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Fixed Radio Systems; Point-to-Multipoint Antennas; Antennas for Point-to-Multipoint fixed radio systems in the 1 GHz to 3 GHz band

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Fixed Radio Systems; Point to Multipoint Antennas; Antennas for Point-to-Multipoint fixed radio systems in the 1 GHz to 3 GHz band

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Foreword

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

The present document was firstly started as part 2 of EN 301 631. It has been decided by ETSI Technical Committee Transmission and Multiplexing to publish it as a standalone document under EN 301 525 V1.1.1.

The purpose of the present document is to define the antenna performance standards necessary to ensure optimum frequency co-ordination between like systems and/or different services by the Regulatory Authorities in the re-planned 1 GHz to 3 GHz band. The 3 GHz upper limit has been introduced making reference to the WARC '92 Final Acts [4] and the frequency plans as given in CEPT Recommendation T/R 13-01 [1], ITU-R Recommendation F.746-3 [2] and ITU-R Recommendation F.1098 [3].

Antennas as components for radio relay systems may need to meet environmental, mechanical and electrical characteristics not covered by the present document, in order that the systems will operate as intended. Characteristics to be considered are provided as guidance in Annex A.

The purpose of the present document is to define the requirements for antennas used in conjunction with point-to-multipoint (P-MP) systems necessary to facilitate frequency co-ordination between services in the frequency band 1 GHz to 3 GHz.

National transposition dates

Date of adoption of this EN:	5 May 2000
Date of latest announcement of this EN (doa):	31 August 2000
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	28 February 2001
Date of withdrawal of any conflicting National Standard (dow):	28 February 2001

1 Scope

The present document specifies the essential electrical requirements for linear polarization fixed beam antennas to be utilized with new Point-to-Multipoint (P-MP) systems, including central station and terminal station applications, operating in frequency bands from 1 GHz to 3 GHz. These systems use various multiple access schemes. Electronically steerable antennas, and circularly polarized antennas are not considered under the present document.

Only in exceptional circumstances, and after a consultation period with operators and manufacturers, the Regulatory Authority may impose the use of tighter requirements than the minimum values given in the present document, in order to maximize the use of scarce spectrum resources.

The application of these radio systems is anticipated to be for point-to-multipoint links in local access networks and customer access links.

For some high gain, point-to-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 300 631-1 [6].

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.

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- [1] CEPT Recommendation T/R 13-01: "Preferred channel arrangements for fixed services in the range 1-3 GHz".
- [2] ITU-R Recommendation F.746-3 (1994): "Radio-frequency channel arrangements for radio-relay systems".
- [3] ITU-R Recommendation F.1098 (1994): "Radio-frequency channel arrangements for radio-relay systems in the 1 900-2 300 MHz band".
- [4] Final Acts of the World Radiocommunications Conference for dealing with frequency allocations in certain parts of the spectrum (WARC-92), Malaga-Torremolinas 1992.
- [5] ETSI EN 301 126-3-2: "Fixed Radio Systems; Conformance testing; Part 3-2: Point-to-Multipoint antennas - Definitions, general requirements and test procedures".
- [6] ETSI 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".
- [7] ETSI ETS 300 019-1-4: "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-4: Classification of environmental conditions; Stationary use at non-weather protected locations".
- [8] IEC Publication 60339-1: "General purpose rigid coaxial transmission lines and their associated flange connectors. Part 1: General requirements and measuring methods".
- [9] IEC Publication 60339-2: "General purpose rigid coaxial transmission lines and their associated flange connectors - Part 2: Detail specifications".

- [10] IEC Publication 60169-1: "Radio-frequency connectors. Part 1: General requirements and measuring methods", and applicable sub-parts.
- [11] EN 122150: "Sectional Specification: Radio frequency coaxial connectors - Series EIA flange".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

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

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

central station: base station which communicates each way with many terminal stations, and in some cases repeater stations.

copolar 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.

crosspolar discrimination: difference in dB between the peak of the copolarized main beam and the maximum crosspolarized signal over an angle measured within a defined region.

crosspolar 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.

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

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 was radiated isotropically.

half power beamwidth: angle between the two directions at which the measured copolar 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.

interport 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.

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

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

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

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

radiation pattern: diagram relating power flux density at a constant distance from the antenna to the direction relative to the antenna main beam axis.

radiation pattern envelope (RPE): envelope below which the radiation pattern shall fit.

radome: cover of dielectric material, intended to protect 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 stations. The repeater station may also provide the interfaces to the subscriber equipment if applicable.

sector angle: declared angle of coverage in azimuth of a sectored antenna, defined as 2α in the present document.

terminal station: 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 (0°) reference direction: declared direction as reference to the antenna mechanical characteristics, used as reference for RPE.

3.2 Symbols

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

α	Alpha (= half the sector angle)
dB _i	Decibels relative to an isotropic source
f _o	Nominal centre frequency of declared antenna operating range
GHz	GigaHertz
MHz	MegaHertz

3.3 Abbreviations

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

CS	Central Station
HPBW	Half Power BeamWidth
PIM	Passive InterModulation
P-MP	Point-to-Multipoint
RPE	Radiation Pattern Envelope
RS	Repeater Station
TS	Terminal Station
VSWR	Voltage Standing Wave Ratio

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4 Frequency bands

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The present document applies to the frequency bands given in CEPT Recommendation T/R 13-01 [1], ITU-R Recommendation F.746-3 [2] and ITU-R Recommendation F.1098 [3].

5 Types of antennas

5.1 Antenna Types

The present document addresses fixed beam antennas used in the central (CS) and terminal (TS) stations including repeaters (RS).

The antennas are used in a system which can generally be described as in figure 1:

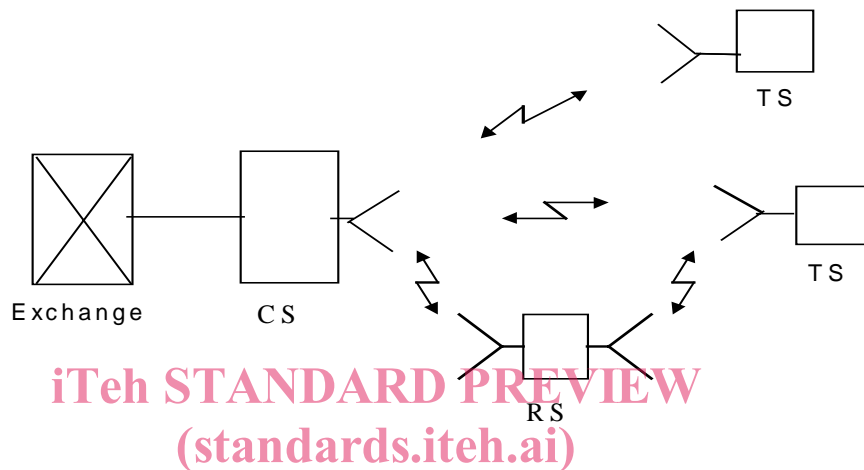


Figure 1: General Point-to-Multipoint System Architecture

<https://standards.iteh.ai/catalog/standards/sist/7d6fc8b0-33dc-4aab-87c7-17c53147a101/en-301-525-v1-1-1-2003>

- CS:** Central Station, which is linked to all remote stations (repeater or terminal stations) by microwave transmission paths.
- TS:** Terminal Station (outstation with subscriber interfaces).
- RS:** Repeater Station (radio repeater outstation with or without subscriber interfaces). A RS may serve one or more TSs.

These antennas shall be grouped into the following Types:

- Central and repeater stations:** Omnidirectional;
 Secteded;
 Directional, conforming to the requirements for TS antennas;
- Terminal stations:** Directional.

5.2 Antenna classifications

5.2.1 Central Station (CS) Classes

With respect to the azimuthal radiation pattern envelope (RPE), a number of Classes may be identified for central station (CS) sectored antennas, for example:

- Class CS 1;
- Class CS 2;
- Class CS 3.

Further Classes may be defined as required. These Classes allow flexibility for a variety of different systems, and may be generally appropriate for lower and higher density deployments. If appropriate, the definition of antenna Classes is given in subsequent parts of the present document.

With respect to the azimuthal RPE for omnidirectional CS antennas, no requirement for separate Classes has been identified.

5.2.2 Terminal Station (TS) Classes

With respect to the radiation pattern (RPE), a number of classes may be identified for terminal station (TS) directional antennas, for example:

- Class TS 1;
- Class TS 2;
- Class TS 3.

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Further Classes may be defined as required. These Classes allow flexibility for a variety of different systems and deployment conditions. If appropriate, the definition of antenna Classes is given in subsequent parts of the present document.

6 Electrical characteristics

For the purpose of the present document, an antenna is specific to Type, Class, the frequency band of operation and the mid - band gain. An antenna which employs a radome shall meet the requirements of the present document with the radome in place.

A 0° reference direction shall be defined for each antenna. The radiation characteristics in the present document are all referred to this 0° reference direction.

6.1 Terminal Station (TS) Antennas

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