



SLOVENSKI STANDARD

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Fixed Radio Systems; Point-to-point equipment; Parameters for packet data radio systems for transmission of digital signals operating in the frequency range 23, 26, 28 or 38 GHz

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European Standard (Telecommunications series)

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Contents

Intellectual Property Rights	5
Foreword	5
1 Scope.....	6
2 References	7
3 Symbols and abbreviations.....	8
3.1 Symbols	8
3.2 Abbreviations.....	9
4 General characteristics	9
4.1 Channel arrangements	9
4.2 Channel Spacing.....	10
4.3 Compatibility requirements between systems	10
4.4 Performance and availability requirements.....	10
4.5 Environmental conditions	10
4.5.1 Equipment within weather protected locations (indoor locations).....	10
4.5.2 Equipment for non-weather protected locations (outdoor locations).....	11
4.6 Power supply.....	11
4.7 Electromagnetic compatibility	11
4.8 System block diagram	11
4.9 Management Interface	11
4.10 Branching/feeder/antenna characteristics	11
4.10.1 Antenna radiation patterns.....	11
4.10.2 Antenna cross-Polar Discrimination (XPD).....	11
4.10.3 Antenna Inter-Port Isolation (IPI).....	12
4.10.4 Waveguide flanges (or other connectors).....	12
4.10.5 Return loss.....	12
5 System Parameters.....	12
5.1 Transmission capacity	12
5.2 Data Interface parameters	12
5.2.1 Ethernet Data interface.....	12
5.3 Transmitter characteristics	12
5.3.1 Transmitter power range	13
5.3.2 Transmit power and frequency control.....	13
5.3.2.1 Automatic Transmit Power Control (ATPC).....	13
5.3.2.2 Remote Transmit Power Control (RTPC).....	13
5.3.2.3 Remote Frequency Control (RFC).....	13
5.3.3 Transmitter output power tolerance	14
5.3.4 Transmit Local Oscillator (LO) frequency arrangements.....	14
5.3.5 RF spectrum mask.....	14
5.3.6 Discrete CW lines exceeding the spectrum mask limit	16
5.3.6.1 Spectral lines at the symbol rate	16
5.3.6.2 Other spectral lines	16
5.3.7 Spurious emissions.....	17
5.3.7.1 Spurious emissions - external.....	17
5.3.7.2 Spurious emissions - internal	17
5.3.8 Radio frequency tolerance.....	17
5.4 Receiver characteristics	17
5.4.1 Input level range	17
5.4.2 Receiver local oscillator frequency arrangements.....	17
5.4.3 Spurious emissions.....	17
5.5 System performance without diversity	18
5.5.1 FER as a function of Receiver input Signal Level (RSL).....	18
5.5.2 Equipment Residual FER	19
5.5.3 Interference sensitivity.....	19

5.5.3.1	Co-channel interference sensitivity.....	19
5.5.3.2	Adjacent channel Interference.....	20
5.5.3.3	CW Spurious Interference.....	20
5.5.3.4	Front-end non-linearity requirements (two-tone CW spurious interference).....	20
5.5.4	Distortion sensitivity.....	20
5.6	System characteristics with diversity.....	21
Annex A (informative): Additional information		22
A.1	Feeder/antenna return loss.....	22
A.2	Automatic Transmit Power Control (ATPC)	22
A.3	Co-channel and adjacent channel interference	23
A.4	RFER	25
Annex B (normative): System type codes for regulatory procedures		26
Annex C (informative): FER/BER equivalence and FER performance measurement equipment settings (example)		27
C.1	FER/BER equivalence	27
C.2	FER equipment settings and measurement techniques (example).....	27
History		28

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[SIST EN 301 785 V1.1.1:2003](https://standards.iteh.ai/catalog/standards/sist/8a59aa86-5596-4baa-b7bf-bca1a8618038/sist-en-301-785-v1-1-1-2003)

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Foreword

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

The present document has already been published as an ETSI Technical Specification, under TS 101 785.

National transposition dates	
Date of adoption of this EN:	13 April 2001
Date of latest announcement of this EN (doa):	31 July 2001
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 January 2002
Date of withdrawal of any conflicting National Standard (dow):	31 January 2002

1 Scope

The present document specifies the minimum performance parameters for terrestrial fixed packet data service radio communications equipments operating at 23, 26, 28, or 38 GHz. Such digital systems are intended to be used for point-to-point connections in local and regional networks at data rates of 10 Mbit/s and 100 Mbit/s and operate in full-duplex mode.

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 either:
 - to separate antennas; or
 - to separate polarizations of the same antenna;
- b) parameters defining the transmission quality of the proposed system.

The present document deals with Radio Frequency (RF) and baseband characteristics relevant to packet data networking equipment. Antenna/feeder system requirements are covered in EN 300 833 [2].

The present document does not focus on aspects related to test procedures and test conditions, however they are to be found in EN 301 126-1 [1], IEEE 1802.3 [15], and IEEE 1802.3d [16].

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

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- Class 2: equipment spectral efficiency based on typically 4-states modulation scheme (e.g. 4-FSK, 4-QAM, 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 are outside the mandate of ETSI and they will not be considered in the present document. However compliance to EN 60950 [22] will be required to comply with 1999/5/EC [24] 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 [11] and IEEE 802.3 [14].

The present document does not address SDH/PDH radio requirements, therefore equipment with SDH/PDH interfaces should meet the requirements of the appropriate SDH/PDH radio specifications.

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, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

- [1] ETSI EN 301 126-1: "Fixed Radio Systems; Conformance testing; Part 1: Point-to-Point equipment - Definitions, general requirements and test procedures".
- [2] 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".
- [3] ETSI ETS 300 019: "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment".
- [4] 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".
- [5] ETSI ETS 300 132-2: "Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)".
- [6] ETSI EN 300 385: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for fixed radio links and ancillary equipment".
- [7] ITU-R Recommendation F.1102: "Characteristics of radio-relay systems operating in frequency bands above about 17 GHz".
- [8] ITU-R Recommendation F.1191-1: "Bandwidths and unwanted emissions of digital radio-relay systems".
- [9] ITU-R Recommendation P.530-8: "Propagation data and prediction methods required for the design of terrestrial line-of-sight systems".
- [10] IEC 60154-2: "Flanges for waveguides. Part 2: Relevant specifications for flanges for ordinary rectangular waveguides".
- [11] ETSI TR 101 036-1 (V1.1.2): "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Generic wordings for standards on DRRS characteristics; Part 1: General aspects and point-to-point equipment parameters".
- [12] IEC 60153-2: "Hollow metallic waveguides. Part 2: Relevant specifications for ordinary rectangular waveguides".
- [13] CEPT/ERC Recommendation 74-01: "Spurious emissions".
- [14] 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".
- [15] IEEE 1802.3 (1991): "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: Currently Contains Attachment Unit Interface (AUI) Cable (Section 4)".
- [16] IEEE 1802.3d (1993): "Supplement to IEEE Std 1802.3-1991, Type 10BASE-T Medium Attachment Unit (MAU) Conformance Test Methodology (Section 6)".

- [17] 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".
- [18] CEPT Recommendation T/R 13-02E: "Preferred channel arrangements for fixed services in the range 22,0-29,5 GHz".
- [19] ITU-R Recommendation F.748-3: "Radio-frequency channel arrangements for radio-relay systems operating in the 25, 26 and 28 GHz bands".
- [20] ITU-R Recommendation F.637-3: "Radio-frequency channel arrangements for radio-relay systems operating in the 23 GHz band".
- [21] IEEE 802.1Q (1998): "IEEE Standard for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks".
- [22] EN 60950: "Safety of information technology equipment".
- [23] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.
- [24] 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.
- [25] 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".

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3 Symbols and abbreviations

3.1 Symbols

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

dB	deciBel
dBc	deciBel relative to mean carrier power
dB _i	deciBel relative to an isotropic radiator
dB _m	deciBel relative to 1 milliWatt
dBW	deciBel relative to 1 Watt
GHz	GigaHertz
kHz	kiloHertz
Mbit/s	Mega-bits per second
MHz	MegaHertz
ppm	parts per million

3.2 Abbreviations

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

ac	alternating current
ATPC	Automatic Transmit Power Control
BER	Bit Error Ratio
C/I	Carrier to Interference ratio
CSmin	minimum practical channel separation (for a given radio-frequency channel arrangement)
CW	Continuous Wave
dc	direct current
DRRS	Digital Radio Relay Systems
EMC	ElectroMagnetic Compatibility
FER	Frame Error Ratio
FSK	Frequency-Shift Keying (modulation)
IF	Intermediate Frequency
IPI	Inter-Port Isolation
LO	Local Oscillator
QAM	Quadrature Amplitude Modulation
RF	Radio Frequency
RFC	Remote Frequency Control
RFER	Residual FER
RSL	Receive Signal Level
RTPC	Remote Transmit Power Control
XPD	cross-Polar Discrimination

4 General characteristics

4.1 Channel arrangements

The equipment shall operate on one or more of the channels as defined below.

The frequency range shall be 22,0 GHz to 22,6 GHz paired with 23 GHz to 23,6 GHz. The channel arrangements shall be in accordance with CEPT Recommendation T/R 13-02E [18].

NOTE: In a transition period for the adoption of CEPT Recommendation T/R 13-02E [18], different plans, derived by ITU-R Recommendation F.637-3 [20], may be required on national basis.

The frequency range shall be 24, 50 GHz to 29,50 GHz. The channel arrangements shall be in accordance with CEPT Recommendation T/R 13-02E [18] or ITU-R Recommendation F.748-3 [19].

The frequency range shall be 37,0 GHz to 39,5 GHz. The channel arrangements shall be in accordance with CEPT Recommendation T/R 12-01 [17].

4.2 Channel Spacing

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 spacing for various bit rates

Channel Spacing [MHz]	Payload Bit Rate [Mbit/s]⇒	10	100
	Class 2 equipments	7	
Class 4 equipments	3,5	56/28	
Class 5 equipments			28

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

4.3 Compatibility requirements between systems

The compatibility requirements between systems are as follows:

- there shall be no requirement to operate transmitting equipment from one manufacturer with receiving equipment from another;
- there shall not be a requirement to multiplex different manufacturers equipment on the same antenna;
- depending on the application, it shall be possible to operate the system in vertical and/or horizontal polarization, if required by the channel arrangement.

4.4 Performance and availability requirements

The requirements for digital equipment defined in clause 5 of the present document are intended to meet the network performance requirements defined by IEEE for 10 Mbit/s and 100 Mbit/s Ethernet networks. The implication of the link design on the performance is recognized and the general design criteria reported in ITU-R Recommendations P.530-8 [9] and F.1102 [7] shall be applied. Performance requirements for public networks are under study by the ITU-T.

All performance measurements shall be done with 64 octet frames.

4.5 Environmental conditions

The equipment shall be required to meet the environmental conditions set out in ETS 300 019 [3] which defines weather protected and non-weather protected locations, classes and test severity.

The manufacturer shall state which class the equipment is designed to withstand.

4.5.1 Equipment within weather protected locations (indoor locations)

Equipment intended for operation within temperature controlled locations or partially temperature controlled locations shall meet the requirements of ETS 300 019 [3] classes 3.1 and 3.2 respectively.

Optionally, the more stringent requirements of ETS 300 019 [3] classes 3.3 (non-temperature controlled locations), 3.4 (sites with heat trap) and 3.5 (sheltered locations) may be applied.