

**Transmission and Multiplexing (TM);  
Digital Radio Relay Systems (DRRS);  
Point-to-multipoint DRRS in frequency bands in the range  
24,25 GHz to 29,5 GHz using different access methods;  
Part 3: Time Division Multiple Access (TDMA) methods**

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Reference

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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 Public Enquiry 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 inter work at radio frequency (i.e. no common air interface).

The present document defines the requirements of radio terminal and radio-relay equipment and associated interfaces.

The present document is part 3 of a multi-part EN covering the Point-to-multipoint DRRS in frequency bands in the range 24,25 GHz to 29,5 GHz using different access methods, as identified below:

- Part 1: "Basic parameters";
- Part 2: "Frequency Division Multiple Access (FDMA) methods";
- Part 3: "Time Division Multiple Access (TDMA) methods".**

<b>Proposed national transposition dates</b>	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
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# 1 Scope

Point-to-Multipoint Radio Relay Systems (P-MP ) may use different access methods. As some technical parameters are different for the various access methods, the standard is divided in four parts.

A basic description of the different access methods and a comparison among them is provided in TR 101 274 [3].

The present document (Time Division Multiple Access Methods, TDMA) is to be used in conjunction with Part 1, describing the basic parameters common to all access methods.

The present document specifies the minimum requirements for system parameters of Time Division Multiple Access (TDMA) Point-to-Multipoint (P-MP) Radio Systems in the terrestrial fixed services operating in the band 24,5 GHz to 29,5 GHz (see [4]). Only sections specific to TDMA are described in respect to the paragraphs stated in EN 301 213-1 [1].

Time Division Multiple Access (TDMA) is an alternative to FDMA and CDMA covered in other parts of this standard. In TDMA point to Multipoint (PMP) systems, a central station broadcasts information to terminal stations in a continuous Time Division Multiplex (TDM) or in a burst TDMA mode. The Terminal stations transmit in TDMA mode. The users may have access to the spectrum by sharing it through time multiplexing.

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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, 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] EN 301 213-1: "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Point-to-multipoint DRRS in frequency bands in the range 24,25 GHz to 29,5 GHz using different access methods; Part 1: Basic parameters".
- [2] EN 301 213-2: "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Point-to-multipoint DRRS in frequency bands in the range 24,25 GHz to 29,5 GHz using different access methods; Part 2: Frequency Division Multiple Access (FDMA) methods".
- [3] TR 101 274: "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Point-to-multipoint DRRS in the access network: Overview of different access techniques".
- [4] CEPT Recommendation T/R 13-02: "Preferred channel arrangements for the fixed services in the range 22,0 GHz to 29,5 GHz".

## 3 Definition, symbols and abbreviations

For the purposes of the present document, the terms, definitions, symbols and abbreviations in EN 301 213-1 [1] apply.

## 4 General characteristics

### 4.1 General System Architecture

Refer to EN 301 213-1 [1] subclause 4.1.

### 4.2 Frequency bands and channel arrangements

#### 4.2.1 Channel plan

Bands allocated to the Fixed Service in the range 24,5 GHz to 29,5 GHz shall be used according to CEPT Recommendation T/R 13-02 [4] annexes B and C.

Regulatory bodies may choose appropriate parts of the above mentioned frequency bands for the application for Point-to-Multipoint systems.

#### 4.2.2 Channel arrangements

The system shall meet at least one or more of the channel arrangements listed in table 1.

**Table 1: Channel arrangement**

Channel Spacing [MHz]	3,5 MHz	7 MHz	14 MHz	28 MHz	56 MHz	112 MHz
<b>System Type A</b>						
Minimum CRS bit rate for transmission and reception (Mbit/s)	4 Mbit/s	8 Mbit/s	16 Mbit/s	32 Mbit/s	64 Mbit/s	128 Mbit/s
<b>System Type B</b>						
Minimum CRS bit rate for transmission and reception (Mbit/s)	8 Mbit/s	16 Mbit/s	32 Mbit/s	64 Mbit/s	128 Mbit/s	256 Mbit/s

NOTE 1: Multi-Carrier-TDMA-Systems may be used provided they do not exceed the appropriate mask and meet all other parameters associated with channel spacing.

NOTE 2: The minimum bit rate for transmission and reception is defined as the gross bit rate. The gross bit rate is defined as the transmission bit rate over the air. In the case of a transmitter working in burst mode, the gross bit rate is the instantaneous maximum bit rate during the burst. The gross bit rate has a unique relation to the symbol rate through the implemented modulation format.

NOTE 3: Systems may offer a combination of Type A and Type B on a per Terminal Station basis, provided that such a system, when operating in mixed mode, complies with the most stringent spectral mask for the types offered.

The CRS transmission, defined as the "downstream" direction, may be continuous, i.e. TDM (Time Division Multiplex). The CRS may transmit in the downstream direction even if there are no active calls, for the purpose of synchronization of the Terminal Stations.

The Terminal Stations (TS) may transmit only in timeslots allocated by control signals from the CS, or on a fixed basis. The TS transmission direction is defined as "upstream". TS may transmit in a TDMA basis. A TS may transmit control, bandwidth requests or signalling information even during the absent of users activities. TS transmissions consist of bursts of fixed or variable duration, usually an integer multiple of a fundamental timeslot duration.

### 4.3 Compatibility requirements

Refer to EN 301 213-1 [1] subclause 4.3.

### 4.4 Environmental conditions

Refer to EN 301 213-1 [1] subclause 4.4.

### 4.5 Power supply

Refer to EN 301 213-1 [1] subclause 4.5.

### 4.6 Electromagnetic compatibility conditions

Refer to EN 301 213-1 [1] subclause 4.6.

### 4.7 TMN interfaces

Refer to EN 301 213-1 [1] subclause 4.7.

### 4.8 Synchronization of interface bit rates

Refer to EN 301 213-1 [1] subclause 4.8.

### 4.9 Branching/feeder/antenna requirements

Refer to EN 301 213-1 [1] subclause 4.9.

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## 5 System parameters for TDMA P-MP systems

NOTE: Where a reference is made to the number of states of a modulation scheme or to the system type class, an equivalent modulation scheme may be applied, provided the system parameters are met.

### 5.1 System capacity

Refer to EN 301 213-1 [1] subclause 5.1.

### 5.2 Round trip delay

Refer to EN 301 213-1 [1] subclause 5.2.

### 5.3 Transparency

Refer to EN 301 213-1 [1] subclause 5.3.

### 5.4 Voice coding methods

Refer to EN 301 213-1 [1] subclause 5.4.

## 5.5 Transmitter characteristics

Refer to EN 301 213-1 [1] subclause 5.5.

### 5.5.1 Transmitter output power

Refer to EN 301 213-1 [1] subclause 5.5.1.

### 5.5.2 Transmitter nominal output power

Refer to EN 301 213-1 [1] subclause 5.5.2.

The power output of the transmitter at point C and C' (see figure 2 of EN 301 213-1 [1]) shall be appropriate to the mode of use.

- A) CRS, or TS "broadcast mode". The power output shall be in conformance with EN 301 213-1 [1].
- B) CRS, or TS operating in TDMA burst mode. The power output during a burst shall be in conformance with EN 301 213-1 [1]. The power may be controlled by ATPC.
- C) The power setting shall have a maximum tolerance of  $\pm 2$ dB for environmentally protected locations,  $\pm 3$ dB for equipment in non protected locations and shall not exceed the maximum allowed transmitter output power.

### 5.5.3 Transmitter power and frequency control

Refer to EN 301 213-1 [1] subclause 5.5.3.

### 5.5.4 RF spectrum mask

The 0 dB level shown on the spectrum masks is the maximum of the modulated spectrum disregarding residual carriers.

The masks do not include frequency tolerances.

#### 5.5.4.1 RF spectrum mask for the central radio station

General test load conditions to measure the spectrum mask for the CRS transceiver:

- The CRS transmitter shall work under full capacity load.



## Spectral Density (dB)

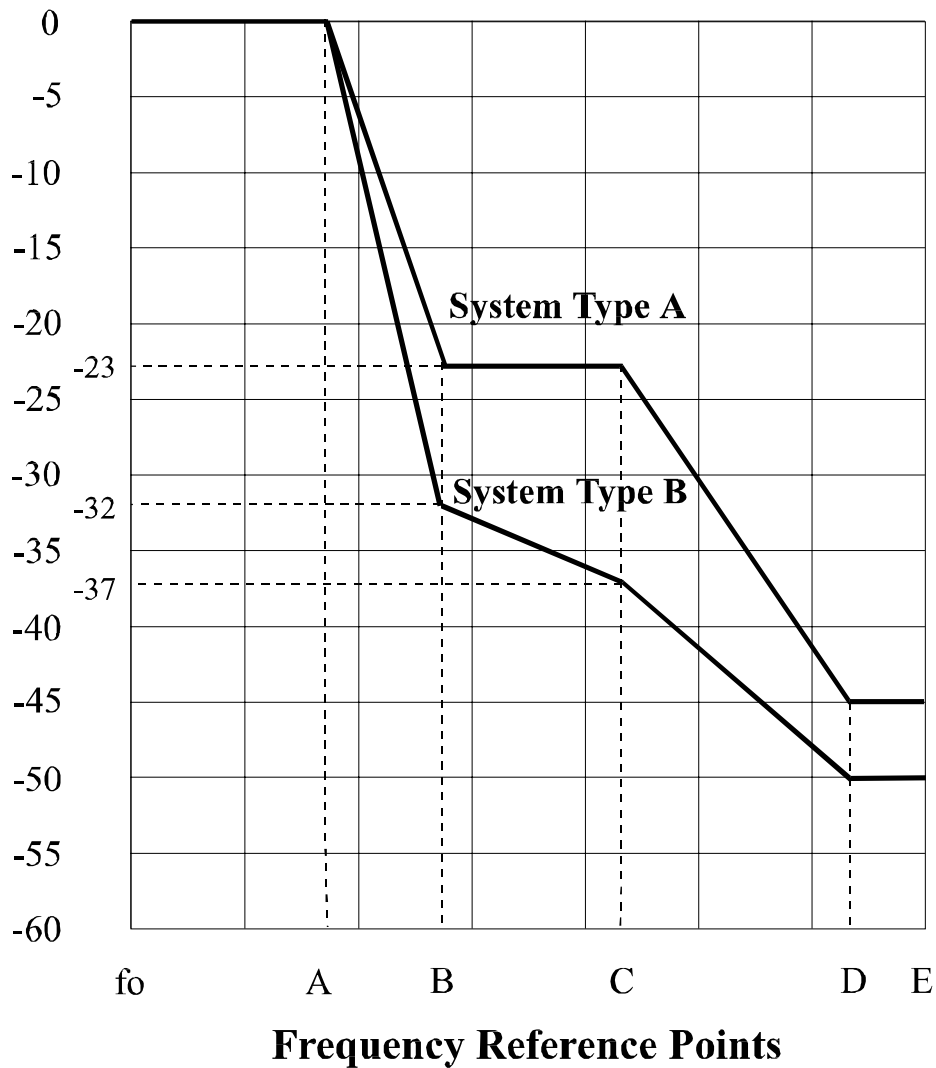
Figure 1: Spectrum masks ( $f_0$  = actual carrier frequency)

Table 2: Spectral masks

<b>System Type A</b>					
Co-polar channel spacing Points in figure 1	0 dB Point A	-23 dB Point B	-23 dB Point C	-45 dB Point D	-45 dB Point E
3,5 MHz	1,5 MHz	2,8 MHz	3,7 MHz	7 MHz	8,75 MHz
7 MHz	2,8 MHz	5,6 MHz	7 MHz	14 MHz	17,5 MHz
14 MHz	5,6 MHz	11,2 MHz	14 MHz	28 MHz	35 MHz
28 MHz	11 MHz	19 MHz	25 MHz	45 MHz	70 MHz
56 MHz	18 MHz	32 MHz	40 MHz	70 MHz	140 MHz
112 MHz	36 MHz	64 MHz	80 MHz	140 MHz	280 MHz
<b>System Type B</b>					
Co-polar channel spacing Points in figure 1	0 dB Point A	-32 dB Point B	-37 dB Point C	-50 dB Point D	-50 dB Point E
3,5 MHz	1,5 MHz	2,8 MHz	3,7 MHz	7 MHz	8,75 MHz
7 MHz	2,8 MHz	5,6 MHz	7 MHz	14 MHz	17,5 MHz
14 MHz	5,6 MHz	11,2 MHz	14 MHz	28 MHz	35 MHz
28 MHz	11,2 MHz	22,4 MHz	28 MHz	56 MHz	70 MHz
56 MHz	22,5 MHz	45 MHz	56 MHz	112 MHz	140 MHz
112 MHz	45 MHz	90 MHz	112 MHz	224 MHz	280 MHz

The spectrum analyser settings for measuring the RF-spectrum masks are listed in table 3.

**Table 3: Spectrum analyser settings for RF power spectrum measurement**

<b>RF channel spacing. (MHz)</b>	3,5	7	14	28	56	112
<b>Centre frequency</b>	actual	actual	actual	actual	actual	actual
<b>Sweep width (MHz)</b>	20	40	80	160	320	640
<b>Scan time</b>	auto	auto	auto	auto	auto	auto
<b>IF bandwidth (kHz)</b>	30	30	30	100	100	300
<b>Video bandwidth (kHz)</b>	0,1	0,3	0,3	0,3	0,3	1,0

#### 5.5.4.2 RF-spectrum mask for the terminal station and the repeater station

The RF spectrum masks for the TS and RS shall comply with the spectrum mask in figure 1.

#### 5.5.5 Tx local oscillator frequency arrangements

Refer to EN 301 213-1 [1] subclause 5.5.5.

#### 5.5.6 Spurious emissions (external)

Refer to EN 301 213-1 [1] subclause 5.5.6.

#### 5.5.7 Radio frequency tolerance

Refer to EN 301 213-1 [1] subclause 5.5.7.

### 5.6 Receiver characteristics

Refer to EN 301 213-1 [1] subclause 5.6.

#### 5.6.1 Rx local oscillator frequency arrangements

Refer to EN 301 213-1 [1] subclause 5.6.1.

#### 5.6.2 Spurious emissions (external)

Refer to EN 301 213-1 [1] subclause 5.6.2.

#### 5.6.3 Receiver IF

Refer to EN 301 213-1 [1] subclause 5.6.3.

## 5.7 System performance

All parameters are referred to reference points B or C of figure 2 of EN 301 213-1 [1]. All measurements shall be carried out with the test signals defined in subclause 5.5 of EN 301 213-1 [1] and under full load conditions.

### 5.7.1 Dynamic level range

The BER shall be less than  $10^{-3}$  for a dynamic level range which shall exceed 50 dB. The dynamic level range shall be declared by the manufacturer.

### 5.7.2 BER as a function of Receiver input Signal Level (RSL)

The input signal level presented to the receiver under test is adjusted to the levels described in the table 4. The BER shall be less than or equal to the values defined in the table. For the purposes of testing, the transmitter is operated at its maximum rated power level.

**Table 4: BER Performance thresholds**

<b>System Type A</b>						
Co-polar channel spacing	3,5 MHz	7 MHz	14 MHz	28 MHz	56 MHz	112 MHz
Channel bit rate (Mbit/s)	4 Mbit/s	8 Mbit/s	16 Mbit/s	32 Mbit/s	64 Mbit/s	128 Mbit/s
$1 \times 10^{-3}$	-83 dBm	-80 dBm	-77 dBm	-74 dBm	-71 dBm	-68 dBm
$1 \times 10^{-6}$	-79 dBm	-76 dBm	-73 dBm	-70 dBm	-67 dBm	-64 dBm
<b>System Type B</b>						
Co-polar channel spacing	3,5 MHz	7 MHz	14 MHz	28 MHz	56 MHz	112 MHz
Channel bit rate (Mbit/s)	8 Mbit/s	16 Mbit/s	32 Mbit/s	64 Mbit/s	128 Mbit/s	256 Mbit/s
$1 \times 10^{-3}$	-75 dBm	-72 dBm	-69 dBm	-66 dBm	-63 dBm	-60 dBm
$1 \times 10^{-6}$	-71 dBm	-68 dBm	-65 dBm	-62 dBm	-59 dBm	-56 dBm

The channel bit rate is the minimum bit rate during a burst.

### 5.7.3 Equipment background BER

See EN 301 213-1 [1] subclause 5.7.3.

### 5.7.4 Interference sensitivity

#### 5.7.4.1 Co-channel interference (external)

The limits of co-channel interference (external) shall be as in table 5, giving maximum S/I values for 1 dB and 3 dB degradation of the  $10^{-6}$  BER limits specified in subclause 5.7.2.

**Table 5: Co-channel interference sensitivity**

Description	BER = $10^{-6}$	
	1 dB	3 dB
Signal to Interference level	S/I [dB]	S/I [dB]
System Type A	23	19
System Type B	30	26,5

### 5.7.4.2 Adjacent channel interference (external)

The limits of adjacent channel interference (external) shall be as given in table 6 for like modulated signals, giving maximum  $S/I$  values for 1 dB and 3 dB degradation of the  $10^{-6}$  BER limits specified in subclause 5.7.2.

**Table 6: Adjacent channel interference sensitivity**

Description	BER = $10^{-6}$	
	1 dB	3 dB
Signal to Interference level	S/I [dB]	S/I [dB]
System Type A	0	-4
System Type B	0	-4

### 5.7.4.3 CW interference

See EN 301 213-1 [1] subclause 5.7.4.3.

### 5.7.5 Distortion sensitivity

See EN 301 213-1 [1] subclause 5.7.5.

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## 6 Types of interfaces at the user equipment and the network node

See EN 301 213-1 [1] clause 6.

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## Bibliography

The following material, though not specifically referenced in the body of the present document (or not publicly available), gives supporting information.

- ETS 300 019: "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment".
- EN 300 339: "Electromagnetic compatibility and Radio spectrum Matters (ERM); General ElectroMagnetic Compatibility (EMC) for radio communications equipment".
- 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".
- ETS 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".
- EN 301 021: "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Time Division Multiple Access (TDMA); Point-to-multipoint DRRS in Frequency Division Duplex (FDD) bands in the range 3 GHz to 11 GHz".
- EN 301 132 (V1.1): "Integrated Services Digital Network (ISDN); Security tools (SET) for use within telecommunication services".
- EN 301 215: "Fixed Radio Systems; Point to Point Antennas; Antennas for point-to-multipoint fixed radio systems in the 11 GHz to 60 GHz band".
- EN 301 390: "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Spurious emissions and receiver immunity at equipment antenna ports of DRRS".
- IEC Publication 154-2: "Flanges for wave guides, rectangular".
- ITU-R Recommendation F.[AD/9D]: "Maximum equivalent isotropically radiated power of transmitting stations in the fixed service operating in the frequency band 25.25-27.5 GHz shared with the inter-satellite service".
- ITU-T Recommendation G.131: "Control of talker echo".
- ITU-T Recommendation G.711: "Pulse code modulation (PCM) of voice frequencies".
- ITU-T Recommendation G.726: "40, 32, 24, 16 kbit/s Adaptive Differential Pulse Code Modulation (ADPCM)".
- ITU-T Recommendation G.728: "Coding of speech at 16 kbit/s using low-delay code excited linear prediction".
- ITU-T Recommendation G.729: "Coding of speech at 8 kbit/s using conjugate-structure algebraic-code-excited linear prediction (CS-ACELP)".
- ITU-T Recommendation G. 773: "Protocol suites for Q-interfaces for management of transmission systems".
- ITU-T Recommendation G.810: "Definitions and terminology for synchronization networks".
- ITU-T Recommendation G.812: "Timing requirements of slave clocks suitable for use as node clocks in synchronization networks".
- ITU-T Recommendation G.813: "Timing characteristics of SDH equipment slave clocks (SEC)".
- ITU-T Recommendation G.823: "The control of jitter and wander within digital networks which are based on the 2 048 kbit/s hierarchy".
- ITU-T Recommendation G.825: "The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)".
- ITU-T Recommendation O.151: "Error performance measuring equipment operating at the primary rate and above".
- ITU-T Recommendation O.181: "Equipment to assess error performance on STM-N interfaces".

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## History

<b>Document history</b>		
V1.1.1	April 1999	Public Enquiry PE 9934: 1999-04-23 to 1999-08-20