



**SLOVENSKI STANDARD**  
**SIST EN 302 062 V1.1.1:2003**  
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Fixed Radio Systems; Point-to-point equipment; High capacity digital radio relay systems carrying STM-4, 4 x STM-1 or 2 x STM-1 signals in bands with 55/56 MHz channel spacing

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# ETSI EN 302 062 V1.1.1 (2003-01)

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*European Standard (Telecommunications series)*

**Fixed Radio Systems;  
Point-to-point equipment;  
High capacity digital radio relay systems  
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## Foreword

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

National transposition dates	
Date of adoption of this EN:	27 December 2002
Date of latest announcement of this EN (doa):	31 March 2003
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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 15 GHz to 38 GHz frequency band intended to be used for point-to-point connections in local and regional networks at data rates between  $2 \times \text{STM-1}$  (transported by one carrier) and  $4 \times \text{STM-1}$  or  $\text{STM-4}$  (transported by two  $2 \times \text{STM-1}$  carriers).

Harmonized channel spacings of 56 MHz are not available in frequency bands below 15 GHz at the drafting date of the present document. However, the present document can be considered as a guideline where national frequency plans allow the use of 55/56 MHz channel spacing in other frequency bands, or where an allocation of two contiguous 28 MHz channels is possible.

The maximum transmission rate in a given bandwidth depends on system spectral efficiency, a single equipment class is defined:

Class 5: equipment spectral efficiency based on typically 128-states modulation scheme (e.g. 128-QAM, or equivalent).

However, for addressing different market requirements, the systems are further subdivided in two grades:

- Adjacent Channel Alternate Polarization (ACAP as class 5a).
- Adjacent Channel Co-Polarization (ACCP or CCDP as class 5b).

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.

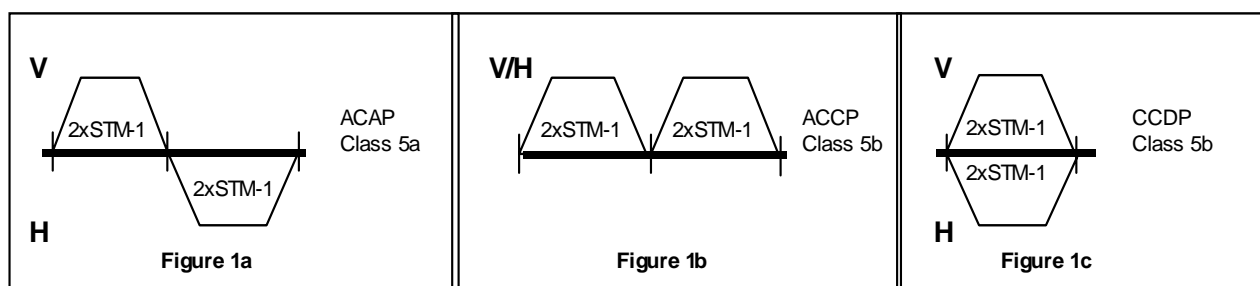
Examples of the spectrum usage are given in figure 1.

The  $4 \times \text{STM-1}$  or  $\text{STM-4}$  connection is achieved by two  $2 \times \text{STM-1}$  carriers. The two carriers can be arranged in three configurations:

- Adjacent Channel Alternate Polarization for which ACAP, class 5a is applicable.
- Adjacent Channel Co-polarization for which ACCP, class 5b is applicable.
- Co-Channel Dual Polarization for which CCDP, class 5b is applicable. For this configuration, XPIC may be used.

Examples of the three spectrum usage of a  $4 \times \text{STM-1}$  or  $\text{STM-4}$  system are given in figures 1a, 1b, and 1c.

A  $2 \times \text{STM-1}$  system is achieved by using one single carrier in 55/56 MHz from any of the configurations in figure 1; the system shall comply with the relevant spectrum efficiency classes (5a or 5b).



NOTE 1: For practical reasons, for configurations in figure 1a and 1b, it may be required to separate the two carriers due to spectrum availability. However, in all cases the two carriers system is required to be capable of operating in at least one of the configurations shown above.

NOTE 2: Due to the internal functionality of the cross-polar interference canceller (XPIC) equipment on both polarization of the same channel is considered to form a single CCDP system according to figure 1c.

**Figure 1: System configurations**



The present document, defines the parameters for  $2 \times$  STM-1 (311 Mbit/s) carriers. The performance of a  $4 \times$  STM-1 or STM-4 system will be directly implicated from this definition, according to the spectrum efficiency classes 5a and 5b.

The parameters to be specified fall into two categories:

- a) Parameters 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 does not contain aspects related to test procedures and test conditions however they are to be found in EN 301 126-1 [9].

Safety aspects are outside the mandate of ETSI and they will not be considered in the present document. However compliance to EN 60950 [47] will be required to comply with Directive 1999/5/EC (R&TTE Directive) [8].

Technical background for most of the parameters and requirements referred in the present document may be found in TR 101 036-1 [45].

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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.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference/standards.iteh.ai/catalog/standards/sist/f1465c37-631e-413d-b945-f29e47a4b427/sist-en-302-062-v1-1-1-2003>

NOTE: In the case of undated references, the time frame of application and new certification procedures for new releases of these normative references next to the date of the first public enquiry of the present document, or to the first certification of the equipment shall be agreed between the supplier and the regulatory authority. These new certification procedures will cover in any case only the parameters subject to changes from the on going release during the previous certification.

- [1] CEPT/ERC/T/R 13-02: "Preferred channel arrangements for fixed services in the range 22.0-29.5 GHz".
- [2] CEPT/ERC/T/R 12-01: "Harmonized radio frequency channel arrangements for analogue and digital terrestrial fixed systems operating in the band 37-39.5 GHz".
- [3] CEPT/ERC/REC 12-07: "Harmonised radio frequency channel arrangements for digital terrestrial fixed systems operating in the band 14.5 - 14.62 GHz paired with 15.23 - 15.35 GHz".
- [4] CEPT/ERC/REC 12-03: "Harmonised radio frequency channel arrangements for digital terrestrial fixed systems operating in the band 17.7 GHz to 19.7 GHz".
- [5] CEPT/ERC/REC 01-02: "Preferred channel arrangement for digital fixed service systems operating in the frequency band 31.8 - 33.4 GHz".
- [6] CEPT/ERC/REC 74-01: "Spurious emissions".
- [7] CEPT/ERC/DEC(00)07 of 19 October 2000 on the shared use of the band 17.7 - 19.7 GHz by the fixed service and Earth stations of the fixed-satellite service (space-to-Earth).
- [8] 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 (R&TTE Directive).

- [9] ETSI EN 301 126-1: "Fixed Radio Systems; Conformance testing; Part 1: Point-to-point equipment - Definitions, general requirements and test procedures".
- [10] 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".
- [11] ETSI EN 300 019: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment".
- [12] 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".
- [13] ETSI EN 300 132-2: "Environmental Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)".
- [14] ETSI EN 300 645: "Telecommunications Management Network (TMN); Synchronous Digital Hierarchy (SDH) radio relay equipment; Information model for use on Q interfaces".
- [15] ETSI EN 301 489 (parts 1 and 4): "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services".
- [16] ETSI ETS 300 635: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Radio specific functional blocks for transmission of M x STM-N".
- [17] ITU-R Recommendation F.595: "Radio-frequency channel arrangements for radio-relay systems operating in the 18 GHz frequency band".
- [18] ITU-R Recommendation F.636: "Radio-frequency channel arrangements for radio-relay systems operating in the 15 GHz band".
- [19] ITU-R Recommendation F.637: "Radio-frequency channel arrangements for fixed wireless systems operating in the 23 GHz band".
- [20] ITU-R Recommendation F.748: "Radio-frequency arrangements for systems of the fixed service operating in the 25, 26 and 28 GHz bands".
- [21] ITU-R Recommendation F.749: "Radio-frequency channel arrangements for radio-relay systems in the 38 GHz band".
- [22] ITU-R Recommendation F.750: "Architectures and functional aspects of radio-relay systems for synchronous digital hierarchy (SDH)-based network".
- [23] ITU-R Recommendation F.751: "Transmission characteristics and performance requirements of radio-relay systems for SDH-based networks".
- [24] ITU-R Recommendation F.752: "Diversity techniques for radio-relay systems".
- [25] ITU-R Recommendation F.1093: "Effects of multipath propagation on the design and operation of line-of-sight digital radio-relay systems".
- [26] ITU-R Recommendation F.1101: "Characteristics of digital fixed wireless systems below about 17 GHz".
- [27] ITU-R Recommendation F.1102: "Characteristics of fixed wireless systems operating in frequency bands above about 17 GHz".
- [28] ITU-R Recommendation F.1191: "Bandwidths and unwanted emissions of digital fixed service systems".
- [29] ITU-R Recommendation 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".
- [30] 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".

- [31] ITU-R Recommendation F.1492: "Availability objectives for real digital radio-relay links forming part of international portion constant bit rate digital path at or above the primary rate".
- [32] 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".
- [33] ITU-R Recommendation P.530: "Propagation data and prediction methods required for the design of terrestrial line-of-sight systems".
- [34] ITU-T Recommendation G.703: "Physical/electrical characteristics of hierarchical digital interfaces".
- [35] ITU-T Recommendation G.707: "Network node interface for the synchronous digital hierarchy (SDH)".
- [36] ITU-T Recommendation G.773: "Protocol suites for Q-interfaces for management of transmission systems".
- [37] ITU-T Recommendation G.783: "Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks".
- [38] ITU-T Recommendation G.784: "Synchronous digital hierarchy (SDH) management".
- [39] ITU-T Recommendation G.826: "Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate".
- [40] ITU-T Recommendation G.828: "Error performance parameters and objectives for international, constant bit rate synchronous digital paths".
- [41] ITU-T Recommendation G.829: "Error performance events for SDH Multiplex and regenerator sections".
- [42] ITU-T Recommendation G.957: "Optical interfaces for equipments and systems relating to the synchronous digital hierarchy".
- [43] ITU-T Recommendation O.181: "Equipment to assess error performance on STM-N interfaces".
- [44] ETSI TR 101 035 (V1.1.3): "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH) aspects regarding Digital Radio Relay Systems (DRRS)".
- [45] ETSI TR 101 036-1 (V1.3.1): "Fixed Radio Systems; Generic wordings for standards on DFRS (Digital Fixed Radio Systems) characteristics; Part 1: General aspects and point-to-point equipment parameters".
- [46] IEC 60154-2: "Flanges for waveguides. Part 2: Relevant specifications for flanges for ordinary rectangular waveguides".
- [47] EN 60950: "Information technology equipment - Safety".

## 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 mW
GHz	GigaHertz
kHz	kiloHertz
Mbit/s	Mega-bits per second
MHz	MegaHertz
mW	milliWatt
ns	nanosecond
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
BB	Base Band
BWe	evaluation BandWidth (resolution bandwidth in which spectrum components are measured)
C/I	Carrier to Interference ratio
CCDP	Co-Channel Dual Polarization
CEPT	Conference of European Posts and Telecommunications
CMI	Coded Mark Inversion
CSmin	minimum practical Channel Separation (for a given radio-frequency channel arrangement)
CW	Continuous Wave
dc	direct current
DEM	DEModulator
DRRS	Digital Radio Relay Systems
EIRP	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
ERC	European Radiocommunications Committee
ESR	Errored Second Ratio
Fc	cut-off Frequency
IEC	International Electrotechnical Committee
IF	Intermediate Frequency
IPI	Inter-Port Isolation
ITU-R	International Telecommunication Union-Radiocommunications standardization sector
ITU-T	International Telecommunication Union-Telecommunications standardization sector
LO	Local Oscillator
MOD	MODulator
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-N	Synchronous Transport Module, level N
TM	ETSI TC-Transmission and Multiplexing