

# ETSI EN 301 751 V1.1.1 (2000-12)

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*Candidate Harmonized European Standard (Telecommunications series)*

**Fixed Radio Systems;  
Point-to-Point equipments and antennas;  
Generic harmonized standard for Point-to-Point digital  
fixed radio systems and antennas covering  
the essential requirements under article 3.2  
of the 1999/5/EC Directive**

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**Reference**

DEN/TM-04090

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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

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## Foreword

This Candidate Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Transmission and Multiplexing (TM).

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [30] 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").

| <b>National transposition dates</b>                                                    |                  |
|----------------------------------------------------------------------------------------|------------------|
| Date of adoption of this EN:                                                           | 4 August 2000    |
| Date of latest announcement of this EN (doa):                                          | 30 November 2000 |
| Date of latest publication of new National Standard or endorsement of this EN (dop/e): | 31 May 2001      |
| Date of withdrawal of any conflicting National Standard (dow):                         | 31 May 2001      |

## Introduction

Fixed Service Digital Radio systems, used in European countries, are presently referred to in a relatively large number of specific ETSI standards.

These ETS/ENs contain other requirements that even if not considered essential under the R&TTE Directive [1] are nevertheless applicable, on the ETSI commonly understood voluntary basis, to guarantee good performance and operability of FDRS.

These standards either for point-to-point or for point-to-multipoint systems, cover a very wide range of frequency bands of emission, traffic capacities, channel separations and modulation formats that, for the point-to-point systems subject of this EN, are typically summarized in table 1.

**Table 1: Fixed Service Digital Radio System (FDRS) parameters**

| Parameter            | Range                                                                                                                                                                                                                   |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency bands      | below 1 GHz to 58 GHz                                                                                                                                                                                                   |
| Traffic capacities   | from 9,6 kbit/s to 622 Mbit/s                                                                                                                                                                                           |
| Channel separations  | from 25 kHz to 112 MHz                                                                                                                                                                                                  |
| Modulation formats   | from 2 to 512 states (amplitude and/or phase and/or frequency states).                                                                                                                                                  |
| Typical applications | <u>POINT-TO-POINT (P-P) CONNECTIONS:</u><br>long haul (trunk), rural and urban low/medium/high capacity links<br><u>STAND ALONE ANTENNAS:</u><br>for all the above applications when integral antennas are not employed |

Many of the standards are produced for similar systems which have different capacity and spectrum efficiency parameters for applications in the various radio frequency channel arrangements as shown in table 1. It is expected that other standards will be developed in the future to cover emerging technologies and / or new frequency bands.

All the systems are very similar in the "principles of parameters" but, besides a few common horizontal parameters, they differ in the "required numerical values".

The present document, for point-to-point systems contains only the phenomena relevant to the essential requirements of article 3.2 of the R&TTE Directive [1], giving the reference of the relevant clauses of the ETSI product standards which contain the actual numerical values and the relevant test methods for the declaration of conformity to the essential requirements.

Where appropriate some horizontal requirements are directly reported.

The selection of the phenomena relevant to the essential requirements has been based on the guidance given by EG 201 399 [27] and by the specific analysis applied to FDRS given in TR 101 506 [28].

The present document 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.

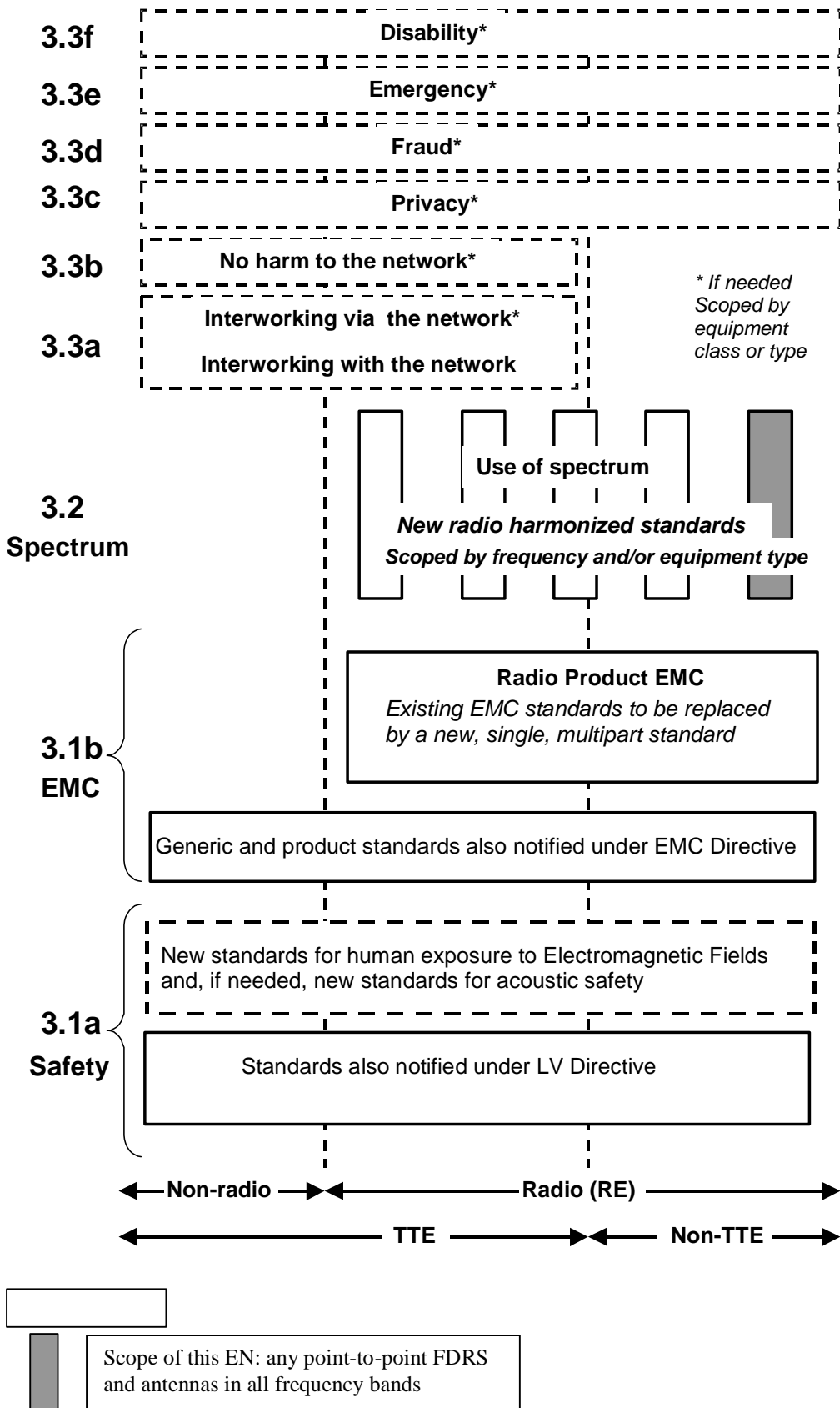


Figure 1: Modular structure for the various standards used under the R&TTE Directive [1]

The left hand edge of the figure 1 shows the different subclauses 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. The scopes of these standards are specified either by frequency (normally in the case where frequency bands are harmonized) or by radio equipment type.

For article 3.1b the diagram shows the new single multipart product EMC standard for radio, and the existing collection of generic and product standards currently used under the EMC Directive [2]. The parts of this new standard will become available in the second half of 2000, and the existing separate product EMC standards will be used until it is available.

For article 3.1a the diagram shows the existing safety standards currently used under the LV Directive [3] 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.

# 1 Scope

The present document applies to the following fixed service digital radio systems (FDRS) types:

- 1) Point-to-point systems intended for operation in frequency bands that require co-ordination;
- 2) Point-to-point systems intended for operation in frequency bands that do not require co-ordination;
- 3) Antennas for point-to-point FDRS.

The present document is intended to cover the provisions of Directive 1999/5/EC [1] (R&TTE Directive) Article 3.2 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.

NOTE 1: A list of such ENs is included on the ETSI web site at <http://www.newapproach.org>.

Table 2 summarizes the ETSI standards applicable to point-to-point FDRS, from which the technical parameters within the present document have been extracted.

NOTE 2: The third digit of the EN version number is not considered essential for dated reference purposes because the ETSI Technical Working Procedures reserve this digit for editorially changed versions, thereby not affecting the technical parameters within that version.

**Table 2: Applicability of the present document to the equipments in the scope of ETSI standards**

| Equipment standards   |         |                                                                                                                                                                           |                                                     |                           |
|-----------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|---------------------------|
| ETSI Reference number | Version | Title                                                                                                                                                                     | Fixed Service Frequency bands of operation (note 1) | Channels separation (MHz) |
| EN 300 197 [4]        | V1.3.b  | Parameters for radio relay systems for the transmission of digital signals and analogue video signals operating at 38 GHz                                                 | 38 GHz                                              | 3,5 to 56                 |
| EN 300 198 [5]        | V1.3.b  | Parameters for radio relay systems for the transmission of digital signals and analogue video signals operating at 23 GHz                                                 | 23 GHz                                              | 3,5 to 56                 |
| EN 300 407 [6]        | V1.2.b  | Parameters for radio-relay systems for the transmission of digital signals and analogue video signals operating around 55 GHz                                             | 55 GHz                                              | 14 to 140                 |
| EN 300 234 [7]        | V1.2.b  | High capacity digital radio-relay systems carrying 1 x STM-1 signals and operating in frequency bands with about 30 MHz channel spacing and alternated arrangements       | any from the 4 GHz to the 15 GHz                    | 28 to 30                  |
| EN 300 408 [8]        | V1.2.b  | Parameters for radio-relay systems for the transmission of digital signals and analogue video signals operating at around 58 GHz, which do not require frequency planning | 58 GHz                                              | 50 and 100                |
| EN 300 430 [9]        | V1.2.b  | Parameters for radio systems for the transmission of STM-1 digital signals operating at 18 GHz in either 55 or 27,5 MHz channel spacing                                   | 18 GHz                                              | 27,5 and 55               |
| EN 300 431 [10]       | V1.2.b  | Digital fixed point-to-point radio link equipment operating in the frequency range 24,5 to 29,5 GHz                                                                       | 26 GHz and 28 GHz                                   | 3,5 to 56                 |
| EN 300 630 [11]       | V1.2.b  | Low capacity point to point digital radio relay systems in the 1,4 GHz band                                                                                               | 1,4 GHz                                             | 0,025 to 3,5              |
| EN 300 631 [12]       | V1.2.b  | Antennas for point-to-point radio links in band 1 to 3 GHz                                                                                                                | any from 1 GHz to 3 GHz                             | N.A.                      |
| EN 300 633 [13]       | V1.2.b  | Low and medium capacity point-to-point digital radio relay systems operating in the 2,1 to 2,6 GHz frequency band                                                         | any from the 2,1 GHz to the 2,6 GHz                 | 0,5 to 14                 |



| <b>Equipment standards</b>                                                                                                                                                                                                                                                        |                |                                                                                                                                                                          |                                                            |                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|----------------------------------|
| <b>ETSI Reference number</b>                                                                                                                                                                                                                                                      | <b>Version</b> | <b>Title</b>                                                                                                                                                             | <b>Fixed Service Frequency bands of operation (note 1)</b> | <b>Channels separation (MHz)</b> |
| EN 300 639 [14]                                                                                                                                                                                                                                                                   | V1.2.b         | Sub STM-1 digital radio relay systems (DRRS) operating in the 13 GHz, 15 GHz and 18 GHz frequency band with about 28 MHz co-polar and 14 MHz cross-polar channel spacing | 13 GHz, 15 GHz and 18 GHz                                  | 14 and 28                        |
| EN 300 786 [15]                                                                                                                                                                                                                                                                   | V1.2.b         | Sub STM-1 digital radio relay systems in the 13, 15 and 18 GHz bands with about 14 MHz co-polar channel spacing                                                          | 13 GHz, 15 GHz and 18 GHz                                  | 14                               |
| EN 300 833 [16]                                                                                                                                                                                                                                                                   | V1.2.b         | Antennas used in point-to-point radio relay systems operating in frequency bands from 3 to 60 GHz'                                                                       | any from 3 GHz to 60 GHz                                   | N.A.                             |
| EN 301 127 [17]                                                                                                                                                                                                                                                                   | V1.1.b         | High capacity DRRS carrying 2 x STM-1 in frequency bands with about 30 MHz channel spacings using co-channel dual-polarized (CCDP) operation                             | any from the 4 GHz to the 15 GHz                           | 28 to 30                         |
| EN 301 128 [18]                                                                                                                                                                                                                                                                   | V1.1.b         | PDH low and medium capacity digital radio relay systems operating in the frequency bands 13, 15 and 18 GHz                                                               | 13 GHz, 15 GHz and 18 GHz                                  | 1,75 to 28                       |
| EN 301 216 [19]                                                                                                                                                                                                                                                                   | V1.1.b         | PDH low and medium capacity and STM-0 digital radio relay systems operating in the frequency bands in the range 3 GHz to 11 GHz                                          | any from 3 GHz to 11 GHz                                   | 1,75 to 30                       |
| EN 301 277 [20]                                                                                                                                                                                                                                                                   | V1.1.b         | High capacity DRRS transmitting STM-4 or 4 x STM-1 in a 40 MHz radio frequency channel using Co-Channel Dual Polarized (CCDP) operation                                  | any from the 4 GHz to the 11 GHz                           | 40                               |
| EN 301 387 [21]                                                                                                                                                                                                                                                                   | V1.1.b         | PDH low and medium capacity digital radio relay systems operating in the frequency band 48,5 to 50,2 GHz                                                                 | 50 GHz                                                     | 3,5 to 28                        |
| EN 301 669 [22]                                                                                                                                                                                                                                                                   | V1.1.b         | High capacity DRRS carrying STM-4 in two 40 MHz channels or 2 x STM-1 in 40 MHz channel with alternate channel arrangement                                               | any from the 4 GHz to the 11 GHz                           | 40                               |
| EN 301 461 [23]                                                                                                                                                                                                                                                                   | V1.1.b         | High capacity DRRS carrying 2 x STM-1 in frequency bands with 40 MHz channel spacings using co-channel dual-polarized (CCDP) operation                                   | any from the 4 GHz to the 11 GHz                           | 40                               |
| <b>Test methods for spurious emissions and receiver immunity standards that are relevant for the test and definition of essential requirements</b>                                                                                                                                |                |                                                                                                                                                                          |                                                            |                                  |
| <b>ETSI Reference number</b>                                                                                                                                                                                                                                                      | <b>Version</b> | <b>Title</b>                                                                                                                                                             |                                                            |                                  |
| EN 301 126-1 [24]                                                                                                                                                                                                                                                                 | V1.1.b         | Fixed Radio Systems; Conformance testing; Part 1: Point-to-Point equipment - Definitions, general requirements and test procedures                                       |                                                            |                                  |
| EN 301 126-3-1 [25]                                                                                                                                                                                                                                                               | V1.1.b         | Fixed Radio Systems; Conformance testing; Part 3-1: Point-to-Point antennas - Definitions, general requirements and test procedures                                      |                                                            |                                  |
| EN 301 390 [26]                                                                                                                                                                                                                                                                   | V1.1.b         | Spurious emissions and receiver immunity at equipment antenna port of DRRSs                                                                                              |                                                            |                                  |
| NOTE: The frequency band identification is taken from the approximate centre frequency as commonly used in Fixed Service ITU-R Recommendations; it also includes national frequency bands that may slightly differ from each other but are commonly referred to by the same term. |                |                                                                                                                                                                          |                                                            |                                  |

The provisions of the present document are valid for all point-to-point (P-P) FDRS (Fixed Service Digital Radio Systems) and related antennas also in the scope of the relevant ETSI standards summarized in table 1.

The present document is considered applicable to fixed radio systems products with integral antennas, for which all the technical requirements included in the present document apply. It also applies to fixed radio equipment without integral antennas and to separate antenna products, to which only the relevant technical requirements apply, and which will be therefore subject to separate declarations of conformity to the essential requirements of the R&TTE Directive [1].

Technical specifications relevant to the R&TTE Directive [1] are summarized in Annex A.

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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, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [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.
- [2] 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).
- [3] 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).
- [4] ETSI EN 300 197 (V1.3.1) (11/2000): "Fixed Radio Systems; Point-to-point equipment; Parameters for radio systems for the transmission of digital signals operating at 38 GHz".
- [5] ETSI EN 300 198 (V1.3.1) (11/2000): "Fixed Radio Systems; Point-to-point equipment; Parameters for radio systems for the transmission of digital signals operating at 23 GHz".
- [6] ETSI EN 300 407 (V1.2.1) (10/2000): "Fixed Radio Systems; Point-to-point equipment; Parameters for digital radio systems for the transmission of digital signals operating around 55 GHz".
- [7] ETSI EN 300 234 (V1.2.1) (10/1998): "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); High capacity DRRS carrying 1 x STM-1 signals and operating in frequency bands with about 30 MHz channel spacing and alternated arrangements".
- [8] ETSI EN 300 408 (V1.2.1) (09/2000): "Fixed Radio Systems; Point-to-point equipment Parameters for digital radio systems for the transmission of digital signals and analogue video signals operating at around 58 GHz, which do not require co-ordinated frequency planning".
- [9] ETSI EN 300 430 (V1.2.1) (10/2000): "Fixed Radio Systems; Point-to-point equipment; Parameters for radio systems for the transmission of STM-1 digital signals operating in the 18 GHz frequency band with channel spacing of 55 MHz and 27,5 MHz".
- [10] ETSI EN 300 431 (V1.2.1) (11/2000): "Fixed Radio Systems; Point-to-point equipment; Parameters for radio system for the transmission of digital signals operating in the frequency range 24,50 GHz to 29,50 GHz".
- [11] ETSI EN 300 630 (V1.2.1) (03/2000): "Fixed Radio Systems; Point-to-point equipment; Low capacity point-to-point digital radio systems operating in the 1,4 GHz frequency band".
- [12] ETSI EN 300 631 (V1.2.1) (12/1999): "Fixed Radio Systems; Point-to-Point Antennas; Antennas for Point-to-Point fixed radio systems in the 1 GHz to 3 GHz band".
- [13] ETSI EN 300 633 (V1.2.1) (03/2000): "Fixed Radio Systems; Point-to-point equipment; Low and medium capacity point-to-point digital radio systems operating in the frequency range 2,1 GHz to 2,6 GHz".

- [14] ETSI EN 300 639 (V1.2.1) (03/2000): "Fixed Radio Systems; Point-to-point equipment; Sub-STM-1 digital radio systems operating in the 13 GHz, 15 GHz and 18 GHz frequency bands with about 28 MHz co-polar and 14 MHz cross-polar channel spacing".
- [15] ETSI EN 300 786 (V1.2.1) (03/2000): "Fixed Radio Systems; Point-to-point equipment; Sub-STM-1 digital radio systems operating in the 13 GHz, 15 GHz and 18 GHz frequency bands with about 14 MHz co-polar channel spacing".
- [16] ETSI EN 300 833 (V1.2.1) (08/2000): "Fixed Radio Systems; Point to Point Antennas; Antennas for point-to-point fixed radio systems operating in the frequency band 3 GHz to 60 GHz".
- [17] ETSI EN 301 127 (V1.1.1) (09/2000): "Fixed Radio Systems Point-to-point equipment; High capacity digital radio systems carrying SDH signals (2 x STM-1) in frequency bands with about 30 MHz channel spacing and using Co-Channel Dual Polarized (CCDP) operation".
- [18] ETSI EN 301 128 (V1.1.2) (06/2000): "Fixed Radio Systems Point-to-point equipment; Digital Radio Relay Systems (DRRS); Plesiochronous Digital Hierarchy (PDH); Low and medium capacity digital radio systems operating in the 13 GHz, 15 GHz and 18 GHz frequency bands".
- [19] ETSI EN 301 216 (V1.1.1) (12/1999): "Fixed Radio Systems; Point-to-point equipment; Plesiochronous Digital Hierarchy (PDH); Low and medium capacity and STM-0 digital radio system operating in the frequency bands in the range 3 GHz to 11 GHz".
- [20] ETSI EN 301 277 (V1.1.1) (02/2000): "Fixed Radio Systems; Point-to-point equipment; High capacity digital radio systems transmitting STM-4 or 4 x STM-1 in a 40 MHz radio frequency channel using Co-Channel Dual Polarized (CCDP) operation".
- [21] ETSI EN 301 387 (V1.1.2) (05/2000): "Fixed Radio Systems; Point-to-point equipment; Plesiochronous Digital Hierarchy (PDH); Low and medium capacity digital radio systems operating in the frequency band 48,5 GHz to 50,2 GHz".
- [22] ETSI EN 301 669 (V1.1.1) (06/2000): "Fixed Radio Systems; Point-to-point equipment; High capacity digital radio systems carrying STM-4 in two 40 MHz channels or 2 x STM-1 in a 40 MHz channel with alternate channel arrangement".
- [23] ETSI EN 301 461 (V1.1.1) (09/2000): "Fixed Radio Systems; Point-to-point equipment; High capacity fixed radio systems carrying SDH signals (2 x STM-1) in frequency bands with 40 MHz channel spacing and using Co-channel Dual Polarized (CCDP) operation".
- [24] ETSI EN 301 126-1 (V1.1.2) (09/1999): "Fixed Radio Systems; Conformance testing; Part 1: Point-to-Point equipment - Definitions, general requirements and test procedures".
- [25] ETSI EN 301 126-3-1 (V1.1.1) (04/2000): "Fixed Radio Systems; Conformance testing; Part 3-1: Point-to-Point antennas - Definitions, general requirements and test procedures".
- [26] ETSI EN 301 390 (V1.1): "Fixed Radio Systems; Point-to-point and Point-to-Multipoint Systems; Spurious emissions and receiver immunity at equipment/antenna port of Digital Fixed Radio Systems".
- [27] ETSI EG 201 399 (V1.1.1) (01/2000): "A guide to the production of Harmonized standards for application under the R&TTE Directive".
- [28] ETSI TR 101 506 (V1.1.1) (01/2000): "Fixed Radio Systems; Generic definitions, terminology and applicability of essential requirements under the article 3.2 of 99/05/EC Directive to Fixed Radio Systems".
- [29] ITU-R Recommendation F.746: "Radio-frequency channel arrangements for radio-relay systems".
- [30] 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.
- [31] ETSI EN 300 385 (V1.2.1) (04/2000): "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for fixed radio links and ancillary equipment".

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

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

**Allocated radio frequency band:** allocation (of a frequency band): entry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more terrestrial or space radiocommunication services or the radioastronomy service under specific conditions. This term shall also be applied to the frequency band concerned (Radio Regulations, Geneva 1998 Article S1.16).

**Automatic Transmit Power Control (ATPC):** this function is implemented to offer a dynamic power control that delivers the maximum power only during deep fading activity; in this way for most of the time the interference is reduced and the transmitter operates in a higher linearity mode. When this function is used, the transmit power is dynamically changed and follows the propagation condition. In principle, when ATPC is implemented, three different level of power may be identified:

- maximum available power (delivered only in condition of deep fading);
- maximum nominal and maximum available power levels may be coincident or, in case of multi-states modulations formats, the maximum available power may be used to overdrive the transmitter (loosing linearity but gaining fade margin when the fade conditions have already impaired the expected RBER). Performance prediction are usually made with the highest "available power";
- maximum nominal power (useable on permanent base when ATPC is disabled); it should be noted that this power is "nominal for the equipment" and has not to be confused with the "nominal level set link by link" by the frequency co-ordinator body, eventually achieved through passive RF attenuators or RTPC function;
- minimum power (delivered in unfaded condition).

**Conformity assessment procedure:** as described in the R&TTE Directive [1] Annexes II, III, IV and V.

**Environmental profile:** the range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present document

**Essential phenomenon:** radio frequency phenomenon related to the essential requirements under article 3.2 of the Directive, that is capable of expression in terms of quantifiable technical parameters..

**Harmonized radio frequency band:** commonly referred as a portion of the frequency spectrum that CEPT/ERC allocates to a specific service through a CEPT/ERC Decision (proper definition is currently under study by CEPT/ERC). It should be noted that, presently, radio frequency bands allocated to Fixed Service are not harmonized.

**Recommended radio frequency channel arrangement:** predefined centre frequencies raster for a number of radio frequency channels, covered by a CEPT/ERC Recommendation in a not harmonized frequency band (not used for the same purpose by all administrations) that is recommended to the member countries in the case they use the relevant frequency band for Fixed Service.

**Maximum available power:** see Automatic Transmit Power Control (ATPC).

**Maximum nominal power:** see Automatic Transmit Power Control (ATPC).

**National radio frequency channel arrangement:** predefined centre frequencies raster for a number of radio frequency channels, covered by a national regulation in a not harmonized frequency band used in a country (it may all or in part overlap with other national or recommended radio frequency channel arrangements).

**Operating frequency range:** range(s) of radio frequency channels covered by the Equipment Under Test (EUT) without any change of HardWare (HW) units (from EN 300 385 [31]).

**Radio Equipment: (As defined in the R&TTE Directive [1]):** radio equipment means a product, or relevant component thereof, capable of communication by means of the emission and/or reception of radio waves utilizing the spectrum allocated to terrestrial/space radiocommunication.

**Radio frequency channel arrangement:** predefined centre frequencies raster for a number of radio frequency channels, as defined by ITU-R Recommendation F.746 [29] used by administrations for co-ordination in the same geographical area.

**Radio frequency channel:** portion of a radio frequency band, where a radio frequency channel arrangement has been established, dedicated to one fixed radio link.

**Remote frequency control (RFC):** many fixed digital radio systems offered this functionality as a qualifying aid to the deployment. When this function is used, the transmit centre frequency/channel can be set either by a local control unit connected to the system control unit or to a by a remote network management terminal. The frequency variation is static and usually made at the activation or re-commissioning of links in order to easily obtain the licensed frequency assigned by the co-ordinating body to the network operator for that link, to control network interference in the same geographical area.

**Remote Transmit Power Control (RTPC):** many fixed digital radio systems offered this functionality as a qualifying aid to the deployment. When this function is used, the transmit power can be set either by a local control unit connected to the system control unit or to a by a remote network management terminal. The power variation is static and usually made at the activation or re-commissioning of links in order to easily obtain the EIRP required by the frequency co-ordinating body for that link, to control co-channel and adjacent channel interference in the same geographical area. In principle, this function is equivalent to the requirement of power regulation capability (e.g. by fixed attenuators) commonly required in fixed systems.

## 3.2 Symbols

For the purposes of the present document, the following symbol applies:

dBm                      decibel ratio relative to 1 milliWatt

## 3.3 Abbreviations

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

|         |                                                           |
|---------|-----------------------------------------------------------|
| ATPC    | Automatic Transmit Power Control                          |
| BER     | Bit Error Rate                                            |
| DS-CDMA | Direct Sequence Code Division Multiple Access             |
| EIRP    | Equivalent Isotropically Radiated Power                   |
| EMC     | Electro-Magnetic Compatibility                            |
| EN      | European Standard (Telecommunications series)             |
| ERC     | European Radiocommunications Committee                    |
| ETS     | European Telecommunication Standard                       |
| ETSI    | European Telecommunications Standards Institute           |
| FDMA    | Frequency Division Multiple Access                        |
| FDRS    | Fixed service Digital Radio Systems                       |
| FH-CDMA | Frequency Hopping Code Division Multiple Access           |
| FWA     | Fixed Wireless Access                                     |
| HW      | HardWare                                                  |
| IF      | Intermediate Frequency                                    |
| IPR     | Intellectual Property Rights                              |
| LV      | Low Voltage                                               |
| OAP     | One-step Approval Procedure                               |
| P-MP    | Point to MultiPoint                                       |
| P-P     | Point to Point                                            |
| R&TTE   | Radio equipments and Telecommunication Terminal Equipment |
| RBER    | Residual Bit Error Rate                                   |
| RF      | Radio Frequency                                           |
| RFC     | Remote Frequency Control                                  |
| RSL     | Receiver input Signal Level                               |
| RTPC    | Remote Transmit Power Control                             |
| TDMA    | Time Division Multiple Access                             |
| XPD     | Cross-polar discrimination                                |

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## 4 Technical requirements specifications

### 4.1 General

With reference to article 3.2 of the R&TTE Directive [1], the technical phenomena in this section have been identified as relevant to the essential requirements.

The tables stated in the following sections identify, in the specific ETSI standards (see table 2), that are in the scope of this harmonized standard, the applicable clauses that are relevant to the essential requirements under Article 3.2 of the R&TTE Directive [1].

Test methods referenced are only those considered essential *for the assessment of conformity to article 3.2* of the R&TTE Directive [1] (*i.e.* for the reproducibility of the results).

Guidance and description of the phenomena is given by EG 201 399 [27] and specific applications and descriptions for FDRS is given by TR 101 506 [28].

### 4.2 Environmental profile and tests

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be determined by the environmental class of the equipment according subclause 4.4 of EN 301 126-1 [24].

The environmental profile of the equipment shall be declared by the manufacturer.

The equipment shall comply with all the requirements of the present document at all times when operating within the boundary limits of the required operational environmental profile.

Any test, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the R&TTE Directive [1] for radio equipment, shall be carried-out with the same principles and procedures, for reference and extreme conditions, reported in subclause 4.4 of EN 301 126-1 [24]. The requirement for test at reference or extreme conditions is reported in any relevant subclause of subclauses 4.5 and 4.7 of the present document according to the principles for similar requirements in EN 301 126-1 [24].

Any test, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the R&TTE Directive [1] for integral or stand-alone FDRS antennas (directional phenomena of subclause 4.6 of the present document), shall be carried-out at reference environmental conditions of the test field according subclause 4.1 of EN 301 126-3-1 [25].

The test report shall be produced according to the procedure foreseen by Article 10 of the Directive 1999/5/EC [1].

### 4.3 Wide radio-frequency band covering units specification and tests

#### 4.3.1 Radio equipments

Even if radio frequency front-ends for FDRS are commonly designed for covering all or part(s) of the possible operating channels within a specific radio frequency channel arrangement, equipments can provide single radio frequency channel operation (e.g. when the RF duplexer filters is tuned to a specific channel) or offer a wider operating frequency range (e.g. wide-band RF duplexer and frequency agility by RFC function for easiness of deployment and spare parts handling by operators with large networks made by more than one assigned channel).

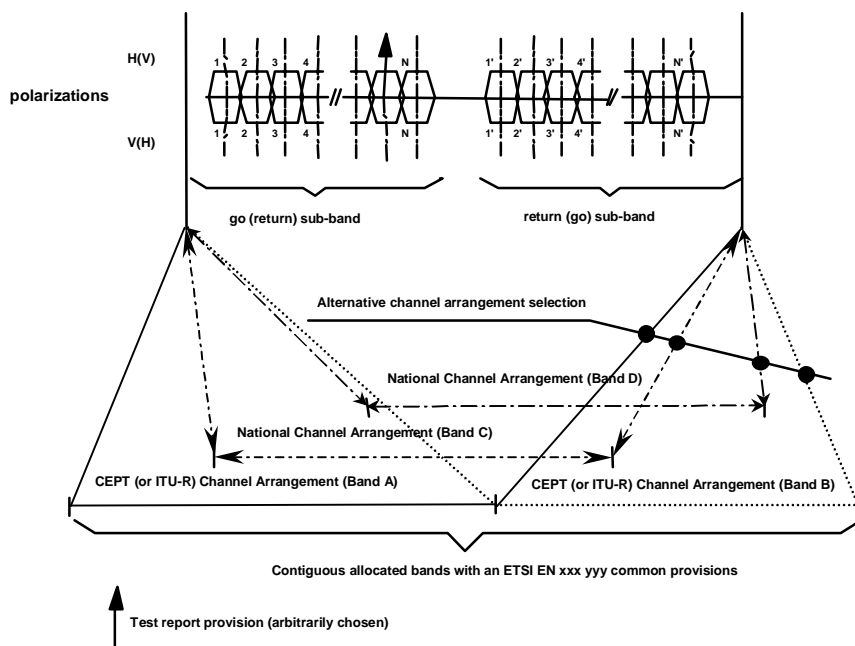
The equipment shall comply with all the requirements of the present document at any possible operating frequency.

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the Directive 1999/5/EC [1], shall be carried-out in the following way:

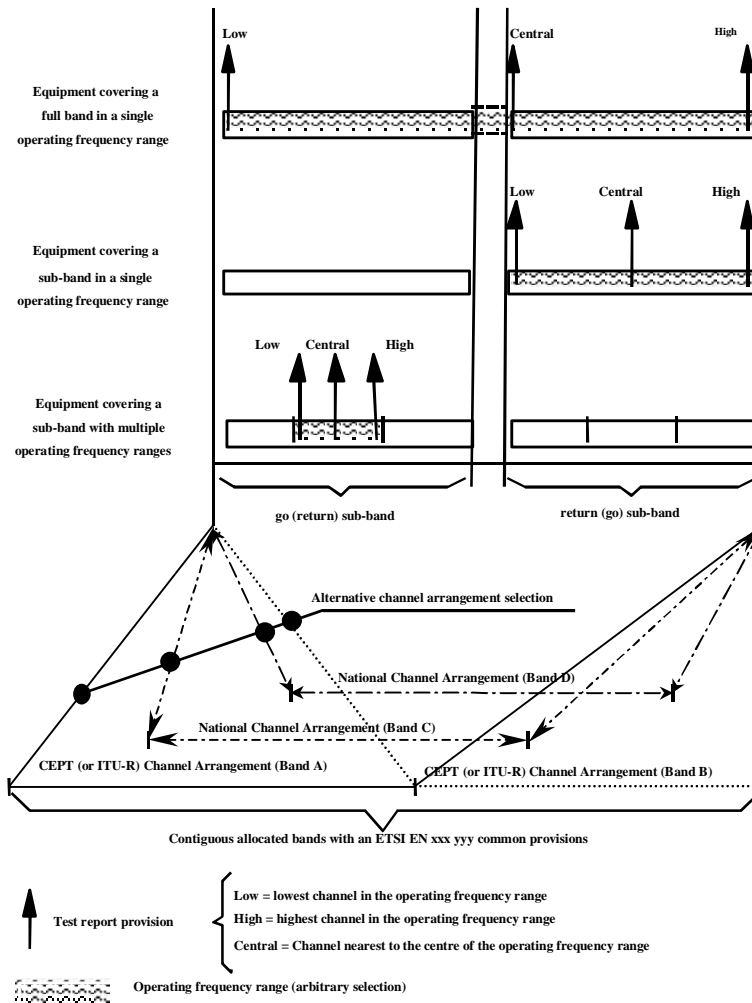
- 1) in the case of equipments intended for single channel operation, the test report shall be produced for one radio frequency channel arbitrarily chosen by the supplier (see figure 2);
- 2) in the case of equipments intended for covering an operating frequency range, the test report shall be produced for the lowest, intermediate and highest possible radio frequency channel within that operating frequency range (see figure 3);
- 3) it is not required that all the tests, required for the test report, are done on the same sample of equipment and at the same time; provided that the test report includes all the tests required by the present document, each test may be made on different samples of the same equipment, at different channel frequencies or frequency ranges and in different times.

When applicable also the following additional provisions apply to the production of the test report:

- in the case of equipments covering a radio frequency channel arrangement with more than one operating frequency range, the test report shall be produced for one of the operating frequency ranges arbitrarily chosen by the supplier, using the above procedures for equipments intended for single channel operation or for covering an operating frequency range (see figure 3);
- in the case of equipments designed to cover, with the same requirements under the same ETSI standard, a number of fully or partially overlapping recommended and/or national radio frequency channel arrangements, similarly established across contiguous radio frequency bands allocated to Fixed Service, the test report shall be produced for one radio frequency channel arrangements arbitrarily chosen by the supplier, using the above procedures for equipments intended for single channel operation or for covering an operating frequency range (see figure 2 and figure 3).



**Figure 2: Test report frequency requirement for equipments intended for single channel operation**



**Figure 3: Test report frequency requirements for equipments intended for covering an operating frequency range**

### 4.3.2 Antennas for FDRS

Also FDRS antennas commonly covers an operating frequency range, the antenna parameters shall comply with all the requirements of the present document at any possible operating frequency.

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the Directive 1999/5/EC [1], shall be carried-out at the highest and the lowest possible operating frequency.

## 4.4 Specification and testing of multirate equipment

FDRS equipments can cover a number of different payload-rate through software pre-settings.

In such cases the equipment shall comply with all the requirements of the present document at any possible payload operation.

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the Directive 1999/5/EC [1], shall be carried-out for transmitting phenomena (see subclause 4.5) at any possible bit rate operation, while receiving phenomena (see subclause 4.7) and control and monitoring functions (see subclause 4.8) shall be tested only at the lowest and the highest bit rate.



## 4.5 Transmitter requirements

### 4.5.1 Radio frequency tolerance (Frequency error/stability)

In table 3 are stated, where applicable, for each ETS/EN in the scope of this Harmonized standard, the clauses that give the limits of this essential phenomenon and the test methods.

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the Directive 1999/5/EC [1] shall be carried-out at reference and extreme climatic conditions.

**Table 3: Relevant ETS/ENs clause(s)**

| ETSI standard                    | Version | Subclause(s)<br>N° | relevant clause(s) title  | test method<br>(if essential)     | Notes                         |
|----------------------------------|---------|--------------------|---------------------------|-----------------------------------|-------------------------------|
| EN 300 197 [4]                   | V1.3.b  | 5.3.8              | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 300 198 [5]                   | V1.3.b  | 5.3.8              | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 300 234 [7]                   | V1.2.b  | 6.6                | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 300 407 [6]                   | V1.2.b  | 5.3.8              | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 300 408 [8]                   | V1.2.b  | 5.3.3              | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 | un-coordinated frequency band |
| EN 300 430 [9]                   | V1.2.b  | 5.3.8              | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 300 431 [10]                  | V1.2.b  | 5.3.8              | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 300 630 [11]                  | V1.2.b  | 6.5                | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 300 633 [13]                  | V1.2.b  | 6.5                | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 300 639 [14]                  | V1.2.b  | 6.6                | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 300 786 [15]                  | V1.2.b  | 6.6                | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 301 127 [17]                  | V1.1.b  | 6.6                | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 301 128 [18]                  | V1.1.b  | 6.5                | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 301 216 [19]                  | V1.1.b  | 5.3.8              | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 301 277 [20]                  | V1.1.b  | 6.7                | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 301 387 [21]                  | V1.1.b  | 5.4.5              | RF tolerance              | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 301 669 [22]                  | V1.1.b  | 6.6                | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| EN 301 461 [23]                  | V1.1.b  | 5.3.8              | Radio frequency tolerance | EN 301 126-1 [24] subclause 5.2.5 |                               |
| N.A.: Phenomenon not applicable. |         |                    |                           |                                   |                               |

For EN 300 631 and EN 300 833, also in the scope of the present document, this requirement is not applicable.

## 4.5.2 Transmitter power range

In table 4 are stated, where applicable, for each ETS/EN in the scope of this Harmonized standard, the clauses that give the limits of this essential phenomenon and the test methods.

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the Directive 1999/5/EC [1] shall be carried-out at reference and extreme climatic conditions.

**Table 4: Relevant ETS/ENs clause(s)**

| ETSI standard   | Version | Subclause(s)<br>N° | relevant clause(s) title                                      | test method<br>(if essential)        | Notes                         |
|-----------------|---------|--------------------|---------------------------------------------------------------|--------------------------------------|-------------------------------|
| EN 300 197 [4]  | V1.3.b  | 5.3.1<br>5.3.3     | Transmitter power range<br>Transmitter power tolerance        | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 300 198 [5]  | V1.3.b  | 5.3.1<br>5.3.3     | Transmitter power range<br>Transmitter power tolerance        | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 300 234 [7]  | V1.2.b  | 6.1                | Output power                                                  | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 300 407 [6]  | V1.2.b  | 5.3.1<br>5.3.3     | Transmitter power range<br>Transmitter output power tolerance | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 300 408 [8]  | V1.2.b  | 5.3.1.1<br>5.3.1.2 | Transmitter power range<br>Transmitter power tolerance        | EN 301 126-1 [24]<br>subclause 5.2.1 | un-coordinated frequency band |
| EN 300 430 [9]  | V1.2.b  | 5.3.1<br>5.3.3     | Transmitter power range<br>Transmitter power tolerance        | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 300 431 [10] | V1.2.b  | 5.3.1<br>5.3.3     | Transmitter power range<br>Transmitter power tolerance        | EN 301 126-1 [24]<br>clause 5.2.1    |                               |
| EN 300 630 [11] | V1.2.b  | 6.1                | Output power                                                  | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 300 631 [12] | V1.2.b  | N.A.               | N.A.                                                          | N.A.                                 | Antennas standard             |
| EN 300 633 [13] | V1.2.b  | 6.1                | Output power                                                  | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 300 639 [14] | V1.2.b  | 6.1                | Output power                                                  | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 300 786 [15] | V1.2.b  | 6.1                | Output power                                                  | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 300 833 [16] | V1.2.b  | N.A.               | N.A.                                                          | N.A.                                 | Antennas standard             |
| EN 301 127 [17] | V1.1.b  | 6.1                | Output power                                                  | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 301 128 [18] | V1.1.b  | 6.1                | Output power                                                  | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 301 216 [19] | V1.1.b  | 5.3.1<br>5.3.3     | Transmitter power range<br>Transmitter power tolerance        | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 301 277 [20] | V1.1.b  | 6.1                | Output power                                                  | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 301 387 [21] | V1.1.b  | 5.4.1<br>5.4.3     | Transmitter power range<br>Transmitter power tolerance        | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 301 669 [22] | V1.1.b  | 6.1                | Output power                                                  | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |
| EN 301 461 [23] | V1.1.b  | 5.3.1<br>5.3.3     | Transmitter power range<br>Transmitter power tolerance        | EN 301 126-1 [24]<br>subclause 5.2.1 |                               |

N.A.: Phenomenon not applicable.

For EN 300 631 and EN 300 833, also in the scope of the present document, this requirement is not applicable.

## 4.5.3 Spectrum mask, spectral lines at symbol rate and RTPC (Adjacent channel power)

### 4.5.3.1 Spectrum mask and spectral lines at symbol rate

In table 5 are stated, where applicable, for each ETS/EN in the scope of this Harmonized standard, the clauses that give the limits of these essential phenomena and test methods.

The spectrum masks and spectral lines at symbol rate limits, reported in the relevant clauses of table 5, are necessary for a number of intra-system and inter-system regulatory and performance requirements. Whenever required in the relevant clause of table 5, mask attenuations beyond those reported in table 6 are considered not relevant to essential requirements under article 3.2 of the R&TTE Directive [1].

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the R&TTE Directive [1] shall be carried-out at reference and extreme climatic conditions.

**Table 5: Relevant ETS/ENs clause(s)**

| ETSI standard   | Version | Subclause(s) N°             | relevant clause(s) title                          | test method (if essential)                                             | Notes                         |
|-----------------|---------|-----------------------------|---------------------------------------------------|------------------------------------------------------------------------|-------------------------------|
| EN 300 197 [4]  | V1.3.b  | 5.3.5<br>5.3.6              | RF spectrum mask<br>Spectral lines at symbol rate | EN 301 126-1 [24] subclause 5.2.6<br>EN 301 126-1 [24] subclause 5.2.8 |                               |
| EN 300 198 [5]  | V1.3.b  | 5.3.5<br>5.3.6              | RF spectrum mask<br>Spectral lines at symbol rate | EN 301 126-1 [24] subclause 5.2.6<br>EN 301 126-1 [24] subclause 5.2.8 |                               |
| EN 300 234 [7]  | V1.2.b  | 6.3<br>6.4                  | RF spectrum mask<br>Spectral lines at symbol rate | EN 301 126-1 [24] subclause 5.2.6<br>EN 301 126-1 [24] subclause 5.2.8 |                               |
| EN 300 407 [6]  | V1.2.b  | 5.3.5 (subclauses included) | RF spectrum mask                                  | EN 301 126-1 [24] subclause 5.2.6                                      |                               |
| EN 300 408 [8]  | V1.2.b  | 5.3.2.1                     | RF spectrum mask                                  | EN 301 126-1 [24] subclause 5.2.6                                      | un-coordinated frequency band |
| EN 300 430 [9]  | V1.2.b  | 5.3.5<br>5.3.6              | RF spectrum mask<br>Spectral lines at symbol rate | EN 301 126-1 [24] subclause 5.2.6<br>EN 301 126-1 [24] subclause 5.2.8 |                               |
| EN 300 431 [10] | V1.2.b  | 5.3.5<br>5.3.6              | RF spectrum mask<br>Spectral lines at symbol rate | EN 301 126-1 [24] subclause 5.2.6<br>EN 301 126-1 [24] subclause 5.2.8 |                               |
| EN 300 630 [11] | V1.2.b  | 6.2<br>6.3                  | RF spectrum mask<br>Spectral lines at symbol rate | EN 301 126-1 [24] subclause 5.2.6<br>EN 301 126-1 [24] subclause 5.2.8 |                               |
| EN 300 633 [13] | V1.2.b  | 6.2<br>6.3                  | RF spectrum mask<br>Spectral lines at symbol rate | EN 301 126-1 [24] subclause 5.2.6<br>EN 301 126-1 [24] subclause 5.2.8 |                               |
| EN 300 639 [14] | V1.2.b  | 6.3<br>6.4                  | RF spectrum mask<br>Spectral lines at symbol rate | EN 301 126-1 [24] subclause 5.2.6<br>EN 301 126-1 [24] subclause 5.2.8 |                               |
| EN 300 786 [15] | V1.2.b  | 6.3<br>6.4                  | RF spectrum mask<br>Spectral lines at symbol rate | EN 301 126-1 [24] subclause 5.2.6<br>EN 301 126-1 [24] subclause 5.2.8 |                               |

| ETSI standard                    | Version | Subclause(s)<br>N° | relevant clause(s) title         | test method<br>(if essential)        | Notes |
|----------------------------------|---------|--------------------|----------------------------------|--------------------------------------|-------|
| EN 301 127 [17]                  | V1.1.b  | 6.3                | RF spectrum mask                 | EN 301 126-1 [24]<br>subclause 5.2.6 |       |
|                                  |         | 6.4                | Spectral lines at<br>symbol rate | EN 301 126-1 [24]<br>subclause 5.2.8 |       |
| EN 301 128 [18]                  | V1.1.b  | 6.2                | RF spectrum mask                 | EN 301 126-1 [24]<br>subclause 5.2.6 |       |
|                                  |         | 6.3                | Spectral lines at<br>symbol rate | EN 301 126-1 [24]<br>subclause 5.2.8 |       |
| EN 301 216 [19]                  | V1.1.b  | 5.3.5              | RF spectrum mask                 | EN 301 126-1 [24]<br>subclause 5.2.6 |       |
|                                  |         | 5.3.6              | Spectral lines at<br>symbol rate | EN 301 126-1 [24]<br>subclause 5.2.8 |       |
| EN 301 277 [20]                  | V1.1.b  | 6.4                | RF spectrum mask                 | EN 301 126-1 [24]<br>subclause 5.2.6 |       |
|                                  |         | 6.5                | Spectral lines at<br>symbol rate | EN 301 126-1 [24]<br>subclause 5.2.8 |       |
| EN 301 387 [21]                  | V1.1.b  | 5.4.3              | RF spectrum mask                 | EN 301 126-1 [24]<br>subclause 5.2.6 |       |
| EN 301 669 [22]                  | V1.1.b  | 6.3                | RF spectrum mask                 | EN 301 126-1 [24]<br>subclause 5.2.6 |       |
|                                  |         | 6.4                | Spectral lines at<br>symbol rate | EN 301 126-1 [24]<br>subclause 5.2.8 |       |
| EN 301 461 [23]                  | V1.1.b  | 5.3.5              | RF spectrum mask                 | EN 301 126-1 [24]<br>subclause 5.2.6 |       |
|                                  |         | 5.3.6              | Spectral lines at<br>symbol rate | EN 301 126-1 [24]<br>subclause 5.2.8 |       |
| N.A.: Phenomenon not applicable. |         |                    |                                  |                                      |       |

For EN 300 631 and EN 300 833, also in the scope of the present document, this requirement is not applicable.

**Table 6: Maximum spectrum masks attenuation relevant to the essential requirements under article 3.2 of the Directive**

| Operating frequency band         | Maximum attenuation |
|----------------------------------|---------------------|
| $F < 10$ GHz                     | 60 dB               |
| $10 \text{ GHz} \leq F < 17$ GHz | 55 dB               |
| $17 \text{ GHz} \leq F < 30$ GHz | 50 dB               |
| $F \geq 30$ GHz                  | 45 dB               |

#### 4.5.3.2 Remote Transmit Power Control (RTPC)

This functionality and ATPC (see subclause 4.5.5.1) are commonly optional features; from the point of view of HW implementation, both these functions are made by an electronic attenuator implemented along the transmitting chain (e.g. at IF or at RF level or at both level) and can be realized in a mixed configuration, e.g.:

- ATPC only is implemented;
- RTPC only is implemented;
- ATPC + RTPC are implemented with separate attenuator functions;
- ATPC + RTPC are implemented with a single attenuator complying both functions with different command functions (either HW or SoftWare (SW)) and the ranges of both may be traded-off from a maximum available attenuation.

Equipment with RTPC will be subject to manufacturer declaration of RTPC ranges and related tolerances.

The equipment shall comply with the requirements of spectrum masks of the above table 5 along all RTPC range.

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the R&TTE Directive [1] shall be carried-out at three operating conditions (lowest, medium, and highest delivered power) of the RTPC power excursion and with ATPC (if any) set to maximum available power. The test shall be carried-out at reference and extreme climatic conditions.

Even if all the procedure provided by subclause 5.2.6 of EN 301 126-1 [24] are followed, the actual tests, at the lower RTPC power levels, might fall outside the available sensitivity of test instruments, currently available on the market. In this event the supplier shall produce an attachment to the test report containing:

- the calculated evidence that the noise floor of the actual test bed is higher than the mask requirement;
- the calculated evidence that the actual noise floor, generated by the transmitter according its noise figure and its implemented amplification/attenuation chain; is lower than the mask requirement.

#### 4.5.4 Spurious emissions

The equipment shall comply with the requirements of subclauses 4.1 and 4.1.1 of EN 301 390 [26] in any setting conditions of ATPC and RTPC, if any.

Test methods shall be in accordance with subclause 5.2.9 of EN 301 126-1 [24].

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the R&TTE Directive [1] shall be carried-out with ATPC, if any, set to maximum available power and RTPC, if any, set at minimum attenuation; actual test shall be limited to the practical frequency ranges foreseen by clause A.1 of EN 301 390 [26]. The test shall be carried-out at reference climatic conditions.

#### 4.5.5 ATPC and RFC (Transient behaviour of the transmitter)

##### 4.5.5.1 Automatic Transmit Power Control (ATPC)

This functionality and RTPC (see subclause 4.5.3.2) are commonly optional features; from the point of view of hardware implementation, both these functions are made by an electronic attenuator implemented along the transmitting chain (e.g. at IF or at RF level or at both level) and can be realized in a mixed configuration, e.g.:

- ATPC only is implemented;
- RTPC only is implemented;
- ATPC + RTPC are implemented with separate attenuator functions;
- ATPC + RTPC are implemented with a single attenuator complying both functions with different command functions (either HW or SW) and the ranges of both may be traded-off from a maximum available attenuation.

Equipment with ATPC will be subject to manufacturer declaration of ATPC ranges and related tolerances.

The correct operation of ATPC function according the supplier declaration shall be tested according the test method described in subclause 5.2.3 of EN 301 126-1 [24].

The equipment shall comply with the requirements of spectrum masks of the above table 5 with ATPC operating in the range between maximum nominal power and maximum available power including the attenuation introduced by RTPC function (if any).

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the Directive 1999/5/EC [1], shall be carried-out with ATPC set at the maximum available output power of the equipment. The test shall be carried-out at reference climatic conditions.

### 4.5.5.2 Remote Frequency Control (RFC)

This functionality is commonly an optional feature.

Equipment with RFC will be subject to manufacturer declaration of RFC ranges and related change frequency procedure.

RFC setting procedure shall not produce emissions outside the previous and final centre frequency spectrum masks required in table 5.

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the R&TTE Directive [1], shall be carried for RFC setting procedure for three frequencies (i.e. frequencies settings from lower to centre, centre to higher and back in the covered range). The test shall be carried-out at reference climatic conditions.

## 4.6 Antenna directional requirements

### 4.6.1 Radiation Pattern Envelope (Off-axis EIRP density)

In table 7 are stated, where applicable, for each ETS/EN in the scope of this Harmonized standard, the clauses that give the limits of this essential phenomenon and the test methods.

**Table 7: Relevant ETS/ENs clause(s)**

| ETSI standard   | Version | Subclause(s) N°        | Relevant clause(s) title   | test method (if essential) | Notes                                                                                                            |
|-----------------|---------|------------------------|----------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------|
| EN 300 197 [4]  | V1.3.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 198 [5]  | V1.3.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 234 [7]  | V1.2.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 407 [6]  | V1.2.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 408 [8]  | V1.2.b  | 4.6.1                  | Antenna requirements       | 6.1 of EN 301 126-3-1 [25] | un-coordinated frequency band<br>Applicable only to equipments with integral antennas                            |
| EN 300 430 [9]  | V1.2.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 431 [10] | V1.2.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 630 [11] | V1.2.b  | 6.1 of EN 300 631 [12] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 631 [12] | V1.2.b  | 6.1                    | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable to both integral and stand alone antennas used in the frequency band(s) covered by this ETSI standard |
| EN 300 633 [13] | V1.2.b  | 6.1 of EN 300 631 [12] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 639 [14] | V1.2.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |

| ETSI standard   | Version | Subclause(s) N°        | Relevant clause(s) title   | test method (if essential) | Notes                                                                                                            |
|-----------------|---------|------------------------|----------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------|
| EN 300 786 [15] | V1.2.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 833 [16] | V1.2.b  | 6.1                    | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable to both integral and stand alone antennas used in the frequency band(s) covered by this ETSI standard |
| EN 301 127 [17] | V1.1.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 128 [18] | V1.1.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 216 [19] | V1.1.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 277 [20] | V1.1.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 387 [21] | V1.1.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 669 [22] | V1.1.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 461 [23] | V1.1.b  | 6.1 of EN 300 833 [16] | Radiation Pattern Envelope | 6.1 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |

## 4.6.2 Antenna gain

In table 8 are stated, where applicable, for each ETS/EN in the scope of this Harmonized standard, the clauses that give the limits of this essential phenomenon and test methods.

**Table 8: Relevant ETS/ENs clause(s)**

| ETSI standard   | Version | Subclause(s) N°        | relevant clause(s) title | test method (if essential) | Notes                                                |
|-----------------|---------|------------------------|--------------------------|----------------------------|------------------------------------------------------|
| EN 300 197 [4]  | V1.3.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas |
| EN 300 198 [5]  | V1.3.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas |
| EN 300 234 [7]  | V1.2.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas |
| EN 300 407 [6]  | V1.2.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas |
| EN 300 408 [8]  | V1.2.b  | N.E.                   | N.E.                     | N.E.                       | un-coordinated frequency band                        |
| EN 300 430 [9]  | V1.2.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas |
| EN 300 431 [10] | V1.2.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas |
| EN 300 630 [11] | V1.2.b  | 6.3 of EN 300 631 [12] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas |

| ETSI standard                                                   | Version | Subclause(s) N°        | relevant clause(s) title | test method (if essential) | Notes                                                                                                            |
|-----------------------------------------------------------------|---------|------------------------|--------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------|
| EN 300 631 [12]                                                 | V1.2.b  | 6.3                    | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable to both integral and stand alone antennas used in the frequency band(s) covered by this ETSI standard |
| EN 300 633 [13]                                                 | V1.2.b  | 6.3 of EN 300 631 [12] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 639 [14]                                                 | V1.2.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 786 [15]                                                 | V1.2.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 833 [16]                                                 | V1.2.b  | 6.3                    | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable to both integral and stand alone antennas used in the frequency band(s) covered by this ETSI standard |
| EN 301 127 [17]                                                 | V1.1.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 128 [18]                                                 | V1.1.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 216 [19]                                                 | V1.1.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 277 [20]                                                 | V1.1.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 387 [21]                                                 | V1.1.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 669 [22]                                                 | V1.1.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 461 [23]                                                 | V1.1.b  | 6.3 of EN 300 833 [16] | Antenna gain             | 6.3 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| N.E.: Not essential for article 3.2 of the R&TTE Directive [1]. |         |                        |                          |                            |                                                                                                                  |

### 4.6.3 Antenna cross-Polar Discrimination (XPD)

In table 9 are stated, where applicable, for each ETS/EN in the scope of this Harmonized standard, the clauses that give the limits of this essential phenomenon and test methods.

**Table 9: Relevant ETS/ENs clause(s)**

| ETSI standard  | Version | Subclause(s) N°        | relevant clause(s) title         | test method (if essential) | Notes                                                |
|----------------|---------|------------------------|----------------------------------|----------------------------|------------------------------------------------------|
| EN 300 197 [4] | V1.3.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas |
| EN 300 198 [5] | V1.3.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas |
| EN 300 234 [7] | V1.2.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas |
| EN 300 407 [6] | V1.2.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas |



| ETSI standard                                                   | Version | Subclause(s) N°        | relevant clause(s) title         | test method (if essential) | Notes                                                                                                            |
|-----------------------------------------------------------------|---------|------------------------|----------------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------|
| EN 300 408 [8]                                                  | V1.2.b  | N.E.                   | N.E.                             | N.E.                       | un-coordinated frequency band                                                                                    |
| EN 300 430 [9]                                                  | V1.2.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 431 [10]                                                 | V1.2.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 630 [11]                                                 | V1.2.b  | 6.2 of EN 300 631 [12] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 631 [12]                                                 | V1.2.b  | 6.2                    | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable to both integral and stand alone antennas used in the frequency band(s) covered by this ETSI standard |
| EN 300 633 [13]                                                 | V1.2.b  | 6.2 of EN 300 631 [12] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 639 [14]                                                 | V1.2.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 786 [15]                                                 | V1.2.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 300 833 [16]                                                 | V1.2.b  | 6.2                    | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable to both integral and stand alone antennas used in the frequency band(s) covered by this ETSI standard |
| EN 301 127 [17]                                                 | V1.1.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 128 [18]                                                 | V1.1.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 216 [19]                                                 | V1.1.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 277 [20]                                                 | V1.1.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 387 [21]                                                 | V1.1.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 669 [22]                                                 | V1.1.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| EN 301 461 [23]                                                 | V1.1.b  | 6.2 of EN 300 833 [16] | Cross-polar discrimination (XPD) | 6.2 of EN 301 126-3-1 [25] | Applicable only to equipments with integral antennas                                                             |
| N.E.: Not essential for article 3.2 of the R&TTE Directive [1]. |         |                        |                                  |                            |                                                                                                                  |

## 4.7 Receiver requirements

The equipment shall comply with the following receiving requirements with transmitter ATPC function, if any, set in automatic operation or at maximum nominal power and RTPC function, if any, set at any value along its power excursion.

Some systems may offer space diversity options for performance improvement on real links; this option is not considered essential for the scope of the R&TTE Directive [1]. Receiving phenomena are therefore considered only without this option.

For receiving phenomena, the tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the R&TTE Directive [1], shall be carried-out with ATPC, if any, set to either automatic or maximum nominal power operation and RTPC, if any, set to an arbitrary value chosen by the supplier.

### 4.7.1 BER as a function of receiver input signal level (Maximum usable sensitivity inc. duplex)

In table 10 are reported, where applicable, for each ETS/EN in the scope of this Harmonized standard, the clauses that give the limits of this essential phenomenon and test methods.

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the R&TTE Directive [1] shall be carried-out at reference and extreme climatic conditions.

**Table 10: Relevant ETS/ENs clause(s)**

| ETSI standard   | Version | Subclause(s) N° | relevant clause(s) title                                         | test method (if essential)          | Notes                         |
|-----------------|---------|-----------------|------------------------------------------------------------------|-------------------------------------|-------------------------------|
| EN 300 197 [4]  | V1.3.b  | 5.5.1           | BER as a function of Receiver input signal level (RSL)           | EN 301 126-1 [24] subclause 5.3.3.1 |                               |
| EN 300 198 [5]  | V1.3.b  | 5.5.1           | BER as a function of Receiver input signal level (RSL)           | EN 301 126-1 [24] subclause 5.3.3.1 |                               |
| EN 300 234 [7]  | V1.2.b  | 8.2             | BER as a function of Receiver input level                        | EN 301 126-1 [24] subclause 5.3.3.1 |                               |
| EN 300 407 [6]  | V1.2.b  | 5.5.1           | BER as a function of Receiver unput level                        | EN 301 126-1 [24] subclause 5.3.3.1 |                               |
| EN 300 408 [8]  | V1.2.b  | N.E.            | N.E.                                                             | N.E.                                | un-coordinated frequency band |
| EN 300 430 [9]  | V1.2.b  | 5.5.1           | BER as a function of Receiver input signal level (RSL)           | EN 301 126-1 [24] subclause 5.3.3.1 |                               |
| EN 300 431 [10] | V1.2.b  | 5.5.1           | BER as a function of Receiver input signal level (RSL)           | EN 301 126-1 [24] subclause 5.3.3.1 |                               |
| EN 300 630 [11] | V1.2.b  | 8.1             | BER as a function of Receiver input level                        | EN 301 126-1 [24] subclause 5.3.3.1 |                               |
| EN 300 633 [13] | V1.2.b  | 8.1             | BER as a function of Receiver input level                        | EN 301 126-1 [24] subclause 5.3.3.1 |                               |
| EN 300 639 [14] | V1.2.b  | 8.2             | BER as a function of Receiver input level                        | EN 301 126-1 [24] subclause 5.3.3.1 |                               |
| EN 300 786 [15] | V1.2.b  | 8.2             | BER as a function of Receiver input level (without interference) | EN 301 126-1 [24] subclause 5.3.3.1 |                               |
| EN 301 127 [17] | V1.1.b  | 8.2             | BER as a function of Receiver input level (dBm)                  | EN 301 126-1 [24] subclause 5.3.3.1 |                               |
| EN 301 128 [18] | V1.1.b  | 8.1             | BER as a function of Receiver input level                        | EN 301 126-1 [24] subclause 5.3.3.1 |                               |
| EN 301 216 [19] | V1.1.b  | 5.5.1           | BER as a function of Receiver input signal level (RSL)           | EN 301 126-1 [24] subclause 5.3.3.1 |                               |

| ETSI standard                                                   | Version | Subclause(s)<br>N° | relevant clause(s) title                               | test method<br>(if essential)       | Notes |
|-----------------------------------------------------------------|---------|--------------------|--------------------------------------------------------|-------------------------------------|-------|
| EN 301 277 [20]                                                 | V1.1.b  | 8.2                | BER as a function of Receiver input level (dBm)        | EN 301 126-1 [24] subclause 5.3.3.1 |       |
| EN 301 387 [21]                                                 | V1.1.b  | 5.6.1              | BER performance                                        | EN 301 126-1 [24] subclause 5.3.3.1 |       |
| EN 301 669 [22]                                                 | V1.1.b  | 8.2                | BER as a function of Receiver input level              | EN 301 126-1 [24] subclause 5.3.3.1 |       |
| EN 301 461 [23]                                                 | V1.1.b  | 5.5.1              | BER as a function of Receiver input signal level (RSL) | EN 301 126-1 [24] subclause 5.3.3.1 |       |
| N.A.: Phenomenon not applicable.                                |         |                    |                                                        |                                     |       |
| N.E.: Not essential for article 3.2 of the R&TTE Directive [1]. |         |                    |                                                        |                                     |       |

For EN 300 631 and EN 300 833, also in the scope of the present document, this requirement is not applicable.

## 4.7.2 Co-channel external interference sensitivity

In table 11 are stated, where applicable, for each ETS/EN in the scope of this Harmonized standard, the clauses that give the limits of this essential phenomenon and test methods.

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the Directive 1999/5/EC [1] shall be carried-out at reference climatic conditions.

**Table 11: Relevant ETS/ENs clause(s)**

| ETSI standard   | Version | Subclause(s)<br>N° | relevant clause(s) title                       | test method<br>(if essential)       | Notes                         |
|-----------------|---------|--------------------|------------------------------------------------|-------------------------------------|-------------------------------|
| EN 300 197 [4]  | V1.3.b  | 5.5.3.1            | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 300 198 [5]  | V1.3.b  | 5.5.3.1            | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 300 234 [7]  | V1.2.b  | 8.3.1              | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 300 407 [6]  | V1.2.b  | 5.5.3.1            | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 300 408 [8]  | V1.2.b  | N.E.               | N.E.                                           | N.E.                                | un-coordinated frequency band |
| EN 300 430 [9]  | V1.2.b  | 5.5.3.1            | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 300 431 [10] | V1.2.b  | 5.5.3.1            | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 300 630 [11] | V1.2.b  | 8.3.1              | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 300 631 [12] | V1.2.b  | N.A.               | N.A.                                           | N.A.                                | Antennas standard             |
| EN 300 633 [13] | V1.2.b  | 8.3.1              | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 300 639 [14] | V1.2.b  | 8.3.1              | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 300 786 [15] | V1.2.b  | 8.3.1              | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 300 833 [16] | V1.2.b  | N.A.               | N.A.                                           | N.A.                                | Antennas standard             |
| EN 301 127 [17] | V1.1.b  | 8.3.1              | Co-channel "external" interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 301 128 [18] | V1.1.b  | 8.3.1              | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 301 216 [19] | V1.1.b  | 5.5.3.1            | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 301 277 [20] | V1.1.b  | 8.3.1              | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |
| EN 301 387 [21] | V1.1.b  | 5.6.3 (a)          | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |                               |

| ETSI standard                                                   | Version | Subclause(s)<br>N° | relevant clause(s) title                       | test method<br>(if essential)       | Notes |
|-----------------------------------------------------------------|---------|--------------------|------------------------------------------------|-------------------------------------|-------|
| EN 301 669 [22]                                                 | V1.1.b  | 8.3.1              | Co-channel interference sensitivity            | EN 301 126-1 [24] subclause 5.3.3.2 |       |
| EN 301 461 [23]                                                 | V1.1.b  | 5.5.3.1            | Co-channel "external" interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.2 |       |
| N.A.: Phenomenon not applicable.                                |         |                    |                                                |                                     |       |
| N.E.: Not essential for article 3.2 of the R&TTE Directive [1]. |         |                    |                                                |                                     |       |

For EN 300 631 and EN 300 833, also in the scope of the present document, this requirement is not applicable.

### 4.7.3 Adjacent channel interference sensitivity (Adjacent channel selectivity)

In table 12 are stated, where applicable, for each ETS/EN in the scope of this Harmonized standard, the clauses that give the limits of this essential phenomenon and test methods.

The requirement shall be met independently on upper and lower adjacent interference.

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the R&TTE Directive [1] shall be carried-out at reference climatic conditions. The test will be produced for the lower or for the upper frequency adjacent channel, arbitrarily selected by the supplier.

**Table 12: Relevant ETS/ENS clause(s)**

| ETSI standard   | Version | Subclause(s)<br>N° | relevant clause(s) title                  | test method<br>(if essential)       | Notes                         |
|-----------------|---------|--------------------|-------------------------------------------|-------------------------------------|-------------------------------|
| EN 300 197 [4]  | V1.3.b  | 5.5.3.2            | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 300 198 [5]  | V1.3.b  | 5.5.3.2            | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 300 234 [7]  | V1.2.b  | 8.3.2              | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 300 407 [6]  | V1.2.b  | 5.5.3.2            | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 300 408 [8]  | V1.2.b  | N.E.               | N.E.                                      | N.E.                                | un-coordinated frequency band |
| EN 300 430 [9]  | V1.2.b  | 5.5.3.2            | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 300 431 [10] | V1.2.b  | 5.5.3.2            | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 300 630 [11] | V1.2.b  | 8.3.2              | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 300 631 [12] | V1.2.b  | N.A.               | N.A.                                      | N.A.                                | Antennas standard             |
| EN 300 633 [13] | V1.2.b  | 8.3.2              | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 300 639 [14] | V1.2.b  | 8.3.2              | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 300 786 [15] | V1.2.b  | 8.3.2              | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 300 833 [16] | V1.2.b  | N.A.               | N.A.                                      | N.A.                                | Antennas standard             |
| EN 301 127 [17] | V1.1.b  | 8.3.2              | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 301 128 [18] | V1.1.b  | 8.3.2              | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 301 216 [19] | V1.1.b  | 5.5.3.2            | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 301 277 [20] | V1.1.b  | 8.3.2              | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 301 387 [21] | V1.1.b  | 5.6.3 (b)          | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |
| EN 301 669 [22] | V1.1.b  | 8.3.2              | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |                               |

| ETSI standard                                                   | Version | Subclause(s) N° | relevant clause(s) title                  | test method (if essential)          | Notes |
|-----------------------------------------------------------------|---------|-----------------|-------------------------------------------|-------------------------------------|-------|
| EN 301 461 [23]                                                 | V1.1.b  | 5.5.3.2         | Adjacent channel interference sensitivity | EN 301 126-1 [24] subclause 5.3.3.3 |       |
| N.A.: Phenomenon not applicable.                                |         |                 |                                           |                                     |       |
| N.E.: Not essential for article 3.2 of the R&TTE Directive [1]. |         |                 |                                           |                                     |       |

For EN 300 631 and EN 300 833, also in the scope of the present document, this requirement is not applicable.

#### 4.7.4 CW Spurious Interference (Blocking or desensitization including duplexer)

In table 13 are stated, where applicable, for each ETS/EN in the scope of this Harmonized standard, the clauses that give the limits of this essential phenomenon and test methods.

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the R&TTE Directive [1] shall be carried-out at reference climatic conditions.

**Table 13: Relevant ETS/ENs clause(s)**

| ETSI standard   | Version | Subclause(s) N°                            | relevant clause(s) title          | test method (if essential)          | Notes                         |
|-----------------|---------|--------------------------------------------|-----------------------------------|-------------------------------------|-------------------------------|
| EN 300 197 [4]  | V1.3.b  | 5.5.3.3                                    | CW Spurious Interference          | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 300 198 [5]  | V1.3.b  | 5.5.3.3                                    | CW Spurious Interference          | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 300 234 [7]  | V1.2.b  | 7 (subclauses included) of EN 301 390 [26] | Receiver immunity at antenna port | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 300 407 [6]  | V1.2.b  | 5.5.3.3                                    | CW Spurious Interference          | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 300 408 [8]  | V1.2.b  | N.E.                                       | N.E.                              | N.E.                                | un-coordinated frequency band |
| EN 300 430 [9]  | V1.2.b  | 5.5.3.3                                    | CW Spurious Interference          | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 300 431 [10] | V1.2.b  | 5.5.3.3                                    | CW Spurious Interference          | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 300 630 [11] | V1.2.b  | 8.3.3                                      | CW Spurious Interference          | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 300 633 [13] | V1.2.b  | 8.3.3                                      | CW Spurious Interference          | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 300 639 [14] | V1.2.b  | 8.3.3                                      | CW Spurious Interference          | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 300 786 [15] | V1.2.b  | 8.3.3                                      | CW Spurious Interference          | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 301 127 [17] | V1.1.b  | 7 (subclauses included) of EN 301 390 [26] | Receiver immunity at antenna port | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 301 128 [18] | V1.1.b  | 8.3.4                                      | CW Interference                   | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 301 216 [19] | V1.1.b  | 5.5.3.3                                    | CW Spurious Interference          | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 301 277 [20] | V1.1.b  | 7 (subclauses included) of EN 301 390 [26] | Receiver immunity at antenna port | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 301 387 [21] | V1.1.b  | 5.6.3 (c)                                  | CW Spurious Interference          | EN 301 126-1 [24] subclause 5.3.3.4 |                               |
| EN 301 669 [22] | V1.1.b  | 8.3.3                                      | CW Spurious Interference          | EN 301 126-1 [24] subclause 5.3.3.4 |                               |

| ETSI standard                                                   | Version | Subclause(s) N°                                  | relevant clause(s) title          | test method (if essential)             | Notes |
|-----------------------------------------------------------------|---------|--------------------------------------------------|-----------------------------------|----------------------------------------|-------|
| EN 301 461 [23]                                                 | V1.1.b  | 7<br>(subclauses included) of<br>EN 301 390 [26] | Receiver immunity at antenna port | EN 301 126-1 [24]<br>subclause 5.3.3.4 |       |
| N.A.: Phenomenon not applicable.                                |         |                                                  |                                   |                                        |       |
| N.E.: Not essential for article 3.2 of the R&TTE Directive [1]. |         |                                                  |                                   |                                        |       |

For EN 300 631 and EN 300 833, also in the scope of the present document, this requirement is not applicable.

## 4.7.5 Spurious emissions

The equipment shall comply with the requirements of clause 5 of EN 301 390 [26].

The test, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the R&TTE Directive [1] shall be limited to the practical frequency ranges foreseen by clause A.1 of EN 301 390 [26]. The test shall be carried-out at reference climatic conditions [and extreme conditions only in the allocated frequency band(s) in which the equipment is intended to operate].

Test methods shall be in accordance with subclause 5.3.2 of EN 301 126-1 [24].

## 4.8 Control and monitoring function requirements

### 4.8.1 Sharing protocols (Interference avoidance requirement)

In table 14 are reported, where applicable, for each ETS/EN in the scope of this Harmonized standard, the clauses that give the limits of this essential phenomenon.

The tests, carried out to generate the test report and/or declaration of conformity, required to fulfil any Conformity assessment procedure foreseen by the R&TTE Directive [1] shall be carried-out at reference climatic conditions.

**Table 14: Relevant ETS/ENs clause(s)**

| ETSI standard  | Version | Subclause(s) N°      | relevant clause(s) title                                       | test method (if essential)            | Notes                         |
|----------------|---------|----------------------|----------------------------------------------------------------|---------------------------------------|-------------------------------|
| EN 300 408 [8] | V1.2.b  | 4.1.3.1<br>4.1.3.2.1 | RF-channel selection procedure<br>Interference avoidance limit | EN 300 408 [8]<br>subclause 4.1.3.2.2 | un-coordinated frequency band |

For all other EN/ETS in the scope this requirements is not essential or not applicable.

## Annex A (normative): The EN Requirements Table (EN-RT)

Notwithstanding the provisions of the copyright clause related to the text of the present document, ETSI grants that users of the present document may freely reproduce the EN-RT proforma in this annex so that it can be used for its intended purposes and may further publish the completed EN-RT.

The EN Requirements Table (EN-RT) serves a number of purposes, as follows:

- it provides a tabular summary of all the requirements;
- it shows the status of each EN-R, whether it is essential to implement in all circumstances (Mandatory), or whether the requirement is dependent on the supplier having chosen to implement a particular optional service or functionality (Optional). In particular it enables the EN-Rs associated with a particular optional service or functionality to be grouped and identified;
- when completed in respect of a particular equipment it provides a means to undertake the static assessment of conformity with the EN.

The following tables A.1, A.2 and A.3 are intended for declaration of conformity of Fixed service Digital Radio Systems in frequency bands that require co-ordination, Fixed service Digital Radio Systems in frequency bands that do not require co-ordination and Fixed service Radio Systems antennas, respectively.

**Table A.1: EN Requirements Table (EN-RT) for point-to-point FDRS (including integral antennas) in frequency bands that require co-ordination**

| EN Reference                            |         | EN 301 751<br>Requirements for equipment under the scope also of ETS/EN xxx xxx (note 2) |        |                                                      |                                  |
|-----------------------------------------|---------|------------------------------------------------------------------------------------------|--------|------------------------------------------------------|----------------------------------|
| <b>Transmitter requirements</b>         |         |                                                                                          |        |                                                      |                                  |
| No.                                     | Clause  | EN-R (note 1)                                                                            | Status | Note                                                 | Supplier Comment for declaration |
| 1                                       | 4.5.1   | Frequency error / stability                                                              | M      |                                                      |                                  |
| 2                                       | 4.5.2   | Transmitter power                                                                        | M      |                                                      |                                  |
| 3                                       | 4.5.3.1 | Adjacent channel power - Spectrum mask and spectral lines at symbol rate                 | M      |                                                      |                                  |
|                                         | 4.5.3.2 | Adjacent channel power - Remote Transmit Power Control (RTPC)                            | O      |                                                      |                                  |
| 4                                       | 4.5.4   | Spurious emissions                                                                       | M      |                                                      |                                  |
| 5                                       | 4.5.5.1 | Transient behaviour of the transmitter - Automatic Transmit Power Control (ATPC)         | O      |                                                      |                                  |
| 6                                       | 4.5.5.2 | Transient behaviour of the transmitter - Remote Frequency Control (RFC)                  | O      |                                                      |                                  |
| <b>Antenna directional requirements</b> |         |                                                                                          |        |                                                      |                                  |
| No.                                     | Clause  | EN-R (note 1)                                                                            | Status | Note                                                 | Supplier Comment for declaration |
| 7                                       | 4.6.1   | Off-axis EIRP density - Radiation pattern envelope (RPE)                                 | M      | Applicable only to equipments with integral antennas |                                  |
| 8                                       | 4.6.2   | Antenna Gain                                                                             | M      | Applicable only to equipments with integral antennas |                                  |

| EN Reference                                                                |        | EN 301 751<br>Requirements for equipment under the scope also of ETS/EN xxx xxx (note 2) |        |                                                      |                                  |
|-----------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------|--------|------------------------------------------------------|----------------------------------|
| 9                                                                           | 4.6.3  | Antenna X-polar discrimination                                                           | M      | Applicable only to equipments with integral antennas |                                  |
| Receiving requirements                                                      |        |                                                                                          |        |                                                      |                                  |
| No.                                                                         | Clause | EN-R (note 1)                                                                            | Status | Note                                                 | Supplier Comment for declaration |
| 10                                                                          | 4.7.1  | BER as a function of receiver input signal level                                         | M      |                                                      |                                  |
| 11                                                                          | 4.7.2  | Co-channel interference sensitivity                                                      | M      |                                                      |                                  |
| 12                                                                          | 4.7.3  | Adjacent channel interference sensitivity                                                | M      |                                                      |                                  |
| 13                                                                          | 4.7.4  | Blocking or desensitization inc. duplex (CW Spurious Interference)                       | M      |                                                      |                                  |
| 14                                                                          | 4.7.5  | Spurious emissions                                                                       | M      |                                                      |                                  |
| NOTE 1: These EN-Rs are justified under Article 3.2 of the R&TTE Directive. |        |                                                                                          |        |                                                      |                                  |
| NOTE 2: Select from table 2 as appropriate.                                 |        |                                                                                          |        |                                                      |                                  |

**Table A.2: EN Requirements Table (EN-RT) for Point-to-point FDRS (including integral antennas) in frequency bands that do not require co-ordination**

| EN Reference                     |         | EN 301 751<br>Requirements for equipment under the scope also of ETS/EN xxx xxx (note 2) |        |                                                      |                                  |
|----------------------------------|---------|------------------------------------------------------------------------------------------|--------|------------------------------------------------------|----------------------------------|
| Transmitter requirements         |         |                                                                                          |        |                                                      |                                  |
| No.                              | Clause  | EN-R (note 1)                                                                            | Status | Note                                                 | Supplier Comment for declaration |
| 1                                | 4.5.1   | Frequency error / stability                                                              | M      |                                                      |                                  |
| 2                                | 4.5.2   | Transmitter power                                                                        | M      |                                                      |                                  |
| 3                                | 4.5.3.1 | Adjacent channel power - Spectrum mask and spectral lines at symbol rate                 | M      |                                                      |                                  |
|                                  | 4.5.3.2 | Adjacent channel power - Remote Transmit Power Control (RTPC)                            | O      |                                                      |                                  |
| 4                                | 4.5.4   | Spurious emissions                                                                       | M      |                                                      |                                  |
| 5                                | 4.5.5.1 | Transient behaviour of the transmitter - Automatic Transmit Power Control (ATPC)         | O      |                                                      |                                  |
| 6                                | 4.5.5.2 | Transient behaviour of the transmitter - Remote Frequency Control (RFC)                  | O      |                                                      |                                  |
| Antenna directional requirements |         |                                                                                          |        |                                                      |                                  |
| No.                              | Clause  | EN-R (note 1)                                                                            | Status | Note                                                 | Supplier Comment for declaration |
| 7                                | 4.6.1   | Off-axis EIRP density - Radiation pattern envelope (RPE)                                 | M      | Applicable only to equipments with integral antennas |                                  |
| Receiving requirement            |         |                                                                                          |        |                                                      |                                  |
| No.                              | Clause  | EN-R (note 1)                                                                            | Status | Note                                                 | Supplier Comment for declaration |
| 8                                | 4.7.5   | Spurious emissions                                                                       | M      |                                                      |                                  |



| EN Reference                                                                |        | EN 301 751<br>Requirements for equipment under the scope also of ETS/EN xxx xxx (note 2) |        |                                             |                                  |
|-----------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------|--------|---------------------------------------------|----------------------------------|
| Control and monitoring function requirements                                |        |                                                                                          |        |                                             |                                  |
| No.                                                                         | Clause | EN-R (note 1)                                                                            | Status | Note                                        | Supplier Comment for declaration |
| 9                                                                           | 4.8.1  | Sharing protocols – Interference avoidance requirement                                   | M      | For equipment classes with this requirement |                                  |
| NOTE 1: These EN-Rs are justified under Article 3.2 of the R&TTE Directive. |        |                                                                                          |        |                                             |                                  |
| NOTE 2: Select from table 2 as appropriate.                                 |        |                                                                                          |        |                                             |                                  |

Table A.3: EN Requirements Table (EN-RT) for Point-to-point FDRS stand-alone antennas

| EN Reference                                                                |        | EN 301 751<br>Requirements for equipments under the scope also of ETS/EN xxx xxx (note 2) |        |                                                     |                                  |
|-----------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------|--------|-----------------------------------------------------|----------------------------------|
| Antenna directional requirements                                            |        |                                                                                           |        |                                                     |                                  |
| No.                                                                         | Clause | EN-R (note 1)                                                                             | Status | Note                                                | Supplier Comment for declaration |
| 1                                                                           | 4.6.1  | Off-axis EIRP density - Radiation pattern envelope (RPE)                                  | M      |                                                     |                                  |
| 2                                                                           | 4.6.2  | Antenna Gain                                                                              | M      | Only for frequency bands that require co-ordination |                                  |
| 3                                                                           | 4.6.3  | Antenna X-polar discrimination                                                            | M      | Only for frequency bands that require co-ordination |                                  |
| NOTE 1: These EN-Rs are justified under Article 3.2 of the R&TTE Directive. |        |                                                                                           |        |                                                     |                                  |
| NOTE 2: Select from table 2 as appropriate.                                 |        |                                                                                           |        |                                                     |                                  |

**Key to columns in tables A1 to A3:****No** Table entry number;**Reference** Subclause reference number of conformance requirement within the present document;**EN-R** Title of conformance requirement within the present document;**Status** Status of the entry as follows:**M** Mandatory, shall be implemented under all circumstances;**O** Optional, may be provided, but if provided shall be implemented in accordance with the requirements;**Supplier Comment for declaration** To be completed as required.

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## Bibliography

The following material, though not specifically referenced in the body of the present document, gives supporting information.

- EC Standardization Mandate M.284: "Harmonized standards for the R&TTE Directive".

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## History

| <b>Document history</b> |               |                                                                    |
|-------------------------|---------------|--------------------------------------------------------------------|
| V1.1.1                  | April 2000    | One-step Approval Procedure OAP 20000804: 2000-04-05 to 2000-08-04 |
| V1.1.1                  | December 2000 | Publication                                                        |
|                         |               |                                                                    |
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