

ETSI EN 302 326-3 V1.3.1 (2008-02)

Harmonized European Standard (Telecommunications series)

Fixed Radio Systems; Multipoint Equipment and Antennas; Part 3: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive for Multipoint Radio Antennas

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Reference

REN/ATTM-04002

Keywords

access, antenna, DFRS, DRRS, FWA, multipoint,
radio, system

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Contents

Intellectual Property Rights	5
Foreword.....	5
0 Introduction	6
0.1 General	6
0.2 Relationship with the R&TTE essentials requirements	6
1 Scope	8
1.1 General	8
1.2 Frequency ranges.....	9
1.3 Profiles	9
1.3.1 General.....	9
1.3.2 Equipment profiles.....	9
1.3.3 Antenna profiles.....	10
1.3.4 System profiles	10
2 References	11
2.1 Normative references	11
2.2 Informative references.....	11
3 Definitions, symbols and abbreviations	12
3.1 Definitions.....	12
3.2 Symbols.....	16
3.3 Abbreviations	16
4 Technical requirements specifications	16
4.1 Classification of antennas.....	16
4.2 Phenomena description.....	17
4.2.1 General.....	17
4.2.2 Radiation Pattern Envelope (RPE).....	17
4.2.3 Antenna Gain	18
4.3 Environmental specifications and test	19
4.4 Radiation Pattern Envelope (RPE) requirements	19
4.4.1 Directional antennas (DN): co-polar and cross-polar RPEs.....	19
4.4.1.1 Classes defined in the present document.....	19
4.4.1.2 Directional antennas conforming to EN 302 217-4-1 and EN 302 217-4-2.....	22
4.4.2 Sectored single beam antennas (SS)	22
4.4.2.1 Radiation Pattern Envelope (RPE), azimuth: co-polar and cross-polar	22
4.4.2.2 Radiation Pattern Envelope (RPE), elevation	25
4.4.2.2.1 Symmetric elevation RPEs: co-polar and cross-polar	25
4.4.2.2.2 Asymmetric elevation RPEs: co-polar and cross-polar	26
4.4.3 Sectored multi-beam antennas (MS).....	26
4.4.3.1 General	26
4.4.3.2 Radiation Pattern Envelope (RPE), azimuth: co-polar and cross-polar	27
4.4.3.3 Radiation Pattern Envelope (RPE), elevation: co-polar and cross-polar.....	29
4.4.4 Omnidirectional antennas (OD and ODT)	29
4.4.4.1 General	29
4.4.4.2 CS Radiation Pattern Envelope (RPE), elevation.....	29
4.4.4.2.1 Symmetric elevation RPEs: co-polar and cross-polar	29
4.4.4.2.2 Asymmetric elevation RPEs: co-polar and cross-polar	30
4.4.4.3 TS Radiation Pattern Envelope (RPE)	30
4.5 Antenna gain requirements.....	31
4.5.1 General.....	31
4.5.2 Directional antennas	31
4.5.3 Sectored single beam antennas	32
4.5.4 Sectored multi-beam antennas	32
4.5.5 Omnidirectional antennas	32
4.5.5.1 CS OmniDirectional (OD)	32

4.5.5.2	TS omnidirectional (ODT).....	33
5	Testing for conformance with technical requirements	33
5.1	Void.....	33
5.2	Wide radio-frequency band covering antennas specification and test.....	33
5.3	Environmental conditions for Testing	33
5.4	Radiation Pattern Envelope (RPE).....	33
5.5	Antenna gain	33
Annex A (normative):	HS Requirements and conformance Test specifications Table (HS-RTT).....	34
Annex B (informative):	Antenna profiles.....	36
B.1	General	36
B.2	Directional antennas.....	36
B.3	Sectorial and omnidirectional antennas.....	37
Annex C (informative):	The EN title in the official languages	38
Annex D (informative):	Bibliography.....	39
History		40

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Foreword

This Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM).

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the 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 ("the R&TTE Directive" [1]).

Technical specifications relevant to Directive 1999/5/EC [1] are given in annex A.

This multi-part deliverable covers characteristics and requirements for fixed multipoint radio equipment and antennas, using a variety of access and duplex methods and operating at a variety of bit rates in frequency bands as specified in the present document.

The present document is part 3 of a multi-part deliverable covering the Fixed Radio Systems; Multipoint Equipment and Antennas, as identified below:

- Part 1: "Overview and Requirements for Digital Multipoint Radio Systems";
- Part 2: "Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive for Digital Multipoint Radio Equipment";
- Part 3: "Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive for Multipoint Radio Antennas".**

EN 302 326-2 [6] and the present document are Harmonized ENs and essential requirements are those requirements which are essential under article 3.2 of the R&TTE Directive [1].

In the above, "equipment" includes equipment with integral antennas, and "antennas" include requirements for antennas whether they are integral or non-integral.

Besides its previous versions, the present document with EN 302 326-2 [6] replaces and supersedes the harmonized EN 301 753 [9] for all Multipoint equipment and antennas under its scope.

National transposition dates	
Date of adoption of this EN:	25 January 2008
Date of latest announcement of this EN (doa):	30 April 2008
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 October 2008
Date of withdrawal of any conflicting National Standard (dow):	31 October 2009

0 Introduction

0.1 General

For the general background, rationale and structure of the present document see also the clause "Introduction" in EN 302 326-1 [5].

With respect to previous version of the present document, provisions for TS omnidirectional antennas for indoor NWA applications are given.

0.2 Relationship with the R&TTE essentials requirements

The present document is part of a set of standards developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the R&TTE Directive [1]. The modular structure is described in EG 201 399 [7] and shown in figure 1.

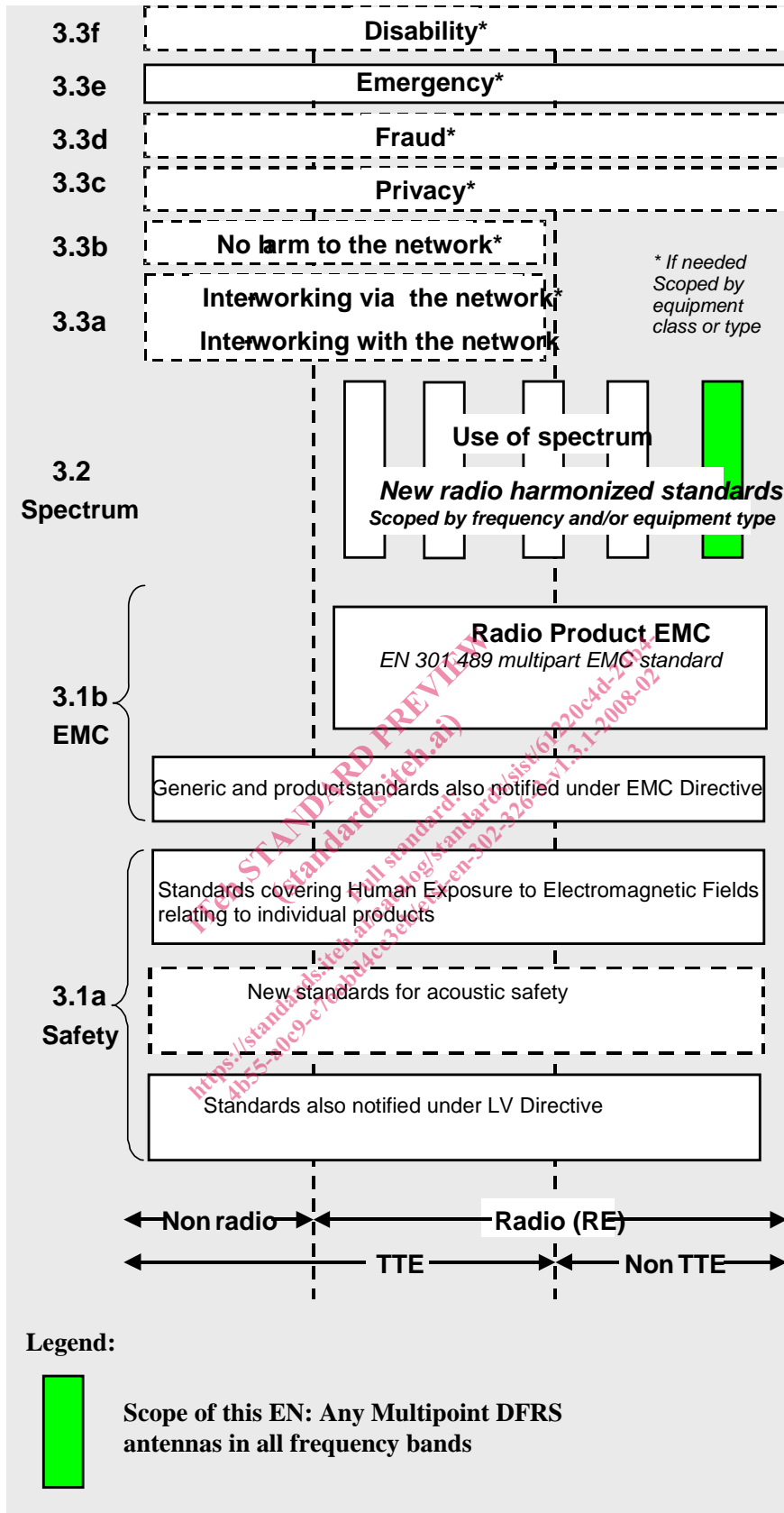


Figure 1: Modular structure for the various standards used under the R&TTE Directive [1]

1 Scope

1.1 General

The present document is intended to cover the provisions of the R&TTE Directive [1] regarding article 3.2, which states that "... radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference".

The present document is applicable to the essential requirements of antennas (including those in equipment with integral antennas) used in Multipoint (MP) Digital Fixed Radio Systems (DFRS) (see note 1) intended for use in the frequency bands identified in EN 302 326-1 [5].

NOTE 1: Applications intended for offering in the bands 3,4 GHz to 3,8 GHz the option of Nomadic Wireless Access (NWA), according to the NWA definition in ITU-R Recommendation F.1399 [13], are also considered in the scope of the present document.

Besides its previous versions, the present document together with EN 302 326-2 [6], replaces and supersedes, after a suitable transition period, the harmonized EN 301 753 [9] for all multipoint equipment and antennas under its scope.

The present document and EN 302 326-2 [6] introduce rationalization among systems conforming to previous EN 301 753 [9] referencing a number of ENs which, being developed at different times, may have specified slightly different antenna parameters. Nevertheless, care has been taken so that such variations will not affect any frequency planning assumption for already deployed networks. Therefore, unless specifically mentioned, these new requirements, whenever different from those single ENs, are considered completely "equivalent". Therefore mixed use of antennas conforming to the present document and to those previous ones will not change, in practice, any frequency planning rule in any network.

Therefore, from a strictly technical point of view, in most cases it is expected that equipment already conforming to the previous versions of Harmonized EN 301 753 [9], would not need re-assessment of essential requirements according to the present document. The legal implications of the declaration of conformity and equipment labelling are, however, outside the scope of this whole multi-part deliverable. Cases, where additional conformance assessment is required, will be specifically mentioned in EN 302 326-2 [6] and in the present document.

A formal change in the requirements, with respect to EN 301 753 [9], is that the antenna manufacturer shall declare the nominal gain and tolerance of the antenna against which the conformity assessment is done.

In addition to the present document, other ENs specify technical requirements in respect of essential requirements under other parts of article 3 of the R&TTE Directive [1] and which will apply to antennas within the scope of the present document.

NOTE 2: A list of such ENs is included on the web site: <http://www.newapproach.org>.

In order to (technically) cover different market and network requirements, with an appropriate balance of performance to cost and effective and appropriate use of the radio spectrum, the present document, together with EN 302 326-2 [6], offers a number of system types and antennas alternatives, for selection by administrations, operators and manufacturers dependent on the desired use of the radio spectrum and network/market requirements; those options include:

- channel separation alternatives (as provided by the relevant CEPT Recommendation);
- spectral efficiency class alternatives (different modulation formats provided in radio equipment standards);
- antenna sectorization alternatives and directivity classes for CS;
- antenna directivity class alternatives for TS and/or RS, as well as omnidirectional alternative for TS intended for Nomadic Wireless Access (NWA);
- antenna basic polarization (linear or circular).

For Digital Fixed Radio Systems (DFRS), antennas are considered "relevant components" of "radio equipment" according the definition in article 2(c) of the R&TTE Directive [1].

More information and background on the R&TTE Directive [1] possible applicability and requirements for stand alone DFRS antennas is found in EG 201 399 [7] and in TR 101 506 [12].

Technical specifications relevant to the R&TTE Directive [1] are summarized in annex A.

1.2 Frequency ranges

The present document is applicable to antennas (whether integral or non-integral) used in multipoint radio systems operating in bands allocated to Fixed Service and assigned by national regulations to MP applications within the following frequency ranges:

- 1 GHz to 3 GHz;
- 3 GHz to 5,9 GHz;
- 5,9 GHz to 8,5 GHz;
- 8,5 GHz to 11 GHz;
- 24,25 GHz to 30 GHz;
- 30 GHz to 40,5 GHz.

NOTE 1: Attention is drawn to the fact that the specific operating bands are subject of CEPT or national licensing rules. Currently applicable Fixed Service bands and channel plans are described in EN 302 326-1 [5], although the applicability of these Fixed Service bands is at the discretion of the national administrations. Therefore, the present document applies only to those bands which are allocated to the Fixed Service and/or assigned by national regulations to MP applications on the date on which the EN was published.

NOTE 2: Antenna characteristics are not specified at frequencies below 1 GHz and therefore the present document and Harmonized EN 302 326-2 [6] can not be used for Declaration of conformity, according article 3.2 of the R&TTE Directive [1] for non integral antennas or for equipment with integral antennas below this limit. In this case, additional test suites for relevant antenna directional phenomena shall be produced in accordance with a Notified Body.

NOTE 3: MWS antenna systems in the band 40,5 GHz to 43,5 GHz are not within the scope of the present document. For these systems see EN 301 997-2 [10].

1.3 Profiles

1.3.1 General

This whole multi-part deliverable allows many distinct types of equipment, several different antenna types and several ways in which they might be interconnected to form a network. However, the applicability is limited to certain combinations of attributes and these combinations of attributes are called "profiles". The following clauses address:

- Equipment profiles.
- Antenna profiles.
- System profiles.

1.3.2 Equipment profiles

This whole multi-part deliverable allows alternative consistent sets of recommendations and requirements, each for identified equipment profiles, which are defined in terms of their Equipment Classification (EqC), which classify equipments in terms of key characteristics. The profiles (or indeed any specific equipment) within the scope of this whole multi-part deliverable may be classified as discussed in normative annex A of EN 302 326-1 [5]. Clause 6.1 of EN 302 326-1 [5] defines the permitted equipment profiles in terms of the various fields of EqC.

1.3.3 Antenna profiles

According to their characteristics, multipoint systems use different types of antennas. Table 1 outlines the multipoint antenna types described in the present document.

Table 1: Antenna Types

Frequency Range	Types	Polarization	Notes
1 GHz to 3 GHz	Directional Sectored single beam Omnidirectional	Linear	The sectored and omnidirectional antennas may have a symmetric or asymmetric radiation pattern in the elevation plane.
3 GHz to 11 GHz	Directional Sectored single beam Sectored multi-beam (up to 5,9 GHz only) Omnidirectional	Linear	The sectored single and omnidirectional antennas may have a symmetric or asymmetric radiation pattern in the elevation plane. The sectored multi-beam antennas have a symmetric radiation pattern only.
1 GHz to 11 GHz	Directional Sectored single beam Omnidirectional	Circular	The sectored and omnidirectional antennas may have a symmetric or asymmetric radiation pattern in the elevation plane.
24,25 GHz to 30 GHz	Directional Sectored single beam	Linear	
30 GHz to 40,5 GHz	Directional Sectored single beam Omnidirectional	Linear	The omnidirectional antennas may have a symmetric or asymmetric radiation pattern in the elevation plane.

The present document is applicable to multipoint radio system antennas of both linear (single or dual) polarization and circular (single or dual) polarization. Linear polarization antennas may support either or both of two mutually perpendicular planes of polarization. These planes are frequently, though not always, horizontal and vertical. Circular polarization antennas may support either right hand or left hand polarization or, for dual polarization, both.

The RPE directional characteristics and polarization characteristics (co-polar and cross-polar and for either linear or circular polarized antennas) impact on the interference to be considered in network planning. A number of antenna options are defined in the present document to allow a trade-off between highly demanding RPE directivity and the cost/size/weight of the antennas. The antenna choice should take into account present and future networks requirements and constraints.

Annex B discusses Antenna Profiles for multipoint systems.

1.3.4 System profiles

This multi-part deliverable applies only to Multipoint systems using the following antenna type to station type combinations according to whether the network topology is P-MP or MP-MP (Mesh). Table 2 indicates which system profiles are within the scope of this multi-part deliverable.

**Table 2: System Profiles within the scope of this multi-part deliverable:
Antenna types - Station types combinations**

Network topology	Station types	Antenna types		
		Omnidirectional	Sectored	Directional
P-MP	Central Station (CS)	Yes	Yes (See note 1)	No (See note 1)
	Repeater Station (RS)			
	Facing CS	No	No	Yes
	Facing TS or further RS	Yes	Yes	Yes
	Terminal Station (TS)	Yes (note 2)	No	Yes
MP-MP	Repeater Station (RS)	No	No	Yes

NOTE 1: Sectored antennas with beamwidth < 15° shall conform to the specification otherwise applicable to a directional antenna.

NOTE 2: Omnidirectional TS antennas are limited to typically indoor deployment (e.g. desk antennas) for NWA applications in 3,4 GHz to 3,8 GHz bands. Nor outdoor deployable at fixed location, neither integral to handheld TS, are considered antennas within the scope of the present document.

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.

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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 301 126-3-2: "Fixed Radio Systems; Conformance testing; Part 3-2: Point-to-Multipoint antennas - Definitions, general requirements and test procedures".
- [3] ETSI EN 302 217-4-1: "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 4-1: System-dependent requirements for antennas".
- [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] ETSI EN 302 326-1: "Fixed Radio Systems; Multipoint Equipment and Antennas; Part 1: Overview and Requirements for Digital Multipoint Radio Systems".
- [6] ETSI EN 302 326-2: "Fixed Radio Systems; Multipoint Equipment and Antennas; Part 2: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive for Digital Multipoint Radio Equipment".

2.2 Informative references

- [7] ETSI EG 201 399: "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of candidate Harmonized Standards for application under the R&TTE Directive".
- [8] 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".

- [9] ETSI EN 301 753: "Fixed Radio Systems; Multipoint equipment and antennas; Generic harmonized standard for multipoint digital fixed radio systems and antennas covering the essential requirements under article 3.2 of the Directive 1999/5/EC".
- [10] ETSI EN 301 997-2: "Transmission and Multiplexing (TM); Multipoint equipment; Radio equipment for use in Multimedia Wireless Systems (MWS) in the frequency band 40,5 GHz to 43,5 GHz; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive".
- [11] ETSI EN 302 078: "Fixed Radio Systems; Multipoint antennas; Circularly polarized antennas for multipoint fixed radio systems in the 1 GHz to 11 GHz band".
- [12] ETSI TR 101 506: "Fixed Radio Systems; Generic definitions, terminology and applicability of essential requirements under the article 3.2 of 99/05/EC Directive to Fixed Radio Systems".
- [13] ITU-R Recommendation F.1399: "Vocabulary of terms for wireless access".
- [14] ETSI EN 301 215-2: "Fixed Radio Systems; Point-to-Multipoint Antennas; Antennas for point-to-multipoint fixed radio systems in the 11 GHz to 60 GHz band; Part 2: 24 GHz to 30 GHz". .
- [15] ETSI EN 301 215-3: "Fixed Radio Systems; Point to Multipoint Antennas; Antennas for point-to-multipoint fixed radio systems in the 11 GHz to 60 GHz band; Part 3: Multipoint Multimedia Wireless System in 40,5 GHz to 43,5 GHz".
- [16] ETSI EN 301 215-4: "Fixed Radio Systems; Point-to-Multipoint Antennas; Antennas for multipoint fixed radio systems in the 11 GHz to 60 GHz band; Part 4: 30 GHz to 40,5 GHz".
- [17] 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 Definitions, symbols and abbreviations

3.1 Definitions

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

antenna: part of the transmitting or receiving system designed to transmit or receive electromagnetic radiation

azimuth plane: reference plane (see note) from which Radiation Pattern Envelopes are referenced

NOTE: This plane is nominally horizontal (see also *tilt*). The azimuth plane is generally mechanically identified by reference to the technical description for actual antennas for testing and deployment purposes. Sectorial and omnidirectional antennas might have intrinsic down-tilt of few degrees. In such cases, it would be more theoretically appropriate reference to a "conical" surface rather than a plane. However, tilt is generally compensated for by the test set antenna mounting (i.e. by tilting up the antenna test set mounting by an equivalent quantity) and the assessment is done by rotating the antenna rather than the receiving instrument. The test is thus performed in such a way that the measurements may be considered equivalent to those made in a true azimuth plane.

Central Station (CS): base station which communicates with Terminal Stations and in some cases Repeater Stations

co-polar: used to define parameters (such as gain or radiation pattern) applicable to radiated signals in the wanted plane of polarization (for linear polarization) or wanted direction of rotation (for circular polarization)

NOTE: The wanted plane or direction of rotation may be defined when the parameter is being measured by the plane or direction of rotation of the reference antenna.

co-polar pattern: diagram representing the co-polar radiation pattern of an antenna under test

NOTE: It is scaled in dBi or, as used in the present document, in dB relative to the measured antenna gain.