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Fixed Radio Systems; Point-to-point equipment; Parameters for radio systems for the transmission of digital signals operating at 32 GHz and 38 GHz

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European Standard (Telecommunications series)

**Fixed Radio Systems;
Point-to-point equipment;
Parameters for radio systems for the transmission of
digital signals operating at 32 GHz and 38 GHz**

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Foreword

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

The present document specifies the minimum performance parameters for radio equipment operating in the frequency ranges as detailed in clause 4.1.1.

The former title of the present document was: "Fixed Radio Systems; Point-to-point equipment; Parameters for radio systems for the transmission of digital signals operating at 38 GHz".

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1 Scope

The present document specifies the minimum performance parameters for terrestrial digital fixed service radio communications equipment operating in the 32 GHz and 38 GHz frequency.

For spectrum efficiency class 5 for STM-1 capacity for 28 MHz Adjacent Channel Alternate-Polarization (ACAP as class 5a) and Adjacent Channel Co-Polarization (ACCP as class 5b), see examples of the spectrum usage in figures 1.1a and 1.1b:

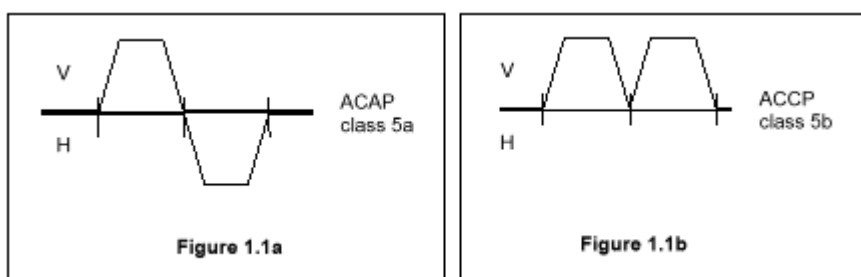


Figure 1

NOTE: In the version 1.2.2 of EN 300 197 [35] there was provision for:

- parameters for wideband analogue systems;
- further options for digital radio systems (there referred as Grade A systems);
- specific antenna radiation patterns (now superseded by EN 300 833 [3]).

These options are not reprinted in this version as they are considered to be no longer of interest for ETSI members. However, for regulatory purposes, they may still be referenced from version 1.2.2 of EN 300 197 [35].

Digital systems are intended to be used for point-to-point connections in local and regional networks at data rates between 2 Mbit/s and Synchronous Transport Module, level 1 (STM-1).

The parameters to be specified fall into two categories:

- a) those that are required to provide compatibility between channels from different sources of equipment on the same route, connected to separate antennas;
- b) parameters defining the transmission quality of the proposed system.

The present document deals with Radio Frequency (RF) and baseband characteristics relevant to low, medium and high capacity Plesiochronous Digital Hierarchy (PDH) transmission systems, STM-0 and STM-1 Synchronous Digital Hierarchy (SDH) transmission systems. Antenna/feeder system requirements are covered in EN 300 833 [3].

The present document does not contain aspects related to test procedures and test conditions however they are to be found in EN 301 126-1 [2].

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

- | | |
|----------|--|
| Class 2: | equipment spectral efficiency based on typically 4-states modulation scheme (e.g. 4-FSK, 4-QAM, or equivalent); |
| Class 3: | equipment spectral efficiency based on typically 8-states modulation scheme (e.g. 8-PSK, or equivalent); |
| Class 4: | equipment spectral efficiency based on typically 16 or 32-states modulation scheme (e.g. 16-QAM, 32-QAM, or equivalent); |
| Class 5: | equipment spectral efficiency based on typically 64 or 128-states modulation scheme (e.g. 64-QAM, 128-QAM, or equivalent). |

The above classes are indicative only and do not imply any constraint to the actual modulation format, provided that all the requirements in the present document are met.

Safety aspects will not be considered in the present document. However compliance to EN 60950 [30] will be required to comply with 99/5/EC [31] Directive (R&TTE).

Technical background for most of the parameters and requirements referred in the present document may be found in TR 101 036-1 [26].

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.

- [1] CEPT Recommendation T/R 12-01: "Harmonized radio frequency channel arrangements for analogue and digital terrestrial fixed systems operating in the band 37-39,5 GHz".
- [2] ETSI EN 301 126-1: "Fixed Radio Systems; Conformance testing; Part 1: Point-to-point equipment - Definitions, general requirements and test procedures".
- [3] ETSI EN 300 833: "Fixed Radio Systems; Point-to-point Antennas; Antennas for point-to-point fixed radio systems operating in the frequency band 3 GHz to 60 GHz".
- [4] ETSI EN 300 645: "Telecommunications Management Network (TMN); Synchronous Digital Hierarchy (SDH) radio relay equipment; Information model for use on Q interfaces".
<https://standards.iteh.ai/catalog/standards/sist/746405c2-0129-47aa-bf5f-380000000000/etsi-en-300-645-2001>
- [5] ETSI ETS 300 019 (all parts): "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment".
- [6] ETSI ETS 300 132-1: "Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 1: Operated by alternating current (ac) derived from direct current (dc) sources".
- [7] ETSI ETS 300 132-2: "Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)".
- [8] ETSI EN 300 385: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for fixed radio links and ancillary equipment".
- [9] ETSI ETS 300 635: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Radio specific functional blocks for transmission of Mx STM-N".
- [10] ETSI ETS 300 785: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Radio specific functional blocks for transmission of M x sub-STM-1".
- [11] ITU-R Recommendation F.750: "Architectures and functional aspects of radio-relay systems for synchronous digital hierarchy (SDH)-based network".
- [12] ITU-R Recommendation F.751: "Transmission characteristics and performance requirements of radio-relay systems for SDH-based networks".
- [13] ITU-R Recommendation F.1491: "Error performance objectives for real digital radio links used in the national portion of a 27 500 km hypothetical reference path at or above the primary rate".
- [14] ITU-T Recommendation G.703 (1991): "Physical/electrical characteristics of hierarchical digital interfaces".

- [15] ITU-T Recommendation G.707 (1996): "Network node interface for the synchronous digital hierarchy (SDH)".
- [16] ITU-T Recommendation G.773 (1993): "Protocol suites for Q-interfaces for management of transmission systems".
- [17] ITU-T Recommendation G.708: "Sub STM-0 network node interface for the synchronous digital hierarchy (SDH)".
- [18] IEC 60154-2: "Flanges for waveguides. Part 2: Relevant specifications for flanges for ordinary rectangular waveguides".
- [19] ITU-T Recommendation G.783 (1994): "Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks".
- [20] ITU-T Recommendation G.784 (1994): "Synchronous digital hierarchy (SDH) management".
- [21] ITU-R Recommendations F.1397: "Error performance objectives for real digital radio links used in the international portion of a 27 500 km hypothetical reference path at or above the primary rate".
- [22] ITU-T Recommendation G.861 (1996): "Principles and guidelines for the integration of satellite and radio systems in SDH transport networks".
- [23] ITU-T Recommendation G.957 (1995): "Optical interfaces for equipments and systems relating to the synchronous digital hierarchy".
- [24] ITU-T Recommendation O.151 (1992): "Error performance measuring equipment operating at the primary rate and above".
- [25] ITU-T Recommendation O.181 (1996): "Equipment to assess error performance on STM-N interfaces".
- [26] ETSI TR 101 036-1: "Fixed Radio Systems; Point-to-point equipment; Generic wordings for standards on digital radio systems characteristics; Part 1: General aspects and point-to-point equipment parameters".
- [27] CEPT Recommendation ERC/REC 74-01: "Spurious emissions".
- [28] ETSI TR 101 035: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH) aspects regarding Digital Radio Relay Systems (DRRS)".
- [29] ITU-R Recommendation F.1191: "Bandwidths and unwanted emissions of digital fixed service systems".
- [30] EN 60950: "Safety of information technology equipment".
- [31] 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".
- [32] CEPT Recommendation 01-02: "Preferred channel arrangement for digital fixed service systems operating in the frequency band 31,8 - 33,4 GHz".
- [33] ITU-R Recommendation F.1492: "Availability objectives for real digital radio-links forming part of international portion constant bit rate digital path at or above the primary rate".
- [34] ITU-R Recommendation F.1493: "Availability objectives for real digital radio-relay links forming part of national portion constant bit rate digital path at or above the primary rate".
- [35] ETSI EN 300 197 (V1.2.2): "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Parameters for DRRS for the transmission of digital signals and analogue video signals operating at 38 GHz".
- [36] 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".

- [37] 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".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

STM-0: medium capacity SDH radio transport module (51,840 Mbit/s AU-3 equivalent, also referred as STM-0 by ITU-T Recommendation G.861 [22])

sub-STM-0: low capacity SDH radio transport module (n times VC-12 or VC2 equivalent)

3.2 Symbols

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

Ω	Ohm
CSmin	minimum practical Channel Separation (for a given radio-frequency channel arrangement)
dB _i	decibel relative to isotropic radiator
dB	decibel
dB _m	decibel relative to 1 mW
dB _u	decibel relative to 1 microVolt
dB _W	decibel relative to 1 W
GHz	GigaHertz
kHz	kiloHertz
Mbit/s	Megabits per second
MHz	MegaHertz
mW	milliWatt
ppm	parts per million

3.3 Abbreviations

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

ac	alternating current
ACAP	Adjacent Channel Alternate Polarization
ACCP	Adjacent Channel Co-Polarization
ATPC	Automatic Transmit Power Control
AU	Administrative Unit
BER	Bit Error Rate
C/I	Carrier to Interference ratio
CEPT	Conférence des Administrations Européennes des Postes et Télécommunications
CMI	Coded Mark Inversion
CW	Continuous Wave
dc	direct current
DRRS	Digital Radio Relay Systems
EIRP	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
ESR	Errored Second Ratio
FSK	Frequency-Shift Keying (modulation)
IF	Intermediate Frequency
IPI	Inter-Port Isolation
LO	Local Oscillator
n.a.	not attributed
PDH	Plesiochronous Digital Hierarchy

PRBS	Pseudo Random Binary Sequence
QAM	Quadrature Amplitude Modulation
RBER	Residual Bit Error Rate
RF	Radio Frequency
RFC	Remote Frequency Control
RSL	Receive Signal Level
RTPC	Remote Transmit Power Control
SDH	Synchronous Digital Hierarchy
SOH	Section OverHead
STM-N	Synchronous Transport Module, level N
TMN	Telecommunications Management Network
VC	Virtual Container
XPD	cross-Polar Discrimination

4 General characteristics

4.1 Frequency bands and channel arrangements

4.1.1 Channel arrangements

4.1.1.1 Frequency arrangement for 32 GHz

The frequency range shall be 31,8 GHz to 33,4 GHz or 31 GHz to 31,3 GHz/31,5 GHz to 31,8 GHz if applicable.

The channel arrangements in the band 31,8 GHz to 33,4 GHz shall be in accordance with CEPT/ERC Recommendation T/R 01-02 [1] or ITU-R Recommendation F.1492 [33]. For reader convenience, the basic parameters of the CEPT Recommendation are shown in annex A, clause A.1.1.1. In addition to this channel plan an interleaved channel plan is allowed by this ERC Recommendation.

The 31,0 GHz to 31,3 GHz band is available in some countries and included in the CEPT Report 25. Moreover the band 31,5 GHz to 31,8 GHz may be used on a national basis (see footnote S5.5461 of the Radio Regulations). The present document therefore also covers the bands 31,0 GHz to 31,3 GHz and 31,5 GHz to 31,8 GHz provided that the channel arrangement is based on the channel separation as stated in the CEPT Recommendation 01-02 for the band 31,8 GHz to 33,4 GHz.

4.1.1.2 Frequency arrangement for 38 GHz

The frequency range shall be 37 GHz to 39,5 GHz. The channel arrangements shall be in accordance with CEPT Recommendation T/TR 12-01 [1]. For reader convenience, the basic parameters of the CEPT Recommendation are shown in annex A, clause A.1.2.

4.2 Channel spacing for systems operating on the same route

System bit rates and their relevant channel spacing in the present document are reported in table 1 (for the precise payload bit rates, see clause 5.1).

NOTE: According to systems characteristics the equipment can be connected either to separate antennas or on a separate polarization to the same antenna.