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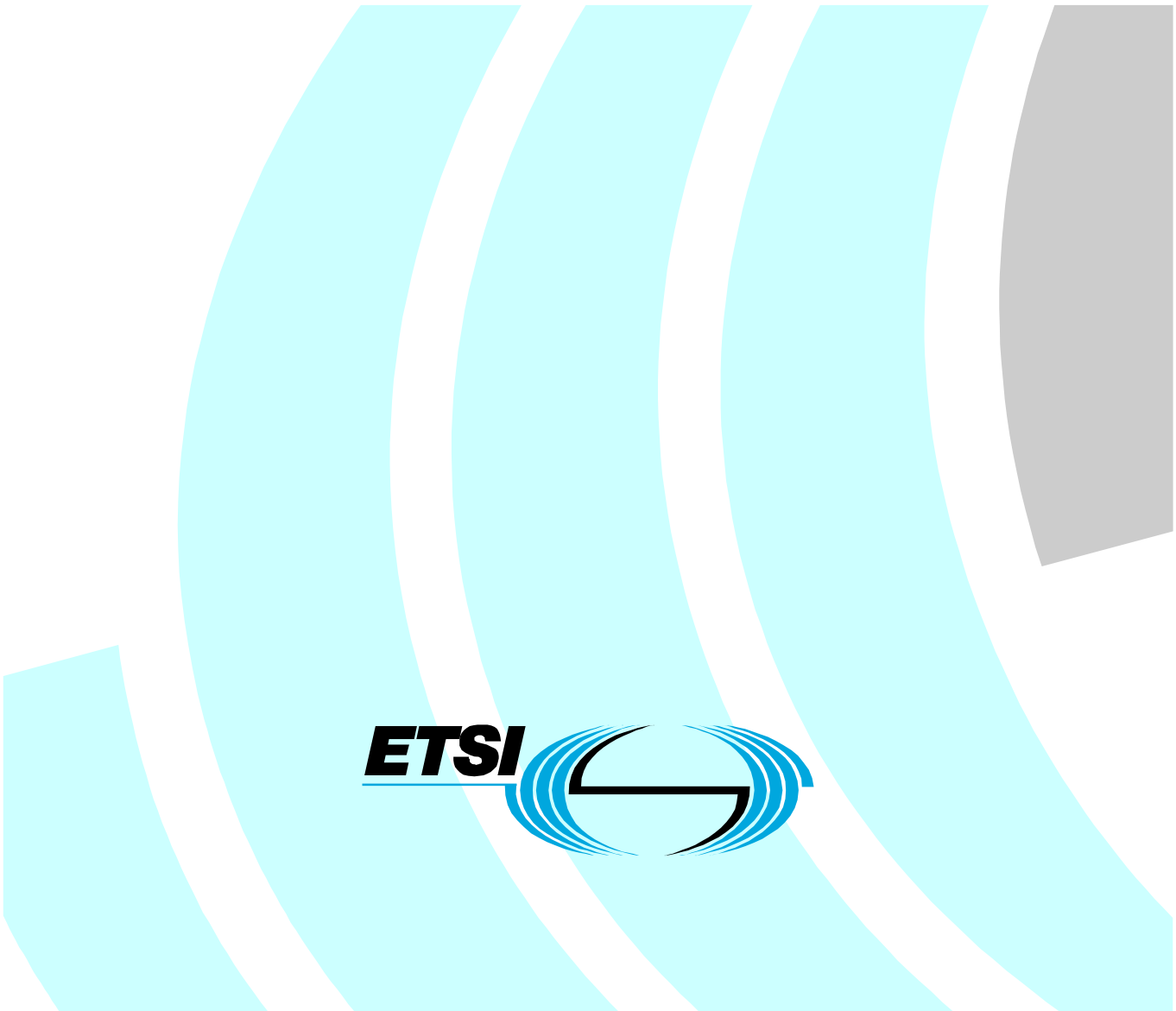
Candidate Harmonized European Standard (Telecommunications series)

Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 3: Harmonized EN covering essential requirements of Article 3.2 of R&TTE Directive for equipment operating in frequency bands where no frequency co-ordination is applied



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

Foreword

This Candidate Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Transmission and Multiplexing (TM), and is now submitted for the Public Enquiry phase of the ETSI standards Two-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 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 3, of a multipart EN covering "Fixed Radio Systems Characteristics and requirements for point-to-point equipment and antennas", as identified below:

Part 1: "Overview and system-independent common characteristics".

Part 2-1: "System-dependent requirements for digital systems operating in frequency bands where frequency co-ordination is applied".

Part 2-2 "Harmonized EN covering essential requirements of Article 3.2 of R&TTE Directive for digital systems operating in frequency bands where frequency co-ordination is applied".

Part 3: "Harmonized EN covering essential requirements of Article 3.2 of R&TTE Directive for equipment operating in frequency bands where no frequency co-ordination is applied".

Part 4-1: "System-dependent requirements for antennas".

Part 4-2: "Harmonized EN covering essential requirements of Article 3.2 of R&TTE Directive for antennas".

This part 3 with EN 302 217-2-2 and EN 302 217-4-2 intend to replace and supersede the harmonised EN 301 751 for all P-P equipment and antennas.

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

Introduction

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.

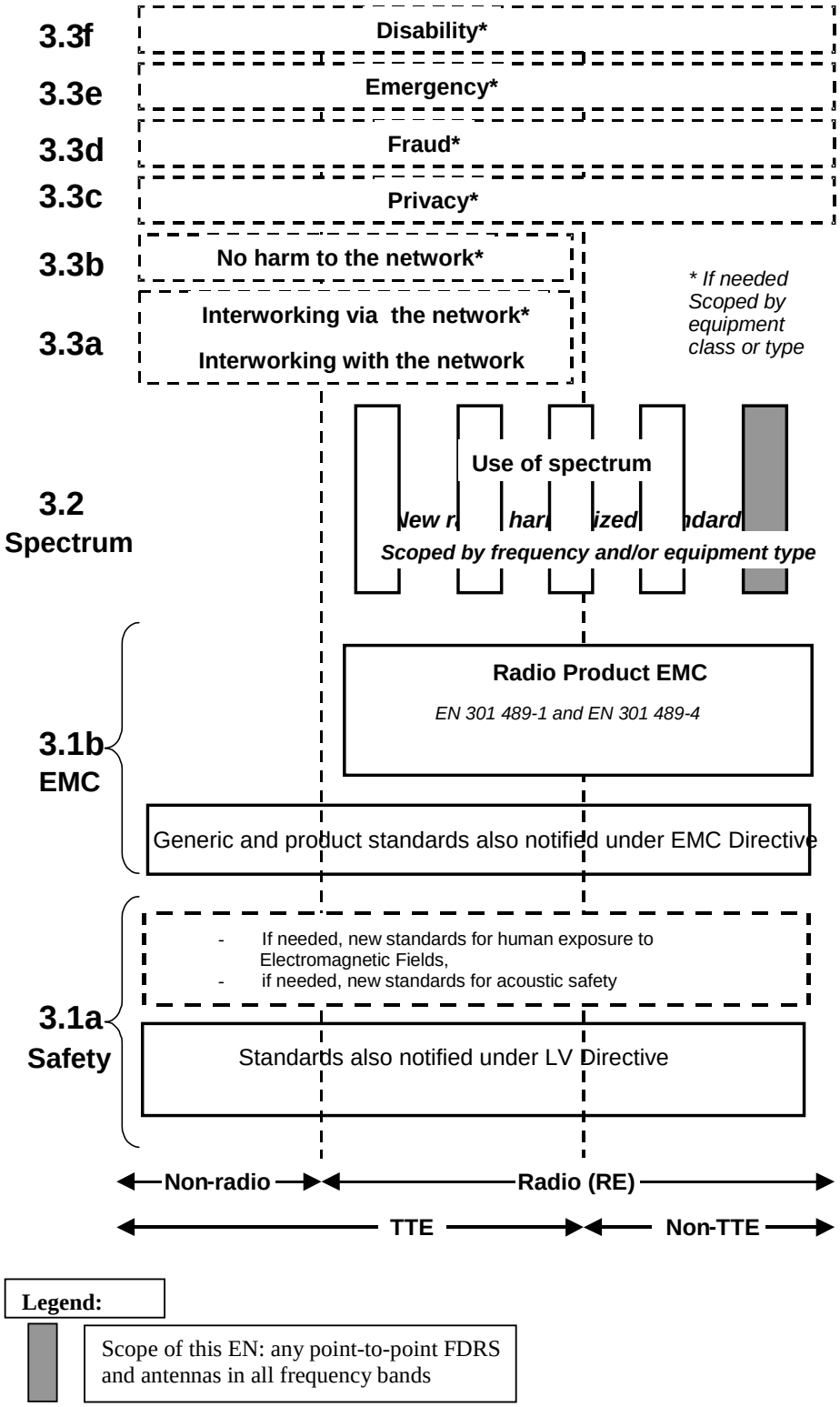

Figure 1: Modular structure for the various standards used under the R&TTE Directive

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

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

The vertical boxes show the standards under article 3.2 for the use of the radio spectrum by radio equipment. 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 EN 301 489, the multi-part product standard for radio used under the EMC Directive.

NOTE: For any fixed radio system, EN 301 489-1 and EN 301 489-4 are relevant.

For article 3.1a the diagram shows the existing safety standards currently used under the LV Directive (73/23/EEC) and new standards covering human exposure to electromagnetic fields. New standards covering acoustic safety may also be required.

The bottom of the figure 1 shows the relationship of the standards to radio equipment and telecommunications terminal equipment. A particular item of 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 equipment;
- it provides scope for standards to be added:
  - under article 3.2 when new frequency bands are agreed; or
  - 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 specifies the essential requirements for Digital Fixed Radio Systems (DFRS) operating frequency bands, which do not require co-ordinated frequency planning. It is intended to cover the provisions of Directive 1999/5/EC [1] (R&TTE Directive) 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".

The present document with EN 302 217- 2-2 and EN 302 217-4-2 intend to replace and supersede, after a suitable transition period, the harmonised EN 301 751 for all P-P equipment and antennas.

Those parts of this multipart EN introduces, for systems (equipment and antennas) already covered by EN 301 751, equal, technically equivalent or less stringent requirements. Therefore, from a strictly technical point of view, it is expected that equipment already conforming to the previous EN 301 751, would not need a new test report for re-assessment of essential requirements according this new multipart EN; however, legal implications with respect to the declaration of conformity and equipment labelling have not been considered, not being in the scope of the present document.

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.

In order to technically cover different market and network requirements, with appropriate balance of cost/benefit, the present document, together with EN 302 217-4-2, offers system types and antennas alternatives, for different network/market requirements, including:

- channel separation alternatives (as provided by the relevant CEPT Recommendation);
- implemented procedure for free radio channel selection;
- antenna directivity class alternatives (for different network density requirement).

As the Fixed Service generally operates in non harmonised bands, National Regulatory Bodies can limit the licensing use only to some selected alternatives according to the provision of R&TTE Directive [1] article 7.2 that reads: *"National Regulatory Bodies may restrict the putting into service of radio equipment only for reasons related to the effective and appropriate use of the radio spectrum, avoidance of harmful interference or matters relating to public health."*

The permitted alternatives should be included within the "national radio interface notification" under the provision of R&TTE Directive [1] article 4.1 and also that the covered alternatives could be mentioned in the "notification of the intention to place a DFRS on the national market" under the provision of R&TTE Directive [1] article 6.4.

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 apply.

For example, the frequency band 58 GHz is proposed to be used by various technologies for uncoordinated use of the band. Besides the RF-channel selection procedure specified in clause 4.2 to avoid unacceptable interference situations this band also benefits from the high and stable atmospheric attenuation which suppresses efficiently distant interferers (about 10 to 15 dB/km at sea level, refer to ITU-R Recommendation P.676.

For the purposes of the present document two equipment Classes are specified depending on the network requirements:

- Class A: Digital equipment for High Density Fixed Service (HDFS) applications typically connected to public networks, which apply the RF-channel selection procedure (see clause 4.2), error performance and availability requirements (see EN 302 217-1 [13]).
- Class B: Equipment without network requirements for quality of service, typically private connections.

Typical applications for Class A equipment are interconnection between cellular networks where there, in some cases, is a need for short length connections (up to about 500 m). The RF channel selection procedure shall be used to protect existing systems from a new system being commissioned. However, the channel selection procedure may not guarantee interference free installation or operation in all cases due to limitations in the procedure with respect to the variety of systems.

Typical applications for Class B equipment are in private connections, such as video surveillance systems.

2 References

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

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

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

NOTE: With regard to ETSI ENs, the third digit of the 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 versions with the same two initial digits. Here is reported the third digit of the latest version available at the time of publication of the present document.

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

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

[3] ERC/REC 74-01 (2002): "Spurious emissions".

[4] ETSI EN 301 390 (V1.2.1): "Spurious emissions and receiver immunity at equipment/antenna port of Digital Fixed Radio Systems".

[5] ETSI EN 301 126-3-1 (V1.1.1): "Fixed Radio Systems; Conformance testing; Part 3-1: Point-to-Point antennas; Definitions, general requirements and test procedures".

[6] ITU-T Recommendation G.703 (1998): "Physical/electrical characteristics of hierarchical digital interfaces".

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

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

[9] ITU-T Recommendation O.191 (2002): "Equipment to measure the cell transfer performance of ATM connections".

[10] IEEE 1802.3 (2001): "Conformance Test Methodology for IEEE Standards for Local and Metropolitan Area Networks: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications: Attachment Unit Interface (AUI) Cable (Section 4)".

[11] IEEE 802.3 (1998): "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".

[12] ERC/REC 12-09: "Radio frequency channel arrangement for fixed service systems operating in the band 57,0 GHz to 59,0 GHz which do not require frequency planning".

[13] ETSI EN 302 217-1 (V1.1.1): "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 1: Overview and system-independent common characteristics".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 302 217-1 [13] apply.

3.2 Symbols

For the purposes of the present document, the symbols given in EN 302 217-1 [13] apply.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in EN 302 217-1 [13] apply.

4 Technical requirements specifications

Guidance and description of the phenomena relevant to "essential requirements" under article 3.2 is given in EG 201 399; specific applications and descriptions for DFRS is given in TR 101 506 .

In the following clauses, limits are required to be met at specific reference points of the system block diagram. Reference points and the system block diagram are those set out in figure 1 of EN 302 217-1 [13].

In the case of wide radio-frequency bands covering units and multirate/multiformat equipment, these specifications shall be met at any frequency, at any rate/format. However the tests, required for generating a test report and/or declaration of conformity, in order to fulfil any conformity assessment procedure with respect to the R&TTE Directive [1], shall be carried-out in accordance with the principles set out in annex UC.

Testing methods and conditions for assessing all requirements are specified in clause 5, where each clause directly refer to corresponding clause in this clause 4.

4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the supplier. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile. For testing the compliance with technical requirements see also EN 301 126-1 [2] and clause 5 of the present document.

4.2 RF-channel Selection

RF-channel selection procedure is mandatory for Class A equipment only.

4.2.1 RF-channel selection procedure

The purpose of the RF-channel selection procedure is to detect and protect existing transmissions in order to avoid unacceptable interference situations.

At both transmission sites, radio-relay terminals shall measure during installation, the interference levels of both receive and transmit channels (see note). Only in the instance when an unoccupied channel is identified and selected as the transmission channel shall the transmit power be switched on. The interference avoidance requirements for the receiver to detect occupied channels are specified in clause 4.2.2.

The principle of protecting existing transmission shall be respected also during the antenna alignment procedure.

NOTE: If the national regulatory rules allows to change the frequency of the link during its operation, it may be considered, in order to decrease the possibility of undetected interference, to apply the RF channel selection procedure whenever appropriate (e.g. when restoring a link after a failure or by suitable automatic timed routine in conjunction with frequency agility as in clause 4.2.3).

4.2.2 Interference avoidance requirements

4.2.2.1 Interference avoidance limit

The radio relay terminal shall consider the radio channel occupied when the level of the interference is above the following limit:

- Pi > C dBm + 10 log (BW/10 MHz).

Where:

- BW is the noise bandwidth of the receiver expressed in MHz;
- Pi is the interference power expressed in dBm measured within the receiver noise bandwidth (BW);

The value C is dependent on frequency band and is given in the relevant annex.

For the rationale of the interference limit formula see informative annex UE.

For test purpose this requirement shall be fulfilled at reference point C within the intended band of transmission:

- with a signal similar to the transmitted one;
- with a CW signal at any frequency within this band.

The value of the intended band of transmission shall be declared by the manufacturer.

4.2.3 Frequency agile automatic channel selection

Frequency agility is an optional feature.

If unacceptable interference which exceeds a predetermined duration is observed, an automatic change of RF-channel can be initiated using the RF-channel selection procedure described above. If an automatic RF-channel change facility is implemented a means shall be provided to disable it. Unacceptable interference criteria shall be declared by the manufacturer (see informative annex UE, clause UE.3).

4.3 Transmitter requirements

The specified transmitter characteristics shall be met with the appropriate base band signals applied at one of the reference points X" of figure 1 of part 1.

The appropriate base band signals for most common digital interfaces is given in table 1.

Table 1: Test signal and type of base band interface

Type of base band signal interface at X/X"	Test signal to be applied according to:
PDH	ITU-T Recommendation 0.151 [7] (PRBS)
SDH	ITU-T Recommendation O.181 [8]
ATM	ITU-T Recommendation O.191 [9]
Ethernet interface (packet data)	IEEE 1802.3 [10] and IEEE 802.3 [11]
Other than the above	Relevant standards which the interface refers to. (see note)
NOTE: When standard interfaces are provided they shall comply with ITU-T standards or other standardised interface declared by the supplier. However, in some applications of these radio relay systems, interface parts may be integrated with other systems and therefore standard interfaces (X, X" reference sections) are not available under these circumstances. In the latter case the radio system assessment shall be made including those other equipment for properly supplying all loading conditions foreseen.	

4.3.1 Transmitter power

4.3.1.1 Transmitter power

Transmitter maximum mean output power at reference point C' of the system block diagram (EN 302 217-1 [13], figure 1) shall not exceed *A dBW* (including tolerance and, if applicable, ATPC/RTPC influence). The values of *A* are dependent on frequency band and are given in the relevant annex(es).

4.3.1.2 Equivalent Isotropically Radiated Power (EIRP)

The Equivalent Isotropically Radiated Power (EIRP) shall be limited to *+B dBW*. The values of B are dependent on frequency band and are given in the relevant annex(es).

NOTE: Testing this requirement is for assessment of equipment with integral antenna only; however also equipment placed on the market without antennas should, in principle, refer when relevant in common practice, to such limitations (e.g. defining the maximum associated antenna gain).

4.3.1.3 Output Power Tolerance

The power tolerance and the nominal output power shall be declared by the supplier and shall be included in the limits in clauses 4.3.1.1 and 4.3.1.2.

4.3.2 Radio Frequency (RF) spectrum mask

The radio frequency spectrum mask is system dependent and is given in the relevant annex.

4.3.3 Spurious emissions - external

The limits of these emissions, which apply at reference point C', shall conform, in any setting conditions of ATPC and RTPC if any, to:

- EN 301 390 [4] when digital equipment is concerned;
- CEPT/ECC REC 74-01 [3] when analogue equipment is concerned.

NOTE 1: ERC/REC 74-01 [3] based on ITU-R Recommendations SM.329, and ITU-R Recommendation F.1191 gives the applicable definitions.

NOTE 2: EN 301 390 [4] includes, for P-P systems, the same limits of ERC/REC 74-01 [3].

4.3.4 Radio frequency tolerance

The maximum allowable RF frequency tolerance from the nominal carrier frequencies shall not exceed ±X ppm. This limit includes both short-term factors (environmental effects) and long-term ageing effects. The values are system dependent and are given in the relevant annex(es). The manufacturer shall declare the values of the nominal carrier frequencies.

In the type test the manufacturer shall state the guaranteed short-term part and the expected ageing part.

4.3.5 Antenna directional requirements

This clause is relevant for all equipment specified in annexes A to F when an integral antenna is provided. Stand alone antenna products are covered, for the relevant frequency band and antenna class, by EN 302 217-4-2.

However, with integral antennas, it may be possible to test the antenna separately from the equipment (see note); in this case the declaration of conformity may be composed of a declaration of conformity for the equipment and a declaration of conformity for the antenna, done separately by the actual supplier(s), according to EN 302 217-4-2.

NOTE: Using special tool supplied by the supplier.

4.3.5.1 Radiation Pattern Envelope (Off-axis EIRP density)

In the case of an integral antenna system and where applicable, the radiation pattern envelope (off-axis EIRP density) is essential under article 3.2 of the R&TTE Directive [1]; the clause that gives the limits of this essential phenomenon is clause 4.2 of EN 302 217-4-2.

4.3.5.2 Antenna gain

In the case of an integral antenna system and where applicable, the antenna gain is essential under article 3.2 of the R&TTE Directive [1]; the clause that gives the limits of this essential phenomenon is clause 4.3 of EN 302 217-4-2.

4.3.5.3 Antenna Cross-Polar Discrimination (XPD)

No requirement apply. (cross-polar radiation pattern requirements are not relevant for equipment operating in frequency bands where no frequency co-ordination is applied).

4.4 Receiver requirements

4.4.1 Spurious emissions

The limits of these emissions, which apply at reference point C, shall conform to:

- EN 301 390 [4] when digital equipment is concerned;
- CEPT/ECC REC 74-01 [3] when analogue equipment is concerned.

NOTE 1: ERC/REC 74-01 [3] based on ITU-R Recommendations SM.329, and ITU-R Recommendation F.1191 gives the applicable definitions.

NOTE 2: EN 301 390 [4] includes, for P-P systems, the same limits of ERC/REC 74-01 [3].

5 Testing for compliance with technical requirements

5.1 Environmental conditions for testing

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

The environmental profile, may be determined by the environmental class of the equipment according to the guidance given in clause 4.4 of EN 301 126-1 [2].

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared operational environmental profile.

Any test, requested to generate the test report and/or declaration of conformity in order to fulfil any Conformity assessment procedure with respect to the R&TTE Directive [1] shall be carried-out:

a) for radio equipment, with respect to the same principles and procedures, for reference and extreme conditions, set out in clause 4.4 of EN 301 126-1 [2]. The requirement for test at reference or extreme conditions is set out in clauses 5.2 and 5.3 of the present document according to the principles for similar requirements in EN 301 126-1 [2].

b) for integral DFRS antennas (directional phenomena of clause 4.4 of the present document), at reference environmental conditions of the test field according to clause 4.1 of EN 301 126-3-1 [5].

NOTE: It is recalled (see Scope) that equipment already assessed for presumption of conformity to EN 301 751 do not need a new test report.

The test report shall be produced according to the procedure described in article 10 of the R&TTE Directive [1].

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

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

An adaptor from point D or D' to IEC standard flange shall be made available by the manufacturer for transmit power, RF-spectrum and spurious emission measurements.

5.2 RF-channel Selection

See clause 4.2.

5.3 Essential radio test suites for the transmitter

The tests, carried out to generate the test report and/or declaration of conformity in order to fulfil any Conformity assessment procedure with respect to the R&TTE Directive [1], shall be carried-out at climatic conditions referred to in table 2 and, when applicable for equipment with integral antenna, in table 3.

Table 2 indicates the different clauses applicable, for a given parameter, to the requirement, the test clause in the present document and the corresponding test method in the base test document EN 301 126-1 [2].

Table 2: Transmitter parameters, test clauses and conditions

Clause	Parameter	EN 301 126-1 [2] reference clause for the test methods	Climatic conditions		Other specific conditions
			Ref	Extreme	
5.3.1.1	**Transmitter power**	5.2.1	X	X	
5.3.1.3	**Transmitter power tolerance**	5.2.1	X	X	
5.3.2	**RF Spectrum Mask**	5.2.6	X	X	
5.3.3	**Spurious emissions-external**	5.2.9	X		The tests 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 range set out by clause A.1 of EN 301 390 [4] or recommends 3 of CEPT/ECC REC 74-01 [3]
5.3.4	**Radio frequency tolerance**	5.2.5	X	X	
NOTE 1 This refers to climatic conditions only; for other environmental and power supply conditions, please refer to EN 301 126-1 [2].					
NOTE 2: For equipment with integral antennas, the essential transmitter test suite clauses include the EIRP and antenna parameters, test clauses and conditions contained in table 3 and clause 5.4.					

5.3.1 Tranmitter power

5.3.1.1 Transmitter power

The clause that give the test methods for the transmitter power and transmitter power tolerance is clause 5.2.1 of EN 301 126-1 [2].

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

For continuous signals the average power shall be measured. For burst type signals (e.g. TDD) the average power during the signal burst shall be measured.

5.3.1.2 Equivalent isotropically radiated Power (EIRP)

For equipment with integral antenna, the clause that provides the test methods for the EIRP is tied to the measurement in clause 6.1 of EN 301 126-3-1 [5].

5.3.1.3 Output Power Tolerance

Test methods for the transmitter power tolerance shall be in accordance with clause 5.2.1 of EN 301 126-1 [2].

5.3.2 RF Spectrum mask

The clause that give the test methods for the RF spectrum masks is clause 5.2.6 of EN 301 126-1 [2].

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

If any, the recommended spectrum analyser settings are given in the relevant annexes.

5.3.3 Spurious emissions - external

Test methods shall be in accordance with clause 5.2.9 of EN 301 126-1 [2].

The tests 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 [4]. The test shall be carried-out at reference climatic conditions.

5.3.4 Radio frequency tolerance

The clause that gives the test methods for the radio frequency tolerance is clause 5.2.5 of EN 301 126-1 [2].

The tests shall be carried-out at reference and extreme climatic conditions.

5.3.5 Antenna and system directional requirements

Table 3: Transmitter/receiver antenna parameters, test clauses and conditions

Clause	Parameter	EN 301 126-3-1 [5] reference clause for the test methods	Climatic conditions		Other specific conditions
			reference	extreme	
5.3.5	**Antenna directional requirements**				
5.3.5.1	**Radiation Pattern Envelope (Off-axis EIRP density)**	6.1	X		
5.3.5.2	**Antenna Gain**	6.3	X		
5.3.1.2	**System EIRP**	6.1	X	X	
NOTE:	This refers to climatic conditions only; for other environmental conditions, please refer to EN 301 126-3-1 [5].				

5.3.5.1 Radiation Pattern Envelope (Off-axis EIRP density)

The clause that gives the test methods of the radiation pattern envelope, essential phenomenon for equipment with integral antennas, is clause 6.1 of EN 301 126-3-1 [5].

5.3.5.2 Antenna gain

The clause that gives the test methods of the antenna gain, essential phenomenon for equipment with integral antennas, is clause 6.3 of EN 301 126-3-1 [5].

5.3.5.3 Antenna Cross-Polar Discrimination (XPD)

Non-essential requirement.

5.4 Essential radio test suites for the receiver

The tests, carried out to generate the test report and/or declaration of conformity in order to fulfil any Conformity assessment procedure with respect to the R&TTE Directive [1] shall be carried-out at reference and extreme climatic conditions according the provisions for each test summarised in table 4. For each parameter table 4 gives the applicable clauses for the requirement, for the test clause in the present document, for the corresponding clause in EN 301 126-1 [2] and possible comments and climatic conditions.

Receiving phenomena tests are considered only without the option of space diversity. However, in case of diversity applications, they do apply separately to any receiver.

Table 4: Essential receiver test suite clauses

Clause	Parameter	EN 301 126-1 [2] reference clause for the test methods	Climatic conditions		Other specific conditions
			Ref	Extreme	
5.3.1	**Spurious emissions external**	5.3.2	X		Actual test shall be limited to the practical frequency range foreseen by clause A.1 of EN 301 390 [4]
NOTE: This table refers to climatic conditions only; for other environmental and power supply conditions, please refer to EN 301 126-1 [2].					

5.4.1 Spurious emissions - external

The test, shall be limited to the practical frequency ranges foreseen by clause A.1 of EN 301 390 [4] or in recommends 3 of CEPT/ECC REC 74-01 [3]. The test shall be carried-out at reference climatic conditions Test methods shall be in accordance with clause 5.3.2 of EN 301 126-1 [2].

Annex UA (normative): Frequency bands around 58 GHz

UA.0 Introduction

The following fixed point-to-point systems are covered in this annex (see note):

- UA.1 Radio systems for the transmission of digital signals operating at around 58 GHz, which do not require co-ordinated frequency planning.
- UA.2 Radio systems for the transmission analogue video signals operating at around 58 GHz, which do not require co-ordinated frequency planning.

NOTE: These systems were previously reported in EN 300 408 (V1.3).

The letter U placed ahead of the annex letter indicates the annex of an Uncoordinated system and distinguishes from the coordinated system annexes presented in EN 302 217-2-1 EN 302 217-2-2.

UA.1 System UA.1 digital

UA.1.1 Frequency bands and channel arrangements

UA.1.1.1 Frequency band

The frequency band is from 57 GHz to 59 GHz as reported in CEPT/ECC REC 12-09 [12] or in ITU-R Recommendation F.1497, annex 2.

NOTE: The successful co-existence of Class A and Class B equipment may require the regulator to define exclusive spectrum for each equipment Class (see annex UE). CEPT/ECC REC 12-09 [12] do not refer to band segmentation for this purpose, therefore it might be regulated at national level only.

Other national or future ITU-R or CEPT/ECC recommendations set around the rough boundary of present ITU-R or CEPT/ECC recommendations are considered applicable to systems assessed against the present document, provided that they use the same channel separation referred in clause UA.1.1.2 without frequency co-ordinated deployment.

UA.1.1.2 Radio channel arrangements

The channel arrangements are specified in ERC/REC 12-09 [12] with either 50 MHz or 100 MHz channel raster. For reader convenience, the basic parameters of the CEPT Recommendation are shown in informative annex UE.

UA.1.1.3 Transmission capacity

The supplier shall declare the transmission capacities and the channel spacing used. The relevant spectrum masks below shall be complied with, for all transmission capacities.

UA.1.2 Transmitter

UA.1.2.1 Transmitter power

Transmitter maximum mean output power limit (clause 4.3.1.1) A = -20 dBW.

UA.1.2.2 Equivalent Isotropically Radiated Power (EIRP)

The Equivalent Isotropically Radiated Power limit (clause 4.3.1.2) B = + 15 dBW.

UA.1.2.3 Output power tolerance

Clause 4.3.1.3 apply.

UA.1.2.4 RF spectrum masks

UA.1.2.4.1 Limits

The spectrum mask for 100 MHz radio channels is shown in figure UA.1 and for 50 MHz channels in figure UA.2 as absolute power density in a required reference bandwidth..

The spectral power density masks do not include frequency tolerance and is referred to the actual carrier centre frequency and to reference point C" of figure 1 in p EN 302 217- 1.

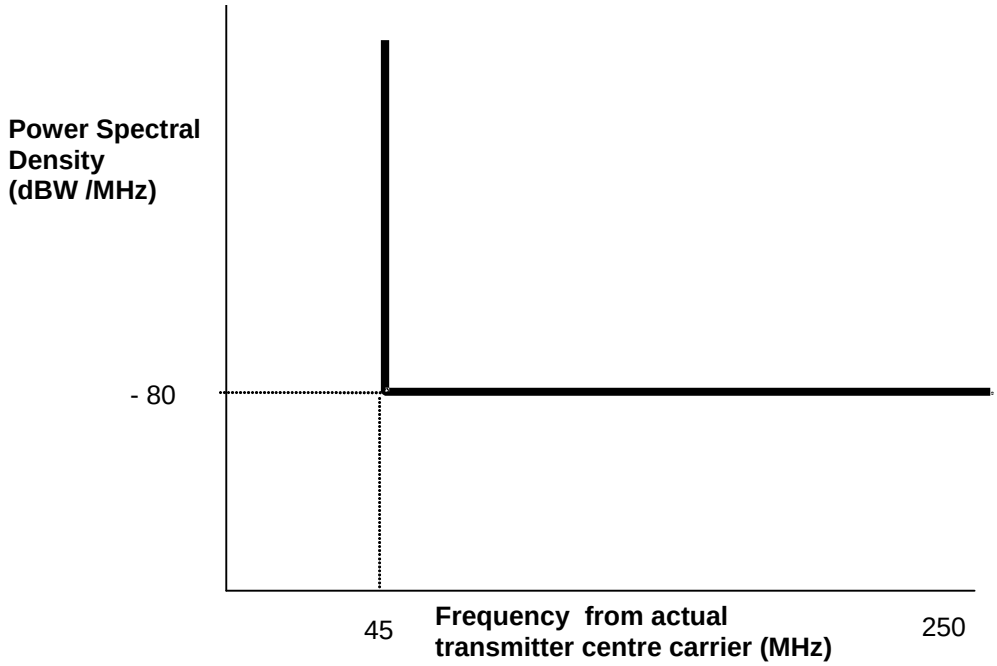

Figure UA.1: Limits of spectral power density for 100 MHz radio channels

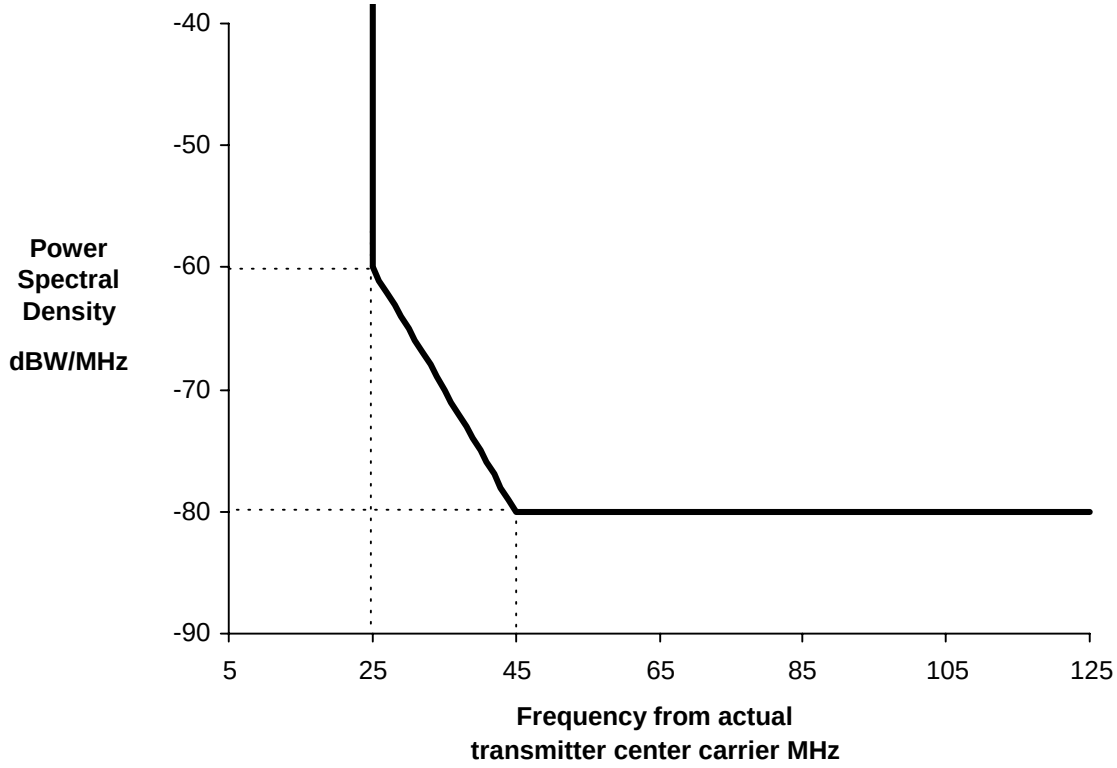

Figure UA.2: Limits of spectral power density for 50 MHz radio channels

UA.1.2.4.2 Spectrum analyser settings

The spectrum analyser setting is not of importance when absolute power density is considered, provided that suitable integration/normalisation is made.

As a general guideline, the resolution bandwidths (measured at the -3 dB points of the final IF filter) of the spectrum analyser should be equal to the reference bandwidths as given in the eirp power density mask requirement. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the reference bandwidth. For instance, narrower resolution bandwidth is sometimes necessary for emissions close to the centre frequency. When the resolution bandwidth is smaller than the reference bandwidth, the result should be integrated over the reference bandwidth. When the resolution bandwidth is greater than the reference bandwidth, the result for broadband spurious domain emissions should be normalized to the bandwidth ratio. For discrete (narrow-band) signals, normalization is not applicable

UA.1.2.5 Spurious emissions-external

Clause 4.3.3 shall apply.

UA.1.2.6 Radio frequency tolerance

The maximum allowable RF-frequency tolerance (clause 4.3.4): ± X = ± 50 ppm

UA.1.2.7 RF-channel selection parameters

Interference avoidance limit parameter (clause 4.2.2.1): C = -81 (dBm)

UA.1.3 Receiver

Clause 4.4.1 shall apply.

UA.2 System UA.2 analogue

Only class B equipment are defined for analogue UA.2 systems.

UA.2.1 Frequency bands and channel arrangements

UA.2.1.1 Frequency band

The frequency band is from 57 GHz to 59 GHz as reported in CEPT/ECC REC 12-09 [12] or in ITU-R Recommendation F.1497, annex 2.

UA.2.1.2 Radio channel arrangements

The channel arrangements are specified in ERC/REC 12-09 [12] with either 50 MHz or 100 MHz channel raster. For reader convenience, the basic parameters of the CEPT Recommendation are shown in informative annex UE.

UA.2.1.3 Transmission capacity

The supplier shall declare the analogue video transmission capacities and the channel spacing used. The relevant spectrum masks below shall be complied with, for any possible capacity and frequency deviation.

UA.2.2 Transmitter

UA.2.2.1 Transmitter power

Transmitter maximum mean output power limit (clause 4.3.1.1) A = -20 dBW.

UA.2.2.2 Equivalent Isotropically Radiated Power (EIRP)

The Equivalent Isotropically Radiated Power limit (clause 4.3.1.2) B = +15 dBW.

UA.2.2.3 Output power tolerance

Clause 4.3.1.3 apply.

UA.2.2.4 RF spectrum masks

Same spectrum mask in clause UA.1.2.4 shall apply.

UA.2.2.5 Spurious emissions - external

Clause 4.3.3 shall apply.

UA.2.2.6 RF frequency tolerance

The maximum allowable RF-frequency tolerance: ±X = ±200 ppm.

UA.2.3 Receiver requirements

UA.2.3.1 Spurious emissions

Refer to clause 4.4.1.

Annex UB (normative): The EN Requirements Table (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.

Table UB.1: 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 302 217-3 annex B**			
Transmitter requirements					
No.	**Clause**	**EN-R (see note)**	**Status**	**Note**	**Supplier Comment for declaration**
1	4.3.4	Radio frequency tolerance	M		
2	4.3.1.1	Transmitter power	M		
3	4.3.1.2	Equivalent isotropically radiated Power	M	For equipment with integral antennas	
4	4.3.1.3	Output Power Tolerance	M		
5	4.3.2	Adjacent channel power - Spectrum mask	M		
6	4.3.3	Spurious emissions	M		
Antenna directional requirements					
No.	**Clause**	**EN-R (see note)**	**Status**	**Note**	**Supplier Comment for declaration**
8	4.3.5.1	Off-axis EIRP density - Radiation pattern envelope (RPE)	M	Applicable only to equipments with	
9	4.3.5.2	Antenna gain	M	integral antennas;	
Receiving requirement					
No.	**Clause**	**EN-R (see note)**	**Status**	**Note**	**Supplier Comment for declaration**
10	4.4.1	Spurious emissions	M		
Control and monitoring function requirements					
No.	**Clause**	**EN-R (see note)**	**Status**	**Note**	**Supplier Comment for declaration**
11	4.2.1	Sharing protocols - Interference avoidance requirement	M	Class A system only	
NOTE: These EN-Rs are justified under article 3.2 of the R&TTE Directive.					

Key to columns:

- **No** table entry number;
- **Reference** Clause 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;

  O.n this status is used for mutually exclusive or selectable options among a set. The integer "n" shall refer to a unique group of options within the EN-RT. A footnote to the EN-RT shall explicitly state what the requirement is for each numbered group. For example, "It is mandatory to support at least one of these options," or, "It is mandatory to support exactly one of these options".

- **Comments** To be completed as required.

Annex UC (normative): Wide radio-frequency band covering units and multirate equipment specification and tests

UC.1 Wide radio-frequency band covering units

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 channels).

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 R&TTE Directive [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 UC.1);

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 UC.2);

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 UC.1 or UC.2);

- 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 UC.1 and figure UC.2).

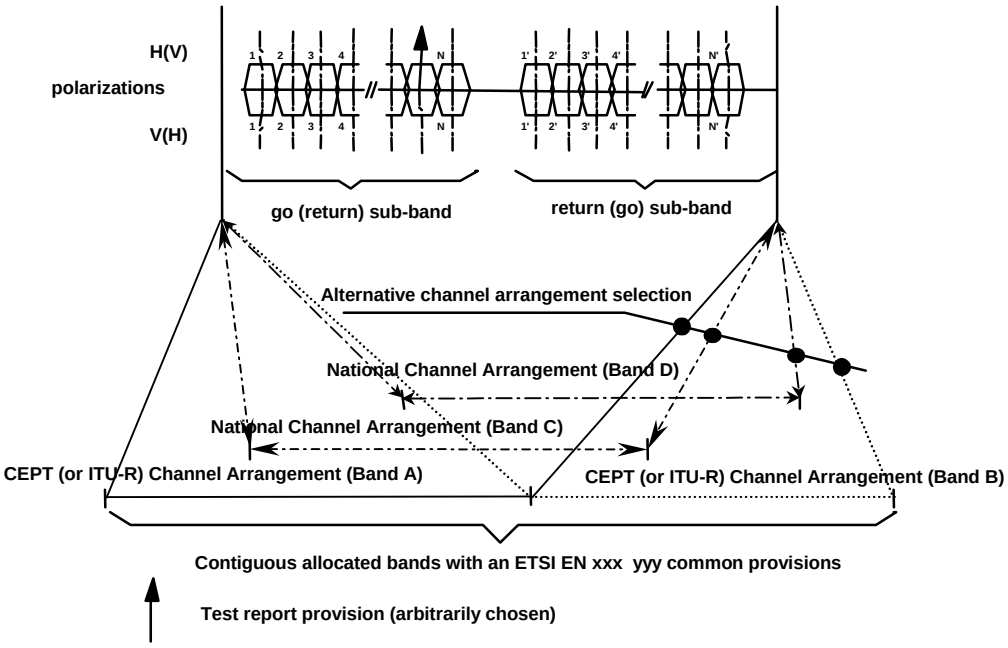

Figure UC.1: Test report frequency requirement for equipments intended for single channel operation

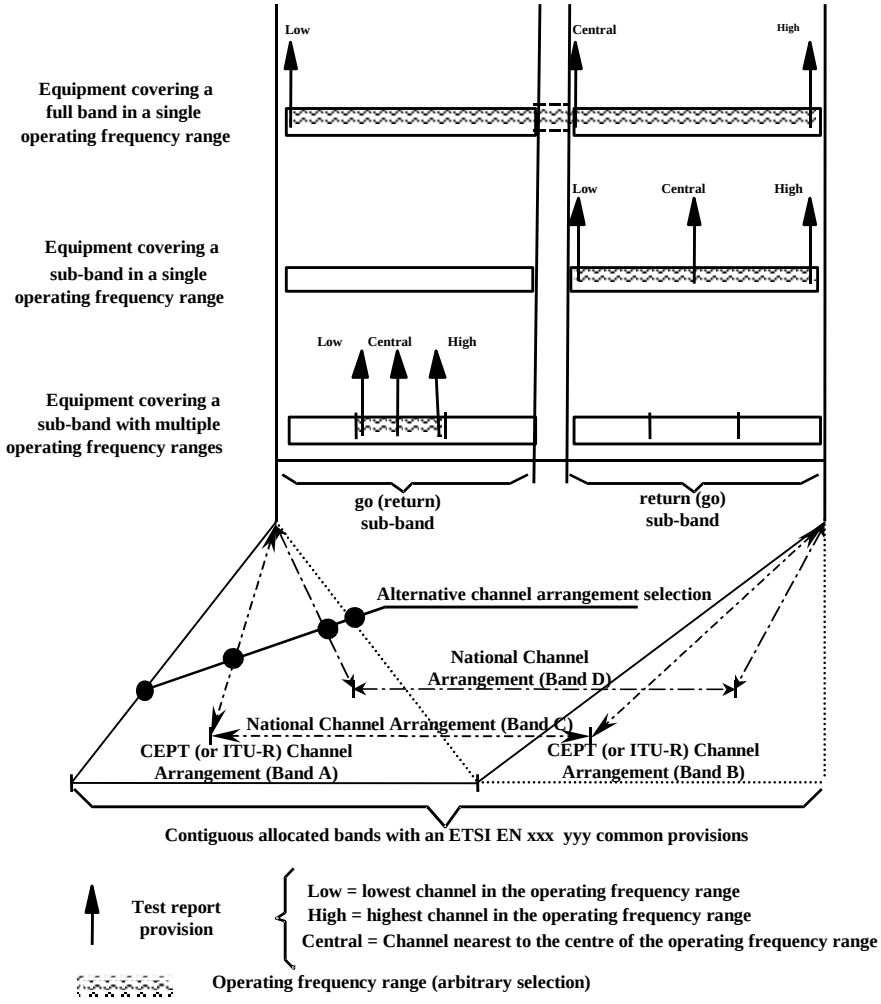

Figure UC.2: Test report frequency requirements for equipments intended for covering an operating frequency range

UC.2 Multirate/multiformat equipment

DFRS equipments can cover a number of different payload-rates or different modulation format 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 with respect to the R&TTE Directive [1], shall be carried-out for transmitting phenomena (see clause 4.3) at any possible bit rate and modulation format, while RF channel selection (see clause 4.2) and receiving phenomena (see clause 4.4) shall be tested only at the lowest and the highest bit rate for any modulation format.

Annex UD (informative): Rationale for the interference limit formula

UD.1 Analysis of the quality value for the channel selection procedure

UD.1.1 Error-performance and availability requirements for Class A equipment

Class A equipment shall be designed in order to meet network error-performance and availability requirements foreseen by relevant ITU-T and ITU-R Recommendations (see part 1).The interference limit specified in clause 4.2.2, rather than the actual threshold of the equipment, should be considered, when planning the hop length for the required fade margin due to propagation effects.

It should be noted that the specified channel selection procedure (see clause 4.2) can help to avoid interference situations between Class A equipment but cannot guarantee interference-free operation in all situations (see note).

The frequency agility, described in clause 4.2.3, may be a useful function in interference avoidance e.g. between systems using different duplexing methods or between Class A and Class B -systems.

UD.1.1.1 Example in the 58 GHz band:

Interference power level in existing network receivers can be in the worst case (e.g. using values applicable to 58 GHz band):

-71dBm -Ptx (dBm) + 10 log(BW/10MHz).

where:

- Ptx is the mean transmit power of the radio relay at the reference point D´ given in figure 1 of EN 302 217-1 [13];
- BW is the noise bandwidth of the receiver.

The interference value calculated from the equation simulates the interference effect of a continuous signal. However, the true effect of a bursty signal may be approximately 3 dB higher (with 50 % duty cycle).

UD.1.2 Theoretical background

The following discussion is tailored to equipment in 58 GHz band, however the principles might be used in any band when frequency co-ordination is not applied.

The channel selection procedure targets to ensure required quality of service of 58 GHz radio links connected to public switched networks. The principle of channel selection procedure is that Class A 58 GHz radio links do not start to transmit on a channel when that channel is already in use. This would ensure continued operation of various kinds of radio links.

The channel use can be detected if the received interference power *I* clearly exceed the noise power. The receiver noise power is given by N_0 NF B where B is the bandwidth of the interference measurement, NF is the noise figure, and N_0=kT. The transmission is allowed when:

- $I/B < M\ N_0\ NF$, (1)

where M is the necessary margin and the noise power density NF N_0. A reasonable channel use threshold is, therefore:

- $(I/B)_{threshold} = M\ N_0\ NF$. (2)

The suggested threshold value for various kinds of systems is -151 dBm/Hz (-81dBm/10MHz). It can be obtained taking noise figure (NF) 18dB and margin of 5 dB or other combination of the two. See figureUD.1 for the breakdown of the margin M.

In order to avoid conflict situations, it is necessary that the interference is measured from the whole transmission bandwidth before transmission is initiated.

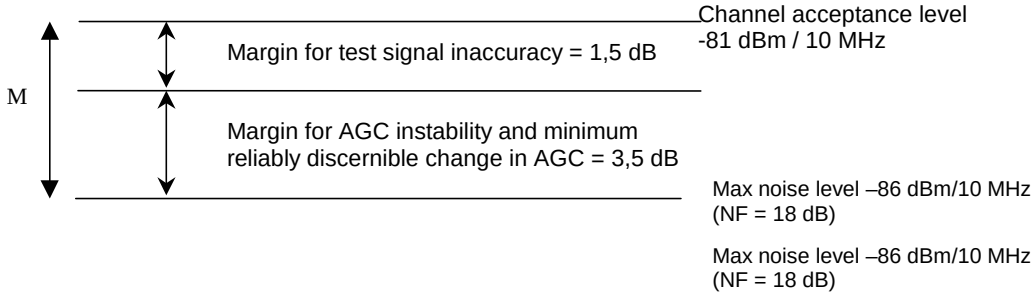

Figure UD.1

UD.1.3 Typical co-channel interference situation when channel rejection threshold is used

The interference level measured by a radio is generally caused by many interfering radios, but in a typical situation one interferer dominates. Therefore, we concentrate on studying the system of two radios belonging to different hops shown in figure D.1B. Radio 0 is transmitting at power P_0 and has signal bandwidth B_0. Its antenna gain in the direction of the interfering radio 1 is $G_0(\theta_0)$. The corresponding values for radio 1 are P_1, B_1, and $G_1(\theta_1)$. The interference power measured in radio 0 on bandwidth B_0, caused by radio 1, is I_0 and the interference power measured by radio 1, caused by radio 0, is I_1.

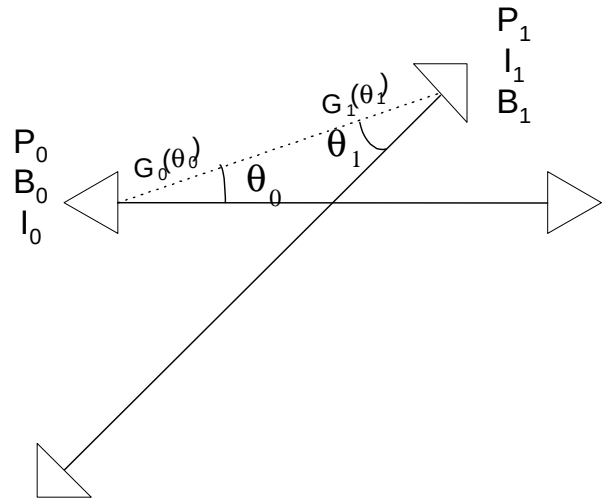

Figure UD.2: A configuration of two interfering links

Assuming that receiver bandwidth is approximately equal to transmit signal bandwidth, and assuming that $B_1 > B_0$, we write the interference powers as:

- $I_0 = (B_0/B_1)P_1G_0(\theta_0)G_1(\theta_1)A_{12}$.

- $I_1 = P_0G_1(\theta_1)G_0(\theta_0)A_{12}$ (3)

where A_{12} is the attenuation. On the other hand, if $B_1 < B_0$, we have:

- $I_0 = P_1G_0(\theta_0)G_1(\theta_1)A_{12}$.

- $I_1 = (B_1/B_0)P_0G_1(\theta_1)G_0(\theta_0)A_{12}$. (4)

When the common factors $G_0(\theta_0)$, $G_1(\theta_1)$, and A_{12} are eliminated from the two equations in (3) we get the relation:

- $P_1I_1/B_1 = P_0I_0/B_0$. (5)

The same equation is found if the common factors are eliminated form the two equations in (4). Thus the antenna gains are of no concern.

If the most recently installed radio system 1 asserts the following condition:

- $I_1/B_1 < (I/B)_{threshold,}$ (6)

we obtain, by using equation (6), for the interference caused to the previously existing system 0:

- $I_0 /B_0 < (P_1/P_0) (I/B)_{threshold}$. (7)

This indicates that the use of the channel selection threshold guarantees that the interference generated to existing radio systems is limited by equation (7).

UD.2 Protection capability of the RF-channel selection procedure

RF-channel selection procedure specifies the maximum interference level of an unoccupied channel which defines the hop length rather than the noise limit. The procedure helps, however, to avoid interference situations between systems with different parameters such as transmit power or spectrum width. The procedure guarantees interference free operation for systems with relatively simple modulation methods typically up to about 500 metres. Longer hops are protected with high probability if the RF-channel with the lowest measured interference power is always selected during the procedure.

The channel selection procedure does not always protect against the adjacent channel interference when there is large difference in out-of-band spectrum of the existing system and the new system and if the distance to the interferer is fairly short.

The interference situations between systems with different duplex methods cannot be always avoided. Interferences from FDD-type systems into TDD-type systems can be avoided if the procedure is applied according to the standard in both systems. However, the procedure cannot guarantee interference free situation for FDD-type systems because duplex-frequency is not standardized. For this reason the concept of "frequency agility" was specified (see clause 4.2.3). This method may also help to avoid long outages due to interference situations between Class A and Class B systems.

UD.3 Frequency agility criteria

A means to implement criteria for the detection of unacceptable interference could be the following:

- unacceptable interference situation (corresponding to unavailability situation) is decided if during 10 consecutive seconds or more the estimated BER evaluated by an in-service proprietary method, with a level of confidence of 99 %, exceeds 10^{-3} and the actual received signal level is more than 5 dB above the receiver threshold level corresponding to BER = 10^{-3}. For conformance testing purposes this receiver threshold level shall be declared by the manufacturer. If available, the new RF-channel shall be operational again within the time declared by the manufacturer.

Annex UE (informative): Bibliography

- Council Directive of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (89/336/EEC) (EMC Directive).
- Council Directive of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (73/23/EEC) (LV Directive).
- ETSI EN 301 489-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements".
- ETSI EN 301 489-4: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 4: Specific conditions for fixed radio links and ancillary equipment and services".
- ETSI EN 301 751 : "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".
- ETSI TR 101 506: "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".
- ITU-R Recommendation P.530: "Propagation data and prediction methods required for the design of terrestrial line-of-sight systems".
- ITU-R Recommendation P.676: "Attenuation by atmospheric gases".
- ITU-R Recommendation F.1102: "Characteristics of radio-relay systems operating in frequency bands above about 17 GHz".
- ITU-R Recommendation F.697: "Error performance and availability objectives for the local-grade portion at each end of an ISDN connection at a bit rate below the primary rate utilizing digital radio-relay systems".
- ITU-R Recommendation F.1497: "Radio-frequency channel arrangements for fixed wireless systems operating in the band 55.78-59 GHz".
- ITU-R Recommendation F.1191: "Bandwidths and unwanted emissions of digital radio-relay systems".
- ITU-R Recommendation SM.329-9: "Spurious emissions".

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

Language	EN title
Danish	Faste radiotjenesterl; Karakteristik og krav til punkt-til-punkt udstyr og antenner; Del 3; Harmoniseret EN vedrørende væsentlige krav af artikel 3.2 i R&TTEE direktivet for udstyr, der opererer i frekvensbånd, hvor frekvenskoordination ikke anvendes.
Dutch	
English	Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 3: Harmonized EN covering essential requirements of article 3.2 of R&TTE Directive for equipment operating in frequency bands where no frequency co-ordination is applied
Finnish	Kiinteät radiojärjestelmät; Kahden pisteen välisten radiolinkkilaitteiden ja antennien ominaisuudet ja vaatimukset Osa 3: Harmonisoitu Euronormi (HEN), joka kattaa koordinoimattomilla taajuuskaistoilla toimivien laitteiden R&TTE direktiivin artiklassa 3.2 tarkoitetut olennaiset vaatimukset
French	Systèmes Hertziens Fixes; Equipements point-à-point et antennes, Caractéristiques et exigences; Partie 3: Norme harmonisee couvrant les exigences essentielles selon l''article 3.2 de la Directive R&TTE pour les équipements opérant dans les bandes de fréquences non-coordonnées
German	Richtfunksysteme; Merkmale und Anforderungen für Punkt-zu-Punkt Systeme und Antennen; Teil 3: Harmonisierte EN über grundlegende Anforderungen nach Artikel 3.2 der R&TTE-RL für Systeme in unkoordinierten Frequenzbändern.
Greek	
Italian	Sistemi radio per il Servizio Fisso; Caratteristiche e requisiti per apparati punto-punto e relative antenne; Parte 3: Norma armonizzata riguardante i requisiti essenziali per l''articolo 3.2 della Direttiva R&TTE dei sistemi operanti in bande di frequenza ove non sia richiesto co-ordinamento di frequenza
Portuguese	
Spanish	Sistemas de radioenlaces; Características y requisitos de equipos para radioenlaces punto a punto y antenas. Parte 3: Norma EN armonizada cubriendo los requisitos esenciales del artículo 3.2 de la Directiva RTTE. Directiva sobre equipos que operan en bandas de frecuencias en las que son se efectua coordinación.
Swedish	

History

Document history			
V1.1.1	August 2003	Public Enquiry	PE 20031205: 2003-08-06 to 2003-12-05