SLOVENSKI STANDARD
SIST EN 301 390 V1.1.1:2003

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Fiksni radijski sistemi ï Sistemi toį ka-toį ka in toį ka-veį toį k ï Neģelena oddajanja in odpornost sprejemnika pri vhodu v opremo oziroma pri antenskem vhodu digitalnih fiksnih radijskih sistemov

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

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Fixed Radio Systems; Point-to-point and Point-to-Multipoint Systems; Spurious emissions and receiver immunity 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).

National transposition dates	
Date of adoption of this EN:	24 November 2000
Date of latest announcement of this EN (doa):	28 February 2001
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 August 2001
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1 Scope

The present document deals with spurious emissions at antenna port of Digital Fixed Radio Systems as defined by Radio Regulation Article 1 [15], ITU-R Recommendation SM.329-7 [1], ITU-R Recommendation F.1191-1 [2] and CEPT/ERC Recommendation 74-01 [3].

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

Scope of the present document is to define specific limits at antenna port of spurious emissions and receiver immunity for suitable inter-working of Digital Fixed Radio Systems (i.e. Point-to-Point and Point-to-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 required to fulfil the EEC directive 89/336 [14] on EMC.

The present document complements CEPT/ERC Recommendation 74-01 [3] 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 N°139 [15]) is aged and give concept and applicability which do not clearly fit to digital systems;

- ITU-R Recommendation SM.329-7 [1] includes emissions with digital modulation but allows options for the definition of the frequency boundary between out of band and spurious emissions and two different Category of level limits applicable to the Fixed Service;

- ITU-R Recommendation F.1191-1 [2] and CEPT/ERC Recommendation 74-01 [3] define the application of Radio Regulations concepts of Out of band, Unwanted and Spurious emissions to fixed Digital Radio Systems, clarify the applicability for the boundary between Out of band and Spurious emissions but maintain the same possible limit options provided by ITU-R Recommendation SM.329-7 [1];

- STC-RES09 has produced many ETSs covering EMC of radio equipment for mobile applications, which include emissions (or radiation) and immunity at antenna port; STC-RES09 also produced EN 301 489-1 [10] and EN 301 489-4 [11] covering EMC for fixed Radio links, which exclude, by mutual agreement with WG-TM4, spurious emissions and immunity at antenna port, which have to be defined by the product standards in order to cover all the technical parameters for conformance to the EMC Directive 89/336;

- 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 of 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 (informative annex B gives also information in this field);

- it is advisable that Fixed Radio Systems 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 Fixed Radio Systems receivers immunity at antenna port may be considered the application of a CW interference.

The present document will cover the limits of spurious emissions for already published ETSI deliverables for Fixed Radio Systems, for the time needed to produce suitable revision, in the following cases:

- the ETSI deliverable does not cover the external spurious emissions and/or receiver immunity items;
- the ETSI deliverable contains less demanding limits;
- the ETSI deliverable contains preliminary limits and/or undefined reference bandwidth.

Some ETSI deliverables for Fixed Radio Systems, 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 informative annex B, spurious emissions are analysed from the point of view of a suitable test method for conformance testing.

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 SM.329-7 (1997): "Spurious Emissions".

[2] ITU-R Recommendation F.1191-1 (1997): "Bandwidths and unwanted emissions of digital radio-relay systems".

[3] CEPT/ERC Recommendation 74-01 (1998): "Spurious emissions".

[4] ETSI EN 301 126-1: "Fixed Radio Systems; Conformance testing; Part 1: Point-to-Point equipment - Definitions, general requirements and test procedures".

[5] ETSI EN 301 126-2-1: "Fixed Radio Systems; Conformance testing; Part 2-1: Point-to-Multipoint equipment; Definitions and general requirements".

[6] ETSI EN 301 126-2-2: "Fixed Radio Systems; Conformance testing; Part 2-2: Point-to-Multipoint equipment; Test procedures for FDMA systems".

[7] ETSI EN 301 126-2-3: "Fixed Radio Systems; Conformance testing; Part 2-3: Point-to-Multipoint equipment; Test procedures for TDMA systems".

[8] ETSI EN 301 126-2-4: "Fixed Radio Systems; Conformance testing; Part 2-4: Point-to-Multipoint equipment; Test procedures for FH-CDMA systems".

[9] ETSI EN 301 126-2-5: "Fixed Radio Systems; Conformance testing; Part 2-5: Point-to-Multipoint equipment; Test procedures for DS-CDMA systems".

[10] 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".

[11] 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".

[12] 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".

[13] ITU-R Recommendation F.746-4 (1999): "Radio-frequency channel arrangements for radio-relay systems".

[14] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

[15] ITU-R: "Radio Regulations Article 1".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

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 emissions: ITU-R Recommendation F.1191-1 [2] defines that any unwanted emission 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. See also RR Article 1 [15] N°138 and ITU-R Recommendations SM.329-7 [1] and CEPT/ERC Recommendation 74-01 [3].

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.329-7 [1].

spurious emissions: ITU-R Recommendation F.1191-1 [2] 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. See also RR Article 1 [15] N°139 and ITU-R Recommendations SM.329-7 [1] and CEPT/ERC Recommendation 74-01 [3].

unwanted emissions: they are composed by Out of band and spurious emissions. See also RR Article 1 [15] N°140 and ITU-R Recommendations SM.329-7 [1] and F.1191-1 [2].

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

3.3 Abbreviations

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

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
DRRS	Digital Radio-Relay Systems
DUT	Device Under Test
Fc	cut-off Frequency
i.m.p.	Intermodulation products
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.329-7 [1] and the application to fixed service provided by ITU-R Recommendation F.1191-1 [2], the external spurious emissions are defined as emissions at frequencies which are ±250 % of the relevant channel separation outside the nominal carrier frequency.

According ITU-R Recommendation F.1191-1 [2], 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.746-4 [13].

The emission within ±250 % of the relevant channel separation includes only fundamental and out of band emissions 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 at antenna port of Fixed Radio Systems of both transmitter and receiver 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.

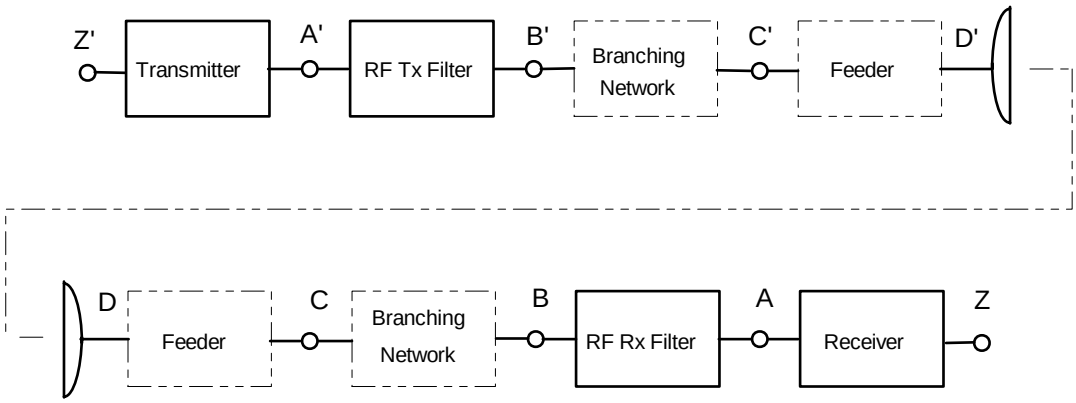

Figure 1: RF block diagram

4.1.1 Point-to-point equipments

The CEPT/ERC Recommendation 74-01 [3] shall apply.

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

4.1.2 Point-to-multipoint equipments with fundamental emission below 21,2 GHz

The CEPT/ERC Recommendation 74-01 [3] shall apply.

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

4.1.3 Point-to-multipoint equipments with fundamental emission above 21,2 GHz

The CEPT/ERC Recommendation 74-01 [3] shall apply for spurious emissions in the frequency range 9 kHz to 21,2 GHz and above 43,5 GHz.

For spurious emissions falling in the range 21,2 GHz to 43,5 GHz the tighter limits shown in figures 2 and 3 shall apply to both Central and Terminal Stations.

In this frequency range, where the -40 dBm limit shown in figures 2 and 3 apply, allowance is given for no more than 10 discrete (CW) spurious emissions which are permitted to exceed the limit up to -30 dBm.

In the same figures, for comparison, the less stringent limits from CEPT/ERC Recommendation 74-01 [3] are also shown.

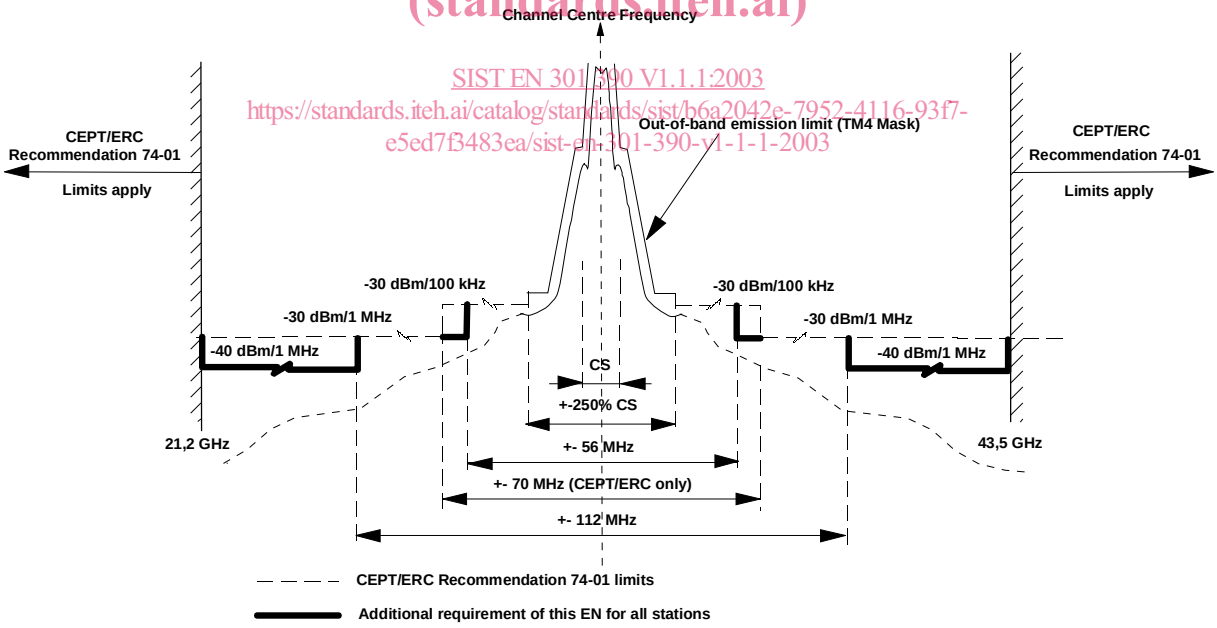

Figure 2: P-MP equipments for channel separation 1 < CS ≤ 10 MHz