

**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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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 [i.2] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Directive 1999/5/EC [1] of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("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):	24 months after doa

Major variants with respect to previous published version.

This new version of EN 302 217-2-2 has considered, among other minor points:

- new system types (filling void set of parameters in some frequency bands/classes/channel, in particular for $n \times$ STM-0 nominal capacities for classes 4H and 6B),
- alternative "unified" spectrum masks for channel sizes lower than about 28 MHz,
- equipment characteristics for the 42 GHz band (made available for PP applications by ECC in revised ERC/REC(01)04 [i.4]).
- some of the oldest equipment types, no longer used in present market have been removed. They are mentioned in specific notes in the relevant annexes. These systems will anyhow be covered by previous version 1.3.1 of the present document until it will cease to be useable for presumption of conformity to the Directive.

In general, if not totally removed, the requirements for equipment types already covered by previous versions of the present document are carried over unchanged; therefore, it is considered that, equipment already conforming to those previous versions, would not need a new test report for re-assessment of the essential requirements according to the present document. However, the legal aspects related to the Declaration of Conformity according the Directive 1999/5/EC [1] are not in the scope of the present document.

Removed old equipment will be covered by a harmonised standard only until the previous version 1.3.1 of the present document will cease to be useable for presumption if conformity to the Directive 1999/5/EC [1].

Nevertheless, attention is drawn to the introduction of the complete set of "unified spectral power density masks", alternative to a number of older masks, some of which has been maintained as equivalent alternative option in the annexes A through E, but are supposed, in medium term maintenance process, to be discontinued. Newly assessed equipment are supposed to use the "unified masks" in clause 4.2.4.2.1, while for previously assessed equipment the supplier may wish to extend the assessment also to the corresponding "unified masks".

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.22] and shown in figure 1.

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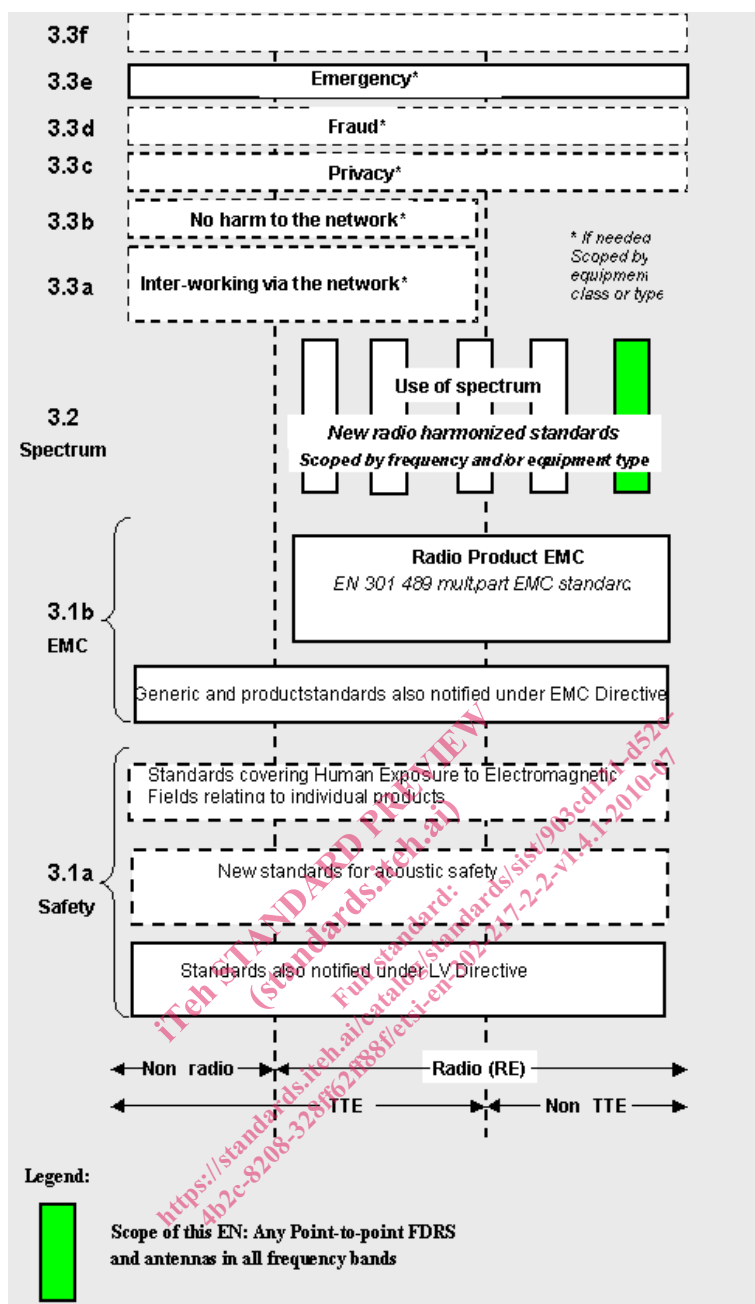


Figure 1: Modular structure for the various standards used under the R&TTE Directive

NOTE: For article 3.1b the diagram shows EN 301 489 [i.23], [i.39], 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.23] and EN 301 489-4 [i.24] 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: In class 3, for design commonality with other efficiency classes, the 16 QAM format is often used. However, some Class 3 systems are defined only for bands at 50 GHz and above while in modern applications for lower bands this class has lost practical importance.

- 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: In class 4L, 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 pre-selection of the class (*Preset-mode*) or with dynamic variation of capacity according to 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 spectral 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.

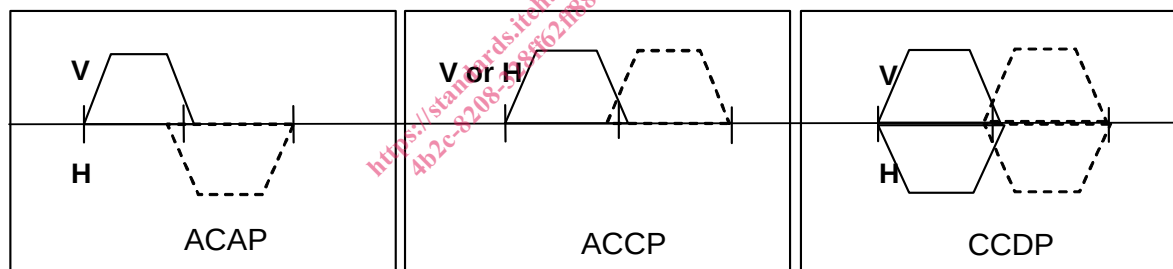


Figure 2: Examples of channel arrangements on the same route

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), $2 \times$ STM-0 (2×51 Mbit/s), STM-1 (155 Mbit/s), $N \times$ STM-1 ($N \times 155$ 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:

- $N \times 2$ 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 $N \times 2$ 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;
- $N \times 2$ 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.55]) in place of a PDH rate (e.g. $4 \times$ VC12/sSTM14 or $1 \times$ 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 $N \times$ 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.22] and TR 101 506 [i.27].

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 $STM-4/4 \times STM-1$ 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 $STM-4/4 \times STM-1$ Mbit/s. See detailed summary in table C.2.
- Annex D: Frequency bands 13 GHz, 15 GHz and 18 GHz:
 $2 \times$ Systems with channel separations ranging from 1,75 MHz to 55/56 MHz (or spread over 55/56 MHz) for indicative payload rates ranging from 2 Mbit/s to $STM-4/4 \times STM-1$ 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 $STM-4/4 \times STM-1$ 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.

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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 (V1.3.1): "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 (V1.5.1): "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".