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European Standard (Telecommunications series)

Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 4-1: System-dependent requirements for antennas

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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Contents

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM), and is now submitted for the ETSI standards One-step Approval Procedure.

The present document is part 4-1 of a multi-part deliverable. Full details of the entire series can be found in part 1 [3].

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

Introduction

The purpose of the present document is to define antenna parameters, which are relevant to Fixed Radio Systems (FRS), including those considered essential for conformity to the R&TTE Directive [1]. Limits are set out in EN 302 217-4-2 [4].

Additional parameters appropriate to system implementation may be subject to agreement between the equipment purchaser and supplier. Further guidance is provided in annex B.

1 Scope

The present document summarizes all requirements for single main beam, linear polarization, directional antennas to be adopted in conjunction with Point-to-Point (PP) systems operating in the frequency range 1 GHz to 86 GHz.

Single polarization antennas, dual polarization antennas, dual band/single polarized antennas and dual band/dual polarization antennas are considered.

Description and limits for parameters relevant to essential requirements under article 3.2 of the R&TTE Directive [1] are given in EN 302 217-4-2 [4].

For other parameters and general information that does not affect the R&TTE Directive [1] "essential requirements" mentioned above, description and limits are set out in the present document.

There are a number of different antenna types for various applications, the principles by which they are classified are given in clause 5.

The present document does not cover aspects related to test procedures and test conditions, which are covered by the scope of EN 301 126-3-1 [2].

Guidance on the definition of radio parameters relevant to the essential requirements under article 3.2 of the R&TTE Directive [1] for DFRS may be found in TR 101 506 [i.1].

2 References

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.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

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NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] 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).

[2] ETSI EN 301 126-3-1: "Fixed Radio Systems; Conformance testing; Part 3-1: Point-to-Point antennas; Definitions, general requirements and test procedures".

[3] ETSI EN 302 217-1: "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 1: Overview and system-independent common characteristics".

[4] ETSI EN 302 217-4-2: "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 4-2: Harmonized EN covering essential requirements of Article 3.2 of R&TTE Directive for antennas".

[5] IEC 60154-1: "Flanges for waveguides. Part 1: General requirements".

[6] IEC 60154-2: "Flanges for waveguides. Part 2: Relevant specifications for flanges for ordinary rectangular waveguides".

[7] IEC 60169-1: "Radio-frequency connectors. Part 1: General requirements and measuring methods".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area**.** For non-specific references, the latest version of the referenced document (including any amendments) applies.

[i.1] ETSI TR 101 506: "Fixed Radio Systems; Generic definitions, terminology and applicability of essential requirements under the article 3.2 of 1999/05/EC Directive to Fixed Radio Systems".

[i.2] ETSI EN 302 217-2-2: "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 2-2: Harmonized EN covering essential requirements of Article 3.2 of R&TTE Directive for digital systems operating in frequency bands where frequency co-ordination is applied".

[i.3] ETSI TR 102 243-1: "Fixed Radio Systems; Representative values for transmitter power and antenna gain to support inter- and intra-compatibility and sharing analysis; Part 1: Digital point-to-point systems".

[i.4] ETSI EN 302 217-2-1: "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 2-1: System-dependent requirements for digital systems operating in frequency bands where frequency co-ordination is applied".

[i.5] ITU-R Recommendation F.699: "Reference radiation patterns for fixed wireless system antennas for use in coordination studies and interference assessment in the frequency range from 100 MHz to about 70 GHz".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 302 217-1 [3] apply.

3.2 Symbols

For the purposes of the present document, the symbols given in EN 302 217-1 [3] apply.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in EN 302 217-1 [3] apply.

4 Frequency bands

The present document defines the characteristics and requirements of antennas in the frequency range from 1 GHz to 86 GHz.

For technical commonalities that range is here divided into sub-ranges as follows:

Range 0: 1 GHz to 3 GHz;

Range 1: 3 GHz to 14 GHz;

Range 2: 14 GHz to 20 GHz;

Range 3: 20 GHz to 24 GHz;

Range 4: 24 GHz to 30 GHz;

Range 5: 30 GHz to 47 GHz;

Range 6: 47 GHz to 66 GHz;

Range 7: 66 GHz to 86 GHz.

5 Classification of antennas

Antenna classification presented in the present document is based on RPE and XPD parameters.

5.1 Templates for definition of Radiation Pattern Envelope (RPE) classes

The RPE directional characteristic (co-polar and cross-polar) impacts the interference situation in the network planning and a trade-off between a highly demanding RPE and the cost/size/weight of the antennas, compatible with the constraints given by present and future networks is then advisable.

With respect to the Radiation Pattern Envelope (RPE), four classes (RPE classes 1 to 4) have been identified according maximum co-polar limit templates for any actual RPE mask in significant range of off-axis azimuth angles. The templates for subdivision in those classes are also depending on given frequency ranges of operation according to figures 1 to 3 and table 1.

Figures 1 to 3 are intended only as templates for defining subdivision of antennas in directivity classes; actual limits options for declaration of conformance to essential requirements under article 3.2 of the R&TTE Directive [1] are defined only in EN 302 217-2-2 [i.2].

When more than one actual standardized RPE falls within the same class template, a sub-class indicative (A, B, C, etc.) will be used according their more demanding RPE limit in angles closer to the intended direction.

NOTE: Figures 1 to 3 report limit templates for any actual RPE mask of classes 2, 3 and 4 antennas; class 1 antennas are defined as those which actual RPE mask exceeds class 2 limit template.

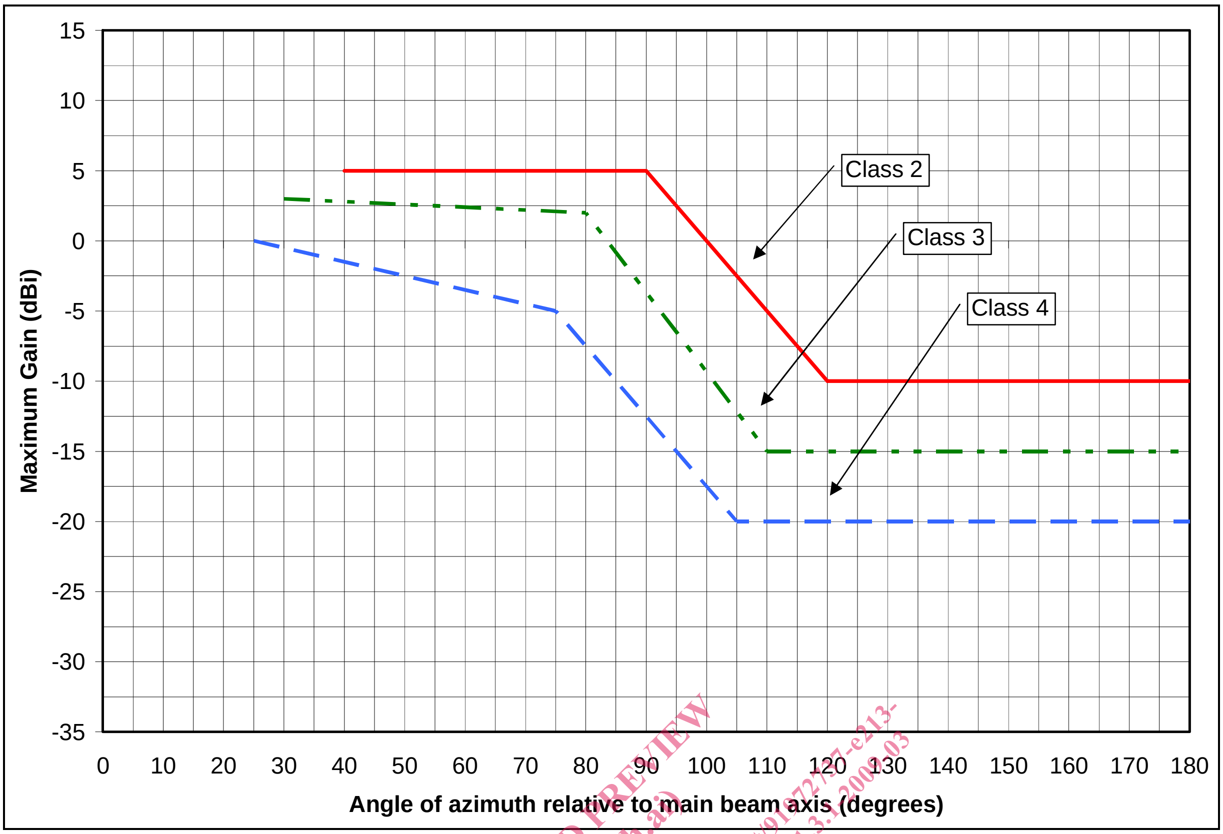

Figure 1: Co-polar limit templates for actual RPE masks of antenna classes in the range 1 GHz to 3 GHz (see table 1)

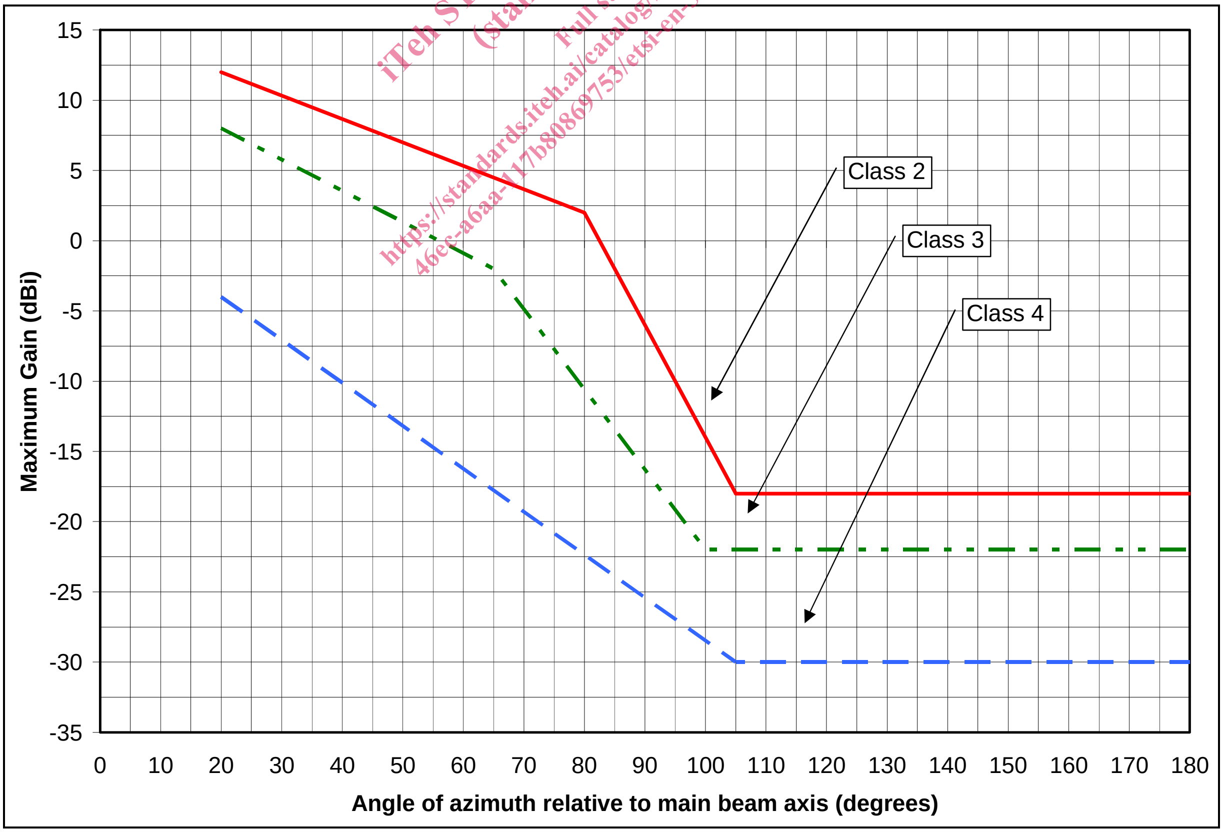

Figure 2: Co-polar limit templates for actual RPE masks of antenna classes in the range 3 GHz to 30 GHz (see table 1)

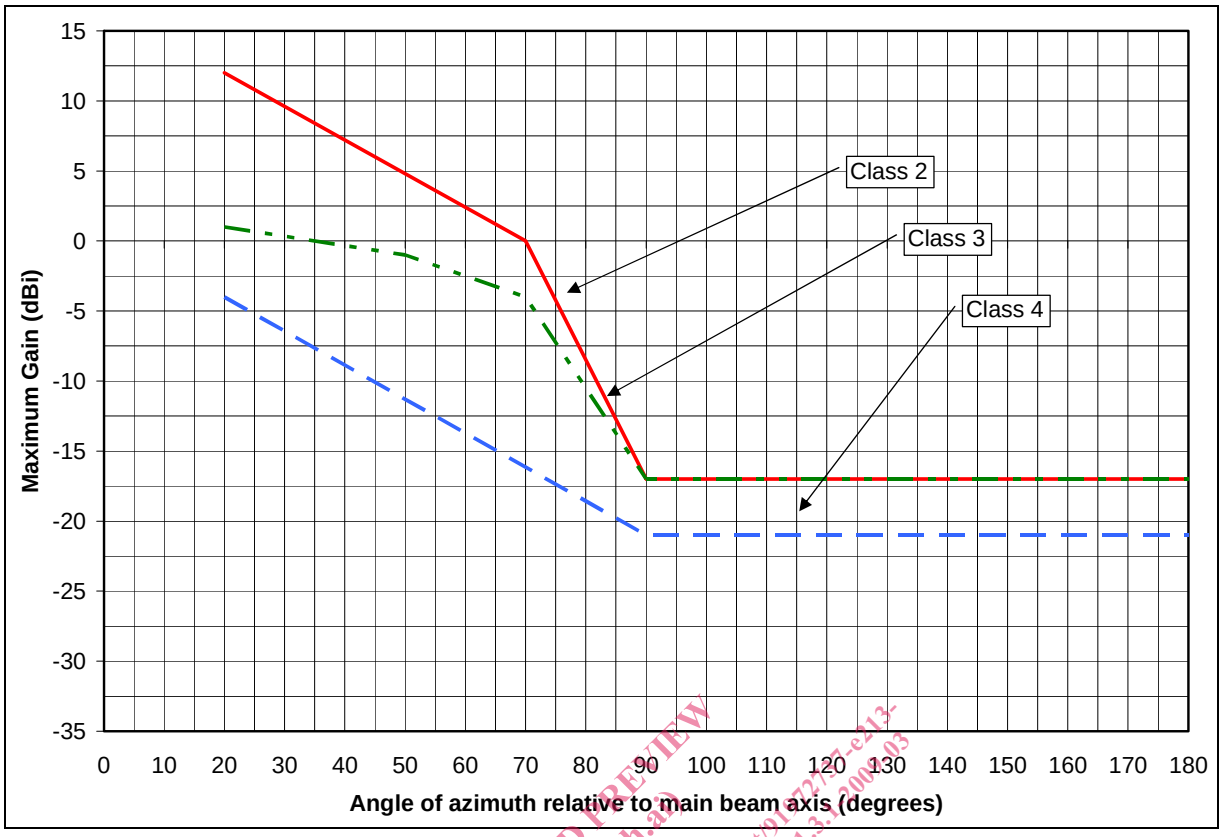

Figure 3: Co-polar limit templates for actual RPE masks of antenna classes in the range 30 GHz to 66 GHz (see table 1)

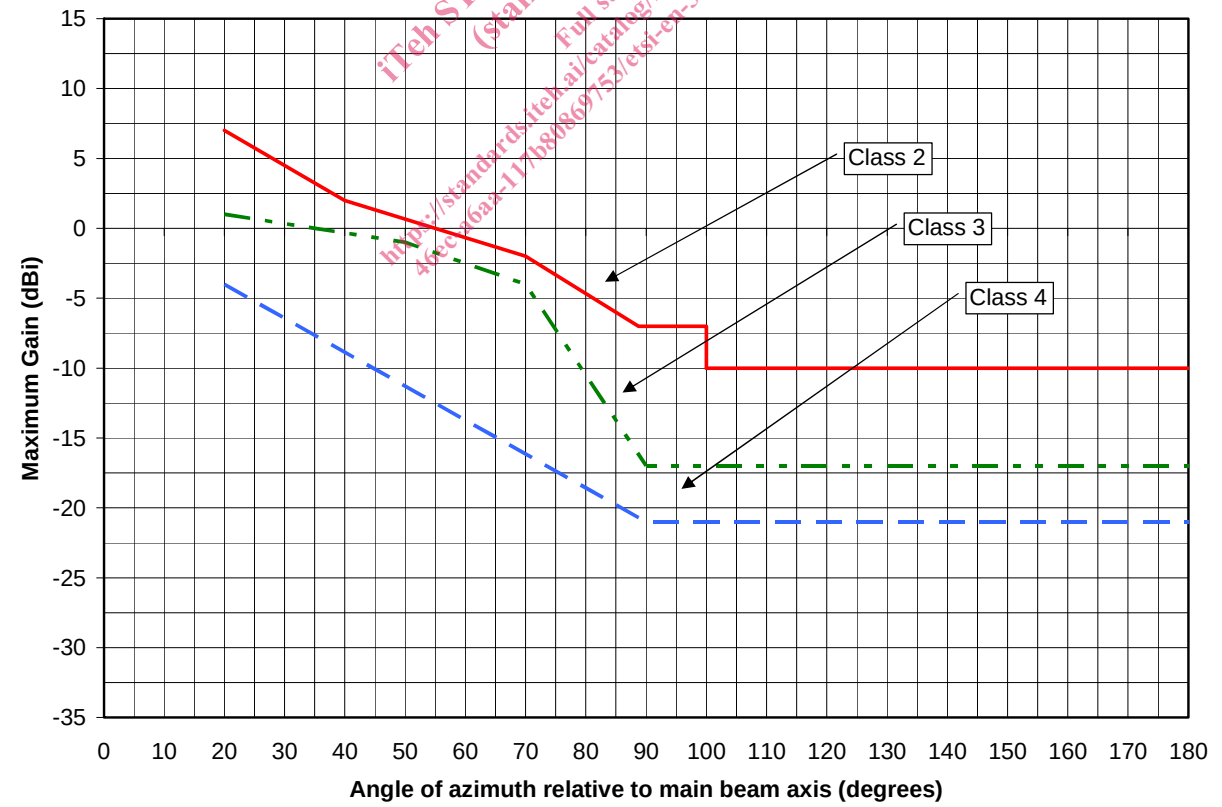

Figure 4: Co-polar limit templates for actual RPE masks of antenna classes in the range 66 GHz to 86 GHz (see table 1)

Table 1: Corner points of co-polar limits for actual RPE masks (see figures 1, 2 3 and 4)

RPE classes (see note 1)	Co-polar maximum limit templates for actual RPEs							
	Range 1 GHz to 3 GHz (see note 2)		Range 3 GHz to 30 GHz		Range 30 GHz to 66 GHz (see note 3)		Range 66 GHz to 86 GHz	
	Azimuth angle (°)	Maximum gain (dBi)	Azimuth angle (°)	Maximum gain (dBi)	Azimuth angle (°)	Maximum gain (dBi)	Azimuth angle (°)	Maximum gain (dBi)
2	40	5	20	12	20	12	20	7
	90	5	80	2	70	0	40	2
	120	-10	105	-18	90	-17	70	-2
	180	-10	180	-18	180	-17	88,75	-7
							100	-7
							100	-10
							180	-10
3	30	3	20	8	20	1	20	1
	80	2	65	-2	50	-1	50	-1
	110	-15	100	-22	70	-4	70	-4
	180	-15	180	-22	90	-17	90	-17
					180	-17	180	-17
4	25	0	20	-4	20	-4	20	-4
	75	-5	105	-30	90	-21	90	-21
	105	-20	180	-30	180	-21	180	-21
	180	-20						

NOTE 1: Class 1 antennas are defined as those which actual RPE exceeds class 2 template limit.
NOTE 2: In EN 302 217-4-2 [4], no specific class 4 antenna RPE is defined for this frequency range; the corresponding limit template in table 1 is set for possible future use.
NOTE 3: In EN 302 217-4-2 [4], no specific class 4 antenna RPE is defined for the frequency range 47 GHz to 66 GHz; the corresponding limit template in table 1 is set for possible future use.

5.2 Cross-Polar Discrimination (XPD) categories

The XPD characteristics also have impact on frequency planning (e.g. minimum angle of nodal frequency reuse of cross polarized carriers) but also on the link performance (e.g. when CCDP or ACAP operation is foreseen for systems using high sensitive modulation formats).

With respect to cross-Polar Discrimination (XPD), three XPD performance categories (XPD categories 1 to 3) have been identified (refer to EN 302 217-4-2 [4]):

- XPD category 1: those antennas required to have standard cross-polar discrimination.
- XPD category 2: those antennas required to have high cross-polar discrimination.
- XPD category 3: those antennas required to have high cross-polar discrimination through an extended angular region.

6 Electrical characteristics

6.1 Radiation Pattern Envelope (RPE)

Co-polar and Cross-polar RPEs are relevant to the essential parameters under article 3.2 of the R&TTE Directive [1] and are stated in EN 302 217-4-2 [4].

NOTE 1: In bands where frequency co-ordination is not applied, cross-polar RPE is not considered relevant to essential requirements for R&TTE Directive [1] conformance, even if the antenna is actually dual polarized. Values are still given in EN 302 217-4-2 [4] but should be considered for reference purposes only. For definition of co-ordination in frequency bands, refer to definitions in EN 302 217-1 [3].