	
English	Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Radio equipment intended for the transmission of data (and/or speech) using constant or non-constant envelope modulation and having an antenna connector; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive
Estonian	
Finnish	
French	
German	
Greek	
Hungarian	
Icelandic	
Italian	
Latvian	
Lithuanian	
Maltese	
Polish	
Portuguese	
Slovak	
Slovenian	
Spanish	
Swedish	

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## History

<b>Document history</b>		
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V1.2.1	April 2002	Publication
V1.3.1	July 2003	One-step Approval Procedure      OAP 20031121: 2003-07-23 to 2003-11-21
V1.3.1	December 2003	Publication