



Electronic Communication Committee (ECC)
within the European Conference of Postal and Telecommunications Administrations (CEPT)

ECC RECOMMENDATION (02)01

SPECIFICATION OF REFERENCE RECEIVER PERFORMANCE PARAMETERS

Recommendation adopted jointly by the Working Group "Spectrum Engineering" (WGSE)
and Working Group "Radio Regulatory" (WGRR)

INTRODUCTION

In cases where reference receiver performance parameters are not included in a given harmonised standard or in any CEPT deliverable such as ECC Decision, CEPT encourages administrations to use this Recommendation as a basis for their spectrum planning criteria and methods of investigation and resolving interference complaints related to receiver parameters. The reference receiver performance parameter values will typically be quantified in a reference standard (such as in the part one of an ETSI product standard) . There should be a consistency between the content of ETSI Product Standards and the parameters stated in this Recommendation. CEPT administrations are also encouraged to publish the appropriate information on their spectrum planning criteria.

"The European conference of Postal and Telecommunications Administrations,

considering

- a) that the radio frequency spectrum is a finite resource which makes it necessary to use it as efficiently as possible and that adequate reference receiver performance parameters enhance the usability of the spectrum resources;
- b) that reference receiver performance parameters play a fundamental role in frequency planning and in radio compatibility analysis;
- c) that reference receiver performance parameter specifications should reflect a satisfactory balance between technology and economic feasibility;
- d) that in certain cases the reference receiver performance parameters can be justified e.g. for safety services and effective use of the radio spectrum;
- e) that Administrations expect the receiving parts of radio equipment to comply with the reference receiver performance parameters to be assumed for national spectrum planning purposes and when investigating and resolving interference complaints;
- f) that CEPT and ETSI have developed a Memorandum of Understanding describing the relative responsibilities of the two bodies; the MoU text is available from the ERO;
- g) that the R&TTE Directive 1999/05/EC, in force since 8th April 2000, is being implemented in EU Member States and also in other CEPT member countries;
- h) that under the provisions of that Directive, in general, radio equipment reference receiver performance parameters are not considered as essential requirements, unless specifically invoked and justified;
- i) that the ETSI Guide to the production of Harmonised standards for application under the R&TTE Directive (EG 201 399) enables the inclusion of reference receiver performance parameters in Harmonised standards under certain circumstances;

- j) that users and/or operators should be responsible for any reception problems experienced as a result of operating/using equipment which does not fully meet the reference receiver performance parameters;
- k) in this context that the reference receiver performance parameters should be taken into account in the relevant national regulatory framework;
- l) that further steps should be taken to harmonise the approach through a more formalised framework;

noting

- a) that technical justification on the need for reference receiver performance parameters can be found in Appendixes A and B;
- b) that spectrum management is ultimately an issue for national consideration and therefore remains the responsibility of national authorities;

recommends

- 1) that the reference receiver performance parameters given in Annex 1 to this recommendation should be used by CEPT administrations as the basis for planning the radio spectrum and for radio compatibility and sharing analysis;
- 2) that CEPT administrations make reference to the reference receiver performance parameters given in Annex 1 to this recommendation for the purpose of making decisions on investigating and resolving interference complaints;
- 3) that, for the purposes of recommends 2) above, CEPT administrations should recognise receiving equipment as either:
 - radio equipment which complies with reference receiver performance parameters as defined in the relevant recognised standards; or
 - other radio equipment for which interference complaints would , in principle, not be investigated.

Note:

a) ETSI is invited to inform the ECC, whether or not receiver parameters are included in Harmonised Standards developed in response to mandate from the European Commission, as well as to maintain appropriate specifications for these parameters

b) Please check the ERO web site (<http://www.ero.dk>) for the up to date position on the implementation of this and other ERC and ECC Recommendations.

Annex 1

List of reference receiver performance parameters to be considered for spectrum planning and investigation of interference¹

On-site paging service (base station receiver)	
Reference Receiver Performance Parameters	Relevant ETSI reference in EN 300 224-1
Sensitivity	§ 8.2.1 and 8.2.2
Protection ratio	§ 8.2.3 and 8.2.4
Blocking	§ 8.2.11 and 8.2.12
Spurious response	§ 8.2.7 and 8.2.8
Adjacent band rejection	§ 8.2.5 and 8.2.6
Intermodulation rejection	§ 8.2.9 and 8.2.10

Commercially available amateur radio equipment	
Reference Receiver Performance Parameters	Relevant ETSI reference in EN 301 783-1
Conducted RF immunity	§ 4.2.3

¹ It is intended that this list will be updated to include other equipment for which receiver parameter are not included in harmonised standards or in any ECC deliverable.

Appendix A

List of reference receiver performance parameters to be considered and their impact on spectrum efficiency in the case of poor receiver performance

Reference receiver performance parameters	Impact on spectrum utilisation and efficiency of radio equipment with poor receiver performance parameters
Sensitivity	<ul style="list-style-type: none"> • increase of number of transmitters (base stations) • increase of transmitter power • increased spectrum demand if number of transmitter and transmitter power can not be changed • <u>increased difficulty</u> to elaborate channel plans <p style="text-align: center;">which leads to:</p> <p>⇒ more interference to other services ⇒ system capacity loss and therefore an inefficient spectrum use</p>
Blocking, desensitisation, spurious response, protection ratio, co-channel rejection, receiving mask, selectivity, adjacent band rejection,	<ul style="list-style-type: none"> • decrease of number of transmitters of the interfering service and • decrease of transmitter power of the interfering service <p style="text-align: center;">which leads to:</p> <p>⇒ system capacity loss for the interfering service and consequently more spectrum for the other service ⇒ increase of the interference probability to the wanted radio service</p>
Intermodulation rejection	<p>⇒ more spectrum is required to allow channel planning to avoid intermodulation products</p>
Cross-modulation rejection	<ul style="list-style-type: none"> • Applies to systems with an AM component only: requires increased received signal so impacts on transmit power

Appendix B

Examples of scenarios where reference receiver performance parameters are fundamental for frequency management

Inter-system scenarios :

- ***compatibility study on adequate guard bands to implement between systems operating in adjacent bands:*** these studies are based on MCL (Minimum Coupling Loss) or statistical (Monte Carlo) methods, both being based on the knowledge of input parameters like receiver sensitivity, selectivity (C/I) and blocking, as defined by the standards available. If these parameters are not controlled, there is a risk that some radio receivers may be subject to harmful interference, although appropriate measures would have been taken which have been assumed to avoid this interference. For future systems, if receiver parameters are not known, pessimistic assumptions will be necessary that will increase the calculated guard bands and consequently lower the spectrum efficiency. In addition, it should be noted that not only are guard bands affected, but also geographical separation distances, particularly in the case where the band is shared between two systems.
- ***studies to produce channel plans for the fixed and mobile services in order to ease standardisation and circulation of equipment:*** these channel plans cannot be produced efficiently if the receiver selectivity is not well known.
- CEPT produced a recommendation on limits of spurious emissions from radio equipment, which applies constraints on the transmitter in order to increase the effectiveness of use of the spectrum. Additionally, ITU-R has also produced Recommendation ITU-R SM.329-9. These recommendations are based on the assumption that the receiver would be sufficiently selective to be more affected by unwanted emissions than by blocking phenomena. This needs to be ensured in order for all users to benefit from increased spectrum efficiency.

Intra-system scenarios :

- ***studies to produce channel plans for the fixed and mobile services in order to facilitate frequency co-ordination, standardisation and circulation of equipment:*** these channel plans cannot be produced effectively if the receiver performance is not well known.
- Some systems related to the safety of life applications require receiver parameters to be used as a basis to ensure correct operation.
- for radio systems using a "Listen Before Talk" protocol of any kind, the receiver performance is inextricably tied to a transmitter response. Where the system capacity is linked to a specific response e.g. power control in a CDMA type system a "rogue" receiver can act in a "predatory" manner, leading to a significant reduction in system capacity, and thus spectrum utilisation.

Examples of scenarios where receiver parameters are required for enforcement activities

When an interference case needs to be resolved it is important to be able to prove that the problem is caused by a rogue transmitter. This would be extremely difficult in a regime where there is no defined acceptable receiver performance parameters to use as reference criteria.