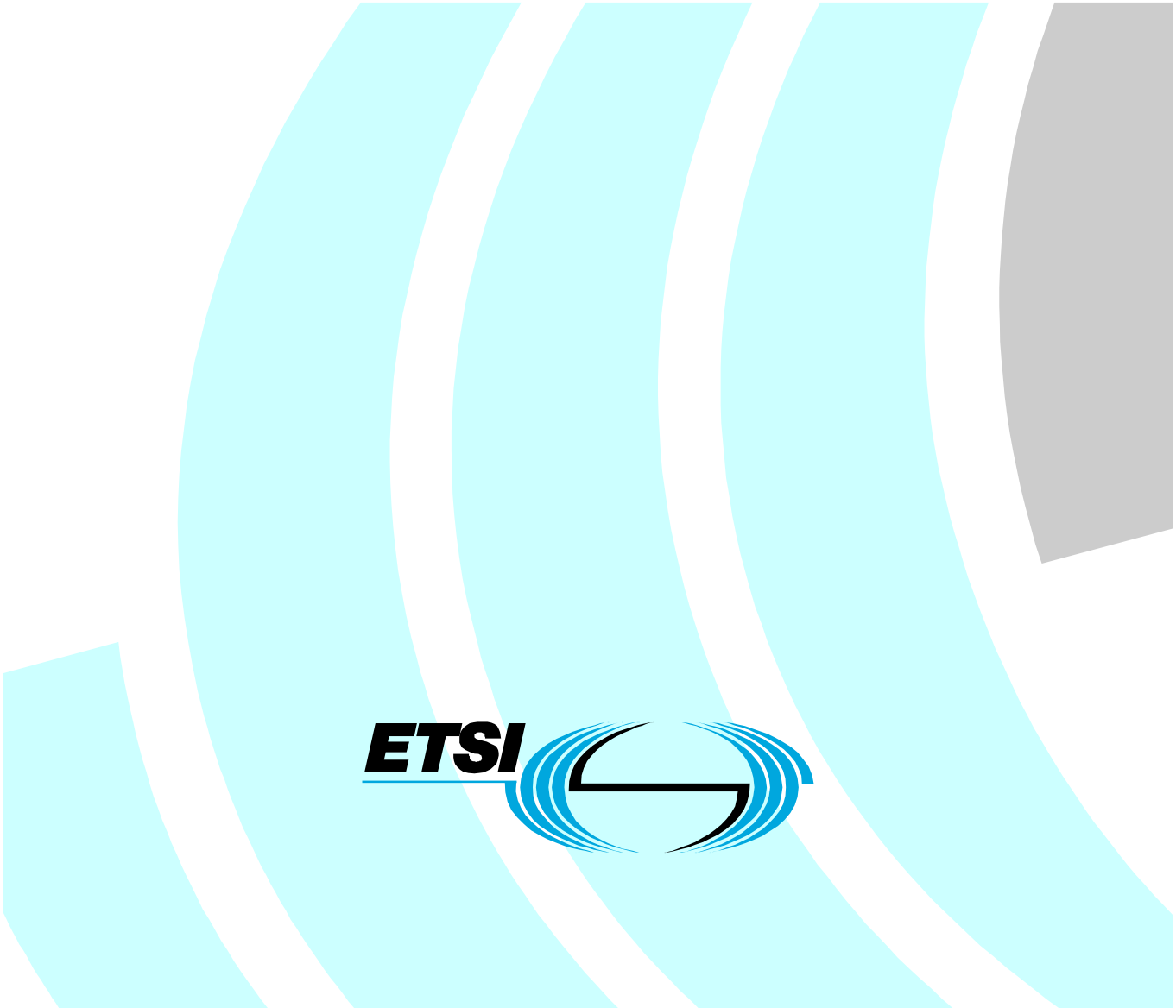
ETSI EN 301 215-4 V1.1.1 (2003-12)

European Standard (Telecommunications series)

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



Reference
DEN/TM-04057-4

Keywords
antenna, DFRS, DRRS, multipoint, radio, RLL, transmission

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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).

The present document is part 4 of a multi-part deliverable covering requirements for antennas in conjunction with MultiPoint (MP) systems necessary to facilitate frequency co-ordination between services in the frequency bands 11 GHz to 60 GHz, as identified below:

Part 1: "General aspects";

Part 2: "24 GHz to 30 GHz";

Part 3: "Multipoint Multimedia Wireless System in 40,5 GHz to 43,5 GHz";

Part 4: "30 GHz to 40,5 GHz".

The present document is organized in the following way. Part 1 gives general information about the scope, normative references, definitions, classification, normative and informative electrical and mechanical characteristics. Part 1 is the framework for further parts, where distinct values of normative characteristics for a given frequency sub-band are defined. Consequently, part 1 in combination with another part forms the EN for a given sub-band.

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 specifies the essential electrical requirements for linear polarization, fixed beam antennas to be utilized with new MultiPoint (P-MP and MP-MP) systems EN 301 997-1 [1], including Central Station, Repeater and Terminal Station applications, operating in frequency bands from 11 GHz to 60 GHz. These systems use various multiple access schemes. Antennas may be aligned manually, by electromechanical or by switching between a set of antennas. Electronically steered antenna arrays, and circularly polarized antennas are not considered in the present document.

The present document, taken together with EN 301 215-1 [4], specifies the requirements for multipoint systems operating in the frequency range 30 GHz to 40,5 GHz.

A Regulatory Authority may impose tighter requirements than the minimum values given in the present document, in order to maximize the use of scarce spectrum resources.

For some high gain multipoint requirements, antennas may be used having performance as per the appropriate point-to-point antenna standard. For these antennas, minimum requirements are given in EN 300 833 [2].

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 301 997-1: "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 1: General requirements".

[2] 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".

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

[4] ETSI EN 301 215-1: "Fixed Radio Systems; Point-to-multipoint Antennas; Antennas for point-to-multipoint fixed radio systems in the 11 GHz to 60 GHz band; Part 1: General aspects".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 301 215-1 [4] apply.

3.2 Symbols

For the purposes of the present document, the symbols given in EN 301 215-1 [4] apply.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in EN 301 215-1 [4] apply.

4 Electrical characteristics

4.1 Terminal Station antennas

The RPEs and gain parameters apply for both horizontal and vertical linearly polarized antennas.

4.1.1 TS Radiation Pattern Envelope (RPE)

The co-polar and cross-polar radiation patterns for both azimuth and elevation, shall not exceed the RPE(s) defined in the following list.

- The gain values defined are all relative to maximum, actual gain at the measurement frequency.

Class TS1: Table 1a, figure 1a

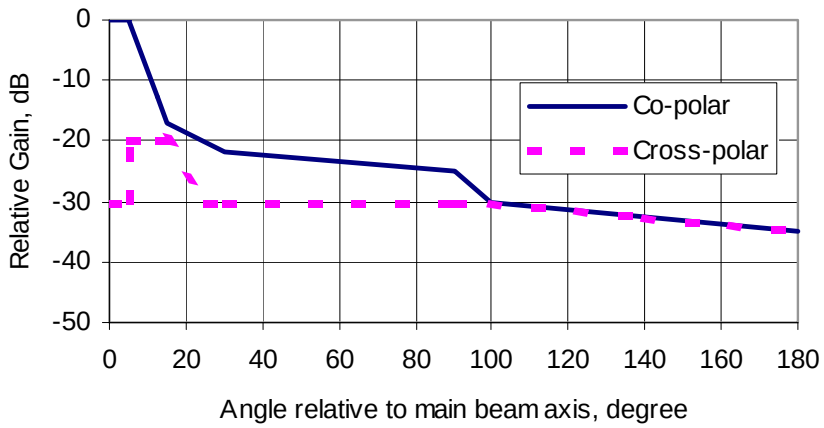

Figure 1a: Class TS1 terminal station antenna

Table 1a: Class TS1

Angle (degree)	Co-polar (dB)	Angle (degree)	Cross-polar (dB)
0	0	0	-30
5	0	5	-30
15	-17	5	-20
30	-22	12.5	-20
90	-25	25	-30
100	-30	100	-30
180	-35	180	-35

Class TS2: Table 1b, figure 1b

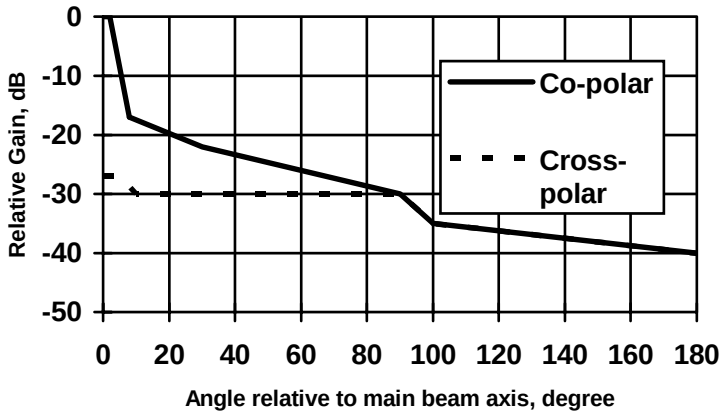

Figure 1b: Class TS2 terminal station antenna

Table 1b: Class TS2

Angle (degree)	Co-polar (dB)	Angle (degree)	Cross-polar (dB)
0	0	0	-27
2	0	5	-27
8	-17	10	-30
30	-22	90	-30
90	-30	100	-35
100	-35	180	-40
180	-40		

Class TS3: Table 1c, figure 1c

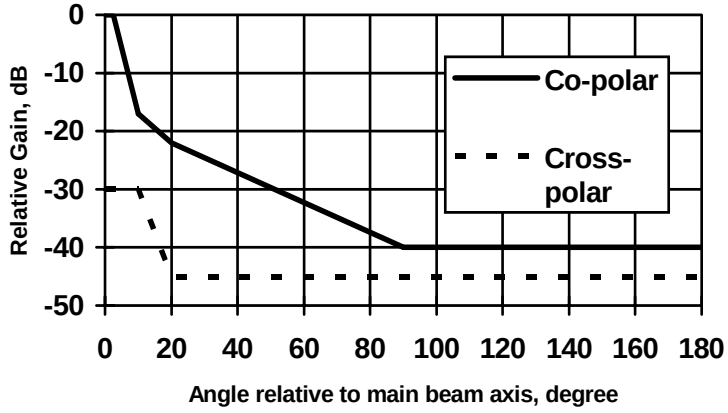

Figure 1c: Class TS3 terminal station antenna

Table 1c: Class TS3

Angle (degree)	Co-polar (dB)	Angle (degree)	Cross-polar (dB)
0	0	0	-30
2,5	0	10	-30
10	-17	20	-45
20	-22	180	-45
90	-40		
180	-40		

4.1.2 TS minimum antenna boresight gain

The minimum gain of the TS antenna, expressed relative to an isotropic radiator, shall be for:

- Gain Category 1: 24 dBi
- Gain Category 2: 28 dBi
- Gain Category 3: 32 dBi

4.2 Central Station (CS) sectored antennas

4.2.1 CS azimuth Radiation Pattern Envelopes, sectored

The CS azimuth templates for sectored (i.e. not omni) antennas are defined in the following list:

Class CS1	table 2, figure 2	for sector angles in the range 15° to 130°
Class CS2	table 3, figure 3	for sector angles in the range 15° to 180°
Class CS3	table 4, figure 4	for sector angles in the range 15° to 180°
Class CS4	table 5, figure 5	for sector angles in the range 15° to 180°

The templates shall apply for all frequencies in the 30 GHz to 40,5 GHz band. Both co-polar and cross-polar patterns are defined. The sector angle defined as 2α [4], shall be declared by the supplier. The gain values defined are all relative to the maximum gain in the declared sector angle.

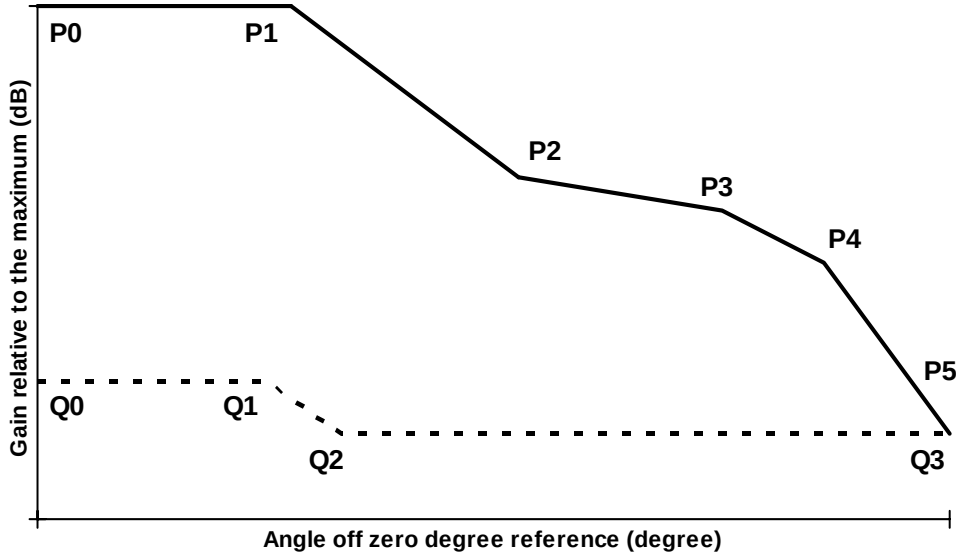

Figure 2: Normalized CS1 sector antenna template for azimuth

Table 2: Class CS1

a)

Co-polar	Angle (degree)	Relative Gain (dB)
P0	0	0
P1	$\alpha + 5$	0
P2	$2\alpha + 5$	-10
P3	135	-12
P4	155	-15
P5	180	-25

b)

Cross-polar	Angle (degree)	Relative Gain (dB)
Q0	0	-20
Q1	α	-20
Q2	$\alpha + 15$	-25
Q3	180	-25

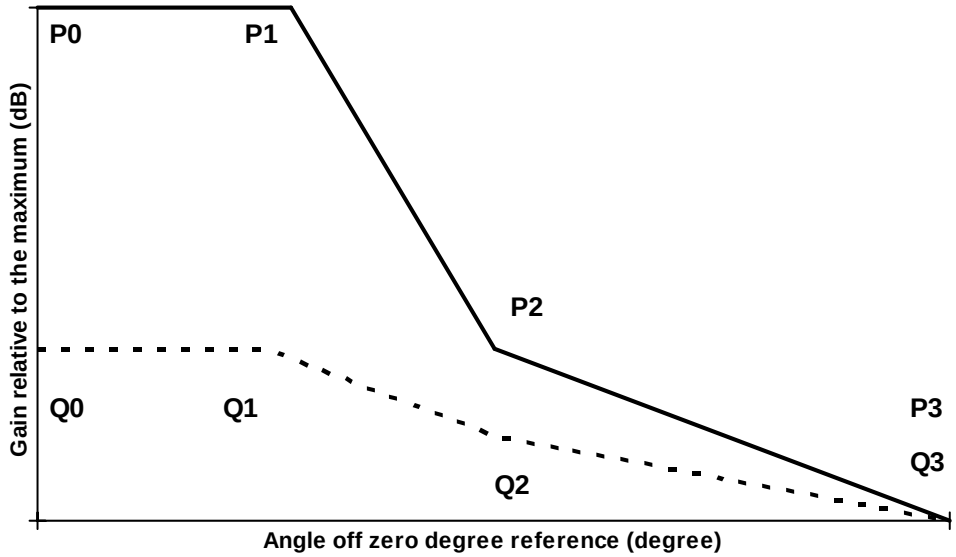

Figure 3: Normalized CS2 sector antenna template for azimuth

Table 3: Class CS2

a)

Co-polar	Angle (degree)	Relative Gain (dB)
P0	0	0
P1	$\alpha + 5$	0
P2	2α	-20
P3	180	-30

b)

Cross-polar	Angle (degree)	Relative Gain (dB)
Q0	0	-20
Q1	α	-20
Q2	2α	-25
Q3	180	-30

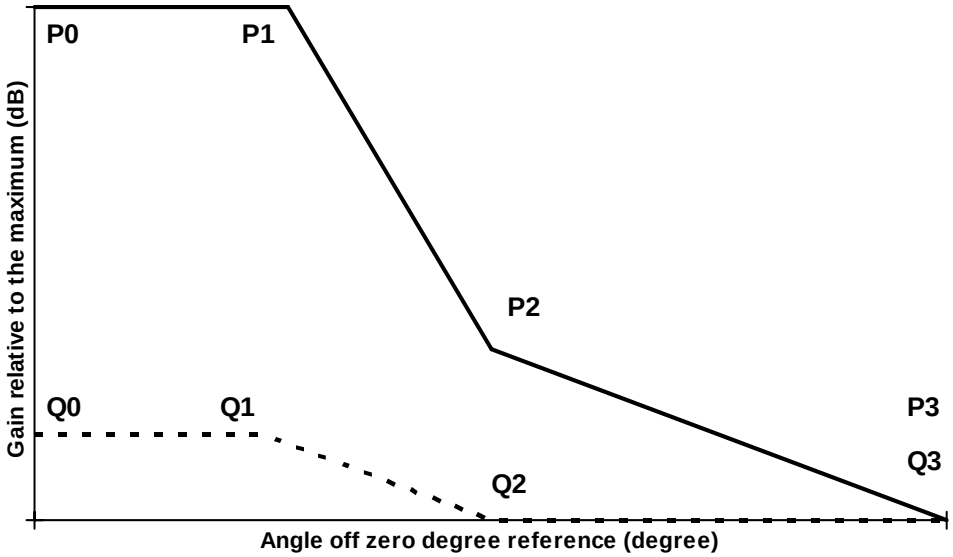

Figure 4: Normalized CS3 sector antenna template for azimuth

Table 4: Class CS3

a)

Co-polar	Angle (degree)	Relative Gain (dB)
P0	0	0
P1	$\alpha + 5$	0
P2	2α	-20
P3	180	-30

b)

Cross-polar	Angle (degree)	Relative Gain (dB)
Q0	0	-25
Q1	α	-25
Q2	2α	-30
Q3	180	-30

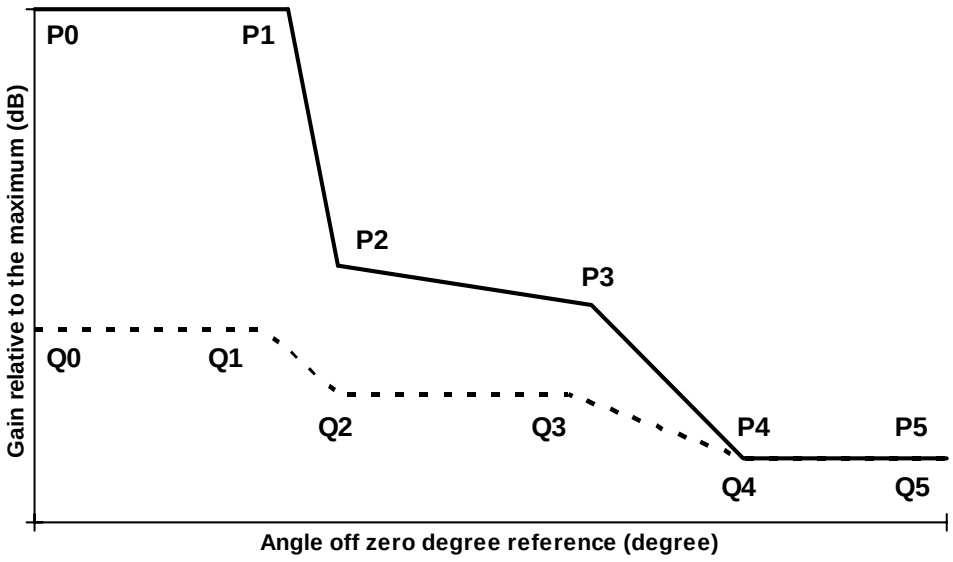

Figure 5: Normalized CS4 sector antenna template for azimuth

Table 5: Class CS4

a)

Co-polar	Angle (degree)	Relative Gain (dB)
P0	0	0
P1	α + 5	0
P2	α + 30	-20
P3	110	-23
P4	140	-35
P5	180	-35

b)

Cross-polar	Angle (degree)	Relative Gain (dB)
Q0	0	-25
Q1	α	-25
Q2	α + 30	-30
Q3	105	-30
Q4	140	-35
Q5	180	-35

4.2.2 Minimum boresight gain, sectored

The CS sectored antenna boresight gain shall exceed the boundaries defined in figure 6 as a function of sector angle 2α, in the range 15° to 180° and for all frequencies in the 30 GHz to 40,5 GHz frequency range.

NOTE: Antenna boresight gain does not necessarily correspond to the 0° reference gain.

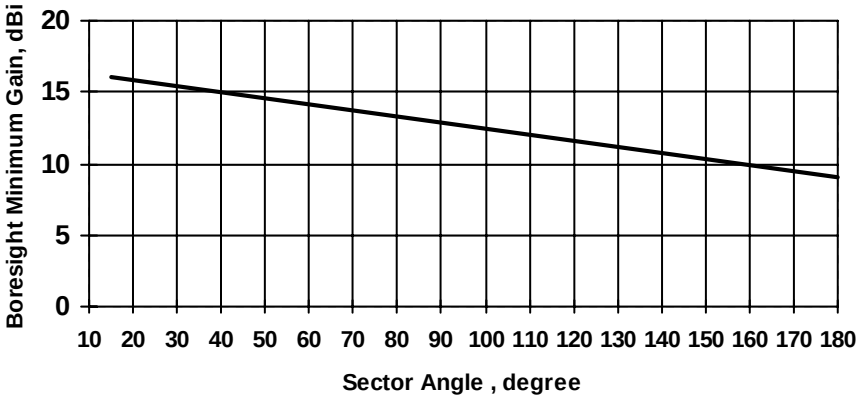

Figure 6: CS sector antenna boresight minimum gain

Table 6: CS sector antenna boresight minimum gain

Angle (degree)	Relative Gain (dBi)
15	16
180	9

4.3 Central station sectored elevation RPEs

One symmetric CS antenna elevation RPE is defined in figure 7. For antennas designed without any tilt the 0° reference direction normally corresponds to the boresight direction.

It may be necessary in practical deployments to use electrical or mechanical tilt, or a combination of these two, to achieve the required cell coverage, taking into account the surrounding terrain, for example.

The elevation pattern is considered appropriate to the commonly used range of 0° to -10° for electrical downtilt. A further mechanical downtilt of up to ±10° may be suitable for some situations.

An electrical tilt is translated onto the corresponding pattern as a θ° shift along the elevation angle axis.

NOTE: Positive angles are for above boresight (up) and negative angles are for below (down).

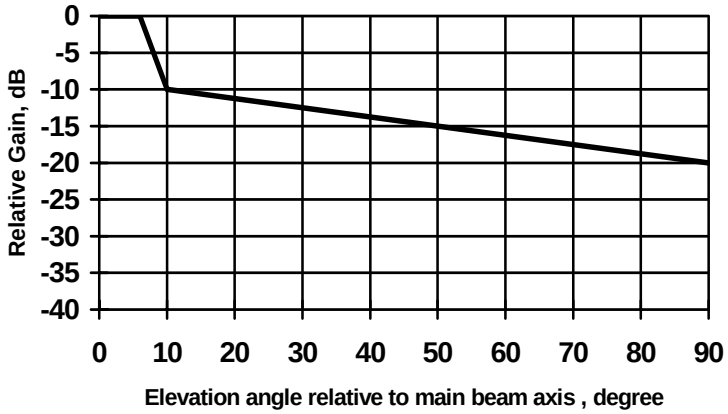

Figure 7: Symmetric CS antenna co-polar elevation RPE

Table 7: Symmetric CS antenna co-polar elevation RPE

Elevation angle (degree)	Co-polar (dB)
0	0
6	0
10	-10
90	-20

The co-polar limit in figure 7 shall be linearly interpolated beyond the -20 dB, 90° point out to the point defined at 180° by the appropriate azimuth class of antennas described in tables 2, 3 and 4.

The cross-polar limit shall be linearly interpolated between the 0° point and the 180° point from the appropriate azimuth Class of antennas described in tables 2, 3 and 4.

4.4 Central Station omni-directional antennas

For omni-directional Central Station (CS) antennas the following parameters shall apply for all frequencies in the 30 GHz to 40,5 GHz band:

- min. nominal gain: 8 dBi;
- gain ripple (azimuth): 3 dB maximum (peak-to-peak);
- cross-polar discrimination: 20 dB minimum.

4.4.1 CS Omni Elevation RPEs

Two CS omni antenna elevation RPEs are defined:

- one for antennas designed to exhibit symmetric RPEs about the 0° reference direction (table 8); and
- one for antennas designed for asymmetric RPEs (table 9).

For antennas designed without any tilt the zero degree reference direction normally corresponds to boresight.

It may be necessary in practical deployments to use electrical or mechanical tilt, or a combination of these two, to achieve the required cell coverage, taking into account the surrounding terrain, for example.

These elevation patterns are considered appropriate to the commonly used range of 0° to -10° for electrical down-tilt. An electrical tilt is translated onto the corresponding pattern as a ± shift along the elevation angle axis.

NOTE: Positive angles are for above boresight (up) and negative angles are for below (down).

4.4.1.1 Symmetric elevation RPEs

For **omni-symmetric** antennas the co-polar limits shown in figure 8 and table 8 shall apply, with a uniform value of -20 dB for the cross-polar limit.

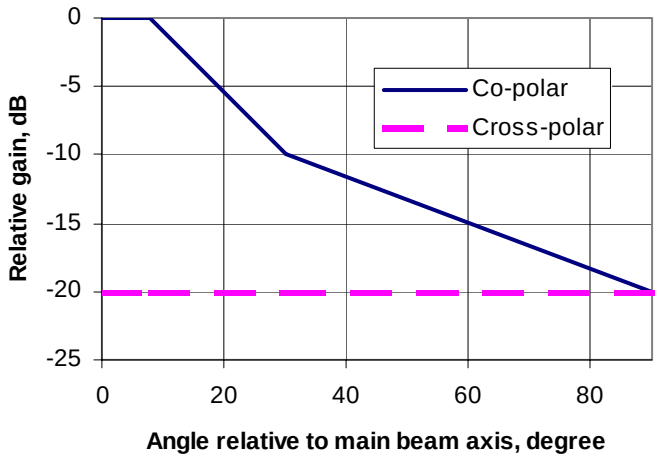

Figure 8: Omni-symmetric CS antenna elevation patterns

Table 8: Omni-symmetric CS antenna elevation patterns

Angle (degree)	Co-polar (dB)	Angle (degree)	Cross-polar (dB)
0	0	0	-20
8	0	90	-20
30	-10		
90	-20		

4.4.1.2 Asymmetric elevation patterns

For **omni-asymmetric** antennas the **co-polar and cross-polar** limits shown in figure 9 and in table 9 shall apply, with a uniform value of -20 dB for the cross-polar limit.

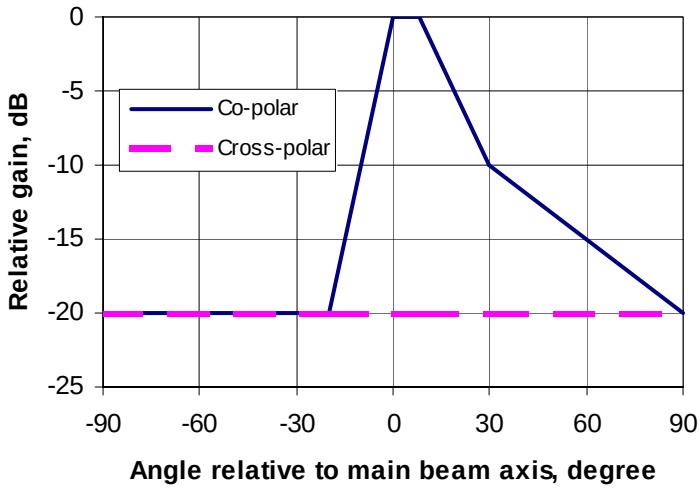

Figure 9: Asymmetric CS antenna elevation pattern

Table 9: AsymmetricCS antenna elevation pattern

Angle (degree)	Co-polar (dB)	Angle (degree)	Cross-polar (dB)
-90	-20	-90	-20
-20	-20	0	-20
0	0	90	-20
8	0		
30	-10		
90	-20		

4.5 Polarization, terminal station and central station antennas

The antenna shall radiate a linearly polarized wave.

4.6 Radomes

Antennas adopting radomes shall conform to the absolute gain and radiation pattern values stipulated in the sections above, with the radome in place.

5 Conformance tests

The requirements in EN 301 126-3-2 [3] shall apply.

Additional parameters appropriate to system implementation may be subject to agreement between the equipment purchaser and supplier.

History

Document history			
V1.1.1	July 2003	One-step Approval Procedure	OAP 20031128: 2003-07-30 to 2003-11-28
V1.1.1	December 2003	Publication	