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Fixed Radio Systems;
Characteristics and requirements for
point-to-point equipment and antennas;
Part 1: Overview, common characteristics and
system-independent requirements

Reference

REN/ATTM-0441

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Foreword

This final draft European Standard (EN) has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM), and is now submitted for the Vote phase of the ETSI standards EN Approval Procedure.

The present document is part 1 of a multi-part deliverable covering the Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas, as identified below (see note):

Part 1: "Overview, common characteristics and system-independent requirements";

Part 2: "Digital systems operating in frequency bands from 1 GHz to 86 GHz; Harmonised Standard for access to radio spectrum";

Part 4: "Antennas".

NOTE: In previous regulatory regime under Directive 1999/5/EC more parts (harmonised and non-harmonised standards) were published. Since Directive 2014/53/EU [i.1] repealed Directive 1999/5/EC the following parts have been replaced while the content has been moved to other parts of the series.
Those parts are:
Part 2-1: Technical content moved to present document (Part 1);
Part 2-2: Technical content reproduced in Part 2 (*);
(*) Part 2-2- was also published in the OJEU under Directive 2014/53/EU [i.1], presumption of conformity will cease on 31-12-2018;
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Part 4-1: Technical content reproduced in Part 4;
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Proposed national transposition dates	
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Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document applies to Digital Fixed Radio Systems (DFRS) in point-to-point operation with integral and external antennas in the frequency range of 1 GHz to 86 GHz corresponding to the appropriate frequency bands 1,4 GHz to 86 GHz as described in ETSI EN 302 217-2 [18], annex B to annex J.

The present document summarizes:

- all characteristics, principles and, of utmost importance, terms and definitions that are common to all P-P equipment and antennas and its consultation is necessary when using all other parts of ETSI EN 302 217 series;
- all system-dependent requirements for Point-to-Point (P-P) equipment. These requirements are introduced in two different clauses sub-sets:
  - **Main requirements** are requirements that are also related to the "essential requirements" under article 3.2 of Directive 2014/53/EU [i.1] and further detailed in the Harmonised Standard ETSI EN 302 217-2 [18].
  - **Complementary requirements** are requirements that are not related to essential requirements under article 3.2 of Directive 2014/53/EU [i.1]. Nevertheless they have been commonly agreed for proper system operation and deployment when specific deployment conditions or compatibility requirements are present. Compliance to all or some of these requirements is left to manufacturer decision.

Technical background for most of the parameters and requirements referred to in this multi-part deliverable may be found in ETSI TR 101 036-1 [i.16].

Health and safety requirements and EMC conditions and requirements are not considered in the ETSI EN 302 217 series.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

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

The following referenced documents are necessary for the application of the present document.

[1] CENELEC EN 122150 : "Sectional Specification: Radio frequency coaxial connectors - Series EIA flange".

[2] CEPT/ERC/DEC(00)07: "The shared use of the band 17.7 - 19.7 GHz by the fixed service and earth stations of the fixed-satellite service (space-to-Earth)". ERC Decision, approved 19 October 2000, amended 04 March 2016.

[3] ETSI EN 300 019-1-0: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-0: Classification of environmental conditions; Introduction".

[4] ETSI EN 300 019-2-0: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-0: Specification of environmental tests; Introduction".

[5] ETSI EN 300 019-1-1: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-1: Classification of environmental conditions; Storage".

[6] ETSI EN 300 019-2-1: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-1: Specification of environmental tests; Storage".

[7] ETSI EN 300 019-1-2: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-2: Classification of environmental conditions; Transportation".

[8] ETSI EN 300 019-2-2: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-2: Specification of environmental tests; Transportation".

[9] ETSI EN 300 019-1-3: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-3: Classification of environmental conditions; Stationary use at weather protected locations".

[10] ETSI EN 300 019-2-3: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-3: Specification of environmental tests; Stationary use at weather protected locations".

[11] ETSI EN 300 019-1-4: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-4: Classification of environmental conditions; Stationary use at non-weather protected locations".

[12] ETSI EN 300 019-2-4: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-4: Specification of environmental tests; Stationary use at non-weather protected locations".

[13] ETSI EN 300 132-2: "Environmental Engineering (EE); Power supply interface at the input of Information and Communication Technology (ICT) equipment; Part 2: Operated by -48 V Direct Current (DC)".

[14] ETSI EN 300 132-3: "Environmental Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 3: Operated by rectified current source, alternating current source or direct current source up to 400 V".

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

[16] ETSI EN 302 099: "Environmental Engineering (EE); Powering of equipment in access network".

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

[18] ETSI EN 302 217-2 (V3.2.0): "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 2: Digital systems operating in frequency bands from 1 GHz to 86 GHz; Harmonised Standard for access to radio spectrum".

[19] ETSI EN 302 217-4 (V2.1.1): "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 4: Antennas".

[20] CENELEC EN 60835-2-4: "Methods of measurement for equipment used in digital microwave radio transmission systems - Part 2: Measurements on terrestrial radio-relay systems - Section 4: Transmitter/receiver including modulator/demodulator".

[21] CENELEC EN 60835-2-8: "Methods of measurement for equipment used in digital microwave radio transmission systems - Part 2: Measurements on terrestrial radio-relay systems - Section 8: Adaptive equalizer".

[22] IEEE 802.3-2012™: "IEEE Standard for Ethernet".

[23] Recommendation ITU-R F.746: "Radio-frequency arrangements for fixed service systems".

[24] Recommendation ITU-R F.1668: "Error performance objectives for real digital fixed wireless links used in 27 500 km hypothetical reference paths and connections".

[25] Recommendation ITU-R F.1703: "Availability objectives for real digital fixed wireless links used in 27 500 km hypothetical reference paths and connections".

[26] Recommendation ITU-R P.530: "Propagation data and prediction methods required for the design of terrestrial line-of-sight systems".

[27] Recommendation ITU-T G.703: "Physical/electrical characteristics of hierarchical digital interfaces".

[28] Recommendation ITU-T G.704: "Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels".

[29] Recommendation ITU-T G.707: "Network node interface for the synchronous digital hierarchy (SDH)".

[30] Recommendation ITU-T G.708: "Sub STM-0 network node interface for the synchronous digital hierarchy (SDH)".

[31] Recommendation ITU-T G.826: "End-to-end error performance parameters and objectives for international, constant bit-rate digital paths and connections".

[32] Recommendation ITU-T G.828: "Error performance parameters and objectives for international, constant bit-rate synchronous digital paths".

[33] Recommendation ITU-T G.829: "Error performance events for SDH multiplex and regenerator sections".

[34] Recommendation ITU-T G.957: "Optical interfaces for equipment and systems relating to the synchronous digital hierarchy".

[35] Recommendation ITU-T I.356: "B-ISDN ATM layer cell transfer performance".

[36] Recommendation ITU-T I.357: "B-ISDN semi-permanent connection availability".

[37] Recommendation ITU-T O.151: "Error performance measuring equipment operating at the primary rate and above".

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

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

[40] Recommendation ITU-T V.11: "Electrical characteristics for balanced double-current interchange circuits operating at data signalling rates up to 10 Mbit/s".

[41] Recommendation ITU-T V.24: "List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)".

[42] Recommendation ITU-T V.28: "Electrical characteristics for unbalanced double-current interchange circuits".

[43] Recommendation ITU-T Y.1540: "Internet protocol data communication service - IP packet transfer and availability performance parameters".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.

[i.2] ETSI TR 101 035: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH) aspects regarding Digital Radio Relay Systems (DRRS)".

[i.3] ETSI TR 102 243-1: "Fixed Radio Systems; Representative values for transmitter power and antenna gain to support inter- and intra-compatibility and sharing analysis; Part 1: Digital point-to-point systems".

[i.4] CEPT/ERC/REC 12-03: "Harmonised radio frequency channel arrangements for digital terrestrial fixed systems operating in the band 17.7 GHz to 19.7 GHz".

[i.5] Void.

[i.6] CEPT/ECC/REC(02)06: "Preferred channel arrangements for digital Fixed Service Systems operating in the frequency range 7125-8500 MHz".

[i.7] CEPT/ECC/Report 80: "Enhancing harmonisation and introducing flexibility in the spectrum regulatory framework".

[i.8] CEPT/ECC/Report 198: "Adaptive modulation and ATPC operations in fixed point-to-point systems - Guideline on coordination procedures".

[i.9] CEPT/ERC/REC 14-01: "Radio-frequency channel arrangements for high capacity analogue and digital radio-relay systems operating in the band 5925 MHz to 6425 MHz".

[i.10] CEPT/ERC/REC 14-02: "Radio-frequency channel arrangements for high, medium and low capacity digital fixed service systems operating in the band 6425 to 7125 MHz".

[i.11] ETSI EN 301 489-1: "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility".

[i.12] ETSI EN 301 489-4: "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 4: Specific conditions for fixed radio links and ancillary equipment; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU".

[i.13] ETSI EN 302 217-1 (V2.1.1): "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 1: Overview and system-independent common characteristics".

NOTE: The ETSI EN 302 217-1 (V2.1.1) is not applicable in Directive 2014/53/EU [i.1] regime.

[i.14] Void.

[i.15] ETSI EN 300 119 (all parts): "Environmental Engineering (EE); European telecommunication standard for equipment practice".

[i.16] ETSI TR 101 036-1: "Fixed Radio Systems; Generic wordings for standards on DFRS (Digital Fixed Radio Systems) characteristics; Part 1: General aspects and point-to-point equipment parameters".

[i.17] ETSI TR 101 506 (V2.1.1): "Fixed Radio Systems; Generic definitions, terminology and applicability of essential requirements covering article 3.2 of Directive 2014/53/EU to Fixed Radio Systems".

[i.18] ETSI TR 101 854: "Fixed Radio Systems; Point-to-point equipment; Derivation of receiver interference parameters useful for planning fixed service point-to-point systems operating different equipment classes and/or capacities".

[i.19] ETSI TR 103 103: "Fixed Radio Systems; Point-to-point systems; ATPC, RTPC, Adaptive Modulation (mixed-mode) and Bandwidth Adaptive functionalities; Technical background and impact on deployment, link design and coordination".

[i.20] CENELEC EN 60153-2: "Hollow metallic waveguides. Part 2: Relevant specifications for ordinary rectangular waveguides".

[i.21] CENELEC EN 60154-2: "Flanges for waveguides. Part 2: Relevant specifications for flanges for ordinary rectangular waveguides".

[i.22] IEC 60169-1 : "Radio-frequency connectors. Part 1: General requirements and measuring methods".

[i.23] IEC 60339 (all parts): "General purpose rigid coaxial transmission lines and their associated flange connectors".

[i.24] Recommendation ITU-R F.383-9: "Radio-frequency channel arrangements for high capacity fixed wireless systems operating in the lower 6 GHz (5 925 to 6 425 MHz) band".

[i.25] Recommendation ITU-R F.384-11: "Radio -frequency channel arrangements for medium- and high-capacity digital fixed wireless systems operating in the 6 425-7 125 MHz band".

[i.26] Recommendation ITU-R F.385-10: "Radio-frequency channel arrangements for fixed wireless systems operating in the 7 110-7 900 MHz band".

[i.27] Recommendation ITU-R F.595-10: "Radio-frequency channel arrangements for fixed wireless systems operating in the 17.7-19.7 GHz frequency band".

[i.28] Recommendation ITU-R F.750: "Architectures and functional aspects of radio-relay systems for synchronous digital hierarchy (SDH)-based network".

[i.29] Void.

[i.30] Recommendation ITU-R F.752: "Diversity techniques for point-to-point fixed wireless systems".

[i.31] Recommendation ITU-R F.1093: "Effects of multipath propagation on the design and operation of line-of-sight digital fixed wireless systems".

[i.32] Recommendation ITU-R F.1101: "Characteristics of digital fixed wireless systems below about 17 GHz".

[i.33] Recommendation ITU-R F.1102: "Characteristics of fixed wireless systems operating in frequency bands above about 17 GHz".

[i.34] Recommendation ITU-R F.1191: "Bandwidths and unwanted emissions of digital fixed service systems".

[i.35] Void.

[i.36] Recommendation ITU-T G.783: "Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks".

[i.37] Recommendation ITU-T G.784: "Management aspects of the synchronous digital hierarchy (SDH) transport network element".

[i.38] Recommendation ITU-T I.414: "Overview of Recommendations on layer 1 for ISDN and B-ISDN customer accesses".

[i.39] ITU: "Radio Regulations, Edition of 2016".

[i.40] J. Redd: "Calculating Statistical Confidence Levels for Error-Probability Estimates" Lightwave Magazine, pp. 110-114, April 2000.

NOTE: Available at http://www.lightwaveonline.com/.

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document and of the other ETSI EN 302 217 series parts (i.e. part 2 [18] and part 4 [19]), the terms given in Directive 2014/53/EU [i.1] and the following apply:

aggregated channel: one of the two channels used in "channel-aggregation" equipment

NOTE: There is no relationship with the "aggregation" terminology used in some ITU-R and ECC recommendations on radio frequency channel arrangements; there, the "aggregation" of contiguous channels is used for determine wider channels positions.

allocated radio frequency band: Derived from the definition of "allocation (of a frequency band)" (Radio Regulations [i.39], article 1.16): "entry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more terrestrial or space radiocommunication services or the radio astronomy service under specific conditions. This term is also applicable to the frequency band concerned".

NOTE: From the regulatory point of view three different applications might be envisaged and used in the whole allocated band or in its dedicated segments:

- **Frequency band where frequency co-ordination is applied:** in these bands, in the licensing process, regulatory bodies enforce co-ordination rules to ensure that all links work on an "acceptable interference" bases.
- **Frequency band where frequency co-ordination is not applied:** in these bands, irrespective of any licensing process or with no licensing at all, the deployment is freely made by the user on a "first on-first served" bases without any warrantee of "acceptable interference" from the regulatory body.
- **Frequency band where self-coordination is applied:** in these bands an approach similar to the "light licensing", described in CEPT/ECC/Report 80 [i.7], is used. Such regimes do not mean "licence exempt" use, but rather using a simplified set of conventional licensing mechanisms and attributes within the scope decided by the administration. This planning is delegated to the licensee.

antenna: part of the transmitting or receiving system that is designed to radiate and/or receive electromagnetic waves

Automatic Transmit Power Control (ATPC): function implemented to offer a dynamic power control that delivers maximum power only during deep fading; in this way for most of the time the interference is reduced and the transmitter operates in a higher linearity mode

NOTE: When this function is used, the transmit power is dynamically changed with respect to the propagation conditions. In principle, when ATPC is implemented, three different levels of power may be identified:

- **maximum available power** (delivered, when licensing conditions permits it, only in conditions of deep fading);
- **maximum nominal power** (useable on a permanent basis when ATPC is disabled); it should be noted that this power is "nominal for the equipment" and is not to be confused with the "nominal level set link by link" by the frequency co-ordinating body. This is achieved through the use of the RTPC function or passive RF attenuators;
- **minimum power** (delivered in unfaded conditions).