

Methods of

Measurement on receiving antennas for satellite broadcast transmission in the 11/12 GHz band —

**Part 2: Mechanical and environmental
tests on individual and collective
receiving antennas**

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British Standard

ICS 33.120.40

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 22, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Amendments issued since publication

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Descriptors: Radiocommunications, satellite broadcasting, receivers, antenna conductor, mechanical tests, environmental tests, measurements, characteristics, testing conditions

English version

Methods of measurement on receiving antennas for
satellite broadcast transmission in the 11/12 GHz band
Part 2: Mechanical and environmental tests on individual
and collective receiving antennas

(IEC 1114-2:1996)

Méthodes de mesure pour les
antennes de réception des émissions
de radiodiffusion par satellite dans la
bande 11/12 GHz
Partie 2: Essais mécaniques et
climatiques sur les antennes de
réception à usage individuel ou
collectif (CEI 1114-2:1996)

Meßverfahren für Empfangsantennen
für Satelliten-Rundfunkübertragung im
11/12 GHz-Bereich
Teil 2: Mechanische und klimatische
Prüfungen an Antennen für Einzel- und
Gemeinschaftsempfang
(IEC 1114-2:1996)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 12A/410/FDIS, future edition 1 of IEC 1114-2, prepared by SC 12A (transformed into SC 100A, Receiving equipment, of IEC TC 100, Audio, video and multimedia systems and equipment), was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61114-2 on 1996-03-05.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1996-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-12-01

Annexes designated “normative” are part of the body of the standard.

Annexes designated “informative” are given for information only.

In this standard, Annex ZA is normative and Annex A and Annex B are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 1114-2:1996 was approved by CENELEC as a European Standard without any modification.

In the official version, for Annex B, Bibliography, the following notes have to be added for the standards indicated:

- IEC 68-2-6 NOTE Harmonized, together with its amendments 1:1983 and 2:1985, as HD 323.2.6 S1:1988 (not modified).
- IEC 68-2-27 NOTE Harmonized as EN 60068-2-27:1993 (not modified).
- IEC 597-3 NOTE Harmonized as HD 95.3 S1:1984 (not modified).
- IEC 1079-1 NOTE Harmonized as EN 61079-1:1993 (not modified).

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1 Scope

This part of IEC 1114 applies to receiving antennas for satellite broadcast transmissions in the 11/12 GHz band. The frequency ranges of the band are those defined by WARC BS-77 and RARC SAT-83.

The object of this part is to define the conditions and methods of measurement to be applied. This part does not specify performance requirements.

The receiving antenna, together with an SHF converter, constitutes an outdoor unit of a satellite receiver. Methods of measurement on the SHF converter are described in IEC 1079-1.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 1114. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreement based on this part of IEC 1114 are encouraged to investigate the possibility of applying the most recent editions of the normative documents listed below. Members of ISO and IEC maintain registers of currently valid International Standards.

IEV 50(712):1992, *International Electrotechnical Vocabulary (IEV) — Chapter 712: Antennas*.

IEC 68-1:1988, *Environmental testing — Part 1: General and guidance*.

IEC 68-2-11:1981, *Environmental testing — Part 2: Tests — Test Ka: Salt mist*.

IEC 68-2-14:1984, *Environmental testing — Part 2: Tests — Test N: Change of temperature*.

IEC 68-2-52:1984, *Environmental testing — Part 2: Tests — Test Kb: Salt mist, cyclic (sodium chloride solution)*.

IEC 1114-1:1992, *Methods of measurement on receiving antennas for satellite broadcast transmissions in the 12 GHz band — Part 1: Electrical measurements on DBS receiving antennas*.

3 General explanation of terms

For the purpose of this part of IEC 1114, the following general definitions of terms apply.

3.1 receiving antenna: An SHF antenna intended for use in individual and collective reception of satellite broadcast signals.

This standard mainly applies to paraboloidal reflector antennas, which include offset paraboloidal reflector antennas, Cassegrain reflector antennas and other equivalent types. However, it may also apply to planar array antennas.

A paraboloidal reflector antenna usually comprises a main reflector, a primary (and sometimes a secondary) radiator, a circular polarizer, an SHF converter, supporting structures for a primary radiator or subreflector, pointing structures and an antenna fixture to a supporting mast. The supporting mast, however, is not included in this standard. A radome is also excluded.

3.2 mechanical characteristics: The characteristics selected concern the ability of the antenna under test to withstand mechanical forces (wind load, vibration etc.) with acceptable degradation of the electrical performance.

3.3 environmental characteristics: These characteristics concern the durability of the antenna under test when exposed to various adverse climatic conditions over a long period.

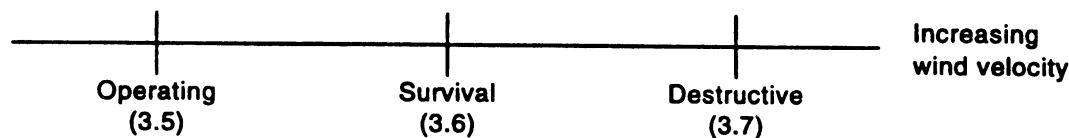
3.4 wind velocity: The wind velocity is defined as the maximum instantaneous wind velocity.

3.5 operating wind velocity: The specified velocity at which the electrical characteristics of the antenna under test shall not degrade by more than specified values, without readjustment of the antenna direction. A typical value for the antenna gain reduction is 1 dB.

3.6 survival wind velocity: The specified velocity at which no permanent degradation of the antenna under test may occur, but re-adjustment of the antenna is required to restore the electrical performance characteristics of the antenna.

3.7 destructive wind velocity: The specified velocity at which permanent degradation of the electrical characteristics of the antenna under test may occur. But, for safety reasons, no part of the antenna shall mechanically disintegrate at this specified wind velocity.

3.8 illustrative definitions and typical values of the three kinds of wind velocities: An illustration of the definitions of the three wind velocity values is shown below:



The three values of wind velocities shall be as specified in the standard of the country for which the antenna is designed. Typical wind velocities are as follows:

- operating wind velocity 20 m/s
- survival wind velocity 40 m/s
- destructive wind velocity 60 m/s

3.9 maximum wind exposure area: The maximum wind exposure area for a device under test is the maximum projected area for the device. It may not coincide with the projected area in the direction of the applied force, but it represents the worst case.

4 General notes on measurements

4.1 General conditions

4.1.1 Introduction

Measurements shall be carried out in accordance with the following conditions, to ensure repeatable results.

4.1.2 Environmental conditions

Unless otherwise specified, the general ranges of ambient atmospheric conditions for measurement are those shown in Table 1.

Table 1 — Environmental conditions

Temperature range	20 °C ± 15 °C
Relative humidity	55 % ± 30 %
Air pressure	86 kPa to 106 kPa

4.1.3 Number of test samples

One antenna should be prepared for each test item. If an antenna has to be tested for more than two test items, the test order shall follow the procedure given in IEC 68-1.

4.1.4 Accuracy of measuring instruments

Under consideration.

4.1.5 Stabilization period

Measurements should be started after the characteristics have had time to stabilize.

4.2 Measuring instruments

4.2.1 Vibration generator

The vibration generator shall be able to generate sinusoidal vibrations over a range of frequencies from at least 5 Hz to 55 Hz and have amplitudes that can be adjusted easily.

4.2.2 Test chamber for thermal test

The thermal test chamber shall have sufficient capacity to contain the antenna under test and be able to maintain the chosen test temperature at any portion of the antenna under test within ± 2 °C.

The test chamber shall comply with the requirements given in IEC 68-2-14.

4.2.3 Water tank for waterproof test

The water tank shall have sufficient capacity to permit the complete immersion of a primary radiator and an SHF converter. Any air leaks from devices under test in the water tank shall be readily observable.

4.2.4 Test instruments for salt mist test

The following instruments are necessary for the test:

- a) test chamber;
- b) salt solution tank;
- c) atomizer;
- d) thermal controller;
- e) humidifier.

The test chamber shall comply with the requirements given in IEC 68-2-11.

The test chamber shall have a capacity that can contain the antenna under test or substitutional specimens for the antenna components.

The salt mist shall flow horizontally.

The atomizer, air supply and salt solution shall comply with the requirements given in IEC 68-2-11.

5 Methods of measurement

5.1 Wind load at operating wind velocity

5.1.1 Method of measurement

- a) The antenna under test is installed on a rigid antenna test fixture, as shown in Figure 1. The centre part of the reflector is directly supported by the fixture and the periphery of the reflector is connected to the fixture by means of springs at four points, that is at the upper edge, the lower edge, the right side edge and the left side edge. There shall be an apparatus to apply forces to a primary radiator in vertical and horizontal directions.
- b) The antenna under test with its fixture is set up in a test site according to clause 4 of IEC 1114-1, for the measurement of the antenna gain.
- c) Measure the antenna gain or the figure of merit (G/T) with no wind load.
- d) Apply forces W_1 and W_2 to the reflector and the primary radiator according to the procedure shown in Table 2. The values of W_1 and W_2 are calculated from the following equations:

$$W_1 = 0,86 \times V^2 \times A_1 \text{ (N)} \quad (1)$$

$$W_2 = 0,61 \times V^2 \times A_2 \text{ (N)} \quad (2)$$

where

- A_1 is the maximum wind exposure area for the reflector (m^2);
- A_2 is the maximum wind exposure area for the primary radiator, the SHF converter and the supporting structures of the primary radiator (m^2);
- $V = V_0$ is the operating wind velocity (m/s).

Table 2 — Test sequence

Sequence	$W_1/4$	W_2
1	Push all	Downward
2	Push all	Sideward
3	Pull all	Downward
4	Pull all	Sideward

- e) Measure the antenna gain or G/T, while applying the above forces.

NOTE The following cross-polarization characteristics are measured in countries where cross-polarized waves are used or interfering signals from other satellites may be received:

- a) the gain or G/T for each polarization;
- b) the radiation diagram for each polarization;
- c) the cross-polarization discrimination.