



SLOVENSKI STANDARD

SIST EN 300 197 V1.4.1:2003

01-december-2003

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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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Ta slovenski standard je istoveten z: **EN 300 197 Version 1.4.1**

SIST EN 300 197 V1.4.1:2003
<https://standards.iteh.ai/catalog/standards/sist/aba0c1e0-5f45-4912-a5c4-b326a2490aaf/sist-en-300-197-v1-4-1-2003>

ICS:

33.040.20	Prenosni sistem	Transmission systems
33.060.30	Radiorelejni in fiksni satelitski komunikacijski sistemi	Radio relay and fixed satellite communications systems

SIST EN 300 197 V1.4.1:2003

en

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ETSI EN 300 197 V1.4.1 (2001-02)

European Standard (Telecommunications series)

**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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Reference

REN/TM-04111-10

Keywordsarchitecture, digital, DRRS, point-to-point, radio,
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Sous-Préfecture de Grasse (06) N° 7803/88

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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: "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".

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National transposition dates

Date of adoption of this EN:	16 February 2001
Date of latest announcement of this EN (doa):	31 May 2001
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 November 2001
Date of withdrawal of any conflicting National Standard (dow):	30 November 2001

1 Scope

The present document specifies the minimum performance parameters for terrestrial digital fixed service radio communications equipment operating in the 38 GHz frequency band and incorporates, where necessary, changes made in Corrigendum 1 of ETS 300 187/C1 [36] and contains a complete revision in the areas of:

- additional systems with higher spectrum efficiency in the new class 4 systems;
- introduction of unique system type codes for regulatory reference to the various system types detailed in the present document, refer to new annex C (normative) and related categories of equipment classes of spectral efficiency;
- change of spectrum mask and adjacent channel selectivity of STM-0 systems in 28 MHz channel spacing to align to EN 300 639 [33];
- introduction of new 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:

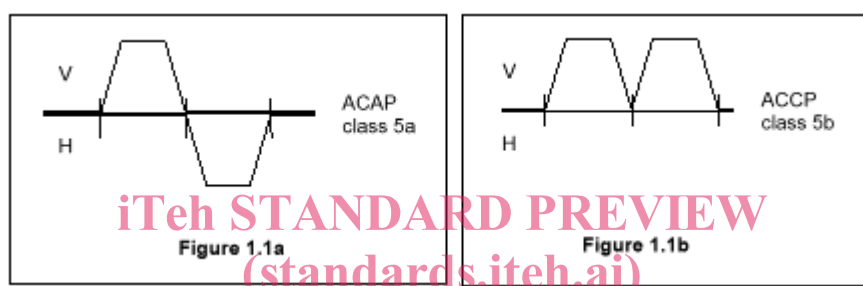


Figure 1

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- technical specifications relevant to the EMC Directive are given in annex B (normative).

NOTE: In the version 1.2.2 of EN 300 197 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.

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 [34] will be required to comply with 99/5/EC [35] 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 [28].

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/TR 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".
- [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.750-4: "Architectures and functional aspects of radio-relay systems for synchronous digital hierarchy SDH-based networks".
- [12] ITU-R Recommendation F.751-2: "Transmission characteristics and performance requirements of radio-relay systems for SDH-based networks".
- [13] ITU-R Recommendation F.1102: "Characteristics of radio-relay systems operating in frequency bands above about 17 GHz".
- [14] ITU-R Recommendation F.1189-1: "Error performance objectives for constant bit rate digital paths at or above the primary rate carried by digital radio-relay systems which may form part or all of the national portion of a 27 500 km hypothetical reference path".
- [15] ITU-R Recommendation P.530-8: "Propagation data and prediction methods required for the design of terrestrial line-of-sight systems".
- [16] ITU-T Recommendation G.703 (1991): "Physical/electrical characteristics of hierarchical digital interfaces".
- [17] ITU-T Recommendation G.707 (1996): "Network node interface for the synchronous digital hierarchy (SDH)".
- [18] ITU-T Recommendation G.773 (1993): "Protocol suites for Q-interfaces for management of transmission systems".
- [19] ITU-T Recommendation G.708: "Sub STM-0 network node interface for the synchronous digital hierarchy (SDH)".
- [20] IEC 60154-2: "Flanges for waveguides. Part 2. Relevant specifications for flanges for ordinary rectangular waveguides".
- [21] ITU-T Recommendation G.783 (1994): "Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks".
- [22] ITU-T Recommendation G.784 (1994): "Synchronous digital hierarchy (SDH) management".
- [23] ITU-T Recommendation G.826 (1993): "Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate".
- [24] ITU-T Recommendation G.861 (1996): "Principles and guidelines for the integration of satellite and radio systems in SDH transport networks".
- [25] ITU-T Recommendation G.957 (1995): "Optical interfaces for equipments and systems relating to the synchronous digital hierarchy".
- [26] ITU-T Recommendation O.151 (1992): "Error performance measuring equipment operating at the primary rate and above".
- [27] ITU-T Recommendation O.181 (1996): "Equipment to assess error performance on STM-N interfaces".
- [28] 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".
- [29] CEPT/ERC Recommendation 74-01: "Spurious Emissions".
- [30] ETSI TR 101 035: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH) aspects regarding Digital Radio Relay Systems (DRRS)".
- [31] ITU-R Recommendation F.1191-1: "Bandwidths and unwanted emissions of digital radio-relay systems".

- [32] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.
- [33] ETSI EN 300 639: "Fixed Radio Systems; Point-to-point equipment; Sub-STM-1 digital radio systems operating in the 13 GHz, 15 GHz and 18 GHz frequency bands with about 28 MHz co-polar and 14 MHz cross-polar channel spacing".
- [34] EN 60950: "Safety of Information Technology Equipment Including Electrical Business Equipment".
- [35] 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.
- [36] ETSI ETS 300 187/C1: "Integrated Services Digital Network (ISDN); Three-Party (3PTY) supplementary service; Functional capabilities and information flows".

3 Symbols and abbreviations

3.1 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	decibel
dB _i	decibel relative to isotropic radiator
dB _m	decibel relative to 1 mW
dB _u	decibel relative to 1 microVolt
dBW	decibel relative to 1 W
GHz	GigaHertz
kHz	kiloHertz
Mbit/s	Megabits per second
MHz	MegaHertz
mW	milliWatt
ppm	parts per million

3.2 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-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 [24])
STM-N	Synchronous Transport Module, level N
sub-STM-0	low capacity SDH radio transport module (n times VC-12 or VC2 equivalent)
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

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 informative annex A, clause A.1.

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.

Table 1: Digital systems channel spacings for various bit rates

	Payload Bit Rate [Mbit/s]⇒	2	2 × 2	8	2 × 8	34	51	140 and 155
Channel Spacings [MHz]	Class 2 equipments	3,5	3,5	7	14	28	56	
	Class 4 equipment			3,5	7	14	14/28	56
	Class 5 equipment							28

NOTE:

- $n \times 2$ Mbit/s and $n \times 34$ Mbit/s bit rates may be used where appropriate.
- $n \times 2$ Mbit/s mapped into SDH VC12 transport bit rates (sub-STM-0 defined by ITU-T Recommendation G.708 [19]) may be used where appropriate (e.g. three or four times VC12 into an 8 Mbit/s channel spacing).
- The class 2 (2 Mbit/s) in 3,5 MHz and the class 4 in 28 MHz reflects equipment more typical to a class 1 (2Mbit/s) and class 3 (STM-0) system and as a result the adjacent channel interference parameters are more stringent.

For regulatory purposes in national procedures for licensing radio equipment according to the present document, the above system types shall be identified by the "system type codes" reported in normative annex C.