



**SLOVENSKI STANDARD**  
**SIST EN 301 126-3-2 V1.2.1:2003**  
**01-december-2003**

---

: ]\_gb]fUX]g\_]g]ghYa ]'E'DfYg\_i yUb'Y'g\_`UXbcghj'E' !&"XY.'5 bhYbY'hjdUlc \_U]j Y  
lc \_U!'8 YZ]b]W]Y'Zgd`cybY'nU hYj Y]b'dfYg\_i gb]dcgld\_]

Fixed Radio Systems; Conformance testing; Part 3-2: Point-to-Multipoint antennas -  
Definitions, general requirements and test procedures

**iteh STANDARD PREVIEW**  
**(standards.iteh.ai)**

Ta slovenski standard je istoveten z: **EN 301 126-3-2 Version 1.2.1**

<https://standards.iteh.ai/catalog/standards/sis/4066557c-7148-4d9c-a307-f726093c3526/sist-en-301-126-3-2-v1-2-1-2003>

**ICS:**

33.060.30	Radiorelejni in fiksni satelitski komunikacijski sistemi	Radio relay and fixed satellite communications systems
33.120.40	Antene	Aerials

**SIST EN 301 126-3-2 V1.2.1:2003**      **en**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 301 126-3-2 V1.2.1:2003

<https://standards.iteh.ai/catalog/standards/sist/406b357c-7148-4d9e-a307-f726093c3526/sist-en-301-126-3-2-v1-2-1-2003>

# ETSI EN 301 126-3-2 V1.2.1 (2003-12)

---

*European Standard (Telecommunications series)*

## **Fixed Radio Systems; Conformance testing; Part 3-2: Point-to-Multipoint antennas - Definitions, general requirements and test procedures**

---

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 301 126-3-2 V1.2.1:2003](https://standards.iteh.ai/catalog/standards/sist/406b357c-7148-4d9e-a307-f726093c3526/sist-en-301-126-3-2-v1-2-1-2003)

<https://standards.iteh.ai/catalog/standards/sist/406b357c-7148-4d9e-a307-f726093c3526/sist-en-301-126-3-2-v1-2-1-2003>



---

Reference

REN/TM-04150

---

Keywordsantenna, DFRS, DRRS, multipoint, testing,  
transmission**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  
Sous-Préfecture de Grasse (06) N° 7803/88

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 301 126-3-2 V1.2.1:2003

<https://standards.iteh.ai/catalog/standards/sist/406b357c-7148-4d9e-a307-f726093c3527/sist-en-301-126-3-2-v1-2-1-2003>  
**Important notice**

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, send your comment to:

[editor@etsi.org](mailto:editor@etsi.org)

---

**Copyright Notification**

No part may be reproduced except as authorized by written permission.  
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2003.  
All rights reserved.

**DECT™**, **PLUGTESTS™** and **UMTS™** are Trade Marks of ETSI registered for the benefit of its Members.  
**TIPHON™** and the **TIPHON logo** are Trade Marks currently being registered by ETSI for the benefit of its Members.  
**3GPP™** is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

# Contents

Intellectual Property Rights .....	5
Foreword.....	5
1 Scope .....	6
2 References .....	6
3 Definitions, symbols and abbreviations .....	7
3.1 Definitions .....	7
3.2 Symbols.....	9
3.3 Abbreviations .....	9
4 Requirements related to antennas conformance test .....	10
4.1 General requirements .....	10
4.2 Implementation under test (IUT).....	11
5 Supplier's Declaration .....	12
5.1 General characteristics .....	12
5.1.1 Frequency range.....	12
5.1.1.1 Frequency band .....	12
5.1.2 Class of antenna RPE.....	12
5.1.3 Sector angle .....	12
5.1.4 Gain .....	12
5.1.5 Environmental characteristics .....	12
5.1.6 Antenna stability .....	12
5.1.7 Antenna input connector .....	12
5.1.8 RL/VSWR.....	13
5.1.9 Inter-port isolation .....	13
5.1.10 Polarization .....	13
6 Test procedures for essential requirements .....	13
6.1 Radiation Pattern Envelope (RPE).....	13
6.2 Antenna gain .....	15
6.3 Other antenna characteristics.....	17
6.3.1 Passive intermodulation, VSWR and inter-port isolation .....	17
<b>Annex A (normative): Supplier's Declaration .....</b>	<b>18</b>
A.1 Supplier's Declaration against the essential parameters .....	18
A.2 Supplier's Declaration against the complementary/optional parameters .....	19
A.2.1 Environmental characteristics .....	19
A.2.1.1 Temperature range .....	19
A.2.1.2 Wind survival.....	19
A.2.2 Antenna stability .....	19
A.2.3 Antenna input connectors .....	19
A.2.4 RL/VSWR .....	20
A.2.5 Inter-port isolation .....	20
A.3 Supplementary information (if applicable) .....	20
<b>Annex B (normative): Test report.....</b>	<b>21</b>
B.1 Test results.....	21
B.1.1 Summary of tests .....	21
B.1.2 General information about the tests .....	21
B.1.3 Test result forms .....	21
B.1.3.1 Radiation Pattern Envelope (RPE).....	21
B.1.3.1.1 Azimuth co-polar radiation patterns.....	21
B.1.3.1.2 Azimuth cross-polar radiation patterns .....	22

B.1.3.1.3	Elevation co-polar radiation patterns .....	23
B.1.3.1.4	Elevation cross-polar radiation patterns .....	24
B.1.3.2	Antenna gain .....	25
B.1.3.3	Environmental conditions during the test .....	25
B.1.4	Measurement accuracy .....	26
B.1.4.1	Gain measurement accuracy .....	26
B.1.4.2	Co-polar and cross-polar radiation patterns measurement accuracy .....	26
<b>Annex C (informative): Test site description .....</b>		<b>27</b>
C.1	Test equipment used for tests .....	28
C.2	Supplementary information (if applicable) .....	28
<b>Annex D (informative): Bibliography .....</b>		<b>29</b>
History .....		30

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 301 126-3-2 V1.2.1:2003](https://standards.iteh.ai/catalog/standards/sist/406b357c-7148-4d9e-a307-f726093c3526/sist-en-301-126-3-2-v1-2-1-2003)

<https://standards.iteh.ai/catalog/standards/sist/406b357c-7148-4d9e-a307-f726093c3526/sist-en-301-126-3-2-v1-2-1-2003>

## Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://webapp.etsi.org/IPR/home.asp>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

## Foreword

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

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's 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 3-2 of a multi-part deliverable 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 2-6: "Point-to-Multipoint equipment; Test procedures for Multi Carrier Time Division Multiple Access (MC-TDMA) systems";
- Part 2-7: "Test procedures and proforma for declaration of results for transmitter eirp mask and block edge mask";
- Part 3-1: "Point-to-Point antennas; Definitions, general requirements and test procedures";
- Part 3-2: "Point-to-Multipoint antennas - Definitions, general requirements and test procedures".**

### National transposition dates

Date of adoption of this EN:	28 November 2003
Date of latest announcement of this EN (doa):	29 February 2004
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 August 2004
Date of withdrawal of any conflicting National Standard (dow):	31 August 2004

---

## 1 Scope

The present document details standardized procedures for conformance testing of antennas for Point-to-MultiPoint radio relay systems [1], [2] and [3] in order to achieve the approval by the Type Approval Authority.

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

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.

The conformance tests described in the present document are related to antenna specific parameters required directly by the relevant antenna standards [1], [2] and [3].

The present document applies to both those antennas that are separate and those that are in some manner partially or fully integrated with the outdoor equipment. In all cases, whilst facilitating access to the appropriate antenna port, testing shall preserve the electro-magnetic environment i.e. be representative of the outdoor unit enclosure / electronics used in the typical (manufacturers' recommended) configuration. This need to maintain consistency with the manufacturer's recommended configuration is particularly important for less directional antennas (commonly with less than 25 dBi gain, although this value will depend on the specific ETS/EN parameters for that class, type etc).

It is noted that antennas intended for Point-to-Point (P-P) use are similarly the subjects of separate standards covering their characteristics and conformance testing [5], [6] and [7]. In some cases, particularly for the higher gains and frequencies, such P-P antennas may be appropriate for P-MP usage at the discretion of the regulatory authority. In such cases the regulatory authority will also define the applicable antenna and conformance-testing standard.

---

## 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.

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

- [1] ETSI EN 301 525: "Fixed Radio Systems; Point-to-Multipoint Antennas; Antennas for Point-to-Multipoint fixed radio systems in the 1 GHz to 3 GHz band".
- [2] ETSI EN 302 085: "Fixed Radio Systems; Point-to-Multipoint Antennas; Antennas for point-to-multipoint fixed radio systems in the 3 GHz to 11 GHz band".
- [3] ETSI EN 301 215 (series): "Fixed Radio Systems; Point-to-Multipoint Antennas; Antennas for point-to-multipoint fixed radio systems in the 11 GHz to 60 GHz band".
- [4] Void.
- [5] ETSI EN 300 631: "Fixed Radio Systems; Point-to-Point Antennas; Antennas for point-to-point fixed radio systems in the 1 GHz to 3 GHz band".
- [6] ETSI 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".
- [7] ETSI EN 301 126-3-1: "Fixed Radio Systems; Conformance testing; Part 3-1: Point-to-Point antennas; Definitions, general requirements and test procedures".
- [8] ISO/IEC 17025: "General requirements for the competence of testing and calibration laboratories".

- [9] ISO/IEC Guide 28: "General rules for a model third-party certification system for products".
- [10] Void.
- [11] EN 45002: "General criteria for the assessment of testing laboratories".
- [12] ISO 9001 (1994): "Quality systems - Model for quality assurance in design, development, production, installation and servicing".
- [13] IEC 60835-2-2 (1994): "Methods of measurement for equipment used in digital microwave transmission systems - Part 2: Measurements on terrestrial radio-relay systems - Section 2: Antenna".
- [14] ISO/IEC 15485 (1997): "Information technology - Data interchange on 120 mm optical disk cartridges using phase change PD format - Capacity: 650 Mbytes per cartridge".
- [15] IEC 60169 (series): "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 17025 [8], ISO Guide 28 [9] and EN 45002 [11]

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

**approval testing:** Approval testing is required for 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 ETS/EN against which it has been tested.

**axial ratio:** the ratio of maximum to minimum power contained in the field components of the polarization ellipse

**boresight:** the axis of the main beam in a directional antenna

**Central Station (CS):** base station which communicates each way with many terminal stations and, in many cases, repeater stations

**complementary requirements:** in an ETS/EN all those requirements not part of the essential requirements are complementary requirements

**conformance testing:** the type testing process to verify to what extent the IUT conforms to the ETS/EN

**co-polar pattern:** diagram representing the radiation pattern of a test antenna when the reference antenna is similarly polarized, scaled in dBi or dB relative to the measured antenna gain

**cross-polar pattern:** diagram representing the radiation pattern of a test antenna when the reference antenna is orthogonally polarized, scaled in dBi, or dB relative to the measured antenna gain

**essential requirements:** basic set of parameters and functions which are necessary to meet any regulatory obligations imposed for radio frequency co-ordination

**fixed beam:** the radiation pattern in use is fixed relative to a defined mechanical reference plane

**full conformance:** the status of the IUT when it has successfully passed all the requirements of the conformance testing process and therefore meets all the mandatory requirements of the ETS/EN

**gain:** ratio of the radiation intensity in a given direction to the radiation intensity that would be obtained if the power accepted by the antenna were radiated isotropically

**half power beamwidth:** angle, relative to the main beam axis, between the two directions at which the measured co-polar pattern is 3 dB below the value on the main beam axis

**input port(s):** flange(s) or connector(s) through which access to the antenna is provided

**inter-port isolation:** ratio in dB of the power level applied to one port of a multi-port antenna to the power level received in any other port of the same antenna as a function of frequency

**Implementation Under Test (IUT):** representative sample of the equipment to be tested

**isotropic radiator:** hypothetical, lossless antenna having equal radiation intensity in all directions

**Left hand (anticlockwise) polarised wave:** an elliptically-or circularly-polarised wave, in which the electric field vector, observed in any fixed plane, normal to the direction of propagation, rotates in time in a left-hand or anticlockwise direction

**main beam axis:** direction for which the radiation intensity is a maximum

**main beam:** radiation lobe containing the direction of maximum radiation

**mandatory requirements:** a mandatory requirement is defined as one which the IUT (implementation under test) shall meet. To achieve full conformance all ETS/EN requirements are mandatory

**mechanical tilt:** fixed angular shift in elevation of the antenna main beam axis by a change to the physical mounting

**optional requirements:** the term "optional" is used in ETS/EN with two different meanings:

- 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;
- 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 ETS/EN.

**radiation pattern:** envelope within which the radiation pattern shall fit

**Radiation Pattern Envelope (RPE):** envelope below which the RADIATION PATTERN shall fit

**radiation pattern:** diagram relating power flux density at a constant distance from the antenna to the direction relative to the notional antenna main beam axis. Specifically referenced in the present document to the zero degree reference direction.

**radome:** cover, of dielectric material, intended for protecting an antenna from the effects of its physical environment

**repeater station:** radio station providing the connection via the air to both the central station and the terminal station(s). The remote station may also provide the interfaces to the subscriber equipment, if applicable.

**right hand (clockwise) polarised wave:** an elliptically-or circularly-polarised wave, in which the electric field vector, observed in any fixed plane, normal to the direction of propagation, rotates in time in a right-hand or clockwise direction

**sector angle:** declared angle of coverage in azimuth of a sectored antenna

NOTE: Defined as  $2\alpha$  in the present document.

**supplier:** organization requesting the approval

**Supplier's Declaration (SD):** procedure by which a supplier gives written assurance that a parameter or function conforms to the ETS/EN

**type approval authority:** National Regulatory/Licensing Authority

**type approval testing:** type approval testing is the process of type testing for approval

NOTE: A type test is to be carried out successfully in order to achieve approval.

**type testing:** type testing is where a representative sample of the equipment is tested

NOTE: The test result is considered to be applicable and representative for all subsequent units of the same type. Any changes that could potentially affect the three essential requirements shall be notified to the Type Approval Authority.

**Terminal Station (TS):** remote (out) station which communicates with a central station

**tilt:** fixed, angular shift of the antenna main beam axis (boresight) in the elevation plane by either electrical, electronic or mechanical means

**zero degree:** declared direction as referenced to the antenna

**reference direction:** mechanical characteristics, used as reference for the RPE

**integrated antenna:** the antenna is considered to be integral to the product if either the antenna forms a component of the enclosure or the antenna is contained within the overall enclosure of the product

## 3.2 Symbols

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

dB <sub>i</sub>	decibels relative to an isotropic radiator
dB <sub>iC</sub>	decibels relative to an isotropic circularly polarised source
dB <sub>m</sub>	decibels relative to milli-Watt
dB	deciBel
2 $\alpha$	sector angle, (twice alpha)
GHz	GigaHertz
MHz	MegaHertz

## 3.3 Abbreviations

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

CR	Complementary Requirement
CS	Central Station
ER	Essential Requirement
Ext	Extreme conditions
IUT	Implementation Under Test
OR	Optional Requirement
P-MP	Point-to-MultiPoint
P-P	Point-to-Point
Ref	Reference conditions
RL	Return Loss
RPE	Radiation Pattern Envelope
RS	Repeater Station
SD	Supplier's Declaration
TR	Test Required
TS	Terminal Station
VSWR	Voltage Standing Wave Ratio

## 4 Requirements related to antennas conformance test

P-MP antennas may be designed for Central Station (CS), Repeater Station (RS) or Terminal Station (TS) use, and may be categorized in the corresponding standard by means of type, class and range, as required [1], [2] and [3].

Some P-MP antennas require definition of the antenna zero degree reference, which is defined as the declared direction as referenced to the antenna mechanical characteristics, and this is used as reference for the RPE.

Although the RPE limits for TS and some RS antennas are generally identical for azimuth and elevation, the actual patterns should not be assumed to be symmetric.

### 4.1 General requirements

In table 1 the generic clauses and parameters are classified, for conformance test purposes, in terms of the various categories. The table also provides for defining the climatic conditions applicable during testing of the parameters.

**Table 1: "Generic requirements" classification**

Function or Parameter Description	Status for conformance			Requirement for conformance test			Power supply conditions		Climatic conditions for test		Limiting values	Test methods	
	ER	CR	OR	SD (see note 1)	TR	SD + TR	Ref	Ref + Ext	Ref (see note 2)	Ref + Ext		Clause Ref.	IEC 60835-2-2 [13] or other references. (see note 3)
Frequency range		X	X	X									
Frequency band(s)		X	X	X									
Class of antenna RPE		X	X	X									
Radiation Pattern Envelope (RPE)	X		X						X		X		IEC 60835-2-2 [13]
Sector or beam angle (see note 4) ( $2\alpha$ )		X	X	X									
Number of beams (see note 5)		X		X									
Reference beam direction ( $\epsilon$ ) (see note 5)		X		X									
Antenna gain	X		X			X			X		X		IEC 60835-2-2 [13]
Environmental characteristics		X	X	X									
Antenna stability		X	X	X									
Antenna input connectors		X	X	X									
Polarization		X	X	X									
Return loss / VSWR		X		X									IEC 60835-2-2 [13]