



**SLOVENSKI STANDARD**  
**SIST EN 301 390 V1.2.1:2003**  
**01-december-2003**

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**Fiksni radijski sistemi – Sistemi točka-točka in večtočkovni sistemi – Neželena oddajanja in omejitve odpornosti sprejemnika pri vhodu v opremo oziroma pri antenskem vhodu digitalnih fiksnih radijskih sistemov**

Fixed Radio Systems; Point-to-point and Multipoint Systems; Spurious emissions and receiver immunity limits at equipment/antenna port of Digital Fixed Radio Systems

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# ETSI EN 301 390 V1.2.1 (2003-11)

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*European Standard (Telecommunications series)*

## **Fixed Radio Systems; Point-to-point and Multipoint Systems; Spurious emissions and receiver immunity limits at equipment/antenna port of Digital Fixed Radio Systems**

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## Foreword

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

<b>National transposition dates</b>	
Date of adoption of this EN:	21 November 2003
Date of latest announcement of this EN (doa):	29 February 2004
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# 1 Scope

The term Spurious emissions is used for simplicity elsewhere in the present document but with the more broader meaning of "*unwanted emissions in the spurious domain*" introduced by ITU-R Recommendation SM.329-10 [1] for clarifying the Radio Regulation definitions and the application of recommended limits for all unwanted emissions; it also recommends that spurious emissions limits apply to all unwanted emissions falling in the spurious domain.

Therefore the present document deals with limits for unwanted emissions in the spurious domain at antenna port of Digital Fixed Radio Systems (DFRS) as defined by ITU-R Recommendation SM.329-10 [1] and CEPT/ERC Recommendation 74-01 [4] and CEPT/ECC Recommendation 02-05 [5].

Moreover it covers immunity characteristics at receiver's antenna port.

Scope of the present document is to define specific limits at antenna port for spurious emissions and receiver immunity for suitable inter-working of Digital Fixed Radio Systems (i.e. Point-to-Point and Multipoint systems) in the same or in different frequency band whenever allocated to Fixed Service in the range 9 kHz to 300 GHz.

However systems with fundamental emission below 30 MHz are not considered relevant for Digital Fixed Radio Systems and are outside the scope of the present document.

Spurious emissions levels and immunity performance at antenna port are also relevant to essential requirements under article 3.2 of Directive 1999/5/EC [15] on Radio equipment and Telecommunication Terminals equipment (R&TTE).

The present document complements CEPT/ERC Recommendation 74-01 [4] which gives Spurious Emissions limits with particular regards to "inter Services" operations, while WG TM4 assumed that in some case more protection is required for compatibility among fixed radio systems deployed in the same geographical area.

Additional considerations and background for producing the present document are:

- Radio Regulations definition of spurious emissions (RR Article 1-145 [16]) is aged and give concept and applicability which do not clearly fit to digital systems; however ITU-R Recommendation SM.329-10 [1] introduced a more useful definition of "*unwanted emissions in the spurious domain*", which should eventually be introduced also into Radio Regulations;
- ITU-R Recommendation SM.329-10 [1] considers emissions from any system, including digital modulation and allows options for the definition of the frequency boundary between out-of-band domain and spurious emissions domain. It recommends different category of level limits applicable to the Fixed Service;
- ITU-R Recommendation SM.1539-1 [2] describes the application of the boundary concept between out-of-band and spurious emission domains;
- ITU-R Recommendation F.1191-2 [3] define the application of Radio Regulations and SM set of ITU-R Recommendations concepts of out-of-band, unwanted and spurious emissions to DFRS, clarify the applicability for the boundary between out-of-band and Spurious emissions domains but maintain the same possible limit options provided by ITU-R Recommendation SM.329-10 [1];
- CEPT/ERC Recommendation 74-01 [4], endorses only the more stringent Category B limits of ITU-R Recommendation SM.329-10 [1];
- after the coming into force of RTTE Directive [15] the emissions and immunity at antenna port fall under its article 3.2 requirements for "*effective use of spectrum*" and "*avoidance of harmful interference*" and they are no longer an EMC requirement;
- considering the large number of TM4 deliverables it is convenient to maintain a single EN covering these parameters instead of replicating them on each single product standard, avoiding possible deviation from what required by other CEPT and ITU-R normative;
- limits for spurious emissions shall be fixed in view of inter-working compatibility among various Fixed Radio Systems in same or different band exploited in the same area;
- the measurement of the required limits should also be feasible in a suitable and cost effective conformance test (annex B gives also information in this field);

- it is necessary that DFRS receivers provide a minimum level of immunity at antenna port towards possible interference at any frequency band of practical interest;
- a suitable and easy to perform criterion for DFRS receivers' immunity at antenna port may be considered the application of a CW interference.

Some ETSI deliverables for DFRS, sometimes, provide limits for both "external" and "internal" spurious emissions and the latter are outside the scope of the present document. Moreover the limits for emissions given in the present document do not prevent more stringent requirement given in those deliverables for intra-system purpose (i.e. local Transmitter to Receiver interference usually referred as "internal").

In order to fix the suitable limits, in annex B, spurious emissions are analysed from the point of view of a suitable test method for conformance testing.

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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.

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63ed191f6242/sist-en-301-390-v1-2-1-2003
- [1] ITU-R Recommendation SM.329-10: "Unwanted emissions in the spurious domain".
  - [2] ITU-R Recommendation SM.1539-1: "Variation of the boundary between the out-of-band and spurious domains required for the application of Recommendations ITU-R SM.1541 and ITU-R SM.329".
  - [3] ITU-R Recommendation F.1191-2: "Bandwidths and unwanted emissions of digital fixed service systems".
  - [4] CEPT/ERC Recommendation 74-01 (2002): "Spurious emissions".
  - [5] CEPT/ECC Recommendation 02-05 (2002): "Unwanted emissions".
  - [6] ETSI EN 301 126-1: "Fixed Radio Systems; Conformance testing; Part 1: Point-to-Point equipment - Definitions, general requirements and test procedures".
  - [7] ETSI EN 301 126-2-1: "Fixed Radio Systems; Conformance testing; Part 2-1: Point-to-Multipoint equipment; Definitions and general requirements".
  - [8] ETSI EN 301 126-2-2: "Fixed Radio Systems; Conformance testing; Part 2-2: Point-to-Multipoint equipment; Test procedures for FDMA systems".
  - [9] ETSI EN 301 126-2-3: "Fixed Radio Systems; Conformance testing; Part 2-3: Point-to-Multipoint equipment; Test procedures for TDMA systems".
  - [10] ETSI EN 301 126-2-4: "Fixed Radio Systems; Conformance testing; Part 2-4: Point-to-Multipoint equipment; Test procedures for FH-CDMA systems".
  - [11] ETSI EN 301 126-2-5: "Fixed Radio Systems; Conformance testing; Part 2-5: Point-to-Multipoint equipment; Test procedures for DS-SS-SSM systems".
  - [12] ETSI EN 301 126-2-6: "Fixed Radio Systems; Conformance testing; Part 2-6: Point-to-Multipoint equipment; Test procedures for Multi Carrier Time Division Multiple Access (MC-TDMA) systems".



- [13] ETSI TR 101 036-1: "Fixed Radio Systems; Generic wordings for standards on DFRS (Digital Fixed Radio Systems) characteristics; Part 1: General aspects and point-to-point equipment parameters".
- [14] ITU-R Recommendation F.746-7: "Radio-frequency arrangements for fixed service systems".
- [15] 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).
- [16] ITU-R Radio Regulations (2001) Article 1.

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

**boundary between out-of-band and spurious domains:** frequency limit that subdivides the two domains and the applicability

NOTE: ITU-R Recommendations SM.329-10 [1] and SM.1539-1 [2] describe the possible application to all radio emissions. ITU-R Recommendation F.1191-2 [3] details it for Fixed Service systems.

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**evaluation bandwidth:** bandwidth where the spurious emission limits are measured (e.g. the spectrum analyser resolution bandwidth) for further normalization/integration to the reference bandwidth

**out-of-band domain (of an emission):** the frequency range, immediately outside the necessary bandwidth but excluding the *spurious domain*, in which *out-of-band emissions* generally predominate

NOTE 1: The terms "out-of-band domain" and "spurious domain" have been introduced in order to remove some inconsistency now existing between, on one hand, the definitions of the terms "out-of-band emission" and "spurious emission" in Article 1 of the RR and, on the other hand, the actual use of these terms in Appendix 3 of the RR, as revised by the World Radiocommunication Conference (WRC-2000). Out-of-band and spurious limits apply, respectively, to all unwanted emissions in the out-of-band and spurious domains.

NOTE 2: Out-of-band emissions, defined based on their source, occur in the out-of-band domain and, to a lesser extent, in the spurious domain. Spurious emissions likewise may occur in the out-of-band domain as well as in the spurious domain.

**out-of-band emissions:** ITU-R Recommendation F.1191-2 [3] defines that any unwanted emission, outside the channel bandwidth, which falls at frequencies separated from the centre frequency of the emission by less than 250 % of the relevant channel separation, where the system is intended to be used, will generally be considered out-of-band emission

NOTE: See also RR Article 1-144 [16] and ITU-R Recommendation SM.329-10 [1] and CEPT/ERC Recommendation 74-01 [4].

**receiver spurious emissions:** spurious sent backwards to the antenna port by a receiver; sometimes they are also referenced as "spurious radiations"

**reference bandwidth:** bandwidth where the spurious emission limits are defined, see ITU-R Recommendation SM.329-10 [1]

**spurious domain (of an emission):** the frequency range beyond the *out-of-band domain* in which *spurious emissions* generally predominate

NOTE: The terms "out-of-band domain" and "spurious domain" have been introduced in order to remove some inconsistency now existing between, on one hand, the definitions of the terms "out-of-band emission" and "spurious emission" in Article 1 of the RR and, on the other hand, the actual use of these terms in Appendix 3 of the RR, as revised by the World Radiocommunication Conference (WRC-2000). Out-of-band and spurious limits apply, respectively, to all unwanted emissions in the out-of-band and spurious domains.

**spurious emissions:** ITU-R Recommendation F.1191-2 [3] defines that any unwanted emission which falls at frequencies separated from the centre frequency of the emission by 250 % or more of the relevant channel separation, where the system is intended to be used, will generally be considered spurious emission

NOTE: See also RR Article 1-145 [16], ITU-R Recommendation SM.329-10 [1] and CEPT/ERC Recommendation 74-01 [4].

**unwanted emissions:** They are composed by out-of-band and spurious emissions. See also RR Article 1-140 [16], ITU-R Recommendations SM.329-10 [1] and F.1191-2 [3].

## 3.2 Symbols

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

dBc	deciBels to carrier mean power
dBm	deciBels to milliwatt
GHz	GigaHertz
kHz	kiloHertz
MHz	MegaHertz

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## 3.3 Abbreviations

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

ATe	external ATtenuator
ATi	internal spectrum analyser input ATtenuator
ATPC	Automatic Transmission Power Control
BER	Bit Error Rate
BWe	evaluation BandWidth for spectral measurement (i.e. spectrum analyser resolution bandwidth)
BWr	reference BandWidth
CS	Channel Separation
CW	Continuous Wave
DFRS	Digital Fixed Radio Systems
DUT	Device Under Test
Fc	cut-off Frequency
IM	InterModulation
i.m.p.	intermodulation products
MP	MultiPoint (generic term including both P-MP and MP to MP mesh architectures)
MS	Master Station of a P-MP system
P-MP	Point-to-MultiPoint system
P-P	Point-to-Point system
QAM	Quadrature Amplitude Modulation
RF	Radio Frequency
RR	Radio Regulations
RS	Repeater Station (of a P-MP system)
RSL	Receiver Signal Level
Rx	Receiver
TS	Terminal Station (remote out-station with subscriber interface) of a P-MP system
Tx	Transmitter
VSWR	Voltage Standing Wave Ratio

## 4 Transmitter spurious emissions at antenna port

According to ITU-R Recommendation SM.329-10 [1] and the application to fixed service provided by ITU-R Recommendation F.1191-2 [3], the spurious emissions are defined as emissions at frequencies which are  $\pm 250\%$  of the relevant channel separation outside the nominal carrier frequency (spurious emission domain).

According ITU-R Recommendation F.1191-2 [3], the Channel Separation (CS) is taken as  $XS/2$  for alternated frequency channel arrangements and  $XS$  for co-channel and interleaved frequency channel arrangements as defined by ITU-R Recommendation F.746-7 [14].

The emission within  $\pm 250\%$  of the relevant channel separation (out-of-band domain) includes only fundamental and unwanted emissions in the out-of-band domain which are outside the scope of the present document.

### 4.1 Limits

Unless more severe requirement were reported into a specific product ETSI deliverable, the spurious emissions delivered at antenna port, of both transmitter and receiver, of Fixed Radio Systems shall be limited within the average power limits reported below.

For "noise-like" emissions, the limits are intended not to be exceeded in any elementary measuring bandwidth.

The limit values are defined at reference point C' shown in the general RF block diagram of figure 1.

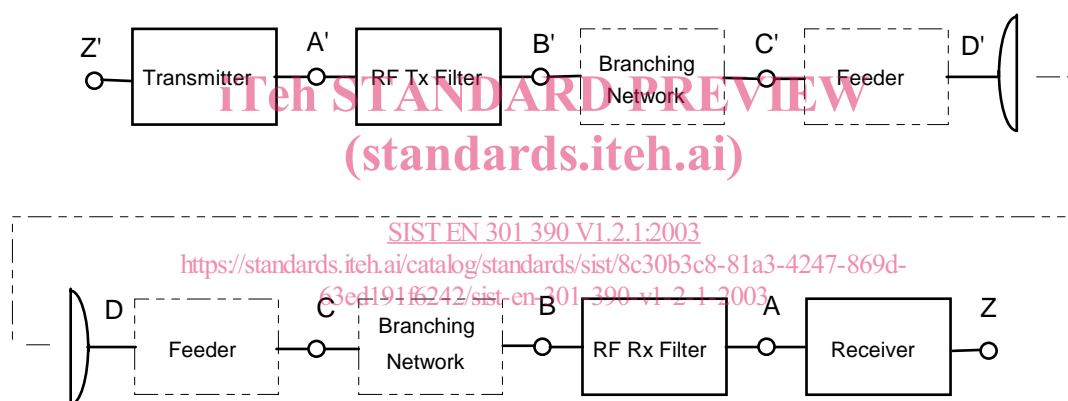


Figure 1: RF block diagram

#### 4.1.1 Point-to-point equipment

The CEPT/ERC Recommendation 74-01 [4] shall apply.

For reader convenience, annex A gives the details for its application to practical systems.

#### 4.1.2 Multipoint equipment with fundamental emission below 21,2 GHz

The CEPT/ERC Recommendation 74-01 [4] shall apply.

For reader convenience, annex A gives the details for its application to practical systems.

#### 4.1.3 Multipoint equipment with fundamental emission above 21,2 GHz

The CEPT/ERC Recommendation 74-01 [4] shall apply as spurious emissions limit in the frequency range 9 kHz to 21,2 GHz and above 43,5 GHz.