



**SLOVENSKI STANDARD**  
**SIST EN 300 431 V1.4.1:2003**

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Fixed Radio Systems; Point-to-point equipment; Parameters for radio system for the transmission of digital signals operating in the frequency range 24,50 GHz to 29,50 GHz

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# ETSI EN 300 431 V1.4.1 (2002-07)

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*European Standard (Telecommunications series)*

**Fixed Radio Systems;  
Point-to-point equipment;  
Parameters for radio system  
for the transmission of digital signals operating  
in the frequency range 24,50 GHz to 29,50 GHz**

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## Foreword

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

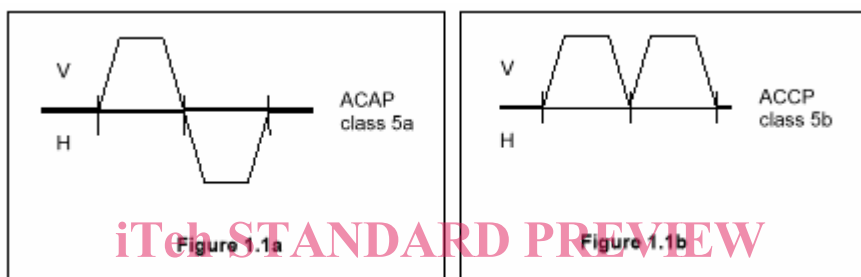
This new version modifies only class 5b spectrum mask giving more allowance for practical implementations, without modifying any other requirements, and proposed design objectives for class 5a BER versus RSL.

| <b>National transposition dates</b>  |                 |
|--|-----------------|
| Date of adoption of this EN:   | 12 July 2002    |
| Date of latest announcement of this EN (doa):  | 31 October 2002 |
| Date of latest publication of new National Standard or endorsement of this EN (dop/e): | 30 April 2003   |
| Date of withdrawal of any conflicting National Standard (dow):                         | 30 April 2003   |

# 1 Scope

The present document specifies the minimum performance parameters for terrestrial fixed service radio communications equipments operating in the frequency range 24,50 GHz to 29,50 GHz and contains a revision from the previous version, in the areas of:

- introduction of unique system type codes for regulatory reference to the various system types detailed in the present document, refer to new annex C and related categories of equipment classes of spectral efficiency;
- additional systems with higher spectrum efficiency in the new class 4 systems;
- change of spectrum mask and adjacent channel selectivity of STM-0 systems in 28 MHz channel spacing to align to EN 300 639 [34];
- 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;



- change to spectrum mask for class 4 (140 Mbit/s to 155 Mbit/s) at "f5" to align with the mask used in the 23 GHz and 38 GHz standards. [SIST EN 300 431 V1.4.1:2003](https://standards.iteh.ai/catalog/standards/sist/0b69bc74-496e-4beb-940f-5acac288b923/sist-en-300-431-v1-4-1-2003)

NOTE: In a previous version (ETS 300 431 [37]), there was provision for:

- further options for Grade A digital radio systems (with 112 MHz channel separation);
- specific antenna radiation patterns (now superseded by EN 300 833 [3]).

These options are not reprinted in the present document as they are considered to be no longer of interest for ETSI members. However, for regulatory purposes, they may still be referenced from ETS 300 431 [37].

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 the 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 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 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].



For digital systems, with capacities up to 34 Mbit/s, for class 2 equipment there are also two types of equipment specified:

- grade A equipment, intended for applications where moderate frequency congestion is envisaged;
- the deployment of grade A equipment in new links will be limited and stopped over a period of time. Therefore, it is likely that provision for grade A equipment will be removed from the present document during the next revision;
- grade B equipment, intended for applications where higher nodal capacity is required.

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. 8PSK, 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 [35] will be required to comply with Directive 1999/5/EC [36] (R&TTE).

Technical background for most of the parameters and requirements referred in the present document may be found in TR 101 036-1 [21].

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## 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 13-02: "Preferred channel arrangements for fixed services in the range 22,0-29,5 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] ITU-R Recommendation F.748: "Radio-frequency arrangements for systems of the fixed service operating in the 25, 26 and 28 GHz bands".
- [5] ETSI EN 300 645: "Telecommunications Management Network (TMN); Synchronous Digital Hierarchy (SDH) radio relay equipment; Information model for use on Q interfaces".

- [6] ETSI ETS 300 019 (all parts): "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment".
- [7] 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".
- [8] ETSI EN 300 132-2: "Environmental Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)".
- [9] ETSI EN 300 385: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for fixed radio links and ancillary equipment".
- [10] ETSI ETS 300 635: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Radio specific functional blocks for transmission of Mx STM-N".
- [11] ETSI ETS 300 785: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Radio specific functional blocks for transmission of M x sub-STM-1".
- [12] ITU-R Recommendation F.750: "Architectures and functional aspects of radio-relay systems for synchronous digital hierarchy (SDH)-based network".
- [13] ITU-R Recommendation F.751: "Transmission characteristics and performance requirements of radio-relay systems for SDH-based networks".
- [14] ITU-R Recommendation F.1102: "Characteristics of fixed wireless systems operating in frequency bands above about 17 GHz".
- [15] ITU-R Recommendation F.1189: "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".
- [16] ITU-R Recommendation F.1191: "Bandwidths and unwanted emissions of digital fixed service systems".  
<https://standards.iteh.ai/catalog/standards/sist/0b69bc74-496e-4beb-940f-38ca268925/sist-en-300-431-v1-4-1-2003>
- [17] ITU-R Recommendation P.530: "Propagation data and prediction methods required for the design of terrestrial line-of-sight systems".
- [18] ITU-T Recommendation G.703: "Physical/electrical characteristics of hierarchical digital interfaces".
- [19] ITU-T Recommendation G.707: "Network node interface for the synchronous digital hierarchy (SDH)".
- [20] ITU-T Recommendation G.773: "Protocol suites for Q-interfaces for management of transmission systems".
- [21] 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".
- [22] IEC 60154-2: "Flanges for waveguides; Part 2: Relevant specifications for flanges for ordinary rectangular waveguides".
- [23] ITU-T Recommendation G.783: "Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks".
- [24] ITU-T Recommendation G.784: "Synchronous digital hierarchy (SDH) management".
- [25] ITU-T Recommendation G.826: "Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate".
- [26] ITU-T Recommendation G.708: "Sub STM-0 network node interface for the synchronous digital hierarchy (SDH)".

- [27] ITU-T Recommendation G.957: "Optical interfaces for equipments and systems relating to the synchronous digital hierarchy".
- [28] ITU-T Recommendation O.151: "Error performance measuring equipment operating at the primary rate and above".
- [29] ITU-T Recommendation O.181: "Equipment to assess error performance on STM-N interfaces".
- [30] IEC 60153-2: "Hollow metallic waveguides. Part 2: Relevant specifications for ordinary rectangular waveguides".
- [31] CEPT ERC/REC 74-01: "Spurious Emissions".
- [32] ETSI TR 101 035: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH) aspects regarding Digital Radio Relay Systems (DRRS)".
- [33] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.
- [34] 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".
- [35] EN 60950: "Safety of information technology equipment".
- [36] 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.
- [37] ETSI ETS 300 431: "Transmission and Multiplexing (TM); Digital fixed point-to-point radio link equipment operating in the frequency range 24,25 GHz to 29,50 GHz".
- [38] 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".
- [39] 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".
- [40] ERC/DEC(99)09: "ERC Decision of 10 March 1999 on the adoption of approval regulations for equipment to be used for digital point-to-point radio relay systems operating in fixed service between 24.25 and 29.50 GHz, based on the European Telecommunications Standard (ETS) 300 431.

## 3 Symbols and abbreviations

### 3.1 Symbols

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

|        |                                 |
|--------|---------------------------------|
| dB     | deciBel                         |
| dBm    | deciBel relative to 1 milliwatt |
| GHz    | GigaHertz                       |
| kHz    | kiloHertz                       |
| Mbit/s | Megabits per second             |
| MHz    | MegaHertz                       |
| n.a.   | not applicable                  |
| 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  |
| BBER      | Background Block Error Rate  |
| BER       | Bit Error Rate   |
| C/I       | Carrier to Interference ratio  |
| 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  |
| 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   |
| PDH       | Plesiochronous Digital Hierarchy   |
| PRBS      | Pseudo Random Binary Sequence  |
| QAM       | Quadrature Amplitude Modulation  |
| RBER      | Residual BER   |
| RF        | Radio Frequency  |
| RFC       | Remote Frequency Control   |
| RSL       | Receive Signal Level   |
| RTPC      | Remote Transmit Power Control  |
| Rx        | Receiver   |
| 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  |
| Tx        | Transmitter  |
| 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 is 24,50 GHz to 29,50 GHz. The channel plan shall be in accordance with CEPT Recommendation T/R 13-02 [1] or ITU-R Recommendation F.748-3 [4].

For reader convenience, the basic parameters of the CEPT Recommendation are shown in annex A.