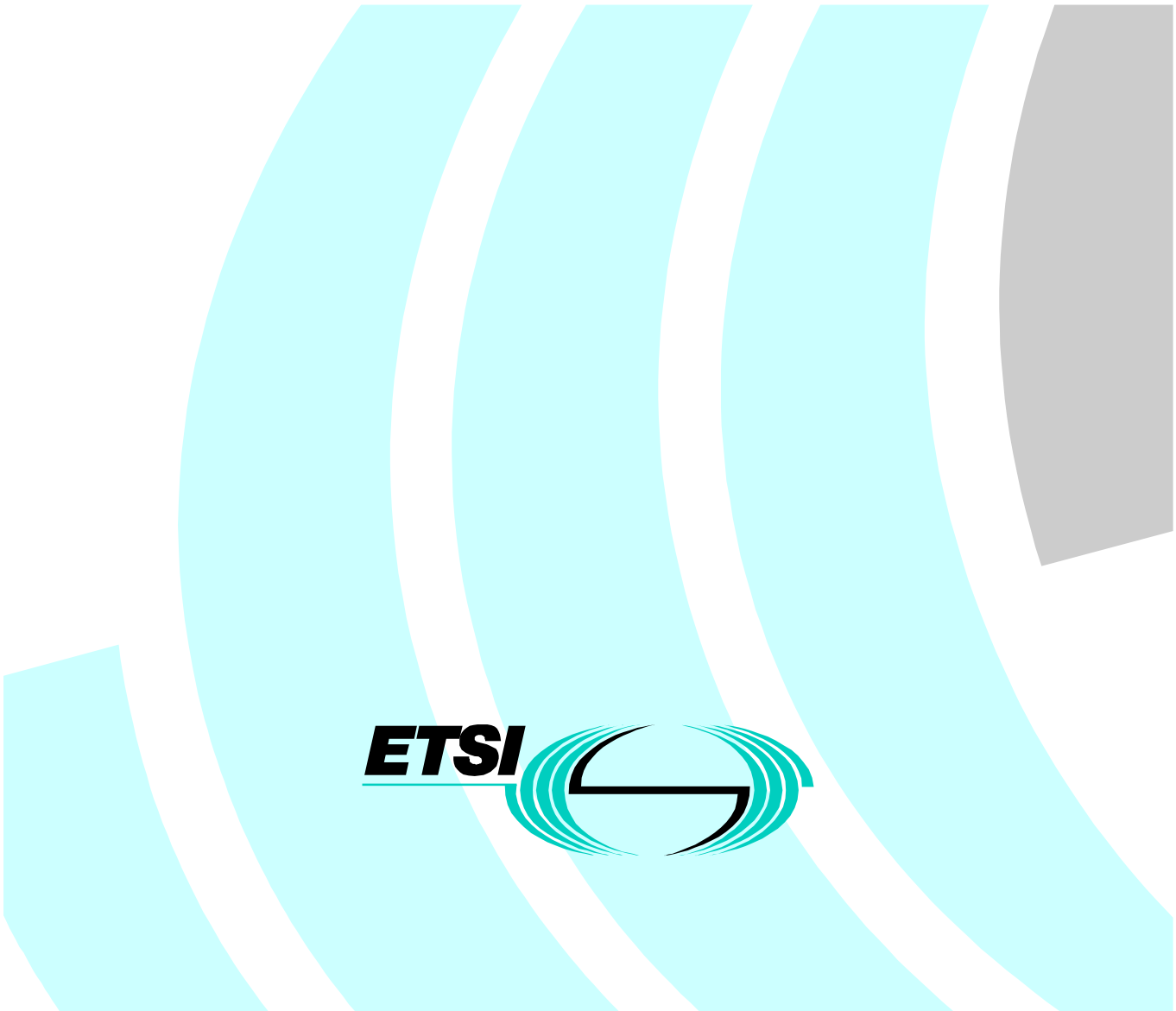
Final draft EN 300 430 V1.1.2 (1998-11)

European Standard (Telecommunications series)

Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); High capacity DRRS carrying 1 x Synchronous Transport Module-1 (1 x STM-1) signals operating in the 18 GHz frequency band with channel spacing of 55 MHz



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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Transmission and Multiplexing (TM), and is now submitted for the Voting phase of the ETSI standards Two-step Approval Procedure.

The present document contains the minimum technical requirements to ensure compatibility of products and conformance with radio regulations across ETSI member states. Radio terminals from different manufacturers are not required to interwork at radio frequency (i.e. no common air interface). However, terminals may be combined with other manufacturers' equipment on an Radio Frequency (RF) branching network for operation on different polarizations.

The present document defines the requirements of radio terminal and radio relay equipment and associated interfaces. The requirements for multiplex, network management and antenna / feeder equipment may be addressed elsewhere.

The present document was sent for ETSI Public Enquiry 67 as an ETS. To comply with the current ETSI deliverable types the present document has been converted to an EN.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

1 Scope

The present document specifies parameters for digital radio-relay systems with a capacity of 1 x Synchronous Transport Module-1 (1 x STM-1) designed to operate in the 17,7 GHz to 19,7 GHz band. The channel spacing between adjacent co-polar channels is 55 MHz. Operation in the Co-Channel Dual Polarized (CCDP) mode with orthogonal polarizations is also foreseen.

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
   - separate polarizations of the same antenna; or
   - one polarization of one antenna at a frequency separation of twice the basic co-polar spacing (2 x 55 MHz), enabling interworking of different manufacturers equipment at the same Radio Frequency (RF) branching.

   This category also includes parameters providing compatibility with the existing radio-relay network;

b) parameters defining the transmission quality of the proposed system.

The standardization deals with Intermediate Frequency (IF), RF and baseband characteristics relevant to Synchronous Digital Hierarchy (SDH). Antenna / feeder system requirements are also considered.

Two possible baseband interfaces have to be considered: one for STM-1 signals in accordance with ITU-R Recommendation F.750 [4] and another for 140 Mbit/s signals.

Safety aspects are outside the mandate of ETSI and they will not be considered in the present document.

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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] ITU-R Recommendation F.595-5: "Radio-frequency channel arrangements for radio-relay systems operating in the 18 GHz frequency band".

[2] ITU-R Recommendation F.634-4: "Error performance objectives for real digital radio-relay links forming part of the high-grade portion of international digital connections at a bit rate below the primary rate within an integrated services digital network".

[3] ITU-R Recommendation F.695: "Availability objectives for real digital radio-relay links forming part of a high-grade circuit within an integrated services digital network".

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

[5] ETS 300 019-1: "Equipment engineering; Environmental conditions & environmental tests for telecommunications equipments, Part 1: Introduction and terminology".

[6] ETS 300 019-2: "Equipment engineering; Environmental conditions & environmental tests for telecommunications equipments, Part 2: Classification of environmental conditions (T/TR 02-12)".

[7] ETS 300 119: "Equipment Engineering (EE); European telecommunication standard for equipment practice".

[8] 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".

[9] ETS 300 132-2: "Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)".

[10] ITU-T Recommendation G.703: "Physical / electrical characteristics of hierarchical digital interfaces".

[11] ITU-T Recommendation G.707: "Network node interface for the synchronous digital hierarchy".

[12] ETS 300 833: "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Antennas used in point-to-point DRRS operating in the frequency band 3 GHz to 60 GHz".

[13] Void.

[14] ITU-T Recommendation G.773: "Protocol suites for Q-interfaces for management of transmission systems".

[15] ITU-T Recommendation G.781: "Structure of Recommendations on equipment for the synchronous digital hierarchy (SDH)".

[16] ITU-T Recommendation G.782: "Types and general characteristics of synchronous digital hierarchy (SDH) equipment".

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

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

[19] ITU-T Recommendation G.821: "Error performance of an international digital connection operating at a bit rate below the primary rate and forming part of an integrated services digital network".

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

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

[22] ETS 300 385: "Radio Equipment and Systems (RES); ElectroMagnetic Compatibility (EMC) standard for digital fixed radio links and ancillary equipment with data rates at around 2 Mbit/s and above".

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

[24] EN 301 390: "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Spurious emissions and receiver immunity at equipment antenna ports of DRRS".

[25] TR 101 036-1: "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".

[26] CEPT/ERC Recommendation 74-01: "Spurious Emissions".

3 Symbols and abbreviations

3.1 Symbols

For the purpose of the present document the following symbols apply:

dB	decibel
dBm	decibel relative to 1 milliWatt
GHz	Gigahertz
km	kilometre
Mbit/s	Mega-bits per second
MHz	Megahertz
ppm	parts per million
ns	nanosecond
VSWR	Voltage Standing Wave Ratio

3.2 Abbreviations

For the purpose of the present document the following abbreviations apply:

ATPC	Automatic Transmit Power Control
BER	Bit Error Ratio
CCDP	Co-Channel Dual Polarized
CMI	Code Mark Inversion
IF	Intermediate Frequency
LO	Local Oscillator
NFD	Net Filter Discrimination
PDH	Plesiochronous Digital Hierarchy
PRBS	Pseudo-Random Binary Sequence
RF	Radio Frequency
Rx	Receive (Receiver)
SDH	Synchronous Digital Hierarchy
SOH	Section Overhead
STM-1	Synchronous Transport Module-level 1
TMN	Telecommunications Management Network
Tx	Transmit (Transmitter)
VSWR	Voltage Standing Wave Ratio
XPD	Cross-Polar Discrimination

4 Network and system considerations

The applications of these DRRS are anticipated to be in the outer core and access networks. Consideration needs to be given to special requirements of the access network, e.g. simple towers, building mountings with less space for antenna, different network structures with high density nodes.

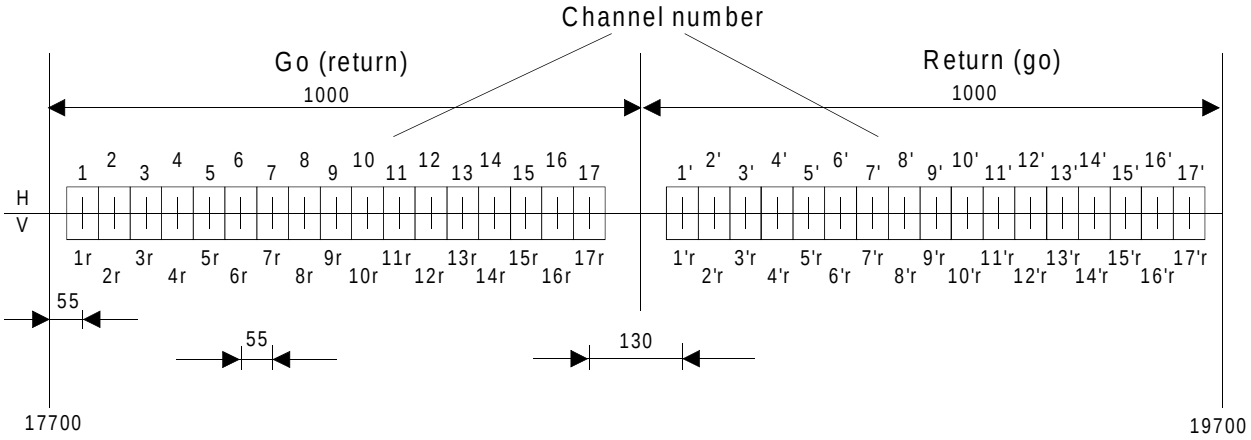
Systems considered in the present document shall be able to respect ITU-R high grade performance objectives, i.e. ITU-R Recommendations 634-4 [2] and 695 [3], ITU-T Recommendation G.821 [19] and the forthcoming performance objectives derived from ITU-T Recommendation G.826 [20] by ITU-R Study Group 9.

As far as propagation phenomena are concerned, the rainfall is considered the main limiting factor. Therefore application of the system is foreseen in the local and regional networks on hops with length up to 15 km.

5 General characteristics

5.1 Frequency bands and channel arrangements

The systems are required to operate in the 17,7 GHz to 19,7 GHz frequency band, with a channel spacing of 55 MHz. The equipment shall be capable of operating to the channel plans specified in ITU-R Recommendation F.595-5 [1] as shown in figure 1.



Co-channel arrangement.
All frequencies are in MHz.

Figure 1: Radio-frequency channel arrangement for radio-relay systems operating in the 17,7 GHz to 19,7 GHz band

5.2 Modes of operation

Depending on application it shall be possible to operate the system in the single polarization mode, in Co-Channel Dual Polarized mode (CCDP) or in the alternated cross-polar mode.

5.2.1 Co-polar channel spacing

For systems operating on different antennas:

- Channel Spacing: 55 MHz.

For systems operating on the same antenna see clause 1.

5.2.2 Transmit / receive centre gap

The centre gap shall be 130 MHz.

5.2.3 Transmit / receive duplex frequency separation

The transmitter - receiver duplex frequency separation shall be 1 010 MHz.

5.3 Types of installation

Both indoor and partially outdoor installations are considered.

Single RF channel links with Transmitter (Tx) and Receiver (Rx) connected either to one polarization or to different polarizations of the same antenna via a polarization diplexer (mainly in a partially outdoor configuration) as well as multi RF channel links with classical RF filter channel branching units are foreseen.

5.3.1 Environmental conditions

The equipment shall be required to meet the environmental conditions set out in ETS 300 019-1 [5] 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.

5.3.1.1 Indoor equipment

Equipment intended for operation within temperature controlled locations or partially temperature controlled locations shall meet the requirements of ETS 300 019-1 [5] classes 3.1 and 3.2 respectively.

Optionally, the more stringent requirements of ETS 300 019-1 [5] classes 3.3 (non-temperature controlled locations), 3.4 (sites with heat trap) and 3.5 (sheltered locations) may be applied.

5.3.1.2 Outdoor equipment

Equipment intended for operation within non-weather protected locations shall meet the requirements of ETS 300 019-1-1 [5], class 4.1 or 4.1E.

Class 4.1 applies to many European countries and class 4.1E applies to all European countries.

5.3.2 Electromagnetic compatibility conditions

Equipment shall operate under the conditions specified in ETS 300 385 [22].

5.3.3 Mechanical dimensions

The mechanical dimensions for indoor installations should be in agreement with ETS 300 119 [7].

The following parameters should be taken into account in the design of equipment incorporating an external unit:

a) maximum weight of the external unit;

b) size of external unit for wind loading considerations;

c) maximum weight of replaceable units;

d) ease of access to replaceable units.

5.3.4 Power supply

The equipment shall operate from one or more of the supply voltages specified in ETS 300 132-1 [8] and ETS 300 132-2 [9].

NOTE: Some countries may require the use of a supply voltage of 24 V DC or 110 V AC, which is not covered by ETS 300 132-1 [8] and ETS 300 132-2 [9].

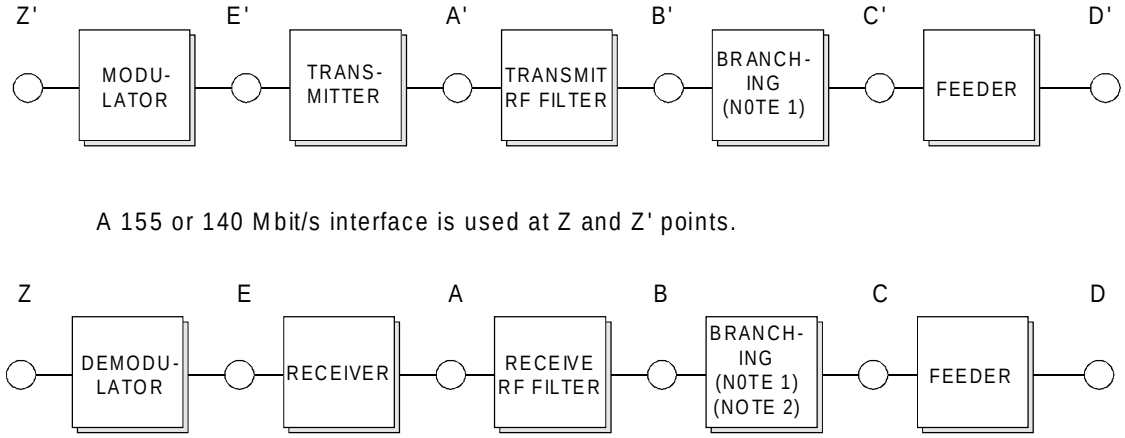
5.4 Telecommunications Management Network (TMN) interface

TMN interface, if any, should be in accordance with ITU-T Recommendation G.773 [25].

NOTE: The standardization of TMN interface functionalities is under responsibility and development in ETSI TC TMN (formerly in TM2), and will be applicable to the DRRS considered in the present document.

5.5 System block diagram

The reference points are shown in the block diagram (see figure 2). These points are reference points only and not necessarily measurement points.



NOTE 1: No filtering included.
NOTE 2: In outdoor equipment, the branching network may be implemented by a common Tx-Rx duplexer.

Figure 2: System block diagram

5.6 Receiver IF

If, for test and maintenance point purposes, receiver IF frequency(ies) is (are) used, one of them shall be either 35 MHz or 70 MHz or 140 MHz in order to allow the use of standard test equipment.

5.7 Local oscillator arrangements

When separate transmit and receiver Local Oscillators (LOs) are used, it is recommended that the LO frequencies for both transmitters and receivers should be arranged so that for channels in the lower half of each band the frequency is higher than the channel assigned frequency, and for channels in the upper half of each half band the LO frequency is lower than the channel assigned frequency.

Whenever a single LO is used for both transmitter and receiver the LO frequency shall be arranged between the corresponding transmit and receive frequencies.

5.8 Mechanical specifications for RF interfaces

RF interfaces for transmitter, receiver and branching units at reference points A, B, C, A', B' and C' (if accessible) of figure 2, shall be either waveguide type R 220 with a waveguide flange type PDR 220 or PBR 220 or waveguide type R 180 with flanges PDR 180 or PBR 180.

6 Baseband characteristics

6.1 Synchronous Digital Hierarchy (SDH)

The SDH baseband interface shall be in accordance with ITU-T Recommendations G.703 [10], G.707 [11], G.781 [15], G.782 [16], G.783 [17], G.784 [18] and G.957 [21] (with possible simplifications under study in ETSI TM 1 and TM 4) and ITU-R Recommendation 750 [4].

Two STM-1 interfaces shall be possible:

- Code Mark Inversion (CMI) electrical (ITU-T Recommendation G.703 [10]);
- optical (ITU-T Recommendation G.957 [21]).

The use of reserved bytes contained in the Section Overhead (SOH), and their termination shall be in accordance with ITU-R Recommendation 750 [4].

6.2 Plesiochronous Digital Hierarchy (PDH)

The present document covers the transmission requirements for STM-1 signals (155,52 Mbit/s). However, there will be a requirement, in the interim, while SDH networks become established for systems with optional baseband interfaces at the PDH level of 140 Mbit/s as described in ITU-T Recommendation G.703 [10]. These 140 Mbit/s signals shall be carried "open port", i.e. in a transparent manner independent of their content. They shall be mapped into a 155 Mbit/s STM-1 signal as described in ITU-T Recommendations G.707 [11].

7 Transmitter characteristics

7.1 Output power

The value of output power (all tolerances included), referred to point B' of figure 2 shall be as reported in table 1, not considering Automatic Transmit Power Control (ATPC).

Table 1

Class A	> 15 dBm	≤ 20 dBm
Class B	> 20 dBm	≤ 25 dBm

Depending on environmental conditions (see subclause 5.3.1), the nominal output power tolerance shall be within:

a) $\left.\begin{matrix}+\ 1\ \text{dB} \\ -\ 1\ \text{dB}\end{matrix}\right\}$ for the classes 3.1 and 3.2, Refer to ETS 300 019-1 [5];

b) $\left.\begin{matrix}+\ 2\ \text{dB} \\ -\ 1\ \text{dB}\end{matrix}\right\}$ for all other classes, Refer to ETS 300 019-1 [5].

In the case of an STM-1 signal the measurement shall be carried out using an STM-1 test signal to be defined.

In the case of 140 Mbit/s signals, the measurement shall be carried out using a Pseudo-Random Binary Sequence (PRBS) 2^{23} - 1.

7.2 ATPC

ATPC is an optional feature, information on ATPC is given in annex A.

7.3 RF spectrum masks

The spectrum masks are shown in figure 3, both for the innermost channels on the same branching networks (curves a, b) and for the normal channels (curves c, d) on the same branching networks. Curves a and c apply only to single RF channel (partially outdoor) systems.

Masks shall be measured with a modulating baseband signal given by a PRBS 2^{23} - 1 in the case of 140 Mbit/s signal or an STM-1 test signal to be defined.

The masks do not include frequency tolerance.

The masks given in figure 3 fix lower limits of 88 dB and 105 dB in order to control local interference between transmitters and receivers.

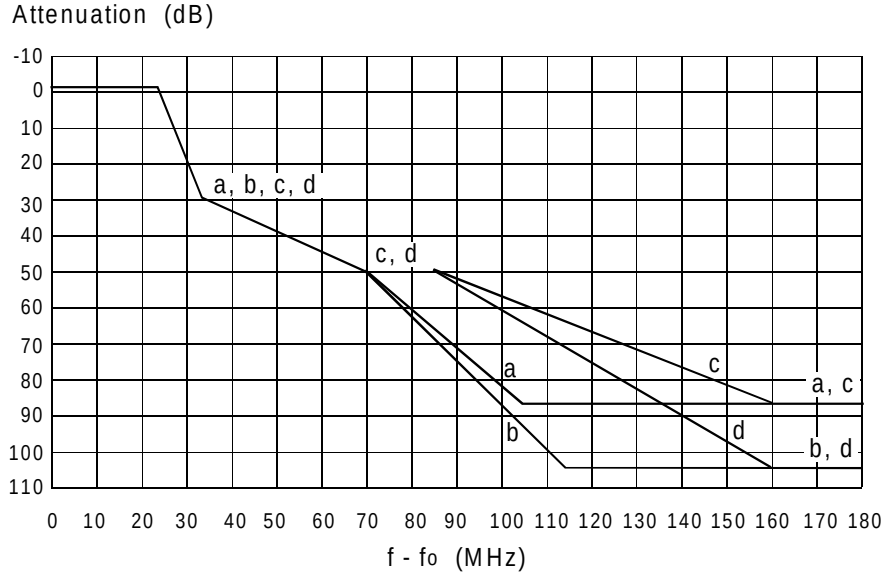
Since it is not possible to measure attenuation values up to 105 dB directly, values above 50 dB in figure 3 should be verified by adding a measured filter characteristic to the spectrum at A' of figure 2.

In some particular circumstances as mentioned in clause A.3, tighter requirements are required.

The spectrum analyser settings for measuring the RF spectrum mask detailed in figure 3 are shown in table 2.

Table 2: Spectrum analyser settings

Parameter	Setting
IF bandwidth	300 kHz
Total sweep width	500 MHz
Total scan time	20 seconds
Video filter bandwidth	0,3 kHz



	dB	MHz
a, b, c, d	-1	0
	-1	22,5
	30	33
	50	70
a	88	105
	88	180
b	105	115
	105	180
c	50	85
	88	160
	88	180
d	50	85
	105	160
	105	180

a) Innermost channels, single RF channel.
b) Innermost channels, multi-channel RF branching.
c) Normal channels, single RF channel.
d) Normal channels, multi-channel RF branching.

Figure 3: Transmitter spectral power density mask referred to the actual carrier frequency f_o

7.4 Spectral lines at the symbol rate

The power level of spectral lines at a distance from the channel centre frequency equal to the symbol rate shall be less than -37 dBm (reference point B' of figure 2).

7.5 Spurious emissions

It is necessary to define spurious emissions from transmitters for two reasons:

a) to limit interference into systems operating wholly externally to the system channel plan (external emissions);

b) to limit local interference within the system where transmitters and receivers are directly connected via the filter and branching systems (internal emissions).

This leads to two sets of spurious emission limits where the specific limits given for 'internal' interference are required to be no greater than the 'external' level limits at reference point B' for indoor systems and C' for outdoor systems (where a common Tx/Rx duplexer is used).

7.5.1 Spurious emissions - external

According to ITU-R Recommendation F.1191 [23], and CEPT/ERC 74-01 [26], the external spurious emissions are defined as emissions at frequencies which are outside the nominal carrier frequency ± 250 % of the relevant channel separation.

The limits of these emissions shall conform to CEPT/ERC Recommendation 74-01 [26].

7.5.2 Spurious emissions - internal

The levels of the spurious emissions from the transmitter, referenced to point B' of figure 2 are specified below.

The required level will be the total average level of the emission under consideration.

Table 3: Internal levels for the transmitter spurious emissions

Spurious emission frequency relative to channel assigned frequency.	Specification limit	Controlling factor
The level of all spurious signals (including LO, +/- IF, +/- 2 x IF)	≤ -90 dBm	If spurious signal's frequency falls within receiver half band and if branching is used on same polarization.
	≤ -70 dBm	If spurious signal's frequency falls within receiver half band and if branching is used on different polarization.

7.6 Radio frequency tolerance

Maximum radio frequency tolerance shall not exceed ± 30 ppm. This limit includes both short-term factors (environmental effects) and long-term ageing effects.

7.7 Return loss

The minimum return loss shall be 26 dB for indoor systems and 20 dB for partially outdoor systems where a common Tx/Rx duplexer is used. The measurement shall be referred to point C of figure 2.

Equipment according to the present document may also have system configurations with integral antennas or very similar technical solutions, without long feeder connections; return loss is not considered an essential requirement. When the antenna is an integral part of the equipment there shall be no requirement.

8 Receiver characteristics

8.1 LO frequency tolerance

Maximum LO frequency tolerance (if applicable) shall not exceed ± 30 ppm. This limit includes both short-term factors (environmental effects) and long-term ageing effects.

8.2 Receiver image rejection

If applicable, the receiver image(s) rejection shall be as listed in table 4.

Table 4: Receiver image rejection

Controlling factor	Image rejection
a) if image frequency falls within receiver half band b) if branching on different polarizations is used	< 90 dB
c) in a system without branching	< 60 dB
d) if branching on same polarization is used and if image frequency falls within receiver half band	< 110 dB

8.3 Spurious emissions

See subclause 7.5.

8.3.1 Spurious emissions - external

The limits of these emissions shall conform to CEPT/ERC Recommendation 74-01 [26].

8.3.2 Spurious emissions - internal

For spurious emissions at the LO frequency a limit of < -110 dBm shall apply (measured to point B of figure 2).

8.4 Input level range

The lower limit for the receiver input level shall be given by the threshold level for Bit Error Ratio (BER) = 10^{-3}. The upper limit for the receiver input level, where a BER of 10^{-3} is not exceeded shall be -17 dBm, a BER of 10^{-10} may only be exceeded for levels greater than -21 dBm.

8.5 Return loss

The minimum return loss shall be 26 dB for indoor systems and 20 dB for partially outdoor systems where a common Tx/Rx duplexer is used. The measurement shall be referred to point C of figure 2.

Equipment according to the present document may also have system configurations with integral antennas or very similar technical solutions, without long feeder connections; return loss is not considered an essential requirement. When the antenna is an integral part of the equipment there shall be no requirement.

9 System characteristics without diversity

9.1 Equipment background BER

Equipment background BER is measured under simulated operating conditions over an artificial hop without interference with a signal level at point C of figure 2 which is between 15 dB and 40 dB above the lower limit for receiver input level which gives a BER = 10^{-3}. In a measurement period of 24 hours the number of bit errors shall be less than 10 (BER < 10^{-12}).

9.2 BER as a function of receiver input level

The reference point for the definition of the BER curve as a function of receiver input level is point B of figure 2.

The BER shall be less or equal to the values given in table 5 for the corresponding receiver input signal levels.

Table 5: Receiver sensitivity

BER	Receiver sensitivity
10^{-3}	-73 dBm
10^{-6}	-69 dBm
10^{-10}	-65 dBm

9.3 Interference sensitivity

All receive signal levels and signal to interference ratio measurements should be referred to point B of the block diagram shown in figure 2.

9.3.1 Co-channel interference sensitivity

The limits of the co-channel interference sensitivity shall be as given in figure 4.

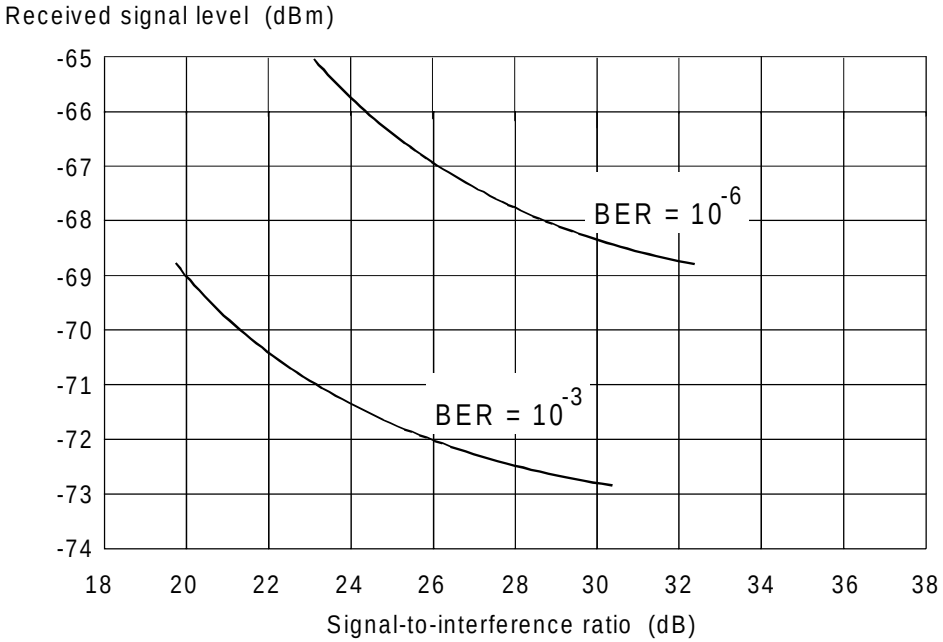


Figure 4: Co-channel digital interference sensitivity mask

9.3.2 Adjacent channel sensitivity

The limits of the adjacent channel interference sensitivity shall be as given in figure 5.

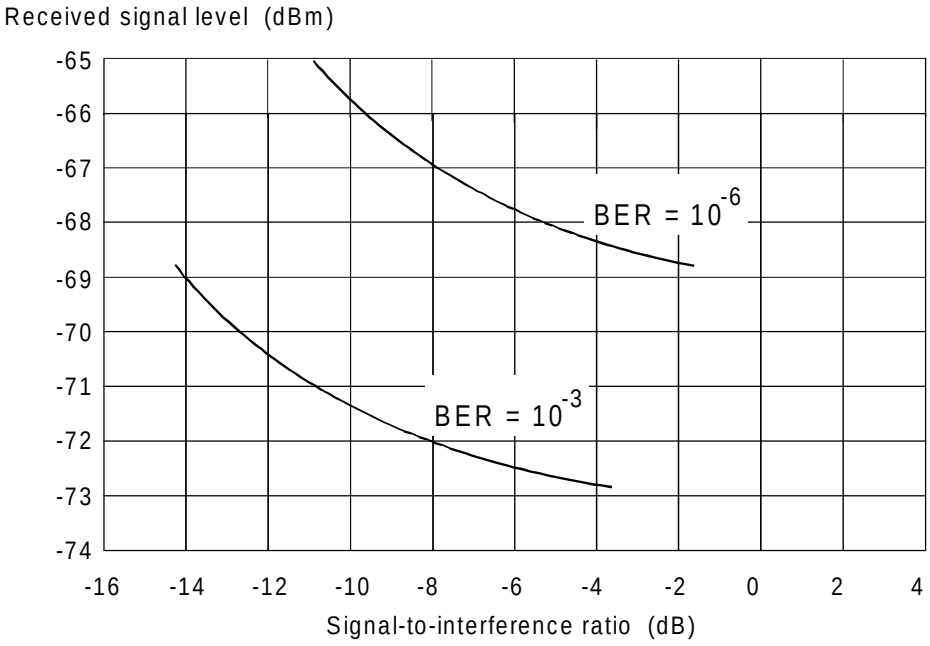


Figure 5: Adjacent channel digital interference sensitivity mask

9.3.3 Continuous wave spurious interference

For a receiver operating with a receiver input signal level given in table 8 for BER = 10^{-6}, the introduction of a continuous wave interferer at a level of +30 dB, with respect to the "wanted" signal at any frequency in the range 1 GHz to 40 GHz, excluding frequencies either side of the "wanted" frequency by up to twice the co-polar channel spacing, shall not result in a BER greater than 10^{-5}.

This test is designed to identify specific frequencies at which the receiver may have a spurious response: e.g. image frequency, harmonics of the receive filter, etc. The test is not intended to imply a relaxed specification at all out-band frequencies.

9.4 Distortion sensitivity

Rainfall is the main propagation factor in the 18 GHz band limiting performance. Equalizers to compensate for propagation distortion are not considered necessary for 18 GHz equipment. The specifications for distortion sensitivity are given below in the form of signatures.

For two path propagation with a delay of 6,3 ns and a BER of 10^{-3} the width of the signature shall not exceed ± 52 MHz relative to the assigned channel centre frequency, the depth shall not be less than 5 dB.

For two path propagation with a delay of 6,3 ns and a BER of 10^{-6} the width of the signature shall not exceed ± 62 MHz relative to the assigned channel centre frequency, the depth shall not be less than 4 dB.

These limits are both valid for minimum and non-minimum phase cases. They shall also be verified by the loss-of-synchronization and re-acquisition signatures.

10 System characteristics with diversity

Rain dominates the outage of this band and in general, diversity will not be required. However, whenever diversity is required, baseband switching diversity should be used.

Annex A (informative): Branching / feeder / antenna requirements and ATPC

A.1 Branching / feeder / antenna requirements

The parameters and values specified in this clause are pre-requisites for the system specification given in the present document. For antenna requirements the assumptions in this annex refer to ETS 300 833 [12].

A.1.1 Cross-Polar Discrimination (XPD)

The antenna XPD value within the 1 dB beam width should not be less than 30 dB.

A.1.2 Intermodulation products

Each intermodulation product caused by different transmitters linked at C' of figure 2 to a measurement test set with a return loss higher than 23 dB is assumed to be less than -110 dBm referenced to point B' of figure 2 or transmitter output power levels up to 25 dBm per transmitter.

A.1.3 Interport isolation

Not less than 40 dB.

A.1.4 Return loss

Not less than 26 dB (VSWR = 1,10 : 1) at the antenna flange (points D, D' of figure 2) in the frequency range 17,7 GHz to 19,7 GHz.

A.2 ATPC

ATPC can be useful in many circumstances, especially:

- to reduce digital to digital distant interference between hops which reuse the same frequency;
- to improve compatibility with digital systems at nodal stations;
- to increase system gain as a countermeasure against rainfall attenuation.

ATPC is an optional feature which is aimed at driving the Tx power amplifier output level from a proper minimum (which is calculated to facilitate the radio network planning and which is used in case of normal propagation up to a maximum value which is defined by the relative class of output power) and conformance to the present document.

The ATPC range is the power interval from the nominal output power level to the lowest transmitter output power level (at point B' of figure 2) with ATPC. The ATPC range should not exceed 15 dB. In any case, the lowest transmitter output level should not be less than +10 dBm.

ATPC may also be used to increase the output power above the nominal level during fading conditions, this can be useful because in this frequency range the main limiting factors are given by non-selective fading (rain attenuation).

A.3 Spectrum masks

The spectrum mask given in figure 3 is consistent with NFD figures between adjacent channels of about 34 dB. For hop lengths of more than about 10 km, NFD of more than 34 dB, or the use of the alternate polarization may be required for systems operating on the same route and using adjacent channels and separate antennas.

The Net Filter Discrimination (NFD) can be taken as the difference between the co-channel interference (stated in the subclause 9.3.1, figure 4: Co-channel external interference sensitivity) and the measured value of the adjacent interference sensitivity) and the measured value of the adjacent channel interference sensitivity C/I referred to the same BER and the same modulation scheme each (see TR 101 036-1 [25]).

History

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