

Methods of measurement for equipment used in digital microwave radio transmission systems —

Part 2: Measurements on terrestrial radio-relay systems —

Section 2.2 Antenna

The European Standard EN 60835-2-2:1994 has the status of a
British Standard

UDC 621.396.6:620.1:621.317.08

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee EPL/12 Radio communication, upon which the following bodies were represented:

- British Broadcasting Corporation
- British Radio and Electronic Equipment Manufacturers' Association
- British Telecommunications plc
- ERA Technology Ltd.
- Institution of Electrical Engineers
- Radio, Electrical and Television Retailers' Association
- Radiocommunications Agency

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 August 1995

© BSI 01-2000

The following BSI references relate to the work on this standard:
Committee reference EPL/12
Draft for comment 90/30574 DC

ISBN 0 580 24395 8

Amendments issued since publication

Amd. No.	Date	Comments

Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Foreword	2
Text of EN 60835-2-2	3
List of references	Inside back cover

National foreword

This British Standard has been prepared by Technical Committee EPL/12 and is the English language version of EN 60835-2-2:1994 *Methods of measurement for equipment used in digital microwave radio transmission systems — Part 2: Measurements on terrestrial radio-relay systems — Section 2: Antenna*, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 835-2-2:1994 published by the International Electrotechnical Commission (IEC).

BS EN 60835 is published in three Parts. The other Parts are:

- *Part 1: Measurements common to terrestrial radio-relay systems and satellite earth stations;*
- *Part 3: Measurements on satellite earth stations.*

The methods described in this Section are suitable for both line-of-sight and tropospheric scatter radio-relay systems using linear polarization. Methods of measurement for passive systems or periscope antennas, and systems where the antenna cannot be measured separately, are not considered.

Some of the many Sections of the three Parts have appeared under the number BS 7573, of the same generic title.

Cross-references

Publication referred to	Corresponding British Standard
IEC 50	BS 4727 <i>Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms</i>
EN 60835-1-2:1993 (IEC 835-1-2:1992)	BS EN 60835 <i>Methods of measurement for equipment used in digital microwave radio transmission systems</i> Part 1 <i>Measurements common to terrestrial radio-relay systems and satellite earth stations</i> Section 1.2:1995 <i>Basic characteristics</i>

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 16, 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.

UDC 621.396.6:620.1:621.317.08

Descriptors: Radiocommunications, Telecommunications, communication equipment, earth stations, radio-relay systems, microwave frequencies, digital technics, antenna, conductors, measurements, electrical properties, tests

English version

Methods of measurement for equipment used in digital
microwave radio transmission systems
Part 2: Measurements on terrestrial radio-relay systems
Section 2: Antenna

(IEC 835-2-2:1994)

Méthodes de mesure applicables au matériel
utilisé pour les systèmes de transmission
numérique en hyperfréquence
Partie 2: Mesures applicables aux faisceaux
hertziens terrestres
Section 2: Antenne
(CEI 835-2-2:1994)

Meßverfahren für Geräte in digitalen
Mikrowellen-Funkübertragungssystemen
Teil 2: Messungen an terrestrischen
Richtfunksystemen
Hauptabschnitt 2: Antenne
(IEC 835-2-2:1994)

This European Standard was approved by CENELEC on 1994-03-08. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B-1050 Brussels

© 1994 Copyright reserved to CENELEC members

Foreword

The text of document 12E(CO)158, as prepared by Subcommittee 12E, Radio relay and fixed-satellite communications systems, of IEC Technical Committee 12, Radiocommunications, was submitted to the IEC-CENELEC parallel vote in July 1993.

The reference document was approved by CENELEC as EN 60835-2-2 on 8 March 1994.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1995-05-01
- latest date of withdrawal of conflicting national standards (dow) 1995-05-01

Annexes designated “normative” are part of the body of the standard. In this standard, Annex ZA is normative.

Contents

	Page
Foreword	2
Introduction	3
1 Scope	3
2 Normative references	3
3 Definitions	3
4 Methods of measurement	5
4.1 Test-range considerations	5
4.2 Antenna gain	6
4.3 Radiation patterns	9
4.4 Cross-polarization discrimination	10
4.5 Return loss	11
4.6 Multi-port antenna isolation	12
5 Bibliography	12
Annex ZA (normative) Other international publications quoted in this standard with the references of the relevant European publications	16
Figure 1 — Measurement of antenna gain by comparison with a gain-reference antenna	12
Figure 2 — Measurement of antenna gain by the direct method	13
Figure 3 — Examples of presentation of results of antenna-gain measurement	14
Figure 4 — Example of arrangement for the measurement of radiation pattern	15
Figure 5 — Example of radiation patterns and their envelope	15

Introduction

Antennas are key elements of radio-relay systems. A satisfactory fade margin for such systems is usually obtained by using high directivity, i.e. high-gain, antennas at both the transmitter and receiver terminals of a radio link.

An antenna with a high directivity usually also has a narrow beam width main lobe which can provide a useful measure of protection against reflected rays. These reflected rays can lead to multipath fading.

Rapid sidelobe suppression away from the main lobe is often a requirement at radio-relay system nodes to provide sufficient de-coupling between radio links which employ frequency use and small angular separation between the line-of-sight paths.

Moreover, and especially for digital radio-relay systems, a high cross-polarization discrimination is necessary to provide sufficient decoupling between adjacent orthogonally polarized channels where the signal spectra overlap considerably, and between two orthogonally polarized co-frequency channels, i.e. using the same nominal carrier frequency.

If the antenna under test is installed with a radome in normal operation on a radio link, all measurements should be performed with the radome fitted.

1 Scope

This section of IEC 835-2 gives methods of measurement of the electrical characteristics of antennas used in terrestrial radio-relay systems at frequencies above 1 GHz.

The methods described are suitable for both line-of-sight and tropospheric scatter radio-relay systems using linear polarization. This section does not consider methods of measurement for passive repeaters or periscope antennas nor does it address systems where the antenna cannot be measured separately.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this section of IEC 835-2. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this section of IEC 835-2 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 50, *International Electrotechnical Vocabulary (IEV)*.

IEC 835-1-2:1992, *Methods of measurement for equipment used in digital microwave transmission systems — Part 1: Measurements common to terrestrial radio-relay systems and satellite earth stations — Section 2: Basic characteristics*.

3 Definitions

For the purposes of this section of IEC 835-2, the following definitions apply.

Where a term is not defined in this section, the definition is assumed to be identical with the definition given in the International Electrotechnical Vocabulary (IEV). In case of conflict, the definition given here takes precedence.

NOTE Characteristics for which methods of measurement are given are defined in the corresponding measurement subclause.

3.1

antenna

an antenna is defined as a device for coupling a transmission line to free-space for the purpose of transmitting or receiving electromagnetic waves. It includes all the elements affecting the radiation characteristics of the antenna, e.g. primary feed(s), including polarization and/or frequency filters, reflectors, etc. It does not include the associated transmission lines and other electrical components on the transmitter/receiver side of the antenna terminals defined for measurement purposes. The antenna terminals must be specified. The antenna may also include a radome