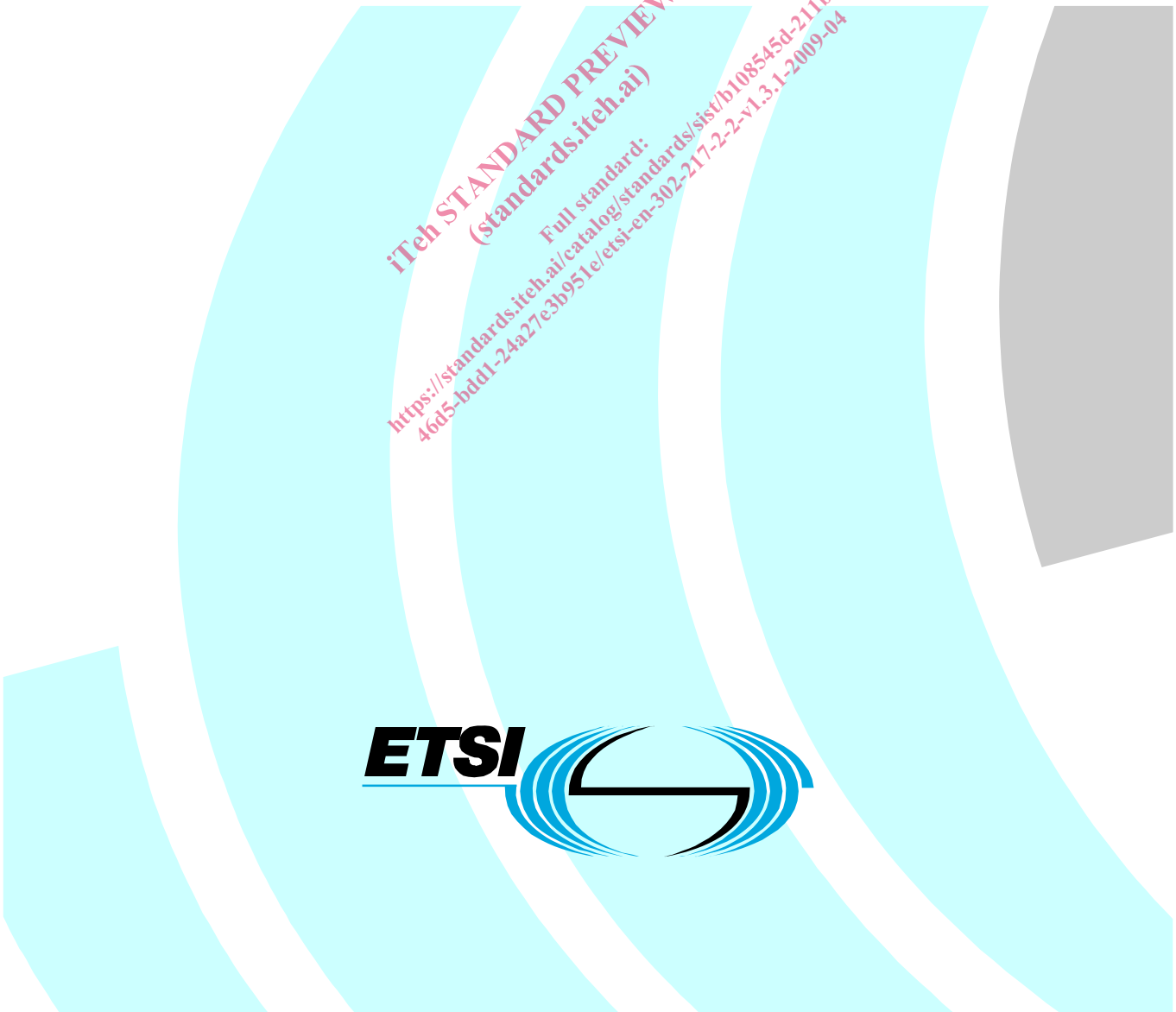
Final draft ETSI EN 302 217-2-2 V1.3.1 (2008-12)

Harmonized European Standard (Telecommunications series)

Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 2-2: Digital systems operating in frequency bands where frequency co-ordination is applied; Harmonized EN covering the essential requirements of Article 3.2 of the R&TTE Directive



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Contents

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Foreword

This Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM), and is now submitted for the ETSI standards One-step Approval Procedure.

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC (as amended) [i.2] 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 ("R&TTE Directive").

The present document is part 2, sub part 2 of a multi-part deliverable. Full details of the entire series can be found in part 1 [6].

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

Introduction

The EN 302 217 [6] series has been produced in order to rationalize a large number of previous ETSI ENs dealing with equipment and antennas for Point-to-Point (P-P) Fixed Service applications. For more details, see foreword in the EN 302 217-1 [6].

The present document is part of a set of standards developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the R&TTE Directive [1]. The modular structure is described in EG 201 399 [i.21] and shown in figure 1.

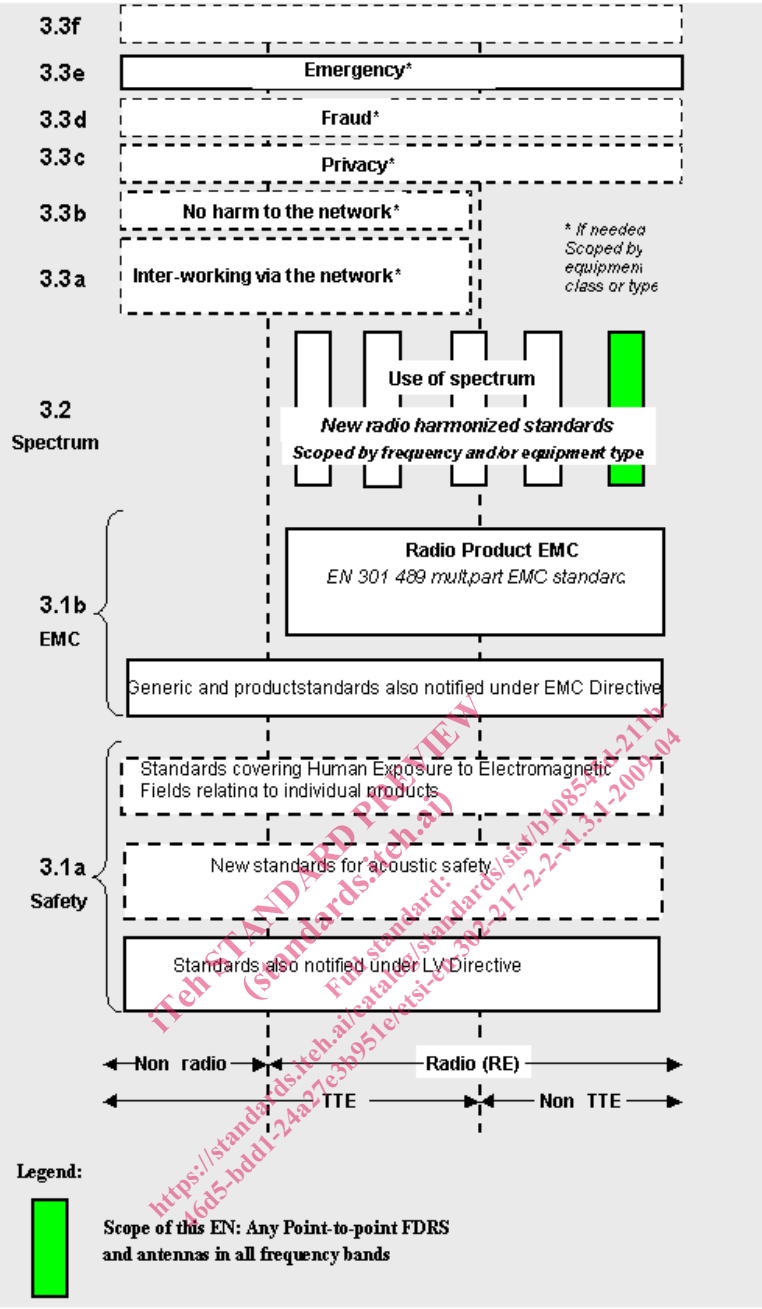

Figure 1: Modular structure for the various standards used under the R&TTE Directive

NOTE: For article 3.1b the diagram shows EN 301 489 [i.22], [i.36], the multi-part product EMC standard for radio used under the EMC Directive 89/336/EEC [i.1]. For Fixed Radio Systems EN, EN 301 489-1 [i.22] and EN 301 489-4 [i.23] are relevant.

1 Scope

1.1 General background

The present document specifies the essential requirements for point to point Digital Fixed Radio Systems (DFRS) operating in frequency bands, which require co-ordinated frequency planning. It is intended to cover the provisions of the R&TTE Directive [1] regarding 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] will apply to equipment within the scope of the present document.

NOTE: A list of such ENs is included on the web site http://www.newapproach.org.

1.2 Spectral efficiency classes

As the maximum transmission rate in a given bandwidth depends on system spectral efficiency, different equipment classes are defined:

- Class 1: equipment spectral efficiency based on typical 2-states modulation scheme (e.g. 2-FSK, 2-PSK or equivalent).
- Class 2: equipment spectral efficiency based on typical 4-states modulation scheme (e.g. 4-FSK, 4-QAM, or equivalent).
- Class 3: equipment spectral efficiency based on typical 8-states modulation scheme (e.g. 8-PSK, or equivalent) (see note 1).

NOTE 1: It is also noted that, in this class, for design commonality with other efficiency classes, the 16 QAM format is popular.

- Class 4L: equipment spectral efficiency based on typical 16-states modulation scheme (e.g. 16-QAM, 16-APSK, or equivalent) (see note 2).

NOTE 2: It is also noted that, in this class, for flexible implementation trade-off between the actual Radio Interface Capacities (RIC) and roll-off shaping, the 32 QAM format is also popular.

- Class 4H: equipment spectral efficiency based on typical 32-states modulation scheme (e.g. 32-QAM, 32-APSK, or equivalent).
- Class 5A: equipment spectral efficiency based on typical 64-states or 128-states modulation scheme (e.g. 64-QAM or 128-QAM, or equivalent), for cross-polar adjacent channel (ACAP) operation.
- Class 5B: equipment spectral efficiency based on typical 64-states or 128-states modulation scheme (e.g. 64-QAM or 128-QAM, or equivalent), for co-polar adjacent channel (ACCP) and frequency reuse through CCDP operation.
- Class 6A: equipment spectral efficiency based on typical 256-states or 512-states modulation scheme (e.g. 256-QAM or 512-QAM, or equivalent), for cross-polar adjacent channel (ACAP) operation.
- Class 6B: equipment spectral efficiency based on typical 256-states or 512-states modulation scheme (e.g. 256-QAM or 512-QAM, or equivalent), for co-polar adjacent channel (ACCP) and frequency reuse through CCDP operation.

The above classes are indicative only and shall not imply any constraint to the actual modulation format, provided that all the requirements in the relevant parts of this EN 302 217 series are met.

1.3 System alternatives

In order to (technically) cover different market and network requirements, with an appropriate balance of performance to cost and effective and appropriate use of the radio spectrum, the present document, together with EN 302 217-4-2 [7], offers a number of system types and antennas alternatives, for selection by administrations, operators and manufacturers dependent on the desired use of the radio spectrum and network/market requirements; those options include:

- channel separation alternatives (as provided by the relevant CEPT or ITU-R Recommendation);
- spectral efficiency class alternatives (different modulation formats provided in radio equipment standards) as defined in clause 1.2 above; actual equipment may operate within one spectral efficiency class only (*Single-mode*) or within multiple classes, either with static preselection of the class (*Preset- mode*) or with dynamic variation of class according the propagation conditions (*Mixed-mode*) (see note);
- antenna directivity class alternatives (for different network requirements).

NOTE: *Single- mode, Preset-mode and Mixed-mode* systems are defined in clause 3.1 of EN 302 217-1 [6]; additional information on *Mixed-mode* systems may be found in annex I of the present document.

1.4 Channel arrangements and utilization

From the point of view of the transmission capacity, these systems are defined, in the relevant annexes, on the basis of their minimum Channel Separation (CS) on the same route, for a given spectrum efficiency class, taken into account by the system design. The possible channel arrangements may be:

- Adjacent Channel Alternate-Polarized (ACAP);
- Adjacent Channel Co-Polarized (ACCP);
- Co-Channel Dual-Polarization (CCDP).

These possible applications and their channel arrangements are shown in figure 2.

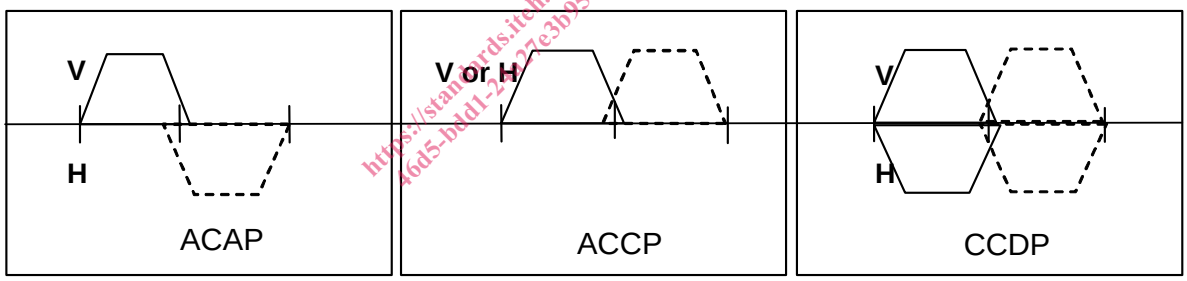

Figure 2: Examples of channel arrangements on the same route

1.5 Payload flexibility

The capacities in tables X.2 (where X = B…E represents the relevant annex) are commonly tailored on typical PDH and SDH base band interfaces, identified for simplicity with 2 Mbit/s, 2 × 2 Mbit/s, 8 Mbit/s, 2 × 8 Mbit/s, 34 Mbit/s, 2 × 34 Mbit/s, STM-0 (51 Mbit/s), 2 × STM-0 (2 × 51 Mbit/s), STM-1 (155 Mbit/s), N × STM-1 (N × 155 Mbit/s), STM-N. Systems in annex A, due to the smaller channel separation provided, are (exceptionally) labelled with typical capacity rate without specific reference to PDH/SDH rates.

Provided that they meet all requirements of the relevant annex, equivalent or higher PDH or SDH transport rates may be used where appropriate. Such equivalence transport rates may be:

- N × 2 Mbit/s or other mixture of PDH rates, even if multiplexed into proprietary frames, in place of higher order PDH or SDH rates;
- 140 Mbit/s (including the above N × 2 Mbit/s or other mixture of PDH rates) in place of STM-1;

- any PDH mapping into STM-0 or STM-1 frames, as defined in the basic multiplexing schemes;
- N × 2 Mbit/s mapped into SDH VC12 or VC2 transport bit rates (sub-STM-0 defined, as sSTM-1k or sSTM-2n capacities, by ITU-T Recommendation G.708 [i.49]) in place of a PDH rate (e.g. 4 × VC12/sSTM14 or 1 × VC2/sSTM21 in place of 8 Mbit/s) (see note);
- any other signal (e.g. IP frames or ATM cells, even possibly mixed with PDH capacities) mapping into PDH or SDH frames, according present or future basic ITU-T or ETSI multiplexing schemes;

NOTE: In addition to this general principle, annex D (system D.2) presents specific characteristics for sub-STM-0 systems in the 18 GHz band.

The present document is also applicable to other base band interfaces (e.g. packet data interfaces or mixed interfaces) even if multiplexed (including compression algorithms if any) into proprietary frames; for such cases annex F gives the basic rules for applying the conventional PDH/SDH set of parameters to those equipment assessment.

Equipment may operate with one single payload rate or with multiple payload rates (multirate systems), either statically preset (possibly coupled also with *Preset-mode* operation) or, when coupled with *Mixed-mode* operation, dynamically changing according to the modulation format.

The requirements of the present document apply separately to each transmitter/receiver or single transmitters or receivers used for combining complex or simple (e.g. space diversity receivers or single transmitters and receivers used for unidirectional links) fixed radio systems. Systems labelled with N × STM-1 (N = 1,2) capacity might actually be aggregated for carrying STM-4 in more than one radio frequency channel, provided that each equipment for each channel meets the channel requirements. When frequency reuse (e.g. dual polarization reuse or other frequency reuse techniques) is applied, the requirements apply independently to each transmitter/receiver; the different interference potential of frequency reuse will be dealt with in the frequency planning associated with the licensing process.

1.6 Document structure

The present document is mainly intended to cover fixed radio equipment without integral antennas. However, it also applies to fixed radio systems products with integral antennas, for which all the technical requirements included in the present document and in EN 302 217-4-2 [7] apply. For more background information on the equipment and antenna parameters here identified as relevant to article 3.2 of R&TTE Directive see EG 201 399 [i.21] and TR 101 506 [i.25].

For simplicity, the point-to-point systems are split into separate annexes, with respect to ranges of frequency bands and channel separations, into the following families which may include a range of corresponding payload rates for covering various applications requested by the market:

- Annex A: Frequency bands from 1,4 GHz to 2,7 GHz:

  Systems with channel separations ranging from 0,025 MHz to 14 MHz for indicative payload rates ranging from 0,0096 Mbit/s to 34 Mbit/s. See detailed summary in table A.2.

- Annex B: Frequency bands from 3 GHz to 11 GHz (channel separation up to 30 MHz and 56/60 MHz):

  Systems with channel separations ranging from 1,75 MHz to 30 MHz and 56/60 MHz for indicative payload rates ranging from 2 Mbit/s to STM-4/4 × STM-1 Mbit/s. See detailed summary in table B.2.

- Annex C: Frequency bands from 3 GHz to 11 GHz (channel separation 40 MHz):

  Systems with channel separations 40 MHz (or spread over 2 × 40 MHz) for indicative payload rates from STM-1 Mbit/s to STM-4/4 × STM-1 Mbit/s. See detailed summary in table C.2.

- Annex D: Frequency bands 13 GHz, 15 GHz and 18 GHz:

  Systems with channel separations ranging from 1,75 MHz to 55/56 MHz (or spread over 2 × 55/56 MHz) for indicative payload rates ranging from 2 Mbit/s to STM-4/4 × STM-1 Mbit/s. See detailed summary in table D.2.

- Annex E: Frequency bands from 23 GHz to 55 GHz:

  Systems with channel separations ranging from 3,5 MHz to 56 MHz (or spread over 2 × 56 MHz for indicative payload rates ranging from 2 Mbit/s to STM-4/4 × STM-1 Mbit/s. See detailed summary in table E.2.

In those annexes further subdivision in sub-annexes is made, as appropriate, according to frequency bands, capacities and/or channel separation (see table 3 of EN 302 217-1 [6]).

2 References

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

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
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  - for informative references.

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

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

2.1 Normative references

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

[1] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

[2] CEPT/ERC/REC 74-01 (2005): "Unwanted Emissions in the Spurious Domain".

[3] ETSI EN 301 126-1 (V1.1.2): "Fixed Radio Systems; Conformance testing; Part 1: Point-to-point equipment - Definitions, general requirements and test procedures".

[4] ETSI EN 301 126-3-1 (V1.1.2): "Fixed Radio Systems; Conformance testing; Part 3-1: Point-to-Point antennas; Definitions, general requirements and test procedures".

[5] ETSI EN 301 390 (V1.2.1): "Fixed Radio Systems; Point-to-point and Multipoint Systems; Spurious emissions and receiver immunity limits at equipment/antenna port of Digital Fixed Radio Systems".

[6] ETSI EN 302 217-1 (V1.2.1): "Fixed Radio Systems; Characteristics and requirements for point to-point equipment and antennas; Part 1: Overview and system-independent common characteristics".

[7] ETSI EN 302 217-4-2 (V1.4.1): "Fixed Radio Systems; Characteristics and requirements for point to-point equipment and antennas; Part 4-2: Harmonized EN covering essential requirements of Article 3.2 of R&TTE Directive for antennas".

[8] IEEE 1802.3-2001: "IEEE Conformance Test Methodology for IEEE Standards for Local and Metropolitan Area Networks - Specific Requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications".

[9] IEEE 802.3-2005: "IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications".

[10] ITU Radio Regulations (2004).

[11] ITU-T Recommendation O.151 (1992) Corrigendum 1 (2002): "Error performance measuring equipment operating at the primary rate and above".

[12] ITU-T Recommendation O.181 (2002): "Equipment to assess error performance on STM-N interfaces".

[13] ITU-T Recommendation O.191 (2000): "Equipment to measure the cell transfer performance of ATM connections".

2.2 Informative references

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

[i.1] 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).

[i.2] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.

[i.3] CEPT/ERC/REC 01-02: "Preferred channel arrangement for digital fixed service systems operating in the frequency band 31.8 - 33.4 GHz".

[i.4] CEPT/ECC/REC 02-02: "Channel arrangement for digital fixed service systems (point-to-point and point-to-multipoint) operating in the frequency band 31 - 31.3 GHz".

[i.5] CEPT/ECC/REC 02-06: "Preferred channel arrangements for digital fixed service systems operating in the frequency range 7125-8500 MHz".

[i.6] CEPT/ERC/REC 12-02: "Harmonized radio frequency channel arrangements for analogue and digital terrestrial fixed systems operating in the band 12.75 GHz to 13.25 GHz".

[i.7] CEPT/ERC/REC 12-03: "Harmonized radio frequency channel arrangements for digital terrestrial fixed systems operating in the band 17.7 GHz to 19.7 GHz".

[i.8] CEPT/ERC/REC 12-05: "Harmonized radio frequency channel arrangements for digital terrestrial fixed systems operating in the band 10.0 - 10.68 GHz".

[i.9] CEPT/ERC/REC 12-06: "Harmonized radio frequency channel arrangements for digital terrestrial fixed systems operating in the band 10.7 GHz to 11.7 GHz".

[i.10] CEPT/ERC/REC 12-07: "Harmonized radio frequency channel arrangements for digital terrestrial fixed systems operating in the band 14.5 - 14.62 GHz paired with 15.23 - 15.35 GHz".

[i.11] CEPT/ERC/REC 12-08: "Harmonized radio frequency channel arrangements and block allocations for low, medium and high capacity systems in the band 3600 MHz to 4200 MHz".

[i.12] CEPT/ERC/REC 12-10: "Harmonized radio frequency arrangements for digital systems operating in the band 48.5 GHz - 50.2 GHz".