SLOVENSKI STANDARD
SIST EN 301 787 V1.1.1:2003

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Fiksni radijski sistemi ï Oprema tipa toļ ka-toļ ka ï Parametri za radijske sisteme za prenos digitalnih signalov Sub-STM-0, ki delujejo v frekvenļ nem pasu 18 GHz

Fixed Radio Systems; Point-to-Point equipment; Parameters for radio systems for the transmission of Sub-STM-0 digital signals operating in the 18 GHz frequency band

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Fixed Radio Systems; Point-to-Point equipment; Parameters for radio systems for the transmission of Sub-STM-0 digital signals operating in the 18 GHz frequency band

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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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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 been previously published as an ETSI Technical Specification under TS 101 787 V1.1.1.

National transposition dates	
Date of adoption of this EN:	13 April 2001
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1 Scope

The present document specifies the minimum performance parameters for terrestrial digital fixed service radio communications equipments operating in the 18 GHz frequency band and provides for the following:

- system types codes for regulatory unique reference to the various system types detailed in the present document, refer to annex B (normative).

Digital systems are intended to be used for point-to-point connections in local and regional networks at data rates of Synchronous Transport Module.

Digital systems considered in the present document will be able to meet the performance objectives of the ITU-R national portion of the reference path, i.e. ITU-R Recommendation F.1189-1 [23] and the performance objectives detailed in ITU-T Recommendation G.826 [30] and in ITU-T Recommendation G.828 [31].

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 Sub STM-0 Synchronous Digital Hierarchy (SDH) transmission systems. Antenna/feeder system requirements are covered in EN 300 833 [13].

These digital systems capacities shall be in accordance with ITU-T Recommendation G.708 [27].

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 [14].

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

Class 1: equipment spectral efficiency based on typically 16 or 32-states modulation scheme (e.g. 16-QAM, 32-QAM, or equivalent);

Class 2: 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 [1] will be required to comply with EC 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 [17].

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] EN 60950: "Safety of information technology equipment".

[2] CEPT/ERC/REC 12-03: "Harmonized radio frequency channel arrangements for digital terrestrial fixed systems operating in the band 17,7 GHz to 19,7 GHz".

[3] CEPT/ERC Recommendation 74-01: "Spurious emissions".

[4] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

[5] ETSI ETS 300 019: "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 M x STM-N".

[10] ETSI ETS 300 638: "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Fixed point-to-point radio link equipment for the transmission of digital signals and analogue video signal operating in the frequency bands 10 GHz and 14 GHz with 20 MHz alternate channel spacing".

[11] ETSI EN 300 645: "Telecommunications Management Network (TMN); Synchronous Digital Hierarchy (SDH) radio relay equipment; Information model for use on Q interfaces".

[12] ETSI ETS 300 785: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Radio specific functional blocks for transmission of M x sub-STM-1".

[13] 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".

[14] 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".

[15] 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".

[16] ETSI TR 101 035 (V1.1.3): "Transmission and multiplexing (TM); Synchronous Digital Hierarchy (SDH) aspects regarding Digital Radio Relay Systems (DRRS)".

[17] 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".

[18] IEC 154-2: "Flanges for waveguides. Part 2: Relevant specifications for flanges for ordinary rectangular waveguides".

[19] ITU-R Recommendation F.595-6: "Radio-frequency channel arrangements for radio-relay systems operating in the 18 GHz frequency band".

[20] ITU-R Recommendation F.750-3: "Architectures and functional aspects of radio-relay systems for (SDH)-based networks".

[21] ITU-R Recommendation F.751-2: "Transmission characteristics and performance requirements of radio-relay systems for SDH-based networks".

[22] ITU-R Recommendation F.1102: "Characteristics of radio-relay systems operating in frequency bands above about 17 GHz".

[23] 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".

[24] ITU-R Recommendation F.1191-1: "Bandwidths and unwanted emissions of digital radio-relay systems".

[25] ITU-T Recommendation G.703 (1991): "Physical/electrical characteristics of hierarchical digital interfaces".

[26] ITU-T Recommendation G.707 (1996): "Network node interface for the synchronous digital hierarchy (SDH)".

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

[28] ITU-T Recommendation G.783 (1994): "Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks".

[29] ITU-T Recommendation G.784 (1994): "Synchronous digital hierarchy (SDH) management".

[30] ITU-T Recommendation G.826: "Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate".

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

[32] ITU-T Recommendation G.957 (1995): "Optical interfaces for equipments and systems relating to the synchronous digital hierarchy".

[33] ITU-T Recommendation O.151 (1992): "Error performance measuring equipment operating at the primary rate and above".

[34] ITU-T Recommendation O.181 (1996): "Equipment to assess error performance on STM-N interfaces".

[35] ITU-R Recommendation P.530-8: "Propagation data and prediction methods required for the design of terrestrial line-of-sight systems".

[36] ITU-T Recommendation G.774 (1992): "Synchronous digital hierarchy (SDH) management information model for the network element view".

3 Symbols and abbreviations

3.1 Symbols

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

dB	decibel
dBc	decibel relative to mean carrier power
dBi	decibel relative to an isotropic radiator
dBm	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
AU	Administrative Unit
BB	Base Band
BBER	Background Block Error Ratio
BER	Bit Error Rate
C/I	Carrier to Interference rate
CMI	Coded Mark Inversion
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
ESR	Errored Second Ratio
IEC	International Electrotechnical Commission
IF	Intermediate Frequency
IPI	Inter-Port Isolation
LO	Local Oscillator
PDH	Plesiochronous Digital Hierarchy
PRBS	Pseudo Random Binary Sequence
QAM	Quadrature Amplitude Modulation
RBER	Residual BER
RF	Radio Frequency
RFC	Remote Frequency Control
RL	Return Loss
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
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
TU	Tributary Unit
TUG	Tributary Unit Group
XPD	Cross-Polar Discrimination

4 General characteristics

4.1 Frequency bands and channel arrangements

4.1.1 Channel arrangements

The frequency range is 17,7 GHz to 19,7 GHz. The channel plan shall be in accordance with CEPT/ERC/REC 12-03 [2].

NOTE: CEPT Recommendation 12-03 allows for low-capacity channel arrangements on a national basis. ITU-R Recommendation F.595-6 [19] details the various channel arrangements including low-capacity channel arrangements.

4.1.2 Channel spacing for systems operating on the same route

System capacity (system bit rate) and their relevant channel spacing in the present document are reported in table 1. The system is defined in the 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

System capacity [Mbit/s]	9 792 (sSTM-14)	14 400 (sSTM-22)
Channel spacing	3,5 MHz	3,5 MHz

sSTM-2n interface
A SDH transmission interface which transports a number 'n' times TUG2 (Tributary Unit Group-2), as defined in ITU-T Recommendation G.708 [27].

sSTM-1k interface
A SDH transmission interface which transports a number 'k' times TU–12 (Tributary Unit-12), as defined in ITU-T Recommendation G.708 [27].

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.

4.2 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 manufacturer equipment on the same polarization of the same antenna;
- there may be a requirement to multiplex different manufacturer equipment on different polarization of the same antenna. This will not apply to systems with integral 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.