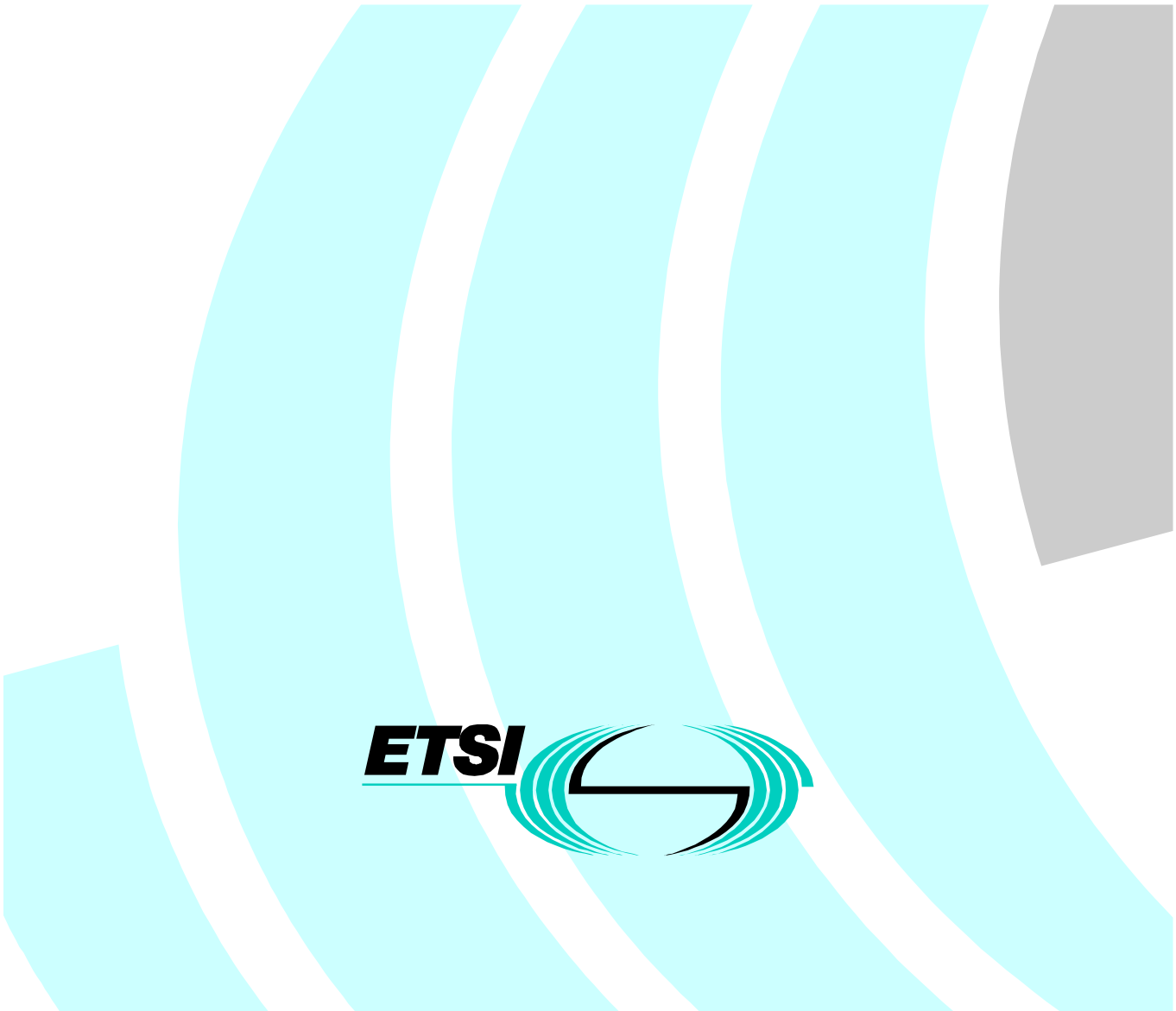
Draft EN 301 126-3-1 V1.1.1 (1999-07)

European Standard (Telecommunications series)

Fixed Radio Systems; Conformance testing; Part 3-1: Point-to-point antennas - Definitions, general requirements and test procedures



Reference
DEN/TM-04026-3-1 (afcr9ico.PDF)

Keywords
antenna, DRRS, SDH, testing, transmission

ETSI

Postal address
F-06921 Sophia Antipolis Cedex - FRANCE

Office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - 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
Sous-Préfecture de Grasse (06) N° 7803/88

Internet
secretariat@etsi.fr
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Contents

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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 defines the type approval testing requirements for the antenna specific parameters, required directly by the relevant radio relay or antenna standard. Harmonized test methods and test report format, for these parameters, are also contained, herein.

In addition to the main body of the present document there are two annexes, namely the Supplier Declaration (annex A) and the Test Report (annex B). The parameters in the two annexes are according to the main body of the present document.

The present document is part 3, sub-part 1 of a multi-part EN covering the Fixed Radio System; Conformance testing, as identified below:

Part 1: "Point-to-point equipment - Definitions, general requirements and test procedures";

Part 2-1: "Point-to-Multipoint equipment - Definitions and general requirements";

Part 2-2: "Point-to-Multipoint equipment - Test procedures for FDMA systems";

Part 2-3: "Point-to-Multipoint equipment - Test procedures for TDMA systems";

Part 2-4: "Point-to-Multipoint equipment - Test procedures for FH-CDMA systems";

Part 2-5: "Point-to-Multipoint equipment - Test procedures for DS-CDMA systems";

Part 3-1: "Point-to-Point antennas - Definitions, general requirements and test procedures";

Part 3-2: "Point-to-Multipoint antennas - Defintions, general requirements and test procedures".

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

1 Scope

The present document details standardized procedures for conformance testing of antennas for point-to-point radio relay systems [1 and 2] in order to achieve the approval by the Type Approval Authority.

The procedure for dealing with established products are outside the scope of the present document.

Standardized procedures are required in order to fulfil CEPT/ERC/DEC/(97) 10 [2] on the mutual recognition, within CEPT, of conformance test of antennas carried out in individual CEPT Countries.

The present document is intended to be applied in conjunction with the individual antenna standards and will enable commonality in the presentation of test results, irrespective of the Suppliers/accredited laboratory carrying out the test.

NOTE: The recent draft Directive by the EEC [97-149 (COD)] and parallel work within CEPT ERC on mutual recognition, proposes that type approval against essential requirements can be carried out at manufacturers or third party premises. The level of accreditation required needs to be clarified by CEPT.

The conformance tests described in the present document are related to antenna specific parameters required directly by the relevant antenna standards.

Integrated antennas which can not be separated from the equipment are not covered by the present document.

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 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".

[2] CEPT/ERC/DEC/(97) 10: "On the mutual recognition of conformity assessment procedures including marking of radio equipment an radio terminal equipment".

[3] ISO/IEC Guide 25 (1990): "General requirements for the competence of calibration and testing laboratories".

[4] ISO/IEC Guide 28 (1982): "General rules for a model third-party certification system for product".

[5] EN 45001 (1989): "General criteria for the operation of testing laboratories".

[6] EN 45002 (1989): "General criteria for the assessment of testing laboratories".

[7] ISO 9001 (1994): "Quality systems; Model for quality assurance in design, development, production, installation and servicing".

[8] IEC 835-2-2 (1994): "Methods of measurement for equipment used in digital microwave transmission systems; Part 2: Measurements on terrestrial radio-relay systems; Section 2: Antenna".

[9] 1999/5/EC: "On radio equipment and telecommunication terminal equipement and the mutual recognition of their conformity".

[10] IEC 154: "Information technology; Data interchange on 90 mm optical diskcartridges; HS-1 format; Capacity: 650 Mbytes per cartridge".

[11] IEC 169: "Radio-frequency connectors".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

Accreditation: formal recognition that a testing laboratory is competent to carry out specific tests or specific types of test.

Accreditation Body: body that conducts and administers a laboratory accreditation system and grants accreditation.

Accreditation System: system that has its own rules of procedure and management for carrying out laboratory accreditation.

Accredited Laboratory: testing laboratory which accreditation has been granted in accordance with the ISO/IEC guides 25 [3] and 28 [4] or EN 45001 [5] and EN 45002 [6].

Antenna: that part of the transmitting or receiving system that is designed to radiate and/or receive electromagnetic waves.

Approval Testing: approval of the Implementation Under Test (IUT) by the appropriate authority for regulatory purposes. In this context approval implies that the IUT has met the essential requirements of the standard against which it has been tested.

Complementary Requirements: all those requirements not part of the essential requirements are complementary requirements.

Conformance Testing: process to verify to what extent the IUT conforms to the standard.

Essential Requirements: basic set of parameters and functions which are necessary to meet any regulatory obligations imposed for radio frequency co-ordination.

Implementation Under Test: representative sample of the equipment for Conformance Testing.

Optional Requirements: used in a standard with two different meanings:

1) optional in the sense that the parameter or function itself is mandatory but there is more than one possible value or configuration which may be chosen (e.g. class of Antenna RPE, frequency band(s), etc.). Once an option is selected it becomes mandatory;

2) optional in the sense that the feature is not mandatory (e.g. antenna input connector etc.). However, once such an option has been implemented it becomes mandatory that it conforms to the requirements of the present document.

Supplier: organization requesting the approval.

Supplier's Declaration: procedure by which a supplier gives written assurance that a parameter or function conforms to the present document.

Type Approval Authority: national Regulatory/Licensing Authority.

3.2 Symbols

For the purposes of the present document, the following symbol applies:

dB	decibel

3.3 Abbreviations

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

CR	Complementary Requirement
EN	European Standard (Telecommunications series)
ER	Essential Requirement
ETS	European Telecommunication Standard
Ext	Extreme conditions
IUT	Implementation Under Test
OR	Optional Requirement
Ref	Reference conditions
SD	Supplier Declaration
TR	Test Required
RPE	Radiation Pattern Envelope
XPD	Antenna Cross-Polar Discrimination

4 Requirements related to Antenna conformance testing

4.1 General requirements

In table 1 the generic clauses and parameters are classified, for conformance testing purposes, in terms of the various categories.

Table 1: 'Generic requirements' classification.

Function or Parameter Description	Status for conformance			Requirement for conformance testing			Power supply conditions		Climatic conditions for test		Limiting values	Test methods	
	ER	CR	OR	SD	TR	SD [3] + TR	Ref	Ref + Ext	Ref. (note 1)	Ref + Ext.		Clause Ref.	IEC 835-2-2 [8] or other Ref. (note 2)
Frequency range		X	X	X (note 3)									
Frequency band(s)		X	X	X[3]									
Class of antenna RPE		X	X	X[3]									
Radiation pattern envelope (RPE)	X		X			X			X				IEC 835-2-2 [8]
Antenna cross-polar discrimination (XPD)	X		X			X			X				IEC 835-2-2 [8]
Antenna gain	X		X			X			X				IEC 835-2-2 [8]
Environmental characteristics		X	X	X									
Antenna stability		X	X	X									
Antenna input connectors		X	X	X									
Return loss / VSWR		X		X									IEC 835-2-2 [8]
Inter-port isolation		X		X									IEC 835-2-2 [8]

NOTE 1: The environmental conditions at the time of test shall be recorded in the Test Report. This declaration will also guarantee that the essential requirements shall be met for the environmental conditions given in suclause 5.1.5 and suclause 5.1.6.
NOTE 2: Alternative test methods may be agreed prior to testing.
NOTE 3: SD is intended for proper selection among provided options or for information necessary to carry out the Test.

Clear distinction is made between "Essential Requirements (ER)" which require "Approval Testing" for regulatory purpose and "Complementary Requirements (CR) or Optional Requirements (OR)" which fulfil the "Conformance Testing" against the relevant standards.

The Type Approval Authority shall require the Supplier’s declaration which encompasses the test report demonstrating essential requirements (radiation pattern, antenna cross polar discrimination and gain), accompanied by evidence of accreditation to an internationally recognized Quality Standard, at least ISO 9001 [7].

The supplier shall be considered legally responsible for any statement in the declaration.

Annex A contains the Suppliers Declaration template for all the parameters in table 1. Annex B contains the Test Report template for the essential requirements listed in table 1.

Test Methods shall be adopted in accordance with IEC 835-2-2 [8], although suitable test methods may be agreed between the Supplier and the Type Approval Authority, prior to testing. A description of the test method is to be included in the test report.

4.2 Implementation under test (IUT)

The IUT presented for Type approval shall be a representative production model.

Testing shall be conducted at point D (D') in figure 1. An appropriate adapter shall be used if required to connect the antenna at point D (D') to the test equipment and the effects of the adapter upon the test results shall be taken into account and declared.

The configuration used during the test shall be provided in the test report clearly indicating point D (D').

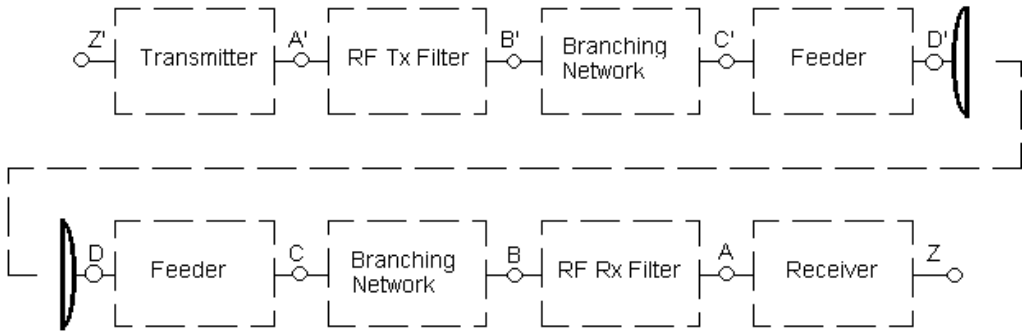


Figure 1: System block diagram

5 Suppliers declaration

5.1 General characteristics

5.1.1 Frequency range(s)

The frequency range(s) from those quoted in the relevant standard shall be stated.

5.1.1.1 Frequency Band(s)

The operational frequency band(s) of the antenna shall be stated and measurements shall be carried out as a minimum at the lowest, middle and highest frequency of (each of) the relevant band(s).

5.1.2 Class of antenna RPE

The class of antenna RPE from within the declared frequency range of the relevant antenna standard shall be stated.

5.1.3 Antenna XPD category

The XPD category of the antenna from within the declared frequency range of the relevant antenna standard shall be stated.

5.1.4 Gain category

The gain category from within the declared frequency range of the relevant antenna standard shall be stated.

5.1.5 Environmental Characteristics

The supplier shall declare the temperature range and the wind survival rating of the antenna. Guidance information on antenna environmental characteristics may be found in the relevant antenna standard.

5.1.6 Antenna stability

The supplier shall declare the operational conditions under which the antenna shall remain stable. Guidance information on antenna stability may be found in the relevant antenna standard.

5.1.7 Antenna input connector

The supplier shall declare that the antenna input connector(s) conforms to IEC 154 [10], IEC 169 [11] and/or other manufacturer's proprietary connection designs.

5.1.8 Return loss/VSWR

The supplier shall declare the minimum return loss value and/or the maximum VSWR over the operational frequency band(s).

5.1.9 Inter-port isolation

For antennas with two or more input ports the supplier shall declare the minimum inter-port isolation over the operational frequency band(s).

6 Test procedures for essential requirements

Where necessary, for better understanding of the application of test methods, reference is made to IEC 835-2-2 [8] (Test methods).

Alternative test methods, among them compact antenna test ranges or near-field scan, may be agreed between the Supplier and the Type Approval Authority prior to testing.

6.1 Radiation pattern envelope (RPE)

6.1.1 Objective

To verify that the antenna radiation pattern, for the declared class and frequency range, is contained within the limits of the stated RPE from the relevant standard.

6.1.2 Test instruments and set-up

Figure 2 below shows a typical test set-up.

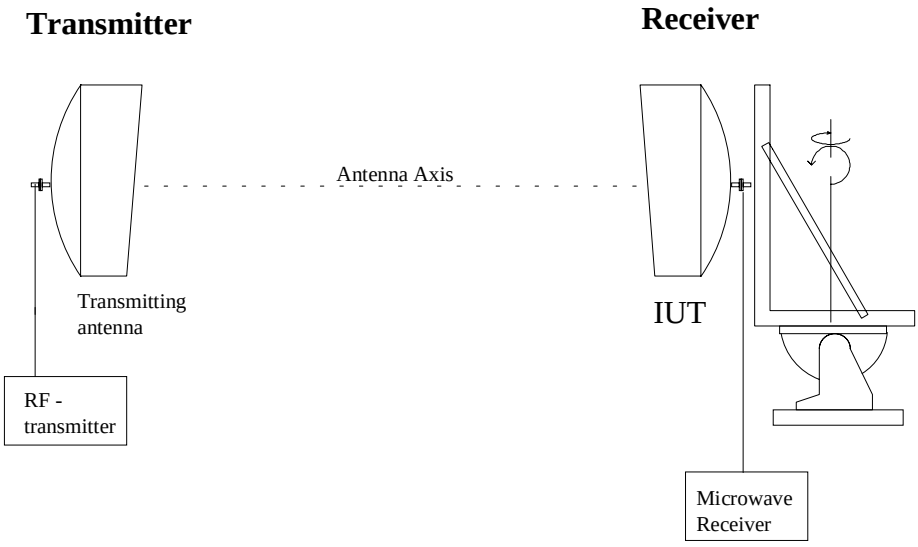


Figure 2: Example of arrangement for the measurement of the radiation pattern in the azimuth plane

6.1.3 Test procedure

The test methods described in IEC 835-2-2 [8] are generally applicable. The antenna shall be measured as a minimum at the lowest, middle and highest frequency of (each of) the declared frequency band(s).

The cross-polar radiation patterns shall be recorded after an alignment procedure based on the minimization of the cross-polar level in the frequency band(s) of the antenna. This setting shall be maintained for all the cross-polar measurements at all frequencies.

6.1.4 Test procedure example (alternative test procedures could be used)

a) all adjustments have to be made at middle frequency;

b) adjust the polarization of the IUT to be parallel or perpendicular to the azimuth plane containing the transmission axis;

c) align the azimuth and elevation of the transmitting antenna and the IUT for maximum co-polar signal;

d) change the polarization of the transmitting antenna to cross-polar;

e) adjust the polarization of the transmitting antenna to the minimum cross-polar level;

f) change the polarization of the transmitting antenna back to co-polar;

g) this alignment should be maintained for all measurements. (In the case of a single polarized antenna the alignment has to be repeated for the other polarization);

h) perform co-polar and cross-polar measurements at lowest, middle and highest frequency in each declared frequency band(s).

6.2 Antenna cross-polar discrimination (XPD)

This suclause applies only to high XPD antennas EN 300 833 [1].

6.2.1 Objective

To verify that the antenna XPD is contained within the limits stated from the relevant standard. This is for the declared class, category, frequency range, frequency band and figure number, as applicable, for the IUT.

6.2.2 Test instruments and set-up

Figure 2 shows a typical test set-up.

6.2.3 Test procedure

The test methods described in IEC 835-2-2 [8] are generally applicable. The antenna shall be measured as a minimum at the lowest, middle and highest frequency of (each of) the declared frequency band(s).

The angular position of the transmitting antenna around the antenna axis, determined during the cross-polar radiation patterns measurements, shall be maintained also during the measurements of the antenna XPD. At each angular point the antenna XPD corresponds to the highest value of cross-polarization referred to the co-polarized main beam gain, both measured at the same frequency.

6.2.4 Test procedure example

To measure the antenna XPD according to figure 3 the following test procedure could be adopted:

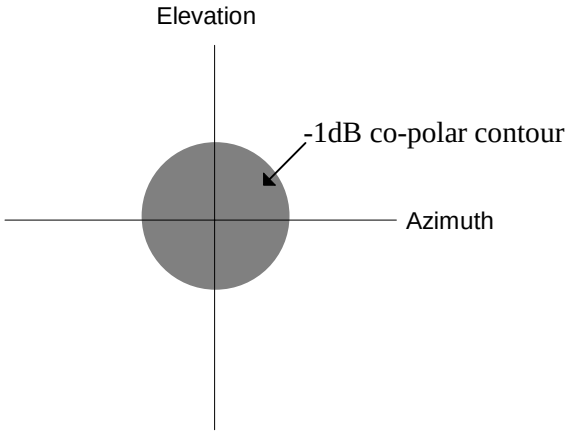


Figure 3: Mask for the antenna XPD measurements around the main beam axis (figure 8)

a) At the same polarization, for both the transmitting antenna and the antenna to be tested, align the antenna under test to obtain maximum received signal. Use expanded scale and record main lobe, azimuth and elevation cut. Note the peak level angles, in azimuth and elevation on the test record. Then change the polarization of the transmitting antenna by 90 degree in order to obtain optimal antenna cross-polar discrimination.

b) The -1 dB angle shall be read from the co-polar expanded pattern and noted on the test record.

c) Verify the antenna XPD within -1 dB contour (see figure 3). This is done by taking several elevation cuts as shown in figure 4. The angular increment between each cut should be as a maximum 10% of the -1 dB co-polar contour down to a minimum of 0,05°. First and last recording shall be labelled direction and angle.

d) Repeat step b) and c) for the lowest and highest frequency.

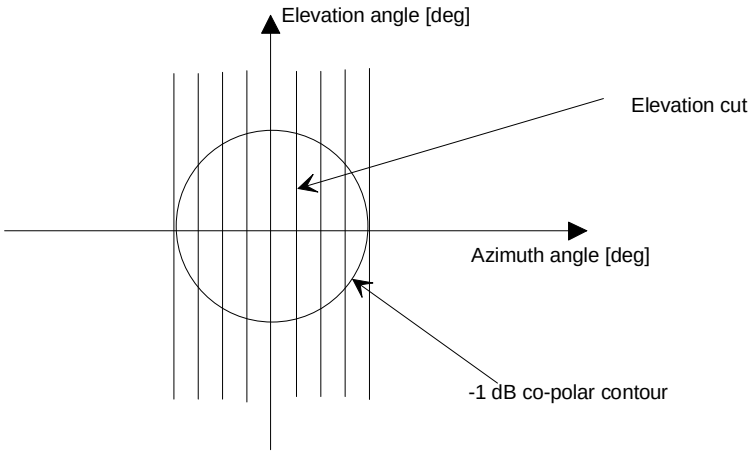


Figure 4: Measurement of the antenna XPD in the -1 dB co-polar contour

Verification of antenna XPD is also possible by taking several azimuth cuts instead of elevation cuts.

6.2.5 Test procedure example

To measure the antenna XPD according to figure 5 the following test procedure could be adopted:

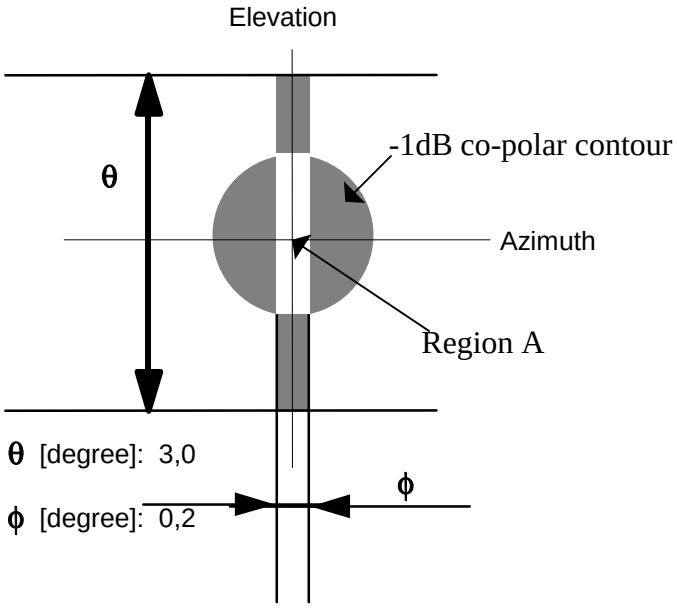


Figure 5: Mask for the antenna XPD measurements around the main beam axis (figure 9)

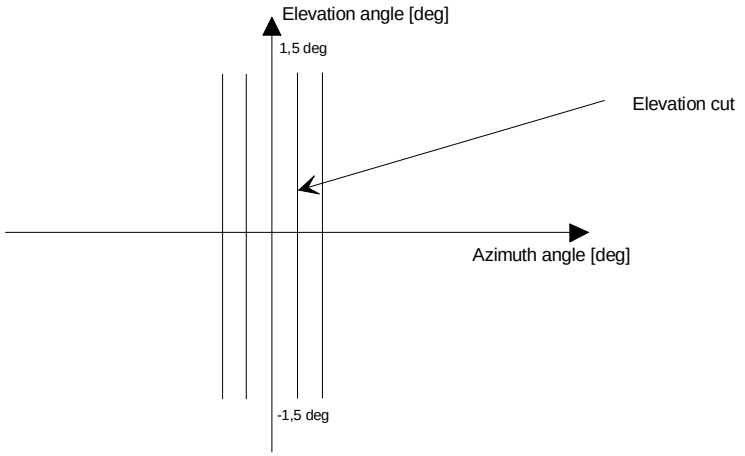
a) At the same polarization, for both the transmitting antenna and the antenna to be tested, align the antenna under test to obtain maximum received signal. Use expanded scale and record main lobe, azimuth and elevation cut. Note the peak level angles, in azimuth and elevation on the test record. Then change the polarization of the transmitting antenna by 90 degrees in order to obtain optimal antenna cross-polar discrimination.

b) The -1 dB angle shall be read from the co-polar expanded pattern and noted on the test record.

c) Verify the antenna XPD within Region A and additional rectangular part of figure 5. This is done by taking several elevation cuts as shown in figure 6.

d) Verify the antenna XPD within -1 dB contour (see figure 3). This is done by taking several elevation cuts. The angular increment between each cut should be as a maximum 10% of the -1 dB co-polar contour down to a minimum of 0,05°. First and last recording shall be labelled direction and angle.

e) Repeat step b) to d) for the lowest and highest frequency.



Az = - 0,1° Record elevation measurement for ± 1,5°.
Az = - 0,05° Record elevation measurement for ± 1,5°.
Az = 0,0° Record elevation measurement for ± 1,5°.
Az = + 0,05° Record elevation measurement for ± 1,5°.
Az = + 0,1° Record elevation measurement for ± 1,5°.

Figure 6: Measurement of the antenna XPD in the region A and additional rectangular part of figure 5

Verification of the antenna XPD is also possible by taking several azimuth cuts instead of elevation cuts.

6.3 Antenna gain

6.3.1 Objective

To verify that the measured gain for the declared class and frequency range meets the minimum gain category quoted in the relevant standard and to use the measured gain to normalize the RPE.

6.3.2 Test instruments and set-up

Figures 7-8 below show typical examples of gain measurement test set-ups.

In the examples illustrated the antenna is taken as having a waveguide port.

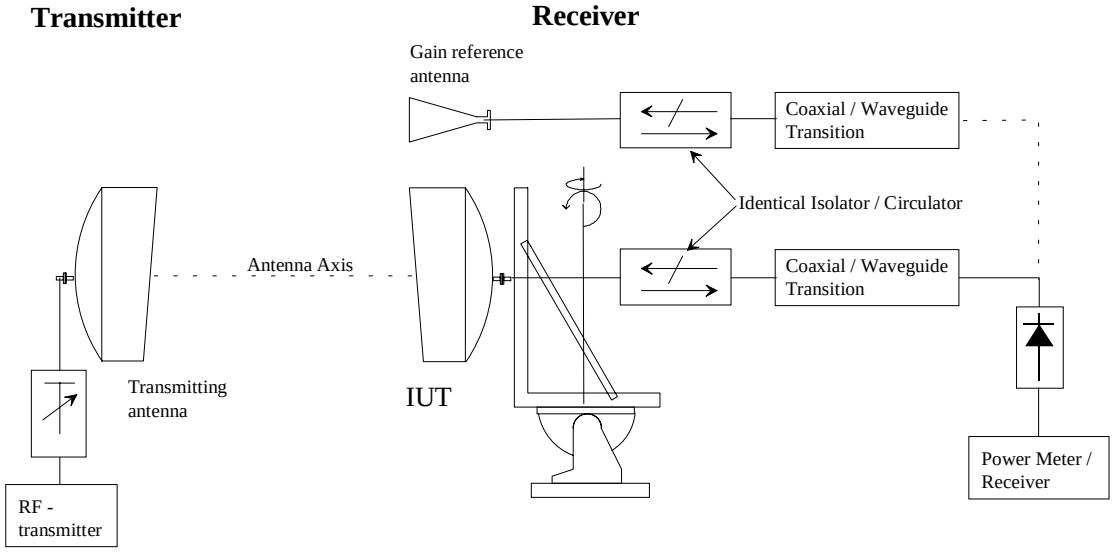


Figure 7a: Test set-up for gain measurement with substitution method using coaxial cables

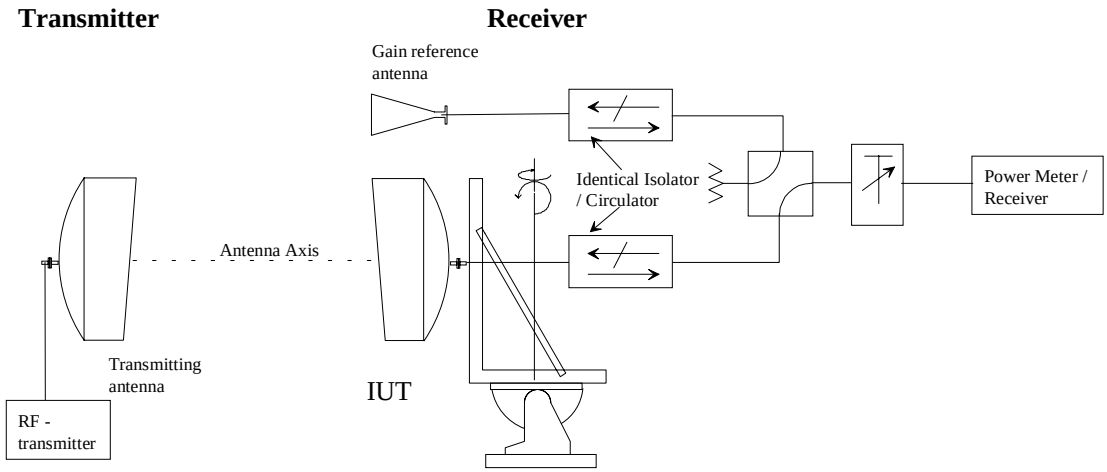
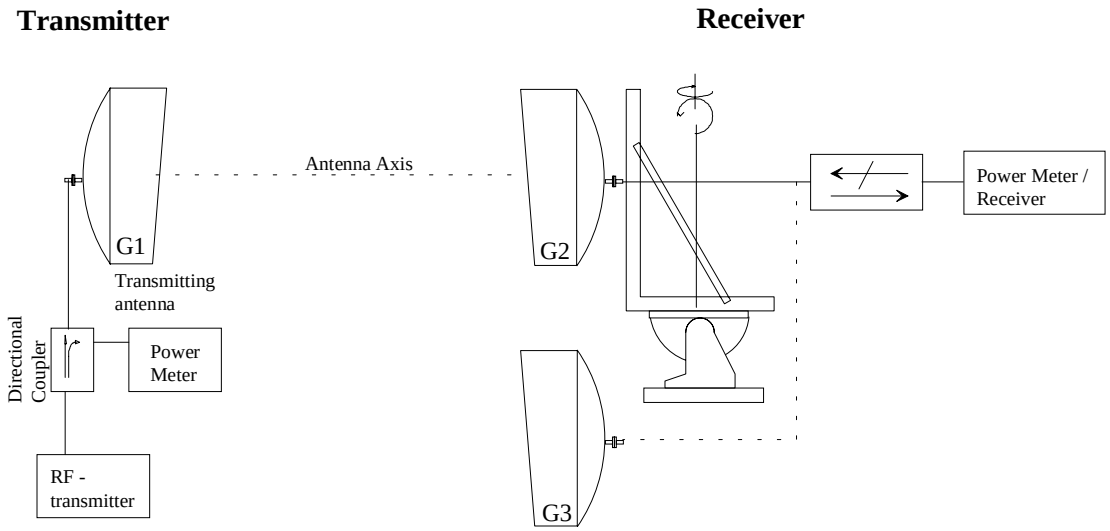


Figure 7b: Test set-up for gain measurement with substitution method using waveguides

Figure 7: Examples of arrangement for the measurement of antenna gain with substitution method by comparison with a gain reference antenna



Note : Interchange G1, G2 and G3 in sequence

Figure 8a: Test set-up for gain measurement with three antenna method

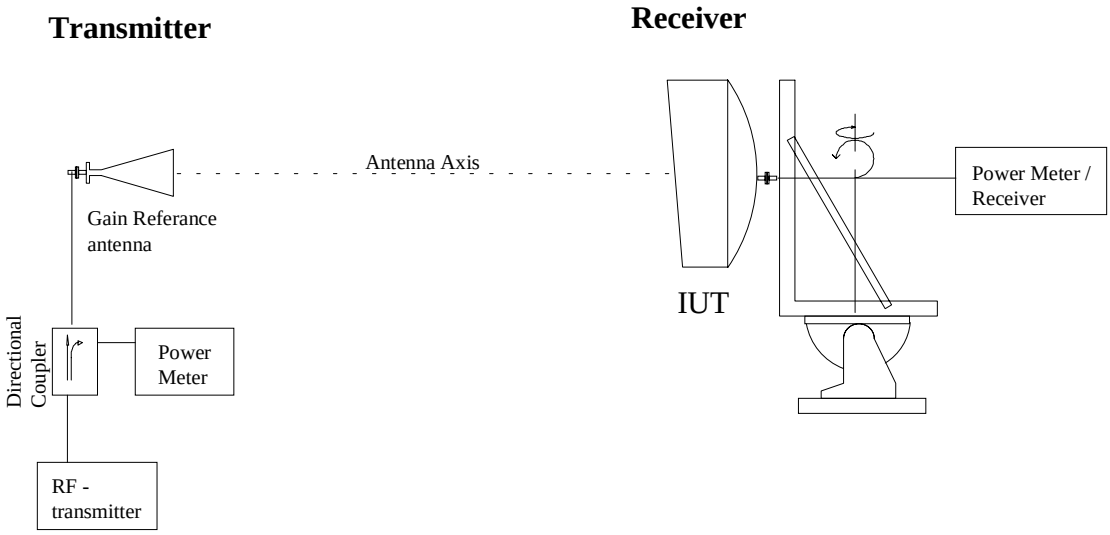


Figure 8b: Test set-up for gain measurement with direct method

Figure 8: Examples of arrangement for the measurement of antenna gain by the direct method

6.3.3 Test procedure

The test methods described in IEC 835-2-2 [8] are generally applicable. The antenna gain shall be measured as a minimum at the lowest, middle and highest frequency of (each of) the declared frequency band(s).

Annex A (normative): Supplier's declaration

A.1 Suppliers Declaration

A.1.1 Suppliers Declaration against the Essential Parameters

The Suppliers Declaration is not complete without the inclusion of the "place and date of issue" and the "name and signature or equivalent marking of authorized person".

Hereby we:

.....

Company name:

.....

Company address:

.....

.....

.....

.....

Declare under our sole responsibility that the product:

.....

Detailed description including name, model type and frequency band(s):

.....

.....

Is produced under the conditions of a full quality system with the registration number:

.....

Registration number:

.....

And it is in conformity with the following standard(s) (ETS/EN) or other normative document(s):

.....

ETS/EN number:

.....

Frequency range(s):

.....

Frequency band(s):

.....

RPE class:

.....

XPD category:

.....

Gain category:

.....

Following the provisions of Directive 1999/5/EC [9].

If applicable, following the provisions of …….. Directive.

The product is considered to be representative for all subsequent units of the same type covered by this Suppliers Declaration.

A.1.2 Suppliers Declaration against the Complementary/Optional Parameters

We also declare that the product.....

is in conformance with the following general characteristics that not will be tested from the supplier.

A.1.2.1 Environmental characteristics

A.1.2.1.1 Temperature range

The antenna has been designed to operate over the following temperature range:

-33°C to +40°C	
-45°C to +45°C	
Other	

A.1.2.1.2 Wind survival

One of the following wind survival ratings should be declared:

Antenna type	**Wind velocity m/s (km/h)**	**Ice load (density 7 kN/m^3)**	
Normal duty	55 (200)	25 mm radial ice	
Heavy duty	70 (252)	25mm radial ice	
Other			

A.1.2.2 Antenna stability

One of the following stability ratings should be declared:

Antenna type	Wind velocity m/s (km/h)	Ice load (density 7 kN/m^3)	
Normal duty	30 (110)	25 mm radial ice	
Heavy duty	45 (164)	25mm radial ice	
Other			

A.1.2.3 Antenna input connectors

The type of antenna input connector is as follows:

Antenna input connector type	

A.1.2.4 Return loss / VSWR

The return loss /VSWR limit is as follows:

Return loss maximum [dB]	
VSWR minimum	

A.1.2.5 Inter-port isolation

The inter-port isolation limit, if applicable, is as follows:

Inter-port isolation minimum [dB]	

....

(place and date of issue) (name and signature or equivalent marking of authorized person)

Annex B (normative): Test report

B.1 Test results

B.1.1 Summary of tests

Parameter	C	NC	Reference to remark
Radiation pattern envelope (RPE)			
Antenna cross-polar discrimination (XPD)			
Antenna gain			
NOTE: C: The parameter is compliant with the requirements. NC: The parameter is not compliant with the requirements.			

B.1.2 General information about the tests

General information about the tests shall be given below.

Name of Laboratory carrying out the tests	
Test report reference number	
Standard applied	
Dates of test (from - to)	
Name of manufacturer	

Antenna Model Type number(s)	
Antenna Module Description:	Serial number (if applicable)
Reflector (if applicable)	
Feed horn (if applicable)	
Radome (if applicable)	
Other	

B.1.3 Test result forms

B.1.3.1 Radiation Pattern Envelope (RPE)

B.1.3.1.1 Co-polar radiation patterns

The co-polar radiation patterns measured as a minimum at the lowest, middle and highest frequency of (each of) the declared frequency band(s) shall be provided.

A possible representation of the results is shown below.

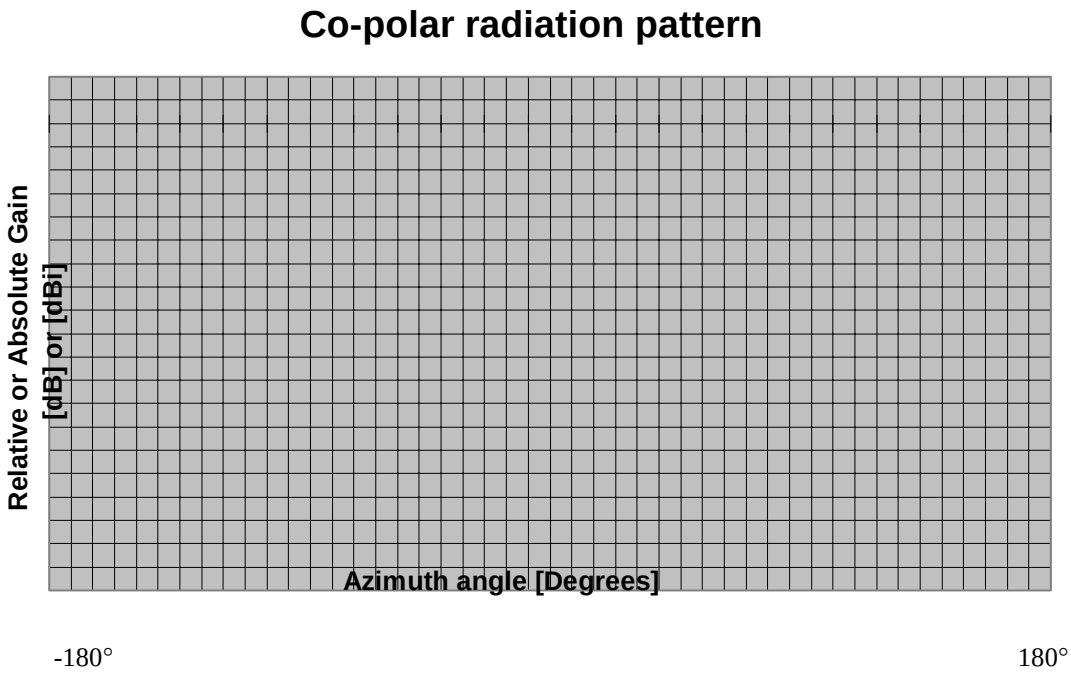


Figure B.1

Antenna model type number	
Frequency	
Polarization	

The co-polar radiation patterns measured as a minimum at the lowest, middle and highest of (each of) the declared frequency band(s) shall be provided also in expanded scale (-10 dB of the main lobe) to verify the -1 dB beam-width needed for the antenna XPD measurements.

The radiation patterns shall be provided on separate graphs for clarification. The option for overlaying the RPEs, as detailed in the relevant ETSI Standard, could be adopted.

If necessary for clarification an appropriate enlarged scale shall be used to present the test results.

As guide-line the plots should be provided on a minimum of 90% of A4.

B.1.3.1.2 Cross-polar radiation patterns

The cross-polar radiation patterns measured as a minimum at the lowest, middle and highest frequency of (each of) the declared frequency band(s) shall be provided.

A possible representation of the results is shown below.

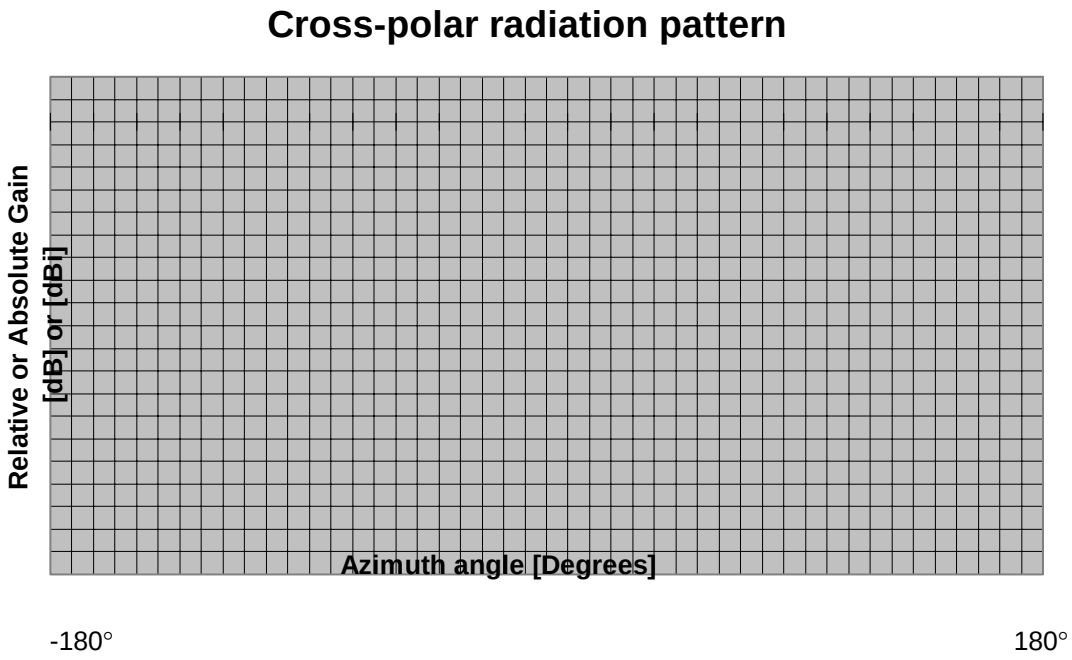


Figure B.2

Antenna model type number	
Frequency	
Polarization	

The radiation patterns shall be provided on separate graphs for clarification. The option for overlaying the RPEs, as detailed in the relevant ETSI Standard, could be adopted.

If necessary for clarification an appropriate enlarged scale shall be used to present the test results.

As a guideline the plots should be provided on a minimum of 90% of A4.

B.1.3.2 Antenna cross-polar discrimination (XPD)

This suclause applies only to high XPD antennas EN 300 833 [1]. For standard XPD antennas the cross-polar radiation patterns give all the information concerning the antenna XPD.

At each measured angular point the antenna XPD shall be provided.

B.1.3.3 Antenna gain

The antenna gain measured as a minimum at the lowest, middle and highest frequency of (each of) the declared frequency band(s) shall be provided.

A possible representation of the results is shown below.

Frequency [GHz]	**Lowest frequency**	**Middle frequency**	**Highest frequency**
Antenna gain [dBi]			

In the case of dual polarized antenna a clear indication of the polarization of the input port shall be stated.

The method used in the gain measurement has to be declared.

B.1.3.4 Environmental conditions during the test

The environmental conditions during the test shall be stated. If the environmental conditions cause the test results to be affected then this is to be stated.

B.1.4 Measurement Accuracy

The radiation pattern measurements must be performed at test sites where attempts are made to suppress the effects of reflected signals from the surroundings and eventual radio interference is controlled IEC 835-2-2 [8].

The level of the reflections has to be used in the definition of the uncertainty of the measurements.

If the RPE is effected by reflections and the level of reflections is known from special verifications with reference antennas or time gating, this shall be clearly noted in the Test Report.

The two parameters to be considered in the measurements of antennas are:

1) the amplitude of the received signal;

2) the angular position of the IUT, generally referred to the main beam axis.

Information relating the test site is contained in annex.

B.1.4.1 Gain measurement accuracy

Where substitution techniques are used particular attention to the following parameters should be noted.

With respect to the amplitude, the measurement accuracy must be derived over the complete dynamic range and in particular the following parameters should be taken into account:

- receiver linearity (between the I.U.T. and reference antenna measured levels);
- receiver sensitivity;
- reflectivity of the test set-up;
- mismatch between the antennas (I.U.T and reference antenna) and the measurement port of the set-up;
- accuracy of the calibration of the reference antenna;
- misalignment of the IUT and reference antenna.

B.1.4.2 Co-polar, cross-polar radiation patterns and antenna XPD measurement accuracy

With respect to the amplitude, the measurement accuracy must be derived over the complete dynamic range and in particular the following parameters should be taken into account:

- receiver linearity;
- receiver sensitivity;
- reflectivity of the test set-up.

In the comparison with the mask of the relevant standard the overall accuracy of the measured radiation pattern must also included the gain accuracy.

B.2 Test equipment used for tests

In the following table the test equipment used for the test shall be listed by the test laboratory.

In each separate part of the test report the used test equipment shall be stated. The instruments are then identified by a number which refers to the table below.

No.	Test equipment	Type	Manufacturer	Reference number	Calibration due day
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					

B.3 Supplementary information

Remarks:

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B.4 Test site details

It may be necessary to provide a sketch of the test site as part of the test report, showing possible sources of reflections and terrain details, i.e. side profile and overall view. The critical angles in the test site should be clearly identified to guarantee the accuracy of the measurements.

B.4.1 Example of test site description

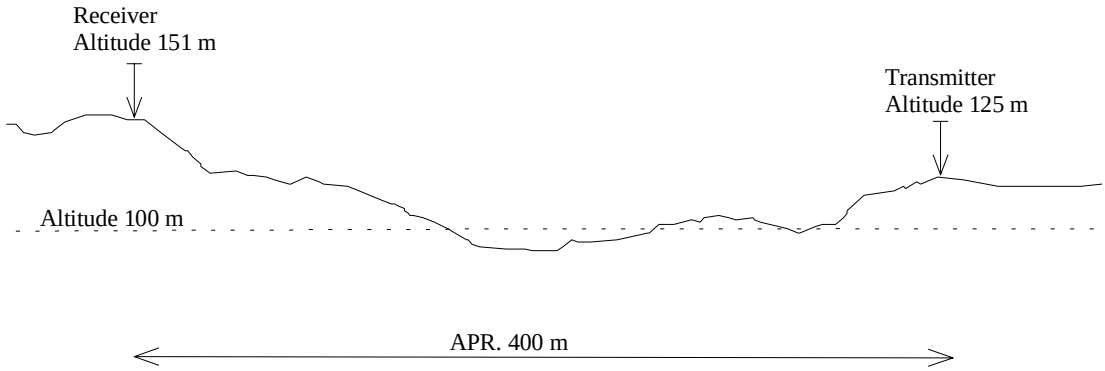

Figure B.3: Terrain profile

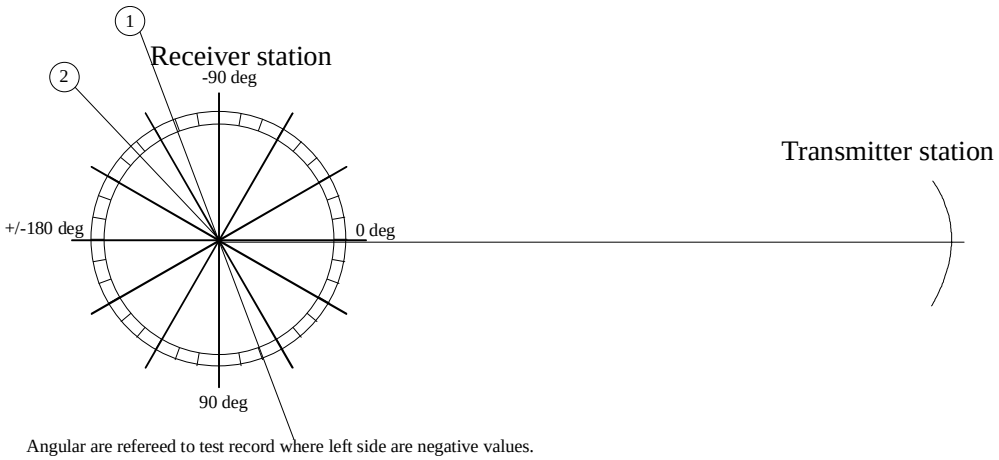

Figure B.4: Typical interference chart with reflections from buildings and structures or radio interferences

Table B.1: Example of table of interference

No.	Interference type	Interference source	Distance to source	Additional information
1	Radio link		23 km	
2	Reflection	tree	120 m	

Bibliography

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

- EN 300 631-1: "Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Part 1: Antennas for Point-to-Point (P-P) radio links in the 1 GHz to 3 GHz band".

- EN 45014 (1988): "General criteria for supplier's declaration of conformity".

History

Document history			
V1.1.1	July 1999	Public Enquiry	PE 9949: 1999-07-07 to 1999-11-05